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ECOLOGICAL AND ECONOMIC INTERACTIONS**

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## PREFACE

In this, the UN declared "International Year of Forests", it is a great pleasure to be co-hosting the 2011 IUFRO Small-scale forestry conference in Freiburg, Germany from 24-28 July 2011. Small-scale forestry is a complex network of social, ecological and economic issues which results in diverse interactions between owners, stakeholder groups, communities and not least the forest environment. This conference aims to make the diversity of these interactions visible, with special attention to the fact they can be synergistic or conflicting.

The 47 papers and abstracts published in these proceedings are the result of a tremendous amount of rigorous scientific research and a careful review process. They present the state of the art of small-scale forestry today and with contributions from more than 20 countries and all continents, truly represent the most up to date global thinking about small-scale forestry.

Credit for the contributions goes first and foremost to the authors and we thank them for their effort and creativity to produce these papers.

Special thanks also to the eight members of the international scientific committee chosen for their technical expertise and good judgment. They dedicated enormous amounts of time to carefully read and evaluate the more than 100 conference submissions received.

It is with pride that we share the results of these collective endeavours with conference participants and the wider forestry community as a "Pre-conference Proceedings". Based on the quality of these significant papers and abstracts we anticipate another informative, diverse and challenging IUFRO Small-scale forestry conference and look forward to hearing the associated presentations "live" at the conference.

We have thoroughly enjoyed planning the conference programme for our Small-scale forestry research colleagues throughout the world and we take great delight in soon welcoming old and new friends and colleagues to Freiburg this July.



Dr. Christoph Hartebrodt  
Forest Research Institute Baden-Württemberg  
Conference co-convenor



Prof. Dr. Ulrich Schraml  
Albert-Ludwigs University  
Conference co-convenor



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# INNOVATION, RESPONSIVENESS AND ADAPTABILITY AS MEANS FOR FOSTERING PARTICIPATION IN FOREST ACCOUNTANCY DATA NETWORKS

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## ABSTRACT

The motivation for participating in a forest accountancy data network hinges on the feedback of relevant economic data to the owners or managers of the respective enterprises. In order to sustain their interest, the contents, the quantity as well as the quality of the information provided has to be adapted to the changing requirements and frame conditions. To some extent, also adjustments according to individual demands can be realized and may serve as incentives.

The paper highlights the role of such innovations for the prosperity of networking activities at the example of Austrian accountancy data networks. Modifications and extensions directly responding to requests on behalf of participating enterprises are of special significance for the general esteem as well as for the further development of the overall system. Offering and demonstrating new possibilities is another driver of a vivid interaction. Examples to be presented comprise e.g. additional ratios and specific formats for interfirm comparison, planning tools and an extension in terms of machine hour accounting for farm forest enterprises.

However, striving for compliance with specific requests faces limits, necessitates trade-offs and may even trigger adverse effects. Safeguarding the consistency of the methodology and hence also of the data pool is a considerable challenge. The paper addresses such critical issues as well and reflects Austrian experiences in dealing with those.

**Keywords:** Forest Accountancy Networks, Ratio Analysis, Interfirm Comparison, Incentives

## 1 INTRODUCTION

Several European countries share the tradition of monitoring the economic situation of forest holdings by means of forest accountancy data networks (see e.g. Hyttinen et al. 1997). These networks represent more or less stable and representative panels. They are a specific infrastructure for gathering data, located somewhere between case studies and surveys in terms of number of enterprises and detail of information (Sekot 2000). Accounting data is either submitted by the participants or collected by specialized staff according to standardized protocols. Safeguarding the motivation for participation is a strategic issue for running any accountancy network efficiently as well as sustainably. The 'Guidelines for Establishing Farm Forestry Accountancy Networks' list several policy tools for encouraging participation (see Niskanen & Sekot 2001, p. 41ff). Although burdened with the likeliness of self-selection bias and panel effect, the feedback of specific information to the participants plays a key role in terms of motivation and for ensuring a high quality of the data.

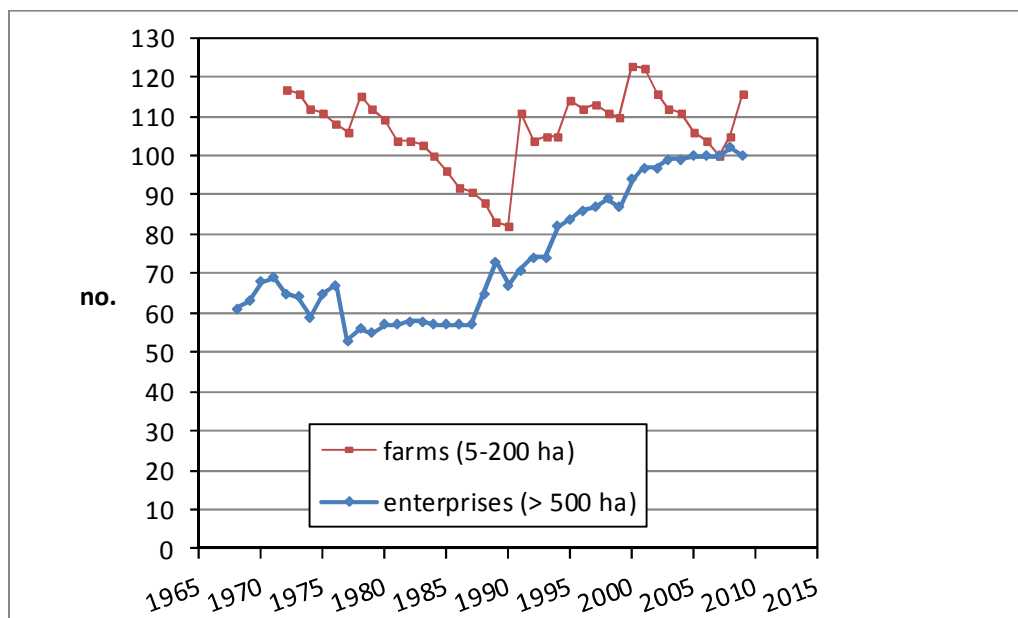
In times of rapidly changing frame conditions, technical possibilities and information requirements, a solid framework of ratios implies a standstill of developments and may be perceived as a retrograde step. It is a major challenge for those running an accountancy network to fulfill the monitoring purposes and at the same time to constantly modernize the system and to respond to specific requests. A flexible design is a technical pre-requisite for adaptability and responsiveness. On top of that, latent wishes and upcoming requests on behalf of the participants should be anticipated so that innovations are implemented not only in reaction to an explicit demand but also or even primarily in a pro-active way.

## 2 AUSTRIAN FOREST ACCOUNTANCY DATA NETWORKS

In Austria, economic monitoring of forest enterprises relies on two accountancy networks. Farm forests are represented by a small sub-sample of the national Farm Accounting Data Network comprising holdings which manage between 5 and 200 ha of forests. Members of the forest owner's association managing more than 500 ha of forests constitute the network of forest enterprises. Participation in these networks is voluntary and the samples cannot be regarded as representative. Both networks apply a system of cost accounting, the major balance sheet being the core element of the individual documentation (see Sekot 2004).

In both cases, the data are collected in the field by a small group of specialists. Conceptually as well as technically, the University of Natural Resources and Life Sciences Vienna (BOKU) is in charge of both networks. All reports are designed as EXCEL-files, the data being extracted from the common database by means of specific functions. Whereas major modifications at the level of the central database require external programming services, reporting is very flexible. Typically, the reports are designed by the project leader at BOKU exclusively. At the level of the EXCEL-output, however, modifications and adjustments can be introduced by the field staff collecting data and moderating benchmarking exercises of bigger forest enterprises.

Currently, the size of the two networks in terms of participants is of the same magnitude. However, the development of participation clearly indicates the different nature of these networks (Figure 1). The network of farm forests is directly commissioned by the ministry for policy purposes. Participants are specifically reimbursed for keeping forestry-specific records and providing their data. There is a general trend of shrinking due to individual farms ceasing their participation. As the size of the sample is not fixed to a specific threshold level, recruiting of new participants occurs at irregular intervals, typically driven by respective requests of the ministry. Conversely, the network of bigger enterprises serves not only policy purposes but is also meant to provide management tools and controlling data to the participants as a special service provided by the forest owners association which is co-running the network (see e.g. Sekot 2007, 2008). Especially from the late 1980s onwards, respective service functions were extended and promoted and met a rising interest. Therefore, the development of participation is mainly driven by the interest of forest owners who would like to join the network and utilize its services. Even the introduction of a fee per day of field work some years ago, which became necessary for financing these activities, did not affect significantly the general trend of rising interest.



**Figure1:** Development of participation in the two Austrian forest accountancy networks

Some statistical data characterizing the two networks are listed in Table 1. Further background information concerning the network of farm forests can be found e.g. in Sekot (2001, 2006). Sekot & Rothleitner (2009a) provide a comprehensive protocol for data collection in bigger forest enterprises, an overview of the various outputs as well as definitions and explanations for the manifold ratios.

**Table 1:** Characteristics of the two Austrian forest accountancy data networks

Feature	Farm forests (5 – 200 ha)	Forest enterprises (> 500 ha)
No. of participants (average 2000/2009)	112	99
Productive forest land (ha) per enterprise (average 2000/2009)	49	3307
Annual volume of cutting (m <sup>3</sup> ) per enterprise (average 2000/2009)	303	23263
Sampling ratio in terms of number of holdings (%)	~ 0.2	~ 32
Sampling ratio in terms of productive forest land (%)	~ 0.6	~ 53
New concept and database application since	1999	1997
First period covered by data in the database	1991	1987
Standard regional groupings	6	6
Standard aggregates of regional groupings	3	3
Standard size classes	1	3
No. of typological features for classification & other features	56	70
No. of quantities for unit costing	7	47
No. of types of cost (including sub-categories) distinguished	28	81
No. of cost centers (including sub-categories) distinguished	6	63+
No. of non-timber revenues distinguished	6	81+
No. of elements in the matrix of timber revenues	1260	3780
No. of individual standard reports (extended master balance sheet)	1	14
No. of variants of individual reports	1	5
No. of individual reports for anonymous interfirm comparison	0	6
No. of reports for benchmarking groups	0	4

Whereas in the network of farm forests recording of all data is obligatory, several differentiations and items are just optional extensions with the bigger forest enterprises (options related to individually definable, auxiliary cost centers are not accounted for in Table 1 but indicated by a plus sign). The individual reports are provided to the farmers as printouts comprising just 10 pages. The various reports designed for forest enterprises are delivered as EXCEL-files, the volume of a total printout potentially amounting to several hundred pages. Typically, only two parts are printed and discussed: a concise information on key ratios ('FOB-Flash') comprising just 6 pages (4 with tables, 2 with graphs of time series) and the main report ('*Fuehrungskennzahlen*') which encompasses 29 pages with tables and an additional 10 graphs. The remainder of reports serves as auxiliary information for detailed analysis, especially in terms of time series analyses and the allocation of auxiliary cost centers (see Table 2).

**Table 2:** Elements of the individual standard reporting in the network of bigger enterprises

Name of report	Main contents	No. of pages
FOB-Flash	Main ratios and developments – overview for owners	4+ graphs
Fuehrungskennzahlen	Part 1: Ratios and proceeds	29+10graphs
BAB-mit-Umlage-1_3	Part 2: Master balance sheet in absolute values; allocation of auxiliary cost centers by means of specific types of cost or proportionally; 2 levels of differentiation of costs	25+52
BAB-mit-Umlage-3_3	Part 3: Master balance sheet in absolute values; generally proportional allocation of auxiliary cost centers; 2 levels of differentiation of costs	20+47
BAB-gruppiert	Part 3 adjusted for working on the screen by means of the EXCEL structuring tool, not designed for printout	-
Hilfsstellen-vor-Umlage	Auxiliary cost centers; original values; 2 levels of differentiation of costs	Max: 9+27
Hilfsstellen-nach-Umlage-1_1	Auxiliary cost centers after allocation of non-wage labor costs; 2 levels of differentiation of costs	Max: 9+27
Hilfsstellen-nach-Umlage-1_3	Auxiliary cost centers after mutual allocation; 2 levels of differentiation of costs	Max: 18+27
Umlage-von	Allocations documented per auxiliary cost center	Variable
Umlage-auf	Allocations documented per charged cost center	Variable
Zeitreihe	Time series of the latest 10 years; nominal values	23
Zeitreihe_real	Time series of the latest 10 years; real values (basic year free to choose)	23

Entwicklungen-ab-1987	Time series from 1987 onwards; nominal values; tables not designed for printout	15 graphs
Entwicklungen-ab-1987_real	Time series from 1987 onwards; real values; ; tables not designed for printout	15 graphs

### 3 SUCCESSFUL INITIATIVES AS STEPS OF DEVELOPMENT

Especially a series of initiatives related to the network of bigger forest enterprises may serve as an example for successful innovations which have been accepted and approved. Instead of the previous FORTRAN-program, which produced only a single, fully standardized report, the technical solution implemented in 1998 relies on a central database. The data frame as well as any reports can be adjusted quite flexibly to new requirements. Reporting consists of a set of EXCEL-files allowing the participants to work with the output e.g. by designing additional graphs or integrating the output in their reporting system e.g. by linking files.

The database in connection with the most flexible scheme of reporting was a pre-requisite for a substantial expansion of the set of documents and information provided to the participants. Major improvements concerned the integration of graphs and the flexible structuring of a variant of a report by means of the respective EXCEL-tool. Meanwhile, 4 types of time series are part of the standard output: one covering the last ten years (formatted ready for printout and including respective averages) is available in nominal as well as in real terms as is the long-term documentation (from 1987 onwards).

However, the number of different reports may confuse forest owners or even some managers, so that they ultimately ignore the information provided. This consideration lead to an additional report specifically designed for providing forest owners with a concise overview. Meanwhile, this report marks the starting point of any discussion of results between the field specialist collecting the data and the individual enterprise. This report not only summarizes key indicators but integrates actual figures and developments at an aggregated level. Expressing the net profit of any cost center in terms of volume and relating this to the allowable cut is an additional element of the 'FOB-flash' not covered by any other report yet. Model calculations balancing the fellings of the last 10 years with the allowable cut and indicating future cutting potentials in terms of sustainability are recently added features triggering vivid discussions.

As indicated in Table 1, interfirm comparisons and benchmarking exercises are supported by means of specifically designed reports. Standard individual reports are provided at least twice a year at different levels of detail: after the first six months of the year, those enterprises where the data could already be collected and processed are provided with preliminary averages for the alpine as well as for the non-mountainous regions. Also a first ranking of all these participants is elaborated. At the end of the year, more detailed material in terms of averages for regions and size classes as well as rankings are provided. Specific averages are calculated for the individual benchmarking circles and fitted into reports which allow a direct comparison of figures and developments. As these benchmarking circles represent the most interested participants, complying to individual requests concerning e.g. additional variables and modified reports is a constant challenge. For instance, one group is interested in average regional results as an additional element of their benchmarking report. Just recently, another group asked for a report which supports direct comparisons of averages stemming from different benchmarking circles.

Several innovations were more or less triggered by respective requests on behalf of individual participants. Respective examples of responsiveness comprise the introduction of additional sub-categories of certain cost and revenue items and ultimately of a refined system of stepwise calculation of contribution margins. Also the sequence of this stepwise calculation scheme has been adopted according to specific requests. Additional variables for the interpretation of harvesting costs such as the structure of technologies applied or the average inclination of the stands were at first used by a benchmarking circle on their own in addition to the standard report provided by the network. While at first only implemented in the benchmarking reports provided to this group exclusively, this set of variables has been adopted as a general new standard meanwhile. Another suggestion was to integrate averages into the comparison of time series. This idea has been adopted as a general standard for all the benchmarking circles.

One participant once commented on the calculation of the break-even point, that typically it is not just a profit of zero which should be achieved. This remark triggered the development of first planning tools, based on the figures of the previous year. The latest extension in terms of planning tools has been developed this spring, once again in response to a quite general request. One of the new tools assists the calculation of an average stumpage

value, thereby taking into account individually definable types of fellings, the respective structure of assortments and the specific costs of different harvesting technologies. A budgeting tool assists the planning process per cost center by providing the figures of the previous year as well as ten years averages in real terms. The scenarios comprise 3 levels of intensity (minimal, ordinary, maximal budget), encompass the whole company and include the planning of investments. The user may choose between a liquidity-oriented and a profit-oriented budgeting approach. All net figures of financing are also expressed in terms of volume valued at average stumpage prices.

A quite far-reaching service may be necessary when a participant requires results which are definitely not in line with the standards of data collection. In such a case, the enterprise may be represented twice in the database: One version consistent with the regulations is used for the computation of averages whereas the other version is provided exclusively to the participant. Respective examples for individually adapted delimitations concern areas belonging to a nature reserve or national park, pension funds or the production of chips for bioenergy plants. However, the number of such exceptional duplicities has to be kept to a low level for sake of efficiency and the respective participants are provided with not fully consistent data for interfirm comparison. Similarly, a differentiation of the enterprise into units at the level of range districts has to be restricted to exceptional circumstances.

## 4 THE RISK OF SUNK COSTS

Typically, most of the developments are not requested explicitly or commissioned by any party but originate from innovative ideas or a merely anticipated future interest on behalf of the participants. Establishing respective reports, tools or services may be regarded as investments in potentials for future success. However, such potentials may never become operational. In such a case, those running the network are burdened with sunk costs, having spent time and money on investments which do not pay off.

In spite of the many positive experiences, some of the developments prepared for the network of bigger enterprises are associated with sunk costs. When specific reports were designed for groups of enterprises engaged in yearly interfirm comparison exercises, a complete set for groups with two up to twelve participants was established although only groups with 2, 5, 6 and 12 participants existed then. The expected demand for the other sizes of groups did not come into effect yet. Meanwhile, however, a general modification of the reporting scheme necessitated a substantial updating of formats and links, rendering the originally designed reports practically useless.

Another example for a minor stranded investment is the 'minimal report' which was designed for those participants, who merely provide their data but are not interested in results and analyses and should therefore be exempted from paying a fee for participation. Ultimately, the forest owners association handled this issue otherwise so that still all the participants are provided with the standard set of individual reports.

Some functionalities of the database application turned out to exceed actual demand as well. A respective feature is the matrix for individually and automatically re-coding types of costs and revenues in the process of importing csv-files into the database. As practice has shown, either the participants adopted the network's classification right away or coding is an integral part in the process of data collection.

It is not always easy to assess future demand and to determine the right time for investing in respective potentials. For instance, a specific survey indicated a general interest in a more flexible application of the model calculation based on allowable cut, which serves as a proxy for changes in the value of the growing stock due to over- or undercutting. Apart from the actual allowable cut alternative measures such as the average allowable cut of the region or the mean of a specific group of enterprises engaged in detailed interfirm comparison were seemingly of interest. Specific functions and adapted reports were designed in order to efficiently manage respective requests. For the time being, however, the demand did not yet materialize. Obviously, the analytical efforts on behalf of the participants still do not encompass these issues in practice.

The network of farm forests provides another example for innovations which remain unutilized. The only major development since the general revision of the concept in 1999 has even been triggered by a very specific interest. The forestry department of the chamber of agriculture in Upper Austria intended to establish a regional farm forest network in order to foster extension services. They wanted to adopt the concept of the national network and were willing to implement a regional extension to it. The only specific request concerned an additional module for machine hour accounting. The respective tool has been developed and implemented. In the end, however, they decided to apply the Styrian concept, which originally had been rejected.

## 5 LIMITS, TRADE-OFFS AND SIDE EFFECTS

Apart from the risk of un-paying investments, responsiveness and adaptability face limits and necessitate trade-offs. Any report or variant increases the hurdles for general steps of development like the introduction of an additional cost or revenue item. In such a case, additional efforts are necessary for updating the whole system in a consistent way. Furthermore, the risk of errors increases as well, the various reports stemming from different periods and reflecting not fully standardized approaches. The manifold links between individual reports (all MS-EXCEL-files) contribute to the complexity of the whole system which is therefore quite prone to mistakes. Consequently, the higher the level of differentiation already is, the more energy-consuming general updates are.

Establishing a valid ranking of the various ideas for further developments is all but straightforward. There is also a certain danger of just tinkering with incremental modifications thus blocking the capacities required for major improvements. In many cases there is no clear correlation between the number of interested participants, the significance of the additional information to be provided and the necessary efforts for implementation. Trade-offs have to be performed between clearly articulated interests of individual participants or small pressure groups on the one hand and general improvements of the system from which the participants benefit only indirectly on the other.

Insufficiently planned or un-coordinated innovations imply a waste of resources and may trigger adverse side effects. On behalf of the institutions and persons running the network a trade-off between centralization and co-ordination has to be performed. Either the competency for adjustments and developments is strictly centralized or the decentralized activities have to be well attuned and co-ordinated. Otherwise, parallel developments may occur, triggering inefficiency and even confusion in case of contradictory solutions provided by different partners. Respective examples pertain to specific reports individually designed for benchmarking circles in parallel. Similar requests were considered as unique and hence treated separately by different field agents, although a general framework existed already.

In the network of bigger forest enterprises, the participants are not paid for providing standardized data but receive a service they even have to pay for on top of their general membership fee to the forest owners association. This places them into a comparatively strong bargaining position as customers. Striving for compliance with specific requests is necessary to ensure the interest in participation but may ultimately corrupt the overall consistency of the accounting data. The personnel collecting the data in the field may be provided with incomplete or biased data or even be urged to knowingly accept certain deviations from the general guidelines. For instance, individual enterprises or specific groups of participants are not interested in certain figures themselves and hence refuse to provide these although respective data is part of the obligatory documentation. Working hours, the volume of sanitary fellings or the number of employees are respective examples. In such a case, the accuracy of reports for aggregates may be impaired, as missing data is counted for zero. This may indeed lead to biased results documented by standard reports. Consequently, one must not rely on the comprehensiveness of the data and a check for missing data has to be performed at least for specific analyses, thereby increasing the cost for data processing. Some deviations from the protocols may nevertheless stay undetected and hence also unaccounted for. For instance, quite a number of participants prefer matching revenues and costs in such a way, that the stocks of felled timber are systematically reduced to zero. This problem could not be resolved properly yet, so that the reported stocks still tend to be underestimated. Another conflict lasted for years until it could be settled. A considerable number of participants preferred to report their timber proceeds at roadside for the sake of better comparability, thereby leaving out any costs and revenues associated with transportation. Ultimately, the general guidelines were adapted in such a way, that logs and pulpwood are to be valued at the roadside but costs and revenues as well as volumes transported are to be recorded as well. In this case, a severe conflict triggered an innovation which is now capable of satisfying all related information requirements.

## 6 CONCLUSIONS, RECOMMENDATIONS AND PROSPECTS

The individual information an accountancy network can provide is later available and less detailed than the output of the internal managerial accounting. Hence, one should focus on such elements, which are typically not supported by standard accounting systems or generally not available within the enterprise. In essence, extended time series and standardized data for interfirm comparison may provide respective additional information.

The limited resources for innovations should be allocated prudently. It is advisable to primarily address immediate demand whereas investments in mere potentials should be postponed as long as possible. However, the budget constraint may necessitate a modification of priorities. Less costly but also less relevant developments should rather be put into practice in case the available means do not allow major investments. Developments necessitating external programming are typically associated with higher financial burdens and may necessitate pooling as compared to minor innovations which can be implemented by the project team itself.

A more or less constant stream of innovations requires some kind of change management for the networking activities. For all the parties concerned it has to be clear, what purpose is served by any modification. Inconsistencies should be avoided as far as possible and convincing arguments for the necessity of changes are to be provided whenever time series are affected negatively in some way. The timing of implementation may support the acceptance of changes: For instance, the main report comprises a comprehensive comparison of all ratios with those of the previous year. Major changes affecting such comparisons are usually implemented in terms of reporting in the second year only, so that at least the consistency of the data stemming from the latest two years is guaranteed.

Communication between those running the network and the participants is a major factor of success. Unless innovations are understood, they may irritate some of the addressees and hence even trigger adverse effects. Therefore, any major changes should be explained at least in terms of an up-to-date documentation as well as specific publications (see e.g. Sekot 2003, 2005, 2011; Sekot & Rothleitner 2008, 2009a,b to this effect). A personal contact is vital for detecting latent information needs and getting feedback as well as ideas for further innovations. Data collection and moderating benchmarking exercises provide respective opportunities. Presentations at congresses, workshops, a survey and a specific e-learning course are further means for providing information and fostering communication which have been or continuously are applied along with the networking activities concerning the bigger forest enterprises in Austria. The fact, that respective supply typically exceeds articulated demand by far must not frustrate the project team but contributes significantly to the image of the exercise. In terms of a participatory approach, opinion leaders among the participants should be consulted at least informally before any major change or investment.

Although the possibilities for a further extension of the data frame are quite limited, this does not necessarily imply poor prospects for innovations also in future. Potentials which have been explored already refer to individual developments in terms of ranking results, the application of Data Envelopment Analysis in order to provide relative measures of efficiency (see Sekot & Hoffmann 2007, Sekot 2010) and international comparisons (Sekot et al. 2010, 2011).

Extending the services provided to a system of consulting on demand beyond the moderation of interfirm comparison exercises within benchmarking circles is a question of strategic significance. Adding text to the figures and graphs, explaining the results to the managers and owners of forest enterprises in more detail and advising them on planning issues would definitely contribute to the value and esteem of the networking exercises but at the same time exceed the capacities of the current system by far. Several scenarios have to be considered, the network hinging on scarce resources and being threatened by a potential lack of financial support on behalf of the ministry. A concentration on consulting activities exclusively financed by the participants themselves would imply the termination of the sector-specific monitoring as the results would hardly be available for policy or scientific purposes any more. Alternatively, the monitoring could be reduced to a simplified reporting system, thereby saving resources for intensified commercial consulting activities. The rate of voluntary participation as well as the quality of the data provided would clearly be bottlenecks of such a system, however.

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# **RISK, VULNERABILITY AND ADAPTIVE CAPACITY: CONCEPTS FOR EXAMINING SMALL-SCALE FORESTRY UNDER CLIMATE CHANGE**

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## **INTRODUCTION**

Throughout the world the specter of climate change is dominating political discourse. Moving beyond questions of whether the earth's climate is changing, and whether human activity is the cause, policy makers are beginning to consider what changes might be in store for specific resources, geographic locations, enterprises and populations. Such discussions are certainly underway in the forestry sector, where concerns range from shifting industrial conifer production zones in North America to impacts on landless forest dwellers in East Africa. In both of these examples, the concepts of risk, vulnerability, and adaptive capacity are employed to define the issues involved and focus the discussion.

Our purpose in this paper is to explore how these three concepts are being used in contemporary climate change conversations, and consider how they might relate to the lived experiences of people engaged in small-scale forestry. How are risk, vulnerability, and adaptive capacity being defined? What are the uses and limitations of these concepts? To what extent are they useful in understanding small-scale forestry across diverse geographic, ecological, cultural, socio-political, and economic contexts? Do the terms mean the same thing to an observer of nonindustrial private forestry in North America and to a development specialist in Ethiopia?

Our working hypothesis is that these concepts do have utility in describing and understanding change in small-scale forestry, and not just climate change. However, we also suspect that risk, vulnerability, and adaptive capacity may be used with very different meanings in different settings. We hope our exploration of these concepts will contribute to fostering a more rigorous conversation about the consequences of a changing climate for small-scale forestry.

## **CONCEPTUAL FRAMEWORK**

Our perspective is grounded in political ecology, which frames ecological change within its contemporary social, political, and economic context (Blaikie and Brookfield 1987, Peet and Watts 1996, Robbins 2004). As outlined by Guillozet and Bliss (2010), political ecology is concerned with; 1) the distribution of economic and political power, and how power relations influence and are influenced by real and perceived ecological change, 2) conflicts over access to resources, 3) social and environmental history, and how these shape contemporary relations, 4) contrasting political narratives of the powerful and the powerless, and, 5) connections between local, regional, national, and global dynamics. Nygren and Rikoon (2008) define political ecology as the examination of the "complex intersection of cultural perceptions of environment, and changing ecological conditions and political-economic interests" (Nygren and Rikoon (2008) p. 773). These authors observe, "...efforts targeted at environmental conservation are intrinsically interwoven with questions of power and political authority" (Nygren and Rikoon 2008, p. 775). Harvey (1993) claims further that, "Ecological arguments are never socially neutral any more than socio-political arguments are ecologically neutral." (Harvey 1993, p. 768). Within a political ecology framework we are compelled to consider individual forest owners and users not only with respect to their interactions with forest resources, but also as members of social groups and hierarchies, and participants in local, national, and global economies.

We now turn to consideration of risk, vulnerability, and adaptive capacity. Given their ambiguous nature (Adger 2006; Hinkel 2011), our objective is to present these concepts as they are currently in use in climate change discussions, highlighting shared and disparate definitions and usages, and reflecting upon their application to small scale forestry in both the global North and South.

## Risk

Risk perception refers to people's understanding of the likelihood of an unfavorable change occurring and affecting them negatively. At certain levels and in certain contexts, perceived risk can lead to adaptive behaviors among individuals and social groups (Andras, Lazarus, and Roberts 2007; Adger 2000; Ostrom 1990; Castillo and Saysel 2005; Andras, Roberts, and Lazarus 2003). However, when combined with high levels of uncertainty or lack of trust in science and management institutions, perceived risk can lead to maladaptive behaviors (Schwartz and Howard 1981; Kunreuther 1996; Niemeyer, Petts, and Hobson 2005), such as underestimating the likelihood of hazards (Crocker 1981; Kunreuther 1996) or becoming excessively risk averse to the point of compromising management goals (Maguire and Albright 2005; Niemeyer, Petts, and Hobson 2005; Slovic 1997). Thus, adaptation strategies that build trust, increase communication, and assuage fears about uncertainty hold potential for channeling perceived risk into action.

Although risk perception can be viewed as a cognitive process an individual undergoes to form judgments about climate change (Slovic 1987; O'Connor, Bord, and Fisher 1999), people form notions of risk through social processes, i.e., interaction with friends, peers, professionals and the media on basis of social norms, world views and ideologies (Berger and Luckmann 1967; Douglas and Wildavsky 1982; Dunlap and Van Liere 1978; Leiserowitz 2006). This social process of defining risk is also influenced by legitimacy and trust between people and institutions (Slovic 1999). Thus, understanding the social context in which people formulate notions of climate change risks as well as individual risk perceptions is important (Dessai et al. 2004).

German sociologist and theorist Ulrich Beck identifies risk as the defining element of contemporary society (Beck 1999; Beck 2006). Beck asserts that industrial modernity is facing a profound institutional crisis due in large part to its inability to manage the problems that it has created. Modern global risks such as climate change transcend national boundaries, driving shifts in institutions and international relations.

## Vulnerability

Vulnerability refers to subjective and objective measures of an individual or social group's exposure to loss. Vulnerability is determined to some extent by physical exposure (i.e., the environmental hazards, the design of dwellings and communities and the resources available in specific geographic areas). Vulnerability can also be assessed through socio-economic measures such as poverty, inequality, marginalization, ability to meet basic needs, access to resources and insurance, and social status (Blaikie and Brookfield 1987; Cutter, Boruff, and Shirley 2003; Blaikie et al. 1994). There are political dimensions to vulnerability as well, for example, the security of people's access to resources for sustenance (e.g., water) and protection (e.g., fire fighting support) (Peet and Watts 1996; Cutter, Boruff, and Shirley 2003; Blaikie et al. 1994) and power to influence decisions and policies (Cutter, Boruff, and Shirley 2003). Differences in vulnerability of communities and social groups also influence how they view risk and the options available to them for responding (Beebe and Omi 1993; Bullard 2000; Peek and Miletti 2002; Cutter et al. 2008; Norris et al. 2008).

Amartya Sen's entitlement approach (Sen 1976) has shaped much contemporary research on vulnerability and risk. Sen describes entitlements as "the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces" (Sen 1984, 497). Vulnerability, then, is the risk that a household's entitlements are insufficient to buffer them against losses (Ribot 2010).

Vulnerability research often seeks to understand the "magnitude of the threat of future poverty" and its effects on decision-making and resource use at the household level (Calvo and Dercon 2005, 7). Vulnerability approaches can reflect dimensions of household well-being that are not captured by prevailing poverty indices (Bigsten and Shimeles 2008) and can acknowledge risks associated with trends such as agricultural shifts from staple to commodity crop production that may increase household income levels but also increase vulnerability (Block, Barrett, and Maxwell 2005).

Investigations by social scientists into the efficacy of rural development programs have led to a gradual expansion in the types of factors considered relevant to household vulnerability. While livelihood interventions tend to focus on micro-level aspects of household economies, social scientists in particular increasingly highlight the importance of "knowledge, politics, scale and dynamics" (Scoones 2009, 190). Ribot (2010) describes an approach that places localized inventories of the "processes that shape vulnerability" as the starting point for discussions on effective strategies to reduce household vulnerability (72). This framework places livelihood loss as the outcome of political, ecological and economic processes that exist at multiple scales.

## Adaptive Capacity

Definitions of adaptation vary from institution to institution, with distinctions often attributed to political differences and negotiations-related concerns (Levina and Tirpak 2006). The UNFCCC defines adaptation as the: “Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (UNFCCC 2011). Adaptive capacity refers to the ability of a social group to adjust to change through a process of learning (Armitage 2005; Nelson, Adger, and Brown 2007; Cutter et al. 2008; Norris et al. 2008; Adger 2003). Adaptive capacity can be fostered by the diversity of social institutions and networks that can learn, store knowledge and experience, create flexibility in problem solving and balance power among interest groups (Berkas and Folke 1998; Folke et al. 2002; Scheffer, Brock, and Westley 2000; Adger 2003).

Key to these conditions are management institutions or arrangements that emphasize collaboration between actors at differing scales and sectors (government, community, civil society) as well as experimentation, flexibility, social learning, and acceptance of uncertainty (Peterson et al. 1997; Walters 1997, 1998; Gunderson 1999; Holling 2001; Folke et al. 2002; Lemos and Agrawal 2006; Huitema et al. 2009). Thus, building social capital and adaptive capacity and encouraging the use of adaptive governance institutions are important elements of strategies for coping with and responding to environmental change.

Fraser (2007) developed an “adaptability and resiliency framework” that emphasizes three key features relevant to the adaptive capacity of small-scale forestry: 1) agro-ecosystem robustness, 2) availability of alternative livelihoods and 3) adequate institutional support.

Insofar as risk perception compels people to take action and plan cooperatively with others, risk and vulnerability are components of adaptive capacity (Grothmann and Patt 2005). Measures of vulnerability may indicate constraints to a community’s ability to make decisions and take adaptive action. Reciprocal relationships among community members and between community members and institutions are prerequisite to collective adaptation strategies. Isolated and economically depressed rural communities lacking strong social institutions may also lack the social capacity to learn how climate change is going to affect them, weigh options for response, and make collective decisions about new forest management strategies that will garner long-term public support.

Policymakers draw linkages between a country’s financial, human and institutional capital and its adaptive capacity (Roberts, Parrotta, and Wreford 2009). Evidence from available studies indicates that high income nations are most likely to adapt, the most vulnerable are least likely to adapt, and proactive adaptation is often government-driven (Berrang-Ford, Ford, and Paterson 2011). Distinguishing climate change impacts from other socio-economic influences (e.g. fluctuating markets, infrastructure, and the availability of financing) is difficult or impossible, leading to calls for the mainstreaming of climate adaptation in development (Declan Conway and Schipper 2011). Adaptive capacity is “deeply and complexly linked with economic and social development paths and stresses” (Wilbanks and Kates 2010, 727).

Studies of household-level exposure and response to extreme climate events reveal a high degree of variability, even when other demographic characteristics are similar, indicating that policy makers should avoid overly prescriptive approaches (Roncoli 2006). The relative ease with which households adapt varies from place to place based on local ecological conditions, information access, capacities to interpret changes and technology and investment-related concerns like path dependence (Chhetri et al. 2010). Strategies found to be successful in one context may not be in another, necessitating flexible, location-specific approaches (Barnett and O'Neill 2010).

Gender experts express concern over the potential that climate change will exacerbate existing social inequalities since adaptive capacities are linked to things that women in many societies already lack, such as access to and control over money, technology, education, information and land (Demetriades and Esplen 2010). Hidden costs associated with adaptation may have disparate impacts within families that may not be reflected in typical measures such as agricultural yields or incomes (Roncoli 2006). People who are already disadvantaged through socio-political and economic exclusion will likely feel the deleterious impacts of climate change most acutely (Ribot 2010), necessitating a needs-driven rather than opportunistic approach to funding (Parks and Roberts 2010).

## RISK, VULNERABILITY AND ADAPTIVE CAPACITY IN SMALL-SCALE FORESTRY

From a 30,000-foot perspective, all inhabitants of Earth share, to some extent, the risks associated with climate change. The academic literature reflects a shared usage of the concept and term. With respect to small-scale forestry, while the global North and South may share a common understanding of risk, the actual exposure to risk clearly varies enormously depending upon geographic location (i.e. latitude, elevation, proximity to coasts, etc.) infrastructure (i.e. dams, dikes, building codes, etc.) and a host of other factors. What should not be overlooked from the literature is the role of trust and social process, or, more broadly, social capital, in formulating peoples' perception of risk. We would suggest that these processes are at work across geographies, societies and cultures.

However, an equivalent level of risk may result in quite disparate levels of vulnerability. In each of the conceptualizations of vulnerability discussed above, exposure to loss is affected not only by the magnitude of climate-induced change, but equally by the suite of available alternatives. If livelihood loss is the primary measure of vulnerability, then those forest owners and users whose livelihoods are most directly dependent upon forest resources are the most vulnerable to perturbations affecting those resources. For example, a change in growing conditions for Douglas fir in the U.S. Pacific Northwest might reduce profitability of some family forest firms, whereas a comparable change in coastal Bangladesh might displace landless families dependent on riparian forest resources for subsistence. Thus one must avoid using the term without establishing clearly the context within which it is being applied.

The concept of adaptive capacity has great salience to small-scale forestry in the context of global climate change. The degree of vulnerability to adverse impacts of climate change varies, in part, with the level of adaptive capacity present. And, as we have seen, adaptive capacity varies widely from North to South, and within individual countries. This is certainly true in the small-scale forestry sector, in which the distribution of secure tenure arrangements, stable governance institutions, access to educational and technical assistance, and other supportive mechanisms is unevenly distributed across the globe.

In summary, the concepts of risk, vulnerability, and adaptive capacity provide useful starting points for examining the consequences of global climate change for small-scale forestry. Although the interpretation of these concepts may vary with the social, economic, and ecological context within which they are applied, we have found their core meanings to be relatively consistent and useful.

This introductory exploration inevitably leads to more challenging and interesting questions to be pursued: How do these concepts apply at different scales, from household to Eco region, to global? What research methodologies might be appropriate for measuring risk, vulnerability, and adaptive capacity at various scales? How do social constructions of risk vary from the Global North to the Global South? What are the consequences for vulnerability of a dependence upon technocratic solutions? Of weakened or poorly developed social capital? What are tradeoffs between "soft" vs. "hard" investments?

Specifically focusing on small-scale forestry, how do risk, vulnerability, and adaptive capacity differ among various forms of forestland tenure (i.e. public, corporate, tribal, community, individual)? Do these phenomena vary with scale of ownership? What are the advantages and disadvantages, strengths and weaknesses of small-scale forest tenures relative to other tenures? What investments show promise for increasing the adaptive capacity of small-scale forest tenures? Given the certainty of change, meteorological or other, we suggest that exploring such questions might be productive.

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## FOREST FUNDING AND SOCIETY

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### ABSTRACT

German private and municipal forest owners have a possibility to receive subsidies for special forest management measures. These subsidies are funded by the EU<sup>1</sup> and German federal and state institutions. In many cases public forest funding has a secondary objective to improve benefits of forest recreation. The paper examines the perception of public forestry funding in Germany.

Initially the different possibilities for public forestry funding are explained. After that the research questions are derived and the survey concept is introduced. In conclusion selected results are presented.

### INTRODUCTION – THE FRAMEWORK OF FOREST FUNDING

At the EU-level forest funding is mainly realized in the scope of the Common Agricultural Policy (CAP). The CAP consists of two pillars. Approximately 80 % of the CAP-budget is apportionable to the first pillar, financed solely by the EU. The first pillar includes direct subsidy payments and price support mechanisms. Only approximately 20 % of the CAP-budget is apportionable to the second pillar; in the future this proportion will probably grow. The EU-payments for this pillar are co-financed by federal and regional payments. The second pillar includes the rural development policy of the EU (EU-VO Nr. 1698/2005). This pillar is divided in four main areas, known as axes:

- First axis: improvement of the competitiveness of the farm and forestry sector
- Second axis: improvement of the environment and countryside
- Third axis: improvement of the quality of life in rural areas and diversification
- Fourth axis: LEADER<sup>2</sup>

In Germany, forest funding is mainly realized within the second axis, focusing on the improvement of the environment and countryside. Europe-wide approximately 10 % of the rural development budget is apportionable to forest funding. Within the current funding period from 2007 to 2013 this is approximately 9 bn euro. On the federal state level rural development policy is implemented through so-called rural development plans. Core measures, which are offered in a similar manner in all federal states, are approved by the EU as a national framework (NFW) at the federal level.

In Germany forest owners can be supported in the scope of "Joint Task for the Improvement of Agricultural Structures and Coastal Protection" (GAK), financed by the federal and federal state governments. The main objectives of the GAK are:

- Improvement of competitiveness and efficiency of agriculture, forestry and food management
- Encouragement of locally adapted, environmentally compatible management practices and adaption of agricultural and forestry management according to the requirements of environment and nature conservation
- Securing and strengthening the functionality of structures in rural areas
- Improvement of coastal protection

Nationwide approximately 5 % of the GAK-budget is apportionable to forest funding.

The GAK is, as a NFW, connected with the CAP and makes up the core of most federal state rural development plans. In the federal states forest funding is realized mostly within this scope. There are also measures which are realized without EU-participation in the scope of GAK, financed only through the federal and federal state governments or, without GAK-participation, only financed by the federal states.

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<sup>1</sup> EU - European Union

<sup>2</sup> LEADER - Liaison entre actions de développement de l'économie rurale

Table 1 gives an overview about the forest measures that are part of the federal states' rural development plans. Measures are funded both in the first axis, main objective: improvement of competitiveness, and the second axis, main objective: improvement of the environment and countryside. However, the focus of the measures funded is in the second axis. Not all of the funded measures are realized yet.

**Table 1:** Overview of forest measures in federal state rural development plans

Measure	German federal states													
	BW	BY	BB/BE	HH	HE	MV	NI/HB	NW	RP	SL	SN	ST	SH	TH
Improvement of the economic value of forests														
Increase added value														
Cooperation														
Forest road construction														
Afforestation														
Payments in the scope of Natura-2000														
Forest environment measures														
Preventative /reconstruction measures														
Nonproductive investments <sup>1)</sup>														

<sup>1)</sup> Including the GAK-measures which encourage natural forest management (forest conversion, pre-commercial thinning, ameliorative liming, maintenance of forest edges, forest protection), some federal states offer here also nature protection measures

Green ... Part of federal state rural development plan

Thicker line ... above measures of the first axis, below measures of the second axis

Source: modified from DVS<sup>3</sup> ([www.netzwerk-laendliche-raeume.de](http://www.netzwerk-laendliche-raeume.de))

## METHODS – RESEARCH QUESTIONS AND SURVEY CONCEPTION

Measures like forest conversion, afforestation, pre-commercial thinning or forest road construction are part of forest funding and have been part of most states' forest management concepts for years. Thus they are often realized with public funds. One reason for forest funding is the importance of forests for maintaining the attractiveness of rural areas as a place for leisure and recreation. To have an influence on the recreation value the physical outcome of a measure has to be recognized by the population.

Accordingly, the research questions are:

- Is forest funding supported by the population?
- Does the population recognize changes in German forests?

To answer these questions a German-wide, representative population survey was conducted. The survey was carried out as a computer-assisted face-to-face-interview by a professional survey institute. The sample

<sup>3</sup> DVS - Deutsche Vernetzungsstelle Ländliche Räume

was drawn by this institute through random-route-method from an AMD<sup>4</sup> parent sample of private households in Germany. Target persons of the survey are all people who live in a private household and are 14 years or older. 1,250 interviews were available for interpretation. Creation of the questionnaire and interpretation was carried out by vTI.

The questionnaire is divided in two parts, a general and a specific part. The general part includes questions about attitude to forests and environmental protection policy. The questions cover information about type and frequency of activities in the forest, appraisal of the importance of different forest functions, preferred forest types and the most important tasks of the federal government in the field of environmental protection. The second part of the questionnaire includes specific questions about forest funding. The following aspects were inquired about: level of agreement, or disagreement, to particular measures; which measures should be most, respectively least, strongly supported; whether changes were recognized which could be an outcome of a supported measure.

All common specific measures of forest funding are included in the survey. If these measures are offered in a federal state, they are offered in a similar arrangement. The questionnaire considers the following forest funding measures: afforestation, pre-commercial thinning, ameliorative liming, forest conversion, forest protection, maintenance of forest edges, contractual nature conservation in forests, payments in the scope of natura-2000, construction of recreational facilities, forest road construction and support of forestry co-operatives. Most of these measures are listed in Table 1. Most of the first axis measures of Table 1 are not included because they are funded under different arrangements.

This paper concentrates on the question about agreement, or disagreement, and the observation of changes in German forests. Next, the design and the results of these questions are explained.

## RESULTS AND DISCUSSION – AGREEMENT OR DISAGREEMENT TO PARTICULAR MEASURES

As “normal people” probably do not know what the particular measure titles mean, first a short description of the current measure is given. The structure of this text is, if possible, the same for all measures: title of the measure, owners get money for a specific activity, short description of the outcome and question about agreement, respectively disagreement. A schematic picture of the specific measure objective is used to illustrate the measure. If possible the picture shows a before and after situation. The agreement, respectively disagreement, is inquired about on a scale from “agree completely” to “disagree completely”.

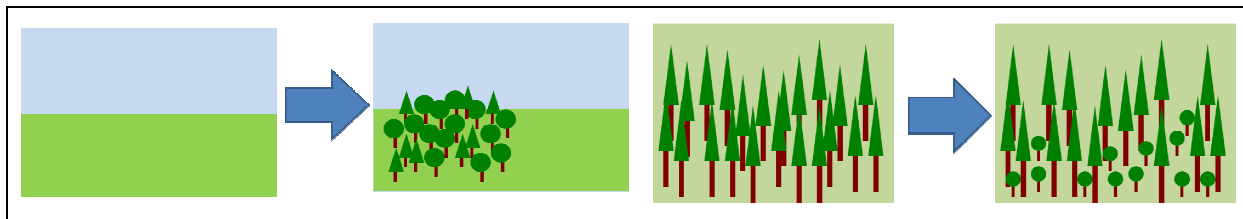
As an example, the measure descriptions and the schematic pictures for the measures afforestation and forest conversion are given below.

*Description afforestation: The first measure is afforestation. A landowner can get money for planting new forests on former fields or meadows. These young forests consist only of broadleaved trees or of broadleaved and coniferous trees. Please tell me what you think about this measure.*

*Description forest conversion: The next measure is forest conversion. A landowner can get money for planting young broadleaved trees in coniferous forests, which wouldn't be planted without this money. In the long run they develop into broadleaved or mixed forests. Please tell me what you think about this measure.*

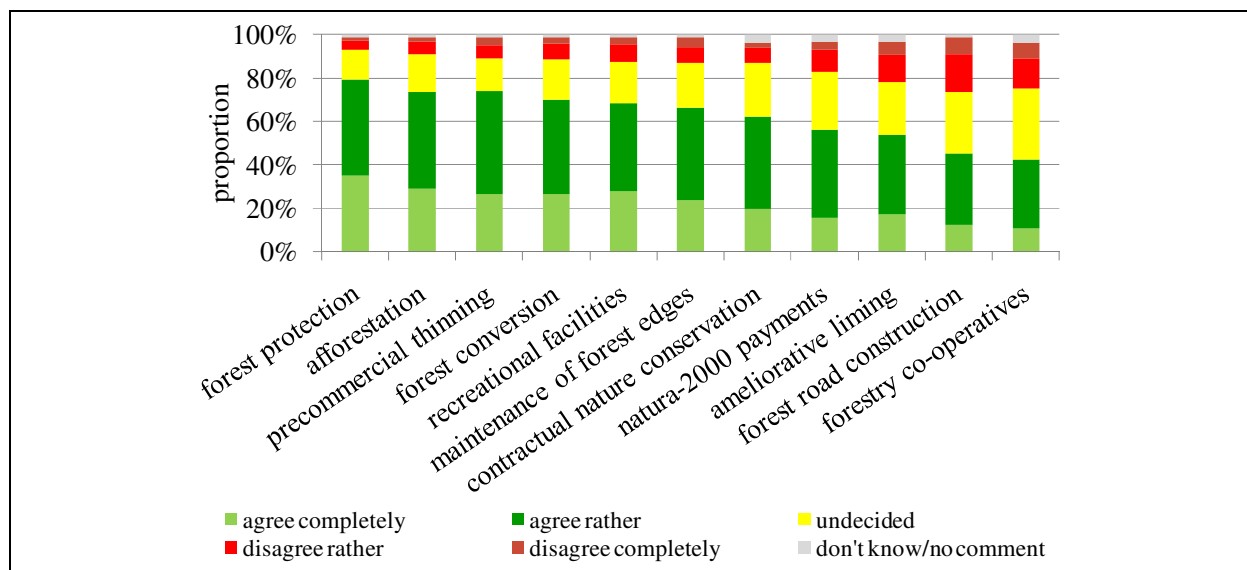
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<sup>4</sup> Random sample of Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V.



**Figure 1:** Schematic picture of the measures afforestation (left) and forest conversion (right)

The results of this question for all measures are shown in Figure 2 as a bar graph. The figure shows the number of times a particular response is mentioned. The measures are ordered by the sum of the “agree completely” and “rather agree” response categories. Overall forest funding receives a relatively high level of agreement. Over 60 % of the respondents completely or rather agree with seven measures. The focus of these measures lies with the establishment and maintenance of broadleaved or mixed forests.



**Figure 2:** Results of the question about agreement, respectively disagreement, to particular measures

Forest road construction and support of forestry co-operatives receive the greatest disagreement. One possible reason is that the focus of these two measures lies with the improvement and maintenance of the competitiveness and utilization of wood. This was also how the measure description was formulated.

## RESULTS AND DISCUSSION – OBSERVATION OF CHANGES IN GERMAN FORESTS

The interest of this question was to find out if respondents recognize changes in German forests which can potentially be ascribed to the aforementioned subsidized measures. It is irrelevant if these changes are actually initiated by subsidized measures or by similar measures without subsidies. In this question type, for every measure the previously mentioned outcome was formulated as a question. The schematic pictures, which were used in the agreement, respectively disagreement, question, were used here as a reminder.

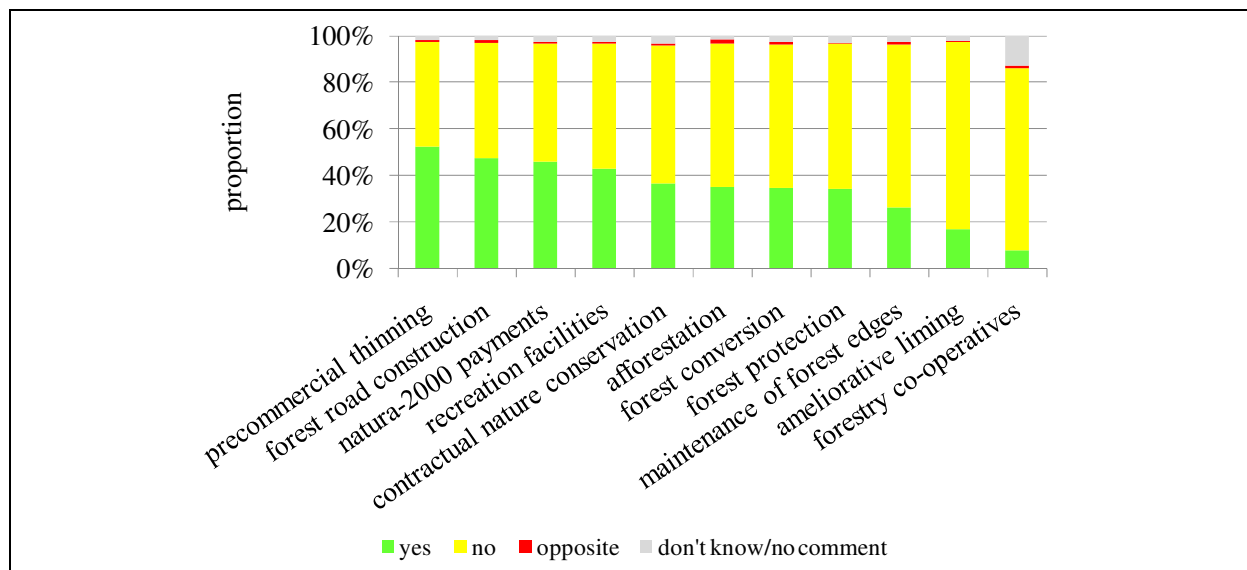
Next, questions formulated for the afforestation and forest conversion measures are listed as examples:

*Question afforestation: Have you recognized that new forest areas have been established in the last 10 years?*

*Question forest conversion: Have you recognized that more broadleaved trees have been planted in German forests in the last 10 years?*

The results of all the measures are shown in Figure 3 as a bar graph. The figure shows the relative frequency of the number of replies in the particular response categories. The measures are shown in order of the response category “yes.” The questionnaire includes only the response categories “yes” and “no.” The other two categories (“opposite,” “don’t know/no comment”) were recorded as spontaneous reaction of the respondents. Altogether the proportion of respondents stating that they recognize related changes is

surprisingly high. During the construction of the questionnaire, our expectation was that the proportion of respondents who stated that they recognize related changes would be much lower.



**Figure 3:** Results of the question about recognition of changes related to the mentioned measures

Only the measures ameliorative liming and support of forestry co-operatives show considerably lower proportions of public recognition. This is logical because people can only directly recognize very few changes related to these measures. Also little can be recognized from the measure natura-2000 payments, because these payments are not associated with concrete measures. But the payments are provided because of the establishment of Protected Areas. So it was asked if it was recognized that there were more Protected Areas established in the last 10 years. Almost half of the respondents stated they recognized this.

Most often changes are recognized which can be ascribed to the precommercial thinning measure. It can be assumed that the respondents do not differentiate between real pre-commercial thinnings and other timber harvesting interventions. In relation to the measure pre-commercial thinning the proportion could be overestimated. Changes here are probably most often recognized because the outcome of timber harvest measures (e.g., skid marks, logged trees) is very easy for “normal people” to notice. The outcomes of the measures forest road construction and recreation facilities are also easy for “normal people” to notice, because they can directly use them. Accordingly the proportion of respondents who recognized changes ascribed to these measures is very high with 43 % and 49 % respectively.

## RESULTS AND DISCUSSION - MOST IMPORTANT TASKS OF THE FEDERAL GOVERNMENT IN THE FIELD OF ENVIRONMENT PROTECTION

One question in the general part of the questionnaire compares the importance of funding of semi-natural agriculture and forestry with other tasks of the federal government in the field of environmental protection. A question from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety’s “Ecological awareness in Germany” study about the most important tasks of the federal government in the field of environment was used supplemented with the answer category “Funding of semi-natural agriculture and forestry.” The respondents were asked to choose the three most important tasks from a total of ten. Most often mentioned are the three following:

- Aim to achieve a clear decrease of climate-damaging gases, e.g., the emission of CO<sub>2</sub>.
- Create independence from oil and gas by renewable energies
- Prevent the extinction of animals and plants

The “Funding of semi-natural agriculture and forestry” is only mentioned second to last in importance. But different forestry measures are related in a direct or indirect way to the most often mentioned tasks. So for example, natural silviculture, contractual nature conservation or the establishment of protection areas contribute inter alia to prevent the extinction of local animals and plants. Forest road construction and

support of forestry co-operatives can contribute to the utilization of wood. And wood as a renewable resource can be used as a substitute for oil or gas.

## **CONCLUSIONS**

Forest funding is assessed positively by the population. At least approximately one third of the respondents recognized changes in German forests which can be ascribed to the mentioned potentially subsidized measures. However in comparison with other tasks in the field of environmental policy, the funding of near nature agricultural and forestry is only a low priority. But many of the supported forest measures both in the first and second axis of rural development programs are related directly or indirectly to the most important tasks like achieving independence from oil and gas with renewable energies or retarding the extinction of animals and plants.

## FOREST LAND CONSOLIDATION – WHO BENEFITS?

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**Key Words:** Small scale forestry, Mobilization, land consolidation, qualitative research, structural change, rural development

### INTRODUCTION

Forest research in Germany has a long tradition. It also seems to be a part of this tradition that the research has so far paid little attention to small scale forests. Even the specific features of small scale ownership have not been investigated. However, several recent studies break this tradition and follow up the needs of small scale forestry. This kind of research has been almost exclusively driven by the perceived need to mobilize small scale forestry because of the actual and suspected usable timber from small scale forests. The forestry and timber industry unanimously argue that this timber has to become accessible.

The impeding factors include, on the one hand, structural disadvantages of small scale forests (e.g., their fragmentation) and, on the other hand, the actions of small forest owners, which appear irrational to the forest administration and timber enterprises, but are in fact caused by forest owners' multiple dispositions and restrictions concerning their forests. The mobilization of owners and, therefore, the increase of the stock of timber in small-scale forests accessible to forest enterprises require transaction costs. Currently, only state actors (e.g., the forest administration) are prepared to bear these costs and actually provide financial support and personnel for mobilizing.

The growing fragmentation of private forests is closely connected to the structural change in agriculture. The number of farmers who used to manage both agricultural and forest land within one enterprise has been steadily decreasing. The abandonment of the farm marks the starting point for a new development of these forests. While arable land is leased or sold to other farmers who continue to use it for agricultural production, the forests and their use rights commonly remain within the family of the abandoned farm. In addition, in some cases the forest land has been repeatedly divided into smaller plots between heirs. This led to the situation when the size and shape of these plots no longer allows a meaningful forest management. Whereas the mechanized harvesting becomes a standard operation in professional forest enterprises, it is not feasible in such fragmented forests. It makes it impossible for forest owners to hire a contractor for harvesting.

This tangle of structural disadvantages, coupled with numerous, sometimes conflicting interests of the owners or owners' associations has to be unravelled. This is the only way to reduce and eliminate obstacles which complicate forest management, or even make it impossible.

There are several options that are likely to help overcome the disadvantages and obstacles discussed above, including joint management with or without conceding individual property in a forest community, voluntary land exchange, and forest land consolidation.

While land consolidation in Germany seems to have become a standard tool for restructuring agricultural land, the rearrangement of small scale forests with this instrument has not been as wide-spread. Yet in Bavaria forest land consolidation has been seen as an alternative to other tools. Politics and administrations have always communicated it to forest owners and to the public in this way. This tool has also been actively applied when proper preconditions were in place.

This paper deals with several aspects of the process of the legitimisation of forest land consolidation in Bavaria. It shows the results of an analyzed case study and attempts to answer the question of who benefits from a forest land consolidation. The paper presents the preliminary results of the on-going research project that will run until 2013.

## METHODS

### Literature analysis

In order to determine the importance of land consolidation and forest land consolidation in particular, we have conducted a text analysis of the articles in the leading German forestry journals since 1900 (1946) to 2011.

Focusing on the structural improvements in small scale forests:

- “Forstwissenschaftliches Centralblatt“, (1900-2003), since 2004 appearing as “European Journal of Forest Research”.
- “Allgemeine Forst und Jagdzeitung“, (1900 - 2011)
- “AFZ - der Wald“, (1946 - 2011)

### Case study analysis

In order to gain empirical knowledge about forest land consolidations in extremely fragmented forest areas and their owners, we have analysed current land consolidation projects, as well as those that have been successfully completed several years ago. This allows drawing a comprehensive picture of the application of the land consolidation tool in different situations. We selected cases from two of the seven administrative regions of Bavaria: “Lower Franconia” and “Swabia”.

Small private forests in “Lower Franconia” are extremely fragmented. Most of the forest land consolidations in Bavaria that have been conducted so far, or are still in progress, are located here. Therefore, this administrative region has accumulated considerable experience with forest land consolidation. The situation in some areas in Swabia is comparable to Lower Franconia. The selected case studies offer a possibility to explore similarities and differences in land consolidation, regarding among other factors different forest types or characteristics of the actors.

The selection of case studies was based mainly on the following criteria:

- High proportion of small scale forests (less than 2 ha) and extremely fragmented ownership.
- The objective of the consolidation is the improvement of the forests’ management (incidentally agricultural land). This ensures that the procedure is motivated by forestry considerations. Forest proportion should be at least two thirds of the total land under consolidation.
- Current land consolidations should have passed the often contested phase of forest valuation and restructuring. The key decisions should have been made.
- Completed land consolidations should be finished at least 2 years ago and at most 15 years ago. This is important because on the one hand, the owners were already able to make experience with their new property and become familiar with their forests. On the other hand, in order to reconstruct the owners’ perceptions, we want to make sure that they can still recall the process of consolidation and their perceptions are not distorted by possible property transitions after the consolidation.

For each case study, we interviewed about 6 to 10 participants, including forest owners and representatives of state agencies and forestry associations, local politicians and consolidation advocates. We used the method of narrative interviews developed by the sociologist Fritz Schütze. It is a type of open interview and is particularly suitable for our purposes, since questions are not standardized, but an initial question is used to make the respondent tell a story the way he experienced it himself. This story should be told impromptu with a starting point, the chronology of the facts and an end (KÜSTERS 2006: 13). Schütze defines impromptu stories as retrospective experience-based stories with authentic content initiated in direct interaction with the interviewer. It is important that the respondent has no way to prepare the content and formulation of his story (SCHÜTZE 1987: 237). The interviewer takes the role of an attentive listener not influencing the narrative flow.

The interviewers usually visited the respondents at home or in the office. The interviews were between 30 and 90 minutes long. With the consent of respondents, the interviews were recorded. The interview begins with a question on a narrative-generating issue (“tell stimulus”). Respondents were encouraged to talk without interruptions from the interviewer about the process of forest land consolidation as openly as possible. In the free narrative, subjective meaning structures can be identified and analyzed in contrast to systematic surveys (MAYERING 2002: 72). Normally, the narrative phase takes 5 to 30 minutes. In a second phase the interviewer focuses on the contents that the respondent mentioned but did not provide enough details (KÜSTERS 2006: 61). In the following phase, the interviewer asks about other issues not mentioned before. From this perspective; this phase can be described as a semi-structured interview. In the end, there are a couple of standardized questions to



record socio-demographic data on forest owners and information about their forests. Only forest owners are asked these questions.

The interviews are transcribed. Their analysis is conducted anonymously. For the analysis of narrative interviews, we apply a documentary method proposed by BOHNSACK (1999). This method allows reconstructing practical experiences of individuals and groups and informs us about their action dispositions. The point is to understand how the narrative and the actions described in the narrative are constructed and how issues involved are framed (NOHL 2009: 8f). The analysis enables identifying specific patterns and, therefore, allows for generalization (NOHL 2009: 45).

## RESULTS

### Literature Analysis Results

Ever since land consolidation has existed as an official instrument, its application to forests has been at best minor. In the forestry literature, there are only a few contributions that directly or indirectly deal with forest land consolidation. Before the enactment of the new Land Consolidation Act in Germany in 1954, we found no articles that mentioned forest land consolidation. After the enactment, several papers were published around 1960 and again around 1980. In connection with increasing research about small scale forestry, again more attention is paid to forest land consolidation. In Bavaria, over 23,000 ha of forests have been reorganized in land consolidations which have been completed since 1995 or are still in progress.

### Case Study "B" Results

The fragmented private forest area is located in the southwest of Bavaria in the administrative district of Swabia and covers about 28 hectares which originally were split into 147 parcels with an average size of about 0.2 hectares. The plots of the 30 forest owners often were only 5 to 6 m wide and the boundaries were mostly not marked. There was no forest road or even a connection to public roads, only tolerated lanes for small tractors. The entire area is covered with Norway spruce of all ages. Many plots were poorly groomed. To introduce an optimal system of forest roads, the commonly managed forest in the north was also included into the project (see Figure 1).



**Figure 1:** Forest area "case study B" before and after land consolidation (Source: ALE Schwaben)

The objectives of the consolidation included the amalgamation of the fragmented forest parcels, cadastral surveying of all plots and the connection of all parcels to a forest road, that trucks could use.

The preparation phase began in 2002 with several information sessions for forest owners on land consolidation and included a visit to a forest that underwent consolidation. In 2006 the responsible Office of Rural Development officially started the forest land consolidation and the board of participants was elected. In 2007, the assessment for soil and forest inventory was carried out and a plan for roads and drainage was developed. The construction of forest roads, as well as measures to improve habitats was also completed in 2007. In the following year, all plots were reorganised and surveyed. The execution order was issued in May 2009. Currently, the consolidation is going through the final evaluation. In 2011 the land consolidation will be completed. The 147 parcels have been merged into 35 plots (the ratio is 4 to 1). The number of forest owners decreased from 30 to 27.

## Interviewed Participants

A forester, 4 forest owners, the head of the participants' board, the mayor, an expert and the representative from the Office of Rural Development.

The narrative interview helped capture the participants' perceptions of the consolidation of the "Case B". In the course of our analysis of the interviews, the important success factors and obstacles influencing the progress of a forest land consolidation were identified. These results represent useful recommendations for future forest land consolidations. We expect that further analysis of the data collected for our project, especially the analysis of additional case studies, will help modify and extend our recommendations.

Success factors and obstacles are shown in Table 1:

**Table 1:** Success factors and obstacles of forest land consolidation "Case B"

	<b>Success factors</b>	<b>Obstacles</b>
<b>Category</b>	<b>Actors and interactions</b>	<b>Actors and interactions</b>
Feature	Confidence	Interests of participants
Feature	Outstanding commitment	Many blockers
Feature	New generation of forest owners	Strong emotional attachment to "own forest"
Feature	Good cooperation	Bad cooperation
<b>Category</b>	<b>Conditions</b>	<b>Conditions</b>
Feature	Positive experiences with land consolidation	Negative experiences with land consolidation
Feature	High subsidies	High costs
<b>Category</b>	<b>Process phases</b>	<b>Process phase</b>
Feature	Speed of the whole measure	Duration of the land consolidation
<i>Phase 1</i>	<i>Preliminary phase</i>	<i>Preliminary phase</i>
Feature	Excursion to a successful completed forest land consolidation	-
<i>Phase 2</i>	<i>Beginning of the Fieldwork</i>	<i>Beginning of the Fieldwork</i>
Feature	Appraisal	Appraisal
<i>Phase 3</i>	<i>Redesign of the land consolidation area</i>	<i>Redesign of the land consolidation area</i>
Feature	Merging wishes easy to fulfil	Merging wishes hard/not to fulfil
Feature	Demarcation of new land	Demarcation of new land
Feature	Road construction / habitat improvement plan	Road construction / habitat improvement plan

In the "Case B", the participants' positive perceptions are mainly influenced by the following success factors:

- Forest owners' **confidence** in the involved actors like municipality, foresters, Office of Rural Development, appraiser and the local board of participants. The presence of confidence in technical and social skills is relevant, since necessary steps such as appraisal of soil and timber and the merging of parcels can be made quickly and without suspicion.
- **Strong commitment** of the responsible actors. A special cooperation between the local board of participants, Office of Rural Development, the forester and the appraiser is also an important success factor. The cooperation should be transparent and open. Personal dialogue is very important,

especially with those forest owners who are principally critical or anxious. Conversations between forest owners and members of the local board or the mayor can solve conflicts when they emerge.

- For the success of forest land consolidation in the "Case B" the **generational change** also played a major role. The younger generation of forest owners has a less emotional attachment to the individual plots and the trees thereon. In their value system, economic and rational aspects prevail. They saw the fragmented plots and the lack of forest roads as the biggest obstacles for an independent management of their forest property and were therefore open-minded about a forest land consolidation.

In the category of conditions there were two success factors mentioned by participants.

- Good experience with former agricultural land consolidation.
- The prospect of subsidies from public funds for the whole measure, including the road construction. This greatly promoted a positive attitude.

## DISCUSSION

So who benefits from a forest land consolidation?"

First, we argue that land consolidation, coupled with village renewal, is probably the most important tool for rural development in Germany. With these measures, the policy objectives for rural areas can be implemented. And even more, by the (co-) design of actions by local citizens, the policy also receives direct inputs about what is suitable to meet the needs of citizens. Therefore, it is not surprising if the main beneficiaries are to be found in rural areas and in close proximity to the land consolidation area. Also, the main beneficiaries of urban development measures are the people who live and work around these areas.

When we compare the situations before and after the consolidation we see that both groups – i.e., those who keep their forests and those who sell it – are the winners. The members of the first group win because they receive a well structured forest with a good connection to forest and public roads. The members of the second group benefit because they are able to sell the plots which, in the worst cases, they did not even know they possessed. As a result, they were, on the one hand, unable to fulfil their duty concerning their forest ownership and, on the other hand, they got a good chance to sell their land that some day might have caused problems. Forest owners who sold their property during the land consolidation are more likely to be those who rarely made use of their wood or did thinnings or plantings – themselves or by contracting a forest enterprise. Mostly, they do not live close to the forest, unlike the other group that preferred to keep their forests. The sold acreage was used mainly for roads and habitat improvement and became the property of the municipality.

Due to the land consolidation, the proportion of traditional agriculture-oriented forest owners increased again. The structural disadvantages of fragmented plots and the lack of forest roads can be overcome with forest land consolidation. Structural change in ownership is unstoppable; at best land consolidation slows it down a little. What cannot be denied is that with the help of land consolidation the vast majority of the forests become incorporated into a meaningful management regime. The "urban" forest owners have the opportunity to sell their forests. In turn, it allows the remaining owners to manage their forests more easily than before.

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# PROMISES AND DRAWBACKS OF PEER-TO-PEER LEARNING IN FINNISH FAMILY FORESTRY

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## 1 INTRODUCTION

Recent research on family forest owners' decision-making networks (Korhonen et al. 2010, Rickenbach 2009) has opened a scene for looking more closely at owners' communication with various actors. Alongside forest and environmental officers, peer land owners appear as sources of trustworthy testimonials (Broussard Allred et al. 2009, Knoot & Rickenbach 2011); experience sharing and identifying with trusted peers is easy. Meanwhile, some land owners perceive distrust or reservations towards professional foresters and their organizations (Hujala & Tikkanen 2008). While new land owners are increasingly often non-farmers both in Europe and in the US (e.g. Butler and Ma 2011, Kvarda 2004), they are also more educated and have more diverse amenity motives towards their land (e.g. Leppänen 2010, Majumdar et al. 2009).

It has been hypothesized (Butler et al. 2007, Korhonen et al. 2011) that strengthened land owners' peer-to-peer (P2P) networks and resulting peer-based adult learning (Eisen 2001) could fill the gap between the high demand and scarce resources for publicly funded forestry outreach. However, until now knowledge regarding the applicability, i.e. the practical opportunities and disadvantages, of P2P learning as a part of policy-motivated forestry extension has been exiguous.

The present study aims to develop understanding about how forestry professionals and forest owners in Finland perceive and value the ideas of supporting P2P networks and learning from peer land owners in the context of forestry extension. The results will help extension programme designers to choose the most promising means and to avoid the troublesome caveats in establishing and promoting P2P learning activities.

## 2 MATERIALS AND METHODS

Seven focus-group interviews were conducted between December 2010 and January 2011, each reaching 4-7 participants. Total number of group interviewees was 44, comprising family forest owners, local/regional forest planning and extension practitioners, and national/regional forestry extension developers (Table 1). Groups of forest owners and practitioners represented two distinct regions from southeastern and northwestern Finland.

Themes of the focus-group interviews included, with a variation according to the group type, topics of P2P experience sharing, sensible contexts for P2P learning, and benefits and drawbacks of P2P extension compared to expert-led guidance. Transcribed voice recordings and observers' notes formed the study material.

**Table 1:** Constellation of the focus groups.

Interview	Date	Informant type	Region	Number of participants
1	9 Dec 2010	Forestry extension developers	Finland	4
2	17 Dec 2010	Forest planners and advisors	North Karelia (SE Finland)	5
3	17 Dec 2010	Forest planners and advisors	North Karelia	7
4	13 Jan 2011	Forest owners (experienced)	North Ostrobothnia (NW Finland)	7
5	14 Jan 2011	Forest planners and advisors	North Ostrobothnia	7
6	14 Jan 2011	Forest planners and advisors	North Ostrobothnia	7
7	25 Jan 2011	Forest owners (basic course participants)	North Karelia	7

The authors analyzed the data qualitatively, by first reading through the material independently and then negotiating in a one-hour meeting about the prevalent themes and generating a simplified concept map (Novak 1998) of the interviewees' views. After that, the main perceptions were studied closer, and representative quotes were selected to support the narrative of results. The analysis searched in particular similarities and differences (i.e. potential synergies and conflicts) between the views of extension experts, root-level foresters and forest owners.

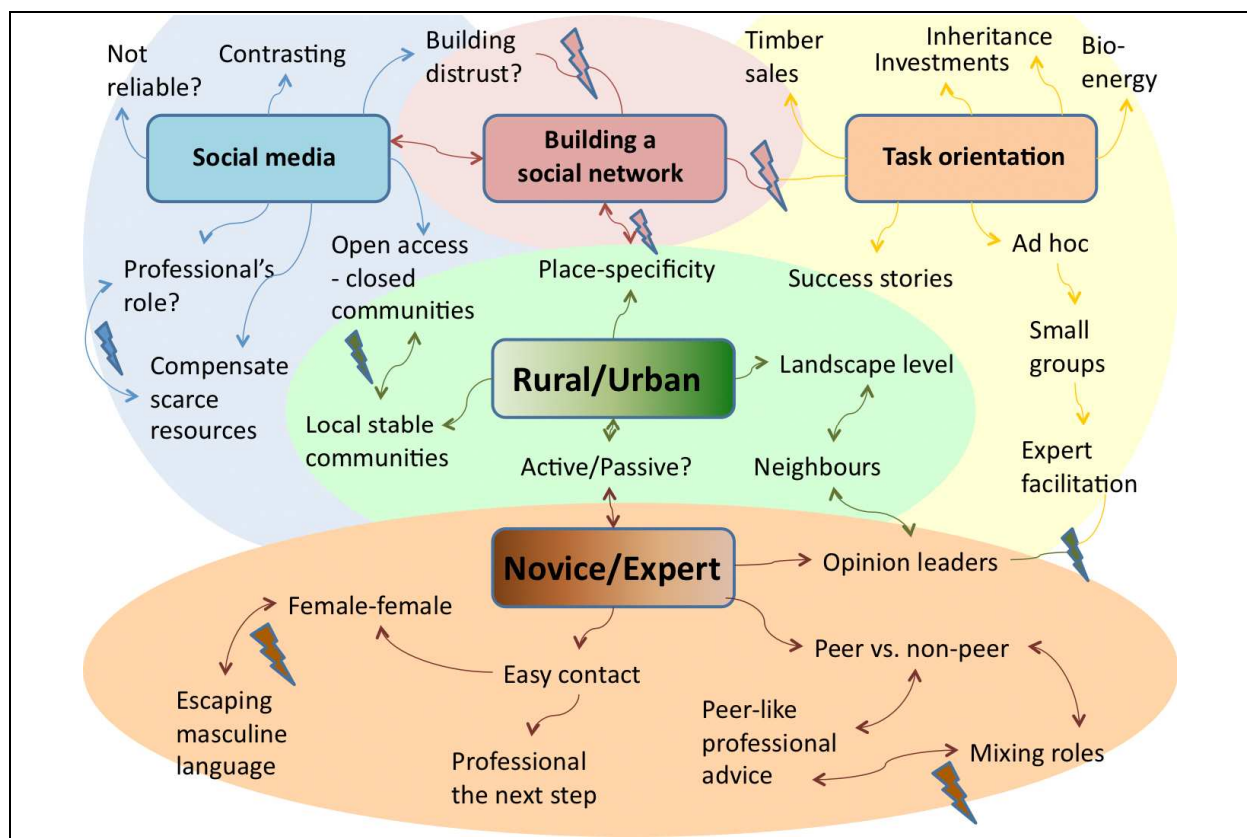
### 3 RESULTS

#### 3.1 Main themes in discussions

A concise view on the applicability of P2P learning approach in family forestry extension in Finland appears in Figure 1. The group interviewees pointed out that novice and expert land owners as well as rural and urban owners differ significantly with respect to their peer communication preferences. Novice owners may feel it easier to contact first other owners than foresters, if they only know any; some expert owners are role models whose actions are monitored and followed. Rural dwellers have their local stable communities and plenty of opportunities to meet other land owners but no specific needs for additional P2P activities, whereas urban owners miss land owner contacts and desire discussions with their more experienced forest neighbours.

Attitudes towards the opportunities of social media are mostly reserved: elderly owners have little interest and forest professionals feel that false information spreads in discussion boards too easily and nasty debates are useless. However, the extension specialists expressed a more positive view on the opportunities of internet-mediated P2P guidance.

*"I believe that internet is such a tool that will develop in the next few years. For other people it is already a common habit that whatever topic, whether it be constructing a house or baking a sacher cake, they seek hints and information, and in this sense forestry matters are not any different."*



**Figure 1:** Concise view of the topics pointed out in the focus-group interviews. The flashes indicate observed tensions between the items.

A tension was discovered between building of owners' social networks (which takes time) and the task orientation of desired P2P learning (which is based on an ad hoc type of contact). However, both forest owners and forest professionals expressed an interest in trainings containing P2P discussions, in which the experts' role would be limited to organizing the situation and facilitating small groups. Gender issue appeared among forest owners: female owners feel easier talking to other females in forestry matters; also forest experts noted the success of female owners' events.

### 3.2 Forest professionals' and owners' perceptions on P2P contacts

The interviewed forest professionals acknowledged that those land owners who participate in training events tend to use the opportunity to discuss with other participants.

*"...at forest owners' basic training courses you can well see this peer support, they do share experiences there. But they are active people as they have joined the course."*

Forest owners, in turn, commented that true social networks are different from those speed-contacts that one may have at extension courses.

*"As far as I understand you cannot establish anything at this kind of short course, I mean this social network springs up elsewhere."*

The owners also pointed out that it is not easy to talk to strangers, and that in Finland it is traditionally considered rude to talk about property. However, forest professionals noted that today's urban owners might be different in that respect than what owners used to be.

*"Yet many people are also sensitive about talking to strangers, no one here would say how many hectares he owns, although we are likeminded here. Finnish mentality considers this boasting."*

*"Present-day urban forest owners are more prepared to say things in front of a crowd compared to owners in the past."*

According to experienced owners, some inexperienced owners hesitate to contact professionals. Discussions with well-experienced owners might be the key to activate these indecisive owners.

*"There's a kind of fear towards public servants in that matter. Probably they don't dare reveal their lack of knowledge."*

*"Well I think it [P2P discussion] in a way initiates things. 'As we talked now, I'll call him.' "*

### 3.3 Differences within owner groups and ownership types

According to forest professionals, face-to-face contacts are common among neighbouring owners in rural areas. Yet they recognized challenges especially with distant communications with urban owners, who also need contacts. The experts admitted that their current working model does not yet provide means to respond to those needs.

*"In our territory it still works simply by talking, at least our owners are not yet chatting to each other via facebook. The neighbours talk with each other."*

*"But then in wintertime there are those forest owners who live elsewhere, they should probably start chatting in the facebook, but then we should also do that I guess."*

Distant forest owners confirmed the above-pondered situation and expressed the lack of interlocutors, when they have no relatives or other long-term contacts where their forest locates. Contacts to cross-border neighbours supersede contacts to other urban owners with no local link. Links to other urban owners are anyhow appreciated.

*"Since we don't live in that community, we have so few persons with whom to change opinions or ask: 'oh you have done this way'. We simply don't know what the other urban owner has done. Especially if there are no relatives or neighbour history from childhood [in the village], the urban owner is rather lonely regardless of their societal position."*

However, the experienced rural owners feel no particular reason to share their knowledge with their urbanized neighbours: they would rather enter discussions with forest professionals whom they consider "peers". Homophily (McPherson et al. 2001) does not come from forest ownership but from the knowledge-level. The national-level extension developers also pondered the nature of "peerness". They think that activating inexperienced owners with P2P activity is worth focusing on.

*“If there’s an urban owner, well then I won’t very easily tell them anything about what I was paid for my timber or forest land. But with a professional or someone who knows and is somehow in a similar position and on the same level, I would say that with him, I would talk more openly.”*

*“Concerning this P2P learning, I wonder if it is so that there are these non-knowers who are then accompanied by a knower so that the peerness is the forest ownership, or is it rather so that we’ll try to gather non-knowers with an open attitude, those who eagerly search information from the same basis, which we [as forest professionals] consider relatively information-poor. I immediately thought that it could be fruitful, as no one needs to play smart in that group. I think public funds must be allocated to the activating; the market will take care of the active ones.*

### 3.4 Potential to utilize peer discussions in extension activities

Forest professionals thought that owners’ discussions could take place in training events. They were ready to organize such spaces.

*“Maybe we could think about this conversation as an intermediate or end part of a more official training event.”*

Some owners felt that an expert-led lecture would be needed to introduce the topic, but after that a discussion would be beneficial. Owners pointed out a need for *small enough discussion groups*, but on the other hand, forestry experts questioned if such facilitation can be cost-efficient.

*“Sharing experiences is practically the best part, if the group is good. Sure the lecture is always important, but regardless of the topic, discussion brings ideas. But the lecture is imperative, and not having too big crowds...”*

*“I would feel that the groups would need to be so small that it would be in a way inefficient as it would require a leader...”*

## 4 DISCUSSION AND CONCLUSIONS

The above results indicate that P2P learning among Finnish land owners has underused potentials that could be better utilized by means of extension foresters’ systematic efforts. Table 2 shows a list of concrete actions that could be useful in promoting P2P networks and learning, with important critical observations to be taken into account. Supporting forest owners’ P2P networks can start from tiny actions, and more ambitious trials can be followed by extensionists’ and land owners’ training programmes. Obviously, different extension organizations may pick those actions that best suit their current activities. The actions suggested may be relevant not only in Finland but also in other countries where supporting land owners’ P2P learning is considered topical.

A noteworthy observation is that urban and rural land owners on one hand, and novice and experienced land owners on the other hand have differing motivations towards P2P discussions. It may be difficult for urban and novice forest owners to find interlocutors in their natural setting whereas rural, experienced owners are on a different knowledge and interest level. This situation could be perhaps mitigated with the help of local extension organizations, which could recruit mentor owners and organize networking type of meetings. These events may be a part of village activity or landscape-level planning of cross-border operations such as watershed management or biodiversity protection (see Kittredge 2005, Rickenbach 2009).

Another important finding was the forest owners’ and practitioners’ rather sceptical view on the internet i.e. discussion boards and social media for P2P learning, mainly because of nasty discussions and the risk of spreading false information. Nevertheless, as the extension developers noted, the internet holds great opportunities for networking and sharing experiences flexibly over distance. At present there seem to be no good, publicly known experiences thus far from successful use of social media in forest owners’ P2P endeavours in Finland. A reasonable next step would thus be to acquire such experiences by organizing and reporting carefully planned pilot projects. The challenge is to guide such good P2P experience without interfering too much with professional guidance. Maybe a group of active volunteers from a forest owners’ training course could take the action in a near future.



**Table 2:** Identified alternatives to promote land owners' networks and P2P learning. The alternatives are arranged from the more straightforward (first) to the more ambitious (last).

Action alternative	Potential benefits	Critical observations
i. Cosy intermissions at extension meetings	Owners' informal discussions	Enough time is needed
ii. Meetings or events with informal parts on schedule	Owner-driven P2P networking	Extension foresters may inspire owners with stimulus material but otherwise step back
iii. Facilitated small group discussions at training events	Meaningful sharing of experiences and ideas, more questions spoken out	Professionals need a new role and thus some training, grouping logic is crucial
iv. Events/forums targeted especially to sharing good experiences	P2P learning is made explicit, can be done in a classroom, with field trips and over the internet	Who decides what experiences are "good", finding volunteers
v. Virtual land owner communities	Long-term activity and owners' active role promote learning	Training of mentor owners and 'facilitation of facilitation' is needed, unit cost may be high

The results revealed a tension between P2P networks and P2P learning. While establishing social networks requires time, motivation for experience-sharing often comes from a topical task that a forest owner is facing. This means that an owner's social network may not be able to match topical interests, and vice versa, the most meaningful peer discussions may happen with those who are not part of an established social network. Like-mindedness is important in forming a group but it is insufficient to serve all learning motivations. Effective P2P learning happens when there is an experience sharing with another owner in a similar decision-making situation. This is why it might be useful to build ad hoc discussion groups for owners who share interests regarding inheritance, timber sales, ditch cleaning, or forest planning etc.

To conclude, promoting family forest owners' P2P networks and learning appears feasible in Finland. Starting with small steps, extension activities in the future will require rethinking forest extension professionals' roles and working models. Training forestry experts as small group and e-learning facilitators will be essential, simultaneously with giving experienced and mentor land owners more responsibility in engaging the novice, hesitant or otherwise more passive fellow owners. Researchers will also have important tasks in investigating and reporting P2P pilot activities.

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# OVERCOMING THE ANTICOMMONS - PATHWAYS TO RESOLVE THE RESTRAINTS OF EXTREMELY FRAGMENTED FOREST PROPERTY

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**Keywords:** fragmentation, anticommons, property rights bundling, new common property, cooperation, new commons, forest owner cooperation

## INTRODUCTION

Fragmentation of forest property is a widespread phenomenon in many European countries. It concerns spatial aspects like the size of property units as well as legal aspects like the share of the property rights bundle attached to land ownership. Under present-day legal and socio-economic conditions extreme fragmentation seriously impairs sustainable and efficient utilization of forest resources. The impairment does not only concern the utilization of forests for timber or fuel wood, but also services such as recreation, habitat management or carbon sequestration. It also concerns the social value of small property as a basic institution procuring personal freedom for many in democratic societies.

Frequently, fragmentation has reached a state of anticommons. According to HELLER anticommons is a situation when multiple small scale owners can exclude each other from efficient use of their property due to extreme fragmentation [HELLER 1998]. The coordination necessary between owners then has become so costly that the utilization of a resource system is abandoned.

One should assume, as P. SAMUELSON did, that an inefficient situation like very small "timber ownership ... will not stay ... so pulverized" due to market forces tending to find the optimal degree of property size for forest management [SAMUELSON 1974]. However, fragmentation and the anticommons dilemma resulting from it often seem to be a dead end. Consolidation of land ownership and elements of the property rights bundle is a rarely occurring process and is not really driven by market forces. Hence the questions are, what are the conditions preserving this impasse and are there pathways leading out of the stalemate.

## METHODS

The paper is based on a research project carried out at the Technical University of Dresden at Tharandt and the University of Freiburg from 2003 to 2006 [SCHURR 2006] and subsequent work of the author. The project analyzed the state and changes in the spatial and legal scope of small scale private forest property in the 20th century in the German state of Saxony, particularly throughout the transformation process from a socialist to a market economy after the political turnaround in 1989. It was aimed at making propositions for improving the functionality of small scale forest property. Methods applied were literature studies, historical and juridical analyses, case studies and hypotheses based expert interviews. The latter served to assess the potential acceptance of means to cope with the anticommons dilemma for forest owners, stakeholders and politicians.

## RESULTS

### Small scale private forests in Saxony

Saxon forests cover 5.183 km<sup>2</sup> (28% of the state's surface). 46 % belong to private owners (communities and churches 10%, state and federal government 44%). Private forests are owned by approx. 85.000 households [SMUL 2009]. Particularly in rural areas, forest ownership is widespread among residents. In Bautzen County, 14.000 of 130.000 households own forests. The average size of a Saxon private forest holding is 2,8 ha, the median average ca. 0,9 ha. Coniferous species (Scotch pine, Norway spruce) make up 62%, deciduous trees 38%

of small private forests (69% : 31% in all forests), the standing timber volume is 260 m<sup>3</sup>/ha (262 m<sup>3</sup>/ha in all forests). Forest roads have a length of 17 m/ha (24 m/ha in all forests) [BWI II 2005].

While some owners strive primarily for income by selling timber, others have consumer goals like self-subsistence for their own energy demands, being active in their leisure time or creating a personal nature reserve. Still another group is obviously not interested in their forests, although few sell their lots. [SCHURR 2007]. Cooperation between forest owners is weak particularly among smallholders. Only 3% of the private and communal forest owners are members of forest associations. However, cooperating owners hold 17% of the private and communal forest estate.

## Origins and present state of property fragmentation

In Saxony, small forest parcels are in part a remnant of subdivision processes in the 19<sup>th</sup> century. But they result also from ongoing splitting up of property among heirs and after-heirs. Another important source of fragmentation was the recent political transformation process in former East Germany. In 1945 - 49, the socialist land reform created small private parcels from expropriated agricultural and forest land, only to force owners a few years later into collectivization. Subsequently, many parcels were given back to the state. After 1990, in agriculture large enterprises were established and large lots privatized. Forest privatization, on the other hand, upheld the small parcel structures and forwent ideas of structural improvement.

Transformation also led to legal fragmentation. For instance, mineral rights (stone, sand, and gravel) or water use were tied to land ownership in the past. When private property was re-instituted in 1990, these rights were kept by government and privatized separately. After most mineral rights had been sold, the remaining rights were re-attached to land ownership as had always been the case in West Germany. Also, land owners previously could exclude third persons from collecting e.g. berries or mushrooms. Today, everybody may collect these forest products. These are just two examples for the separation of land ownership and attached rights.

Even without transformation, the property rights bundle is far from stable over time. While old uses of forests lose their value, other goods and services are permanently discovered anew. Although their provision is in most cases the product of management (or non-management) of the forest resource capital, political processes allocating property rights for new goods and services seem to run against small forest holders. Examples of such uses are horse-back riding, CO<sub>2</sub> - fixation or environmental impact compensation measures, where the newly constituted rights were retained by the government, given to the general public or special interest groups, or exclude small forests. So obviously the remainder (or entitlement) to new property rights doesn't any more "follow the ground" [BERGE 2002, 2003] and becomes decoupled from land ownership. To a certain degree this can be explained by the notion to manage these new utilizations in a larger area and avoid the cost of coordinating many owners. On the other hand there is no hinge between provision of the service and the responsibility and liability for forest management. So, obviously, there cannot be an optimal allocation of the resource.

Over a long time property rights attached to land ownership have eroded legally and spatially particularly in small scale forests. A substantial core of property which conveys chances and opportunities to the forest owner and makes small forest property functional as an economic and social institution is absent.

This development is aggravated by changes in ownership and silviculture. For the increasing number of absentee owners or owners without a farming background, small property becomes even less usable. Regarding silviculture, the coppice system, widespread until the early 20<sup>th</sup> century, was better adapted to small parcels as the high wood system dominating today. Even modern technologies like precise positioning systems combined with electronic timber measuring in harvesters don't really cure the problem of small parcels.

While spatial fragmentation can easily be seen on maps, it's difficult to recognize legal fragmentation at first glance. In this study a scheme assigning the 5 categories of property rights described by SCHLAGER & OSTROM for natural resource systems (access - withdrawal - management - exclusion - alienation) to different tenants was used [SCHLAGER & OSTROM 1992]. Each of these rights can relate to different goods and services. Table 1 shows the situation in Saxon private forests for selected goods and services and forest owners and government as just two tenants of rights (SCHURR 2006).

**Table 1:** Distribution of property rights for various forest goods and services for forest owners and government (++ strong right - sole tenant or wide ranging power to act, + right and power to act are split, (+) weak right, little power to act, but power of veto, – no property rights)

<i>tenant</i>	<i>forest owner</i>				
<i>goods &amp; services</i>	<i>timber</i>	<i>biodiversity</i>	<i>horse-riding</i>	<i>gathering mushrooms</i>	<i>hunting</i>
access	++	+	+	+	
withdrawal				+	
management	+	(+)	(+)	+	(+)
exclusion	+	–	–	(+)	+
alienation	++	(+)	(+)	(+)	+

<i>tenant</i>	<i>government</i>				
<i>goods &amp; services</i>	<i>timber</i>	<i>biodiversity</i>	<i>horse-riding</i>	<i>gathering mushrooms</i>	<i>hunting</i>
access	–				
withdrawal	–				
management	+	+	+	(+)	(+)
exclusion	+	+	+	(+)	(+)
alienation	(+)	+	+	(+)	+

## Defragmentation

Overcoming an anticommons situation must lead to a substantial core of property. It may aim at larger property units, at extended rights or a combination of both. One path leads to a wider concentration of property rights in the hands of individual owners. Another path is that smallholders combine property rights in some form of shared common property or that they cooperate by pooling some rights or certain aspects of them for a longer span of time.

Bundling by buying out small neighboring parcels works, when a single active owner with larger interest tries to acquire neighboring lots. Cooperation in forest owners associations is viable in other German states. Partial bundling exists in the case of the right to hunt which is inextricably attached to land ownership. A smallholder can benefit from it only as member of the local hunting association as long as he doesn't own 75 hectares contiguously. Common forest property is a rare exception in Saxony, but historically widespread in other states as Thuringia.

The analysis shows that these bundling paths don't work in Saxony at this time due to multiple reasons, e.g.

- the information, who owns forest lots, and the intentions of the owners (e.g. willingness to sell, cooperation interest) is not easily available for other persons;
- for a person trying to buy forest parcels in a fragmented forest area there is no clear perspective to reach the goal of a contiguous property unit due to strategic behavior of other owners who can blockade the plans even at a late stage;
- the legal procedures for transferring property are expensive and proportionally even more expensive for small lots. In particular, the regular process specified by civil law for consolidation of small individual lots to a common property forest is very time consuming, legally difficult and costly;
- more cooperation of owners is impaired by financial incentives for forestry associations solely rewarding the amount of timber sold. Subsidies don't give an impulse to extend the associations towards smallholders or non-timber interests;
- the state forest service offers gratuitous or low cost technical support for smallholders which unburdens owners from many practical difficulties when they want to harvest timber. Thus, price signals or incentives for changing inefficient structures are missing.

For some owners, the shadow of former socialist collectivization plays a role, too. But this role diminishes with historic distance and cost-benefit-considerations dominate.

Finally, while spatial bundling seems economically and practically conceivable, any attempt for legal bundling is out of the influence of single owners but rather demands political action which in turn will not be triggered by small unorganized interests.

Economically spoken, the cost of bundling for the individual smallholder is often prohibitively high, at least for a voluntary transfer of parcels or merging of rights.

## Pathways out

Forest politics could follow a laissez faire track. The experts interviewed felt though, that due to the key relevance of the forest resource system for economic and social welfare, there should be a more active approach for overcoming forest anticommons – not one of coercing owners into bundling by government action but one of providing advice, procedures and support. The objective should not be to make forest property units just larger, but to make them a bit "less little" for a lot more of economically and socially functional property and the opportunities arising from that.

A first step would be to reduce transaction cost for voluntary ownership transfer of small parcels. This can be achieved e.g. by

- providing access to information about potential buyers, sellers and prices ("forest exchange"). A working example is the French "*Bourse Foncière*";
- exempting transfer of small lots from public permissions and pre-emption rights;
- making use of procedures of land consolidation, which so far have been mainly applied for agricultural and infrastructure development. The land consolidation act gives the opportunity to involve owners in finding voluntary measures of restructuring, allows cession of parcels in exchange for land or monetary compensation, and exonerates owners from fees and taxes when restructuring. Finally, the change of the land register is implemented by administrative deed rather than by the expensive procedures of civil law.

Further, there should be significant incentives to increase cooperation, e.g. by

- changing the rules of support for smallholders by the forest administration so that non-cooperating owners are no longer rewarded;
- exempting community forest holdings which are important for cooperation building from organizational rules tying their forest management strictly to the state forest administration. Instead they should be given the freedom of choice to organize it within forestry associations;
- changing the subsidy system so that there are incentives for forestry associations to make more efforts for integrating smallholders (e.g. higher support for timber sales from small forests) as well as forest owners not primarily interested in timber (e.g. support for initiation and trust building, development of new services).

Founding new common property forests is a challenging pathway - not for large scale bundling but for pre-bundling on a local scale. Thuringia has created a specific procedure within the forest commons act to found new common forests on a voluntary basis from small parcels in exchange for shares given to the owners. The forest administration serves as an advisor and warrantor for the process. Thus, several new common property forests have been founded.

Incorporating new common property may also be realized through a step-by-step approach leading from less to more intensive forms of cooperation.

Accompanying measures to bundling like charging long-lasting heir communities financially to advance their liquidation should also be taken.

A particularly difficult field of action is legal bundling. Only if forest owners can convincingly communicate that they can reach better results from resource utilization will politicians even think about giving them property rights or rights to grasp for newly discovered goods and services. One idea, though, is to turn things around and use the commitment of a transfer of rights as an incentive for cooperation.

In Saxony, some of these proposed steps are at least discussed.

## CONCLUSION / FINAL REMARKS

The question how to avoid ever more subdividing of forest property has occupied foresters for a long time. The socialist way failed as well as the expectation that market forces solely would solve the problem. Often solutions were proposed from government, science or special interest groups, which disregarded smallholders' interests or notions. We also have to ask if fragmentation is perhaps only a problem from the point of view of a timber resource manager. Sometimes fragmented forest areas seem totally underutilized regarding timber; but a closer look reveals a vivid forestscape with many owners following their individual goals (SCHURR 2007).

The single big solution cannot be found. I'm convinced that we can cope with this situation only with small and diverse steps. Also, there are new chances for small property today, like wood energy. To a certain extent they drive bundling. There is no panacea, only a diversity of pathways.

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A detailed list of literature can be obtained from the author.





# LOOKING FOR SUSTAINABILITY IN TRADITIONAL SMALL SCALE FOREST MANAGEMENT IN NORTH WESTERN FORESTS OF IRAN (ARASBARAN)

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## ABSTRACT

Prior to 1962, small-scale landlords owned most of Iran's forestlands, in 1962, however, all lands, including forestlands and forest resources were nationalized. Their management was handed over to the Forest and Range Organization. As a result of losing ownership and usufruct rights both the ex-owners and the traditional forest dwellers and users lost from then on their interest and sense of responsibility for the sustainable management and protection of the forests. The gradual disintegration of the forest and range resources persists, in view of the fact that no modern government initiated alternatives to traditional management and production systems. In an iterative procedure a list of regional indicators was developed based on the issues identified in the systems approach via the DPSIR frame and existing sets of indicators for Sustainable Forest Management (SFM), and agro-environmental indicator to compare sustainability performance between traditional and modern forestry. After several rounds of checking requirements such as data availability, sensitivity, and specificity regarding the case study area the consolidated list included 7 criteria and 40 indicators. From the total of 40 main indicators most are split into several sub-indicators (up to 6 sub-indicators per one main indicator). This amounts to a total of 69 indicators. All of these indicators appeared in different existing sets of indicators. Forest administration, environmental administration and villagers were identified as main relevant stakeholder groups. The applicable and consequential indicators were selected concerning objectives of study. Quantitative measures, historical documents and stakeholder's judgments have been utilized for measuring indicator's values. Selected C&I have been utilized to compare and rank two forestry approaches (traditional & modern) for the case study areas from the viewpoint of involved stakeholder groups. The results demonstrated; based on the majority of employed indicators the traditional forest management appears more sustainable than the modern approach.

## INTRODUCTION

Although the concept of forest sustainability has a long tradition, forest management is currently shifting from sustained wood yield and steady forest cover to increasing diversity of goods, benefits and ecosystem values obtained or at least demanded by society (Wolfslehner et al., 2005) from forests while in the past decades forest management was mainly focused on achieving sustained timber production (Boncina, 2000; Castañeda, 2000; Rametsteiner, 2001).

Nowadays, according to the SFM concept, forest management should target achieving sustainability of all forest functions considering economic, environmental, social and cultural dimensions (Boncina, 2000; Castañeda, 2000; Rametsteiner; Simula, 2003; Wolfslehner et al., 2008).

The paradigm of forest management has shifted from timber-based management into ecosystem based and community-based management. However, to put the concept as defined above into practice was and still is a challenging task.

It is not easy to implement the SFM concept in practice because there is no universally accepted definition of sustainable forest management (Raison et al., 2001; Vogt et al., 2000).

The development of criteria and indicators (C&I) for SFM is a significant effort that has been made by many international organizations to further "clarify what is meant by SFM in practice" (Rametsteiner, 2001). C&I are tools which can be used to collect and organise information in a manner that is useful in conceptualising, evaluating, communicating and implementing sustainable forest management (Fürstenau et al., 2007; Castañeda, 2000; Mendoza and Prabhu, 2000; Prabhu et al., 1999) with which we may be able to judge whether a particular forest management is sustainable based on the SFM concept or not. C&I can be identified at various levels:

global, regional (ecoregional), national and subnational, or at the forest management unit (FMU) level (Prabhu, 1999).

## Major landcovers of Iran

Recent historical evidence indicates that the vast areas of central Iran, which are now suffering aridity and desert-like conditions, had once been covered by valuable ranges and forests. Although environmental factors and climatic changes have undeniably contributed to the desertification processes, it is believed that they have, in most cases, been less destructive than human activities. The country's present land use categories may be classified as follows:

- a. Rangelands (90 million ha) make up 55% of Iran's territory;
- b. Forests (12,4 million ha) cover 7,4% of the country's land area;
- c. Deserts (34 million ha) occupy 21% of the country;
- d. Settlements, infrastructures and water bodies with an area of about 4 million ha, occupy 2,2% of the country's surface area;
- e. Agricultural lands considered globally (rain-fed and irrigated) exceed by far the forestland area. They are distributed over 23,6 million ha, thereby occupying 14,4% of the national territory.

## Sustainability in the context of traditional management

Prior to 1962, small-scale landlords owned most of Iran's forestlands, whose resources were sufficient to meet national and local demands for industrial as well domestic wood products. In 1962, however, all lands, including forestlands and forest resources were nationalized.

Their management was handed over to the Forest and Range Organization. As a result of losing ownership and usufruct rights both the ex-owners and the traditional forest dwellers and users lost from then on their interest and sense of responsibility for the sustainable management and protection of the forests. These became henceforth seen as free public good and were used with less restraint to face the growing demands that followed the dramatic population growth that followed. The forest nationalization of Iran has alienated customary owners and users, and making people dependent on the government for access to, and utilization of their traditional lands and resources. A breakdown in the traditional systems of community forest and range management, coupled with the advent of cash-crop economy and population increase contributed to the collapse of large tracts of forests and range.

## Iran forest policy

Following are six basic guideline principles of the forest, woodland and rangeland development policy:

- (1) Integrated approach to planning and development following natural resources' study and assessment
- (2) Awareness-raising vis-à-vis the importance and value of natural resources;
- (3) Developing participatory approaches to resource management;
- (4) Securing the required support from the legislative, judiciary and executive bodies, to ensure full implementation of FRWO's national development policy and programmes
- (5) Taking measures towards institutional reform and capacity building;
- (6) Ensuring a continuous monitoring/evaluation of forestry policies and programmes' implementation.

These policies have been translated into six major activity fields as described below:

- (i) Conservation of natural resources;
- (ii) National Forestry Action Plan formulation and implementation. The objective here is to achieve sustainable participatory development of forests and green areas through the rehabilitation and the development of the national tree resources;
- (iii) Achieving the national objective of balancing the livestock population in harmony with the rangelands actual carrying capacity;
- (iv) Settling scattered livestock owners and nomads, respectively outside commercial forests (Caspian area) and natural rangelands, by means of various alternative opportunities;
- (v) Settling land property disputes by thorough land ownership demarcation at national level;

(vi) Undertaking the implementation of the National Action Plan for Desertification Control.

Promoting participation has become the foundation to sustainable natural resources management policy in Iran. The implementation of any development, extension and supportive project cannot be done without the agreement, commitment and full involvement of the rural people and the private sector. The approach adopted remains however strictly top down. Even though tenure rights and technical and material support are granted, they do not set in motion the profound sense of ownership of, and responsibility for the resource, which is necessary for achieving long-term sustainable conservation and development of forests and rangelands.

### The study region Arasbaran

The selected area for this study is located in Arasbaran in the North-West of Iran. These forests are affected by different degradation factors of which fuelwood harvesting and livestock grazing are more important than the others. Arasbaran is one of Iranian biosphere reserve with valuable fauna and flora diversity, therefore the conservation of these forests which are located in the semiarid zone is particularly important. As other forests in Iran, land tenure and utilization rights in this area also make people careless of forest conservation. Villagers and nomads who are living in this rural mountainous area are poor people and this increases the pressure on natural resources. Forest conversion to rangeland and farmland, overgrazing of ranges and forests, illegal wood harvesting and incessant challenges between local communities and Forest, Range and Watershed Organisation (FRWO) experts are the major problems of study area. Two major forest types in this area are *Carpinus betulus/Quercus petraea* forests and *Carpinus betulus/Quercus macranthera* forests.



Figure 1: Map of the Islamic Republic of Iran incl. selected study area.

### Forest management in study area

Although five forest management plans have been designed by FRWO for this area since 1962 none of them has been implemented completely due to administrative or technical problems. Currently there is no forest management plan approved by administration. The most recent management plan designed as a “multiobjective forest plan” is under review within FWRO. There are also some suggestions in these plans such as evacuation all

of livestock from forests with more than 50% canopy cover and from forests under operational activities, hiring forest dwellers for operational implementation activities as workers to substitute for their livestock husbandry income, developing centralized livestock husbandry in stables instead of open grazing. And finally developing sericulture for improving villagers' economic condition. Initial negotiation with villagers to participate in these project activities was not successful.

## METHODOLOGY

The approach taken for developing a set of indicators for the study region was a systematic approach including top-down, bottom-up, Driving force-Pressure-State-Impact- Response [DPSIR] and interaction analysis of elements within an initial set of indicators.

Stakeholders were also identified and analyzed by employing "who counts matrix" (introduced by Colfer, et al. 1999). Forest administration, environmental administration and villagers were identified as main relevant stakeholder groups.

In an iterative procedure a list of regional indicators was developed based on the issues identified in the systems approach via the DPSIR frame and existing sets of indicators for sustainable forestry and agriculture. After several rounds of checking requirements such as data availability, sensitivity, and specificity regarding the case study area the consolidated list included 7 criteria and 40 indicators. From the total of 40 main indicators most are split into several sub-indicators (up 8 sub-indicators per one main indicator). This amounts to a total of 69 indicators. All of these indicators appeared in different existing sets of indicators. Forest administration, environmental administration and villagers were identified as main relevant stakeholder groups.

Generally the criteria are derived from pairwise comparisons of the criteria with respect to their parent element in the decision. In a participative process where local stakeholders should express their opinion on criteria, pairwise comparisons, despite the intuitive approach, may be too complex and demanding. For the current analysis different approaches have been used depending on the background of the involved stakeholder groups.

Finally developed regional criteria and indicators are as follows:

### **Criterion 1 Current area and percentage of major terrestrial ecosystems**

- Indicator 1.1. Forest area, Range area, Farm area
- Indicator 1.2. Percentage of areas under landuse management plan
- Indicator 1.3.
- Indicator 1.4. Conversion of forest land to other land cover types

### **Criterion 2 Biodiversity conservation in forest lands**

- Indicator 2.1. Area of conserved forests
- Indicator 2.2. Number of forest dependence species
- Indicator 2.3. Number of endangered forest species
- Indicator 2.4. Area of mixed forests
- Indicator 2.5. Plantations with exotic species

### **Criterion 3 Integrity of forest ecosystem**

- Indicator 3.1. Natural forest regeneration
- Indicator 3.2. Areas and percentages of forests mainly affected by:
  - fire
  - drought
  - wildlife
  - other natural causes like as pests
- Indicator 3.3. existence and amount of deadwood
- Indicator 3.4. Naturalness of forest species composition
- Indicator 3.5. Naturalness of range species composition
- Indicator 3.6. Degree of forest degradation:
  - forest canopy cover
  - soil compaction

- soil erosion

Indicator 3.7. Degree of range degradation:

- vegetation cover
- soil compaction
- soil erosion

Indicator 3.8. Environmental damages caused by different landuse practices

- air pollution
- soil pollution(forest, range and farmland soils)
- surface and underground water pollution

#### **Criterion 4 Forest functions and production capacities**

Indicator 4.1. Quantity and value of harvested wood

- traded in market
- for subsistence uses

Indicator 4.2. Quantity and value of harvested NWFP

- traded in market
- for subsistence uses

Indicator 4.3. Quantity and value of livestock products

- traded in market
- for subsistence uses

Indicator 4.4. Quantity and value of crop products

- traded in market
- for subsistence uses

Indicator 4.5. Annual balance between growth and removal of wood and non-wood forest products

Indicator 4.6. economic values of forest eco-tourism

#### **Criterion 5 Forest ecosystem services**

Indicator 5.1. Areas and percentages of forests managed mainly for soil and water conservation

Indicator 5.2. Areas and percentages of forests managed mainly for wildlife conservation

Indicator 5.3. Areas and percentages of forests managed mainly for protection of endangered and rare species

Indicator 5.3. Areas of plantation in land erosion

#### **Criterion 6 Maintenance and improvement of socioeconomic benefits of forest**

Indicator 6.1. Share of the forestry sector in the formation of local communities' incomes

Indicator 6.2. Investment in forestry sector incl. forest industries

Indicator 6.3. Condition of local community livelihood include: income per capita, education, employment rate, health, required skills and population growth rate.

Indicator 6.4. Share of energy consumption based on renewable resources

Indicator 6.5. Existence of mechanism for participation of local communities in planning, implementing and monitoring of forestry plans

Indicator 6.6. Traditional cultures and customs are respected by governmental organization

#### **Criterion 7 legal and institutional framework**

Indicator 7.1. Existence of a national and/or sectoral forest policy /plan/programme that ensures the integration of forest management in rural land use planning and to the economic and social development strategic framework.

Indicator 7.2. The management plan and supporting documents has been providing:

- Management objectives.
- Description of the forest resources to be managed, environmental limitations, land use and ownership status, involved stakeholders, socioeconomic conditions, and a profile of adjacent lands.
- Description of silvicultural and/or other management system, based on the ecology of the forest, socioeconomic conditions of local societies in question and information gathered through inventories.

- Provisions for monitoring of forest growth and dynamics.
- Maps describing the forest resource base including protected areas planned management activities and integration of uses by different stakeholders.
  - Description and justification of harvesting techniques and equipment to be used.

Indicator 7.3 The management plan has been periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social and economic circumstances.

Indicator 7.4 FRWO provide sufficient budget during plan implementation.

Indicator 7.5 Share of area (or quantity of material) utilized based on rights

Indicator 7.6 Share of area (or quantity of material) utilized based on customs

Indicator 7.7 Existence of mechanisms for resolving disputes over tenure claims and use rights

## RESULTS

The current management approach (governmental forest management) as well as traditional small scale forest management has been compared by means of developed indicators in the simply ranking method. Criteria weighing profiles were also applied. Indicators values in traditional system were estimated form historical documents and also by interviewing with older villagers.

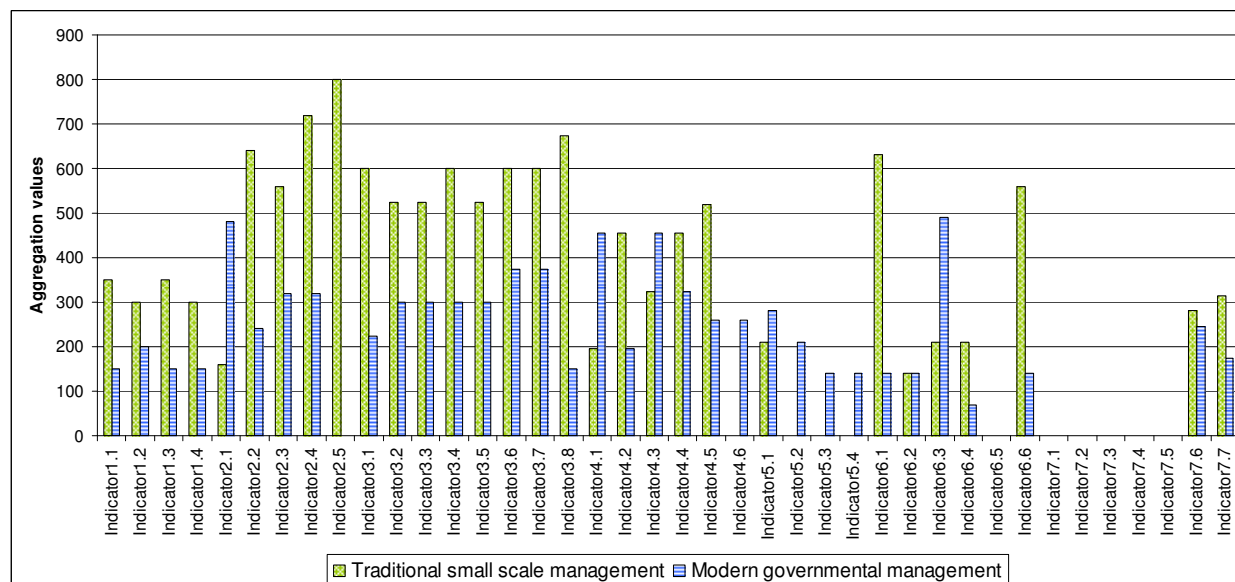
Table 1 shows the descriptive values of indicators in two management systems as well as the aggregative values by means of criteria weights.

**Table 2:** Comparing indicators values in two management systems

Sustainability Indicator	Indicator weight	Indicators values		Aggregated Values	
		Traditional management	Governmental management	Traditional management	Governmental management
Indicator1.1	7	3	50	350	150
Indicator1.2	6	4	50	300	200
Indicator1.3	7	3	50	350	150
Indicator1.4	6	3	50	300	150
Indicator2.1	2	6	80	160	480
Indicator2.2	8	3	80	640	240
Indicator2.3	7	4	80	560	320
Indicator2.4	9	4	80	720	320
Indicator2.5	10	0	80	800	0
Indicator3.1	8	3	75	600	225
Indicator3.2	7	4	75	525	300
Indicator3.3	7	4	75	525	300
Indicator3.4	8	4	75	600	300
Indicator3.5	7	4	75	525	300
Indicator3.6	8	5	75	600	375
Indicator3.7	8	5	75	600	375
Indicator3.8	9	2	75	675	150
Indicator4.1	3	7	65	195	455
Indicator4.2	7	3	65	455	195
Indicator4.3	5	7	65	325	455
Indicator4.4	7	5	65	455	325
Indicator4.5	8	4	65	520	260
Indicator4.6	0	4	65	0	260
Indicator5.1	3	4	70	210	280
Indicator5.2	0	3	70	0	210
Indicator5.3	0	2	70	0	140
Indicator5.4	0	2	70	0	140
Indicator6.1	9	2	70	630	140
Indicator6.2	2	2	70	140	140
Indicator6.3	3	7	70	210	490
Indicator6.4	3	1	70	210	70
Indicator6.5	N.A	N.A	70	0	0
Indicator6.6	8	2	70	560	140
Indicator7.1	N.A	N.A	35	0	0
Indicator7.2	N.A	N.A	35	0	0
Indicator7.3	N.A	N.A	35	0	0

Sustainability Indicator	Indicator weight	Indicators values		Aggregated Values	
		Traditional management	Governmental management	Traditional management	Governmental management
Indicator7.4	N.A	N.A	35	0	0
Indicator7.5	N.A	N.A	35	0	0
Indicator7.6	8	7	35	280	245
Indicator7.7	9	5	35	315	175
Total				13335	8455

Figure 2 presents the comparison state of two forest management systems by applying the sustainability indicators.



**Figure 2:** Aggregated indicators values in traditional and modern management

## CONCLUSION

The study area can be considered as archetypical for many of today's problems in Iranian forest resource management in particular and of landuse planning and management in general. The gradual disintegration of the forest and range resources persists, in view of the fact that no modern government initiated alternatives to traditional management and production systems.

Since forests and rangelands belong all together to nobody and to everybody, they are recklessly overexploited. The "first come, first serve" concept became a predominant method of natural resources' utilization and misuse and mismanagement have resulted in even deeper socio-economic problems, giving rise to more poverty in rural areas. The government and its administrative authorities are investing massively to rehabilitate, protect and manage on one hand, and communities inclined to misuse and degrade, to survive, on the other hand.

Despite the government's commitment to promote more community involvement in environmental and forestry affairs, there is still a need to review the present laws and incorporate all elements that will lead to true community participation and partnership.

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# A PERSPECTIVE FROM PRIVATE FOREST PROPERTY OWNERS ON FOREST POLICIES IN CATALONIA: A SPECIFIC FOCUS ON THE RESPONSE TO NATURAL RISK EVENTS

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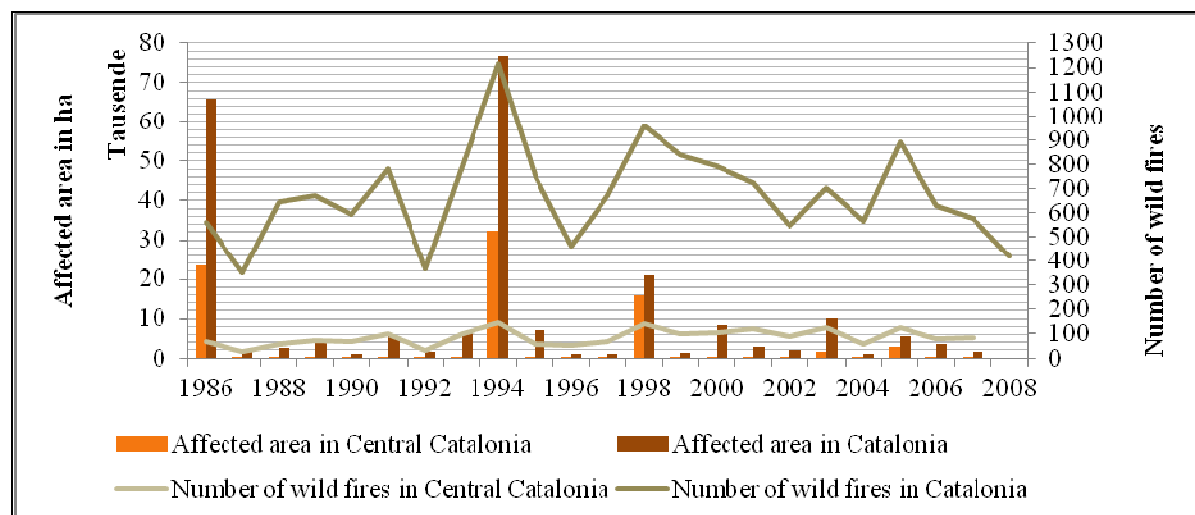
**Keywords:** Private property owners; extreme events; policy instruments

## INTRODUCTION

Catalonia is a Mediterranean region situated in the northeast of Spain. Here, forest land covers 64.2% of the territory, of which 38% consists of dense vegetation, with more than 20 % treed canopy cover. The Pyrenean and Pre-Pyrenean mountain ranges strongly define its regional character. This includes its orography, a unique climate variety<sup>1</sup> and soil diversity. As a result of the set of conditions, conifers are the widest spread tree species (38%), but deciduous trees also represent an important part of the forest territory, making up at present about one third (27%) of the species. Among them, oak trees are the most common ones (Generalitat, 2010).

Climatic conditions, with its hot and dry summers, make Catalonia vulnerable to wild fires (see Figure 1). On average, around 692 forest fires break out every year. Figure 1 shows fire events in the period between 1986 and 2007. The territorial damage was most serious in the years 1986, 1994 and 1998. In total, they affected 160 thousand hectares of land. Only 1% of all fire ignitions finally lead to 70 – 80% of the caused damage (Castellnou et al. 2004).

While wild fires are frequent in Mediterranean regions, snowfall can only be experienced on rare occasions. During the past three decades, only four snowfall events have been registered. They occurred in 1986, 2006, 2008 and 2010. The latest event took place in March 2010. This unusual event affected 10.083 km<sup>2</sup> in the northeast of Catalonia, among others damaging trees and cutting municipalities from electrical supplies. In fact, the damage produced on the vegetation increased the risk of potential forest fires as dry branches catch fire more readily.



**Figure 1:** Wild fires in Catalonia 1987 – 2007

Source: Own elaboration based on data from the Environmental Department of Catalonia (DMAH 1986 – 2007)

<sup>1</sup> Rainfall intensity varies between 350mm – 1.300 mm and temperature between 13-20°C ( $\Delta T$ ).

## Challenges to the forestry sector

The economic forestry sector is suffering a drop in value. Wood prices in Catalonia are high compared to competitors. This is due to the region's orography which makes wood extraction difficult and hinders the use of machines. In 2010, the forestry sector contributed only 2.8% to the regional Gross Product (Gross Domestic Product plus subventions; IDESCAT, 2011). Consequently, investments in forest property are not profitable and therefore activities need to be subsidized by the public sector. The ownership structure is dominated by private owners, possessing 80% of the land. According to the cadaster 2011 (unpublished), there are approximately 200,000 private owners. From an ownership perspective there are many owners with small property sizes of 1 to 5 hectares of land. But from a territorial perspective there are a few owners who possess extensive properties. Hence for forest policy to be effective, policy instruments have to reach those diverse stakeholder groups.

The Catalan Government started to assume responsibilities of this sector in 1989, approving the Forestry Act. Still twenty years later, 422,101 hectares, only 28.6 % the territory (MARM, 2007), were declared to have a management plan. Another problem is that since 2004, the approval of a new overall strategy for Catalan forests remains unresolved, so that even though management is undertaken, there is no territorial coherency. Furthermore, there still exist many open questions concerning the socio-demographic structure of the property owners and the result of policy measures. Thus as the target group for policies is not clearly analyzed, there is a great risk that political measures fail in effectiveness.

Forest management is crucial in Mediterranean regions in order to be compatible with human coexistence. As already mentioned, forests are vulnerable to forest fires. Catalan statistics on the origin of forest fires show that only 12.6% of all fires are of natural origin (Generalitat de Catalunya, 2010). Moreover, forests fulfill an important social function (mushroom hunting, excursions, tourism) but without forest management practices those functions cannot be fulfilled due to the impenetrable vegetation structure. Also, biodiversity suffers from highly dense forests. Studies have shown that there is an inverse correlation between densification of the vegetation and a strong decline in biodiversity (Camprodon and Plana, 2007; Castellnou & Miralles 2010).

Another aspect is the erroneous public perception towards the nature of the forests, which does not see the necessity of forest management but relates it much more to a destruction of biodiversity. The lack of public concern for the forestry sector most likely has negative repercussions on the political priorities of the Catalan government. This might be reflected in the fact that actually more effort is undertaken for fire combat than for prevention (see conclusions), even though it is known that great forest fires cannot be extinguished by human efforts. (Plana et al, 2004)

## Objective

In this context, this article is pursuing two objectives. On the one hand it seeks to identify the actual political-administrative bottlenecks that hamper a successful development of forest management in Catalonia and on the other it seeks to describe the learning process concerning social and environmental issues in relation to extreme events. The study centers on a snowfall event in 2010 as a meteorological phenomenon and the great forest fires<sup>2</sup> in the last 30 years within the geographical framework of Central and Northeast Catalonia in order to exemplify the findings.

For the first part of the analysis, current forestry legislation serves as one axis for comparing legally fixed objectives with results. It includes increasing competitiveness of the sector and management of forest territory through forest management tools. The second axis reflects political willingness to set incentives in this area. While the first two mentioned aspects are long-term measures, the latter provides the overall framework to implement legal objectives. In this way the effects of extreme events on the territory exemplifies how efficient previous measures have been in a determined area.

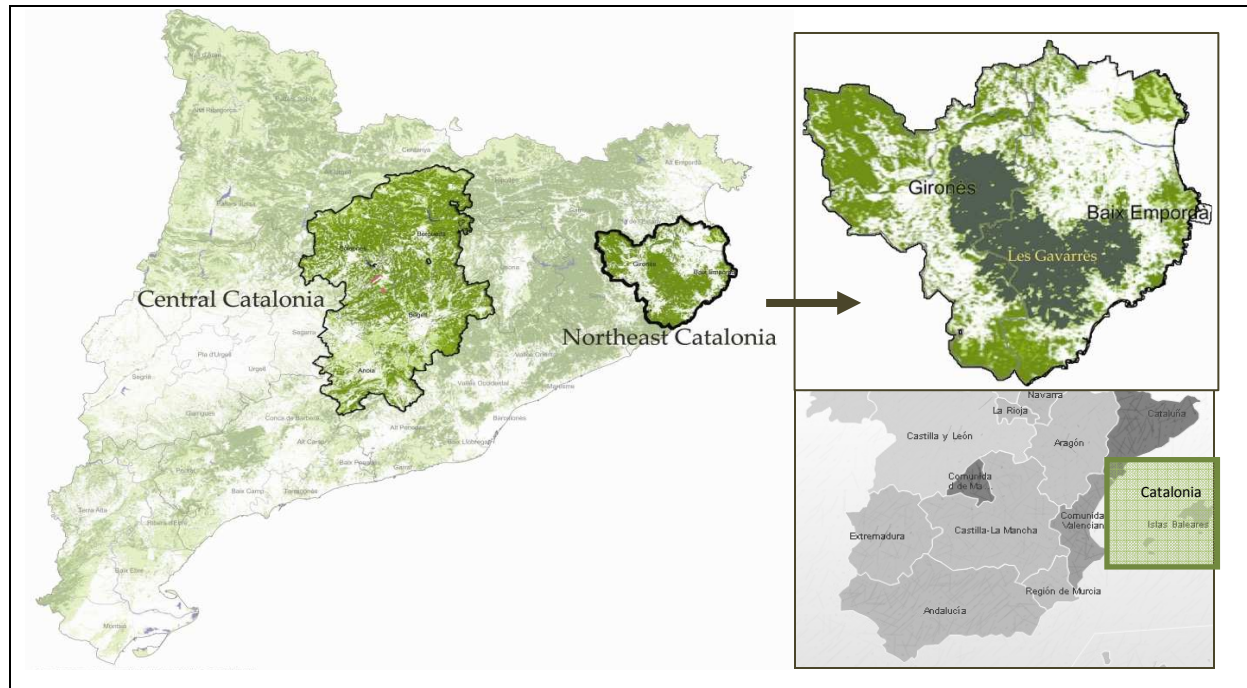
The second objective focuses on social issues. Taking as a starting point the fact that forest property owners in Catalonia act more individually than jointly, it is interesting to study the development process of forest property owners associations. This aspect goes hand in hand with distinct forest management manners and the relationships and synergies among implied social agents facing extreme events such as great forest fires.

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<sup>2</sup> According to the official definition of the Catalan Government, the term *Great Forest Fires* refers to fires that affect at least 500 hectares of land.

## Study area

The concrete study areas are located in Central and Northeast Catalonia. Both were affected by extreme events in the past. While in Northeast Catalonia the focus will center on the snowfall in 2010, in Central Catalonia the focus will lie with forest fires.



**Figure 2:** Study area

Source: Own elaboration based on the Draft of the General Plan on Forest Policies 2007 - 2016

## Central Catalonia

Central Catalonia, or also denominated the “fourth forest region”, forms 14% of the Catalan territory. It was severely affected by the forest fires in 1986, 1994 and 1998. Those events affected in total 17% of this territory. The latest fire incidence took place in 2005 however it was less intense than the aforementioned events.

This region is rich in forests and agricultural land. Over half of the territory is covered by dense forests and about one fourth is used as agricultural land. Only a small part is urbanized. It is a hilly region of which over half of the territory is situated between 400 and 800 meters above sea level with mainly gentle slopes. Forest areas are 94% in private hands and property patterns vary in sizes between 5 to 10 hectares up to more than 40 hectares. (Land registry, 2011 (unpublished))

Concerning population, it can be said that there exists a significant distinction between rural and urban areas. About 40% of the population lives in the sub-regional capitals (IDESCAT, 2010). Since the rural exodus in the 1970's, agricultural land has been abandoned. Nowadays, 2 - 13% of the population depends on the area in Central Catalonia which is dedicated to the primary sector (Census, 2001).

## Les Gavarres

The second study area is located in the northeast of Catalonia. It specifically concentrates on a protected area named “*les Gavarres*” which expands over an area of about 29,000 hectares. In March 2010, the snowfall event heavily affected the area.

*Les Gavarres* is situated within a mountain chain, with the highest peak reaching 533 meters above sea level. Due to erosion, the relief presents gentle forms as in Central Catalonia. Its legal status was defined in 1992, protecting it for its ecological, social, cultural, historic and scientific values. Almost the whole area is covered by forests; only 6% is dedicated to agricultural activities. Similar to Central Catalonia, 93% of the property lies in

private hands. In the northern part of the territory the property extensions reaching about 100 – 600 hectares while in the rest of the area property sizes are similar to the rest of Catalonia.

Les Gavarres is developing economic potential in cork production by centering forest management on cork oak development. Apart from the cork sector there exist companies dedicated to forest management services.

Even though the area is sparsely populated (3 inhabitants/km<sup>2</sup>), there are 20 municipalities with a total of 231,979 inhabitants surrounding it which produce urban pressure on the area in a way that a further expansion of the protected area would be difficult. The greatest pressure is produced by tourism and secondary residents that are attracted to the coast area.

## METHODS

As a basis for the realization of this research, a bibliographic study provides the required background knowledge to develop the overall theoretical framework for the subsequent field research. The research model consists of in-depth interviews with social agents related to the study area.

In total 43 individual interviews were conducted in a period between 2010 and 2011. On average, each lasted between 1 and 2 hours. The chosen interview method follows a general guideline on the above mentioned issues, rather than asking predefined questions. Even though underlying questions were maintained throughout every interview, others were adapted to the experience of each interviewee regarding the field of interest of this study. This approach was chosen in order to obtain precise and complete information on the research topic. The atmosphere generated by the open questions left space for the interviewees to communicate aspects that were not considered in the guidelines.

The selection criterion to obtain reliable information from the interviewees mainly depended on their experience related to forest management. The group of interviewees comprised among others: private owners, associations, syndicates, public administrations with technical and/ or political competencies generally in higher working positions. The table below contains a summary of the profile of the interviewed social agents.

**Table 1:** Overview on details of the interviewees

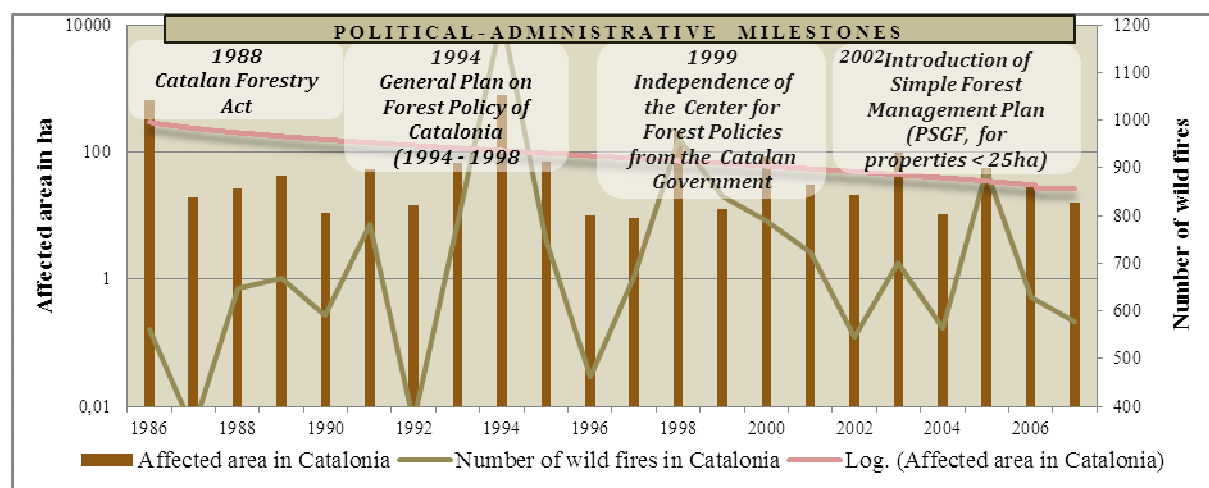
Function	Institution	Number of interviewees
Technical experts (working position within the Catalan Government)	Centre of Private Forest Property (CPF)	6
	Department of the Territory and Sustainability	2
	Department of Agriculture, Fishery, Food and Environment (DMAH)	5
	Department of the Interior	3
Technical experts of the <i>Diputació de Barcelona</i> (provincial level)	Technical Office for Municipal Prevention of Forest Fires	5
Technical experts and management at municipal level	Civil Protection	1
	Mayor	1
Executive manager, Vice-president, President	Agricultural Syndicate	1
	Forestry Associations	3
Forest property owners, Rural Officers, Associations for Forest Fire Defense.(ADF), Associations for Forest Property Owners		10
Head of the CTFC; Experts in Forest Fires.	Forest Research Centers (Research Center for Ecology and Forestry Applications; Catalan Technological Forestry Center)	3
Group of ecologists		1
Total		43

To achieve coherence among the responses, the information gathered was contrasted with responses of other social agents, as well as with diverse sources of information, such as previous studies or statistical data. Additionally, certain data were obtained by attending forest property association assemblies.

## RESULTS AND DISCUSSION RESULTS

There is a direct relation between the impact of extreme events and the development and implementation of forest policies. Those imply a legal framework, planning instruments and an effective distribution of responsibilities. Forest fires are a clear example that reflects the necessity to take preventive measures. Figure 3

shows the relation of forest policies and the events of forest fires in Catalonia between 1986 and 2007. In the upper part of the graph milestones in political-administrative measures are pointed out with its respective year of implementation. It can be seen that the affected area by forest fires reduced since the implementation of forest policies. However the number of wild fires that occurs remains high and in the year 2000, 2003 and 2005 fire incidences affected between 4,500 and 9,300 hectares of land (DMAH, 1986 - 2007). This is a sign that structures for fire extinction are efficient but long-term prevention is still lacking efficiency.



**Figure 3:** Relation of Forest fire events and implementation of forest policies 1986 - 2007.

Source: Own elaboration based on data from the Environmental Department of Catalonia

### Political-administrative perspective

Several examples can be listed that show the political response to extreme events in the past. From a planning perspective, the General Plan on Forest Policies (1994 – 2004) - a strategic plan that treated forestry at the regional scale, and management plans – planning instruments at the local/ property scale were approved. Furthermore new institutions were created or incentivized. On the one hand, entities with control functions came into life such as the fire prevention program *Foc Verd*, (local) Associations for Forest Fire Defense (*ADF*) and “Rural Officers” (*Agentes Rurales*). On the other hand, the Centre for Forest Property was created to support private owners in planning and managing their forest territory. Concerning territorial planning instruments, maps on forest fire risk and respectively high risk areas were elaborated. These risk area perimeters have to comply with certain rules in order to be prepared in case a fire breaks out. Also, since the great forest fire in 1998, the *Diputació de Barcelona*, the public administration for the province of Barcelona, gave impulse to managing forest territories through associations.

However, in many examples those measures remain purely theoretic and formal and the task of consolidating and implementing them remains. Hence, the fact that instruments are approved does not mean that they will finally be completely implemented but in a partial or unconnected manner and sometimes even without an overall framework to provide coherence among individual actions/ plans. In fact, the lack of overall planning instruments for forest management was broadly criticized by the interviewees. The development of an overall plan for forest management was projected since the enforcement of the Catalan Forestry Act in 1989. Since then the General Plan on Forest Policy (*PGPF*) 1994-2004 was approved, however its effectiveness is highly questioned (*PGPF*, 1994; interview result). Further legislation proposed the development of overall management plans at a sub-regional level, Management Plans for Forest Resources (*PORF*), grouping forest areas with similar characteristics. In that way, further planning would be standardized and thereby would be more cost efficient and plans could be simplified. For now 2 out of 7 of those plans are in the process of being developed.

A step towards further regulations in this field would represent a solution to other criticism, such as fluctuating and low budget assigned to the sector and a clear strategy on long-term objectives. For example, in response to the general crisis, the budget was cut down to 15.55%, to 3,204 M€ out of 20,600 M€, of the agreed amount in 2010 (Unió de Pagesos, 17.10.2010). But even under normal conditions, the set budget for forest management is low. It only allocates 3.90 € per hectare as an average value for the whole territory and represents only 2.39% of the budget for environmental activities of the Catalan Government (Data: MAH/1668/2010 and governmental

budget). In the case of the snowfall event last year, 9.5 M€ were assigned to alleviate and repair damage and to avoid potential forest fires that are facilitated by the high amount of accumulated biomass (Tusell i Armengol, 2010). This amount is almost three times the allocated value for preventive measures for the whole sector of private properties.

Until 2009, 28.42% of private forest properties possessed a technical management plan (MARM, 2007 and DMAH 2005). However, in an unofficial interview response it was stated that only “10%” of the property owners finally implemented their management plan and that in the majority of the cases subventions for management were allocated to the same applicants year after year. No official statistics were found that prove those data. Nevertheless, on the one hand it confirms the above mentioned criticism of the merely theoretic management instruments and on the other hand it leads to the conclusion that the managed forest areas do not expand and even decline in times of crisis as a logical consequence of budget cut backs. This conclusion can be deduced from the statements made by interviewees from the public sector which say that forest property owners only manage their territory when receiving financial support as management practices generate costs instead of income.

Stakeholders such as the Catalan Forest Consortium (*CFC*), the *Diputació de Barcelona* and the Federation of Associations of Private forest property owners (*BosCat*) pursue the objective to group owners to use budget resources more efficiently. This is partly achieved through agreements made in forest owner assemblies. However, from a legal perspective, individual actions are favored as there still is a lack of a legally accepted joint management instruments and owners still have to apply individually for subventions.

## Social perspective

From a social perspective certain changes have been detected. In the past, forest property owners would act in individual rather than in a collective interest (Dominguez, 2008). But when facing extreme events such as snow or wind storms or forest fires, owners were obliged to act in a joint manner:

- To act more quickly, it pays to be well organized when the situation of a forest fires comes about.
- To be more efficient in the way of managing the territory
- To possess greater power when negotiating with forest companies
- To have more possibilities to dialogue with politicians
- And to obtain greater financial resources to be able to develop forest policies and a greater social recognition.

The learning process can also be observed in scientific and technical areas. Their conservative perspective on the “untouchable natural environment” has changed towards the implementation of management techniques that manage forest territory in the best possible way to preserve it. There is also a change on the paradigm of forest fires. Forest fires were always seen as a phenomenon that has to be fought (detected and immediately extinguished) and to be prevented by infrastructure for protection, preventive forest management and legislative measures. Nowadays, proactive prevention measures are finding acceptance among stakeholders of the sector. Those imply management practices by agroforestry or by alternating landscape patterns such as woodland, agriculture fields and pastureland in order to reduce biomass and so reducing the risk for forest fire incidences. (Plana et al, 2004)

Also the Support Group for Forest Activities (*GRAF*) – a group of “firemen” that aims to prevent forest fires, contributed to new concepts for example, accepting the necessity for the occurrence of forest fires. Without them, the forest area would expand always more, consequentially creating optimal conditions for the break out of a great forest fire. Additionally, the group is using fire as an instrument for forest management. By burning the biomass, it aims to reduce the organic fuel.

It will be a future challenge to reach an effective exchange among the academic world and that of the property owners and to enter those matters into the political area.

## CONCLUSIONS

The forestry sector hides a range of potentials that could be developed through political support. There is for example economic potential by enhancing tourism or by supporting small and medium sized companies in the wood sector. Nowadays, local wood has lost its value and is substituted by other materials such as concrete or

metals. Not only would the usage of Catalan timber be a potential to increase the importance of the sector within the regional economy but it would also contribute to generating jobs and to manage forests by making management profitable and finding a use for the waste products which today remain in the forests. The introduction of biomass as thermal energy is a promising concept which is supported by the government and other forest associations.

Stable and sufficient financial support is a key aspect to change the actual situation of the sector. But in order to reach long-term effects, a general strategy is indispensable. There still exists a new strategy draft since 2007. However its date of approval remains open, instead, politicians talk about new changes to the draft to update its status.

Many political measures were taken after the incidence of an extreme event and finally lacked throughout implementation. The question is whether it is favorable to take action directly after an incidence taking advantage of the situation by attracting media attention or whether it would be more effective to reflect more deeply on the matter before implementing measures.

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# FURTHER DEVELOPMENT OF A NEW CONCEPT IN SMALL-SCALE FORESTRY: “FOREST-MANAGEMENT-SERVICE-CONTRACTS” IN BAVARIA

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## 1 INTRODUCTION

The forests in Bavaria cover about one third of its land area or 2.56 Mio hectares (ha) and the major part of these forests are held by private forest owners. Around 700 000 landlords manage approximately 1.4 Mio ha. Two thirds of the private forest enterprises cover less than 20 ha. In Bavaria, about 140 Forest Owner Associations (FOAs) play a key role in managing the small scale forests.

In the last years, a new concept in small scale forest management arose. The background is:

1. A considerable part of the forest owners are not able or willing to manage their forest by themselves. The reasons could be described as “social demographic changes in modern societies”. That means forest owners are overage and/or physically unable to work or deal with the management of their property, they do not have the skills and expertise or they live too far from their forest property (urban forest owners).
2. In 2005, according to a “reform” of the Forest Service in Bavaria, the Forest Service reduced the subsidised management service for statutory corporations (those are for example: church as forest owner, municipalities and common land bodies).

In this situation a “new market” for forest management services arose. The statutory corporations needed a proper management for their forests according to the German forest laws and the FOA took the chance to adopt a new business concept, the “Forest-Management-Service-Contract” (FMSC). The Bavarian Forest Service has reduced the subsidies for the statutory corporations on one side, and started supporting the FOA on the other side, to incentivise them to fill this market niche.

In Bavaria, approximately 3000 Forest-Management-Service-Contracts exist at the present, covering over 40.000 hectares. For about 20 % of the FOAs, FMSCs are already a significant business segment. The FOAs supervise on average, more than 500 hectares each and contract professional forest engineers.

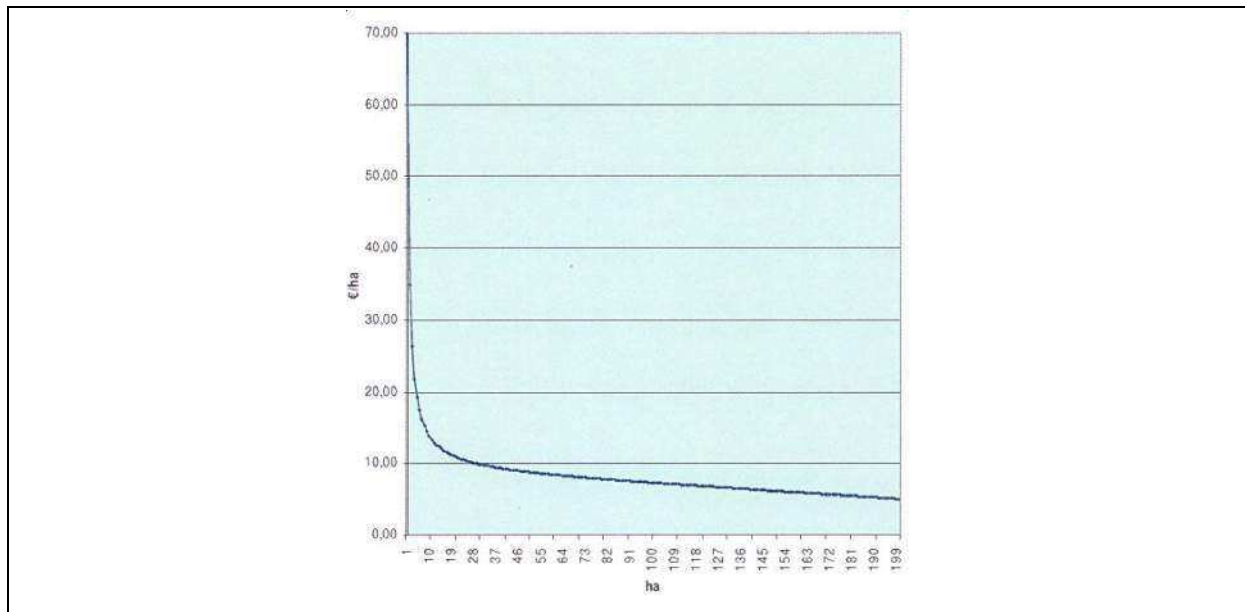
The subsidies for the FOAs in the framework of the development of the FMSC concept are regulated in the “directive of subsidies for project measures of forest owner associations within the frame of a forestal support programme”<sup>2</sup>. For a better understanding of the development of FMSCs, some important facts of this directive are summarized:

- I. The »basic-supervision« (which is a precondition to receive the »state subsidies«) includes: a) forest protection and b) legal duty to maintain safety. Further agreements between the parties are possible, independently of the state directive.
- II. Subsidies depending on FMSC areas:

Area of FMSC	Subsidies
0,1 – 2 ha	70 € per contract and year
> 2 ha	Single case calculation, see figure 1

<sup>1</sup> SUDA, M.; SCHAFFNER, S.; HUML, G. (2009): Projekt G 28. Die Beratung der Forstlichen Zusammenschlüsse in Bayern – Inhalte, Methoden und Erfolge. TUM, Freising.

<sup>2</sup> Richtlinie für Zuwendungen für projektbezogene Maßnahmen der forstlichen Zusammenschlüsse im Rahmen eines forstlichen Förderprogramms (FORSTZUSR 2007), Bekanntmachung des Bayerischen Staatsministeriums für Landwirtschaft und Forsten vom 12. März 2007 Nr. F2-NW 264-1716



**Figure 1:** Subsidies for FMSC related to contract area in € per year (source: <sup>2)</sup>)

Figure one shows the declining state subsidies as a function of the total FMSC area. This financial incentive fosters the development of FMSCs, but the FOAs still have to analyse every single contract to estimate its cost-benefit-ratio.

The intended project “Further development of the successful concept - Forest-Management-Service-Contracts - through economic analysis” will support the FOAs in this point and will contribute to facilitate this economic analysis. The main objective of the project will be: Elaboration of a data base for the better understanding of crucial factors of FMSCs success. Since there are no sound economic data available to verify the profitability of single FMSCs, the participating FOAs will be able to improve their decision making. The economic analysis will be based on business process analysis related to the administration of single contracts on economic operating figures deviated from single contract analysis and performance data. This information base aims to optimize the contracting process and to reduce the risks related to unknown hazards of the single FMSC.

The main partners of the actual ongoing preliminary study as well as the partners of the intended project are the FOAs and the Bavarian Forest Service. The Forest Service works traditionally close together with the FOAs and supports them especially with extension work for the forest small holders.

## 2 METHODOLOGY

The applied methodology is orientated strictly at the objectives of the study. Thus a) participatory methods of empirical social research are used to analyse business processes related to FMSCs, b) quantitative analysis serve to document and process the individual working time of FOA-staff members used for single working steps within the FMSC business process, c) single FMSCs are analysed for concrete economic information (revenue and costs) and are put in relation to the forest structure of the contract area and d) in workshops, the project team applies methods like SWOT (strength, weaknesses, opportunities and threats) to analyse the FMSCs and develop the concept for future benefits for the forest owners as well as for the FOAs.

## 3 RESULTS

First results of the preliminary study show, that the crucial factors for success vary because of natural or regional characteristics like tree species, age, potential hazards and size of contract area.

### 3.1 Revenues from Forest-Management-Service-Contracts

In principle, revenues from FMSCs are based on three pillars: I) the state subsidies (see point 1), II) direct payments of the forest owner for fixed annual services or services on demand and III) indirect revenues (service charges) from harvesting and marketing measures on the contracted area.

An example of the FOA, called “Lower Bavaria”, may clarify the basic-supervision as combined in the contract and the revenues from pillars II. and III.:

- A) The basic-supervision includes the following, inter alia:
  - General administration and accounting
  - Mentoring/counseling/advisory service in silviculture
  - Forest protection (controlling and realisation of measures)
  - Annual reporting
  - Legal duty to maintain safety
- B) Revenues from the basic-supervision:
  - 25 €/ha/year
  - Additional services, in accordance with the forest owner:
    - § Realised by a forest engineer: 35€/hour
    - § Realised by qualified forest worker: 25€/hour
    - § Realised by non-skilled worker: 15€/hour.

In case of additional controlling measures (more than two) due to calamities, for example because of bark beetles, these measures will be paid like additional services. Travel expenses are recompensed at 0.32€/km.

- C) Revenues from wood harvesting and marketing:
  - 4 % of gross selling price (provision)

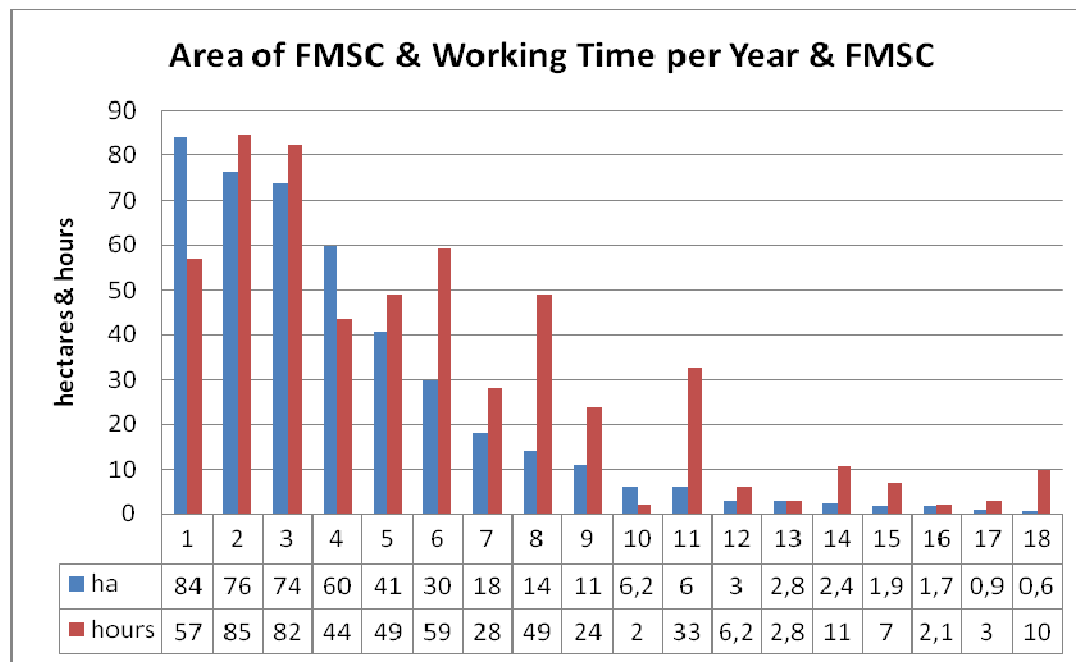
This brief analysis shows that the main regular possible revenues are already determined by the contract. Additional or variable<sup>3</sup> revenues can be expected from wood harvesting and marketing, thus from the core process of the FOAs<sup>3</sup>. But these desired, additional revenues depend on the forest estate itself (species, age, growing stock and so on) as well as on the owner objectives and the wood market.

### 3.2 Working times for single FMSC

The results of working times documentations for single FMSCs show a clear tendency: The smaller the total area of a single contract is, the higher the time effort per hectare. For FOAs, that means that they have to analyse accurately in what kind of work they invest their time (productive work or service hours for forest protection or legal duty to maintain safety e.g.).

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<sup>3</sup> Compare: Lutze, M. (2010): Forest Owner Associations as Intermediaries between Forest Owners and the Wood Based Industry, IUFRO Conference “Small Scale Forestry in a Changing World”, Bled, Slovenia.



**Figure 2:** Areas of single Forest Management Service Contracts (FMSC) and the invested working time per year

### 3.3 SWOT Analysis

The so called SWOT analysis is a very suitable method to identify strengths, weaknesses and threats as well as opportunities for the FOA within the scope of their FMSCs. In a workshop with an FOA, the following examples were elaborated and they partially underline the above analysed risks of time consuming non-profitable activities. Moreover, the examples summarize further critical points and chances for the FOA (see table next page).

**Table 1:** SWOT analysis of the FMSCs of the FOA »Lower Bavaria«

Strengths	Weaknesses
FOA is present locally, that means »trust & security« for the forest owners	<u>Model contract:</u> The FOA has to accomplish defined and contractual fixed activities for fixed prices
The forest owners have confidence in the work of the FOA	
In the group of so called „urban“ forest owners, circa 1/3 are women. So, to have a female forest eng. for this field is advantageous	
Professional business process of the Core Process “Wood Supply and Marketing”	
Sufficient number of professional forest eng. within the staff, logical distribution of duties and responsibilities	
Reliable collaboration with the local adviser of the forest administration	
Opportunities	Threats
A presence in the private forests can lead to further contracts ( <u>marketing</u> )	Missing cost-benefit analysis; reliable data do not exist
<u>Synergies:</u> Harvesting and wood marketing in one private forest estate can motivate the neighbors to ask the FOA to execute the same services on their land	Small forest areas ( $\leq 1$ ha) → high operational expenditure? Profitable for the FOA?
FMSC can contribute to a continuous wood supply and marketing by the FOA	To many nonpaid services (for the forest owner) are included in the so called »basic-supervision« (which are preconditions to receive the »state subsidies«) Profitable for the FOA?
	Faithfulness of forest owner successors is insecure
	Further development of state subsidies is inexplicit

## 4 DISCUSSION

The first analytic results of the preliminary study are demonstrating some risks and chances of Forest Management Service Contracts. In workshops and discussion with the managers of the involved FOAs such outcomes were underlined. Some points are discussed here:

1. The fixed revenues - composed of the state subsidies and the contractual payments - do not cover in all cases all costs related to the tasks determined by contract. This risk increases with declining contracting areas due to inefficient work in small forest areas and unknown threats from hazards, like calamities from bark beetles, damages through wind blasts and following high working input for reforestation and long periods without additional revenues from wood harvesting and marketing.
2. Some FOAs are speculating on additional or variable revenues through wood harvesting and marketing measures, even without further analysis and unsecure market outlooks or unknown forest owner objectives. Especially in small structured private forest estates such “gambling” can cause deficits.
3. Some FOAs accepted in the past “all kinds” of forest areas for their portfolio of FMSCs as a “political” measure of the association to demonstrate to their members that they are willing and able to fulfill this desired concept by the state, to demonstrate to them that the association is able to cover this business and – maybe as the most important argument – to avoid that competing neighbor associations or private consulting firms gain parts of this market segment within the association’s natural boundaries.
4. FOAs use the FMSC concept as a marketing tool by accepting all offered areas to gain attractive contracts with bigger forest areas.
5. Solutions for risk reduction can be especially found in contracting details:
  - a. Optimizing the contractual details: non profitable duties should be reduced to the minimum of “basic-supervision« (which is a precondition to receive the »state subsidies«). If the fixed revenues for the basic-supervision do not cover the estimated costs, consideration should be given to refusing an offered contract or to increase the service charge individually depending on the contract circumstances.
  - b. Reducing the contract period or combining clauses to reduce the risks for the association, for example in case of certain hazards.

Up to now the FMSC is a success story as it contributes to the further professional development of FOAs and is able to raise the revenues of the FOA through fixed revenues or additional revenues. The concept also offers the opportunity to create new jobs at the FOA. The risks are manageable through further development of the contracts and optimization of related business processes. Because of unknown economic data and the short period of experience, further research on this concept is advisable.



## FINANCIAL VALUATION OF YOUNG TEAK PLANTATION TIMBER IN IMPROVING ACCESS TO MARKETS AND MICRO CREDITS IN LAO PDR

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### ABSTRACT

Smallholder teak plantations have been established at an increasing rate in Northern Lao PDR since the early 1980s. The share in value addition in smallholder teak remains typically below 15 % for the primary producers. A first pilot intervention on FSC certification showed considerable benefits in teak smallholder production. Tenure rights were documented in plantation management certificates, which also include stand inventory and tree valuations. The realization of financial gains through valuing logs in terms of volume and quality and selling at loading points has led to an increased share to teak smallholders in the production chain. An interesting application of the plantation management certificates has emerged in the valuation of the standing logs as bank collateral in local microfinance schemes. This is most encouraging, since it addresses both the issue of smallholder cash needs and the problem that teak trees are very often being harvested prematurely, before reaching higher commercial value. By taking microfinance loans at interest rates around 12 to 15 % the trees can be saved for longer rotations of up to 25 to 30 years when the annual value increment of teak is in the order of 20 to 25 %. A comparison with the value increment with young eucalypt plantations in southern China is also provided for the same age class range in order to assess the collateral scheme with faster growing lower value species.

### Smallholder teak plantation development in Lao PDR

Smallholder teak plantations have been established at an increasing rate in Northern Lao PDR since the early 1980s. They cover presently about 25,000 hectares (ha) and are concentrated in the area around Luang Prabang. An important element in the rural economy, they can constitute between 25 and 55% of annual household income. However, only 5% of the timber is locally sawn and remains in the region, 95% is transferred in log form via Vientiane-based traders to Thailand, Vietnam and China. The share in value addition is rather low and remains typically below 15 % for the primary producers.

At ages of 12 to 15 years teak reaches commercially utilizable diameters with DBHs ranging around 15 cm. At this early stage, the first logs can be used to cut squared sections with minimum dimensions of 8 x 8 cm and a heartwood ratio of over 80 %. Such utilization has traditionally involved the premature removal of the largest trees from the plantations.

This young teak material is considered utilizable for indoor applications and low quality garden furniture. At an international scale this seems to be at the lower limit of technical utilization (Budija a. Čufar, 2008; Kjaer et al., 2000; Kokutse, 2002; Perez, Cardero a. Kanninen, 2003; Posch et al., 2004; Trockenbrodt a. Josue, 1999; Thulasidas a. Bhat, 2009) and market acceptance of plantation teak (EDMS, 2004; EU, 2009; Hochsteiner, 2008; Midgley a. Laity, 2009).

However, in many cases teak plantations in Laos are harvested prematurely due to immediate cash needs of the smallholders. This observation coincides with a case study on smallholder teak producers in Indonesia; Kurniawan and Roshetko (2009) found that in 80 % of cases immediate cash needs were the main reason leading farmers to harvest their teak trees. In only 14 % of the cases was attainment of the optimum rotation age found to be the reason for harvest. To make matters worse, very often the biggest, most vigorous trees are removed and suppressed low value trees with little potential for further value increment remain in the plantation for prolonged periods. Thus the site potential is very often underutilized.

## Documenting user rights and valuation of smallholder teak

In a first pilot intervention by **The Forest Trust (TFT)** in cooperation with the Provincial Agriculture and Forestry Office in Luang Prabang in Laos PDR, considerable progress could be shown in teak smallholder production over relatively short time. In order to achieve FSC certification, tenure rights had to be clarified resulting in the introduction of a **plantation management certificates**, which gives smallholders rights to cultivate teak on a designated plots for rotation times of up to 30 years.

The certificates consist of:

- Description of the land user/owner, and in the case of a land title it contains the respective land registration number;
- A location sketch map with cadastral compass or GPS survey coordinates along with details of the nearest road to assess harvesting distance to roadside (also with an overlay of a Google Earth map);
- Inventory of standing trees by diameter classes;
- Provision for updated inventory data after removal of trees;
- Short descriptive section.

The **certificate** forms the entry point for the **harvesting and transport permits** at the time of harvesting and helps addresses present obstacles in the initial stages of the value addition in relation to primary local processing (squaring) by chainsaws and subsequent road transport of logs. Thus it enables smallholders to take over many of the roles of intermediary traders (see Fig.1) along with the achievement of increased financial returns.

## Teak prices

Table 1 summarizes findings on prices realized for teak plantation timber in 2005 in standing form, which reflect strongly the initial situation of the timber sale practices prior to project intervention.

**Table 1:** Prices for standing teak trees in Luang Prabang (from Midgley 2007)

Age (years)	Av. DBH (cm)	Av. ht (m)	Volume/tree (m <sup>3</sup> )	No. of trees/m <sup>3</sup>	Price (US\$/m <sup>3</sup> )
12 - 15	165	10	0.094	10.64	50
17 - 20	20	12	0.218	5.00	70
25 - 30	30	16	0.734	1.36	100
>30	35	17	1.111	1.00	150

The squared log prices, delivered over a road distance of about 400 km to mills in Vientiane, Laos PDR, are given in Table 2. These prices include road transport costs of around \$15/m<sup>3</sup>

**Table 2:** Delivered mill door prices for squared logs (2 m lengths) in Vientiane for export to Thailand (from Midgley, 2007)

Log section (cm)	Price per cubic metre	
	Baht	US\$
10 × 10	7,000	184
20 × 10	10,000	263
10 × 15	12,000	316
20 × 15	14,000	368
20 × 20	14,000	368

The comparison of both tables shows that considerable price increases and thus profit margins can be achieved in harvesting, squaring and transporting logs. So far, plantation owners have by and large been excluded from this potential value addition.

## Value addition

Harvesting of plantation teak in Laos PDR is at present done entirely by hand – in many cases even handsaws are used for felling. In most cases the logs are cut into lengths which are amenable to being handled manually.

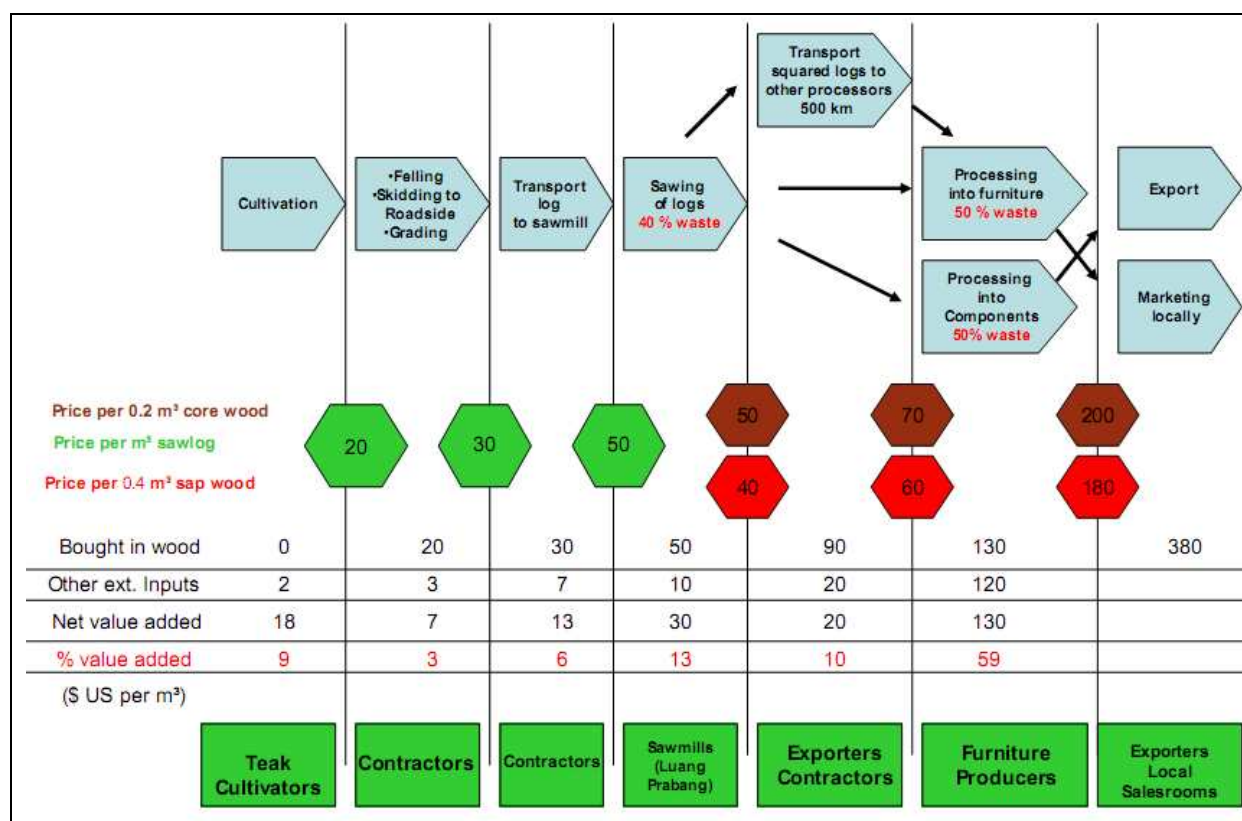


At best, some local traders have chainsaws and improvised loading devices to handle the relatively small logs from standing tree to roadside and finally onto a vehicle for road transport.

The issue of limited appropriate technology in the hands of small scale farmers and tree cultivators has recently been highlighted in several international fora. Unless such kind of technology is made available to the producers they are basically excluded from any reasonable value addition in the initial links of the value chain. (Mohns, 2006; Mohns a. Laytie, 2011). Besides access to appropriate technology, the shortage of finance, lack of organization at the producer level and managerial weakness serve to exacerbate these problems and challenges facing small scale farmer-growers.

Estimates of potential value addition that occur within the teak furniture value chain are shown in Figure 1. The progression in the chart's centre depicts the flow of saw logs/round wood (green) until the process stage of sawing. From there onwards the sawn timber is presented either as the more valuable and sought after heartwood (brown) or the less valuable sapwood (red). The respective figures refer to the value of the actual remaining wood volume after each processing step. The recovery/wastage percentages are given in the respective boxes of the processing step (blue).

It has to be noted that the figures presented were derived from data obtained during stakeholder interviews in combination with estimates based on similar value chains.



**Figure 1:** Value added in plantation a teak value chain

It should be noted that the price of a saw log increases from 20 to 50 \$US/m³ from the plantation until it reaches the sawmill (in Luang Prabang Province). In the case where logs are transported to Vientiane, the price would increase by a further 50 \$US/m³ due to transport alone. In this situation, about 40 % of the log volume transported will end up as waste wood during processing. It is obvious that there is quite a lot of potential to create a win-win situation if sawmills in Vientiane would cooperate with teak farmers in at least squaring teak logs as close as possible to the plantation sites, thereby reducing transport costs considerably.

These findings are consistent with other case studies on logging and primary processing under community forestry conditions. Such studies are unfortunately quite rare in the international forestry context. Antinori and Bray (2005) found that Mexican community forestry groups could achieve an increase in total village employment from 15 % for stumpage sale systems, to 19 % for logging and to 26 % for simple secondary

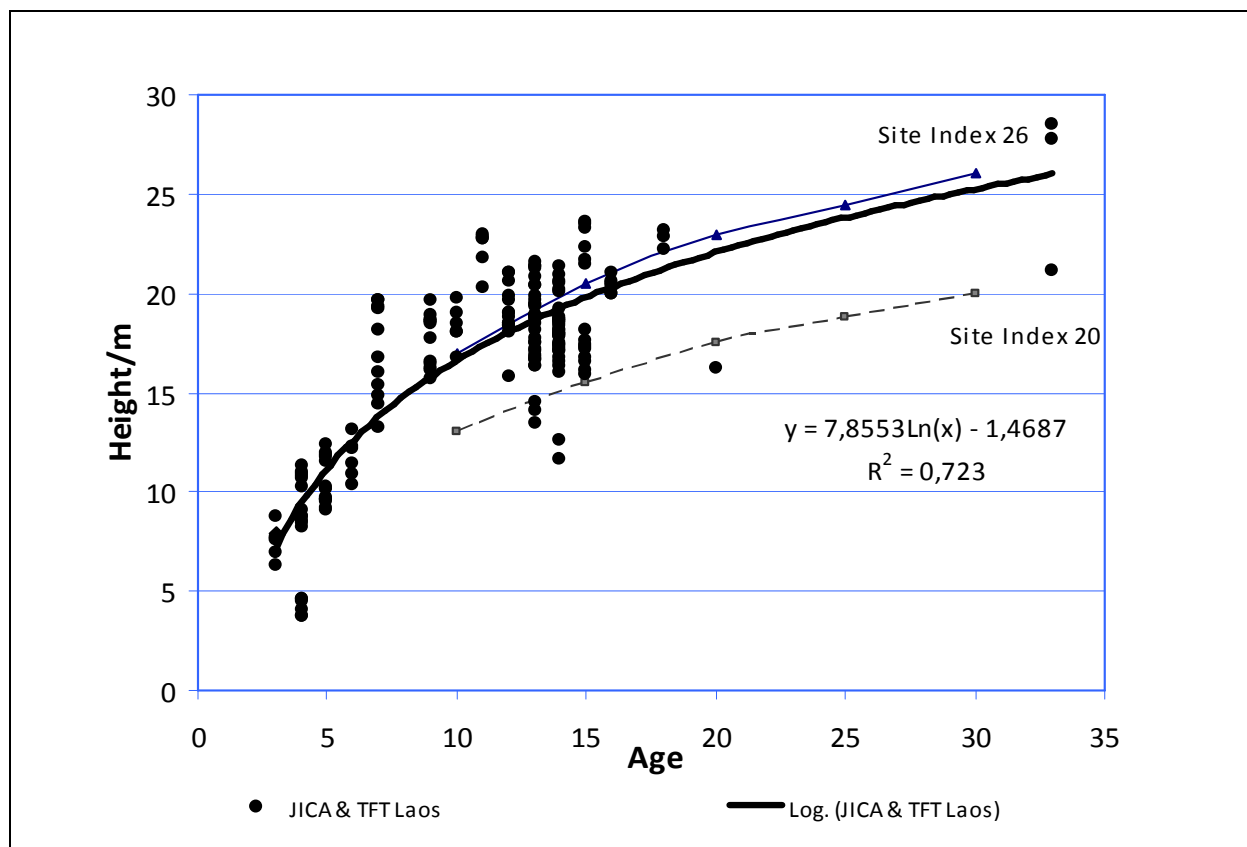
processing (sawmilling) situations. Auzel et al, (2001) showed a 12 fold increase (!!!) in log prices for community based operations versus the traditional concession logging systems in Cameroon.

## Growth and value increment of smallholder teak plantations

### Growth models

There are only a few scientifically based thinning regimes currently available for teak plantations in Laos PDR and current management practices are often derived from trial and error. Most studies from tropical countries indicate marked beneficial effects of thinning young teak stands. For example Ramnarine (1994) found a mean DBH of 20 cm for unthinned and 32 cm for thinned stands, resulting in a 60 % increase of the average tree volume.

For Northern Thailand Chanphaisaeng (1977) proposed a site classification model for teak with 5 site classes ranging from 14 to 26 m mean height at age 30 years. We followed this classification as shown in Figure 2. Along with data from the TFT pilot project we also included height measurements of a Japan International Cooperation Agency (JICA) (2001) study for 30 teak plantation plots in the Luang Prabang region from ages 4 to 51 years. The plots and associated regression curve show that the Luang Prabang teak plots fall between the site classes 20 and 26 for Northern Thailand. Thus it is valid to use stand data of such site classes for further comparison with our data sets.

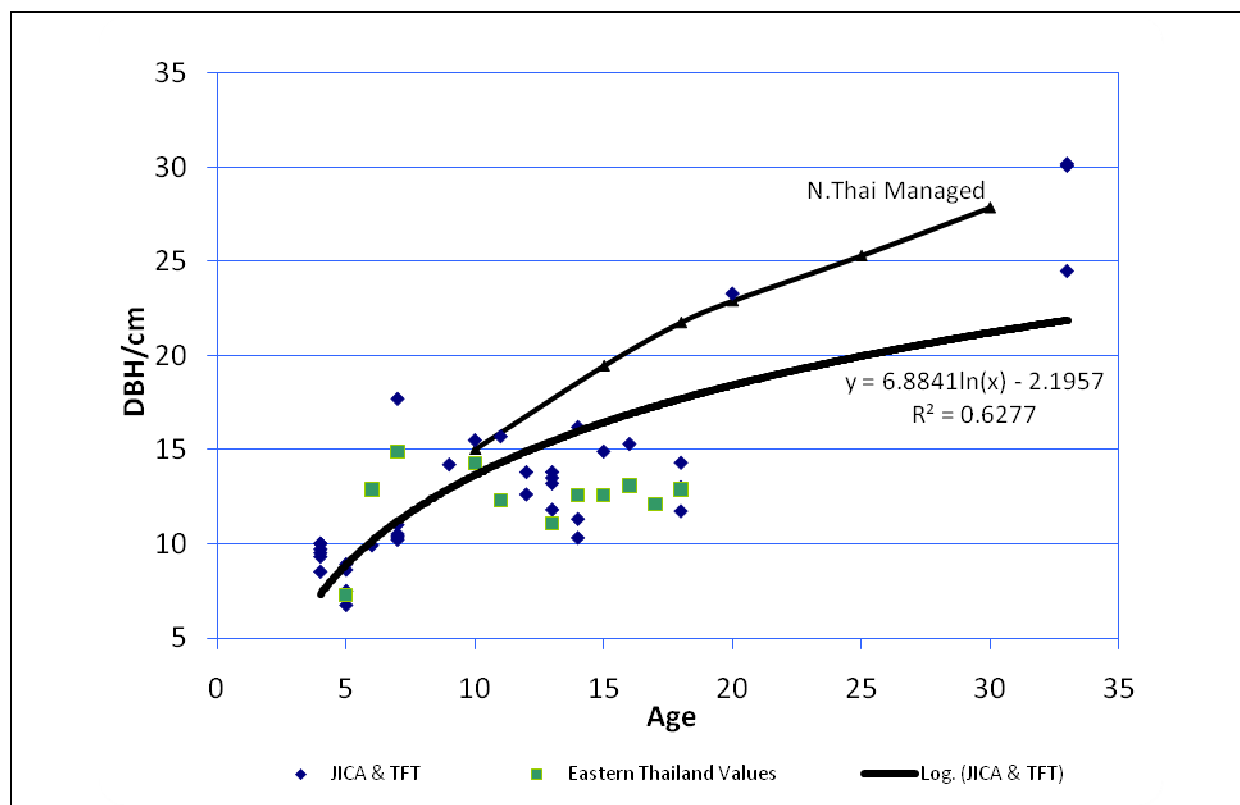


**Figure 2:** Relationship between teak plantation age and average height in Laos PDR

In a further analysis (see Figure 3.) mean DBH data was plotted against age for (1) the JICA 2001 data, (2) the TFT data from 2009 and (3) Michigan State University (MSU, 2008) data from Eastern Thailand collected in 2006. It is instructive to note that both the TFT and MSU Eastern Thailand data indicate a stagnating DBH from the 10th year onwards. Based on data for stem numbers per ha, this could mainly be due to the fact that no systematic thinnings were carried out and, in the Luang Prabang case, stems with larger DBH were probably removed as for sale due to cash needs.

Based on the DBH distribution it can safely be assumed that even with moderate thinning the DBH distribution would follow an average growth model ( $R^2 = 0.62$ ), as indicated in the lower curve in Figure 3. The

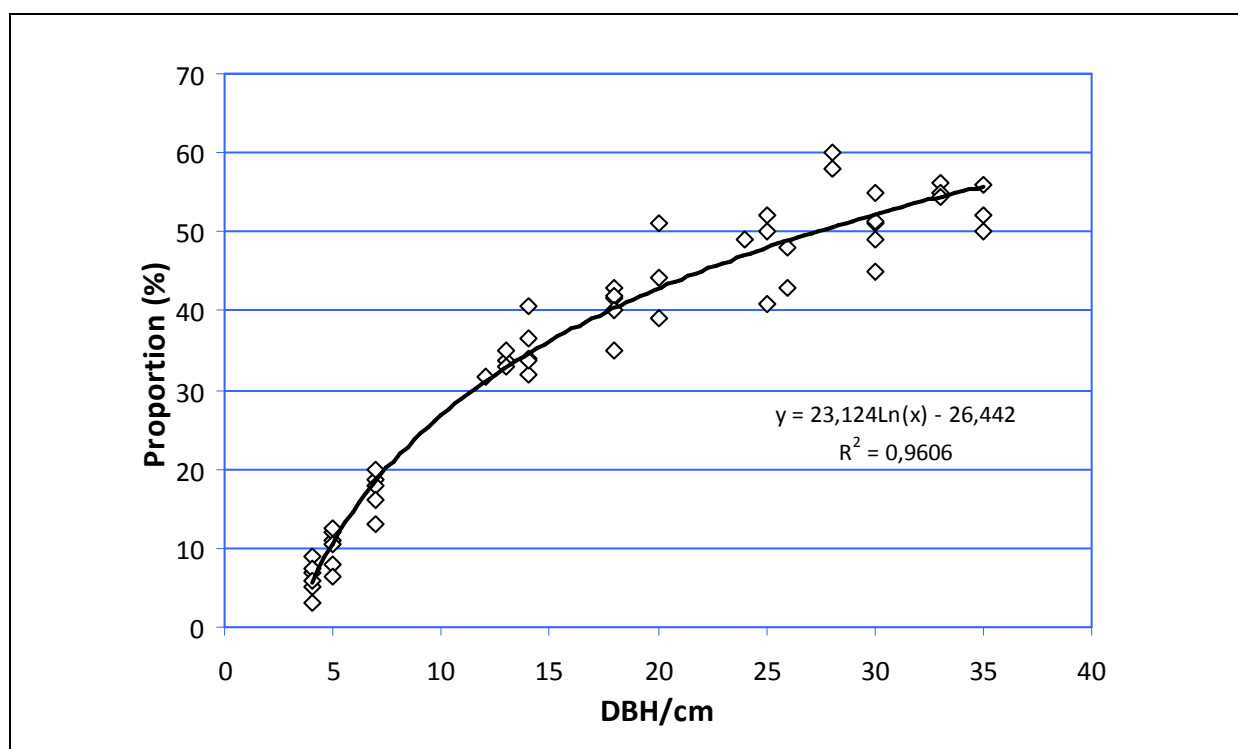
age DBH curve for the Northern Thailand managed stands was calculated from mean DBH values as presented in Chanphaisaeng's (1977) study.



**Figure 3:** Relationship between teak stand age and DBH in Laos PDR and eastern Thailand

In order to value young plantation teak the percentage of the dark coloured heartwood is decisive since most higher value products require this portion of the log only. Log diameters of around 15 cm yield squared sections with sufficient heartwood for commercial utilization, starting at around 8 x 8 cm.

An earlier study in a Vientiane sawmill in 2006 on log sections of length 2.5 to 3 m yielded the relationship presented in Figure 3. The heartwood percentage at these ages accounts for between 40 and 60 % of the total stem volume. This falls within the range documented by studies on this subject in other tropical regions (Bhat, 1995; Kokutse et al., 2004; Perez, 2007). The heartwood percentage is known to increase logarithmically with increasing DBH (Arce, 2001) and reaches over 90% at ages above 50 years.



**Figure 4:** Heartwood formation in young teak plantation timber

### Value increment and tree value as micro finance collateral

In a further step we conducted a monetary valuation of teak plantation at ages between 10 and 30 years based on volume measurements in teak both in Laos PDR and in eastern Thailand under similar growing conditions. The value increment of teak is compared with the interest rates of different microfinance schemes presently operated in Laos PDR. Valuation of teak logs was done using the finding of a TFT study in 2006 for roadside log prices.

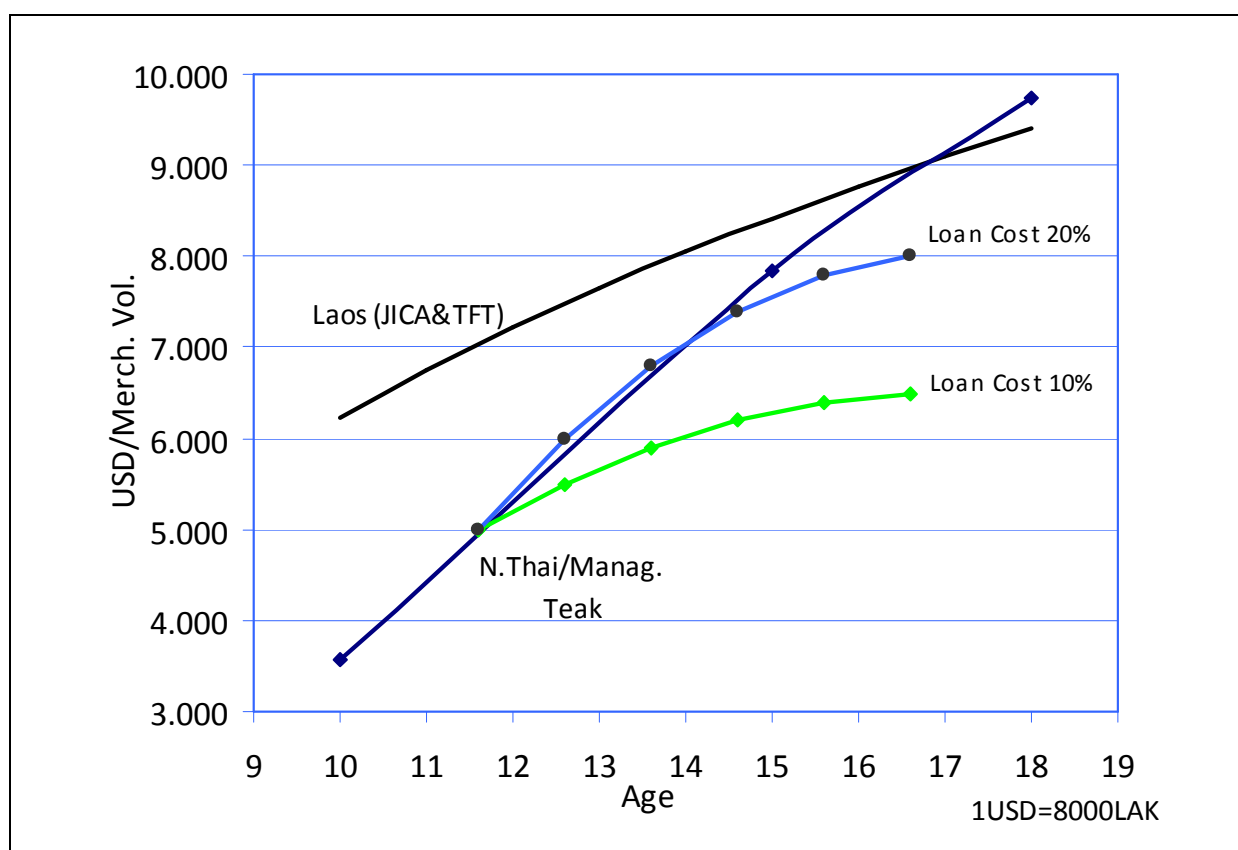
**Table 3:** Average total volume and traders prices (standing trees) and roadside prices for teak (ACIAR/Valtip, 2007)

DBH Class	Avg. Total Vol.	Traders Price/ tree (USD)	Roadside price (USD/tree)			Merchantable Volume (m³)		
			Avg.	Min.	Max.	Avg.	Min	Max.
10-13	0.08	N/A	2	1	4	0.03	0.01	0.07
14-17	0.13	N/A	4	1	8	0.06	0.02	0.14
18-20	0.20	8	8	3	18	0.12	0.04	0.23
21-23	0.29	9	13	6	25	0.17	0.08	0.31
24-26	0.39	10	19	10	29	0.23	0.15	0.33
27-30	0.50	11	17	10	24	0.31	0.09	0.41

First experiences in the Luang Prabang study area show that the documented valuation of trees in the form of plantation management certificates is used in the following way:

- Farmer to farmer arrangements where individual trees and whole stands are sold or bartered well ahead of any fixed harvest date, the buyers having realized that by delaying harvest significant financial gains can be achieved;
- Sawmills buy standing trees up to 2 years in advance before harvesting based on the documented valuation of the certificates;
- Formal microfinance loan collaterals through the *Luang Prabang Savings and Credit Union*, a local micro finance institution, using the management certificate as documentation (more than 20 documented cases according to bank files).

Figure 5 illustrates the value increment of managed teak according to the recommendations for northern Thailand (steeper curve) and the present situation in Laos PDR (upper flatter curve). In our model a loan is taken when the plantation reaches a value of 5000 \$US between age 11 or 12. The cost for the loan (interest rate) at both 10 and 15 % over a repayment period of 5 years falls below the value increment of the teak plantation in this age range. The argument here is that the plantation owner can save his trees for a later stage of harvest or better market opportunity and thereby achieve a small but significant financial benefit as compared to premature harvesting often under time pressure for immediate cash needs. The underlying assumption is however that repaying the loan itself is done through realized returns on the loans' investment in productive purposes e.g. agricultural investments.



**Figure 5:** Loan costs in comparison with value increment of young teak plantations

First silvicultural benefits of the system can already be observed in the pilot sites. The focus on harvesting larger trees from the plantations is shifting with an associated first acceptance of thinning regimes. Where trees are harvested for immediate cash needs, some owners are making the first attempts to market smaller, thinned trees.

### Valuation of Eucalypt plantations in southern China in the micro finance context

To our knowledge the only other case for stand valuation in relation to micro finance schemes in the Southeast Asian region is that recorded for eucalypt plantations in southern China.

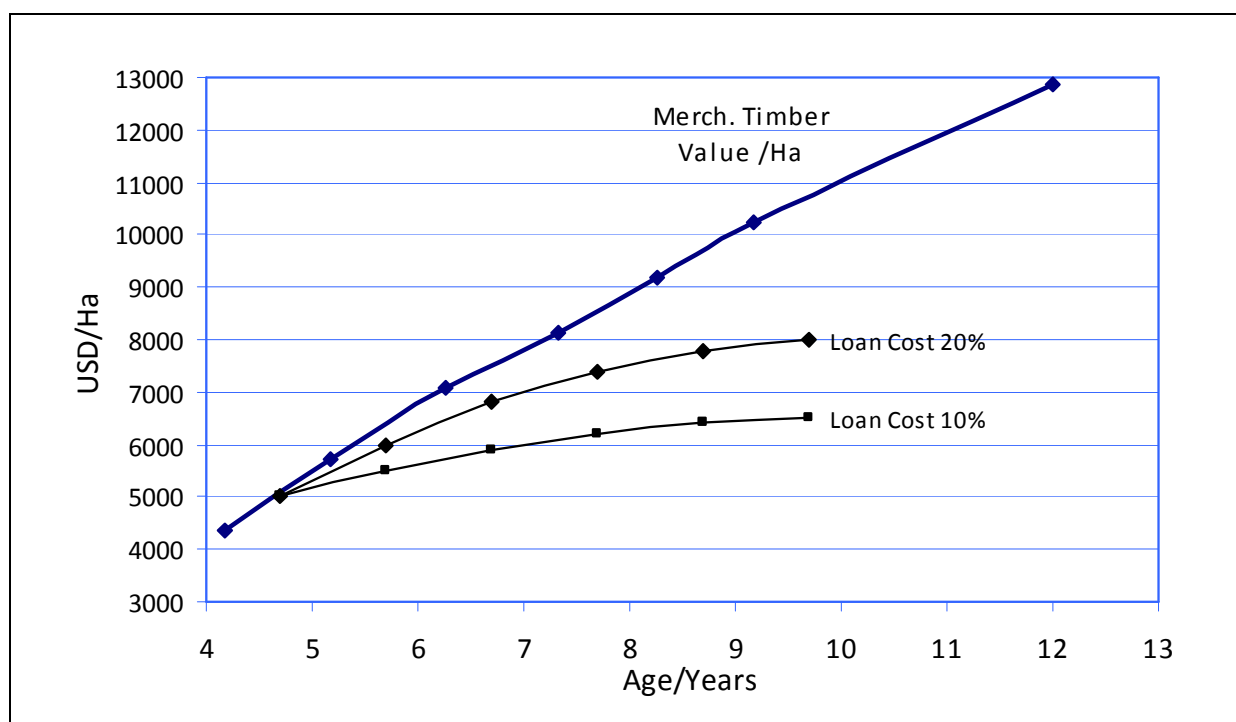
Eucalypt growers in China currently benefit from a strong, rapidly growing economy, good acceptance of eucalypt timber for a wide range of products and applications and well established wood processing industries in many of the regions where eucalypt plantations are concentrated. Together these manifest in a strong demand for eucalypt logs of all sizes, relatively high prices for even small size logs and substantial price premiums for relatively small increments in log size (measured by small end diameter).

**Table 4:** Roadside log prices for eucalypt logs in southwest Guangdong province (from China Eucalypt Research Centre, unpublished data)

Small end diameter under bark (cm)	Roadside value USD/m <sup>3</sup>
8 > x > 4	58
12 > x > 8	75
16 > x > 12	92
x > 16	138

Some of the highest prices even for relatively small diameter eucalypt logs in China are currently obtained from veneer manufacturers. Over the past decade, small logs (small end diameters down to as low as 6 cm) from China's fast-growing, high-yielding plantations, especially those of poplars and eucalypts, have become sought after for veneer production to supply core layers of higher grade plywoods as well as for both core and surface veneers of industrial and construction grade plywoods. This shift to smaller diameter feedstock for rotary peeled veneers has been greatly facilitated by the development of relatively efficient, low cost, Chinese manufactured rotary veneer peeling lathes.

On account of the demand from such industries along with the strong demand for eucalypt fibre from local fibre-board and pulp manufacturers, small size eucalypt logs in China demand relatively high prices in the domestic markets and substantial price premiums are also provided for relatively small increments in log diameters (Table 4). These premiums are due to recognition by veneer manufacturers that recovery rates increase sharply as log small end diameters increase. In addition, there is a strong market for eucalypt logs of small end diameters of 16 cm or more for sawn timber.



**Figure 6:** Loan costs in comparison with value increment of young Eucalypt plantations in southern China

In China most eucalypt plantations in warmer coastal regions of southern China are established at relatively high densities (1,350 to 2,200 stems ha<sup>-1</sup>). No thinning is carried out and these plantations are typically clear-felled at ages of just 4 to 6 years. Given the average patterns of volume increment development with age in such plantations, these short rotations are appropriate for optimising mean annual volume increments (Chen et al., 2011). However, such short rotations ignore the potential for optimising value increments – growers might receive substantial financial rewards from employing longer rotations and/or thinning. Recent analyses by the China Eucalypt Research Centre (unpublished data) have revealed that mean annual value increments of eucalypt plantations will peak much later than the mean annual volume increment does (e.g. around 10 to 12 years at 1,250 stems ha<sup>-1</sup>) due to the interplay of volume and average small end diameter grade. Extending rotation lengths beyond 6 years increases not only the total volume per unit area but also the proportion and magnitude of volume that falls within the substantially higher value larger diameter grades. Thinning at appropriate ages would accelerate the increment of logs in the retained trees to larger diameter and therefore higher value brackets.

It is a common practice in China for micro finance loans to be taken on small woodlots – these loans are supported through state banks with well organized and standardized valuation procedures. In contrast to Laos however, the land value is normally taken into account as well. Cases of collaterals with standing trees only have so far not been recorded in China. It is striking to see in Figure 6 that Eucalyptus species could well enable such strategies at even earlier ages than in Laos, i.e. from as low as five years in China, as the value increment would far exceed reasonable loan costs.

## CONCLUSIONS AND OUTLOOK

The documented valuation of young plantation teak has increased the bargaining power of teak smallholders and has removed uncertainty over log prices which was often misused by middlemen in the marketing of logs to outside sawmills. The understanding of the rapid value increment in relation to DBH and age has initiated the advance purchase of standing trees in anticipation of financial gains over direct harvesting.

Even the formal micro finance sector has begun to accept the documented valuation of young teak stands as collaterals with an emerging realization that the value increment of such plantations can offset costs of loans, even with interest rates of up to about 15 %.

Further attempts will be made under a new Finland funded project initiated by RECOFTC to test the collateral approach within an ongoing microfinance scheme with 135 village banks in the Bokeo province of Northern Lao PDR. The project will also explore the ongoing loan schemes in southern China in greater detail in the near future.

## ACKNOWLEDGEMENTS

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The Regional Community Forestry Training Centre (RECOFTC), Bangkok, is in the process of promoting the application of plantation management certificates to other areas in Northern Lao PDR.

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# AFFORESTATION ON MARGINAL CROPLANDS FOR ENHANCING THE RESILIENCE OF RURAL INCOMES TO WATER SCARCITY IN DRY AREAS OF CENTRAL ASIA

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## INTRODUCTION

Irrigated agricultural production is a major income source for the rural population in Central Asia (CA), which is illustrated in Uzbekistan. Rural areas are home to more than 60% of Uzbekistan's total population and agriculture provides near 34% of total employment (Sutton et al. 2008) and constitutes up to 22% of GDP. However, improper crop rotations, unsustainable and poor performance of irrigation water use resulted in extensive land degradation (Sutton et al. 2008). Presently, about 20% of all arable land (884,893 ha) has been coined as marginal, bringing low or no profits from annual crop cultivation. Furthermore, future agricultural production is under uncertainty as a result of climate change impact. It is expected that by 2030-2050 the availability of water in the main two rivers in CA - Amu Darya and Syr Darya - may decrease by as much as 30% and 40%, respectively (Perelet 2007). Hence, options for coping with the projected water scarcity in the face of land degradation should be explored to make the rural population more resilient.

Within this context, afforestation of marginal croplands is one option for climate change mitigation and would supply land users with a wide variety of benefits. Previous findings showed that planting trees on marginal croplands offers potential carbon sequestration and income generation for land users (Parks and Hardie 1995, Kremar et al. 2005, Niu and Duiker 2006). Storing carbon in terrestrial sinks such as woody tree products has been suggested as a cheaper solution to climate change mitigation compared to other offset schemes (Boyd et al. 2007) and shows great potential in arid areas (Khamzina et al. 2008). This can be achieved via Certified Emission Reductions (CERs) under the Clean Development Mechanism (CDM). The ecological benefits of a land use change from annual crop production on marginal cropland to CDM forest are multifaceted but the economic consequences of such projects are largely unknown. In addition, despite climate change mitigation objectives, CDM enhances development. For instance, many rural households in Khorezm, Uzbekistan, feed livestock expensive byproducts owing to a lack of cheap and rich fodder alternatives (Djumaeva et al. 2009). In this respect, the foliage produced by certain tree species has the potential to improve rural incomes. Similarly, the provision of fuelwood that is currently undersupplied, would allow households to reduce their expenditure on domestic energy consumption.

Therefore, the purpose of this paper is to investigate the impacts of the land use change on incomes of rural households using a mathematical linear programming (LP) model that integrates simultaneously farm and household decision making. More specifically, we evaluated the potential of CDM afforestation to strengthen the resilience of rural incomes to the reducing water availability. Emphasis is given to the interdependencies between farmers and rural households through capturing a system of payments for hired labor.

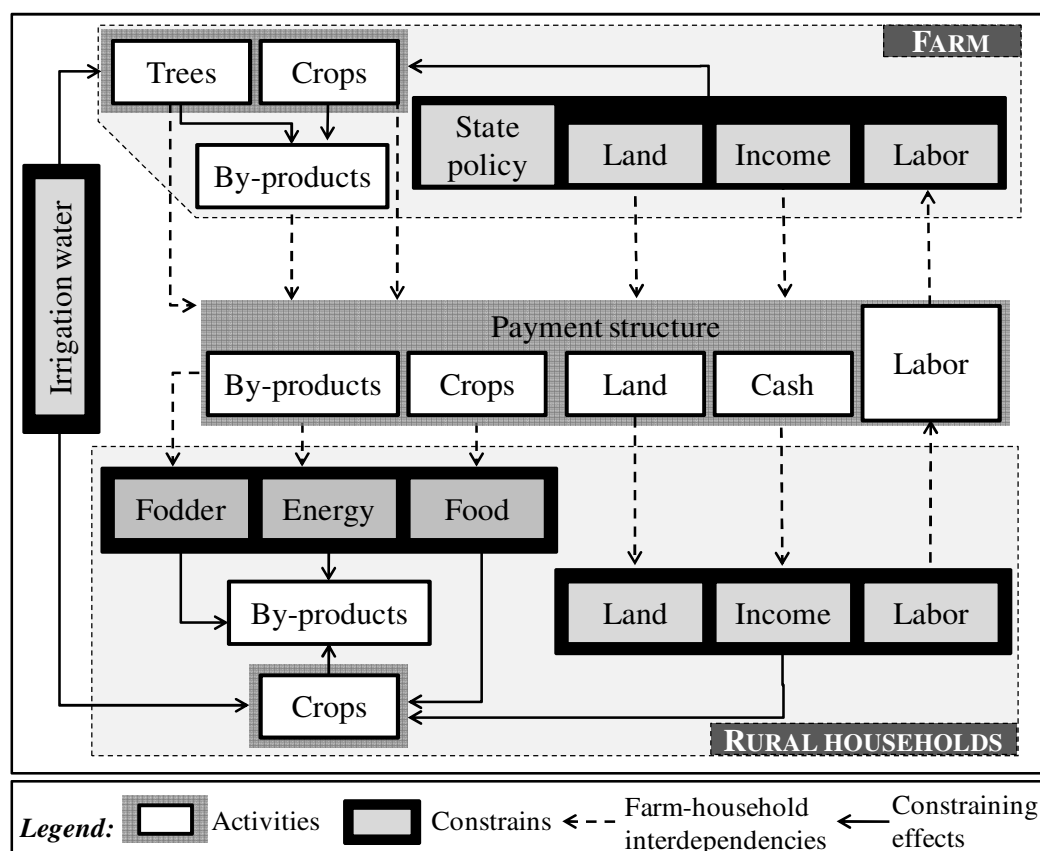
In the next section we provide a description of the model structure used for the analysis, an overview of the study site, an explanation of modeling farms and households, a brief description of the data used in the study and scenarios examined. This is followed by an assessment of the impacts of land use change on incomes of farmers and rural households.

## METHODOLOGY AND DATA REQUIREMENTS

### The model

To investigate the impact of afforesting marginal croplands on the incomes of the rural population in Khorezm, we used a consolidated model of farm and household decision making based on the linear programming (LP) approach. The LP has been used successfully for many years in operations research for both agricultural and forestry production (Delforce 1994, Jolayemi and Olaomi 1995, Shiferaw and Holden 2000,

Merry et al. 2002, Dolisca et al. 2008). This approach supports the choice of optimal production planning in interdependent farms and households that maximize their joint net annual income under two situations: (i) business-as-usual and (ii) where the farmer is involved in a CDM afforestation project. The LP model (Figure 1) includes: (1) annual cropping activities (production, consumption, storage and selling) to meet the policy, food, fodder and energy requirements; (2) labor activities with labor use in their own-household plots and hiring for activities in farm fields; (3) payment structures to households received from farmers as a remuneration of labor. The LP model considered storage of crop byproducts for the next years for duration of six years. The input and output prices as well as food consumption levels were assumed to be fixed. The constraints comprised restrictions on: (1) the size of household and farm cropland; (2) annual cash required for purchasing inputs; (3) labor; (4) irrigation water; (5) households' food, fodder and energy requirements; and (6) cotton policy constraint. The model comprises five crops (cotton, wheat, rice, maize and vegetables), eleven products, and eight byproducts. The interdependencies between the modeled farm and rural households are depicted in the module of payment structure (Figure 1). According to the balance imposed, the amount of cash, crops, byproducts and land transferred to households is determined by the total household labor hired for the farm operations.



**Figure 1:** Overall model structure

## Study area

The case study region Khorezm is located in 60°05' N and 61°39' E longitude and between 41°13' and 42°02' N latitude, in northwest Uzbekistan. Khorezm is an arid area with an annual precipitation of around 100 mm. The region consists of 10 administrative districts. Nearly 1.7 million people reside in Khorezm with 70% being rural. The population growth rate is about 1.7% annually. The total land area is 680,000 ha, of which 270,000 ha is arable and depends entirely on irrigation water diverted from the Amu Darya river. Agriculture accounts for 35% of regional GDP. The 6,030 registered farms (as of 2010) possess 87% of the total arable land, while the rest mainly belongs to rural households. Major crops cultivated by farms are cotton and winter wheat, covering 40% and 21% of the arable land. Both crops fall under the state target production policy (details in Djanibekov et al. 2010). Rural households are mainly involved in gardening and livestock production in their backyards.

Farms and rural households in Uzbekistan can be distinguished according to land size, income level, equipment availability, purchase of inputs, labor employment, agricultural activities and application of the state policies. We modeled a 100-ha cotton and wheat growing farm with an initial amount of cash of 650 USD/ha. The share of marginal croplands was assumed to be 15 ha of total farmland. According to the state policy, a farmer allocates half of the farmland for cotton cultivation. The farm employs 15 rural households, each comprising of six family members and endowed with 0.2 ha of arable land and 2,000 USD in cash. The rural households depend on farm payments received in cash, in-kind and in-land from being employed for farming activities, income from agricultural production in their household plots and non-agricultural revenues. For each hired household member working hour the farmer pays 0.4 USD in cash, in kind and/or in part of his farm land for crop cultivation. The in-kind payments included payments of crops and by-products including those of tree production (foliage, fuelwood and fruits).

### Source of data and scenario settings

The model's database comprises several categories such as social and policy conditions of the study region, input and output prices, input-output coefficients, crop labor requirements, costs for different field operations of the modeled crops, payment structures between farmers and household members employed on the farm, income structure of households and others (Table 1). The socio-economic datasets were derived from the findings of farm and household surveys conducted in 2010. Prices were collected for food, fodder, timber and fuelwood through market surveys conducted also in 2010. The FAO Statistical Database (2007) provided information on the consumed quantities and energy content which were used as primary product equivalents consumed annually per capita in Uzbekistan in 2007.<sup>1</sup> Therefore, the parameters in the FAO database were aggregated into the modeled food categories. Data on per capita energy resources consumption was obtained from Kenisarin and Kenisarina (2007). The data on diesel use, nitrogen application rates, and commodity transportation costs are based on recommendations by the Ministry of Agriculture and Water Resources of Uzbekistan in 2007. Rates of irrigation water and timing followed recommendations of the Uzbek hydro-module scheme developed for<sup>2</sup> Khorezm. The annual interest rate equals to 14% according to the Central Bank of Uzbekistan (as of July 2009). Bio-physical information on *Eleagnus angustifolia* L. growth and products were obtained from a study started in 2003 on a 2 ha sized degraded cropland with a stand density of 5,714 trees/ha. The tree species required in the first two years annually about 1,600 m<sup>3</sup>/ha of irrigation water and after two years relied on the groundwater (Khamzina et al. 2008). Since tree leaves are not traded in Khorezm, foliage prices were derived based on its leaf crude protein content as compared to the crude protein content of dry alfalfa (Lamers et al. 2008). Survey results indicated that the stems of *E. angustifolia* are unsuitable for construction and therefore its timber value was excluded.

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<sup>1</sup> FAO Statistical Databases: <http://faostat.fao.org/>

<sup>2</sup> European Bank of Reconstruction and Development (2010): Transition report of Uzbekistan 2009: 244-247.

Table 1: Example of basic information used in the model				
Farm size, ha Household size, ha Number of households Person per households  Agricultural wage, USD/wh Discount rate, % Initial funds in farm, USD/ha Initial funds in household, USD/hh  Energy expenditure, % Share of non-food products, % Carbon price Annual energy consumption, MJ/cap Raw cotton price, USD/t	100 0.2 15 6  0.4 14 650 2,000  3 33 4.76 24,700 205	<b>Food</b>	Price, USD/ton	Food consumption, kg/cap/y
		Wheat	316	174
		Rice	1,048	5
		Maize	250	8
		Vegetables	290	206
		Meat	3,500	29
		Eggs	103	84
		Milk	247	143
		<b>Fodder</b>	Price, USD/ton	Nutrient content ME, CP, MJ/kg DM g/kg DM
		Straw	33	6 74
		Maize stem	30	7 95
		Foliage	53	8 227
		<b>Energy</b>	Price, USD/ton	Energy content, MJ/t
		Cotton	36	17,007
		Coal	45	21,000
		LPG	682	46,150
		Wood	41	19,000

To evaluate how participation in CDM afforestation projects may affect the incomes of rural households in the face of reduced irrigation water availability, we simulated (i) the business-as-usual (BAU) situation and (ii) the situation where farmer turns its marginal croplands to afforestation for seven years for participating in CDM project under a *ceteris paribus* condition. During the first seven years of the CDM project, temporary Certified Emission Reductions (tCER) payments were included. This short-rotation strategy was motivated by the fact that the rural population heavily relies on purchasing energy sources, such as cotton stem, coal, LPG and fuelwood. In addition, the substitution of fuelwood for energy resources can bring a significant reduction in carbon emissions (Kaul et al. 2010). During the implementation of the CDM project, the farmer also harvests foliage and fruits. Seven years after tree site establishment, a clear-cut of the tree plantation was assumed for fuelwood which simultaneously ended the CDM project participation. Following this short-term rotation scenario, the BAU settings can be reapplied. In both simulations, we assumed that the total irrigation water volume declines annually by 1%. To understand the capacity of CDM projects to cope with long-term projections of reduced water availability and population growth, the system is simulated over 21 years. The model was programmed in GAMS and solved as a non-linear problem via CONOPT3 solver.

## RESULTS AND CONCLUSION

The simultaneous decrease in water availability and population growth in rural parts of Uzbekistan would cause a steady decline in per capita food production per capita and a decline in rural incomes. Afforestation of low productive croplands under compliance of CDM would allow a reversal of these trends and strengthen rural resilience. However, in many parts of Uzbekistan, the benefits of afforestation are unknown and thus their impacts on rural livelihoods need to be understood to ensure sustainable rural development. Given that at present the economic performance of small-scale households depends heavily on large-scale farms, the economic analysis incorporates joint farm and households decisions on land use, production and policy choice.

In this study we evaluated how changes in cotton policy (reduction in cotton cropland area) in favor of afforesting marginal croplands contribute to an improvement in the welfare of rural households. The model results indicate that the establishment of a tree plantation cushions the mid- and long-term impacts of water scarcity on rural welfare. The results are presented in Figures A1-A3 in Annex. As expected the decreased water availability would cause a decline in annual farm and household profits both in the BAU and CDM scenarios.

However, participating in the CDM afforestation would allow a more efficient use of 15-ha of marginal cropland which in turn would increase profits through tCER payments. Due to high initial investments in the establishment and maintenance costs of tree plantation, farm profits may fall in the first two years. Furthermore, during project implementation, agricultural profits of rural households are likely to decline because afforestation demands less labor than cropping activities which could result in an agricultural labor discharge. Consequently, additional measures would be required to cushion these losses considering that the majority of rural population depends on wages received from employment on farms.

The offset of CDM afforestation projects would result in a consecutive increase in labor employment and contribution to rural incomes because farmers would be able to include tree products - tree foliage and fuelwood - in agricultural payments to households. Such shifts in payment structures would allow households to reduce their expenditures for livestock fodder and domestic energy consumption. In the model, the maize stem would be substituted by tree foliage during the CDM project period, while fuelwood could be stored and consequently substitute coal and LPG beyond the duration of a CDM afforestation project. The substitution effects of these alternative energy resources results in decreased emissions and thus fuelwood consumption contributes to CDM objectives. Under the BAU scenario, a decline of irrigation water availability would result in more farm land being used as payments to households to reduce the impact of a decline in crop production and farm profits. Hence, the implementation of CDM afforestation projects could reduce the dependency of rural households on farm croplands as gaining foliage and fuelwood may be included into the payment structure. This may lessen further the pressure on households' capital and resources which could be now directed to other agricultural and non-agricultural activities.

The inclusion of several short-term forestry rotations, i.e. harvesting and replanting of tree plantations, could result in a significant change in the income and consumption structure of the rural population as well as reduced stress on irrigation water availability. Areas for future research include investigating how CDM project development may influence the entire agricultural sector and what additional policies and institutions are required for achieving mid- and long-term sustainable development.

## ACKNOWLEDGMENTS

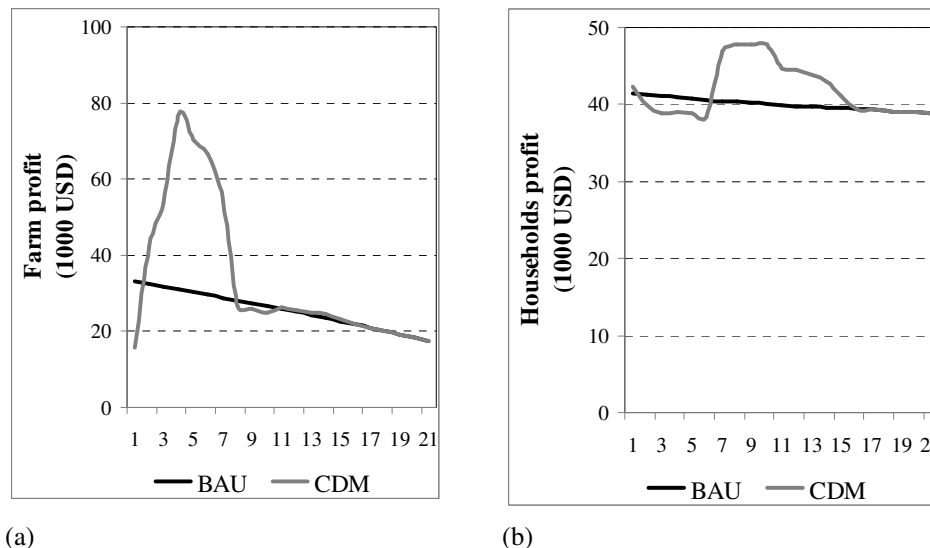
The research was conducted in the collaborative framework of German-Uzbek Agroforestry project supported by the Robert Bosch Stiftung and ZEF/UNESCO program supported by BMBF. The authors are thankful to International Postgraduate Studies on Water Technologies (IPSWaT) for financial support in doctoral research of the first author.

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## ANNEX



(a) (b)  
**Figure A1:** Annual profits of the farm (a) and rural households (b)



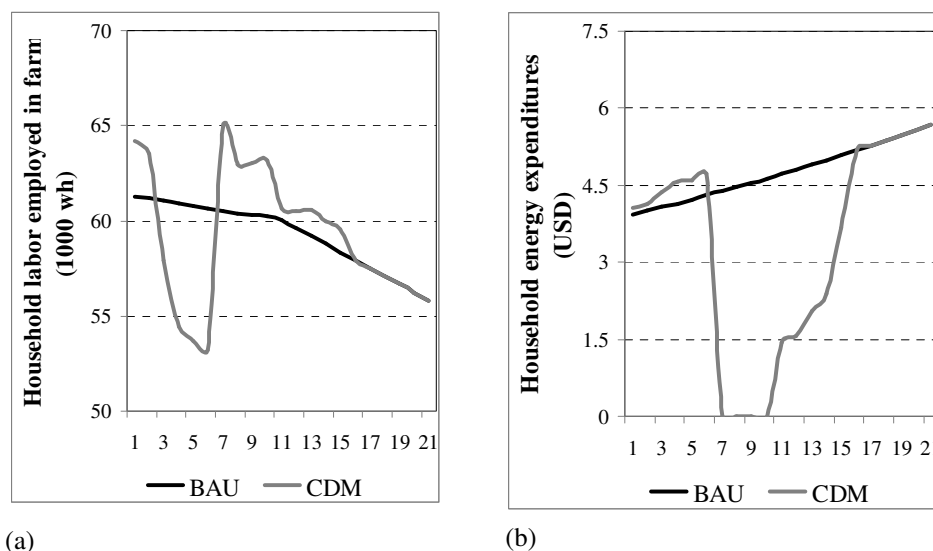


Figure A2: Labor employment in farms (a) and household energy expenditure (b)

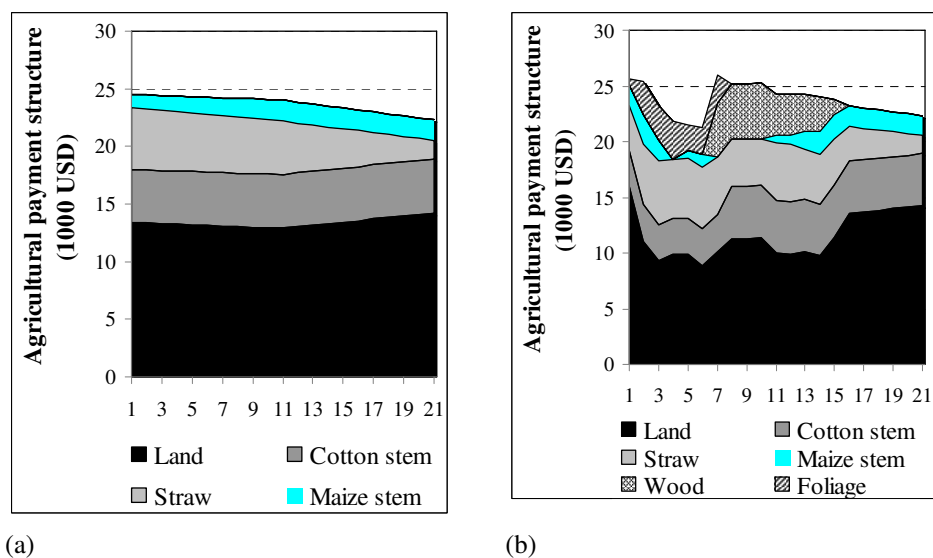


Figure A3: Farm-to-household payment structure at BAU (a) and CDM (b)



# PUBLIC PARTICIPATION GIS TO SUPPORT A BOTTOM-UP APPROACH IN FOREST LANDSCAPE PLANNING

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## ABSTRACT

Forest landscape planning analyzes all forest aspects (economic, ecological and social) and defines long-term forest management guidelines. Various actors are influenced by the effects of landscape planning, so at this level of analysis it is strategic to take into account objectives and targets expressed by different stakeholders.

The participatory process can concretely support the development of a bottom-up forest plan when stakeholders are involved all along the decision making process. In this way management guidelines are defined by decision makers and local communities through a shared process.

In such a perspective a Public Participation GIS (PPGIS) is a useful tool in order to support the decision-making process in forest planning.

The aim of the paper is to present a method that meets these requirements by exploiting the potential of GIS. The application of Public Participation GIS (PPGIS) represents a useful support to integrate stakeholders' priorities and expectations into forest planning strategies. Furthermore it represents the starting point to draw up management scenarios integrating and comparing both technical and social preferences.

The paper presents an application of PPGIS potentiality in a forest landscape plan in Southern Italy (Alto Agri district – Basilicata region).

**Key-words:** Forest landscape planning, public participation, decision making, Public Participation GIS

## INTRODUCTION

Forest landscape planning is an approach to manage the forest ecosystem considering all forest functions in an integrated and holistic way (Kangas and Store 2002). This approach is intended to have an intermediate role (tactical level) between forest management plans at a national or regional level and at a forest management unit level (Baskent and Keles 2005). Forest landscape planning addresses long-term forest management guidelines, based on three key-issues: (i) a particular emphasis on Sustainable Forest Management (SFM) as a management paradigm, (ii) a large-scale analysis (landscape) and a small-scale intervention, (iii) a special attention to the involvement of stakeholders in the decision-making process.

Regarding SFM, it is the new forest management paradigm, born in the early 90s in the wake of the principles established by the United Nations Conference on Environment and Development (Rio de Janeiro 1992). SFM involves the balancing of ecological, social and economic values to meet society's objectives over the long term (Sheppard 2005), with the key objective of maintaining the health, integrity, and biodiversity of forest ecosystems at multiple scale (Luckert and Williamson 2005).

Large-scale analysis and small-scale intervention is the challenge of forest landscape planning: it means that the extensive analysis of the forest as an ecosystem be coupled with the definition of specific planning interventions. As a matter of fact, the evaluation of complex and various parameters to assess the overall

multifunctionality develops in parallel with the accurate definition of planning and silvicultural options in order to manage specific forest formations.

Social sustainability, as well as environmental sustainability, plays a key role in forest landscape planning. This kind of sustainability requires that individual or collective actors affected by a plan or program have the right to be involved in the planning process (Kangas et al. 2010). In general terms, participation covers processes and mechanisms that enable people who have a direct stake in forest resources to be part of decision-making in various aspects of forest management (Günes and Coskun 2010). Participatory planning can be characterized by different phases and levels of public involvement (IAP2 2007, Germain et al. 2001), but participatory process can concretely support the development of a bottom-up forest plan when stakeholders are involved all along the decision making process. In this way management guidelines are concertedly defined by decision makers and local communities.

In consideration of the above mentioned issues, it is important to develop a method which can usefully support landscape planning process in: i) gathering different information collected during the field survey and the participation process ii) organizing stakeholders' preferences and communicating to stakeholders the information concerning the various planning alternatives, iii) giving transparency and traceability to the decision-making process.

The aim of the paper is to present a method that meets these requirements by exploiting the potential of GIS. The application of Public Participation GIS (PPGIS) represents a useful support to integrate stakeholders' priorities and expectations into forest planning strategies. Furthermore it represents the starting point to draw up management scenarios integrating and comparing both technical and social preferences.

## MATERIALS AND METHODS

### Study area

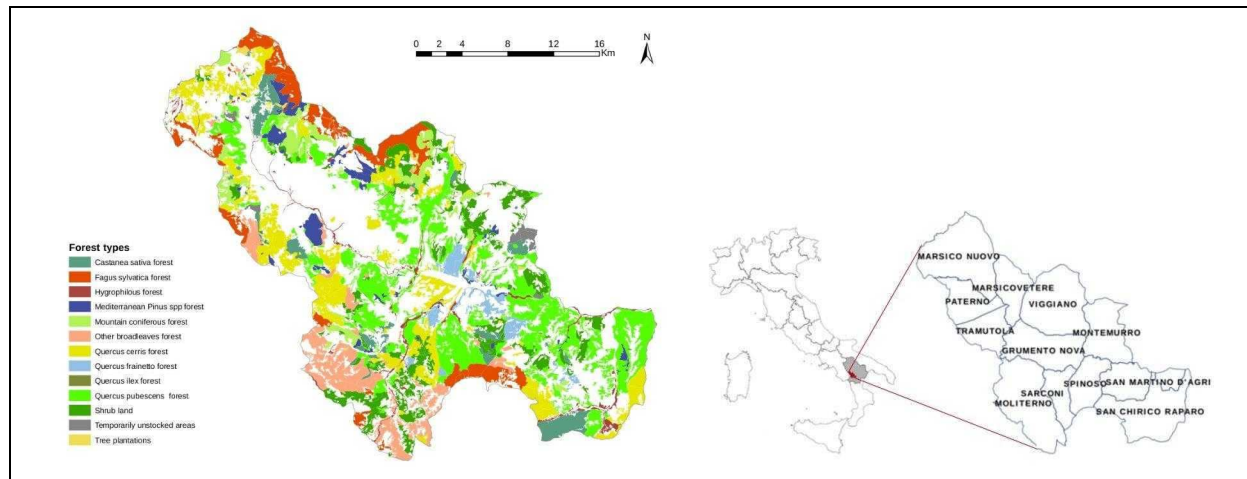
The Alto Agri district, located in the Basilicata region, Southern Italy (40° 20' 25'' N; 15° 53' 52'' E), occupies about 72,559 hectares of territory and is divided into twelve municipalities (Fig. 1). Geographically, the territory is characterised by a valley, through which the Agri river flows. The actual population density - with a population of 33,739 people - is 60 people/ km<sup>2</sup>, compared with the national value of 200.1 people/ km<sup>2</sup>. This situation is the result of a slow depopulation, which started in the 50s and continued down to this day. The forest surface area covers 42,367 hectares, comprising 58.4% of the district territory. Privately-owned land amounts to 72.8 %, whereas the remaining 27.2% belongs to public administrations: various municipalities and the Basilicata Region.

As shown in Figure 1 the four main forest types are *Quercus pubescens* Willd. forests (28%), *Quercus cerris* L. forests (18%) and *Fagus sylvatica* L. forests (10%). Collectively, the other forest types present constitute around 30%, with a high degree of forest composition. In addition, shrubland is represented in 13 % of the territory.

About 47,567 ha (66% of the study area) are located in protected areas. Particularly, 37,188 hectares are included in the "Appennino lucano – Val d'Agri – Lagonegrese" National Park (about 51%) and 33,648 ha (about 46%) in the Natura 2000 sites.

### Research design

In order to achieve the goal of comparing stakeholders' preferences with technical assessments, the research is divided into three phases: (i) evaluation of forest functions and multifunctionality from the technical point of view, (ii) survey about stakeholders' individual preferences in relation to forest functions, (iii) development of a Public Participation GIS to support the small-scale forest planning.



**Figure 1:** Alto Agri district: forest types and municipalities

## Technical evaluation

At the beginning of the landscape planning process technical managers and decision-makers met in a brainstorming finalized to discuss various issues concerning the plan development. In this framework they outlined the main functions of Alto Agri forests, gathering and comparing information already available (including: cartography, previous management plans, etc). The functions identified are: firewood production, timber production, non-wood forest products (NWFP) collection, hydro-geological protection, tourist and recreational activities, landscape conservation and habitat conservation.

During the forest inventory phase, the forest functions are assessed in ecological and technical terms in 577 areas of sampling with a surface of 5,000 m<sup>2</sup>, stratified by forest type. In each sampling point both qualitative features of the forest (descriptive investigation) and quantitative data (dendrometric parameters) are collected. The qualitative description of the forest focused on collecting site data, and studying the structure of the vegetation including tree, shrub and herbaceous layers. Qualitative and quantitative attributes permitted the description of both the quality and structure of the forest. Over and above the statistical parameters, the objective of the inventory was to define the forest functions for each subcategory in order to evaluate the overall multifunctionality.

The multifunctionality of each sampling point is evaluated by estimating the capacity of the forest to fulfill different functions, in the context of an Index of Importance of Function (I). The estimation is expressed by providing a score for each function considering the measured structural parameters and a qualitative assessment made by the technicians. A scale ranging from 0 to 10 is utilized to synthesize the assessment. A value of 10 was assigned to the most prevalent function, with each decreasing value (9, 8, 7 etc), respectively, signifying those functions with an increasingly minor importance. Functions that were not applicable in the context, were given a score of 0. (Cantiani et al. 2010). The functions, reported in the literature, have to be adapted to the Alto Agri context because of the characteristics specific to that territory. The sampling points are aggregated per municipality and then compared using two indicators measuring the level of multifunctionality. The two indicators are:

the average value of each function associated to the municipality  $\overline{v}_{ft}$

$$\overline{v}_{ft} = \frac{\sum_{i=1}^{i=n} I_i}{n}$$

n = total of sampling points per municipality

$I_i$  = index of importance of function in a sampling point  $I$

the mean total value of all functions  $\overline{V}_{FT}$  referred to each municipality

$$\overline{V}_{FT} = \frac{\sum_{j=1}^{j=m} \overline{v}_{ftj}}{m}$$

m = total of functions

$\overline{v}_{ftj}$  = average value of a municipality for the function j

Moreover, the total value and the value of each function are calculated for the entire area of the Alto Agri district and for single forest types.

## Stakeholders' preferences

Through a preliminary stakeholder analysis, a total of 115 stakeholders have been identified. A distinction, among the stakeholders interviewed, is made between institutional (public administration) and non-institutional actors: 32 stakeholders belong to the first category and 83 to the second. In the latter non-institutional category, 23 actors belong to the non-profit world (18 environmental and local associations, 5 hunting associations). The remaining part comprises individual actor representatives of the following activities: 20 tourist farmers and other actors linked to the tourism, 25 actors of the forestry-wood chain (forest owners, forest and wood entrepreneurs), 15 cattle-breeding entrepreneurs.

A questionnaire has been chosen as the tool to gather stakeholder preferences regarding forest functions. The questionnaire - subdivided into thematic sections (one thematic section specifically concerns forest multifunctionality) - is administered by interviewers through face-to-face interviewing.

The list of forest functions identified during the brainstorming phase is presented to the interviewees. Individuals are allowed the possibility of integrating the list with more forest functions. The interviewees are asked to assess the importance of each single forest function in a 4-ranking scale: 4=high importance, 3=medium importance, 2=low importance, 1=very low importance.

Furthermore interviewees are requested to specify which area their answers refer to. Three possibilities are given: (1) one municipality, (2) two or more municipalities and (3) the entire district. The request to declare the reference area has the aim of georeferencing the gathered information.

Finally the individual preferences attributed by the stakeholders to each forest function have been elaborated by sorting them according to a list of priorities. The results have been subsequently converted into a 10-ranking scale, in order to compare it with the results given by forestry experts in the field. According to the list, and to the gaps among the functions, is possible to have a clear overview of stakeholders' priorities and expectations. This information would be then assessed successively on the basis of both the forest survey and the technical feasibility in order to support managers in the definition of preliminary management strategies.

## Public Participation GIS

GIS linked to the participatory approach in the decision making process can be defined Public Participation GIS (PPGIS). More specifically in forest sector decision making processes and participatory planning, GIS offers the opportunity to determine the geographic location of opinions (Hytönen et al. 2002) and to compare the social preferences with the technical evaluation (forest measurement) in a spatial area.

In the case study, the information flow chart of PPGIS can be represented in various steps (Fig. 2).

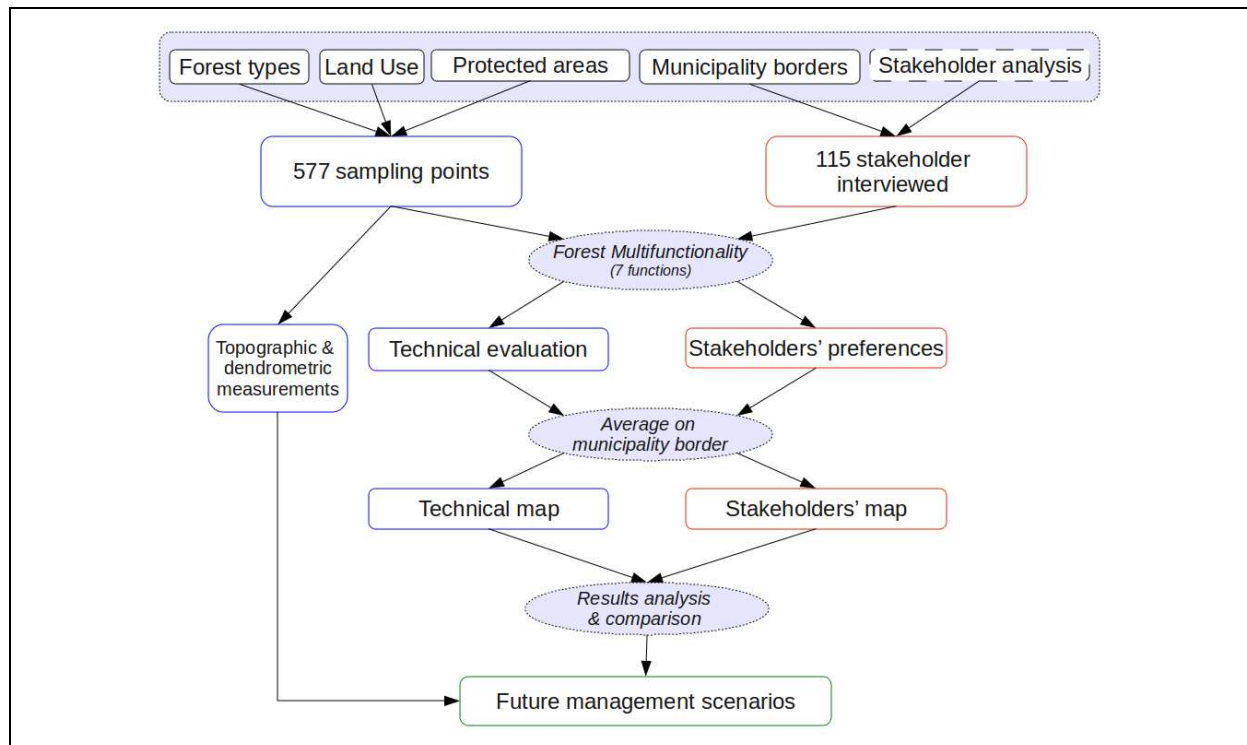
In the first step all available information on the geographical maps (forest types, land use, protected areas and municipality borders) and the results of stakeholder analysis (localization and category of each stakeholder) are collected and processed to characterize the study area.

Secondly, the information collected in the field (sampling points) and the results of stakeholders' questionnaires are used for the evaluation of forest multifunctionality. For each sampling point all forest functions are evaluated and georeferred to the relative geographic point, while for each stakeholder the same information is evaluated and georeferred to the municipality of reference.

Thirdly - in order to compare the evaluation of technicians and stakeholders -the sampling points' values are averaged by each municipality. So the technical and stakeholders maps are obtained.

At last the two evaluations are compared in order to analyze differences and similarities. This comparison is a simple and representative graphical representation of technical and social priorities and the proper way to gather and organize information that can be shown in a simple form to planners and decision makers.

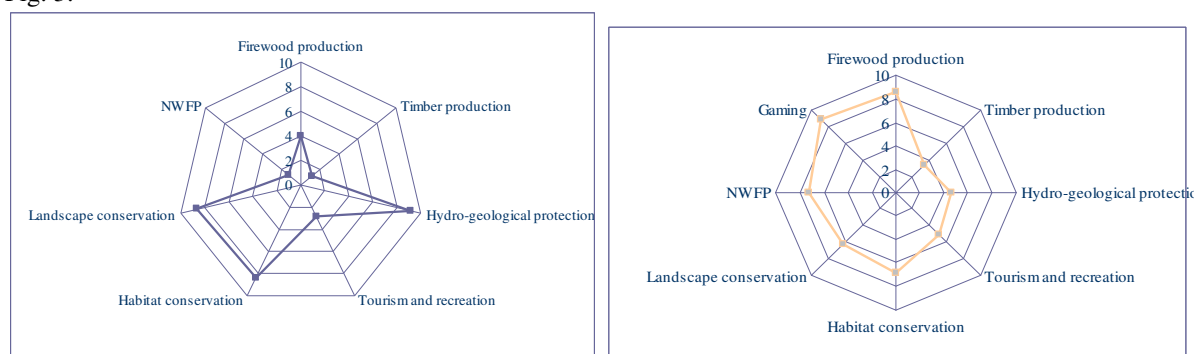
This analysis could be the starting point for the construction of future management scenarios integrating and comparing both technical and social preferences.



**Figure 2:** Steps and relationships of qualitative, spatial and preference analysis in the Public Participatory GIS

## RESULTS AND DISCUSSION

The results of technical and stakeholders evaluations for each forest function are represented and compared in Fig. 3.



**Figure 3:** Mean values of the forest functions values in Alto Agri district for the technical evaluation (left) and stakeholders evaluations (right)

The chart regarding technical evaluation evidences that there are three main functions that differ from the other forest functions: hydrogeological protection (9.2), landscape conservation (8.6) and habitat conservation (8.4).

This result is mainly influenced by the forest type, indeed the firewood production is high in the *Quercus pubescens* Willd. forests (8.1), *Quercus cerris* L. forests (8.3), *Quercus frainetto* Ten. forests (8.2) and relatively low in all other forest formations. Timber production shows low values only in the Chestnut (3.9) and Beech forests (4.0), while habitat conservation reaches its maximum in the *Quercus ilex* L. forests (9.7).

The results of stakeholders' preferences shows that the most important forest function is gaming (mean value 8.6), a function not present in the list of forest functions identified during the brainstorming phase. The other functions that stakeholders consider important are: collection of firewood production (8.5), NWFP (6.9) and habitat conservation (6.4).

The results - subdivided for five categories of stakeholders with similar interests and purposes - are reported in Tab. 1. It is possible to observe that the public administration - compared to other actors - gives higher value to the functions useful for the community (hydrogeological protection, landscape and habitat conservation). An anomalous result is observed for local and environmental associations that give higher values to gaming (8.9) and timber production (4.1) in comparison to the other social actors. These results most likely show that same forest functions are not perceived in an univocal way by the population. Vice versa stakeholders indicate the gaming as a very important function, although not originally considered by technicians and decision makers in the initial brainstorming.

**Table 1:** Perceptions of forest functions per stakeholder category

Function Stakeholder	Firewood	Timber	NWFP	Hydro- geological protection	Tourist activities	Landscape conservation	Habitat conservation	Gaming
<b>PUBLIC ADMINISTRATION</b>	8.9	3.0	7.3	5.3	5.9	6.5	7.7	8.8
<b>CATTLE- BREEDING ACTORS</b>	8.3	2.2	6.8	4.7	6.0	5.7	7.1	8.2
<b>FOREST-WOOD CHAIN ACTORS</b>	8.1	3.6	6.6	4.5	5.3	5.5	6.1	8.5
<b>LOCAL ASSOCIATIONS</b>	8.7	4.1	7.0	3.5	6.1	5.4	5.6	8.9
<b>TOURISM ACTORS</b>	8.3	3.2	7.0	3.2	6.7	4.7	5.3	8.3
<b>Mean</b>	8.5	3.2	6.9	4.2	6.0	5.5	6.4	8.6

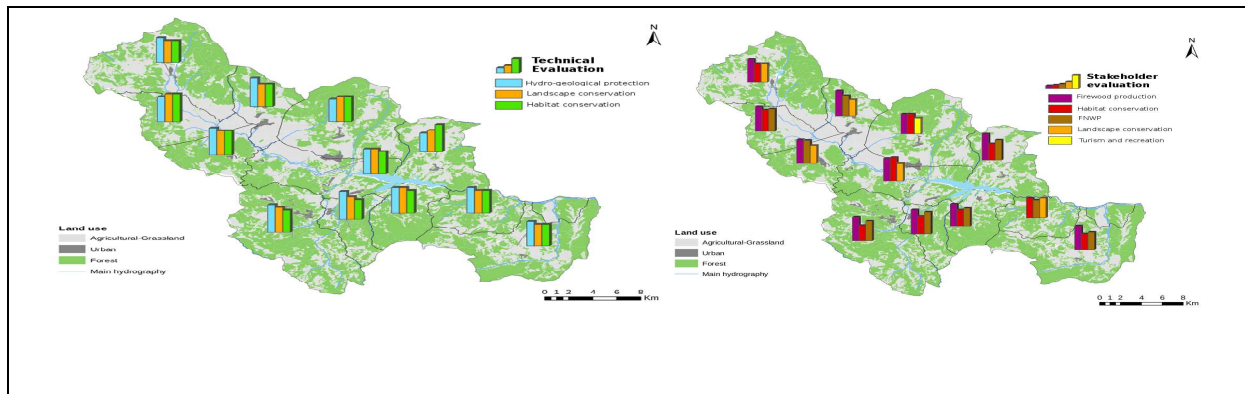
Two maps drawn by the PPGIS represent the three main functions in each municipality in the two evaluations (technical and stakeholders) (Fig. 4). Here, in order to compare the same functions, the gaming function is not considered.

In the first map it is possible to observe that in all municipalities the technicians evaluated the same three functions as the most important: this means that all Alto Agri district forests are intended principally to protect watersheds and soils, control soil erosion and preserve the territory. Differences among municipalities are found in the priorities list: in nine municipalities the soil and natural risk protection is the first function, while in two municipalities the habitat conservation is the most important function and in one case the landscape conservation.

In the second map there are five main functions: in almost all municipalities firewood production prevails; habitat conservation, NWFP and landscape conservation are the other main functions. Only in one municipality (Viggiano) tourism and recreation function is present (in third position, 8.1).

In the Southern and Eastern municipalities (Moliterno, Sarconi, San Chirico in Raparo, Montemurro) the function values are very similar to each other: first the firewood production, than the forest non-wood products (NWFP) and third, the habitat conservation. Moreover, productive functions of forest have a high value especially in the municipalities of Montemurro (firewood production 10, timber production 4.8) and Paterno (firewood production 9.17, timber production 4.8), while Tramutola stakeholders attribute high value to the firewood production (8.9) and NWFP (8.6). Grumento Nova scores the highest value for habitat conservation (8.9), and San Martino d'Agri for landscape and habitat conservation (7.5).





**Figure 4:** Comparison between the three main forest functions for the technical evaluation map (left) and the stakeholders' evaluation map (right)

Differences between technical and stakeholders evaluation are relevant: technicians seem to emphasize the role of environmental functions (landscape and habitat conservation); instead stakeholders attribute great importance to productive functions (firewood).

Differences are probably due to various issues:

- technical evaluations take into consideration the presence of the “Appennino lucano – Val d’Agri – Lagonegrese” National Park and of the Natura 2000 sites. Probably stakeholders do not consider these aspects, also due to the recent institution of these protected areas;
- technical estimation of productive function values are based, as far as possible, on parameters of an objective nature. This evaluation guarantees an objective comparison among different areas, but do not take into account the economic role of forests for local communities;
- Viggiano is the Alto Agri municipality where tourist activity registers the greater presence. In Viggiano there is both religious tourism and winter tourism. The importance given by stakeholders to tourist and recreational functions is probably attributable to these characteristics;
- according to the technical evaluation less importance is given to the hydrogeological function in Montemurro municipality. This fact is probably due to the scarce presence of coniferous and Holm oak forests in the territory, which are the formations with higher values for the hydrogeological function.

## CONCLUSIONS

During the field survey, technicians assess their evaluation considering site conditions and qualitative and structural parameters of forests. The estimation is based on objective considerations and takes into account differences among territories. On the other hand, stakeholders' evaluations are based on their individual perception and not on the technical characteristics of forests. Their evaluations can be highly conditioned by the emotional and imaginary sphere and can distort from an objective estimation. On the basis of these considerations, a participatory process occurring throughout developed all along the forest planning permits the better incorporation of priorities and expectations of all the actors, taking effectively into account their opinions in defining the draft of the plan. The comparison and integration of technical and social evaluations of forest functions can be the starting point for the development of future management scenarios, based on a shared multifunctionality evaluation.

PPGIS proved to be a useful support in order to facilitate the gathering and organization of preferences expressed by stakeholders, and to compare technical and stakeholder evaluations.

In the ambit of participatory planning, this step gives stakeholders the possibility to verify their real potency in defining planning alternatives. In general it means giving transparency and traceability to the decision-making process and demonstrating that participation concretely influences defining planning strategies.

The territory of Alto Agri district is currently managed, especially by private properties, in a mono-functional manner (firewood). If we consider the priorities order expressed by the stakeholders about forest functions, a request of multifunctionality emerges. In a similar manner, technical evaluations outline the importance of multifunctionality in Alto Agri forests.

In order to answer this demand, it is possible to readapt the Wake Theory or Kielwassertheorie. The original formulation of this theory postulates that the social forest effects result from a profit oriented forest management. In other words, the primary goal to be pursued is substantially firewood and timber production. The remaining forest functions then come in the wake of this main function, without any specific management interventions (Glück 1987). This theory was conceived in the middle of the 20th century in Germany and was valid in a specific social and cultural context. As a matter of fact, its application today requires some conceptual readjustments. A possible application may be the direct achievement of a moderate multifunctionality of two to three functions, and an indirect fulfillment of the remaining functions thanks to the wake effect.

## ACKNOWLEDGEMENTS

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## MARKET SUPPLY OF WOOD FROM AREAS WITH FRAGMENTED FOREST-OWNERSHIP STRUCTURES – A EUROPEAN CASE STUDY APPROACH

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### INTRODUCTION

Forest resources in Europe are expected to continue to expand (FAO, 2009) although the process is slowing down. Forest management will continue to serve a wide variety of purposes. Economic viability is likely to remain a challenge, especially for small-scale forest owners, but the increased demand for wood for fuel could continue to change this (FAO, 2009).

The latest available international data on forest ownership (FAO, 2006) in the EU 27 shows that around 60 % of forest area (excluding other wooded land) is in private ownership, while around 40% is publicly owned. The share of private ownership is very diverse amongst the EU's 27 countries. The highest share of privately owned forest area occurs in Portugal (92.7%), followed by Austria (80.4%), Sweden (80.3%) and France (74%). In the private forest ownership enquiry carried out by Schmithüsen and Hirsch (2009) 18 out of the 23 countries indicated an increase in private forest area and in growing stock, mostly due to afforestation. Both, Schmithüsen and Hirsch (2009) as well as MCPFE/UNECE/FAO (2007) state that the number of private forest owners will still rise in the future due to on going restitution and privatisation processes, but no quantitative data are given.

In terms of numbers of private forest owners as well as distributions of size classes, small scale land holdings prevail in European forests. This is for example demonstrated by the data from responding countries in the study by Schmithüsen and Hirsch (2009) that were able to furnish detailed information on the prevailing land structure of holdings. Aggregated figures<sup>1</sup> show that 61% of all private forest holdings have an area of less than 1 hectare and 86% of all holdings belong to the size classes of up to 5 hectares. 13% of the private forest holdings are in the size classes from 6 to 50 hectares and around 1% of the owners have forest units over 50 hectares.

The economic efficiency of European forestry is impaired by a number of factors, including the fragmentation of the ownership which also implies other deficiencies. In the case of Central Europe, Rametsteiner et al. (2006) have found that small-scale forest owners often do not pursue commercial goals with their forest ownership but rather just maintain the capital. It was also found that they are often not trained or educated in forestry. Their business strategies, if they have any, are thus also dominantly “business as usual” (in the meaning of continuing with what has always been done). Their work time spent on forest management is low. As a consequence, the income share to the family/forest owner income is low, and the product mix small. Forests, in sum, are neither the focus of investments nor innovation strategies.

A first step to assessing the participation of private forest owners in wood markets is by investigating the degree of forest management in their holdings. Managed forests and other wooded land can be defined as areas managed in accordance with a formal or an informal plan applied regularly over a sufficiently long period (five years or more). Management operations include the tasks to be accomplished in individual forest stands e.g. compartments during the given period. 14 responding countries in Schmithüsen and Hirsch (2009) have supplied information on the share of managed areas according to ownership categories. In seven of these countries (Bulgaria, Czech Republic, the Netherlands, Slovakia, Serbia Latvia and Ireland) both private and public forests have been reported to be completely or almost completely under some form of management. In some of these countries, like Bulgaria, governments require the adoption of a management plan for all types of forests, both private and public.

Overall, it remains difficult to draw general conclusions about the sustainability of the forest management from the presence or absence of a management plan. While management plans often contain requirements with

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<sup>1</sup> Austria, Belgium, Bulgaria, France, Hungary, Latvia, Lithuania, Slovak Republic and United Kingdom

regard to sustainable forest management, such requirements differ. Furthermore, the absence of a management plan, in particular in small-scale often privately owned forests, does not necessarily imply that the forest owners do not have the objective of managing their forests sustainable. Moreover, the absence of a plan and of any clear objectives may mean that forest management is effectively neglected, but it may be nevertheless perfectly sustainable.

## Objective

The purpose of the overall project work was to: “identify the most appropriate measures for increasing the market supply of wood and other forest biomass from the areas where forests are held by many individuals owning relatively small parcels of forest.”

In this study, fragmented forest ownership is understood as the presence of a high number of individuals owning small-size forest parcels. Forest fragmentation here is not meant to be mainly addressed from the spatial point of view, considering distribution of individual forest stands in the landscape, even though this may also be viewed as one of the limiting factors for effective mobilisation of wood. Since the average lot size, which may be considered as a small-size forest parcel, may heavily depend on the site conditions (e.g. stock, topography, site development, etc.) the decision on what may be considered as fragmented was taken on a case-by-case basis.

## METHOD

According to Yin, the case study research method is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used (Yin, 1984).

There are many different types of case studies mentioned in literature. The case studies carried out in this work can be defined as comparative, explanatory and/or descriptive case studies. Comparative case studies are a set of multiple case studies of multiple research entities for the purpose of cross-unit comparison. Both qualitative and quantitative comparisons are generally made. Explanatory cases are suitable for doing causal studies.

Besides secondary data (literature and archival document review) the case study research used focus group techniques as a major source of information as well as in-depth expert interviewing to gain a comprehensive and well balanced representation of the situations and developments in the case study regions.

The selected eight case study regions (Saxony, Austria, Rhône-Alpes, Sweden, Catalonia, England, Hungary and Estonia) are the best possible representatives for the EU in terms of forest related factors as well as in geographical or economic terms. The selected case studies include areas from EU 15<sup>2</sup> and the Member States that joined the EU in 2004 or thereafter and from Member States having high, medium and low proportions of private forest owners and intensities of wood mobilisation. Furthermore the selected case studies include countries with relatively high and relatively low forest cover and with relatively large, medium and relatively limited forest industries, whether state-controlled or privately owned. A very important feature is that the selected case studies include different levels of fragmentation (in terms of average size) and wood mobilisation (in terms of harvest related to annual increment). As a matter of fact the selected case studies are suitable to study factors influencing wood mobilisation in the context of fragmented forest ownership.

Each case study report had to include a collection of data and structured information regarding:

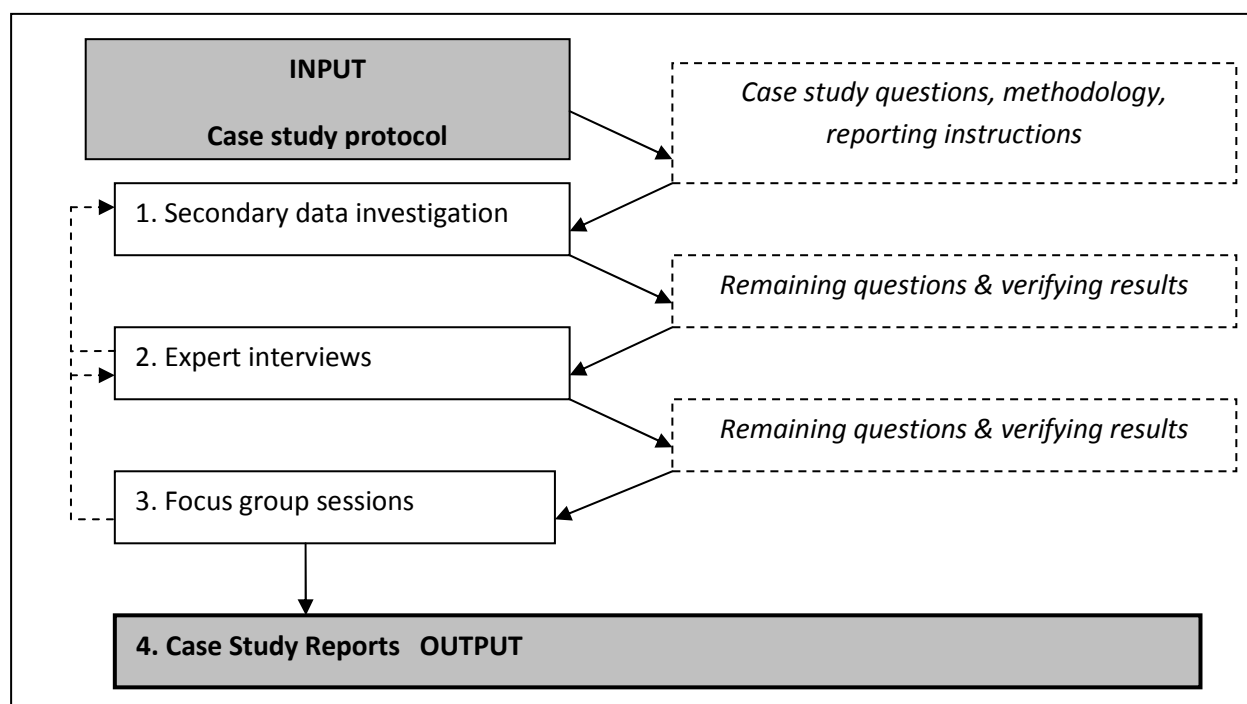
- Availability, supply and demand in the regional wood market of the particular region as well as the amount of resources (wood and other forest biomass) with potential to be mobilized from fragmented forest ownership;
- Characteristics, number and organization of private forest owners and wood buyers;
- Market structures for wood and other forest biomass trade;
- The level of private forest owners' participation in the wood markets;
- Interest and motivation of private forest owners to actively participate in forestry as well as state-of-the-art in their cooperation;

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<sup>2</sup> Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

- Possibilities and constraints for market access by private forest owners;
- Experiences with wood mobilisation programmes in practice
- Conclusions and recommendations for options for wood mobilisation
- Wood mobilisation measures, strategies and policies in the region both successful and ineffective ones.

The typical work flow for carrying out each case study is indicated in figure 1.



**Figure 1:** Work flow for carrying out the case studies

As shown in figure 1 each case study started with the implementation of the case study protocol by investigating the case study questions. Ideally the questions were investigated by a four step approach beginning by 1) an intensive secondary data investigation. The results obtained in the first step were 2) verified and extended by means of expert interviews during the second step. The expert interviews were also used to address those questions that could not be answered in a satisfactory way during the secondary data investigation. Thereafter 3) focus group sessions were held in order to verify previous results and to address remaining questions and to discuss conclusions. As indicated in figure 1 by the broken arrows on the left, 4) feedback loops between steps 1, 2 and 3 could be employed whenever useful. Overall each case study provided a comprehensive overview of how these selected wood markets are structured and operate.

## RESULTS

Conditions of wood supply, wood demand, legal framework and infrastructure of each European case study region were evaluated by using three values<sup>3</sup>. Simplifications help to finally identify three categories of market conditions, under which wood mobilisation is currently taking place:

- **“Strong market”** with advantageous conditions of wood mobilisation, e.g. in Sweden
- **“Developing market”** with mediocre conditions of wood mobilisation, e.g. in Austria, Estonia, Saxony
- **“Weak market”** with disadvantageous conditions of wood mobilisation, e.g. in Catalonia, England, Hungary, Rhone-Alpes

<sup>3</sup> Values are represented by symbols:

+ (strong, high importance), o (intermediate, some importance), - (weak, no importance)

		AUS	CAT	ENG	EST	HUN	RHO	SAX	SWE
Supply	<b>High natural potential</b> (forest area, increment, terrain)	+	-	0	+	-	-	+	+
	<b>High ownership-related potential</b> (fragmentation, economic objectives, cooperation)	0	-	-	0	0	-	-	+
Demand	<b>Low informal markets</b> (subsistence)	-	+	0	0	-	-	0	+
	<b>Existence of industrial markets</b> (sawmills, pulp and paper, chipboard, wood energy - differing capacities)	+	-	+	+	0	0	+	+
Infra- structure	<b>Well-organised wood marketing</b> (PFO organisations, authorities support, industry and operators)	0	0	-	-	0	-	0	+
	<b>Good infrastructure</b> (roads, market information, suitable sales methods/contracts)	0	0	0	0	0	0	0	+
Legal framework	<b>Support of the state</b> (guidance, legal framework, financial support)	0	0	+	0	0	0	+	0
	<b>Low degree of bureaucracy</b> concerning forest management and harvesting operations	+	-	-	+	0	+	+	+
<b>Evaluation in total</b>		0	-	-	0	-	-	0	+

**Figure 2:** Wood market conditions in the eight case study regions regarding the wood mobilisation situation

### Category I: “Strong market” with advantageous conditions of wood mobilisation

Regions (Sweden in this case) with a strong market and advantageous conditions of wood mobilisation are characterised by a high natural potential and a wide range of industrial buyer types and demanded wood volumes (i.e. there are very large wood buyers but also small-sized ones). There is scarcely any fragmentation of ownership structures, i.e. the average size of properties is relatively high. The importance of subsistence economy is negligible. As a consequence of a high share of “traditional” private forest owners in market category I, cooperation is well established as is forest-related infrastructure. Market information is available and market transparency is given for all types of forest owners. There are also no limitations in the availability and quality of forest operators’ work.

### Category II: “Developing market” with mediocre conditions of wood mobilisation

Estonia and Saxony, but also Austria<sup>4</sup>, are regions where market conditions and wood mobilisation are “in development”. Such regions are characterised by moderate to high natural potentials and a relatively broad range of wood consumers. Large-scale buyers exist in all regions of category II. Fragmentation of ownership (i.e. a low average size of private forest land) exists, but is not extremely problematic in most cases. The level of bureaucracy concerning harvesting and wood marketing is relatively low. With regard to infrastructure and legal framework, the conditions vary within this category. While some conditions are already well-established, others need to be improved. Limitations in the availability and quality of forest operators’ work can be present (Estonia). Cooperation of private forest owners is low (Saxony and Estonia) to relatively high (Austria) and market information access and transparency is partly limited. Subsistence economy plays a certain role. There is a certain share of traditional and non-traditional forest owners, but no obvious dominance of one of these groups.

<sup>4</sup> Austria is a highly potential region within market category II (trend towards category I) mainly since infrastructure (i.e. especially quite good marketing structures) is more favourable than in other regions

### **Category III: “Weak market” with disadvantageous conditions of wood mobilisation**

Weak markets with disadvantageous conditions of wood mobilisation are to be found in Catalonia, England, Rhone-Alpes and also in Hungary<sup>5</sup>. Regions of category III have low to moderate natural (supply) potentials, while demand for wood (volumes and assortments) is similarly limited (very large wood buyers are missing). Wood imports are relatively important. Disadvantageous conditions of wood mobilisation are furthermore a result of a high degree of fragmentation (low average property sizes and/or distribution of properties) and a relatively low degree of cooperation amongst private forest owners whose economic objectives in forest management are mostly restricted to self-supply. There is a relatively high proportion of unknown private forest owners (“UFOs”) in market category III regions (e.g. in England, Catalonia) and in comparison to other regions a high proportion of owners that are uninterested in their forests altogether. Market information and transparency is limited. In general, the majority of conditions are insufficient for wood mobilisation, albeit some positive influences also exist (e.g. low degree of bureaucracy in Rhone-Alpes, strong wood demand in England).

### **Contribution of wood supply from fragmented private forest ownership**

Owners of fragmented private forests are characterised by relatively small forest properties and related small harvestable wood amounts per owner. Forest owners’ involvement in the wood market solely depends on their personal objectives. In contrast to the objectives of wood buyers, which are purely economic, owners of fragmented forests mostly have multiple objectives and attitudes. Since the share of urban forest owners has been increasing for years in most of the studied countries, the proportion of owners that are not interested in forest management and wood marketing is also rising in most of the regions.

In case (fragmented) private forest owners are interested in the economic use of their forests, i.e. in wood marketing, two preconditions must be fulfilled for any activity: trust in the contract partner and profitability of the harvesting/marketing operation.

Trust originates from positive experiences, e.g. appropriate wood prices, careful logging operations and fast payments. It is questionable if owners of fragmented forests can build a trusting relationship with operators/industrial buyers at all, since amounts of harvestable wood are small and marketing activities rarely occur. Nevertheless, since there is an increasing interest by the wood industry to work closer with private forest owners (e.g. in Sweden or Hungary), a trusting environment could be established. This is especially valid for members of private forest organisations.

Profitability can be based on low harvesting/marketing costs and/or high wood prices. Low harvesting costs can be the result of joint activities or cooperation, which enables forest owners to use shared machinery and technical equipment, have easy access to information and joint marketing, or participate in the management of pooled properties. However, there is a remarkable high degree of uncertainty regarding the future development of private forest owners’ organisation in the case study regions. Increasing organisation levels of private forest owners are expected in Catalonia and Rhone-Alpes. Increasing cooperation levels of private owners of fragmented forests are additionally seen in Estonia, while there is no development towards a higher share of organised owners of fragmented forests in Saxony. This means that today’s low level of cooperation amongst European private owners of fragmented forests will at best only slightly improve in the long term. This is not a surprising development since small forest properties, low wood amounts and thus rare wood marketing possibilities, do not require membership in economic-driven associations or cooperatives.

High(er) wood prices can be the result of specific contracts (e.g. high volume contracts of large-scaled forest owners or private forest owners associations) or general market developments. As previously mentioned, wood prices are generally expected to rise. Especially prices for low quality wood and hardwoods are assumed to increase. This puts owners of fragmented private forests into a favourable position since they often own forests with low-quality hardwood. Resulting cost efficiency for private forest owners could thus lead to higher wood supply in the long term. Regardless of cost efficiency, owners of fragmented private forests are only rarely able to market wood and each “large-scale” wood harvesting operation is a special event for the owner, which makes

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<sup>5</sup> Hungary must be seen as a region with high potential within market category III (trend towards category II)

wood prices particularly important for fragmented private forest ownership (e.g. Saxony). A high sensitivity of owners of fragmented private forests related to high wood prices is emphasized in all case study reports<sup>6</sup>.

In conclusion it can be stated that there will be a higher supply of wood from fragmented private forest ownership in the long term. This supply will however be limited to forest owners with economic objectives and therefore will be strongly influenced by increasing urbanity of owners, i.e. a rising share of non-traditional forest owners. In any case motivation towards additional wood supply from owners of fragmented private forests with other than purely economic objectives needs to address their specific attitudes<sup>7</sup>, i.e. some mobilisation activity is necessary. Nevertheless, cost efficiency and thus high(er) wood prices are also a precondition in these cases, if recreational or ecological objectives are not dominant.

In general, wood supply from fragmented private forest ownership will be restricted to time periods of high wood prices, which means that they will most probably not contribute to the basic market supply. An increased market participation of fragmented private forest ownership as a result of higher wood prices is also seen in the Austrian, Saxon and Catalan studies. However, financial incentives, specific initiatives and political support are emphasized as at least equally important (Rhone-Alpes, Estonia, Hungary, Saxony, Catalonia) for wood mobilisation from fragmented private forest ownership.

### Most promising measures for wood mobilisation

As a result of the evaluation and weighted sorting of measures a list of subgroups could be derived and is presented in the following (figure 3) for each market category:

**Bureaucracy** or rather its facilitation is most effective in improving wood mobilisation under all market conditions. **Pooling activities** as well as **counselling** should especially be considered for improvements of wood mobilisation in “developing” and “weak” markets, albeit both measures are also effective under “strong” market conditions. **Flagship projects** should be taken into account for category II and III-markets, while **specific information** has significant effects in “strong” and “developing” markets. Improvements to infrastructure (**forest roads**) have considerable importance in market category I-regions, but it is also an effective measure under more unfavourable market conditions II and III. Although **organisation** is especially effective in market category II-regions, it is nevertheless an important instrument for wood mobilisation.

Market category I ("strong")	Market category II ("developing")	Market category III ("weak")
1 Forest roads	1 Pooling activities	1 Pooling activities
2 Land consolidation	2 Counselling	2 Bureaucracy
3 General information	3 Bureaucracy	3 Counselling
4 Transport	4 Specific information	4 Networking
5 Bureaucracy	5 Forest roads	5 Training
6 Specific information	6 Contracts	6 Forest roads
7 Networking	7 Harvesting technology	7 General information
8 Counselling	8 Organisation	8 Contracts
9 Pooling activities	9 Training	9 Harvesting technology
10 Contracts	10 Networking	10 Specific information
11 Training	11 Forest Information System	11 Organisation
12 Forest Information System	12 Subsidies	12 Subsidies
13 Harvesting technology	13 General information	13 Transport
14 Subsidies	14 Transport	14 Forest Information System
15 Organisation	15 Land consolidation	15 Land consolidation

**Figure 3:** List of most effective measures for each market category (Ranking considers ease and speed of implementation)

<sup>6</sup> No information on this topic is given by England and Hungary.

<sup>7</sup> i.e. owners that focus forest management for self-supply could easily be convinced of fuelwood sales since they have already experienced fire wood production; owners with nature protection aims could be informed of a higher natural diversity in case of thinnings or openings; owners that use their forests for recreation could be made aware of the higher recreational value of woodlands with openings, “traditional” forest owners could be convinced by indicating close similarly “traditional” wood buyers (sawmills) etc.



## CONCLUSION AND DISCUSSION

First of all, several barriers to wood mobilisation from fragmented forest ownership have been identified which include low or even no profitability of forest management (e.g. taking the cost of regeneration into account), income independency of private forest owners (i.e. income from forestry), lack of knowledge and skills of forest management by private forest owners (e.g. harvesting technique or gaining felling permission) and a cooperation deficit between different private forest owners.

The assessment of mobilisation measures by type of market and by type of owner is one of the central achievements of this study. The analysis of the market factors supply, demand, infrastructure and legal framework resulted in a categorisation of three types of dominating market conditions in Europe into which the case study regions were classified.

It is concluded that measures for additional wood mobilisation are necessary in regions of category II (aimed at an “improvement” of existing structures supporting wood mobilisation) and in regions of category III (aimed at an “establishment” of structures supporting wood mobilisation). Within market categories II and III a clear relationship between fragmentation of ownership and a lack of wood mobilisation has been found in almost all regions. Investigating the underlying factors for this relationship by analysing the cases studies results showed that specific forest owner factors (owner typologies, motives), market conditions and regional differences must be taken into account to fully understand the relation between fragmented forest ownership and the lack of wood mobilisation.

The usefulness and efficiency of wood mobilisation measures towards fragmented forest ownerships is extremely dependent on region, market condition and forest owner type.

There exists neither the one and only perfect mobilisation measure, nor is there a need to develop many new measures. The results suggest that the most efficient mobilisation strategy may be achieved by a combination of measures selected according to the regional situation particularly considering market type and the distribution of forest owner types and their objectives.

In a similar way the priority of the recommended measures is dependent on various factors like the objective of mobilisation (e.g. amount of wood, economic efficiency, short or long term effects). Decisions on implementation and efficiency of some measures is dependent on other measures (general package, information, knowledge) and hence these measure can seen as important pre-measures.

Regarding forest owners it has been found that in general (in all cases with sufficient data available) a significant number of fragment forest owners show a strong and positive reaction regarding wood price changes<sup>8</sup>. Hence, a huge mobilisation potential can be assumed in case of rising wood prices - a factor that is again linked to the market type.

### **Traditional forest owners (economic orientation towards wood production)**

Those who do participate in wood production for markets or their own use are most likely to be traditional forest owners with a farming or forestry background and associated knowledge. They could be characterised by their economic-oriented objective of forest ownership. Their major barrier to mobilising wood is the unfavourable economic conditions of fragmented forest ownership. Consequently they strongly react to changes in profitability, be it due to rising demand and prices for wood (mostly) or due to direct or indirect financial incentives that affect profitability. Hence this group is comparably easy to tackle using traditional tools for wood mobilisation but the efficiency of these measures dependent on their impact on profitability, their interrelation with changing wood prices and the short-term dynamics (volatility) of the wood market e.g. in relation to calamities.

In the case of these more traditional forest owners the effects of market structures have been found to play a significant role in the effectiveness of wood price premiums. More developed or mature wood markets show much better performance than developing or emerging markets. Mature wood markets have been found in the case of regions with a diversely developed wood consuming industry as well as in the case of a diversity of forest service and owner association offers. Furthermore, well established wood selling methods and channels

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<sup>8</sup> This applies to wood delivered to markets only whereas household consumption and informal markets can be considered as comparably constant.

support wood mobilisation in these markets. In the best case (Sweden) such markets are also characterized by a high level of confidence between forest owners and the wood industry achieving various forms of vertical cooperation. All these wood mobilisation measures have to take into account the existence of the short term dynamics of wood markets mainly caused by storm events. Hence, short term oriented measures have to be applied with great care in order not to create adverse effects in the medium term.

## Non-traditional forest owners

In contrast to traditional forest owners, two other forest owner types have been characterized that may not, or only to a minor degree, participate in wood markets. These non-traditional forest owners may have no farming or forestry background, hence no forest-related knowledge, and they may live far away from their forest and may have typically become forest owners by restitution or inheritance. Probably the most important point to understand about this group is to recognise the diversity of non-economic, or at least no wood related, motivations in relation to their forest ownership. This growing group of non-traditional forest owners requires a completely new understanding of and new ideas about wood mobilisation. This group is definitely lacking in extensive possible mobilisation measures but shows a larger strategic potential for mobilisation in the medium and long term, especially as this group is expected to grow in the future. Although general knowledge about this group has been found to be low, it is possible for the purpose of wood mobilisation measures to divide this group into two subunits:

- Owners with no wood-related (often non-economic) objectives
- Uninterested owners (no objectives at all)

In the case of forest owners with no wood-related or non-economic objectives it is clear that a key issue for wood mobilisation lies in knowing and understanding their objectives. So far it seems that this group is characterized by a great variety of different possible objectives - in some cases even a mixture of various objectives within the one ownership. A few of these objectives may conflict with wood mobilisation in general (e.g. conservation; loss of property value, tourism) but others may be unaffected or even highly convergent with wood mobilisation (e.g. family tradition, leisure, ownership pride). In these cases, a lack of forest-related knowledge, network and service opportunities (in the context of market type) may turn out to be the reason why such forest owners do not participate in wood markets. Hence measures targeting this group need to reach owners with information, guidance and services but not with profitability-related measures.

Uninterested forest owners represent a group that by definition cannot be reached by traditional and general mobilisation measures. Beside the attempt to awaken their interest by information campaigns, probably the most efficient measures for this group are those preventing further fragmentation by law or by regulations as well as land consolidation programmes including legal settings that simplify transfer of forest land.

## Rough estimations on mobilisation potentials

In order to assess the amount of wood that may be available by mobilisation measures from fragmented forest ownership structures the case studies revealed some key figures that however were highly uncertain. The share of fragmented forest ownerships by total forest area was in most case studies found to be between 20% (Saxony) and 50% (Sweden) except Hungary (4%) and England (no estimation available). In those regions where data or estimations were available it was expected that in fragmented forest ownerships the harvests reach only 20 to 50% of the increment with the exception of Sweden reaching 80%. Assuming that the total increment is equal distributed over all ownership groups the available data and estimations allow an estimation that the total annual amount of wood potential mobilised from fragmented forest ownerships may in the range of 0.9 million cubic meters in case of Rhone-Alpes, 1.5 million cubic meters in Saxony and 8.3 million cubic meters in Austria. Anyhow increment data will definitely tend to overestimate the ecological and economical feasible potential (BFW, 2009) in most regions. On the other hand the assumption of equally distributed increments over ownership types can be considered a conservative assumption.

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<sup>9</sup> None of these objectives and wood mobilisation is necessarily mutually exclusive; of course, it always depends on site conditions and situation.

Even more difficult and uncertain are estimations regarding the traditional and the non-traditional owners share within these potentials. Available indicators are the share of non-farm forest ownerships and non-residential forest ownerships as well as the share of relevant education among forest owners. Such information is always related to the total number of private forest owners and not to the fragmented forest owners or the forest area. Hence the assumption that forest area is equally distributed among private forest owners is necessary to get rough estimations although it is clear that non-traditional forest owners are very likely to own smaller lots than traditional owners. This systematic over estimation is very likely fully or partly compensated by the fact that non-traditional forest owners may be characterized by even lower wood utilisation rates than their traditional counterparts. In Rhone-Alpes these considerations lead to the conclusion that between 0.3 and 0.7 million cubic meters annually, or 55% of the potential from fragmented forest ownerships, may originate from non-traditional owners. A similar level can be assumed in Saxony (57%) whereas the estimations in the Austrian case study lead to a lower average level (between 5 and 33%). The definition and understanding of who is considered a non-traditional forest owner is vague, varying and depending on regional conditions. Therefore these figures are very difficult to verify.

Indeed the share of non-traditional forest owners and their share of forest area are widely unknown and are very likely to differ at the regional level. For example farm owners represent 20% of the owners in Austria but they represent a larger share of forest area because they have larger forest properties than other types. In Rhone-Alpes, around 60% of the forest land can be related to this owner category of active managers (savers, local social foresters, local producers, long-term managers). In any case there is a clear trend that this category of traditional forest owners is decreasing in prevalence across most of the case study regions. It should be noted that in the ongoing structural change in forest ownership, there is still a large part of forest owners that have some family-related connection to agriculture and would be open to traditional forest management services that are offered by neighbours or associations. It can be assumed that these transitional owner categories will change to non-traditional types in the next generation at the latest.

Flagship projects are recommended to serve as exemplary actions of how a selected “package” of measures improves the situation of wood mobilisation in certain regions. Such projects represent the whole process of wood mobilisation activity, indicate difficulties and serve a public relation function. Realisation of flagship projects strongly depends on policy support (i.e. mainly financial incentives). In such cases rural development funds may be used.

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# **FAMILY FOREST OWNERS' VOLUNTARY BIODIVERSITY PROTECTION - DECISION SUPPORT NETWORK, SATISFACTION AND PERCEIVED DIFFICULTIES**

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## **1 INTRODUCTION**

The worldwide agreements to halt the decline of biodiversity have changed national forest policies. In Finland, the biodiversity values of forests are protected by law. In addition, new voluntary protection instruments (i.e. cost-share measures and subsidies) have been developed and they have gained popularity among Finnish family forest owners. Similar progress with the voluntary protection approach is going on also elsewhere in Scandinavia, for instance within the Komet programme in Sweden (Min naturvård, 2011).

According to Finland's National Forest Programme 2015 the task of conserving the biodiversity of forests is concentrated in the Forest Biodiversity Programme METSO 2008-2016 (Valtioneuvoston periaatepäätös, 2008; Kansallinen, 2010). The aim of the programme is to protect and enhance the biodiversity of the forests in southern Finland, where the proportion of protected forests is smaller than in northern Finland. The protection in southern parts has traditionally been more demanding due to the dominance of private forest ownership. In this study, we focus on those voluntary protection agreements that family forest owners have made within METSO.

In the METSO programme, the protection-quality of a forest stand is estimated by its indicators for biodiversity and its suitability as a habitat for different species. Valuable habitats include, for instance, herb-rich forests or heathland forests with plenty of decaying wood. There are two organizations in Finland that offer the possibility of a protection agreement for family forest owners: Centres for Economic Development, Transport and the Environment (later referred to as ELYs); and Forestry Centres (later referred to as FCs). In practice, agreements of permanent conservation areas are made with the ELYs and agreements for fixed term periods, typically for 10 years, with FCs. The size of the protected area is typically larger in a permanent agreement. An agreement specifies certain monetary compensation for the forest owner. Compensation is based on the cutting value of the timber in the protected area. Compensation has been tempting due to high timber prices during the previous years.

In practice, the cores of fixed 10 years agreements are typical ecologically valuable habitats that are protected by forest law (Meriluoto & Soininen, 1998). In other words, these voluntary protection areas are typically extensions to statutory protection sites. These valuable habitats are, for instance, minor water bodies, cliffs or various types of peatlands. The law prevents treatments that would lead to a decline in the characteristics of these habitats e.g. cutting is restricted and small buffer zones are applied.

The process of compiling a voluntary protection agreement is new and the functionality of the process from forest owners' perspective has not been studied earlier. The aim of this study is to analyze the actualized METSO protection agreements paying attention to forest owners' decision support networks. We wanted to find out if forest owners experience problems or lack information during or after the protection process. In addition we investigated forest owners' satisfaction levels and which factors contributed to this satisfaction. It is important to study these actualized cases to be able to secure good guidance to forest owners and reduce possible conflicts. It is supposed that good practices will increase forest owners' willingness to make agreements and recommend them to others.

## **2 MATERIAL AND METHODS**

Data for the study were gathered from owners of holdings located in the region of North Karelia in eastern Finland. We interviewed by phone 44 forest owners who have entered into an agreement in 2009. 19 of them had made a permanent agreement and 25 had made an agreement of fixed 10 years. The main analysis technique was qualitative: the transcribed phone discussions were carefully read through and forest owners' answers for every important question were extracted from the text. The most typical opinions were formed from the answers and

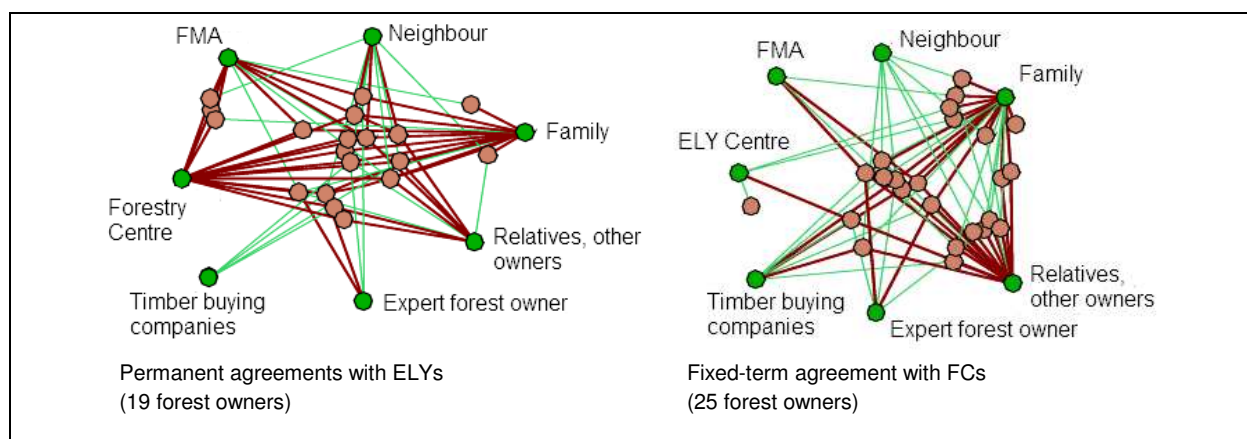
exceptions were taken into account. In addition, quantitative data and techniques were used to find the most typical network characteristics related to the decision process.

### 3 RESULTS

#### 3.1 Decision support networks

In most cases, the first move to protect came from the forest owner; 64% of fixed-term agreements and 68% of permanent agreements were based on the owner's own initiation. In fixed-term agreements, the role of the professional forest planner from FC as an initiator was more common; these planners suggested more than one third of the agreements. It was typical that planners found the valuable areas while making a field inventory for holding's forest plan. A few initiatives also came from the local Forest Management Associations (FMAs).

There was extensive contact with FCs or ELYs officials during the preparation of both the fixed-term and permanent agreements, on average there were six contact occasions during the process. Besides the necessary contact with respective officials, in fixed-term agreements forest owners had on average 2.6 persons or organizations with whom they were in contact and in permanent agreements 3.7 persons or organizations. In fixed-term agreements, the networks were concentrated mainly around family members and relatives or other owners in joint ownerships (Figure 1). In permanent agreements, additional connections with FCs (79%) and FMAs (58%) were more typical (Figure 1). In Finland, it is typical that spouses own holdings together and therefore the actual decision about protection is often made inside the family. Forest owner's children, as the future forest owners, and forest owner's parents, as former owners, were often asked for their opinion or even for their approval for the protection.



**Figure 1:** Forest owners' (brown dots) connections with different actors (green dots). Forest owners' connections with the other side of an agreement (ELY or FC) are not represented. Thick, brown lines represent relationships that are conversational and informative, in other words, these relationships did matter to the birth of agreement. Thin, green lines represent relationships that did not matter to the agreement, e.g. information afterwards. FMA refers to Forest Management Association.

Most owners, especially in the fixed-term agreements, said that they have not actively been telling other people about their protection agreement. In some cases, neighbours and timber buying companies were informed afterwards (Figure 1). Owners thought and assumed that other people also think that protection is their own business. It was not typical to co-operate with other forest owners in protection agreements. A few even said that they want to keep the protection agreement a secret. Many of the owners who lived far from their holding did not even know their neighbouring forest owners. However, there were also some owners who had actively been talking about the protection agreement to their acquaintances or other forest owners. Some even said that they are worried that the message of voluntary protection will not reach owners who are more passive. Their opinion was that the best way to spread the idea of voluntary protection is through forestry professionals.

Most of the comments forest owners had received about their protection were positive, supportive or neutral. Only a few owners have faced clearly negative comments, mainly from elderly people. Some owners thought

that negative comments were not expressly stated but could be read in a neighbour's face. A few owners reported that the employees of timber buying companies have made conservationist jokes about them.

### 3.2 Forest owners' motives to protect

One of the most typical reasons to protect, especially permanently, was the existence of valuable forest near to the owner's home or summer cottage. These values were related to scenery or they were places for recreation (observing nature, picking berries and mushrooms). These areas were typically already protected by the owner's own decision. It is usual that the forest holding has been in a family for several generations and for instance, the protected areas were childhood playing grounds, former pastures or otherwise personally or culturally important. Owners also feel that they want to save their most valuable places for the next generation. Besides the value for the forest owner him-/herself, the areas were also perceived to be important for others such as villagers and recreationists. One owner said that he would not have even dared to cut the forest because the cutting would have had a huge effect on the scenery.

Another typical reason to make an agreement was the compensation. Especially in fixed-term agreements, where the protected areas are extensions around habitats protected by the law, protection is often the only way to get monetary compensation. Several owners, especially among the permanent-agreement-makers, mentioned that the protected area was difficult to utilize for timber production or the standing trees were already too decayed to be commercially utilized. Despite the significance of the compensation, all the owners recognized that their protected area was somehow different from the surrounding forest, slopes, streams, old trees and forests that were in a natural condition were especially valued and brought up in conversation.

There were a few examples of forest owners having even bought the holding to be able to protect it permanently. One owner said that they wanted to have their own buffer around the house where they were living. Some were clearly against the presently practiced clear cutting as a forest management regime. However, more typical were owners who had large forest properties in commercial use and were ready to protect a piece of their land; the idea that not everything needs to be utilized. Special reasons for protection in some areas were the existence of a rare animal or plant species, such as the white-backed woodpecker (*Dendrocopos leucotos*).

### 3.3 Received and needed guidance and support

In most protection processes, the delivery of information between the forest owner and different organizations was smooth. Forest owners felt that they have had enough assistance to be able to make a decision about the protection. Besides forestry professionals, they got information from newspapers and leaflets. Several owners, especially in fixed-term agreements, were experienced forest owners or some kind of forestry professional. For them making a fixed-term agreement with FC was easy and no additional persons were needed. Contrary to this, some of the owners, especially in permanent agreements, had their own trusted forestry professional e.g. from FC or from FMA. These "mediators" supported the decision and some even took care of the whole process.

Several owners had difficulties in recognizing and remembering the names of different organizations during the interview. ELY was typically mentioned as the "nature protection people". Some of the forest owners would have been willing to protect their area several years earlier, but they had faced difficulties in trying to find the right organization or the right professional in an organization. Some of the owners also had the same problem at the beginning of the actualized process. As feedback, forest owners highlighted that every forestry professional should be able to help if an owner expresses willingness to protect their land. At least, they should guide the owner to the right person.

For some owners the progression of the protection agreement was not obvious and they needed general information about the process, but they found it difficult to raise any specified questions because everything was new for them. One specific information need was the estimate of compensation before even suggesting the protection to officials. Remaining questions after the process regarded the future of the protected area and the forest around it. For some owners it was unclear whether someone would take care of marking the protected area, or whether clearing of the bushes is allowed to keep the scenery open or whether it would be acceptable to have a forest track/road to the other parcel through the protected area.

### 3.4 Forest owners' satisfaction and perceived difficulties

Most of the owners were satisfied with their agreement and the process. Remarkably many of the owners mentioned that the process was quick and some were surprised that even the bureaucracy was so fast. Owners felt that the process, especially in fixed-term agreements, was easy and simple "like going to a milk shop". Forest owners were highly satisfied with the actions of officials and their opinion of ELYs and FCs were more positive after the process. Owners were satisfied and grateful if the officials themselves took other users of the protected area or the commercial use of the surrounding forest into account. However, several owners said that they were offered only one agreement type (fixed-term or permanent), depending on which organization the owner was dealing with.

There were negotiations about the amount of compensation especially in permanent cases. Some forest owners were able to raise the amount of compensation in negotiations and most of them were satisfied. Some were even positively surprised at the level of compensation and would have settled for less. For some owners protection had been a long-term dream and some were satisfied that there was a way to get money from the area where cutting is impossible. However, some owners thought that compensation does not cover all their losses, for instance, value of the growth or flood damage to other forest parcels around the protected area.

Even though the METSO programme is voluntary, in fixed-term agreements some owners felt that they had no other choice than to protect the area to get revenue because a part of the area was protected by law and thus worsening the opportunities for commercial income in the surrounding areas. In these agreements, the compensation was predefined. Several owners said that they could have taken more, but in the end, they were satisfied because compensation was tax-free, the agreement was done at the right time (the timber price that affects compensation was high) or it would have been difficult to generate income from cuttings anyway.

Property rights seem to be highly important for forest owners. During the years 1998-2004 the officials of FCs had mapped the valuable habitats defined by law. Forest owners had not participated in the process but were only told in advance and afterwards if valuable habitats were found in their forests. This still irritates some of the interviewed owners. However, compared to the earlier process, this voluntary process was more appropriate for most owners. There were still some owners who were annoyed if an official visited and valued their forests without calling them beforehand. In these cases, officials did have permission from the forest owners, but the exact time had not been agreed upon. A few owners were also slightly afraid that even though they still are the owners of the forest, the state might make a decision regarding their area after the agreement has been signed. Conversely, distance forest owners appreciated the possibility of making the agreement without even seeing an official or visiting the forest.

The future of the permanent agreements caused speculation among the owners. Owners were not sure whether the monetary compensation is good enough for losing all the cutting incomes in the future. The characteristics of the protected area will change and the values that the forest owner has appreciated, such as beautiful scenery or a beaver, might disappear. In fixed-term agreements, owners were satisfied with the possibility of a temporary contract; they now have time to get use to the idea of protection and the next generation of owners is able to make their own decision. In fixed-term agreements, owners were not sure what will happen in 10 years, however, most of them were willing to continue the protection and even make it permanent. None of the interviewed owners said that they have already decided to quit the protection scheme after 10 years.

## 4 DISCUSSION AND CONCLUSIONS

The interviewed forest owners appeared highly satisfied with the protection process and no major problems were observed. However, there are certain limitations in this study. The data were collected only from those owners who have made a protection agreement (i.e. successfully completed the protection process) and perhaps the most significant "bottlenecks" of voluntary protection are not found. It would be interesting to also have data from unsuccessful protection attempts. In addition, all the interviewed forest owners are from one part of Finland, where the idea of voluntary protection has gained more popularity than in some other regions. However, as the instruments and the processes are rather similar, we assume that the results of the study can partly be applied in other parts of Finland. Furthermore, some observed motivations for protection (e.g. money, scenery) are apparently, at least to some extent, universal among private landowners worldwide.

It seems that fixed-term agreements are not a "big issue" for forest owners and some of them did not even feel that they had really protected their forest - they simply made an agreement to get compensation. As also shown



in earlier results (Horne, 2006; Koskela, 2010), fixed term agreements are an essential way to ease forest owners' entrance into nature protection. It is obvious that permanent agreements are much bigger issues for forest owners; social networks are larger and typically, besides officials, there is a trusted expert from a forest related organization or a nearby person, who is asked for information and their opinion.

Based on the interviews, there are some issues that forestry professionals could improve or take into account during the protection process. Owners need more information about how compensation is determined and what the principles for compensation are (see also Koskela, 2010). The results of our study suggest that some kind of estimate of compensation is needed before the process is started so that the forest owner is able to decide whether to even contact an official. In addition, some of the interviewed owners were confused about the names of the organizations and the overall progress of the process. Our suggestion is that the process could be more visibly represented beforehand and documented during the process. Property rights and authority to their own forest seems to be a highly sensitive issue for forest owners, possibly due to previous, compulsory nature protection programmes, (see also Koskela, 2010; Horne et al., 2009). The stability of land tenure could be highlighted while informing forest owners about the programme. Some practical written guidelines of what can or cannot be done in a protected forest area is also a recommended deliverable according to owners' feedback.

Even though forest owners are not always satisfied with the compensation, compensation seems to be one of the important driving forces in making an agreement, as earlier studies also prove (Koskela, 2010; Boon et al., 2010). However, the lack of public money and allocating it to the right targets has already been an issue in the METSO programme (Koskela et al., 2010). As the results of this study show, for several owners the protected area was already valuable and it would have been saved even without a protection agreement. It is important to find owners who would settle for a smaller amount of monetary compensation. Many of the owners were interested in the development of nature in their protected areas. Instead of monetary compensation could e.g. botanical excursions with an expert or a management plan for the protected area be satisfactory compensation for some owners? Likewise, it is important to find those biologically valuable areas that are under the threat of commercial treatments and allocate monetary compensation to these areas.

Some forest owners were worried that the message of voluntary protection will not reach all owners. This task was passed to forestry professionals as also found in earlier results (Koskela, 2010). Only a few owners have actively spread the "gospel" of voluntary protection to other forest owners e.g. to their neighbours. For biodiversity, it would be important to get large adjacent areas under protection. This would require organized cross-boundary co-operation between neighbouring forest owners (e.g. Rickenbach et al., 2004). Compared to forestry professionals, forest owners' peer-to-peer networks could be a more efficient way to spread, maybe not exact technical information, but at least attitude and values and the spirit of practical personal experience (Rogers, 1983; Butler et al., 2007). This would require that forest owners stop keeping their protection agreements a secret and not be afraid of becoming marked as a conservationist but converting their mindset so that protection is something to be proud of.

Voluntary protection in private forests is a balance between property rights, sufficiency of compensation and benefits for nature biodiversity. From the forest owners' viewpoint some concrete issues, like the determination of compensation or reaching the right official could be improved. More research is needed, for instance, about forest owners' motives to be able to allocate compensation correctly. In addition, co-operation and peer-to-peer networks among forest owners should be developed in order to create larger cross-boundary protection areas and to increase favorable attitudes towards protection.

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# THE STRUCTURE AND POTENTIAL OF SMALL SCALE FORESTS IN THE NORTH-WEST OF CROATIA

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## SUMMARY

In the Republic of Croatia almost one quarter (23%) of all forests and forest lands belong to private forest owners (593,027 ha). This research was prompted by the lack of empirical data concerning growing stock, areas, annual increment, annual felling and forest roads of private forests in the northwest of Croatia. Sustainable development of rural environments is one of the primary European Union goals. The area has good possibilities for rural development based on the forest industry on one hand and wood utilization with support of private forest owners' associations on the other. Forest management possibilities and other parameters of these forests indicate the insufficient use of these forests and of their immense potential. The main reason for neglecting this economic potential lies in the historical development and disregard of this issue by professional foresters in the past. According to recent estimates, there are 600,000 forest owners who manage their forest properties of 0.51 ha and leave the unused potential to forestry economic management. The research has shown that the average stand volume of 199 m<sup>3</sup>/ha is higher than the previous estimates of 45 m<sup>3</sup>/ha, and so the annual increment is 6.19 m<sup>3</sup>/ha (compared to the previous 4.7 m<sup>3</sup>/ha). The paper deals with the issues of development and results of the Forest Extension Service in this region, the establishment of private forest owners' associations, small scale forest characteristics compared with the EU member states, regional project research results, as well as the supporting and impeding factors.

**Key words:** small scale forests, management, potential, private owners, northwest Croatia

## 1 INTRODUCTION

The countries of south-eastern Europe have moved from a centrally planned economy to a market economy. In the past decade, the majority of private forests were state owned. Now, the situation has changed and private forests play an important role in the forest policy. The percentage of private forests in the region is as follows: Serbia 51%, Croatia 23%, Macedonia 10%, Bosnia 20%, and Albania 1%. Private forest management is an increasingly serious problem. In most countries, forests are either managed by state companies or are not managed at all. Private forest owners' associations are rarely established, and there is no operational Forest Extension Service. Most countries in the region share one common feature: their forests are a significant resource for the development of a market economy and private ownership. Although the share of private forests varies between 1% (Albania) and 51% (Serbia) and is going to increase when the restitution and privatization process is concluded, private forest owners are virtually unrepresented in the national forest policy due to a lack of organization (Glueck et al., 2010).

Primarily because of their specific nature, the issue of private forests should be viewed from several aspects, including management forms, legal framework, sociological aspects and organisational structure (Posavec, Vuletić, 2004). Private forest owners and a rising number of forest associations have for the past several years evolved into one of the most dynamic forestry fields. Legislative reforms and the activity of a specialized public enterprise, Forestry Extension Service, have brought about considerable changes and a revival of the private forestry sector. Regrettably, following the decision by the Croatian Government (Forest Law amendments, Official Gazette 124/2010), this service was abolished and was merged with Croatian Forests Ltd., a state company responsible for managing forests and forestland. This decision could affect further development and care of private forests in the Republic of Croatia.

The beginnings of the establishment of private forest owners' associations go back to 2004 when the first associations were founded in north-western and western Croatia. During 2008 the "Croatian Union of Private

Forest Owners' Associations'' was founded as an umbrella union comprising all the associations in the Republic of Croatia with its headquarters in Zagreb and with the goal of representing the interest of all forest owners. The Union currently represents 34 associations from the whole country. In accordance with the Associations Act (Official Gazette No. 88/2001) the association is defined as any form of a free and voluntary union of a number of natural or legal persons, for the purpose of protection of their interests and benefits, without the intention of generating profit. An association is a non-profit organization which spends its income strictly for the purpose of advancing the activities of the association.

Privately owned forests are not equally distributed; hence, 13% of private forests are in the lowland area, 82% are in the hilly-mountainous area of Croatia, and 5% are in the high- mountainous and pre-alpine area (Anon, 2006). Private forests are divided approximately into 1.5 million cadastral plots, which are owned by more than 600,000 forest owners. Accordingly, one forest owner has in his possession 2 cadastral plots sized 0.76 ha on average. The results of the First National Forest Inventory in the Republic of Croatia (Čavlović, 2010) have shown that the total area of forests and forestland is 2,580,826 ha while forested areas account for 2,377,686 ha, of which 77% are state owned and 23% are privately owned. According to the same source, the total growing stock is 552,146,000 m<sup>3</sup>, of which 84% is state owned and 16% is privately owned. This indicates the size and quality of the majority of private forests. The average growing stock in state forests is 255.84 m<sup>3</sup>/ha and in private forests it is 155.84 m<sup>3</sup>/ha. The annual cut in state forests is 7,325,000 m<sup>3</sup> whereas in private forests it is 1,087,000 m<sup>3</sup>. As much as 84% of forests are dominated by deciduous tree species, while 16% of forestland is covered with conifers (Posavec, S., Čavlović, J., Šporčić 2005).

In Europe, Sweden has the highest growing stock (2.5 billion m<sup>3</sup>), followed by Germany (2.2 billion m<sup>3</sup>) and France and Finland (both about 1.7 billion m<sup>3</sup>). The mean volume in 1995 was approximately 140 m<sup>3</sup>/ha for all of European countries, and the net annual increment 711 million m<sup>3</sup> (Hytinen, P. 2001).

With 23% of privately owned forests, Croatia ranks among European countries with a very high share of state-owned forests and forestland. In comparison with Austria, Germany or Switzerland, for example, this definitely has specific significance which should be taken into account, particularly when forming forestry policy. Care for small-scale forests is an important and constituent part of modern forest-management policy, which is already in force in the majority of the European Union countries, and is implemented through various advisory institutions (Extension Services) and support.

## 2 RESEARCH METHODS

There has been very little sociological research into forest owners in Croatia to date. Therefore, research conducted in the area of the Zagreb County and the City of Zagreb (Čavlović, 2003) and (Posavec, Vuletić et al., 2010) will have a significant effect on the survey. The basic sociological characteristics of forest owners were studied using a sample of 216 respondents, which provides an essential framework for the description of a typical forest owner in north-western Croatia. In the opinion of the authors, this description should not be extended to other forest owners. According to the research, a typical forest owner usually comes from the ranks of the older rural population (over 60 years of age), as a rule works on their own agricultural property or is retired. The average forest owner has a lower level of education, a modest personal income, and is not interested in selling his forest. In general, he expresses little interest in his forest and is therefore not keen on enlarging his forest property. He does not use the potentials of his forest, does not want to invest work or money in his forest, and is sceptical with regard to forest owners' associations. In addition, many of them do not manage their forests at all, although most live relatively close to their property (at a distance of up to 5 km). Younger forest owners have so far not shown much interest in working or investing in their forest property, so officially not a single forest owner in the Republic of Croatia makes a living exclusively from his forest. This is also a reflection of the size of the property, which does not guarantee a steady and sufficient income.

This research focuses on private forests from the area of north-western Croatia. Forest management possibilities of private forests were investigated in three north-western counties: the Koprivnica-Križevci County, the Virovitica-Podravina County and the Bjelovar-Bilogora County. The study area is characterized by a large number of small plots, which constitute bigger or smaller forest complexes surrounded by arable land and meadows. Research items consist of small forest properties which make up forest complexes totalling 2.95 ha in size, and which consist of a larger number of cadastral plots. The terrain is intersected by water courses. The inclinations are mostly mild and the terrain is hilly, while in the southern part of the study area it is flat. The

lowest point of the study area is 80 m above sea level, and the highest point is 646 m above sea level. The forest stands are in the area of the Euro-Siberian – North-American region. The largest part of the study area is covered by forests of pedunculate oak and common hornbeam (ass. *Carpino betuli* – *Quercetum roboris*) and forests of sessile oak and common hornbeam (ass. *Festuco drymeiae* – *Carpinetum betuli*). In the sessile oak- common hornbeam belt there are a large number of stands dominated by common beech. These stands grow on loess and loess-like parent material, which allows for deep rooting.

Data were collected on the basis of the constructed and approved management programmes for privately owned forests totalling 10,868 ha. The following parameters were collected and processed: growing stock, increment, annual cut, surface area, number of forest owners, average plot and property size, health status, phytocenological features, accessibility of forests and biological regeneration. The obtained data were processed with Microsoft Excel and Statistica for Windows platforms. Descriptive statistics (arithmetic means, minimum, maximum) were made for all the analyzed variables (height increment, diameter increment). An HP iPAQ 214 Enterprise Handheld GPS measuring instrument was used to stake and identify the terrain.

Research objectives were set up with the goal of determining the following:

- 1) Possible management options for private forests in the northwest of Croatia (areas, growing stock, increment, annual cut)
- 2) Average plot sizes, number of forest owners and possibilities of enlarging small forest properties.

The obtained results will shed more light on the problem of private forest management and will indicate the basic characteristics of private forest owner development in Croatia on a smaller sample.

### 3 RESULTS

The investigated stands are characterized by heterogeneity in terms of age, quality, cover, technical values and other parameters, and range from a small number of well preserved stands of common beech, sessile oak and pedunculate oak with hornbeam to completely devastated forests accompanied by a broad variety of transitional forms.

Only 34,528 ha (6%) of the planned 591,633 ha of privately owned forests in Croatia are covered by management plans. The total value of operations is estimated at 16,215,038.77 €, or 27.40 €/ha. Forest management possibilities for private forests in north-western Croatia show that these forests have good silviculture and economic potentials. The average growing stock at 199 m<sup>3</sup>/ha is 45m<sup>3</sup>/ha greater than that in the area management plan, which amounts to 150 m<sup>3</sup>/ha on average for even-aged and selection forests. The annual current increment in these forests amounts to 67,273 m<sup>3</sup>, or 6.19 m<sup>3</sup>/ha on average, while the increment percentage amounts to 3.19%. The overall annual cut to be realized in the next 10 years is 321,629 m<sup>3</sup>, which represents an exceptional economic potential for this area.

With only 5.77 km/1,000 ha, the accessibility of forests in the study area is poor with regard to the redeployment of small forest properties. It is lower than the optimal accessibility for predominant EGTs (Ecological Management Types) (14.1-15.6 km/1000 ha), and thus represents an impeding factor for the accomplishment of the annual cut.

The average forest property consists of two cadastral plots averaging 0.25 ha in size, which indicates distinct fragmentation of a forest property (0.51 ha). This poses serious problems to the future management of these forests. The fact that there are no records of owners possessing forests over 100 ha is also a cause for concern. Future legal proposals will have to curb fragmentation of existing properties and stimulate their enlargement.

The following table shows the structure of privately-owned forests in the research polygon in relation to the forest property size. The majority of forest owners (75%) possess the smallest forests (less than one hectare).

**Table 1:** Survey of privately owned forests with regard to forest size

Forest property size	Structure of private owned forests with regard to forest size			
	Area	Number of forest owners	Forest property share	Forest owners share
	ha	persons	%	%
<1 ha	9842.07	38292	74.70	94.4
1 -5 ha	822.53	10539	23.13	5.5
5 – 10 ha	63.48	28	0.88	0.06
10 – 30 ha	50.02	6	0.46	0.01
30 – 100	89.90	3	0,83	0
>100 ha	0	0	0	0
$\Sigma$	10 868	48 868	100.00	100.00

Clearly, forest estates should be enlarged if the remaining forest complexes are to be preserved. This will additionally stimulate forest owners to apply sustainable management. If fragmentation of the existing property is not prevented, which some EU countries have already done, this potential might go unused due to the impossibility of managing and harvesting the timber volume. In turn, this might result in an even greater lack of interest by forest owners in their forests. The results of the 1<sup>st</sup> international public bid for wood assortments show that there is a market, but the economic crisis has slowed down this segment of forest management development.

Forest owners generally belong to an older population, live predominantly in rural, and only occasionally in urban environments; their properties of 0.51 ha on average are fragmented; felling usually follows the owner's needs or wishes, and not the rules of the profession; increments are relatively good, indicating that the forest soil is preserved and of good quality and that it has good potential (Šašek, 2009). According to the research conducted in Austria by Hogl, Pregernig and Weiss, about 90% of all proprietors hold less than 200 ha of forestland and almost 40% less than 3 ha (Hogl et al. 2005).

Both positive and negative factors that influence the establishment of private forest owners' associations were analyzed in order to conform to a research project by the European Forestry Institute EFI PRIFORT (Research into the organization of private forest owners' associations in the Western Balkan region)

**Table 2:** Impeding and supporting factors for the formation of private forest owners' interest associations (Glück, 2008)

Impeding factors	Supporting factors
<ul style="list-style-type: none"> <li>- large number of members</li> <li>- small-scale forest properties</li> <li>- fragmented forest properties</li> <li>- low-value forest properties</li> <li>- historic development</li> <li>- cadastral problems</li> <li>- powerful public forest administration and state forest enterprise</li> <li>- lack of political will</li> <li>- restrictive legal regulations for private forest owners</li> </ul>	<ul style="list-style-type: none"> <li>- obligatory membership</li> <li>- selective incentives</li> <li>- moral persuasion</li> <li>- education</li> <li>- training</li> <li>- specific forest program</li> <li>- reformulation of forest law</li> <li>- solution of cadastral problems</li> </ul>

Research undertaken in the polygon of north-western Croatia has shown that private forest owners are prepared to associate for the purpose of managing their forests, as well as participate in education and training despite small and fragmented forest areas.

The situation is somewhat better in the EU, and particularly in Scandinavian countries, which have succeeded in the application of sustainable management in private forests. The size of forest properties in the EU ranges from 2 to 25 ha for smaller forest properties and from 25 to 100 ha for medium sized forest properties, whereas large forest owners with over 100 ha represent only 10% of the total area. In some European countries private forest owners are well organized and receive state subsidies. There are services in Europe similar to the Croatian Forest Extension Service, which advise forest owners on sustainable management in private forests. It should be

emphasized that some countries (e.g. Scandinavian countries) do not allow fragmentation of property, the purpose being to preserve coherent forest complexes. Management is easier because all forest co-owners are associated in a so-called family forestry form. The good prospects of this model are responsible for it becoming increasingly widespread in other countries. CEPF (Confederation of Private Forest Owners) also advocates so-called family forestry, which also involves younger generations. By learning about non-market forest functions from an early age, they raise their awareness about the importance of forests.

## 4 DISCUSSION

If conclusions about Croatian forestry were made only on the basis of the condition of private forests, then the image of Croatian forestry would be slightly different, particularly in relation to state forests. Until recently, it was thought that the average growing stock per hectare was a modest 80 m<sup>3</sup>/ha. This provided sufficient information about the condition of these forests in terms of their economic importance, and even more in terms of other beneficial (non-timber) forest functions, which are divided into social and ecological or protective functions (Prpić, 1992). A big problem of private forests in Croatia is that in the past several years, management programmes have been made for only small part of the private forests (6%), while the rest has remained unmanaged (Šašek, 2005). It has been a little more than five years since the first meeting of forest owners in Delnice in 2005 which was the basis for setting up the private forest sector reform, and where key problems were highlighted (fragmentation of property, social status of forest owners, disintegration of rural areas, mistrust of forest owners, incompetent operations, illegal felling, no control or sanctioning and disobedience of legal rules, etc.). One of the most important turning points for private forests took place when communication between forest owners and the profession was established, the associations were organized and concrete activities in the sense of revitalizing and regenerating small forest properties were launched. A great role in this process was played by the Extension Service, whose field activities encouraged private forest owners to actively participate in the management of their property.

The most common reasons for the establishment of forest owners' associations include the exchange of information on new forest policy measures concerning private forests, pooling resources for the purpose of joint planning and construction of forest infrastructure (for which the means are allocated in the Non-Wood Forest Functions Fund), and common interest in the prevention of illegal activities in forests (guarding forests, illegal use, maintenance of the existing forest roads, and similar). In this respect, the size of a forest property does not play any role. Forest owners unite mostly for the purpose of advancing the condition and preservation of their own forests, which the majority of them still regard as a special resource that needs to be preserved, regardless of its size. The main reason for forest owners' associations - joint representation in the market – has not yet been achieved. It is expected, however, that the enlargement of forest estates and a higher share of larger private forest properties following restitution process will stimulate interest grouping and will achieve a more successful joint appearance at the market. The private forest owners in the region build large "latent" groups in the sense of Mancur Olson's logic of collective action (Olson 1965). The high number of potential members can only be achieved if positive (individual economic advantages) or negative (compulsory membership) selective incentives are supplied to the potential members (Glueck et al., 2010).

The number of silvicultural treatments aimed at regenerating devastated private forest properties and achieving a positive turnaround has been increased. It has provided an example to others how and in what manner private forest revitalisation should be accomplished (Oršanić, 2003). Historically, soil use for agriculture has always had priority in these regions. The most valuable soils, i.e. deep soils with higher natural fertility, have been used for food production, while soils unsuitable for food production have been left to forests. This has led to the formation of a significant fund of so-called marginal soils, whose use in agriculture is unprofitable. If they no longer perform their function, they should be converted to their natural cover, which is a forest. Croatian forestry has been working on forestation of degraded forest sites for more than 150-years, especially in the Mediterranean region.

The average growing stock in the amount of 199 m<sup>3</sup>/ha, with an annual increment of 6.19 m<sup>3</sup>/ha (increment percentage of 3.19%) was recorded in the study area. The share of management classes per surface unit is as follows: black locust 24%, beech 22%, hornbeam 20%, black alder 10%, sessile oak 9%, linden 4%, and pedunculate oak 3%. Average accessibility is 5.77 km/1000 ha (min. 14.10, max. 15.6 km/1000 ha). Among

objective impeding factors for sustainable management of private forests are small size forest properties and fragmentation.

Research results show an immense but insufficiently explored potential of private forests. A discrepancy between the data of cadastre culture with the concrete condition in the field, as well as the lack of co-ordination between cadastral books and land registers, result in the impossibility of using resources from the Non-Wood Forest Functions Fund, solving property-rights relations and receiving state support for ownership issues. For forest owners, these procedures are exceptionally costly and de-stimulating in practice. We should definitely try to apply models used in the EU, in particular those relating to enlarging the property, preventing property fragmentation and stimulating family forestry. In that case, the size of the property would not play a decisive role in management as there would be no fragmentation.

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# **NATURAL RESOURCE ENTERPRISES: ENHANCING LOCAL SYNERGIES AND OPPORTUNITIES IN SUSTAINABLE SMALL-SCALE FORESTRY AND ECONOMIC DEVELOPMENT TO ENHANCE GLOBAL CONSERVATION**

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## **ABSTRACT**

Mississippi landowners were found to diversify incomes from their lands through fee-access outdoor recreation, including hunting, angling, wildlife watching, and other nature-based activities. In 1998, fee-access hunting revenues ranged from US\$2,964-\$5,254 on average/landowner or \$7.50-\$14.28/ha (1). During 2005-2008, outdoor recreation increased Mississippi rural property values by 52% or \$1,615/ha and those tracts that were leased for hunting collected over \$61/ha on average (2). Additionally, outdoor recreation in Mississippi, including hunting, angling, and wildlife viewing generated \$2.7 billion in economic impact to the state in 2008 (Jones unpublished data). The Natural Resource Enterprises Program at Mississippi State University educates private landowners, resource agencies, and local communities about recreational enterprises, conservation management practices, and integration of these activities with sustainable forestry and agriculture through outreach programming and demonstrations. Since 2005, we have conducted 45 landowner workshops in 8 US states and Sweden and recruited an estimated 3,000 participants. Participants owned on average 505 ha comprised of 50% forests, 29% agriculture, 13% uncultivated or fallow lands, and 8% wetlands and impoundments. Seventy-five percent of participants reported intentions to implement recreational operations, conservation, and sustainable land-use practices on their lands (1.0 million ha) and estimated that they would average an additional \$25,208 annually from these activities. Outreach programming promoting fee-access recreation and conservation on privately-owned lands can benefit landowners and local communities through sustainable economic development, environmental conservation, and land stewardship and retention.

## **INTRODUCTION**

Demand for quality outdoor recreation that involves hunting, fishing, wildlife watching, horse trail riding, or other farm and nature-based tourism is popular throughout the world. U.S citizens (87.5 million) spent over US\$122 billion on wildlife-related recreation in 2006 (3). Past research found that revenues collected in 1998 from fee hunting on Mississippi private lands ranged from \$2,964 to \$5,254 on average per landowner or \$7.50-\$14.28/ha, depending upon the region of the state evaluated. Net revenues averaged from \$1,539 to \$3,244 per landowner or \$1.60 to \$3.91/acre (1). Additionally, fee-access wildlife recreation increased average proceeds collected from Mississippi land sales by \$809/ha or 36% from 2002 – 2005 (4). Property characteristics that influenced sales price were hectares of bottomland hardwood forests, pine-hardwood forests, and wildlife supplemental food plots. During 2005-2008, outdoor recreation increased Mississippi rural property values by 52% or \$1,615/ha and those tracts that were leased for recreational hunting collected over \$61/ha on average (2). Expenditures for outdoor recreation (hunting, angling, wildlife watching, horse trail riding, and etc.) produced \$2.7 billion in economic impact to Mississippi in 2008 (2). Despite the economic and environmental benefits of fee-access outdoor recreation, only 10-14% of Mississippi non-industrial, private (NIP) landowners participated in these businesses on their properties in 2005 (1) primarily due to concerns in accident liability and incompatibility with traditional agricultural and forestry land uses. Similar trends in revenues and land values associated with fee-access wildlife and fisheries recreation have been documented in other southern US states (5, 6).

Marginal lands, such as agricultural field borders, wetlands and wetland forests, and riparian corridors along watersheds, are often difficult to farm or manage for timber due to flooding problems or regulatory restrictions (7). However, these properties are ideal for conserving wildlife and fisheries habitat and can be readily enrolled in fee-access recreational businesses and governmental cost-share assistance programs. Revenues from fee-

access recreation on private lands were substantially greater on forested and managed agricultural lands, particularly bottomland hardwoods and forested riparian buffers along watersheds. This finding reveals that NIP landowners can generate income from conservation and restoration of sites that were marginal for agriculture or development (1). This study also revealed that fee-access recreation and wildlife habitat conservation promoted by governmental cost-share assistance programs were compatible with agriculture and forestry.

Natural resource enterprises may include outdoor activities, wildlife-related recreation, and associated amenities such as hunting, angling, wildlife watching, agritainment or farm tours, horse trail riding, bed and breakfasts, and much more. Establishing these types of enterprises on family farms provides multiple benefits including the diversification of family incomes, land ownership retention, conservation and stewardship of the land, improved watershed integrity, reduced regulatory measures for environmental protection, and sustainable rural development (1).

## **Natural Resource Enterprises Program**

The Natural Resource Enterprises Program (NRE) ([www.naturalresources.msstate.edu](http://www.naturalresources.msstate.edu)) was established in the Department of Wildlife, Fisheries, and Aquaculture and Cooperative Extension Service at Mississippi State University to educate NIP landowners in the southeastern US about fee-access recreational business development, wildlife and fish habitat management on the farm, and compatible land-use practices. Historically in the US, educational materials for natural resource enterprise development, though available, have been difficult to locate. As a result, landowners may not be aware of training opportunities and resources available. Working with program partners, we have developed educational workshops, demonstrations, and resources to inform landowners, agency professionals, and community leaders about enterprise opportunities and associated wildlife habitat management on private lands. The NRE Program partners with US resource agencies and land grant universities, farm bureaus and agricultural trade organizations, US state agencies, non-governmental organizations, and private-sector firms. Partners actively participate in workshops as well as assist with advertisement and recruitment for these events. Through these partnerships, we offer on-the-ground educational demonstrations and workshops to assist private landowners in outdoor recreational business development and conservation practices on their lands to enhance natural resources, including wildlife and fish and their associated habitats, located on the farm.

## **Workshops**

NRE workshops provide landowners with the opportunity to learn from and interact with resource and agency professionals as well as to view wildlife habitat and enterprise management activities first-hand. We conduct workshops on properties that are in agricultural or forestry production that also offer a fee-access recreational enterprise. When a property with an existing enterprise is not available, workshops are conducted on properties that demonstrate successful wildlife habitat management, but also have the potential for enterprise development.

At each workshop, participants are given learning experiences including instructional lectures from resource professionals and field tours on properties supporting a fee-access recreational business. During the lecture sessions, speakers from universities, resource agencies, and organizations discuss a variety of topics including revenue potential of outdoor recreational enterprises, business planning and management, legal considerations and liability reduction, governmental cost-share assistance, and habitat management considerations on the farm.

After the morning lectures, a catered lunch is served on the grounds, allowing attendees the opportunity to interact with lecturers, NRE Program staff, agency biologists, and other landowners. Following lunch, workshop participants tour the property to observe enterprise operations and wildlife and fisheries management integrated with agriculture and forestry. Each workshop attendee is given a resource binder containing over 600 pages of compiled information on enterprise operations, business management and marketing, liability reduction, wildlife and fisheries management, cost-share assistance programs, and other topics pertinent to managing an enterprise.

## **Advertising**

Marketing the NRE Program and its activities is an important tool in reaching our target audience of landowners and agricultural producers. We utilize multiple outlets to advertise our events in the US. Workshops are announced with statewide press releases, radio public service announcements, and direct mail letters.

Brochures and posters for each workshop are disseminated through partner organizations and county extension offices in respective US states as part of the land-grant university network. Additionally, a website with information on scheduled workshops, directions to each event, and registration information has been established to promote these workshops ([www.wildlifeworkshop.msstate.edu](http://www.wildlifeworkshop.msstate.edu)). These methods have been successful in publicizing events and achieving maximum attendance at most venues.

Questionnaires given to workshop attendees indicate that several methods are required to reach the intended audience. Workshop participants learned about workshops through:

- Direct mail (37% of participants)
- Partner organizations (34%)
- Radio (11%)
- Newspaper (7%)
- Extension offices (6%)
- Other (5%)

## Participation

NIP landowners are interested in learning more about fee-access recreation and conservation practices on their US lands. From 2005 and 2010, the NRE Program and partners have conducted over 40 landowner workshops and demonstrations in Alabama, Arkansas, Indiana, Minnesota, Mississippi, South Carolina, and Tennessee. Attendance at these events has been exceptional with nearly 3,000 participants, including an estimated 2,200 landowners with landholdings located in the US states of Alabama, Arkansas, Florida, Indiana, Louisiana, Minnesota, Mississippi, South Carolina, Tennessee, and Texas. Other US states have indicated interest in conducting landowner outreach in enterprise development and include the states of California, Florida, Georgia, Illinois, Iowa, Kentucky, Michigan, Missouri, New Hampshire, Oklahoma, Oregon, and Texas. Additionally, the program participated in a conference and series of workshops sponsored by Lunds University (Dr. Marie Appelstrand) and Swedish Forest Agency to promote sustainable outdoor recreation within local communities in central Sweden.

To evaluate satisfaction levels of US workshop participants, the NRE program staff developed a workshop attendee questionnaire. Workshop participants were asked to complete the questionnaire at workshops conducted in US states. Participants were asked to rank workshop content, instructors, facilities, and program value. Due to survey design, not all questions pertain to or were answered by every respondent completing the questionnaire. Responses from 20 workshops were pooled and evaluated on participant ratings of educational information and resources provided. Participants were asked to rank factors pertaining to workshops conducted using a Likert scale from 1 to 4, with 1 being poor and 4 being outstanding, on workshop content, quality of materials and handouts, quality of instructors' presentations, instructors' knowledge levels, accommodations, food arrangements, and overall workshop rating.

## RESULTS

Approximately 1,100 landowners attended the workshops resulting in 748 useable questionnaires that were completed adequately for evaluation purposes. Respondent ratings of workshop quality factors ranged from 3.70 to 3.86 with the overall workshop rating for the 20 events evaluated scored at 3.79 (SE=0.017).

Landowners attending workshops were larger in terms of land area owned with an average ownership of 505 ha. Cover composition of these reported tracts were forests (50%), agriculture (29%), fallow (13%), and water or wetlands (8%). Seventy-five percent of respondents (n=510) reported that they expected to modify current land-use practices on their properties based on the knowledge gained from workshop participation.

Respondents were asked if the information learned would increase revenues collected from their properties based on initiating fee-access recreational enterprises. Most respondents (96%, n=531) reported that revenues collected on their properties would increase while the majority of landowners believed that information acquired at events (98%; n=434) would facilitate meeting wildlife and fish habitat management on their lands. Additionally, respondents were asked to report the amount that they expected revenues to increase from their property due to establishing a recreational enterprise (Table 1).

**Table 1:** Expected income of landowner respondents from natural resource enterprises developed on their properties based on information obtained at 20 educational workshops held in the US from 2005-2010.

Expected income from enterprise development	Number of responses (n=371)	Percentage (%) of total responses
\$1,000 - \$5,000	143	38
\$5,001 - \$10,000	31	8
\$10,001 - \$25,000	110	30
\$25,001 - \$50,000	21	6
\$50,001 - \$100,000	44	12
Over \$100,000	22	6

Respondents reported that they expected to make an additional \$25,208 on average per individual from establishing an outdoor recreational enterprise on their properties. On a per area basis, respondents expected to collect \$65.55/ha in gross revenues from these businesses. In total, landowners reported that they expected to earn over \$13 million from their recreational enterprises on approximately 200,000 ha in private ownership. Currently, 30% of respondents (n=139) operated outdoor recreational enterprises on their lands. Of those respondents who did not operate an enterprise, 34% of these landowners (n=91) reported that they planned to establish an outdoor recreational enterprise on their lands based upon information obtained from workshop participation.

## CONCLUSION

Past research has shown that NIP landowners earn additional revenues from their properties through fee-access outdoor recreational businesses. As a result, NRE Program staff have developed workshops to educate private landowners about fee-access recreational enterprise development and integrated conservation practices on their properties. Survey findings reveal that workshop participants believed that they had become more knowledgeable about enterprise operations and associated land management and expected to change land-use practices to incorporate these business development strategies. Additionally, landowners reported that they expected to earn additional income from these activities on their lands.

Multi-state stakeholder collaboration among US land-grant universities, federal and state resource agencies, conservation and agricultural trade organizations, and private-sector groups has been vital in the design and implementation of comprehensive outreach programming to attract and educate forest landowners and agricultural producers at workshop events in the US. High visibility advertising of outreach events through multiple mediums has generated strong participation rates from landowner clientele and should be continued as the program expands in the US and internationally.

Outreach programming promoting fee-access recreation and conservation on privately-owned US lands can benefit landowners and local communities through sustainable economic development, environmental conservation, and land stewardship and retention. It is believed that this hands-on approach of participatory teaching, marketing, and information dissemination through workshop programming is effective at delivering quality information to US NIP landowners who often times have difficulty in acquiring knowledge and skills. In this fashion, we can assist landowners in rural landscapes to diversify family incomes on their lands while enhancing land and water conservation, thereby strengthening local economies and natural resource bases of communities and US states.

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## FORGING LINKAGES: THE CASE OF FOREST CONNECT AS A SMALL-SCALE FOREST ENTERPRISE DEVELOPMENT NETWORK TOOL

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### FOREST-BASED POVERTY AND THE PROBLEM OF ISOLATION

Small and medium forest enterprises (SMFEs) typically make up a significant proportion of enterprises overall and are often the main source of forest employment in many countries. SMFEs offer particular advantages for poverty reduction<sup>1</sup>. They contribute to the accrual of local wealth, empower local entrepreneurship, strengthen social networks, promote local stewardship of natural resources through increased social and environmental accountability and can preserve indigenous cultural values and traditions.

The number of SMFE start-ups in developing countries, particularly least developed countries, is high. Ensuring the survival of these enterprises over time is challenging. However understanding the essential enabling conditions that must be in place for SMFEs to be profitable and sustainable over time can improve success. There are three primary conditions, including: i) clear commercial forest rights, i.e. clear rights of durable access to the natural resource base, ii) strong social organization and iii) competitive business skills.

In developing countries, SMFEs often face problems such as:

- Excessive government bureaucracy;
- Frequently changing policies or regulations;
- Policies or regulations that are biased towards large scale operators;
- Insecure tenure;
- Inaccessible credit;
- Poor market information;
- Inadequate technology and technical assistance;
- Huge distances and poor transport infrastructure;
- Lack of bargaining power; and<sup>2</sup>
- Insufficient business know-how<sup>3</sup>.

Business inefficiencies are often exacerbated by isolation from market information and financial and business development services and by policies biased against small-scale actors. In reaction to these problems, SMFEs frequently group together to overcome scale inefficiencies, adapt to new market opportunities and improve their political and market bargaining power<sup>3</sup>. In least developed countries, structures that connect with and support SMFEs and their associations are weak. National governments often do not fully understand the potential of SMFEs to contribute to poverty alleviation, sustainable forest management and national development and therefore are unable to formulate appropriate national forest policies responding effectively to the challenge of isolation of SMFEs.

The problem of isolation can also be seen from another angle: Poverty means more than simply receiving little or no income. In a summary of how 40,000 poor people from 50 countries themselves saw poverty, it was concluded that: “Poor people’s definitions of poverty do not only include economic well-being, but also include vulnerability, powerlessness, the shame of dependency and social isolation.”<sup>4</sup>

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<sup>1</sup> Mayers, 2006; Macqueen, 2007a

<sup>2</sup> Auren and Krassowska, 2003; Lewis et al. 2003; May et al. 2003; Saigal and Bose, 2003; Sun and Chen, 2003; Thomas et al. 2003

<sup>3</sup> Macqueen et al. 2006

<sup>4</sup> Narayan et al. 2000

Reflecting these findings above, the analysis<sup>5</sup> of the most critical common problems facing the forest-dependent poor reveals four closely linked issues :

- A lack of representation of the poor and their enterprises in policy and decision making;
- Inappropriate laws and policies;
- Weak relationships between local institutions resulting in sufficient power to influence policies and regulations; and
- An isolation of the poor from supportive infrastructure and services.

If one had to summarize these problems in a few words, it might be “being disconnected”. This problem is most acute in least developed countries where neither government resources nor private sector initiatives provide the infrastructure, information technology or networking opportunities for forest-dependent people and their enterprises to flourish.

The implications are clear. If poverty is to be lessened in forest-based communities, social isolation and powerlessness must be reduced, and a greater “connectedness” fostered. There is much at stake. Approximately 60 million indigenous people depend primarily on natural forests for their livelihoods. A further 350 million rural people rely on the forests as a safety net or for supplemental income. Up to 1 billion more grow trees on farms or manage remnant forests for subsistence and income. Some 45 million people run or are employed by forest enterprises<sup>6</sup>. Connecting forest-dependent people and enterprises with each other, service providers, markets, and policies will be a significant step towards developing socially, economically and environmentally sustainable forest usage and forest management practices.

While local business associations go some way towards addressing the ‘disconnectedness’ problem, substantial evidence exists on the lack of adequate institutional support networks to assist them<sup>7</sup>. In recent years, ‘Forest Investment Forums’ have concluded that more needs to be done to build productive partnerships or multi-stakeholder processes that link communities and smallholders with companies, service providers and state forest authorities<sup>8</sup>. Strong calls have been made by the International Institute for Environment and Development (IIED), the Food and Agriculture Organization of the United Nations (FAO), the International Union for Conservation of Nature (IUCN), the Centro Agronómico de Investigación y Enseñanza (CATIE), the Rights and Resources Initiative (RRI) and others at these forums and at recent international conferences and dialogues on local livelihoods and forestry in Costa Rica<sup>9</sup>, Vietnam<sup>10</sup>, Brazil<sup>11</sup>, Belgium<sup>12</sup>, Panama<sup>13</sup> and Nepal<sup>14</sup> for SMFEs and their associations to be better connected to markets, service providers and policy processes such as national forest programmes. These calls are based on an increasingly widely shared analysis which stipulates that there is insufficient local knowledge and capacity in many national forest sectors of multi-sectoral innovation in strategies and processes to connect small enterprise associations better to markets, service providers and policy formulation.

## The Forest Connect Alliance

FAO has been involved in SMFE development through its Community-Based Forest Enterprise Development (CBED) programme since 2000. In 2006 the FAO CBED programme organized an international conference in

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<sup>5</sup> Macqueen et al. 2001

<sup>6</sup> Scherr et al. 2004

<sup>7</sup> Bose et al. 2006; Bukula and Memani, 2006; Campos et al. 2005; Figueiredo et al. 2006; Kazoora et al. 2006; Ousman et al. 2006; Weyerhaeuser et al. 2006

<sup>8</sup> e.g. World Bank 2003a and 2006

<sup>9</sup> Donovan, et al., 2007

<sup>10</sup> Oberndorf et al., 2007

<sup>11</sup> Mayers and Macqueen, 2007

<sup>12</sup> Degawan et al., 2009a

<sup>13</sup> Castro Diaz et al., 2009

<sup>14</sup> Degawan et al. 2009b



Costa Rica to discuss with its programme partners and a wide range of stakeholders some of the most urgent gaps not yet addressed by international and national efforts supporting the development of SMFEs. As a direct result of this conference, FAO and IIED partnered to develop an initiative tackling the problem of isolation and lack of connectivity amongst SMFEs, and to help secure local rights, profitability and responsible practice for these enterprises. This initiative was called the Forest Connect International Alliance. From the start, the central aim of the Forest Connect Alliance has been to connect SMFEs to national forest programmes (empowering SMFEs to be heard by policy makers), emerging markets (by enhancing market linkages between supply and demand) service providers (by strengthening their capacity to provide training and finance) and to other SMFEs (by supporting existing SMFE associations).

Today, the Forest Connect Alliance continues to be co-managed by the Natural Resources Group within IIED and the FAO CBED programme. Forest Connect currently involves partner institutions in thirteen countries, including Burkina Faso, China, Ethiopia, Ghana, Guatemala, Guyana, Lao PDR, Liberia, Malawi, Mali, Mozambique and Nepal. The initiative also has an international presence, linking interested institutions, individuals and groups from around the globe through the use of an innovative online social networking tool.

## National

At the national level, Forest Connect hub organizations are selected to take the lead in facilitating support of SMFEs in the country. These hubs are currently in a 'pilot phase'. They can either be registered as CBO's, national NGO's with a mandate of (forest) enterprise development or natural resource management, producer organizations, private service providers or research institutes. National hubs are responsible for conducting:

- Diagnostic studies and existing in-country conditions of and for forest-based SMFEs and their associations;
- A survey on service providers relevant to SMFEs in each country, identifying gaps in service provision and, based on the existing institutional capabilities in the country, supporting the preparation of a strategy for addressing those gaps;
- Collection of information on the main forest decision-making processes in each country and development of a strategy for eliciting the key policy concerns of SMFE members and enabling participatory representation by Forest Connect members in forest decision-making;
- Preparation of national Forest Connect websites in each country with relevant information for small forest enterprises for use as information platforms, and development of communication strategies based on the information needs of the SMFEs; and
- Sharing of Forest Connect experiences between countries.

Each country hub is also requested to create a steering committee in order to represent all relevant stakeholders and to participate in SMFE related events in the country. Further, each Forest Connect hub looks into different activities, depending on the context and available financing. These activities are mostly focused on facilitating service provision in businesses planning, network development, financial literacy, quality improvement, design, etc.

## International

At the international level, a social-networking website, <http://forestconnect.ning.com>, has been developed for peer-to-peer exchange of ideas and information targeted towards stakeholders in the member countries, as well as to international donors, NGOs, development agencies and other interested parties.

Additionally, the national hubs are selected by an international Steering Committee of representatives from five of the Forest Connect countries, as well as from the coordinating organizations (FAO and IIED). The Steering Committee also provides oversight and strategic direction to the initiative.

The alliance currently consists of active teams supporting small forest enterprises in 12 countries with more than 700 associate members from 60 countries.

## Forest Connect Toolkit

With PROFOR funding, the Forest Connect alliance is starting to share experiences on the facilitation of support for SMFEs. The first step was the organization of a workshop in 2008 to explore with practitioners from

Forest Connect member countries where guidance was felt to be most needed. From the modular framework that emerged lead authors were contracted to draft guidance based on their experiences. The guidance material is presented in the form of a toolkit. The intention is to develop this toolkit through action-learning (or learning by doing) – capturing lessons from literature, as well as from the real experiences of partner institutions in the countries in which Forest Connect is active. The toolkit gives facilitators guidance about different areas of enterprise development. The main audience for the toolkit is support organizations for SMFE's, such as the national Forest Connect hubs, and thus not the forest enterprises themselves. The immediate intention is to empower these national hubs by giving them sufficient confidence to engender practical and useful interventions in their own context – boosting their confidence to apply tried and tested approaches and successes from elsewhere.

As much as funding allows, face-to-face exchanges between national Forest Connect hubs are stimulated. A second international Forest Connect workshop was held in March 2011 in Ethiopia. This workshop provided an opportunity to exchange national experiences, take stock of achievements, identify gaps, connect with peers and forge partnerships between Forest connect stakeholders. On a demand basis, exchange in the form of in-country visits between individual national hubs has also occurred.

## FAO and Forest Connect

Support from FAO for the Forest Connect Alliance has been manifold. FAO, through the continuing commitment by its member countries, provides funds for the development and implementation of Forest Connect. The CBED programme is also responsible for identifying and securing new funding sources and donors for Forest Connect activities. FAO provides operational and technical inputs to Forest Connect countries. CBED staff is also attempting to maximize synergies between Forest Connect and other CBED activities and projects, by highlighting linkages and facilitating the connection and exchange of information and ideas.

## Impacts of Forest Connect so far – 2 country cases

The recent workshop in Ethiopia made clear that national partners see Forest Connect as a “way of doing things”: facilitating the connection of the unconnected – virtually (through the international and the national websites) and effectively (with a variety of initiatives and actions on the ground). Importantly, the Forest Connect initiative is a process that is run by the countries themselves. The format and status of Forest Connect in the various participating countries is subsequently diverse. It is, in fact, a reflection of the motivation, capacity and interest of the individual national hubs. The following brief overview of the implementation of Forest Connect in Burkina Faso and Nepal illustrates this point.

### Burkina Faso

The Forest Connect national hub in Burkina Faso is based in the national NGO TREE AID. TREE AID is a forestry focused development organization providing funding and on the ground training and support to local communities in the Sahel of Africa. Its goal is to reduce the vulnerability of communities to drought and famine in rural Africa's dry lands by focusing on forest management and income, food and medicines from trees. The efforts of TREE AID in the implementation of Forest Connect aim in particular at:

- Increasing the understanding of the non-wood forest product (NWFP) enterprise sector through research and dissemination of information. In 2009, the NGO conducted a comprehensive national diagnostic study on SMFEs, mapping out forest enterprises support services and information needs for SMFEs;
- Sharing information and analysis with government departments, and encouraging engagement between technical services, NGO and private sectors; and
- Improving market understanding amongst SMFEs and helping them to collect market information in a dynamic manner.

One of the focus-areas of the Forest Connect national hub in Burkina Faso has been the encouragement of participation of members of government institutions in the initiative through the Forest Connect Steering Committee. The participation of key government staff is seen as a means of generating high-level support and interest as well as guidance on the implementation of the Forest Connect initiative. In line with this goal, TREE AID has maintained a strong connection with a FAO technical cooperation project to formulate a national

strategy for the promotion of NTFPs in Burkina Faso as well as with the currently FAO supported follow-up project to improve the sustainable management and use of NWFPs.

Thus, one of the indirect impacts of Forest Connect on the capacity of SMFE development in Burkina Faso is the mainstreaming of NWFP and SMFEs into national forest and economic policies, with official recognition of their contribution to livelihood and environmental conservation. TREE AID's efforts in Burkina Faso are also considered to have contributed to the decision of the Government of Burkina Faso to set up an 'Agence de Promotion des Produits Forestiers Non Ligneux' (APFNL), a government agency with the sole aim of developing policies and implementing strategy for the NWFP sector. This is the first of its kind in the West African region. The current FAO technical cooperation project mentioned above, in which TREE AID is also participating is in fact a project with the Government of Burkina Faso supporting the establishment of and providing technical input to activities of the APFNL.

Furthermore, through Forest Connect, value chain actors are beginning to establish local level contact points (e.g. at village level) often piggy-backing on existing government or private sector infrastructure, allowing them to achieve greater access to markets and service providers and realize economies of scale.

As the organization hosting the national Forest Connect hub, TREE AID is currently undertaking NWFP based enterprise development projects using the Market Analysis and Development (MA&D)<sup>15</sup> approach, in Burkina Faso, Ghana and Mali. TREE AID has been able to draw lessons from these projects across West-Africa to contribute to the Forest Connect toolkit for facilitation of support for SMFEs, particularly in the areas of:

- Market understanding – setting up market information systems for community-based forest enterprises;
- Business and financial planning – implementation and review of enterprise development plans;
- Delivery of financial and business development services (BDS) – partnerships with financial institutions and BDS providers; and
- Building (environmental) sustainability – implementation of environmental plans contained in the MA&D business plans.

Finally, through TREE AID's implementation of MA&D in Burkina Faso and its close cooperation with the Government of Burkina Faso, the Government has now also adopted the MA&D approach for its 'Agence de Promotion des Produits Forestiers Non Ligneux' (APFNL).

## Nepal

In Nepal, Forest Connect is implemented by the Asian Network for Sustainable Agriculture and Bioresources (ANSAB). ANSAB is a civil society organization working in South Asia and headquartered in Kathmandu, Nepal. Its main focus is on biodiversity conservation and economic development through community-based, enterprise-oriented solutions.

Forest Connect Nepal aims to:

- Contribute to the goal of Forest Connect as a whole by increasing the visibility of the SMFE sector of Nepal;
- Increase the level of organization and connectedness of SMFE members to markets (by supporting existing SMFE associations), to service providers (by strengthening their capacity to provide trainings and finance) and to policy processes (by empowering SMFEs to be heard by policy makers); and
- Increasing the viability of 'Forest Connect' members in the market.

The approach of Forest Connect Nepal was initially focused on knowledge generation, data gathering and analysis. Within the first two years of becoming the national hub for Nepal, ANSAB:

- Conducted a diagnostic study on SMFEs and their associations in Nepal;
- Carried out a comprehensive review of five NWFP species as well as associated enterprises to explore the relationship between forests, poverty and livelihoods;
- Facilitated stakeholder consultations nationally and internationally;
- Documented a value chain analysis process and developed a reference document for future applications of the value chain approach in SMFE development; and

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<sup>15</sup> Market Analysis and Development (MA&D) is a participatory training methodology developed by FAO that aims to assist people in developing forest-based income-generating enterprises while sustainably managing and conserving natural resources (see: <http://www.fao.org/forestry/enterprises/en/>).

- Created an electronic directory of existing SMFEs in Nepal.

Based on these activities, ANSAB identified major challenges and barriers for SMFEs in Nepal. A national consultative meeting was organized to discuss these issues and challenges, which can roughly be grouped in policy, market and service constraints. A round table discussion was organized to further discuss the prioritized issues and to develop broad strategies for addressing each issue.

Taking on the role as national hub for Forest Connect reflects only a small part of ANSAB's overall activities. Given its nature and general goals, prior to joining the Forest Connect initiative, ANSAB was largely involved in more theoretical, knowledge creating work. But with the technical input from FAO through the Forest Connect initiative, ANSAB is in the process of initiating and supporting national level associations of producer groups and community enterprises, improving collaboration and coordination among supporting organizations and enhancing their linkages with SMFEs and community forest user groups. The first concrete activity supporting such a national level producer association is the expansion of services of the Nepal Herbs and Herbal Products Association (NEHHPA), a national membership based association of herbal business entrepreneurs. NEHHPA has until recently only represented and worked with intermediate herbal manufactures, traders and exporters of the plants and its products. ANSAB is now technically supporting NEHHPA to enable them to also open up their services to the micro entrepreneurs further down the value chain, such as the collectors and primary processors at the resource base.

## Lessons learned

Some of the key observations and lessons learned from a management and coordination perspective of Forest Connect are:

- Experience in Forest Connect member countries has shown, that, from the range of organization types that can serve as national hubs for representing, linking and supporting SMFEs, commercial associations, such as forest producer organizations and cooperatives seem to be best positioned to further SMFE interests, not in the least for their ability to reach out to the most remote geographic areas.
- Each type of organization serving as national hub joined Forest Connect with a preexisting mandate and agenda – establishing a new initiative such as Forest Connect and aiming it to become a self-sustaining mechanism often requires some reorientation in such organizations and technical support from outside therein.
- A tremendous amount of new data and knowledge has been generated so far through the work of Forest Connect members – the application of this new knowledge to generate real changes however is still lagging behind. Forest Connect member countries will need more technical support from partner organizations in putting their wealth of data to good use to promote, support and effectively connect SMFEs.
- The international Forest Connect social networking website took off very well, generating many interesting discussions and exchanges. To continue the success of this tool however, it is essential to dedicate additional human resources to facilitate the exchange-process, start discussions, share new reports and findings and so on.
- Uncertainty about funding is ever-present throughout all Forest Connect activities. The initiative was created with much ambition and little funding, and secure and stable funding is needed in order to sustain the initiative's momentum.
- The ultimate goal for the coordinating organizations (FAO and IIED) of Forest Connect is to achieve sustainability of the national hubs as effective service providers for SMFEs once funding and technical support end. It is now clear that, besides providing technical and coordinating inputs to the hubs, this also means providing more substantial initial financial support.

## What happens next?

The Forest Connect initiative has had a successful start in facilitating more connectivity between small and medium forest enterprises, within markets and the policy sphere. The Forest Connect approach is now well established in its member countries and is being recognized as a promising means to facilitate the creation of more organized enterprises and groups that can:

- Take advantage of economies of scale and improve income generation opportunities;
- Improve and secure access to finance;
- Have a louder voice and ability to lobby in policy processes;
- Achieve lower costs for and reach more people in capacity development activities; and
- Enable peer-to-peer learning.

Because in-country experiences with the facilitation of support for SMFEs have been rich and diverse, there is a need to consolidate the lessons learned in these national contexts and further promote the exchange of ideas, approaches and tools globally. FAO is currently working with IIED to enrich the Toolkit for Forest Connect, which will collate this information into a single easy-to-use reference document.

In addition, FAO and IIED will work with six of the Forest Connect countries to develop country case studies, each telling the story of the work, experiences, success stories and challenges encountered during their implementation of activities under the Forest Connect initiative. The case studies will be written for a wider audience and are intended to serve as a basis for further refining the Forest Connect message and approach internationally, as well as in each of the participating countries.

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## GROWING FOREST PARTNERSHIPS IN GUATEMALA

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### INTRODUCTION

Climate change, extreme poverty, natural resource degradation and a variety of other environmental challenges confront countries around the globe. The international community, national and local governments and other stakeholders have sought solutions for these pressing issues through passage and implementation of a wide range of innovative policies and funding instruments. Several of these policy and funding mechanisms could provide opportunities for rural communities around the globe to improve their livelihoods, which could in turn lead to more sustainably managed environments and decreased levels of poverty. A major obstacle for many rural forest-dependent communities however is that local stakeholders, including forest smallholders and indigenous people, are frequently not organized into partnerships for cooperative and unified action and advocacy, and many lack the necessary skills to effectively engage in policy and funding processes. This means that the people with the most to gain are frequently not at the table, leaving their issues and particular needs unvoiced and unrepresented.

### Growing Forest Partnerships

In 2009, in response to this lack of organization and need for capacity development, the Growing Forest Partnerships (GFP) initiative was established. It set out with the goal of supporting the development of partnerships amongst forest smallholders, indigenous people and forest-dependent communities, and to enable them to acquire and develop the necessary capacities required to access financing for forestry related activities. GFP also set out to improve national and international investment in and support for locally driven sustainable forest management related processes. Towards this end, support has been provided for knowledge sharing between local, national, regional and international actors in the forestry, policy and finance arenas.

GFP has been established in five countries, tailoring assistance to each country's unique context. These countries include Ghana, Guatemala, Liberia, Mozambique and Nepal. While each country process has included capacity and knowledge development activities focused on facilitating partnership development and enhancing abilities to access finance, each country process has progressed and grown in a unique way as a result of the various contexts, priorities and interests of those involved. This has proven to be an important factor in participants in the countries embracing and owning the activities and goals of GFP.

The GFP initiative is facilitated by a group of partner institutions that work together to provide technical and advisory support to each GFP country, including the Food and Agricultural Organization (FAO) (under the management operations of the National Forest Programme (NFP) Facility), the International Union for the Conservation of Nature (IUCN), the International Institute for Environment and Development (IIED) and the World Bank. GFP funding is provided by the World Bank. In addition to providing the technical expertise of its staff, FAO has been able to add to GFP efforts by building on the NFP Facility's knowledge and human resources, such as the expertise of NFP Facility country 'Coaches', located within the regions and providing regular advice and guidance to in-country GFP project facilitators. A multi-stakeholder group of relevant experts forms the GFP 'Reference Group', and serves in a quasi-steering capacity, providing input into major programme decisions and strategies (e.g. annual workplans and budgets, programme visioning, etc).

### The importance of partnerships

A fundamental question for those involved in early conversations about the development of the GFP was what people in forest-dependent communities needed in order to become empowered to improve their social,

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<sup>1</sup> Grouwels and Schweitzer Meins, 2011.

economic and ecological conditions. Based on research findings and on practical experience, three main drivers were identified for achieving greater empowerment including large numbers of organized people, financial resources and articulated and well communicated ideas.

- Organized groups can wield tremendous social, cultural and political influence. By coming together within partnerships, previously disconnected local groups and individuals can access capacity-development assistance, identify common needs and work together to translate their ideas into viable policy recommendations and requests for financial and technical assistance.
- Financial resources can be used to exert economic and political influence. For example, in many local communities, business leaders have a large role in local politics and community activities as a result of the economic influence they maintain within the community (source of employment, funding source for community activities, etc). At a broader level, the wealthy may choose to donate heavily to political campaigns, and thus gain the ear of political leaders. In other words, those with financial resources can buy influence.
- Ideas themselves can be powerful. As solutions are sought by politicians, donors and natural resource managers for a variety of development challenges, innovative and workable ideas and solutions that are well articulated and communicated are invaluable.

In all five GFP countries, many forest-dependent communities struggled with a lack of organized partnerships or networks of people and money. While ideas lay nascent in many communities, individuals within the localities did not have an understanding of how those ideas could inform policy and finance dialogues. By encouraging partnership development, GFP's intent was to support local people in increasing their influence through the development of organized partnerships, which could in turn allow them to development and subsequently share their ideas in a focused and targeted way and, potentially lead to greater financial access and security.

## GFP GUATEMALA

A GFP country since 2009, Guatemala's efforts have focused on building forest community partnerships, strengthening the capacity of forest communities and improving finance instruments to benefit smallholder and forest communities, all through the development of strong partnerships.

At the start of the GFP programme in Guatemala, four thematic areas were identified as core areas to which GFP activities should respond in order to generate positive economic, social and environmental impacts in the country. These areas have served to guide the evolution of GFP in<sup>2</sup> Guatemala and include governance, financing instruments, institutional strengthening and capacity development.

### Governance

The first major action of the GFP programme in Guatemala was to provide support for the development of a partnership called the '*Alianza Nacional de Organizaciones Forestales Comunitarias de Guatemala*' (the National Alliance of Community Forest Organizations) ('Alianza'). The Alianza was established as a platform for Guatemalan small holders, indigenous groups and forest communities to develop and speak with a common voice in order to influence national and international forest policy. Additionally, with support from the GFP, the Alianza initiated a training plan for developing local capacity in several areas of Guatemala.

Today, the Alianza is made up of more than 400 community groups, with about 77,000 members, and has become a strong platform for engaging people in national decision-making processes, particularly and, as its first priority, lobbying for forest financing policies and instruments that can benefit local people. This partnership represents an unprecedented level of diversity and coordination among indigenous people and community forest

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<sup>2</sup> Boscolo, van Dijk, Savenije, 2010.

<sup>3</sup> Ibid



organizations in Guatemala, and demonstrates the enormous potential that lies in strong partnerships, as the following section illustrates.<sup>4</sup>

## Finance instruments

On 17 November 2010, at the Congress of the Republic of Guatemala, *El Programa de Incentivos Forestales a Pequeños Poseedores* (PINPEP) (Forest Smallholders Incentives Program) was signed into law (Law No. 3937, Decree No. 51). The law was passed, in large part, as a result of lobbying by and inputs from the Alianza, showing its increasing strategic importance in policy decision making.<sup>5</sup>

The new law, which sets aside 0.05 to 1.0% (the equivalent of several million US dollars each year) of the national budget for forest management and reforestation incentives, has the potential to dramatically impact forest communities all over Guatemala because people can access PINPEP funds regardless of whether they actually own the land in question. This is a major step forward in addressing the difficulty of providing financial support to indigenous and local people who frequently have traditional rights to use forest areas but do not necessarily have legal ownership. It is expected that more than 400,000 people with smallholdings, who have no legal registration of ownership, may directly benefit from PINPEP. Additionally, community forestry organizations will play an active role in the technical decision-making body of PINPEP, which will ensure their perspectives contribute to the shaping of PINPEP's implementation into the future.<sup>6</sup>

## Institutional strengthening

In November 2007, a process to develop and implement a national forest financing strategy (NFFS) was initiated,<sup>7</sup> receiving final approval from the Board of Directors of the Guatemalan Forestry Authority (INAB) in 2009. This process set out to improve the flow of information and ideas between the forestry sector and the finance sector. The NFFS was also established to explore various options for improving access to finance amongst forest stakeholders.

A key role has been played by the Alianza, as the network has engaged in various fora focused on innovative new programs and funding sources to ensure inclusion of forest community interests and perspectives. One such forum is the Forest, Biodiversity and Climate Change Group which is focused on developing a national strategy and program for Reduction of Deforestation and Forest Degradation (REDD+). The Alianza participation in this group is critical as there is broad concern about how to adequately include local communities, and ensure they are not harmed by climate change actions.

## Capacity development

Within INAB, a small team was appointed to establish a *Unidad de Inteligencia Financiera Forestal* (UIFF) (Forest Finance Intelligence Unit) to follow up on the implementation of finance instruments identified as likely to be beneficial for smallholders and forest dependent communities. The unit provides forest finance information and capacity-development opportunities for foresters and finance professionals, and supports the development of forest sector business proposals.<sup>8</sup> To complement the efforts of the UIFF, GFP has provided support to the Alianza, as well as to Alianza member organizations, to focus specifically on building local forest-based entrepreneurs' capacity to develop and market viable business plans. This has been carried out through the convening of several training workshops and exchanges focused on improving market competitiveness, developing projects, developing guidelines and management and strategic business visioning.

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<sup>4</sup> Grouwels and Schweitzer Meins, 2011.

<sup>5</sup> Instituto Nacional de Bosques Guatemala, 2011.

<sup>6</sup> Instituto Nacional de Bosques Guatemala, 2011.

<sup>7</sup> Rodas, 2010.

<sup>8</sup> Boscolo, van Dijk and Savenije, 2010.

It is important to enable local communities and actors to drive their own social and economic development because they are best placed to consider local realities, needs, aspirations and dynamics. By working together in partnerships, these community actors can more easily organize training and other capacity-building activities, for example, to support the preparation of well-structured and fiscally sound business plans for investors and donors.

### **The Alianza: One member's story**

The Alianza membership includes smaller networks (often called 'second level organizations'). One such network member is a group called Utz Che. Utz Che is an association focused on strengthening sustainable forest management and biodiversity and natural resources conservation. Its membership includes legally recognized organizations from around the country, focused on the development of small and medium sized forest-based businesses. The network strives to achieve its mission through training and capacity development on business and forest management, participation, policy and other relevant topics.<sup>9</sup>

Utz Che has been able, in part, to carry out its business development goals with funding and technical support provided by an initiative called Forest Connect, co-facilitated by FAO and IIED. Forest Connect focuses on strengthening market linkages and capacity development amongst forest-based small and medium enterprises. In 2009, Utz Che applied to FAO for funding under GFP under their "Forest Connect" umbrella, pointing out their work in partnership and capacity development, their connection to the Alianza and their potential to provide enhanced capacity development services to forest-dependent communities for all the members of the Alianza which needed business support. This request was approved, and with the funding provided by the GFP initiative, the association has been able to further improve commercial connections and relationships to aid market access, and build capacity in business acumen and in skills such as leadership and conflict resolution. Utz Che members believe that if they continue to learn and build their technical and business skill set, they will be able to move away from needing financial support in the future as they will be able to build financially sustainable and independent enterprises.<sup>10</sup>

### **Lessons learned<sup>11</sup>**

The experience of GFP and FAO has led to the identification of several points to consider when supporting the development of forest community partnerships and the improvement of finance instruments to benefit smallholder and forest communities.

- Every country will have a different context and partners. It is critical that context, as well as the country's specific needs and gaps are taken into account when considering providing assistance similar to that of the GFP. Rather than prescribing too strictly the way in which a partnership development and financing improvement programme should be carried out in the country, interventions should try to respond to the country's specific needs.

For example, while Guatemala's GFP programme saw the development of the Alianza, Liberia's GFP programme has contributed to the development of several County Forest Fora and an overarching National Forest Forum, and Ghana has focused primarily on the generation of information by conducting studies on sector mapping, climate change funds preparedness and a variety of other topics relevant to forest-based communities. Allowing each country to self-determine the best way forward based on their specific conditions and partners leads to greater sense of ownership of the initiative by those within each country, and a higher likelihood that the programme will have lasting and sustainable impacts on forest-based communities.

- The implementation of GFP in various contexts has been, in part, successful because whenever possible it has built upon existing studies and diagnostic processes and strengthened existing networks. This has been another important element in creating a greater sense of ownership of GFP amongst stakeholders, as well as of anchoring the initiative to each country's reality. Additionally however, it means that many of the

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<sup>9</sup> Lobos, 2009

<sup>10</sup> *ibid*

<sup>11</sup> IIED, 2010

successes of GFP are also successes of other programmes and initiatives. For example, in Guatemala, while the success of the Alianza can certainly be attributed, in large part, to the support provided through GFP, other programmes like the NFP Facility have also played an instrumental role in strengthening the Alianza and its activities.

- It takes time to create a diverse multi-stakeholder platform, and for genuine ownership of an approach like the GFP's to take root. Achieving and building trust is not a simple process and there may be cases where it simply is not possible. It is therefore important to step back periodically to examine the partnership development process and critically analyze the 'glue' that keeps it together. This will serve as an opportunity to celebrate successes, as well as to identify and assess remaining obstacles.
- For instance, the Alianza has already, as has been highlighted above, met with tremendous success. Nevertheless, the Alianza today only represents around fifty percent of the country's forest-dependent people. A network of indigenous authorities (Red de Autoridades Indígena) has been reluctant to join the Alianza, and many households and small communities are so isolated and impoverished that they simply cannot be reached, even by local organizations. While the Alianza does continue striving to increase participation by forest dependent people and groups that are not currently part of the group, it also keeps moving forward, making strides to improve livelihoods and forest conditions in communities throughout Guatemala.

## CONCLUSION

The GFP approach seeks to encourage processes and activities which lead to more empowered forest smallholders, indigenous people and forest communities in each of the countries in which it has programmes. Working with stakeholders within the GFP countries, particularly on partnership development, has been viewed as a critical part of strengthening the capacity and voice of forest-dependent people. Guatemala's method of developing a broad national network is just one approach applied under the GFP. Other countries have tried different mechanisms, including creating in-country multistakeholder participatory platforms like county and district forest fora, conducting studies to enhance and improve the knowledge base, carrying out multi-stakeholder community-based forest management projects and so on.

As GFP has evolved, the importance of connecting to and partnering with stakeholders at the international level who are striving to increase investment in and support for locally driven forest management processes has also been increasingly recognized and supported by GFP. This is because of a growing understanding that partnership building can be both a vehicle for forest-dependent people to connect within each country, as well as a mechanism for the needs and conditions of forest-dependent people around the world to be communicated to a global audience.

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## THE CURRENT STATE OF ROUND WOOD DISTRIBUTION IN JAPAN

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### SUMMARY

The role of the auction market system has been important for the distribution and pricing of round wood in Japan. Wood circulation through auction markets began in the 1970s. The auction market system functions in procuring, sorting and pricing round wood as well as collecting sales proceeds. The auction market system has been an easy, safe and fair way for small-scale private forest owners, who are the main suppliers of small amounts of round wood, to sell their timber. At the same time, the auction market system is an efficient way for small buyers, such as small sawmills, to purchase round wood.

After the globalization of the 1990s, the number of small sawmills in Japan decreased, a few larger sawmills were established, and the wood industry began to use domestic round wood. (In Japan, a large wood consumer has a consumption of more than 100-200 thousand cubic meters of round wood per year.) It is difficult for larger consumers to collect sufficient amounts of round wood through auction markets because most auction markets trade less than 100 thousand cubic meters of round wood; this is quite small, compared to large buyers. Most large mills are decreasing the amount of round wood bought through auction markets and increasing the amount bought directly from large logging contractors because the auction market system reduces the advantage for large buyers. In general, a turning point in the wood circulation structure is occurring.

The purpose of this article is to examine how and why the round wood circulation structure has changed as a result of the establishment of the large wood industry, and how this change has affected the production and sale of round wood by small-scale forestry owners. I argue that changes in the round wood circulation structure in Japan are incomplete due to the insufficient scale of expansion in the wood industry and that strengthening price formation by the stable supply of round wood on the supply side is an important issue.

### INTRODUCTION

Round wood production from domestic resources has been decreasing since the early 1960s, when Japan opened its timber market. Imported timber has filled the increasing demand for a long time. Round wood production in Japan decreased further in the 1990s, while forest resources matured. One reason for this is a decrease in timber prices due to globalization.

The auction market system has played an important role in the pricing of round wood. Forest owners who harvest round wood by themselves from forests that they own, logging contractors and timber traders could sell round wood in auction markets, and sawmills could buy round wood in the same auction markets. The price for round wood is decided by bids. This system is fair, even for small-scale forest owners and small consumers. In the 1970s and 1980s, many round wood auction markets were established.

After globalization in the 1990s, a few big sawmills that consume more than 100 thousand cubic meters of domestic round wood were founded, and plywood makers began using domestic instead of imported wood because the price of domestic wood was decreasing and becoming cheaper than imported round wood.

In the late 1990s, the circumstances around the distribution channels for domestic round wood began to change gradually. The number of larger sawmills increased, and in 2006, the government began encouraging private sawmills to expand their scale of production. As sawmills consumed much more round wood, they tended to avoid purchasing their wood at auction markets. Most auction markets were not big enough to handle the log required by larger sawmills. If sawmills obtained logs from auction markets, they had to buy wood at relatively higher prices. The bigger sawmills tried to purchase wood directly from larger private forest owners, national forests and big logging contractors. A turning point has now been reached where it has become necessary to reform the round wood supply system.

The purpose of this article is to find out how and why the round wood circulation structure has changed as a result of the establishment of the large wood industry, and how this change has affected and will affect the production and sale of round wood by small-scale forestry owners.

The term “large wood industry” used in the article refers to both sawmills and plywood companies that use domestic round woods, and does not include the large wood industry that consume imported timber.

## METHODS

Japan’s wood circulation structure is currently undergoing changes. In this paper, I focus on the role of round wood auction markets.

First, I describe clearly the current state of and trends in wood circulation. I stress here the importance of round wood auction markets, because auction markets play an important role in bringing round wood from small-scale owners to wood consumers. Moreover, it is thought that wood distribution through auction markets has been suitable for the forest ownership, wood production, as well as supply and demand structure in Japan. The importance of auction markets is discussed, in view of their special circumstances.

Second, I discuss trends in timber prices and the structural change within the wood industry, and I propose that these factors have changed wood circulation. Timber prices in Japan have been maintained at a higher level than international standards. Around the 1990s timber prices began to fall, and this became an immediate driver of structural change within the wood industry. The special circumstances surrounding the price of round wood stemmed from the Japanese preference for round wood for residential construction, and it was assumed that changes in preference for building raw materials was a factor in falling timber prices. In addition, the existence of large-scale plants using domestic timber altered the circulation structure. I argue that the significant change here is the movement toward market evasion by larger plants.

Third, I clarify how the market corresponds to such structural changes. In a case study, I examine the round wood auction markets in the Kyushu region where several big sawmills are located and change has occurred faster than in other regions

To understand the facts and analysis mentioned above, I use statistical data and literature, and I confirm my results through site investigation.

To conclude, I discuss the future development of round wood auction markets and their role under the changed circumstances of the wood circulation structure. In addition, I analyse the influence of the change on small-scale owners, and I propose a policy of correspondence for small-scale forest owners.

## RESULTS AND DISCUSSION

### 1. Domestic round wood circulation and the role of round wood auction markets

According to the 2007 wood market report issued by the Ministry of Agriculture, Forestry and Fisheries, 68% of domestic round wood is consumed by sawmills, 9% is used for the production of plywood, and 23% is converted to pulp wood. The most important consumer of domestic round wood is the sawmill industry. The prices of logs for lumber are higher than prices of logs for plywood and for pulp. Therefore, the production of round wood for lumber is significant for forest owners.

The origins of domestic round wood procured by sawmills was determined, and Table 1 shows the percentages of domestic wood bought by sawmills from different suppliers between 1968 and 2006. In 1968, 27% of round wood came from self-harvest, where sawmills bought stands from forest owners and harvested those stands by themselves. Purchases from auction markets were only 17% of the total. The share of auction markets reached 56% by 2001, but decreased to 48% in 2006. Conversely, the share of self-harvest decreased during this period. It was 27% in 1968, but around 9% between 1984 and 2006. Percentages bought from public forests (i.e., national forests, prefectural forests and municipal forests, with the main supplier being the national forest) dramatically decreased after 2001, due to national forest reform in 1997 and reductions in harvests from public forests.

The most important point is that most domestic round wood consumed by sawmills have been supplied through auction markets, and that the existence of auction markets characterizes round wood circulation in Japan.

**Table 1:** Percentages of domestic round wood bought by sawmills from different suppliers between 1968 and 2006

Fiscal year	Public forest	Self-harvest	Logging contractor	Auction market	Wood trading company	Other
1968	20%	27%	18%	17%	13%	4%
1975	26%	19%	15%	25%	11%	3%
1980	27%	12%	15%	30%	12%	4%
1984	27%	9%	16%	34%	10%	4%
1991	19%	9%	15%	42%	11%	3%
2001	5%	10%	17%	56%	9%	3%
2006	8%	9%	18%	48%	11%	5%

Source: Ministry of Agriculture, Forestry and Fisheries, Wood circulation structure investigation.

The small- and mid-scale nonindustrial private forest (NIPF) owners have significant roles in the timber production and economy of rural areas (Hori, 2000). Fifty-six percent of the forest area in Japan is privately owned, and in 1990, 63% of forest owners were NIPF. In addition, most NIPF owners have small-scale properties, as 89% have more than 0.1 ha to less than 5 ha of forest.

Small-scale owners have small forests and produce round woods of varying quality and quantity, and they therefore have no way to sell their products at a reasonable price. This is disadvantageous to the stable round wood supply for wood consumers and is the reason why round wood auction markets are necessary. Auction markets are a kind of converter, transforming a small, scattered and uneven round wood supply into a large, sorted and stable supply (Sakai, 1986). Some auction markets are managed by the Forest Owners' Cooperative Association and its prefectural federation, the Joint Organization of Logging Constructors, while others are managed by private companies. It has been convenient for small sawmills to purchase needed round woods through auction markets because most small sawmills are too small to have enough capital and space to reserve stock. Before 2000, auction markets were suited for both suppliers and buyers.

## 2. Falling timber prices

In the 1990s and especially after 2000, timber prices were clearly on a downward trend. There were many factors pushing prices down, for example, an oversupply of logs due to the government's program encouraging thinning, and falling demand for pulpwood due to increasing purchases from overseas by domestic paper mills. The most important factor was that the demand of higher quality round wood for wooden pillars in home construction fell. Wooden pillars and beams were special materials in Japanese-style houses (Cohen, Gaston and Kozak, 2001). Wooden pillars and beams have a decorative as well as a structural function. Therefore, clean pillars (without knots) were favoured, and these pillars were priced higher. Some professional and skilled forest owners invested in the production of clean logs. The production of wood pillars had a special meaning in Japanese forestry, and the price of wood pillars remained high independent of international prices. This was one reason why forest owners, especially professional and skilled ones who are a model for forest owners in general, neglected efforts to reduce the costs of their product. They focused on production of quality logs.

On the end-user side, the westernization of housing styles meant that Japanese-style rooms were not needed. The demand for clean pillars and beams decreased. In addition, in 1995 the massive Kansai Awaji earthquake occurred, and more than 6,000 people died. Eighty percent of the casualties were due to the collapse of wood-frame houses (Beniya, 2008). The earthquake resistance of wood-framed houses became an issue, and, building codes were revised by the government. Housing manufacturers developed stronger wood-framed houses that could withstand an earthquake.

To build a strong house, a uniform quality of materials is necessary. Most solid wooden materials such as pillars and beams are insufficiently dry and their quality is not uniform. Because the supply of dried wooden pillars and beams was insufficient, laminate lumber (especially lumber imported from Europe) was used for newly built houses instead of solid wooden materials. Wooden pillars and beams lost their market. Sawmills that

mainly processed wooden pillars and beams without drying withdrew from the market, and the demand for round wood suitable for processing wooden pillars and beams decreased.

### 3. Structural change in the sawmill industry and round wood distribution

Throughout Europe, the sawmill industry is concentrated, with fewer mills and higher total production (Sten, 2001). Concentration of the sawmill industry using domestic timber also occurs in Japan (Shimase, 2010). One reason is the reduction in domestic timber prices. In the 2000s, the price of domestic round wood fell to below international prices. A few bigger sawmills and plywood factories tried to use domestic timber instead of imported round wood. But the wood industry in Japan does not consume as much wood as European wood industries; the larger sawmills use around 100 thousand cubic meters of round wood per year. Since the domestic timber supply is not stable, supplies would not increase with lower prices. Increasing consumption means for sawmills risk.

Most round wood auction markets trade between 30 thousand and 100 thousand cubic meters of wood per year. They are too small to provide a stable supply of round wood for big sawmills. If sawmills purchase their wood from auction markets, they must bid at higher prices. Therefore, some big sawmills reduce the proportion of their purchases from auction markets and buy directly from logging contractors. This is the so-called evasion of auction markets.

Market evasion provides wood suppliers with an advantage. Suppliers can save on the market commission and do not need to pay a fee for stacking logs at the auction location. The market commission is 5 to 8 % of the sales total and the fee for stacking is generally 500 to 1,000 Japanese yen per cubic meter. A stack is the unit of sale. The purchaser's bid price is different depending on whether stacks are made or how large they are. Each market has a unique method of making stacks, according to customers' needs.

Most plywood factories used to use imported woods and did not originally depend on markets for wood purchasing. Since the early 2000s, plywood factories tried to use domestic timber and contract with suppliers to determine prices, quality and quantity of industrial round wood. Suppliers consist of the prefectural federations of Forest Owners' Cooperative Association and prefectural federation of logging contractors. This is termed the Council Method. The Council normally meets every 3 months. This approach is successful. However, there are some problems: the demand side decides prices, and the supply side can not refuse the proposed price.

In some regions, a group of sawmills tried to establish a similar system for round wood for lumber rather than industrial wood. This trial was not successful. Because sawmills in a group are rivals, it is difficult to reach a consensus, even within the same group. In other regions, some large sawmills individually determined prices, quality and quantity with large logging contractors or wood suppliers and purchase round woods under a long-term agreement. This case is going relatively well and promotes the evasion of auction markets.

In the case of a logging contractor in Miyazaki, the contractor previously sold all round wood that he harvested in an auction market. Recently, he contracted with three sawmills and a plywood factory to sell round woods at a negotiated price. He sells 60% of his total round wood (of 16 to 34 cm diameter) to sawmill A, 10% (more than 36 cm) to sawmill B, 10% (smaller than 14 cm) to sawmill C, and 20% of bending wood to a plywood factory (interviewed on Dec. 8, 2008). The contractor no longer needs to sell any of his round wood at the auction market.

To summarize, the existence of large-scale wood industry has had an impact on the wood circulation structure in Japan, namely, evasion of the auction market. This means that big suppliers connected with large consumers do not play a role in price formation at auction markets.

Table 2 shows the percentage of domestic round wood sold by logging contractors to different buyers per fiscal year. The share of auction markets as the sales destination of logging contractors increased between 1968 and 2001, but decreased in 2006. This shows the evasion of the market. In 2006 the share of wood sold to plywood factories increased dramatically. This corresponds to the fact that plywood factories began to use domestic round wood. Incidentally, plywood factories purchased half the amount of domestic round wood from logging contractors in 2006 according to the Ministry of Agriculture, Forestry and Fisheries' wood circulation structure investigation.



**Table 2:** Percentage of domestic round wood sold by logging contractors to different buyers per fiscal year

Fiscal year	Auction market	Sawmills	Plywood factory	Other
1968	32%	44%	2%	21%
1975	41%	39%	1%	19%
1980	49%	30%	1%	20%
1984	48%	27%	1%	24%
1991	58%	28%	0%	14%
2001	64%	23%	0%	13%
2006	60%	24%	6%	10%

Source: Ministry of Agriculture, Forestry and Fisheries, wood circulation structure investigation.

#### 4. Changing the function of round wood auction markets

The managers of auction markets are experiencing a crisis due to the trend of auction market evasion. On the one hand, auction markets have experience and understanding of the timber trade, and they have information about sellers and buyers. They could collect a large amount of round wood.

Auction markets have tried to become involved in the contract price sales system. They collect round wood and sort logs into those sold by auction and those sold by a contracted price. Large buyers purchase their wood at the contracted prices.

The contract price sales system can moderate price fluctuations. It is advantageous to both the buyer and seller, especially for large-scale buyers and sellers. Of course, there is a possibility that the price will be suppressed to low levels by avoiding auction markets. Even if the price is somewhat low, it is more desirable for the seller that all of his round wood is sold. Additionally, the sellers can save on the stacking fee.

The function of price formation was most important when all round wood was sold by auction. Recently it has become more important for the markets to secure a large amount of round wood. Some markets have begun to place emphasis on the collection of round wood. For example, some markets in Kyushu have bought or have started to buy stands directly, with or without forest land, and they get harvest contractors to harvest round wood from these stands, or they lend capital for purchase of stands to logging contractors and then buy from the contractor; in this way, they can be assured of purchasing a large amount of round wood (Maeda, Kohoroki and Sato, 2008).

## CONCLUSION

### 1. Future development of the round wood auction market

Changes in the round wood circulation structure reflect changes in the market. In the future, I anticipate that the role of the auction market will be two-fold. Auction markets will continue to supply small sawmills, as they do currently. In addition, auction markets will have a stable collection of large amounts of round wood for large customers, and will have a stronger power over price negotiation against large customers. Strengthening the power of price negotiation is especially important from the forest owner's viewpoint.

Such change corresponds to structural changes within the sawmill industry. It is forecasted that two types of sawmills will survive, small sawmills that supply a niche market, and large sawmills for mass production (Sten, 2001). The development of large-scale sawmills is insufficient for Japan. In other words, the concentration of production in the sawmill industry is not enough. It is thought that the aforementioned change will occur more rapidly if some factories with 300,000 cubic meters or more of annual consumption are established as larger factories want to secure a stable amount of woods.

## 2. Future development for small-scale forest owners

A long-standing and important issue within Japan's forestry policy has been the united management of small NIPF owners' forests. United management has been necessary to manage these forests because forest road networks and infrastructure were unfinished. It is particularly advantageous for owners to combine this work from the perspective of cost. However, each owner has the power to make decisions regarding final cutting and thinning, and it is difficult for a third party to propose timing. In addition, united management is made more difficult under short-term market price changes.

A short-term price fluctuation is avoided by switching from pricing by auction to contract pricing. As result, harvest income can be estimated more accurately. This makes it easier for logging contractors and the forest owners' cooperative association to appeal to the forest owners for final cutting and thinning. Changing to contract pricing might be able to solve a long time problem with the united forest management in one step.

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# FORECASTING TIMBER SUPPLY FROM SMALL-SCALE FORESTS: ANALYSIS OF SUPPLY-INFLUENCING FACTORS

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## ABSTRACT

When negotiating wood prices with the wood processing industries, the Styrian<sup>1</sup> forest owner association (SFA) needs to determine the expected timber supply for the upcoming months. Since the total monthly supply of timber is subject to strong volatilities, it is essential to reduce inherent price risks, planning risks, and risks of contract fulfillment which have a clear monetary implication for the members of the SFA.

The main aim of this project is to develop a model which forecasts short-term timber supply marketed by the association. To achieve this goal, the factors affecting supply, like roundwood price, plot size, calamities, etc. are identified in a first of three steps. This first step of identification is presented in this work.

The underlying panel data set is unique. It aggregates every single delivery of all 12.000 members of the SFA to a monthly individual total over a period of 60 months - from 2006 to 2010.

**Keywords:** monthly timber supply, forest owner association, panel regression, Tobit, hurdle model, price elasticity of supply, Austria

## 1 INTRODUCTION

When negotiating wood prices with the wood processing industries, the Styrian forest owner association<sup>2</sup> (SFA) needs to determine the expected wood supply for the upcoming months. As only a certain proportion of the about 12.000 associated forest owners delivers its wood according to earlier announcements, it is difficult for the SFA to assess the amount of wood that will be marketed. In the past, many associated forest owners have been found to deliver wood on a seemingly “random” basis, with the result that the total monthly amount of wood supply is subject to strong volatilities. It is essential to reduce the resulting price risks, planning risks, and risks of contract fulfillment which have clear monetary implications.

Thus, the main aim of this project is to develop a model which predicts the short-term wood supply marketed by the SFA. To achieve this goal the quantity affecting factors like roundwood price, plot size, calamities, etc. are identified in the first of a three step process. In a second step - to be covered in near-future work - the retrieved information shall be used to develop a model which measures the intensity of the identified factors. In a third step, the model will be used to forecast short-term aggregate supply of the SFA.

From this final version of this forecasting model an easy-to-work-with forecasting tool (i.e. a programme) shall be generated which then will be handed over to the administration of the SFA. In contrast to many other contributions in this field, this project's aim is not only academic, but it also has a quite strong applicational component. It therefore combines academic research with the every-day business in a small-sized enterprise.

The feasibility of this project is given by the unique possibility to combine daily<sup>3</sup> wood supply data from the SFA with monthly roundwood prices from the Austrian Statistics Office and with socio-economic information about the individual forest owners which is provided by the Austrian Federal Ministry of Agriculture, Forestry,

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<sup>1</sup> Styria is an Austrian Bundesland (state), located in the south-east of Austria.

<sup>2</sup> Waldverband Steiermark

<sup>3</sup> From 1st January 2006 until today and running.

Environment and Water Management (BMLFUW). Both the SFA and the BMLFUW are partners and financial supporters of this project.

Data-wise, the project can be summarized by the following key figures. The SFA has almost 12.000 members which are individually tracked. The time dimension in this particular paper is 60 months, i.e. daily individual supply information was aggregated to monthly individual totals. Total supply of the SFA in 2008 was around one million cbm u.b.<sup>4</sup> compared to a national total of 21.7 million cbm or - when referring to units with less than 200 ha - 12.7 million cbm.<sup>5</sup> This translates into a market share within the small-scale market segment (units with less than 200 ha) of around 8%, nationwide.<sup>6</sup> In 2009 market shares decreased. However, the reason for this might be due to different supply elasticities<sup>7</sup> rather than the business concept of the SFA.

In this paper, descriptive analysis techniques are used to understand and visualize potential interrelations of variables. Further, regression analysis is used to explain the relation of the price (or its lag) for the main assortment and the aggregated supply. Additional regression techniques which may exploit the advantages of panel analysis are postponed for later work. An outlook of further work is given in the discussion section where possible panel regression techniques are also discussed briefly.

## 2 METHODS AND DATA

In this first step of this project, the methods applied are rather simple. Mostly descriptive analysis tools will be deployed in this paper. For the identification of the lag order of the roundwood price, basic times series analysis (on the aggregated level) is put to use. The emphasis in this section, however, is placed on the data, since the fact that the supply can be tracked on a daily and individual basis is the true novelty. Additionally, this unique supply data set is enriched with individual socio-economic information from other databases. For this reason this section explains in greater detail from which sources the data sets were taken, how they were matched and finally merged into a panel data set.

### 2.1 Sources

Five different data sets from three different sources were combined to form the final panel. Most importantly, the supply data set as well as the members database were provided by the SFA. It shall be noticed that the SFA operates in all regions of Styria and has about 12.000 members. An additional number of around 1.750 non-members also market their timber through the SFA. Due to an online access to the association's server,<sup>7</sup> the most recent data, e.g. of today, can be downloaded and imported to the statistics software.

Nominal national prices for the main roundwood assortment - spruce/fir sawlogs class B, 2b Media - were taken from the Austrian Statistics Office. Socio-economic information about the individual suppliers was provided by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) in form of two datasets. The first one (Agrardieseldatenbank 2009) offers recent data about e.g. the plot size of the farm and forest lands of the suppliers. The second, a bit outdated database (Agrarstrukturhebung 1999) offers additional information (e.g. year of birth and sex of the farm owner) which usually tends not to change in the long-run.

### 2.2 Construction of the panel

The main problem constructing the panel was to merge the members database from the SFA with the databases from the BMLFUW. The reason for that is that the SFA and the BMLFUW use different systems of individual identification. Thus, on the basis of certain characteristics a special algorithm had to be invented which tried to match the member identifier (from the SFA) with the operating identifier (from the BMLFUW). At the end of

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<sup>4</sup> Cubic metre under bark. In the remainder of the text, cbm means cbm u.b.

<sup>5</sup> Grüner Bericht 2010

<sup>6</sup> Schwarzbauer, 2009.

<sup>7</sup> The statistics software Stata SE 11 is used.

this matching process almost 8.000 members were matched. This means that for „only“ 8.000 out of 12.000 members additional data is available. Finally, the data sets were merged, keeping all 12.000 members. The outcome of this merging process was an enriched cross-sectional members database of around 13.750 individual suppliers (12.000 members and 1.750 non-members).

This generated cross-sectional data set had then to be merged with daily individual timber supply - the time-series dimension. This supply data set offers information about each individual's daily supply. Obviously, since no individual supplies timber on all 1826<sup>8</sup> days in the observed time period from 1.1.2006 to 31.12.2010, this data set consists of a non-trivial amount of zeros<sup>9</sup>. Consequently, this panel with around 25 million observations, which is not a useful basis for analysing timber supply, was aggregated to monthly individual totals, resulting in a workable panel with „only“ 825.000 observations and „only“ 92% zeros<sup>10</sup>. At the end of this matching and merging process the generated panel has the following dimensions: it has a cross-sectional dimension of 13.750 individuals and a time-series dimension of 60 months. This panel is the basis for the analyses in this paper.

For later studies the dimensions are allowed to vary over time. This means that as time goes by more and more supply information enters the data pool since firstly and obviously more time (i.e. months) has to be covered and secondly the number of members may increase rather than decrease. As a result, the software (Stata) was handled in a way that future data prolongations can easily be read in and that the dimensions of the panel automatically adjust to the most recent situation of the provided data. In order to get the most recent information about today's wood supply - which may be of importance for the third part of the project which focuses on short-run forecasting - an online access to the SFA's server was set up. This allows the download of the very recent data.

### 3 RESULTS

In this section the main results of the descriptive analysis will be shown. It basically looks at the supplied quantities from different points of view in order to understand how and maybe to which extent different factors influence timber supply.

For this reason the influence of the main price assortment on the aggregate supply is first analysed. Then calamities (storm) are introduced to understand the differences in the supply behaviour under normal and under extraordinary conditions. Thirdly, seasonal dependencies are investigated. And finally, the relationship between the size of the individual forest area and the quantity supplied is examined in a fourth step. Obviously, further supply affecting factors suggest themselves but that goes beyond the scope of this contribution.

#### 3.1 The relation between quantity supplied and price

As Schwarzbauer et al (2009) illustrate in their „General consideration on supply behaviour“ suppliers of timber in principle adjust their quantity according to the price offered at the markets. Or as Jöbstl (1986) already remarked, the parameter that determines the suppliers' actions is the price for timber. Mainly dependent on that they are willing to supply timber. This means that the price of the main assortment determines the quantity supplied while the price itself is determined by the sales markets here and overseas (world market price). Summarizing, timber suppliers are basically price takers and „quantity-adjusters“<sup>11</sup>.

Following these „general considerations“ this finding might be even more true for smaller suppliers than for others. This results in different supply behaviour according to the size of the forest land and to their silvicultural exposure compared to the agricultural one. In short, larger forest holdings are much more constrained by their specialization on timber supply. They are more likely to be forced to sell their quantities even at a lower price just because they have to cover their running costs or make use of their capacities.

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<sup>8</sup> 5 years times 365 days including one leap year.

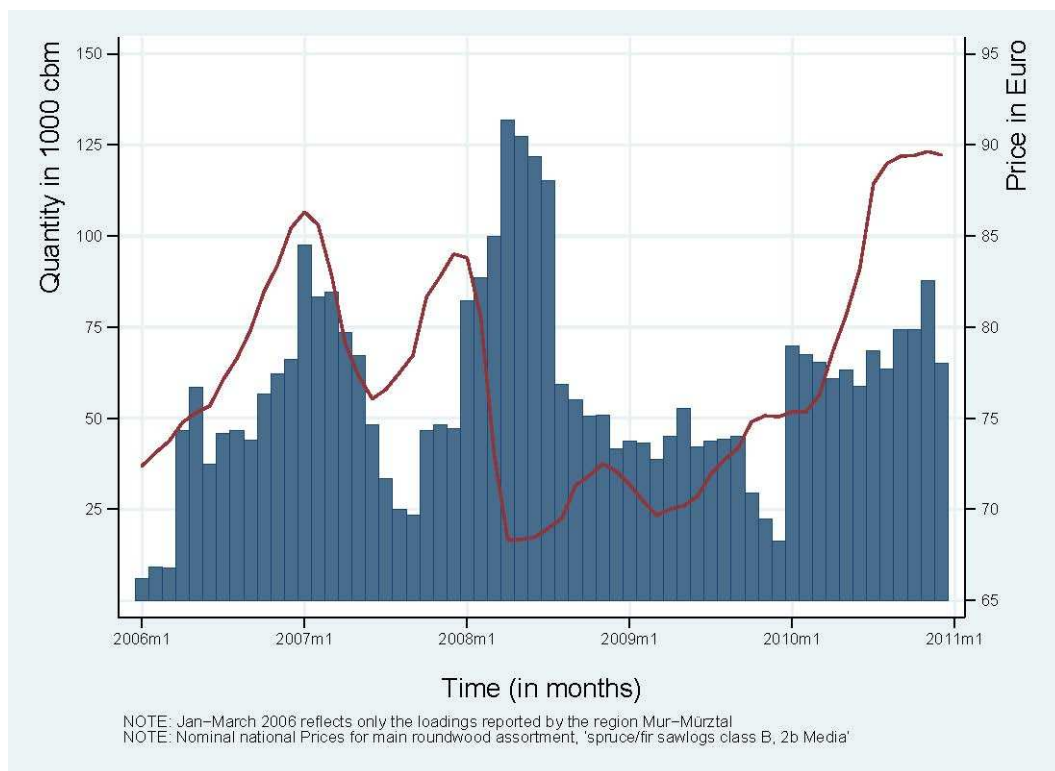
<sup>9</sup> Around 99.9% of the data set would be filled with zeros.

<sup>10</sup> This non-trivial number of zeros is the reason why usual panel regression techniques might not work with this data set.

<sup>11</sup> Schwarzbauer, 2009

On the other hand, typical small-scale forest owners in Styria are farmers who do not generate their principle income through timber supply. Moreover, their main income is generated by the agricultural part of their establishment or they even are employed externally. Hence, only a small part of the small-scale forest owners is assumed to rely on their income from timber. However, some of them see their forests as a kind of a „savings account“<sup>12</sup> which might be touched if extraordinary funding requirements justify such a decision. Of course, smaller removals due to timber stand improvements do not fall under this definition.

But the general principal is clear: broad independence from timber income and the fact that trees - usually - do not foul when left growing in the forest, un-couples the decision to harvest from the dictat of time as it is existent in agriculture. This liberty to pre- or postpone the harvest strengthens the influence of the price.



**Figure 1:** Total monthly quantities: blue = „normal“; red = windstorm

Before explaining and drawing conclusions from figure 1 the individual supply has to be specified more closely. In this paper different assortments are all treated the same way, which is rather uncommon, but inevitable because the database does not break down each delivery into the assortments. A differentiation into different assortments is in fact possible by grouping the purchasers of the timber according to their preferred assortment, but this is a rather difficult and time-consuming exercise. For this reason, this paper will neglect that while noting that the prices for the different assortments follow at least by trend the price of the main assortments. In other words all supply is treated as if it would react only to the price of the main assortment; at least for now.

Keeping this in mind figure 1 can be explored. The blue bars indicate the quantity marketed by the SFA in each of the 60 months observed. The axis on the left indicates the quantity in 1000 cubic meters (cbm). Note that the first three months do not cover all regions of the SFA. The red line marks the nominal, national price in Euro in that month, as reported by the Austrian Statistical Office.

Looking at the graph, several observations may be noticed. While in the first one and a half years quantity supplied and prices move quite parallel to each other this can not be said for the remainder of the period. With the beginning of 2008, prices and quantities diverge strongly. After a short period of expected parallel behaviour, prices and quantities diverge again in the beginning of 2010 only that this time prices increase much faster than quantities.

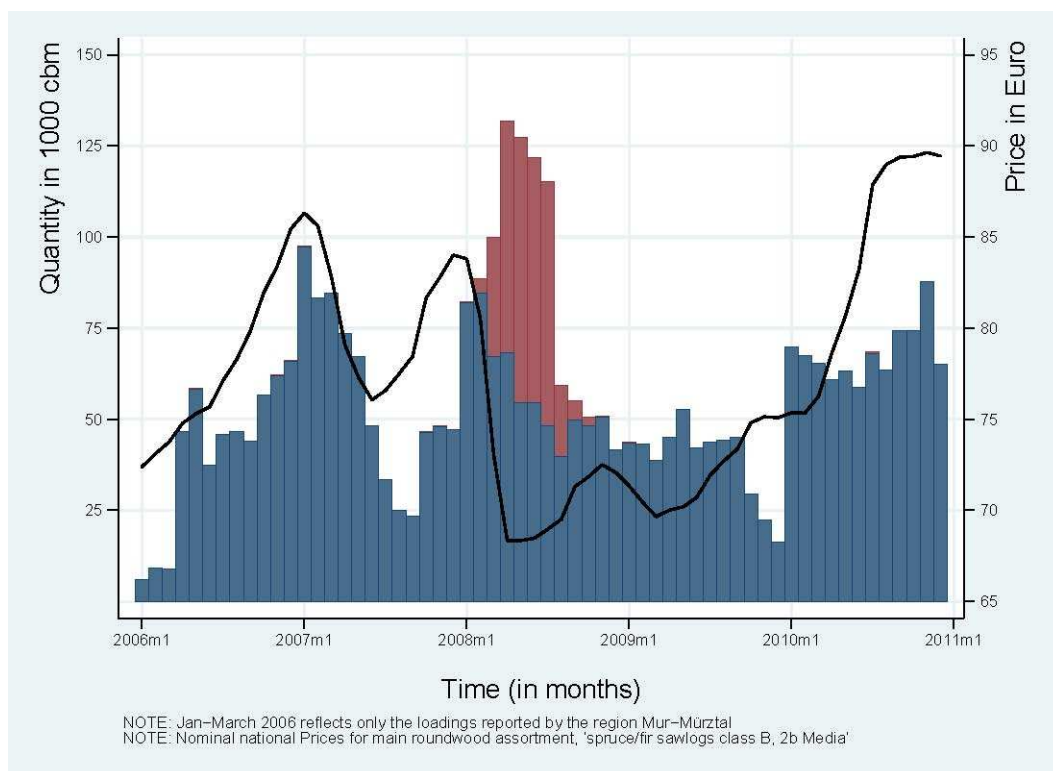
<sup>12</sup> Schwarzbauer, 2009

However, there are also a few explanations at hand. The windstorm Emma (March 2008) caused severe calamities in at least three regions of the SFA, which explains removals over 100.000 cbm in the subsequent months. On the other hand, national and even European prices crashed since this storm affected not only parts of Styria but most of Central Europe. In the following months losses due to the windstorm were processed. Full stocks and low prices in the aftermath of Emma kept the fellings under 50.000 cbm per month. Further, one has to recall, that the financial crisis additionally kept the prices at levels between 70 and 75 Euro. The year 2010 is marked by a distinct (global) recovery from the financial crisis leading to price rises up to 90 Euro per cbm. Quantities remain on a high level with around 70.000 cbm per month on average. This may indicate some kind of upper capacity constraint.

Before further observation and interpretations take place the next section introduces a variable which captures the fact that in a certain period or month windstorms occur: the windstorm dummy variable.

### 3.2 The relation between quantity supplied and windstorm variable

Windstorms create distortions. These distortions usually have two main effects in the field of forestry. First, they create extra quantities, which under Austrian law have to be retrieved from the forest. And second, these extra quantities of wood may in turn create price distortions. In order to build a model which explains the quantity supplied, these distortional effects have to be implemented. This is done with the help of a dummy variable, which is zero by default but reveals the value of 1 for those months in which quantities due to windstorms have to be processed. Note that it does not mark the moment of a storm, but rather the time period till all extra quantities are worked off from the forests. In the panel data set, the windstorm dummy variable was set to 1 for all loadings which were specified as „pool-priced“. This means that these quantities were not marketed immediately but moreover gathered by the SFA and marketed collectively until - little by little - all extra quantities were sold for a pooled price. This affects only the months from March 2008 until September 2008. Figure 2 updates figure 1 insofar as it shows in red the quantities which were due to the windstorm Emma.



**Figure 2:** Total monthly quantities: blue = normal; red = windstorm

Another interesting observation is visible. In many cases first the price changes its direction and then quantity adopts that change of direction a couple of month later. This may refer to the above addressed fact that prices determine the quantity supplied. This „naked-eye“ observation shall now be backed up by applying basic time-

series analysis. In other words, a time series regression is used to find out whether total supply reacts on price changes immediately or with a time lag. In order to do this the total quantity supplied is regressed on prices corrected for price distortions due to windstorms.

The model is described by the following equation

$$S_t = c_1 P_{t+h} + c_2 WS_t \quad (1)$$

where  $S_t$  describes the quantity supplied in period  $t=1,2,\dots,60$ ,  $P_{t+h}$  represents the price in period  $t$  which may be lagged by  $h=0,1,\dots,6$  periods and  $WS_t$  is the dummy variable indicating that timber was processed due to windstorms.

The first seven columns of table 1 show the coefficients of price dependent on its lag  $h$ , the windstorm dummy variable, the adjusted R-squared, and the number of observations.

Surprisingly, the simple model from equation 1, which uses only prices and the windstorm dummy variable to explain monthly total supply, have all an adjusted R-squared of more than 0.5. This means that without adding further explanatory variables, these two variables explain more than half of the variance of total supply. Leaving out the windstorm variable as shown in column 8 yields in a sharp drop of the explanatory power of this simple model. The conclusion is that the windstorm variable plays an enormous corrective role.

**Table 1:** Lagging prices by  $h$  periods

Regressors	Time lag in $h$ periods (months)							
	$h=0$	$h=1$	$h=2$	$h=3$	$h=4$	$h=5$	$h=6$	$h=0$
price ( $h$ ) (s.d.)	2.07* (0.44)	2.19* (0.41)	2.24* (0.38)	2.26* (0.37)	2.25* (0.40)	2.02* (0.47)	1.38* (0.57)	1.98* (0.53)
WS (s.d.)	67.14* (8.62)	63.56* (7.72)	57.28* (6.94)	50.37* (6.39)	44.36* (6.64)	39.69* (7.44)	38.87* (8.59)	
Adj $R^2$	0.50	0.55	0.58	0.61	0.58	0.51	0.41	0.18
Obs.	60	59	58	57	56	55	54	57

\* significant on a 1% confidence level

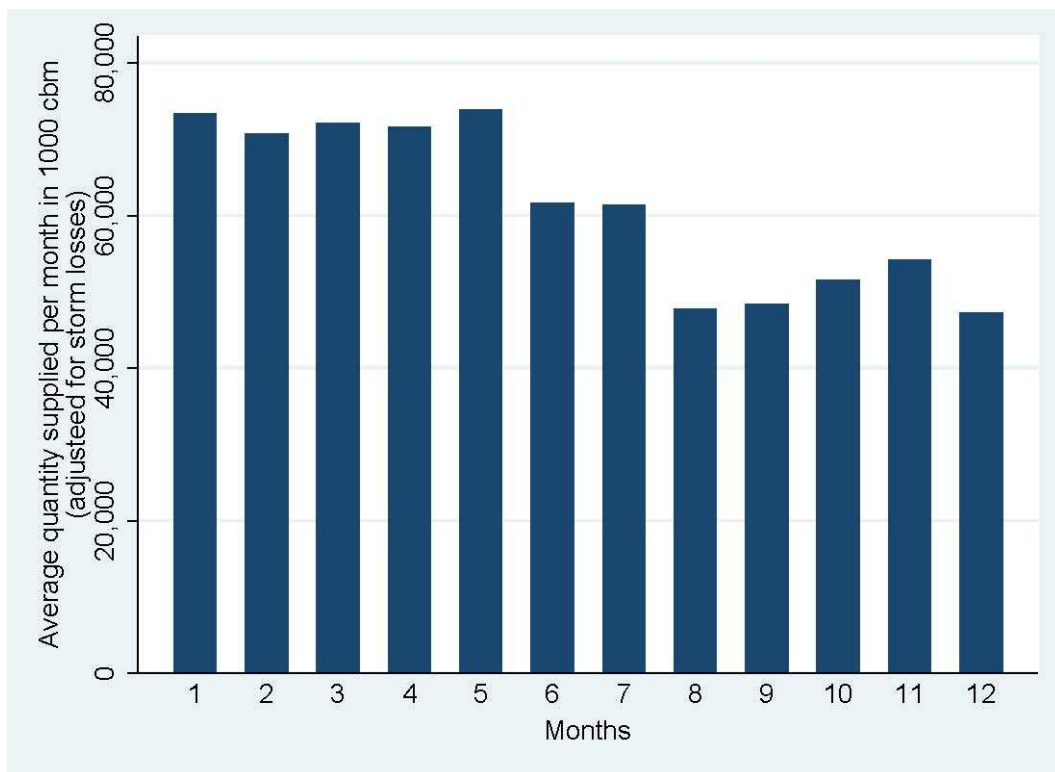
When it comes to identifying the correct lag order of the price, table 1 shows that the coefficient as well as the adjusted R-squared are highest when the time lag is 3 periods. This result may be interpreted in a way that the development of the prices is 3 periods ahead of the development of the total quantity supplied. In other words, price changes may on average affect the quantity supplied with a time lag of three months. This result has huge implications for the final aim of the project of forecasting total monthly supply.

### 3.3 The relation between quantity supplied and seasonality

When analysing total monthly timber supply from small-scale forest owners, seasonality supposedly plays an important role. In contrast to yearly data for which seasonality obviously plays no role at all, monthly quantities are influenced by the time of the year. The reasons at hand are plenty. First of all, almost all suppliers have an agricultural background. This means, the time of the year decides - as for all farmers - which work has to be done first. During harvest time usually there is no time left to work in the forest. Consequently the months of July, August, and September should show less quantities on average. The winter time - on the contrary - should show more supply, since farmers firstly have more time as there is less work to be done on the fields and in the



stables and secondly during the cold months trees grow slower which improves the quality when cut. But in the case of strong winters with snow depths of more than approximately half a metre, work in the forest becomes impossible. Summarizing the above, during summer months less quantity is expected while during winter time more quantity should be supplied - on average.

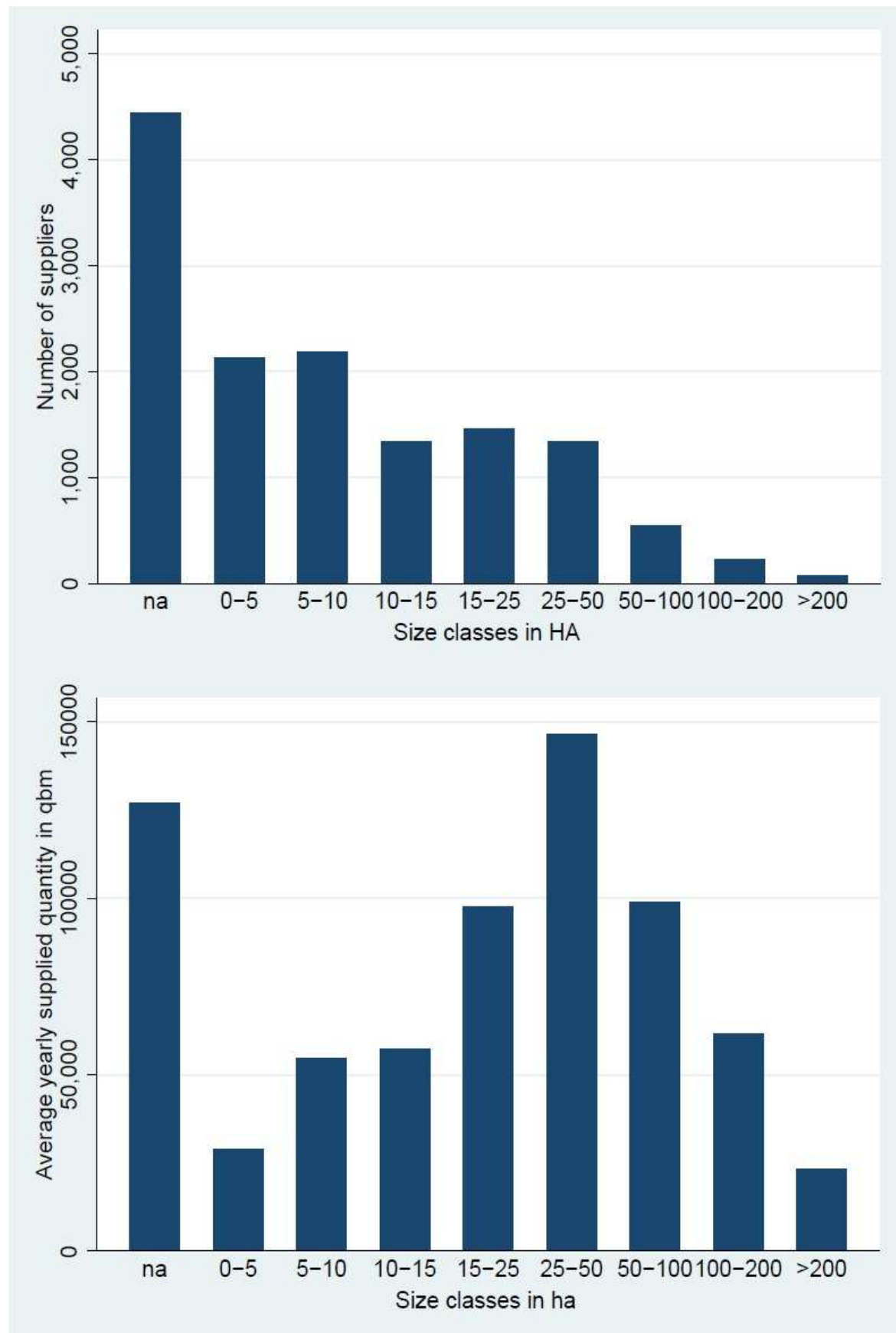


**Figure 3:** The relation between quantity supplied and seasonality

Figure 3 shows the quantities supplied - corrected for the storm losses - on a monthly average. Note that only four or five years form the average which may support the appearance of unexpectedly high or low monthly averages. This might be the case when in a certain year a rather extreme event happened. This might be true for the months of April and May. Although the quantities shown are already corrected by the extra quantities due to the windstorm Emma, there might be a certain amount of timber which resulted from that storm but was not marketed on the above described pool-priced basis. If this is true - which has to be assumed - then especially the months April and May in figure 3 might overstate the monthly average. With that in mind, average monthly quantities do in fact decrease from January to August or September and then start to rise again with the beginning of the winter time. Just December shows a sudden decrease, which might be explained by the fact that less timber is harvested during Christmas holidays. So, the monthly averages behave in a way as it was expected with the exception of the above mentioned for the month April, May, and December. As time goes by and further years are observed, monthly averages may move to their true values. The implication of this result for following work is quite clear: when it comes to forecasting monthly total supply, seasonality has to be accounted for. A quantification of this effect is also left for later.

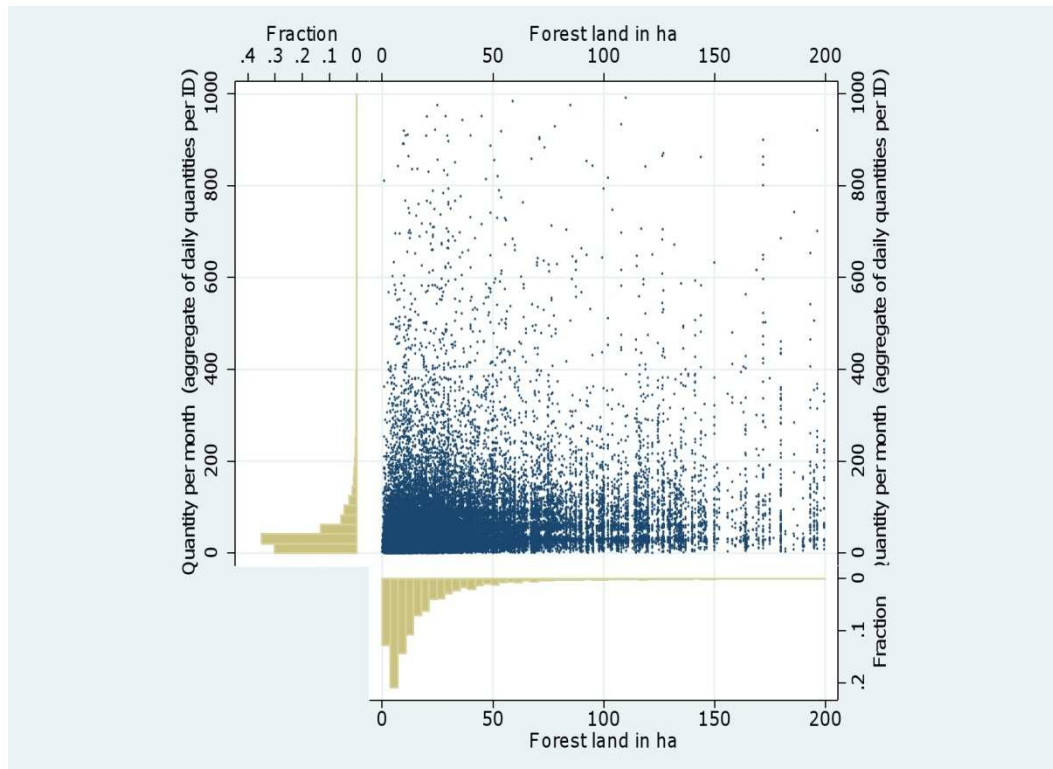
### 3.4 The relation between quantity supplied and plot size

As a last supply affecting factor introduced in this work, the interrelation between supply and the individual plot size is analysed. Plot size is assumed to have a positive effect on the amount of quantity supplied for the simple reason that larger forest lands - on average - are supposed to induce higher amounts of harvested timber. It is used as a good proxy for growing stock. This is obviously not true when looking at a single supplier with a certain plot size because this supplier could have harvested everything just in the last period and therefore is not able to supply timber for the next decades. But when looking at all of the almost 9300 of 13.750 suppliers, for which information about the plot size is available, general statements referring to the average supplier can be given.



**Figure 4:** Number of forest owners per size class and the corresponding yearly average supply per size class

In figure 4, plot sizes are grouped into size classes. While the upper panel of figure 4 shows the total number of suppliers per size class in ha, the lower panel shows the amount of timber harvested - on a yearly average - by each size class. The 4450 suppliers with no information about their plot sizes supply around 125.000 cbm per year. While the number of suppliers of the two smallest size classes is highest, their average yearly supply amounts to only 25.000 and 50.000 cbm per year respectively. On the other hand, the number of suppliers of the size class of 25 to 50 ha is only around 1250, while that size class's yearly average supply is highest with almost 150.000 cbm per year.



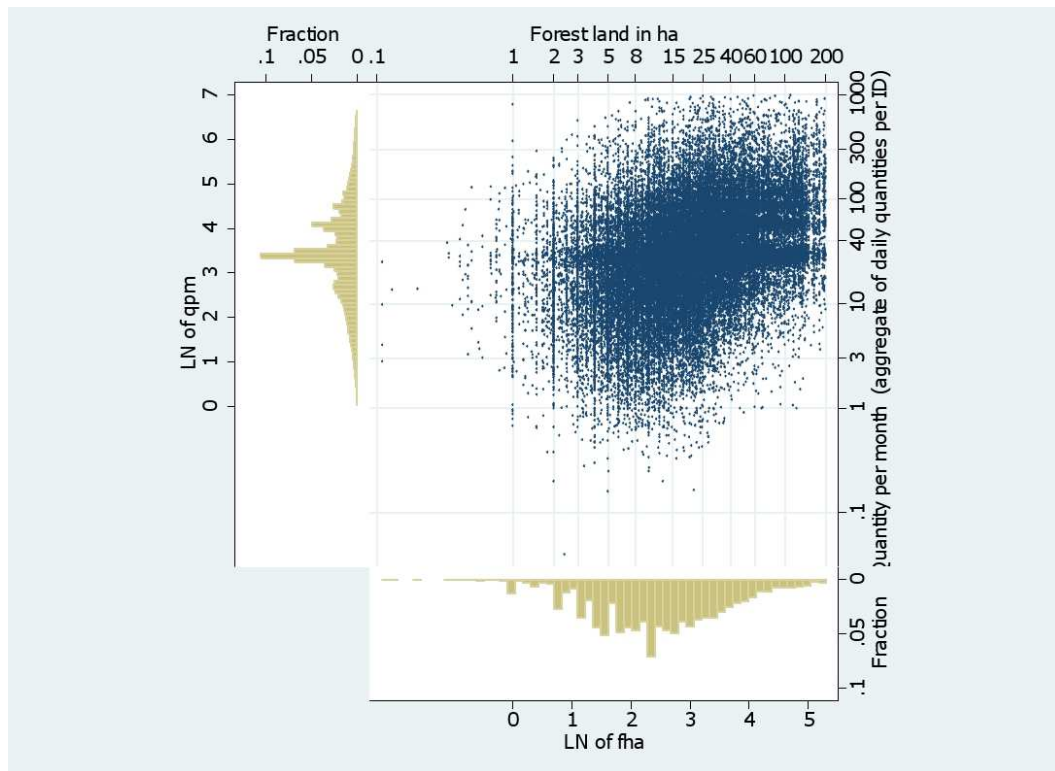
**Figure 5:** Distribution of forest land and individual monthly quantities

Figure 5 shows a scatter diagram where the size of the forest land is plotted against the individual quantity per month. This latter variable - individual quantity per month - represents the amount of timber supplied by every single supplier in every month. This yields in a total of around 825.000 observations<sup>13</sup> of which „only“ 63.600 observations are non-zero. Plotting those 63.600 non-zero quantities against their respective plot size yields figure 6 which was capped for reasons of visualization at a maximum of 200 ha of forest land as well as a maximum of 1000 cbm individual supply per month. Additionally, histogramms were added for a better understanding of the distribution of the two variables. The scatter plot concentrates its mass close to the origin which means that many suppliers of the smaller size classes deliver quantities which are mostly smaller than 50 cbm. After that, forest land and the quantities show a fading out behaviour.

Since these kinds of distributions are inconvenient in a later regression analysis, the usual way to deal with that is to take the natural logarithms of the variable. The simple effect is that the distributions are now rather normal than skewed to the right. Figure 4 shows the result of this procedure which usually is rather uninteresting. In this case however, it reveals a property of the data set which can best be seen from the left histogram which now has a log-scale. In this histogram three spikes appear at 3.4, 4.1, and 4.5 which translates into quantities of 30, 60, and 90 cbm. In other words, the distribution of logged quantities is normal; with the exception that certain amounts gather more “mass” than others. The explanation for that behaviour - at first quite striking but on second thought rather clear - is that these numbers mark the capacity of one, two, and three truck loads. The high concentration around these numbers is explained by capacity constraints regarding transportation. This means that, from the point of view of a small-scale forest owner, it is cost-efficient to use all available capacity per

<sup>13</sup> 60 observations (months) pro supplier

truck. On the other hand, it makes no sense to harvest timber which needs 1.3 timber wagons because the price of two transporters has to be paid then.



**Figure 6:** Distribution of forest land and individual monthly quantities after taking natural logarithms

Regressing the log of the monthly non-zero quantity of each supplier on their plot size yields an elasticity of 0.35. In other words, for a 10 percent increase in the quantity supplied one needs on average an increase of 3.5 percent in forest land. The explanatory power of this incomplete model is with an R-squared of 0.13 quite good. It is statistically significant on the lowest significance level of 0.01.

The implication for the construction of a model of this finding is that the plot size influences the quantity supplied by each supplier. On an aggregate level this result may be unimportant since plot sizes usually do not tend to change on a monthly basis. But still, it is possible that the price elasticity of supply on an aggregate level might depend on the plot size.

## 4 DISCUSSION

Resuming the discussion from the previous section, some suppliers might be more receptive and responsive to price signals because they can afford to postpone a planned removal into next year or even later. This is possible because their principal income is not effectuated through the sale of timber but rather through the sale of their agricultural products or through sector-different labour income.

For the planned forecast of total monthly supply it might be interesting not to randomise over all suppliers, but to calculate different price elasticities of supply for different groups of suppliers. But on what basis do you classify the suppliers?

Since plot size does matter, according to the above findings, a segmentation of the suppliers according to their plot size is the most obvious way. But is it the most appropriate one? For instance, suppliers can also be grouped according to their frequency of supply. In this sense, frequent suppliers may tend to be more inelastic than sporadic suppliers. It can also be a combination of both and/or other factors which might be summarized in a certain index. But how to construct such an index? These and other interesting questions are tackled in future work.

It is also very interesting which estimator to use in the subsequent econometric panel estimations. As addressed before, the panel introduced here contains mainly zeros. How to handle this specific and rather un-

typical issue? Ordinary estimators (OLS) are already out of the game because basic assumptions are not met. Further, it does not exploit the advantages that come along with the panel structure. Panel estimators might be appropriate, but still the non-trivial number of zeros, which awkwardly skews the distribution to the right, might lead to wrong conclusions when not accounted for. A third possibility is to use a tobit model which turns the quantity supplied into latent dependent variable with misleadingly so-called „censored“ observations. Threshold models, another possibility, assume that when a certain price (threshold) is crossed the model reacts in a different way. And finally, a hurdle model can be used. This two-step model first tries to answer the question whether the single supplier decides to supply or not to supply (probit model). Then in a second step the model tries to estimate the quantity delivered for those suppliers who decided to supply timber. This discussion of the right model will also be addressed in the planned works. For a detailed description of the workings of such models the reader is directed to Baltagi (2005) or Long (1997).

As a final concluding remark, the broad possibilities this unique panel data set has to offer, have to be highlighted once again. The combination of microeconomic and macroeconomic data on the basis of monthly time intervals allows to ask and hopefully answer a totally different set of questions.

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# THE COMMONS IN SOUTH WEST GERMANY: PROSPERITY, DECLINE AND TRANSFORMATION

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## 1 ORIGIN, LEGAL BASIS AND PROSPERITY OF COMMONS

The idea, to use a resource system commonly, was introduced by German nations and tribes in West and South Germany. During a long period – the 3rd to 6<sup>th</sup> Century - Europe experienced and suffered under large waves of migration from the north and east to the south and west. As a result, Middle Europe was in great parts depopulated. German tribes used the new situation, conquered and settled in large parts of what we today call Germany, mainly in southern and western Germany. They brought with them their own legal concept, primarily based on customary law.

The understanding of property rights was remarkable. For new settlements and their inhabitants, usually small villages of 5 – 10 farm estates, the right to use a land resource was decisive. The right to possess a piece of land was not the priority that it later was. Consequently, Germany customary law differentiated between the right to use and the right to possess. Another distinction was made between resources which were objects of common use e.g. forests, pastures, water, paths and trails, and resources which were objects of individual use – all the arable land belonged in this category.

Arable land was divided into small parcels and each parcel was assigned to a farmer and his family who were responsible for its cultivation. According to the primarily used Three-Field-System of rotation, land within the village boundaries was divided into three zones of similar sizes. Each farmer had to cultivate at least one parcel in each zone so that he could take part in the rotation system.

The “right to use” (lat. *dominium utile*)<sup>3</sup> the commons guaranteed the village inhabitants the continuing supply of products from the respective resources. The right to possess land was only of some importance to authorities who claimed this right over the commons for themselves e.g. the local lord. In many cases the question of possession of a commonly used forest was considered as unimportant as nobody claimed this right. The right to possess a forest or other part of a common was in most cases restricted by the rights of other people to use products from this resource. Full ownership with the unrestricted right of disposal (lat. *dominium*) as we know it today was not realized at this time (7<sup>th</sup> – 18<sup>th</sup> Century AD).

The legal definition was:

- the “right to use” (lat. *dominium utile*)<sup>3</sup>: this right existed independently of whether there was also a right to possess;
- the “right to possess” (lat. *dominium directum*)<sup>1</sup> a forest or other part of a common was in most cases restricted by the “right to use” claimed by other people e.g. the farmers of a village.

Property rights as we know them today with full, unrestricted ownership and nearly unlimited rights of disposal was not applicable to the legal system which was a precondition for the existence of commons over a long period.

The differentiation between “*dominium utile*” and “*dominium directum*” and the priority of “*dominium utile*” in rural settlements provided the necessary framework for establishing and maintaining the commons. Documented evidence shows that they started in the 7<sup>th</sup> Century and existed until the 18<sup>th</sup> Century (Schmidt, U.E., 2010). Within the existing legal framework the commons developed into a well organised institution. Legal prescriptions, restrictions regarding the amount of use, controls and organizing rules had become part of the system.

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<sup>1</sup> Brockhaus Enzyklopädie 1998 19 Auflage, Band 5. Mannheim S. 600.

## 2 CHARACTERISTICS OF GERMAN COMMONS

Recently, commons have been the subject of scientific investigations by Elinor Ostrom (1990). She found and published design principles which are preconditions for the success and permanence of the commons (Ostrom 1998, Table 1).

**Table 1:** Design Principles for stable resource using systems (e.g. commons)

1	Clearly defined boundaries
2	Congruence between appropriation and provision rules and local conditions
3	Collective-choice arrangements
4	Monitoring
5	Graduated sanctions
6	Conflict-resolution mechanisms
7	Minimal recognition of rights to organize
8	Nested enterprises

Source: Ostrom 1998 cited in Schurr 2006: 2 – 101.

An analysis of the since disappeared commons in Germany, shows that they were based on the same principles which ensured their stable functioning. Common use had often been organized in associations, so called *Markgenossenschaft*. They were characterized by:

- Fixed boundaries between the villages marking their specific boundaries (Principle 1).
- Having their own economic system regulating the use of the forests. Each entitled member of the community is subject to limitations with regard to the quantity of fuel wood, construction timber or number of cattle which could be brought into the forest. There were also limitations regarding the time for timber harvesting e.g. only in winter and in different weeks for fuel wood and sawn timber. Also the locality for cutting was defined; timber-harvesting was concentrated on marked places which changed from year to year. (Principle 2 and 3).
- Jurisdiction had been established with court days, judges of the forests and lay assessors applying customary German law (Principle 6).
- Institutions built up by statutes, the election of a chairman or mayor, the nomination of forest guards to control the prescriptions (Principle 4 and 6).
- Self-government, although the *Markgenossenschaft* were often influenced by higher authorities, mainly the local lord. They could influence the organization and regulation of the commons and a great variety of such influence could be found. The sovereign head of a larger country (e.g. a duke) could help or limit their freedom of action (Principle 6 and 7). Such influences varied between regions and over time. Starting in the 16<sup>th</sup> and 17<sup>th</sup> Centuries the strong restrictions by the sovereign were sometimes one factor contributing to the decline of the commons.

The historical survey shows that the principles found in today's existing commons by Ostrom (1998) are also valid for explaining the foundation of the commons in Germany more than 1,000 years ago and their maintenance into the 16<sup>th</sup> Century.

## 3 DECLINE AND TRANSFORMATION OF THE COMMONS

The historical review of the commons in Germany shows a success story during the period from the 7<sup>th</sup> to 15<sup>th</sup> Century. With the end of the Middle Ages and beginning of the “Modern Times” in the 16<sup>th</sup> Century a process could be observed which endangered the stability of the commons. However, historical research about the reasons for this development is often made more difficult by a lack of documentation and knowledge about



details which are difficult to interpret. Ostrom's research results into existing commons were used to develop a structure to systematically investigate the decline of the German commons. She found not only the principles for success but also the risk factors which influence the stability of commons in a negative way (Ostrom 1998).

**Table 2:** Risks for the foundation and maintenance of stable common resource systems

1	Blue print thinking
2	Over reliance on simple voting rules
3	Rapid exogenous changes
4	Transmission failures
5	Turning to external sources of help too frequently
6	(International) aid that ignores indigenous knowledge and institutions
7	Corruption and other forms of opportunistic behaviour
8	Lack of large scale supportive institutions

Source Ostrom 1998 cited in Schurr 2006: 2 – 101.

If the eight risks listed in Table 2 are compared with the results of historical research in Germany, only one risk factor was found to be of great importance. The key influencing factor was "Rapid exogenous changes". However it was took three centuries (16<sup>th</sup> – 19<sup>th</sup> Century) until nearly all the commons in Germany had disappeared.

As described early, two prerequisites had been the main factors for the prosperity of the commons.

- i) The splitting of the property rights into two parts, the right to possess (*dominium directum*) and the right to use (*dominium utile*), with the right to use having the clear priority
- ii) The stability of the society, mainly the rural population, so that Ostrom's "design principles" could be realized over time.

### 3.1 The erosion of the dual property rights system

In the 15<sup>th</sup> and 16<sup>th</sup> Centuries, the principles of the Roman right were increasingly introduced and adapted in Germany. In particular, the authorities – the sovereigns and their staff – used this new juristic instrument to expand and intensify their sovereignty. The new juristic framework brought a great change; it did not accept the dual property right system. As a first step the newly trained legal experts (jurists, lawyers) tried to break the priority of the right to use. Their aim was to establish new titles with the right to possess.

At this time in commonly used forests, there often existed an inextricable mixture of rights to use and rights to possess. This led to many conflicts between the two parties entitled to claim rights which were often taken to court. These disputes were often taken to a higher or the highest court and could last many years or even decades (von Below & Breit 1998 pp 57-236).

In the system of the Roman right, property rights were understood as comprehensive with the unlimited right of disposal over the property e.g. a forest. This concept of unbounded property rights for one person or a group of persons was finally realized at the end of the 19<sup>th</sup> Century. This result had not only been achieved by court decisions, other influencing factors and developments had also been necessary.

### 3.2 The change in society

The key event was the change of paradigms throughout the whole society. At the end of the 17<sup>th</sup> and during the 18<sup>th</sup> Centuries, new philosophical ideas arose and influenced the entire society. Rapid changes occurred in the political arena (American independence, French revolution, Napoleonic wars) and also in regard to the social conditions and even mental basis of people.

John Locke<sup>2</sup> (1632 – 1704) had incredible influence on the structure and characteristics of the new civil society (von Below & Breit 1998 pp 18). In his work, primarily in “Theories of the State”, his main demands were:

- Equality
- Freedom
- Inviolability for the person (indefeasibility)

These requirements influenced:

- The American declaration of independence 1776
- The French draft constitution 1791 and later
- The German constitution 1949.

John Locke also elaborated a new theory of possessions (ownership). As a result of the freedom of a person he saw property as a constitutive part of a person. Consequently he demanded the full, comprehensive and unrestricted right of disposal over a property or other possession. This comprehensive right of disposal was realized during the 18<sup>th</sup> and 19<sup>th</sup> Centuries in most countries. Naturally this new principle of property rights was in total contradiction to the division of the right to use and the right to possess. A solution had to be found to guarantee the full, unrestricted property right to the owner of a forest. The main consequence of this fundamental change was that the commons could not survive in the used structure. Thus the main task of these two centuries was to clarify the legal situation in the commons.

A political development with regard to the administrative structure of a state was helpful in this respect. Reforms in the old absolutistic regimes gave communities in Germany more political responsibility and they received more rights of self-government for defined tasks. This opened the way for communities to take over the commons in their district as new communal forests owned as communal property. Regionally this mainly occurred in Rhineland Palatinate and Baden-Württemberg.

In some cases the possessors of the right to use, mostly farmers in a community, did not agree to the conversion of their commons into communal forests. One solution was to pay the entitled persons financial compensation. This was an easy option for the possessors, but unfavourable for the users. The difficulty was to convert a permanent use of a certain amount of timber for example into monetary terms and to calculate the fair amount of money to be paid. Therefore often the farmers did not accept this agreement. In the cases where they did, the forests passed into the ownership of the state or community.

In other cases another solution was found. In a longer process with often controversial discussions the users received compensation in the form of a part of the commons. In the case of forests the area was divided into small parcels and each person or legitimate claimant was given an equivalent share. This was one of the main origins of “Small-scale private forests” in Germany. Regional concentrations can be found in Lower Saxony, Saxony, Bavaria and also in some parts of Baden-Württemberg.

In rare cases the group of legitimate users could organize themselves apart from the political community and successfully claim the full ownership for a certain forest which they had commonly used.

In the German Civil Code paragraphs had been inserted which allowed the existence of the shared ownership of a forest by a group of persons. They had special terms such as “Realgenossenschaft”, “Realgemeinde” or “Waldmärkerschaft”. All are associations of persons who own a share of a commonly used forest. They have a legal status and the required organising structures as statutes. These still existing associations are relicts of former commons and are often based on an old tradition with a long history. Adapted to our legal system they show us how commons successfully worked in olden times and how they can be used as model in our time to overcome problems and for the successful management in regions with small-scale forest units of ownership.

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## DEVELOPING FORESTRY-RELATED LIVELIHOOD PROJECTS FOR PHILIPPINE SMALLHOLDERS

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### ABSTRACT

This paper reports the development of a business case – including financial, social, environmental and institutional analysis – and development of implementation plans, for community livelihood projects in upland areas in the Philippines. Two particular project types – production of briquette charcoal and of compost from forest and crop harvest residue and domestic waste – are found to be financially viable and have environmental benefits. These seem well suited to traditional communities in upland areas, as part of a package to involve them in reforestation for watershed protection.

### INTRODUCTION

Deforestation has been a major concern in many countries during the 20<sup>th</sup> century. However, as reported in FOA (2006), forest loss in some regions of Southeast Asia has been halted from 2000-05, with major reforestation recorded in China, India and Vietnam. There is a body of research into the reasons for forest transition (FT) in undeveloped countries (Rudel et al. 2005, Nagendra 2005, Mather 2007, Santos et al. 2011) and factors leading to reforestation that are taking place in these countries. Some parallels may be observed between the European and North American experience of reforestation levels during the 19<sup>th</sup> and 20<sup>th</sup> centuries and the current reforestation witnessed in Southeast Asian countries. Mather (2007) concluded that the reasons for FT in Asian countries were complex and require further research regarding the relationship between reforestation and forestry governance policies in these countries.

Pulhin et al. (2007, p. 872) observed that the introduction of Community Based Forestry Management (CBFM) in the early 1990s witnessed a ‘galloping expansion’ in forest cover in the Philippines. These authors further argued that whilst the growth in forest cover was impressive the real test of the success of CBFM programs had to be measured in how these programs affected local communities. The literature suggests that institutional interference and the lack of suitable livelihood projects for local communities to date have meant that CBFM programs have not delivered on the major goal of decreasing poverty in upland communities (Pulhin et al. 2007, Villamor and Lasco 2009, Santos et al. 2011).

Harrison et al. (2004) defined a CBFM as an agreement between the Department of Environmental and Natural Resources (DENR) and a People Organisation (PO) for a duration of 25 years renewable for a further 25 years subject to satisfactory performance. The agreement required the PO to manage the forest sustainably and reforest the parcel, through which the PO receives tenurial security. Pulhin et al. (2007, p. 874) reported that ‘An assessment of 155 CBFM sites indicated that 116 or about 75% have been rated not to meet the minimum criteria set in terms of support for non-forest-based livelihood activities’ and observed that ‘major obstacles include unstable policies on timber utilization and bureaucratic requirements’. They further argued that the lack of capital to finance livelihood projects made POs vulnerable to middlemen who dictated the price of timber, and that in many cases organizational skills of the POs had been overestimated by the project organizers. This led to the conclusion by Pulhin et al. (2007) that the CBFM projects require not only financial assistance but capacity building amongst the POs in order that these groups can make sound decisions about project management. They further concluded that though to date the livelihood projects in CBFM areas had not been as successful as anticipated the experience should be utilized to design management systems to assist POs to develop more sustainable business models.

As reported by Santos et al (2011), a domestic timber shortage now exists in the Philippines, and further incentives are needed to make smallholder forestry or *treefarming* a more attractive investment, promote greater national timber self-sufficiency, support rural incomes, and generate environmental benefits. Currently, the profitability of treefarming appears to be marginal for smallholders. Some of the measures by which treefarming

could be made more profitable include promoting increased stumpage value, introducing some form of payments for environmental services (PES) for treefarmers, and increasing seedling quality. Various measures to increase stumpage prices for treefarmers have been trialled in a series of forestry projects funded by the Australian Centre for International Agricultural Research (ACIAR), as reported by Harrison et al. (in process). A number of research studies have examined the potential for PES initiatives (e.g. see Pasa 2007, Bishop et al. 2009, Villamor and Lasco 2009). Increasing seedling quality has been the focus of ACIAR project ASEM/2006/091 (Gregorio et al. 2008).

This paper investigates the potential to increase the profitability and sustainability of smallholder forestry projects – including watershed rehabilitation – in the Philippines, through utilizing forest harvest residue and other biomass for production of renewable energy and organic fertilizer products. The rural household energy situation in the Philippines is first examined. Case studies of the two types of livelihood projects are then introduced by presenting the production technology for DENR charcoal briquettes (DCB) and windrow composting. Each project type is then evaluated against financial, social, environmental and institutional criteria. Concluding comments follow.

## The importance of timber as cooking fuel in upland communities in the Philippines

Rapid population growth and increasing fossil fuel import prices are forcing up household energy costs in the Philippines, and highlighting the importance of developing alternative sources of household energy for poorer communities. According to Samson et al. (2001), 75% of the entire biomass production in the Philippines is utilised as cooking fuel. NSO (2004) observed that the majority of Philippine families purchasing fuelwood, charcoal or biomass residue use this as a source of energy for cooking. The NSO (2004) survey observed that use of fuelwood, charcoal or biomass was prevalent in the income classes earning less than 10,000 PhP (US\$ 200) per month. Samson et al. (2001) and Arcenas et al. (2010) expressed some concern over the rising problem of pulmonary diseases in Philippines amongst woman and children, which they linked to inhalation of smoke generated from utilizing wood-related cooking fuel. They further reported that improvements in stoves utilised to burn wood-based cooking fuels would substantially reduce smoke-related health problems. Table 1 report that amongst the families that use wood as an energy source the majority of thee families utilize wood as a cooking fuel in the Philippines. Table 2 reports on the importance of wood as cooking fuel in southern Mindanao. The figures in Table 2 are relevant to this paper as the intended watershed rehabilitation is in the reported area.

**Table 1:** Utilization of non-fossil fuel as cooking energy in the Philippines

Source of energy	Share of total consumption utilised for cooking (%)	Number of families naming the energy resource as their main source of fuel (million)
Fuelwood	99%	9.2
Charcoal	88%	5.7
Biomass residue	86%	3.2

Source: NSO (2004).

**Table 2:** Numbers of households using various types of cooking fuel, southern Mindanao

City or municipality	Electricity	Kerosene	Liquid petroleum gas	Traditional charcoal	Wood	Others	None
Banga	181	374	1696	938	10,713	36	163
Koronadal City	740	1,608	8694	3891	12,110	19	561
Norala	223	287	1174	538	5,918	12	111
Polomolok	682	2490	7358	1038	10,596		328
Surallah	270	775	1925	559	9,674	20	411
Tampakan	37	231	875	341	5,178	11	81
Tantanga	58	253	930	482	4,851		9
T'boli	10	453	377	472	11,191	11	165
Tupi	81	426	1657	256	8,414		215
Sto.Niño	138	195	1074	227	5,349		99
Lake Sebu		581	198	142	10,051	20	166
Total	2,420	7673	25,958	8,884	94,045	129	2,309

Source: Bacongus (2009).

Boconguis (2009) highlighted the importance of wood-related sources of cooking fuel in southern Mindanao. The quantities – reported in Table 2 –combined with the figures in Table 1 reveal a pressing need to replace the woody cooking fuels with a more environmentally friendly cooking fuel. Samson et al. (2001) and Baconguis (2009) identified that the alternative cooking fuel would need to be relatively inexpensive and require low capital outlay in adaptation.

### Importance of adopting composting and organic fertilizer in Philippine farming practices

Since the beginning of the green revolution in the mid-1960s there has been rapid growth in inorganic fertilizer usage throughout the world. Consumption reached a plateau in developed countries in the 1990s but continued an increasing trend in Asian countries (Hossain and Singh 2000). In the Philippines the consumption had reached 542,670 mt by 2006 (BASP, 2010). The increasing demand on food security in the Philippines has further fuelled the demand for increased yields from arable land. Buresh et al. (2009) reported that most farmers have a poor understanding of appropriate fertilizer application rates and believe that more fertilizer automatically equates to higher yield and financial returns. This has led to over-utilization of inorganic fertilizers with all the environmental consequences that this created, and accelerated poverty amongst the farming community due to extortionate chemical fertilizers prices (Concepcion 2006).

Table 3 is an illustration of the amount of organic fertilizer used for various crops in South Cotabato province in Mindanao. The area represented in this table amounts to only 2% of the overall area that is registered as farming land in South Cotabato. Strong interest by representatives of large farming and horticultural cooperatives in utilizing compost and organic fertilizer was observed during a visit to South Cotabato province in 2010. Subsequent interviews with local government representatives and local industry development agencies further confirmed the interest in promoting usage of compost as an organic fertilizer to local farmers. The local fruit and vegetable cooperatives indicated that they would purchase the entire production quantity because they realised that falling fertility of their land was linked to over-usage of chemical fertilizers and that there was a need to return organic matter to the soil.

**Table 3:** Areas and quantities of compost sold for the main crops produced in South Cotabato Province in the 1<sup>st</sup> quarter of 2007

Crop fertilized	Area of application (ha)	Quantity (tonnes)
Palay	1,350	540
Corn	397	200
Banana	785	196
Asparagus	65	37
Papaya	15	2
Durian	35	42

Source: PCARRD (2008).

The Department of Agriculture (DA) launched a program of ‘Balanced Fertilization Strategy’ in 1997 to combat poverty concerns in rural communities, deteriorating soil fertility levels, and decline in water and air quality in the Philippines. The program was financed by the Japanese government and the Philippines National Agricultural and Food Council (NAFC) and has reached Phase 3 in which it aims to promote use of a mixture of chemical and organic fertilizers, the latter including compost.

### Watershed rehabilitation in the Philippines

Brooks and Eckman (2000) argued that the importance of healthy watersheds can be traced back to early civilization and illustrated this statement with the Chinese proverbs ‘whoever rules the mountain also rules the river’ and ‘green mountains yield clean and steady water’ (p. 11). These statements highlight the economic and social importance of healthy watersheds. Brooks and Eckman (2000) further argued that ever increasing population was of real concern to the sustainable development of these watersheds and recommended that management plans be introduced to save and repair watersheds throughout the world. The consequences of not managing watersheds (landslides due to deforestation, decreasing potable water supply, increasing poverty in upland communities, social unrest created by heavy-handed institutional intervention) have been widely reported

(e.g. by Brooks and Eckman 2000, Arocena-Francisco 2003, Guiang 2004, Harrison et al. 2004, Lasco and Pulhin 2006, Nagendra 2007).

Over the last two decades CBFM programs have been introduced in the Philippines in response to the increasing problem generated by continuous watershed degradation (Lasco and Pulhin 2006). As of the end of 2009 the Philippines reported 1790 registered CBFM projects covering an area of 1.63 million ha (DENR 2009). The CBFM program was introduced in 1995 as a national strategy for sustainable forestry and social equity, and embraced community reforestation programs dating back to the 1970s.

CBFM as a watershed rehabilitation and forestry program has had mixed results. Various authors – including Pulhin et al. (2007), Bishop et al. (2009) and Villamor and Lasco (2009) – have argued that to increase the success of watershed rehabilitation there is a need to involve upland communities in the design of the rehabilitation management plan, deliver relevant livelihood projects, utilize local expertise when designing and implementing livelihood projects, build capacity regarding financial management of the projects, and facilitate access to institutional services in order to build better cooperation and reward communities for the environmental services (ES) that have been created through their watershed rehabilitation.

## Description of the case study area

The case study is situated in the Philippines, embracing three watershed areas in the Visayas and Mindanao. Data collected in 2009-10 was initially used to form the base of a financial, social and environmental analysis of a set of eight forestry-related livelihood projects: timber milling at a central sawmill, mini-sawmilling, furniture making, production of wooden pallets, windrow composting, vermicast production, production of DENR charcoal briquettes, and wildling collection. The project anticipates recommending tree planting as a way of securing sustainability of the timber-related livelihood projects. This paper reports on two of these projects, viz. DENR charcoal briquettes and windrow composting as livelihood projects.

## RESEARCH METHOD

The primary information gathering for this paper was part of larger set of interviews with stakeholders who have direct input in upland communities' livelihood projects in the Philippines. During the data collection period interviews were conducted with officers in government agencies, NGO representatives, in-country researchers as well as local business people directly involved in timber-related industries. The social data were collected through a workshop and personal interview with a local anthropologist who had extensively studied the communities involved in the watershed rehabilitation area. Further primary data were collected by interviews with business people in Brisbane, Australia, involved in sawmilling and windrow composting, so as to include recent commercial experience and research data. Secondary data were assembled from literature reviews on the web and past experience from members of the research team.

A case study method was adopted, in which production of DENR charcoal briquettes (DCB) and windrow composting were investigated. The research comprised developing descriptions of the products and best management production methods, identification of markets, and required levels of expertise and training. Also, the supply chain and the business justification for each product type were critically examined, including financial analysis following the method of Dayananda et al. (2002).

The triple bottom line model was used (similar to that of Hacking and Guthrie 2008) with the added component of institutional analysis. This fourth component integrated the national, regional and local institutional parties and their policies as intrinsic project stakeholders. The input of institutional organizations with the design of the project was considered to be helpful in augmenting the cooperation between the communities and the institutional organizations.

Information sources for briquette charcoal was obtained through DENR in Philippines Region 11 (Davao) and DENR research section the Ecosystems Research and Development Bureau (ERDB) in Los Baños. DCB production is promoted by DENR as a livelihood project for communities affected by watershed rehabilitation programs. The introduction of briquette charcoal is seen as a way of reducing demand for fuelwood and fossil fuels for cooking, throughout the Philippines (Bacongus 2009). The technology received the national seal of approval through the *Climate Change Act, 2009*. During the data collection period DENR in Region 11 organized an inspection of a commercial DCB production centre run by Share an Opportunity Philippines Inc in Polomolok. The visit was utilized to obtain information about the production method of DCB and to validate



some of the financial data with DCB producers. The visit to a DCB production plant was utilized to collect information on problems with community acceptance of the technology to produce DCB and the suitability of DCB as substitute cooking fuel. Interviews were conducted at the University of Philippines Los Baños (UPLB) campus with ERDB researchers who are leaders in the Philippines in designing and promoting the new technologies for briquette charcoal. This information was particularly useful for financial analysis of the project as well as obtaining background information to build a business case.

## **Production and technology to produce DENR charcoal briquettes and windrow compost**

### **DENR charcoal briquettes (DCB)**

Feedstock suitable for production of DCB could include domestic waste (e.g. paper, cardboard), agricultural waste (especially rice straw and corn stalks), vegetation (including regrowth from land clearing for plantation establishment), forest plantation harvest residue, and fruit tree prunings (e.g. from citrus and mango trees).

There are several steps in the production of DCB which involves a relatively simple technology. The mulch must be of uniform length of (30cm) and the moisture content needs to be brought down to 50%, typically by air drying. The process will require modifying a 205 l (44 gallon) steel drum, with a chimney hole made through the lid. This is linked to a bamboo pole to collect the smoke and convert it to liquid form, reducing emissions when carbonizing the feedstock. A bamboo pipe is used to create a vertical tunnel down the centre of the drum, before loading the feedstock. The bottom layer of the drum is loaded with a mixture of small dry twigs or straw for initial ignition of the feedstock. The remaining content of the drum is loaded up to 1cm from the open top of the drum. A set of six holes is drilled in a vertical succession (three on either side of the drum) to facilitate ignition. Once ignition has occurred, the middle and top hole is plugged with a clay bung and at the same time the lid placed on the drum. Once the bottom layer turns to glowing embers the bottom hole is covered with clay and the middle hole is unplugged. The same process is repeated with the top hole of modified drum carbonizer. The carbonizing process takes about five hours and reduces the feedstock volume by 70 to 75%.

The carbonized charcoal is allowed to cool, and then ground to fine particles. A grinder with a 5HP electric motor is well suited for this task. A dust exit pipe covered by a wet sack will eliminate most dust and the associated health risk to the operator and any bystanders.

The carbonized material is mixed uniformly with a binder, for example with 10% cassava flour, cassava being readily available in many Filipino communities. A small electric or manually operated cement mixer can be used for this purpose. A uniform coat throughout the carbonized charcoal mixture will assure strong adhesion and produce firm briquettes.

The mixture is fed into a hopper, which is moved backwards and forwards over 10-hole briquettor. When the holes are full a manually operated hydraulic pump compresses the briquettes, which are then removed and placed on trays to be dried, say for one hour in the sun then two days in a covered drying shed. The final stage involves packing the briquettes in lots that would represent one day's cooking for an average Filipino family. According to Bacongus (2009) an average Filipino family would require about 1.7 kg/day (or 8 briquettes) for cooking, this being about half the quantity of traditional charcoal to obtain the equivalent

### **Windrow composting**

Suitable feedstock for compost production includes forest, farm and biodegradable house waste. Compost production essentially involves mulch being placed in windrows of say 6m long by 2m wide and 1.5m high, with environmental control and regular turning, with microbes carrying out the transformation of the organic material to a form more suitable for various uses in horticulture, tree planting and seedling potting mix. The composting cycle takes between 12 and 16 weeks. The product is sold either in bulk or in say 50 kg bag lots.

Initially the windrows are turned regular (every second day), with monitoring of moisture content as well as heat control. This labour intensive process takes about 4 weeks. As noted by Baker (2010), adequate water and oxygen is needed for production of high quality compost. For the compost production to be successful the operators will need to have a thorough understanding of the ratio of these components and how to intervene in the composting process to rectify any divergences. The compost feedstock during the initial period should have the same moisture content that of a sponge which when pressed will just release water (Baker 2010).

The next step is to use a 20 mm screen to separate out composted mulch. The sifted material with particles of between 10 and 20 mm length is suitable for use as mulch. Semi-composted mulch (with particle size greater than 20 mm), which contains composting microorganisms, is an important addition to the new batch of feedstock (Jenkins 2005). The recovery rate for compost is 50% of the original feedstock by weight (Baker 2010).

Once the compost has been cured final quality testing is performed to ensure the product reaches the reported quality level as, for moisture content (preferably about 35%), wetting qualities, pH and nutrient levels (nitrogen, phosphorus and potash). The product is then ready for bagging or bulk disposal depending on the market.

### **Finance options for the livelihood projects**

It is envisaged that the DCB and windrow composting projects would be carried out in a small subsistence community, such that financial assistance would be required to develop the projects, particularly to cover the cost of initial capital outlays. This finance could be obtained from a variety of sources, e.g. government grants or loans, formal finance institutions (Philippine banks), informal finance institutions (private money lenders), and non-government organizations and philanthropic organizations (including church groups). Consideration is also required about financial sustainability over time, after the funding support period. The financing of livelihood projects is examined in another paper, by Velge and Harrison (2011).

## **EVALUATION OF THE DCB AND COMPOSTING PROJECTS**

Production of charcoal briquettes and windrow composting were evaluated against a set of performance criteria with regard to the financial, social, environmental and institutional suitability. Financial analysis was performed using an Excel spreadsheet (illustrated for DCB in Appendix A) and comprised two parts – the assumed parameters, and the annual cash flows and performance criteria.

### **Financial performance of DCB production**

The DCB project is formulated as a biofuels livelihood project converting forest or farm waste into briquettes that are used as cooking fuel. The amount of feedstock available and the required daily briquette output will determine the briquettor size. For this project it was assumed that there would be 240 production days per year utilizing 144t of feedstock producing a total of 36,000 kg of briquettes. Bacongus (2009) suggested that a family of average size in the Philippines would utilize 1.69 kg/day.

The capital outlay of this project (\$17,126) included the land, machinery and initial training costs. The cost of the land and buildings does include fencing (\$5575). The manufacturing equipment consisted of 5 modified drum carbonizers, liquid smoke collection pipe and container, grinder, mixer, 10-holes briquettor and drying racks (\$3715). The cost for initial training and for designing the project is estimated to be \$7000. Annual operating cost (\$9689) consisted of wages (\$6000) including a supervisor and four part-time unskilled workers. All wages are inclusive of a 25% on-cost to cover allowances. The project NPV is estimated to be \$15,612 over a period of 10 years. The project NPV without capital subsidy is negative. The financial analysis does not include income from liquid smoke because this technology has not been fully investigated. The financial performance is most sensitive to the briquette price and the daily production rate.

The pricing policy for DCB will be influenced by substitute products available, notably fuelwood and charcoal. Fuelwood has often been reported as in short supply in Southeast Asia; however, unlike in drier areas in Africa and India the forecast shortage in supply does not appear to have eventuated and therefore it is important when designing the pricing policy to understand where the fuelwood supply might come from (Bensel 2008). The pricing of DCB was set to match the existing cost of cooking fuel. The research by Bacongus (2009) identified current cooking fuel in upland communities in the Philippines as fuelwood and charcoal, for which charcoal briquettes would be a substitute. The current price for DCB is \$ 0.30/kg.

### **Social and environmental benefits and institutional aspects for DCB**

The project was analysed against a set of social, environmental and institutional parameters, the research being designed to also identify non-financial differences between projects, so as to help the communities decide which projects would be most suitable as livelihood projects and how the introduction of the projects would affect their

overall wellbeing. The analyses could aid upland communities that are affected by watershed rehabilitation projects in obtaining external sources of finance required to implement these projects.

The literature review identified that an important element in the success of livelihood projects is that the communities need to be involved in the development of the design of the projects. The upland communities have experience in production of charcoal and whilst the technology to produce briquetting charcoal is very different it would require little training to produce charcoal briquettes. The project is gender neutral because the task does not require heavy lifting and can be performed around the village whilst children are at school. Young adults entering the workforce would be able to participate fully in the production of DCB in a short period and earn full wages. The production cycle can be adapted to fit daily routines of the project participants as well as other commitments to community life. DCB production could be performed as full and part-time employment. The operations manager will be involved in the day-to-day running of DCB production, and in project training activities. The project presents only a low level of concern over workplace health and safety. Health concerns would be the risk of burns caused by the heat around the carbonisation drums and when the carbonised material is removed from the drums to cool. The grinding of the carbonized charcoal can create dust, but simple dust control measures can be implemented.

Fuelwood collection has resulted in forest clearing, e.g. of hills around the communities in southern Mindanao. Switching to DCB as cooking fuel would reduce the need to collect fuelwood. Originally the feedstock would come from forest waste from plantations and orchards around the communities. It is envisaged that as part of the watershed rehabilitation project the communities would be encouraged to plant trees that would be registered with DENR for logging in the future and securing future feedstock for DCB production. Collection of fuelwood generates human traffic in the hills surrounding the communities. It has been stated that often the same areas get harvested for fuelwood and a decreased need to collect fuelwood would allow for regeneration of the hills through decreased traffic in the hills and increased germination of seedlings. The trees in the watershed rehabilitation area would be allowed to reach maturity which would increase the gene pool in upland areas. As the upland vegetation regenerates, more habitat for animals would be created. It is anticipated that through watershed rehabilitation the water quality for both upland and lowland communities would improve. Educating the communities in the benefits from improving air and water quality will help preserve the project sustainability. Bacongus (2009) observed that burning briquettes for cooking releases little or no smoke. The Asian Development Bank in its report Country Environmental Analysis 2008 (ADB 2009) stated that one third of all respiratory-related illnesses in the Philippines could be directly attributed to indoor air pollution (IAP). The report identified high usage in rural areas of fuelwood and charcoal as cooking fuel as one of the main contributors to air pollution in Southeast Asia. Liquid smoke that will be generated through the collection of smoke during the production of DCB can be used as an insecticide on fruit trees and thus reduce the use of synthetic insecticides with their adverse environmental impacts (Bacongus 2009).

The DENR promotes the adaptation of DCB technology to upland communities as a method to reduce illegal logging because briquetting charcoal can be produced from domestic and farm waste, prunings of fruit trees and harvest residue from registered tree plantations. According to the literature produced by DENR the preferred feedstock for DCB would be harvest waste from registered timber plantations and farm waste. The national government has nominated DCB as one solution to reduce the carbon emissions in the Philippines and have included DCB production in their Climate Change policy.

## **Financial analysis of windrow composting**

Two scales of operation have been examined for windrow composting production, namely small-scale windrow composting that would be suitable as a pilot project in an upland communities and a larger semi-automated windrow composting system for commercial production. The literature review conducted for this paper established that the livelihoods projects envisaged needed to be sustainable beyond the initial period, evidence suggesting that too often projects were never designed to generate long-term sustainable businesses and therefore were destined to failure.

## **Evaluation of small-scale windrow composting production**

The capital outlay for a small-scale windrow composting production is estimated at \$6079; this includes \$2060 for machinery, \$1500 for building and minor earthworks, first year training at \$1900, a further \$500 for business registration, and working capital at 2% of other capital outlays.

The operating cost of \$5083 is dominated by wages (\$4200), included the wage of a working supervisor (\$1800) and 4 part-time employees (\$2400) (each being paid \$2/half-day worked). The financial analysis assumes that the employees work the equivalent of 48 weeks per year and 5 days per week, though in reality it is likely that job sharing will take place and the time allocated to the project will be greatest when cropping labour demands are low.

The project size envisaged would be small, with 2 windrows of dimensions 4m long, 2m wide and 1.5m high) producing 62t per year of bulk compost and a further 21 t of bagged compost. To increase market reliability the business model would work better if it was linked to another business with the supply chain (e.g. nurseries, a small farming cooperative).

The NPV for a small-scale windrow composting production was estimated at \$1695 with a 100% subsidy on initial capital outlays. Sensitivity analysis indicates that project financial performance is most sensitive to the price obtained for compost and the daily production rate of composting.

## **Estimated financial performance for a semi-automated windrow composting project**

The commercial project will introduce a semi-automated production system with the use of belt elevators in order to reduce the heavy lifting during the aeration period and make the project gender neutral. The capital outlay for each windrow composting production unit is estimated to be \$29,376. The high capital requirement and complexity of manufacturing compost to a certifiable quality would require that the project employ a manager and assistant manager who would be responsible for training, quality control and marketing of compost as organic fertilizer. The evaluation of only a single composting unit is reported here, although it is envisaged that a number of composting plants would operate semi-autonomously under a single coordination group and with group marketing. Because production of compost generates unpleasant odours it is envisaged that the activity will be undertaken on the outskirts of the community. Each composting production unit will have living quarters for the operation supervisor and their family and will be fully fenced. The cost for building and land including earthworks is estimated as \$17,500 per production unit. A bagging shed will be required to keep the compost as organic fertilizer dry after production. Windrow composting production will be a high water user therefore the earthworks will need to include a runoff channels and collection pond. The collected water will be repeatedly used for the next compost production. The overall machinery cost (\$8000) will include a second-hand 1-ton truck, a rubber matt elevator, and small equipment items (shovels, hoses, water pumps).

The annual operating cost (\$8244) is dominated by wages (\$4200). The cost of the manager (\$1755) is represented in a charge of 1cent/kg produced by the each production unit. The project will employ one full-time employee per production centre, who will live on site, employ casual staff, and supervise day-to-day operations. It is anticipated that each operation would require two casual workers. All wages incur a 25% on-cost. The NPV for a single semi- automated composting operation is estimated at \$5126 with a 100% capital subsidy. Sensitivity analysis indicates that project financial performance is most sensitive to the price obtained for compost and the daily production rate of composting.

Inconsistent quality of compost as organic fertilizer has proven to be a constraint on sales in commercial markets in the Philippines, and has delayed the uptake of compost as organic fertilizers by local farmers. To overcome these problems it is necessary that the product meet a quality certification standard. It is envisaged that the distribution of compost as organic fertilizers would be through either the local farmer cooperative or a recognized resellers of organic fertilizers. Watershed rehabilitation programs will utilize large amounts of fertilizer each year whilst carrying out tree plantings. It was suggested that the compost project manager determine the required compost standard for establishing trees in the rehabilitation area and adjust the composition of the compost as organic fertilizer to meet this standard. The demand for certified organic fertilizer is growing in the Philippines.

A new research project about to commence has provision to establish trial sites to train farmers in the production of compost. There would also appear to be a need to educate prospective buyers about the benefits and application rates when switching from inorganic to organic fertilizers.

## **Social and environmental benefits and institutional aspects of windrow composting**

Communities already have a sound understanding of vermicasting (production of earthwork casts as a fertilizer) but not practice in windrow composting. The level of acceptance to composting appears related to personal positive experience, but most of the experience has been with the small-scale production and windrow composting production has as yet had minimal uptake. The low level of skills required by the casual labour will allow for flexibility in employment schedules. It was recommended to have one full-time production supervisor who would work with the project manager to ensure quality of the finished product complies with a certified quality label and registered eco-label. The project analysis exposed few issues with workplace health and safety. To decrease the chances of back injury a belt conveyor was introduced to help with the turning the windrow material and make the project gender neutral and suitable for youth workers. The reagents used to accelerate the decomposition of the mulch may sometimes create gasses. It is recommended that face masks be worn during turning of the windrows so as to reduce the chance of inhaling toxic gasses such as ammonia that can be released during the initial composting stage. Research identified that occasionally reports of heavy metals are found in compost. However, the intended feedstock here is limited to forest biomass, farm waste and household vegetable waste, but excluding industrial waste (the cause of heavy metals found in compost).

It could be argued that by removing forest and farm waste from the natural environment to produce compost as an organic fertilizer preventing this waste from decaying and creating organic matter in the forest and crop sites can consequently be seen as a negative effect on creating biodiversity. Any potential run-off from the composting pads will flow into the collecting pond avoiding overflow ending in waterways. Baker (2010) argued that leaching through the windrow composting pads could create environmental problems. It is desirable that, prior to choosing a site for windrow composting, testing of soil structure be conducted. If the test indicates a high level of permeability then it would be recommended that during the construction of the pads clay is added so as to reduce soil percolation and leaching into the underground water supply. Air pollution generated through composting of biomass was identified as a negative environmental factor. Also, early stages of compost production can be associated to strong unpleasant odours that could be detrimental if the community lives near or downwind. To decrease the odour problem it is recommended that after each turning the windrow is covered with plastic sheeting (Baker 2010). The composting process releases CO<sub>2</sub> during the breaking down process. However, in general the release is no greater than in the natural environment where forest waste decays over time. The Philippine government is keen to promote production of compost because the Philippines have an increasing problem with disposal of domestic and industrial waste as the population grows. The use of forest waste to replace inorganic fertilizer is recommended by the Department of Agriculture (DA) in the Philippines. The project has the further merit of fulfilling two out of the eight Millennium Goals (decrease world poverty and ensure environmental sustainability) to which the Philippines is signatory.

## **CONCLUDING COMMENTS**

The importance of revegetation in Philippines upland areas is now receiving considerable attention. Engaging local communities in tree planting is not a sustainable activity in the sense that when the external funding ceases financial hardship can occur and illegal logging can be resorted to. Hence research is being conducted into a wide range of livelihood projects which potentially can generate employment and income for upland communities. For resident communities to become involved in this activity there must be a source of income.

This paper has examined two such livelihoods projects – briquette charcoal production and compost production – which also have environmental benefits. The technology is reasonably well established for these projects, and financial analysis indicates acceptable payoff levels, but more experience is needed on project implementation (training of community members, financing, product marketing) and on their long-term sustainability.

It is intended to carry out pilot trials of these livelihood projects at multiple sites in a new ACIAR research project being developed in the Philippines. As part of watershed rehabilitation projects this paper identified the need to further develop sustainable business models including financing arrangements that support livelihood projects and compensate the providers of environmental services.

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## APPENDIX A. SCREENSHOTS OF THE DCB FINANCIAL MODEL

	A	B	C	D	E	F	G	H	I
1	LIVELIHOOD PROJECT 2.4: DENR briquetting charcoal								
2									
3	<b>General parameters</b>								
4	Grant for capital outlays (% of outlays)	100%		Number of supervisors					1
5	Proportion of target production, year 1	100%		Wage supervisor (\$/day)					8
6	<b>Capital outlay parameters</b>								
7	Land purchase of 150 m <sup>2</sup> (\$)	45		Number of part-time unskilled staff					4
8	Landleveling (\$)	330		Wages unskilled staff(\$/day)					3
9	Fencing (50m) (\$)	1000		Electricity (\$)					500
10	Bunkhouse, office (\$)	2000		Fuel (\$/yr)					100
11	Shed for briquetting (36m <sup>2</sup> ) (\$)	1200		Casava starch price (\$/t)					225
12	Watertanks (10,000l)(\$)	1000		Casava content used per batch (%)					10%
13	5 modified drum carbonizers (\$)	70		Casava starch (\$/yr)					810
14	Liquid smoke tank and pipes (\$)	20		Packaging and marketing (\$/yr)					1440
15	Grinder (\$)	900		R&M (% of capital outlay machinery)					7%
16	Mixer (\$)	200		R&M (% of capital outlay land & buildings)					5%
17	Briquettor (\$)	1000		First aid kit (\$/yr)					200
18	Drying shelves (\$)	150		PPE gear (\$/yr)					200
19	Scales (\$)	200		Ongoing training (% of skilled and unskilled wages)					5%
20	Packaging machine (\$)	100		Wages on cost (%)					25%
21	Waterpump (\$)	400							
22	Shovels (\$)	100		<b>Derived parameters</b>					
23	Hoses (\$)	200		Capital outlay on machinery (\$)					3715
24	Trolley (\$)	200		Capital outlay on land and buildings (\$)					5575
25	Wheelbarrow (\$)	150		1st Yr Training cost (\$)					2000
26	Water boiler (\$)	25							
27	Training 1st yr (\$)	2000		<b>Revenue parameters</b>					
28	Consultant (\$)	5000		Price of briquettes (\$/kg)					0.3
29	Business registration (\$)	500		Price of liquid smoke (\$/l)					
30	Working capital (% of capital outlay)	2%		Number of days of production (days)					240
31	<b>Annual operating cost</b>								
32	Daily mulch requirements (kg)	600		Quantity of briquettes produced yearly (kg)					36000
33	Recovery rate (%)	25%		Quantity of liquid smoke produced yearly (l)					
34	Average daily output of briquettes (kg/day)	150		<b>Financing parameters</b>					
35	Average daily output of liquid smoke (l/day)			Required rate of return					15%
36	Production time per year (weeks)	48							
37	Number of work days per week	5							



	A	B	C	D	E	F	G	H	I	J	K	L
Year→		0	1	2	3	4	5	6	7	8	9	10
<b>Capital outlay</b>												
Machinery (\$)		3715										
Land and building (\$)		5575										
Training cost 1st yr and WHS gear (\$)		2000										
Consultancy fee		5000										
Business registration (\$)		500										
Working capital (\$)		336										
Total capital outlay (\$)		17126										
Grant for capital outlay (\$)		17126										
Total capital outlay (\$)		0										
<b>Annual operating cost</b>												
Wages supervisor (\$)			2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
Wages part-time unskilled staff (\$)			3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
Electricity (\$)			500	500	500	500	500	500	500	500	500	500
Fuel (\$)			100	100	100	100	100	100	100	100	100	100
Casava starch (\$)			810	810	810	810	810	810	810	810	810	810
Packaging (\$)			1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
Ongoing training (\$)			300	300	300	300	300	300	300	300	300	300
R&M machinery (\$)			260	260	260	260	260	260	260	260	260	260
R&M building (\$)			279	279	279	279	279	279	279	279	279	279
Purchase of mulch (\$)												
Total operating cost (\$)			9689	9689	9689	9689	9689	9689	9689	9689	9689	9689
<b>Project revenue</b>												
Sale of briquettes (\$)			10800	10800	10800	10800	10800	10800	10800	10800	10800	10800
Sale of liquid smoke (\$)												
Total revenue (\$)			10800	10800	10800	10800	10800	10800	10800	10800	10800	10800
Net cash flow (\$)		0	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111
Project balance (\$)			966	1806	2537	3172	3725	4205	4623	4986	5302	5577
Net present value (\$)		15612										
<b>NPV profile</b>												
Discount rate (%)					0%	4%	8%	12%	15%	18%	21%	
NPV (\$)				15612	61116	40252	27639	19695	15612	12586	10302	
<b>Capital subsidy profile</b>												
Capital subsidy (%)					0%	25%	50%	75%	100%			
NPV (\$)				15612	-1514	2768	7049	11331	15612			



# POSSIBILITY OF ASSOCIATING SMALL SCALE ENTERPRISES IN THE TIMOK FOREST AREA: ENTREPRENEURS AND DECISION MAKERS' ATTITUDES TOWARD CLUSTER ESTABLISHMENT

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## ABSTRACT

In accordance with the political and socio-economic changes that occurred in Serbia during the transition period, the forestry sector was reformed and certain activities within forestry were privatized. The problem of unemployment, which appeared in this period and entrepreneurial initiatives by the local population have resulted in the establishment of a significant number of small scale forest-based enterprises.

However, most of these enterprises are not well organized and connected into the supply chain and are therefore not competitive in the marketing of wood-based products. Accordingly, this paper aims to analyze and compare the attitudes of entrepreneurs and decision makers toward the possibility of associating small scale forest-based enterprises into a cluster in order to achieve more efficient business activities. The paper uses the results of the project "Development of small scale enterprises in Timok forest area: system of support measures and model of organization". The main research question was: "What is the attitude of entrepreneurs and decision makers about the possibility of an association and establishment of a cluster of small scale forest-based enterprises in the Timok forest area?" Research was conducted in eastern Serbia in 2009, when 138 entrepreneurs were interviewed and in 2010, when 23 decision makers and representatives of other relevant organizations were interviewed.

Results of this paper show that 70% of entrepreneurs consider that associating could have a positive impact on the business activities of small scale forest-based enterprises. The majority of decision makers agree with this attitude. Also, 84% of entrepreneurs and 95.7% of decision makers have a positive attitude toward the possibility of establishing a cluster of small scale forest-based enterprises. However, the decision makers show a certain amount of distrust about the realization of this idea. In this paper, the authors attempt to analyze the results and to give their interpretation and propose policy and institutional measures to improve the current situation.

**Keywords:** Small scale forest-based enterprises, Cluster, Timok forest area, Serbia

## 1 INTRODUCTION

Similar to other European countries, small and medium enterprises (SMEs) in Serbia make up over 99% of all enterprises (2010). In recent years, the number of SMEs has been growing and there is a visible trend of increasing the number of employees in this sector (from 59% to 65.5% over the three year period, from 2007 to 2010). The growing role of the SME sector is reflected in the volume of turnover, import and export (from 39.6 billion *RSD* to 50.2 billion *RSD* in 2007)<sup>1</sup>, as well as the size of the gross added value (2010).

The SME sector has emerged and developed in the last ten years in accordance with political, legislative and institutional reforms in the forestry sector in Serbia. SMEs are primarily developed as a result of: (i) restructuring and privatization of some activities in Public Enterprise (PE) "Srbijašume", or (ii) expanding service sector of wood industry enterprises. However, the small and medium enterprises in the forestry sector in Serbia are still very poorly organized because there are no relevant data on their businesses nor elected officials who represent their interests. In addition, a common challenge for forest owners, owners of SMEs in forestry and service enterprises in the wood-industry is to establish cooperation within the value chain and, above all, their

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<sup>1</sup> RSD – Serbian Dinar (see: [http://coinmill.com/RSD\\_calculator.html](http://coinmill.com/RSD_calculator.html))

active entrepreneurial activities. These activities would contribute to business success and much more efficient flow of goods. The success of an enterprise is significantly dependent on other companies, and because of that, it is necessary to develop formal and informal forms of cooperation and flows of knowledge and information. Primarily, this is possible by organizing them into appropriate forms of associations (clusters, cooperatives, etc.), gathering together related companies or associations of producers from the same branch. The aim of this activity is problem solving and business improvement, achieving a greater competitiveness and promotion at home and abroad.

This paper uses the results of the project: “Development of small and medium enterprises in Timok forest area: a system of support measures and a model of organization“, which was implemented in the period 2009-2010, supported by the Ministry of Agriculture, Forestry and Water Management - Forest Administration. Entrepreneurs and decision makers’ answers to the questions about possibilities of establishing a cluster have been analyzed.

The purpose of this study was to determine the attitudes of SMEs owners and decision makers toward the possibility of associating SMEs in the forestry sector and to propose appropriate measures to enable the establishment of such a form of association. The aim of this paper was to determine the possibilities of establishing the cluster and its development potential in a selected pilot area, based on the analysis of preceding attitudes. In this sense, the main research question in this paper was: “What are the attitudes of owners of small and medium-sized enterprises and decision makers about the possibilities of an association and the establishment of a SME cluster in the Timok forest area?” The subjects of the research were the entrepreneurs (owners of small scale forest-based enterprises) and policy makers (representatives of relevant institutions and organizations) who were observed through the answers from the questionnaires (survey and interview).

Our research assumption was that interest in connecting into a cluster would be shown by a large number of entrepreneurs, which would, via joint engagement, contribute to the achievement of defined goals and a significant cluster development of SMEs in the forestry sector. Creating favourable conditions for the establishment of clusters would help organize related companies or associations in the forestry and wood industry, while the strengthening of activities in cooperation and coordination of entrepreneurs would achieve successful interest representation in relevant institutions.

The importance of SMEs in the forestry and wood-industry is reflected in the large number of companies in the EU. In the forestry and wood-industry in Europe, there is a wide and diverse range of companies that employ about 1.6 million people, of which the largest number of workers is in the furniture industry. Also, SMEs make direct sales of about 148 billion Euro (<http://epp.eurostat.ec.europa.eu>). In addition, the forestry and wood-industry and their production and processing of wood as a renewable resource, provide an essential contribution to sustainable development, primarily from the economic point (Schmithuesen *et al.*, 2006).

Creating value in the forestry and wood-industry provides, among other things, the economic activity of SMEs and thus creates value that can be realized in money. It should be noted that the value creation is reflected in the creation of complex and intertwined processes of production and exchange within the value chain. Primary production in the forestry sector represents a starting point of the value chain which is connected to value creation processes within different branches of the wood-industry (Schmithuesen *et al.*, 2006, Niskanen *et al.*, 2007). A very important issue in estimating the efficiency of the value chain in forestry is the connection between forest owners and enterprises in the forestry and woodworking industry. Thus, different forms of connectivity and better mutual cooperation of these participants contribute to the effectiveness of the flow and exchange of resources within the value chain.

Special emphasis should be placed on the importance of cluster development in forestry and wood industries, because it presents a specific form of cooperation between enterprises in one or more industries. Through connecting related industries and enterprises, clusters have become an increasingly important instrument of policy development in areas related to entrepreneurship, competitiveness and innovation. The importance of cluster development initiatives has been recognized within the EU as a priority. In December 2006, these initiatives have been identified and accepted by the European Council as one of the nine priorities that are essential for the development of competitiveness (Ketels *et al.*, 2008).

Clusters are a natural combination of enterprises. Also, a cluster does not function if it is formed by imposing a set of factors on a group of enterprises or when enterprises are forced to enter into an association. Clusters foster specificity of a company and allow companies to choose the level and type of cooperation in the cluster and to identify which part of the production program enters the cluster and which part functions independently (Solvell *et al.*, 2003). The basic characteristics and key advantage of a cluster lies in a multidimensional closeness of all

stakeholders. Of course, it is not just about geographical proximity, but also their cultural and institutional cohesion and coherence (Solvell *et al.*, 2003). This allows a common vision and action, and therefore the joint use of their potential and resources. The consequence of this community is a better mutual cooperation and rapid information flow.

The influence of a cluster in the forestry sector can contribute to more efficient cooperation within the value chain that unites private forest owners, forestry companies and companies in the wood-industry, whose intertwined relationships are rich in specificities. Within these areas there is a large number of SMEs so the importance of cluster development is undoubtedly important.

Benefits that SMEs can achieve by working in clusters can include: an increase in the volume and quality of production, a specialization of labour through the mid-career training, an increase in profitability, a stimulation of exports, reaching major markets, better positioning in the European and world markets, a better use of resources through mutual cooperation, etc.

## 2 METHODS

In order to investigate the possibility of an association of entrepreneurs and the establishment of a cluster within the project: "Development of small and medium enterprises in Timok forest area: a system of support measures and a model of organization", we designed two types of questionnaires. Depending on the test target groups, data collection was performed in two different ways, through surveys and interviews (Neuman, 2006, Glück *et al.*, 2011).

During the research both quantitative (entrepreneurs attitudes) and qualitative (attitudes of decision makers and representatives of relevant institutions) analyses are used. The qualitative analysis followed the quantitative analysis, by cross referencing entrepreneurs' attitudes with the attitudes of all respondents. By cross referencing the attitudes of entrepreneurs, decision makers and representatives of relevant institutions we tested what are the needs, options and possibilities for establishing an association of entrepreneurs in the form of cluster.

First, data were collected by survey from 138 entrepreneurs from 7 municipalities in the Timok forest area: Knjazevac, Negotin, Zajecar, Bor, Boljevac, Kladovo and Majdanpek (Donji Milanovac). The questionnaire consisted of 60 questions, ranging from simple introductory questions to those with the Likert scale. The data were processed in the software program for statistical data analysis (SPSS). The data analysis contains descriptive statistics and correlation analysis.

As another way to collect data, interviews were held with 23 decision makers and representatives of various interest groups, namely:

- representatives of relevant institutions and organizations of public administration in the forestry sector (MPŠV-UŠ), rural development (MPŠV-RR) and entrepreneurship (MERR, NARR) <sup>2</sup> ;
- representatives of public (JP-SŠ, ŠG-BG) and private companies (FORNET, SGS, BMI, ZLATIC, EP) in the forestry and wood-industry ;
- representatives of scientific institutions in forestry (IŠ, ŠF), non-governmental organizations (PK, PG) and political parties (DS) <sup>4</sup> .

For this purpose a specially constructed, in-depth interview was used. The selection of respondents focused on the representatives of institutions and organizations that influence the creation of forest and entrepreneurs policy, as well as on the representatives that have influence on practical problem solving and on an enterprise's business (Glück *et al.*, 2011). In this way the connection with the subject of research is much better expressed and more complete, accurate and better information is obtained. The questionnaire contained 18 questions, ranging from introductory through to detailed questions about entrepreneurship and opportunities to support companies in the

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<sup>2</sup> MPŠV-UŠ (Ministry of Agriculture, Forestry and Water Management-Directorate for Forests); MPŠV-RR (Ministry of Agriculture, Forestry and Water Management-Sector for rural development); MERR (Ministry of Economy and Regional Development); NARR (National Agency for Regional Development).

<sup>3</sup> JP-SŠ (Public Enterprise "Srbijašume"); ŠG-BG (Forest Estate "Beograd"); FORNET (Private company-consulting and services in forestry); SGS (Certification group); BMI (Private company); ZLATIC (Private company); EP (Eko pres-private company).

<sup>4</sup> IŠ (Institute of Forestry, Belgrade); ŠF (Faculty of Forestry, University of Belgrade); PK (Serbian Chamber of Commerce); PG (Nature Conservation Movement); DS (Democratic Party).

forestry and wood-industry, to issues relating to association and cluster establishment. Data collected for qualitative analysis or attitudes of decision makers in forest policy and representatives of sector institutions and organizations are presented in the table 2.

### 3 RESULTS

#### 3.1 Basic characteristics of SMEs in the Timok forest area

Proportionally to the representation and the productivity of forests (Table 1) in Timok forest area is active a large number of forest based enterprises. According to the Serbian Business Registers Agency (SBRA) in 2009, the total number of registered enterprises in the Timok forest area that have based their activities on the forest as a resource is 281, of which 203 are entrepreneurs and 78 are companies.

**Table 1:** Basic data about forests in Timok forest area

Forest area (ha)	215,083.82
The total volume of various standing ( $m^3$ )	22,410,781.52
The average volume of various standing ( $m^3/ha$ )	104.20
Annual increment ( $m^3$ )	370,194.77
Average growth ( $m^3/ha$ )	1.72

Source: 2004.

Listed companies are engaged in the following activities: (i) silviculture and logging of forests; (ii) service in the silviculture and logging of forests; (iii) production of the sawn timber; (iv) production of other wood products; (v) production of building carpentry and elements; (vi) production of wood packaging; (vii) impregnation of wood; (viii) intermediation in the sale of timber and building materials.

In terms of diversification of activities, the field research provided data that some enterprises are engaged in a combination of these activities, for example: (i) logging, wood processing and trade, (ii) logging, wood processing and production of other wood products, (iii) wood processing and production of other wood products, (iv) logging and production of other wood products, etc.

The results confirmed that small scale forest-based enterprises in Serbia intensively developed after 2000. Of the total number of surveyed enterprises, 91.97% of the enterprises were established in the period 2001-2009.

#### 3.2 Association and clustering

An analysis was performed to determine the need and willingness of entrepreneurs in the studied area to associate and form a cluster. According to the respondents' answers to several questions their attitudes and opinions were obtained and were later statistically analyzed and interpreted.

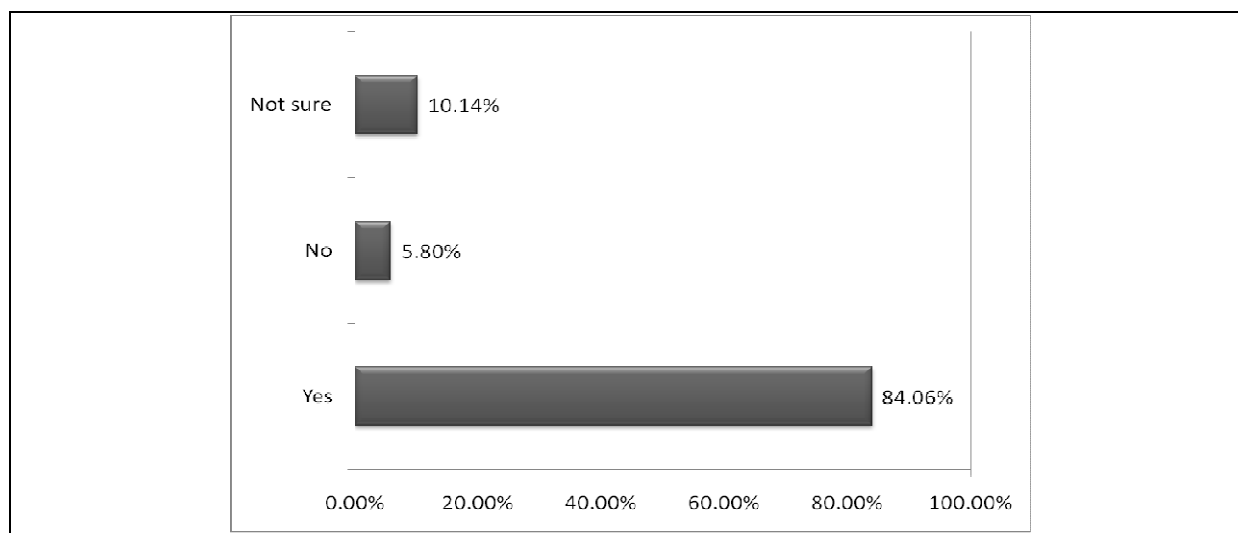
##### 3.2.1 Quantitative analysis

In the relation to the possibility of organizing, 61.61% of entrepreneurs are willing (very much and much) to engage in the establishment of an interest association. The largest number of respondents (83%) would be willingly to become a member of the association if it provided some economic benefit to its members, while 52% of respondents would become a member if the association achieved some positive effects.

When it comes to knowledge about the cluster concept, its importance and ways of functioning, the majority of respondents (62.32%) responded that they had never heard of the concept of clusters, while only 8% of respondents answered positively to the question. The proportion of respondents who are familiar with the measures of support that exist for the development of clusters is even smaller (3.62%) and nearly 73% of respondents had never heard of the existing support measures. Almost all respondents (96.38%) are interested in receiving information about this kind of association. Based on these results, it is clear that entrepreneurs need more information about the concept and functioning of clusters, what could be achieved by having appropriate meetings, conferences and workshops.

Approximately  $\frac{2}{3}$  of entrepreneurs (64.49%) considered that the formation of cluster could enhance cooperation among enterprises in the region. Similar to the this question, about 53% of entrepreneurs think that in this way certain business problems in the forestry and wood-industry would be overcome. Most respondents (84%) are interested in participating in a cluster if it were to be formed, while only 5.8% of entrepreneurs have a negative attitude toward this issue (Graph 1).

**Graph 1:** Entrepreneurs' interests in participation in a cluster that would be established in Timok forest area



Source: Authors

The results show that entrepreneurs see associating as an opportunity for business growth. These extremely positive attitudes show that there is a need for associating and provided support measures should ensure conditions for associating and clustering.

### 3.2.2 Qualitative analysis

In relation to the facts obtained during the quantitative analysis that the entrepreneurs in the forestry and wood-industry are disorganized and have no relevant representatives of their interests, decision makers and representatives of relevant institutions expressed their attitudes toward associations as a way of improving their own business. Most respondents believe that an association is one way in which it is possible to improve business opportunities for small scale forest-based enterprises.

What the respondents have pointed out is that associating, by itself, does not necessarily mean that the current way of doing business will be improved. They believe that it is necessary to design the most appropriated model of associating and clearly define the interests, goals, priorities, expectations and requirements of potential members, so that the association could function and contribute to business improvement.

Representatives of forest institutions and decision-makers believe that the attitudes of entrepreneurs who are quite opposed<sup>5</sup> to each other is an outcome of „...ignorance, lack of education and lack of motivation by entrepreneurs...“, because of „...undefined goals, interest and programs of associations“. They also state that the reasons for this result could be sought in the insufficient motivation of the entrepreneurs as a consequence of the lack of initial support from forestry institutions which had previously allowed the formation of associations of private forest owners.

In table 2 are shown attitudes of decision makers and representatives of sector organizations toward the possibility of improving the existing role of entrepreneurs and their position in the decision making processes, by

<sup>5</sup> Survey showed that 71% of entrepreneurs „...see association as a way of improving the business...“, and 62% of entrepreneurs are „...much or very much ready to engage themselves into establishment of associations...“, where, even 77% of entrepreneurs „...are not a member of any associations of entrepreneurs“.

theirs associating. All these attitudes are homogeneous and positive. Also, the views of decision makers about the possibilities of forming clusters in forestry as a way of organizing and improving SMEs business are shown.

**Table 2:** Attitudes of decision makers and representatives of sector institutions and organizations

Topic	Public Administration				Public Enterprises				Private Enterprises					SRO		NGO		PP	
	MPŠV		MERR	NARR	JPŠŠ		ŠGBG		FN		SGS	BMI	ZLT	EP	ŠF	IŠ	PK	P G	DS
	UŠ	RR																	
Associating due to better positioning	+	+/-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Establishing of cluster in forestry	+	+	+	+	+	+	+	+	+	+	+	+	+/-	+	+	+	+	+	+

Legend: + advocate, – opponent, +/- indifferent; SRO – Scientific-research organizations;

NGO – Non-governmental organizations; PP – Political parties.

It can be concluded that only the participation of all stakeholders in decision making processes, where each party has certain requirements and recommendations, can lead to better cooperation and an improvement in existing roles of SMEs and the SME sector in forestry.

From the table it can be seen that the attitudes of almost all decision makers and representatives of forestry institutions toward the possibility of forming clusters in the forestry sector are positive, with one interviewee pointing out that clustering is „...one of the best ways for improving business“. However, among the respondents there appears to be a certain amount of distrust about the realization of this idea, or about the formation and successful management of clusters in forestry. Reasons for this are given as „...lack of information, distrust, lack of clear interest, as well as the reluctance of entrepreneurs to form clusters“.

Representatives of the Ministry of Economy and Regional Development pointed out that the key issues and obstacles in the formation and development of clusters are the lack of a clear legal framework that applies to them. Representatives of private companies also see clusters as a way to improve business, but there is a degree of distrust about the realization of the idea. They explained this distrust by comments such as the attitudes that „... there are different interests among entrepreneurs in the forestry and timber industry “. Despite the positive attitudes, it is suspected that most entrepreneurs are not really ready to join the cluster.

## 4 DISCUSSION

In Europe, the concept of sustainable development and forest-based association is reflected in numerous associations (private forest owners, private companies in forestry, etc.). Efficient operations of forestry undoubtedly contribute to better cooperation and relations between different entities within the value chain. Therefore, for the efficient operation of businesses in forestry a correlation between ownership of forests, forestry companies and companies in the industry is very important to achieving the effective flow and exchange of goods in business (Schmithuesen *et al.*, 2006). Associating is one of the options for business improvement, primarily through increased competitiveness and better performance in the market (Porter, 1998). In the Timok forest area there are no developed associations, although the views of entrepreneurs about an association are positive.

Similar results were also obtained from also occurred in the previous research in the PRIFORT project where the interviewed private forest owners in Serbia expressed a positive attitude toward the establishment of an

<sup>6</sup> It is important to note that during the quantitative research in the Timok forest area, has come to results which indicate that 63% of entrepreneurs „...never heard for the concept of cluster...“, and 73% „...not familiar with the measures of support for cluster development“. In the other hand, even 95% of entrepreneurs were „...willing to become familiar with concept and functioning of the cluster...“, while 85% of entrepreneurs, in obtaining basic information, express „...positive attitudes about joining the cluster which would be established in their area“.



interest association (Glück *et al.*, 2011). In addition, most of the decision makers believe that associating is one way in which it is possible to improve business opportunities of small scale forest-based enterprises. As in the PRIFORT project, where the decision makers supported the idea of strengthening the position of private forest owners through the establishment of an interest association, in this project they also believe that an association of entrepreneurs could strengthen role and influence of entrepreneurs in decision making processes.

Clusters, by linking related industries and companies, have become an increasingly important instrument of policy development in areas related to entrepreneurship, competitiveness and innovation (Ketels *et al.*, 2008). According to many authors (Porter, 1990, Pyke, Sengenberger, 1992, Saxenian, 1994, Van Dijk, Rabellotti, 1997, Steiner, 1998, Crouch *et al.*, 2001, Rocha, 2004, Ketels *et al.*, 2008) one of the main reasons for the increasing interest in clusters is assumed influence on the performance of enterprises, regional economic development and competitiveness of the country.

Entrepreneurs and decision makers show a positive attitude about the capabilities of a cluster development in forestry in Timok forest area. There are a number of respondents who were not familiar with the term and concept of clusters, but after a short introduction to the concept and the functioning of clusters, they expressed a positive attitude. It is emphasized that the possibility of creating clusters of forestry should be a model of networks of small scale enterprises where the development is initiated and driven in a flexible way.

After a short introduction to the concept and functioning of clusters, entrepreneurs said that the conceptual approach of cluster development is relatively complex and could be achieved through simultaneous cooperation and collaboration.

Due to this, there was scepticism among the respondents about implementation in practice. Reasons for distrust are the following: characteristics and degree of (under)development of the region, strengths of industrial base, the degree of (under)development of the SME sector, critical mass of entrepreneurial spirit (despite positive attitudes that are highlighted) and interest of stakeholders. But there is still a prevailing opinion that it is possible to establish and, more importantly, to successfully lead a cluster in forestry if there are strong leaders and identifiable support. Entrepreneurs believe that linking companies in some way represents a change in current business, but most respondents viewed this phenomenon as a challenge to perform common tasks and improve the current way of doing business.

## 5 CONCLUSION

Based on the statistical analysis, within the quantitative analysis, the following conclusions for the studied forest area can be emphasized:

- most of the examined entrepreneurs are not a member of any association (77%);
- a large number (61.61%) are ready to engage with some form of interest-association;
- all entrepreneurs believe that they need more support to SME sector (99.29%);
- the concept of a cluster is very little known (only 8% responded positively);
- just over half of the respondents (55%) had a positive attitude towards the formation of a cluster;
- it is confirmed (cluster analysis) that most entrepreneurs see an opportunity for improving business in an association, and a cluster is recognized as one of the possible forms of associating.

Based on our qualitative analysis, we can draw the following basic conclusions:

- decision makers recognize that an association is a way to solve some problems of the SMEs sector in forestry;
- the obstacles to the faster implementation of associations in SMEs in forestry are a lack of clearly defined goals, inability of entrepreneurs to clearly recognize their own interests a failure to recognize the interests and a certain amount of distrust by entrepreneurs;
- all respondents expressed a positive attitudes toward the possibility of establishing a cluster in forestry.

Identified problems indicate that small scale forest-based enterprises will face difficulty in solving their (dis)organization and lack of interconnection. This clearly indicates that it is necessary to take this connection to the next level of interest associating. All the facts stated in the conclusions indicate the appropriate measures and activities to be undertaken in order to start and develop a process of associating. For questions about the possibilities of association, the majority of respondents (in the qualitative analysis) gave a positive response,

noting that an association is one of the solutions for improving business operations. However, the prevailing opinion is that an association is not the only way to improve business, but that is certainly a very important step both for business improvement and for improvement of the position of entrepreneurs.

Based on the results in the first (quantitative) phase, which indicate that more than 70% of entrepreneurs have problems in business (obsolete machinery, payment realization, lack of access to bank funds, state support or other companies). Decision makers (in the qualitative research) pointed out that association is one of the solutions and a chance to improve business. Connectivity is necessary in order to accomplish the efficient flow of goods and money in the value chain in the forestry and wood-industry.

Based on the results of the surveys in the first phase, entrepreneurs believe that the association is one way to improve operations, with 71% of entrepreneurs saying they see the association as a means of improving business and 63% are much and very much ready to engage in the establishment of associations, while on the other hand 77% of entrepreneurs are not a member of any association.

Respondents who were interviewed in the second phase interpreted these results arguing that the entrepreneurs may make easy declarations but they are not willing to take some concrete steps. According to them this is the result of bad experiences of entrepreneurs in the past and a general mistrust towards other organizations that would be involved in associating. For example, there is mistrust of entrepreneurs, which remained from the socialist period, towards state institutions. After 2000 and political changes, entrepreneurs believe in changes and business improvement, but they are not satisfied with the speed of changes. On the other hand decision makers believe that entrepreneurs have problem to change the current way of operating. Actually, entrepreneurs are afraid of every change in their current business which would lead to more transparency in their business. Another kind of mistrust is that the entrepreneurs believe that scientific and other similar institutions do not fully understand their needs. Decision makers consider that this is due to lack of communication and cooperation between entrepreneurs and scientific institutions. As a reason for the poor results of previous associations, all respondents cited the lack of clearly defined goals or failure to recognize the interests of the members themselves.

All respondents expressed a positive attitude toward the possibility of establishing a cluster in forestry. They stated that the most appropriate model of associating is a cluster, because it is through connecting with other similar companies and enterprises who lead in a given field and scientific research institutions, that good conditions for business growth will be created.

It should be emphasized that all decision makers emphasized that a cluster is a good idea of multidisciplinary connectivity of production, science and education, but raised the question of implementing this idea under the existing conditions. An aggravating factor may be the underdevelopment of small scale forest-based enterprises.

The survey results show that 73% of entrepreneurs have not met with the term or the functioning of clusters. Most interviewed respondents pointed to the importance of educating entrepreneurs about the concept and functioning of the clusters and it is a precondition for the establishment and successful management of clusters in forestry. Also, respondents stressed the need to prepare a strategy for clustering in forestry with clearly defined goals so that entrepreneurs could perceive their interest.

On the basis of the conducted research and results arising by cross referencing the attitudes of entrepreneurs, decision makers and representatives of relevant institutions, appropriate measures are identified. These measures are the indicators of positive attitudes and prerequisites for the establishment of cluster in forestry sector. Of the most importance are the following measures (Rankovic *et al.*, 2011):

- (i) organization of meetings and workshops that would, by an interactive process, provide a sufficient level of knowledge on clusters and clearly define the objectives and needs of entrepreneurs,
- (ii) facilitating the associating through a simpler procedure,
- (iii) initiatives for the associating with clearly defined goals and interests of entrepreneurs,
- (iv) providing financial support for the establishment and initial operation of the cluster,
- (v) establishment of temporary information centres,
- (vi) co-financing the costs of building infrastructure and renting facilities of associations at the local level.

Measures such as promoting the process of clustering and support for SMEs development based on wider use of the experiences and results of cluster programs, should also be implemented, but they are of less importance than the above measures. It is necessary to provide funding not only for cluster establishment, but also for its functioning, at least in the first stage of establishment. Also, training of entrepreneurs through organizing conferences and workshops has great importance. These measures are considered as direct support measures.

In addition, it is necessary to promote the process of clustering, because, as can be seen from the previous entrepreneurs' answers, they have little knowledge about the concept of clustering and existing measures for its development. Promotion can be implemented in two ways, indirectly (through the media, brochures, fairs) and directly through direct contact with entrepreneurs through various training and workshops presenting the features and benefits of this type of association. Also, one of the important steps in terms of informing entrepreneurs would be the establishment of information centres where interested entrepreneurs could obtain the desired information on the cluster.

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# SOCIAL, ECOLOGICAL AND ECONOMIC ASPECTS IN PRIVATE FOREST MANAGEMENT DECISION MAKING

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## ABSTRACT

Private forest owners are diverse. Even in small scale forestry, it is assumed that economic interests are among the most important reasons for engaging in forest management activities. However, there is a need to better understand the owners' management decisions and their drivers so that forest policies can be better adjusted to different management types. Based on face-to-face interviews ( $N = 380$ ) with randomly selected private forest owners in two forest management regions in Slovenia in 2009/2010, we studied which information private forest owners consider important in making management decisions. Nineteen issues describing social, ecological, and economic aspects of forest management were presented to the landowners for their assessment of the relevancy in management decision making. The ecological and social aspects of forest management turned out to be considered in decision making by the smallest landowners ( $< 5$  ha) as well as by the landowners of forest properties bigger than 30 ha. Forest management decisions in private forests were primarily based upon social information; economic information did not influence the decisions much. Slovenia Forest Service decision support reduced the proportion of non-oriented decision making in private forests as evidenced by significantly higher mean relevancy assessments of information by the supported owners compared to non-supported and lower variability of relevancy assessments of social, ecological and economic information. This does not apply to the smallest properties, where the influence of SFS on more distinctive management profiling was not significant. The low relevancy of all information assessed by the owners of the smallest properties ( $< 5$ ha) indicates that their decisions are rather stochastic. We analysed the differences in the management decision making related to selected variables (e.g. forest land size, socio-economical status) and discussed the complexity of individual owner's decision making. Public forest service should pay special attention to two aspects: 1) private forest owners are still not prepared to include mechanised harvesting into their working model and 2) the role of the forest land market in solving the problems in private forest management should not be overestimated. The complexity of decision making in private forest management calls for more adaptive forest policy.

**Keywords:** Management information, management objectives, private forest owners, decision support, public forest service

## 1 INTRODUCTION

Forests provide economic, social, and environmental benefits to society. The sustainability of these benefits is indispensably related to forest management practiced by the owners. In countries, where private forests prevail (e.g. in Slovenia), private forest management plays a key role in assuring the sustainable development of forests. Forest management behaviour reflects owner's attitudes to his property and is a result of the management decision process. Arising from the notion that each management behaviour has an economic, social and ecological environment (Lönnstedt, 2010), we wanted to find out what is the influence of this environment upon management decisions in private forests in Slovenia. Put another way, we examined the relevancy of economic, social and ecological information available to private forest owners in making forest management decisions.

Policy makers need to understand the current management decision practices in private forests to be able to follow the new paradigms in private forest management and understand the responses of forest owners to them. In recent decades, private forest ownership across Europe has been undergoing structural change, particularly as a consequence of land restitution (Hogl et al., 2005, Järvinen et al., 2003, Bouriaud and Schmithüsen, 2005, Medved et al., 2010). Consequently, management attitudes, due to new owners' objectives and the fundamentals of decision making in managing forest property and management, has changed. This is reflected in new types of forest ownership, diverse management motives and attitudes to forestland.

In Slovenia and elsewhere in Central Europe (Medved et al., 2010; Bouriaud and Schmithüsen, 2005), management intensity in private forests has been well below the desired level for the last decades, which in some cases has resulted in diminishing forest health and resilience. On the other hand, we are facing rising demands for forest goods and services, recently particularly due to demands for fuel-wood. Thus it could be expected, that the management attitude of private forest owners is likely to change following changed market situations, changing social characteristics of forest owners, and also changing environmental conditions, such as climate changes.

In many countries (e.g. Nordic countries, USA) there is extensive research into private forest owners' attitudes to forest management and factors driving their behaviour (e.g. Boon et al., 2004; Majumdar et al., 2008; Joshi and Arano, 2009). In Slovenia however, there have been only few extensive studies in this field made recently (e.g. Medved, 2000; Adamič and Winkler, 2005) and the decision making environment is still quite unexamined. The circumstances under which forest management is practised and information which is relevant for managing forest properties, is still unknown. This study shall contribute to the current knowledge of private forest management practices in Slovenia.

The aim of this study is threefold: (1) to find out which information private forest owners consider relevant in managing forest properties; (2) to find out the differences in forest management decision making between specific groups of private forest owners; (3) to discuss what are the implications of the results for forest policy makers.

## 2 METHODS

### 2.1 Study area and data acquisition

We selected two forest management regions (FMR Kranj and FMR Slovenj Gradec) in the northern part of Slovenia as case studies. Forests cover more than 66% in both regions of which 82% is private forests in FMR Kranj and 72% in FMR Slovenj Gradec. The FMRs differ from each other in their natural conditions and management traditions. The prevailing European forest category (EFC) (EEA, 2006) in FMR Kranj is Beech forests on non-carbonate ground (EFC 6). In FMR Slovenj Gradec beside EFC 6, Alpine coniferous forests (EFC 3) also represent a remarkable proportion. In the lowlands of FMR Kranj forests have been pushed aside for agriculture and industry, while in the sub-montane southern and northern part of the region, where forest cover is greater, the importance of forests rises.

The pre-selection of the candidates for the interviews was stratified by four forest property size groups, following the established methodology of Medved (2000) (1.0-4.9 ha, 5.0-14.9 ha, 15.0-30.0 ha, and >30.0 ha, respectively) to ensure that all size classes were represented with the roughly equivalent number of 50 interviewees. From 380 interviewees, 95.8% explicitly expressed in a face-to-face interview that they manage their properties and that they can assess, which information they use in managing their properties. Any type of an owner's activity in their property (e.g. performing regular/occasional harvesting, solely maintenance, or no physical interventions but regular surveillance visits) met the definition of forest property management and was included in the analysis. The paper thus analyses 364 answers from interviews carried in 2009 and 2010 (N=189 in FMR Kranj and N=175 in FMR Slovenj Gradec).

By following the notion that each decision takes place in a decision making environment (Hujala et al., 2007), i.e. in a real world, where all the circumstances under which a decision is made are considered, we modelled the decision making environment with three aspects (Lönnstedt, 2010); being the economic, social, and ecological aspects. In total nineteen issues i.e. information describing economic, social, and ecological aspects of decision making in their properties, were presented to the owners in the form of a questionnaire (Table 1).

Economic aspects of decision making mostly comprised the financial performance of forest management (nine issues), three issues related to organisational issues. We assumed that forest owners consider expected net income, current market situation, cost calculation, cash flow etc. before making any management decision. In general, economic aspects were most often related to wood production (e.g. allowable cut, expected costs of harvesting and forwarding, profitability of management), but also to business planning in a private company, such as information about the possibilities and costs of building forest roads, or information about the current market prices of forest land. In total twelve issues describing economic aspects of forest management were included in the questionnaire as possible relevant sources of economic information for forest management decisions (Table 1).

Social aspects of decision making in forest management included the possible interactions of forest management with stakeholders, authorities and society, such as respecting administrative procedures or following legal regulations in making management decisions, or considering public rights and duties arising from forest possession. In total four issues were included in the questionnaire.

Ecological aspects of decision making included all information regarding the sustainable functioning of forest ecosystems, i.e. sustainable development of forests and their ecosystem services and goods (e.g. information about silvicultural measures, forest protection, wild game habitat protection and population densities) which forest owners might consider when making a decision. In total three ecological issues were included in the questionnaire.

## 2.2 Analysis

Forest owners ranked the relevancy of nineteen pieces of information describing economic, social, and ecological aspects of decision making for forest management from irrelevant (rank 1) to extremely relevant (rank 5). We used descriptive statistics for the interpretation of relevancy of social, ecological and economic information in forest management decision making in private forests. The non-parametric Kruskal-Wallis test (KW-H) was used for finding differences in relevancy assessments due to selected forest owner's variables (forest land size, socio-economic status, decision support by Slovenia Forest Service (SFS)). The range between the maximum and the minimum value of relevancy assessments for the economic, social and ecological aspects was calculated as a measure representing the multi-objectiveness of an owner's decision, (i.e. economically, socially, ecologically or multipurpose oriented owner). A high range in the relevancy assessments of social, ecological and economic information represents a high heterogeneity of decision making and could partly indicate an integration approach (Bončina, 2011) in forest management and vice versa; a low range in relevancy assessments indicates that the forest owner only searches for one type of information (e.g. economic) and makes his decisions mostly on one aspect of forest management.

All statistical analyses were carried out in Statistica.

## 3 RESULTS

### 3.1 General pattern of forest management decision making

From the nineteen pieces of information forest owners ranked seventeen as relevant, very relevant or extremely relevant for forest management. Only 2 pieces of information were considered by the owners to be unimportant. Management decisions did not depend on the possibilities for mechanised harvesting or the availability of nearby harvesters. Similarly, the owners were not influenced by the current forest land market situation in making their management decisions. The most relevant piece of information was knowing who to contact at the public forest service when the owner wanted to harvest.

**Table 1:** Forest owners' assessments (N=364) of the relevancy of information for forest management decisions in private forests (1- irrelevant, 5 - extremely relevant)

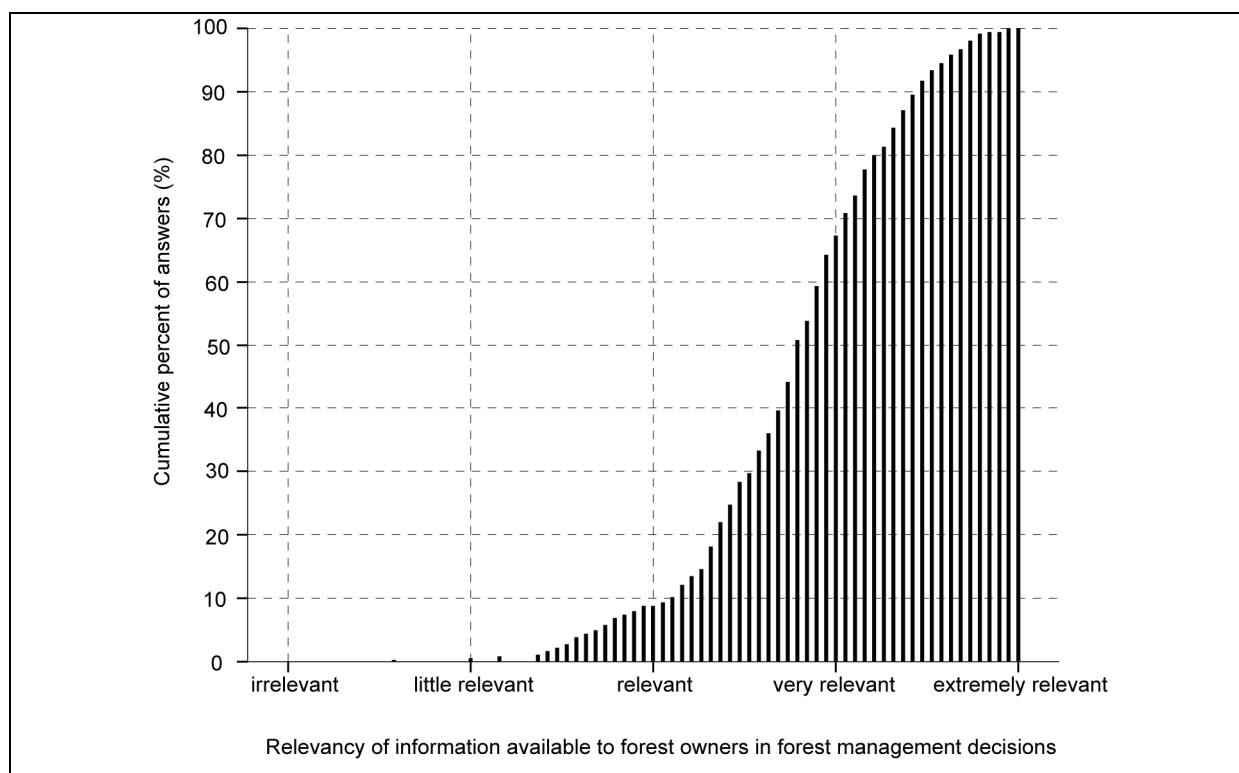
Information about the...		Mean relevancy	Information supplier <sup>1</sup>
Economic aspects	...expected costs of wood harvesting	4.0	Owner himself
	...profitability of management	3.9	Owner himself
	...local companies or private entrepreneurs offering forest operation services	3.4	Market
	...possibilities for mechanised harvesting and availability nearby my property	1.5	SFS
	...bucking techniques	3.9	SFS
	...wood sale market and wood prices	3.9	Market
	...possible cut for each individual parcel	4.3	SFS
	...allowable cut in my forest	4.5	SFS
	...the current market prices of forest land	2.6	Market
	...borders of my parcels	4.5	SMARS <sup>2</sup>

Ecological aspects	...locations of my parcels	4.5	SMARS
	...possibilities and costs of building forest roads	3.7	SFS
	...about the silvicultural measures	4.4	SFS
	...forest protection and bark beetles prevention	4.5	SFS
	...game species and their population densities	3.0	SFS
	...rights and duties of forest possession	3.9	SFS
Social aspects	...public rights in forest property (free access, non-commercial non-wood goods)	3.4	SFS
	...management restrictions due to nature protection	3.8	SFS
	...who to contact, when cut wants to be done	4.6	SFS

<sup>1</sup>The institution which is officially responsible for supplying the information or most probable source of information

<sup>2</sup>SMARS: Surveying and mapping authority of the Republic of Slovenia

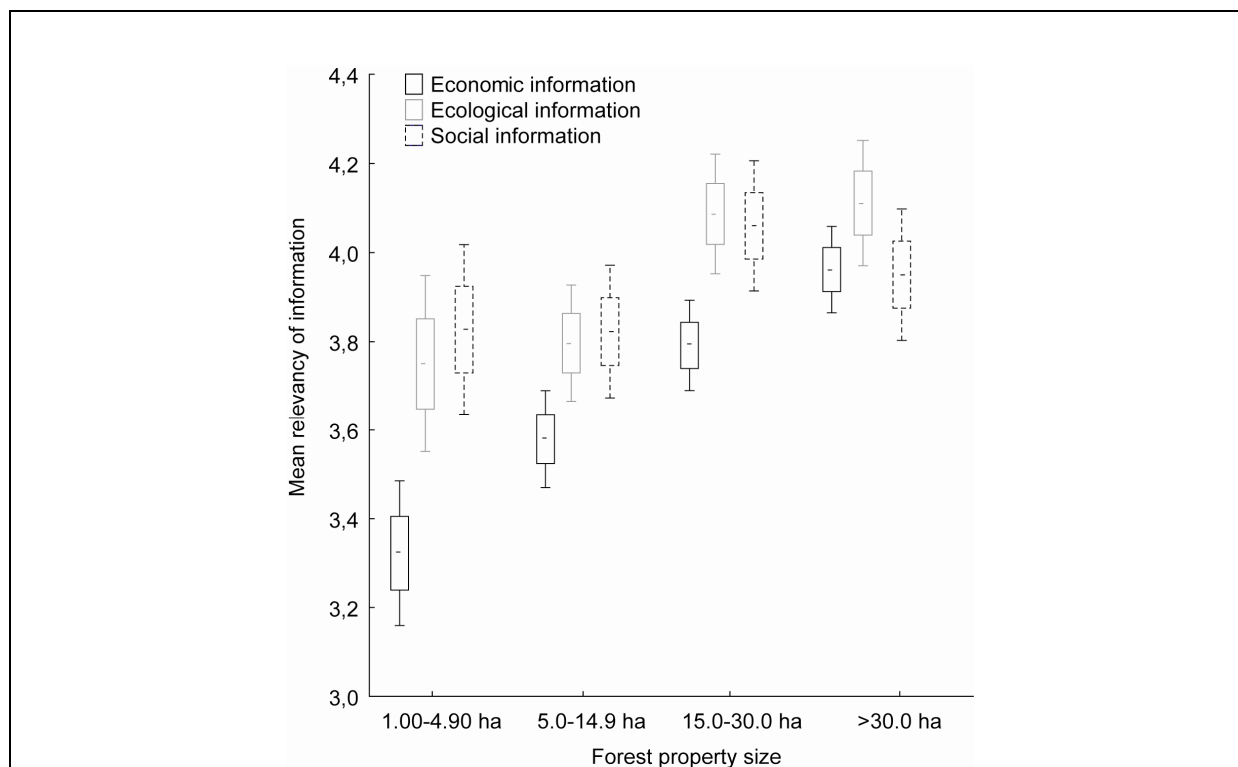
In more than 90% of the cases, forest management decisions of private forest owners were based on information which is ordinarily available to forest owners mostly via SFS communication channels and which we assumed to be relevant for management decisions. Less than 10% of forest owners, who managed their property, made forest management decisions based on information not listed, or made decisions by chance (Figure 1).



**Figure 1:** Cumulative distribution of forest owners according to relevancy of nineteen information for forest management decisions

Forest management decisions in private forests were primarily based upon social information, which was equally relevant for all sizes of properties (KW-H (3; 364) = 6.240;  $p = 0.100$ ) (Figure 2). Social information represented legal and administrative minima which a forest owner should consider in forest management. The most relevant information for the owners was the contact to the district forester (mean relevancy = 4.6), who as a person in charge of marking the trees for harvesting, represents the most direct relation of the owner to society. Other relevant social information also related to legal regulations of forest management, such as information about the rights and duties of forest possession or about public rights in the property (e.g. free access, non-commercial non-wood goods, and management restrictions due to nature protection). Social information that was primarily looked at by the owners, thus represented the minimum framework for more specific and detailed decisions at the operative level, e.g. the decision when to harvest wood or where to build a forest road.





**Figure 2:** Valuing the relevancy of economic, ecological and social information for forest management (N = 364)

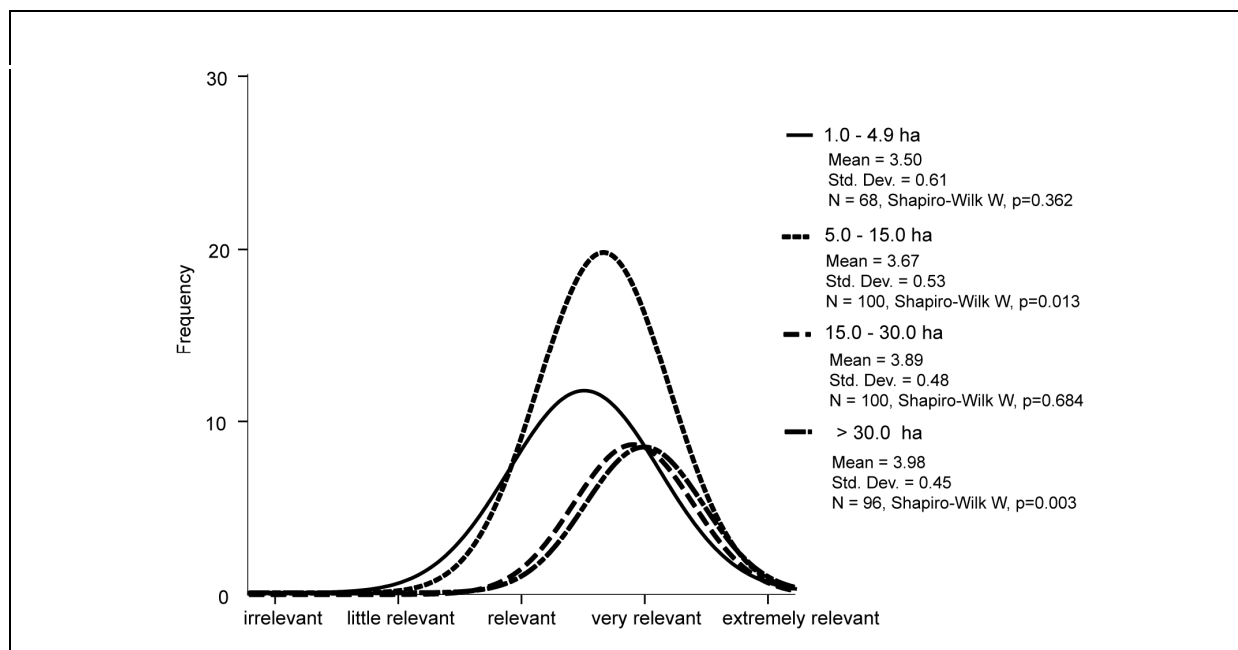
Social information was followed by ecological information which included data about forest ecosystem services and goods. Information about silvicultural measures, forest protection and wild game species became more relevant than social information for owners possessing more than 15 ha of forest land.

Economic information did not influence much on the decisions. Though its relevancy grew with the size of the forest property since it could contribute to better profitability of management. The economic criteria of decision making became more relevant compared to social and ecological information only in properties bigger than 30 ha of forest land. Also here the owners consider the ecological aspects of forest management more important than the economic (Figure 2).

By providing most of the information relevant for forest management (Table 1), the SFS significantly reduces the proportion of decision making by chance as evidenced by: 1) the owners who were supported by SFS, assessed the relevancy of information for decision making significantly higher compared to non-supported owners (KW-H (1; 364) = 25.9;  $p = 0.000$ ); 2) decisions support by SFS diminished the variability in the assessments of relevancy of information for decision making (KW-H (1; 364) = 23.2;  $p = 0.000$ ). This does not apply to the smallest properties, where the influence of SFS on lower variability of relevancy assessments was not significant (Table 2). This indicates that the support of SFS generally enables more profiled and self-dependent decision making in private properties, e.g. toward economically oriented forest owners, ecologically oriented forest owner etc. However, the overall percentage of private forest owners, who were supported by the SFS is only 51.1%, mostly on account of the 19.1% rate of decision-supported forest owners in the smallest size group (Table 2).

### 3.2 Heterogeneity of private forest owners

Patterns of decision making differed significantly ( $P < 0.050$ ) according to owner's socio-economic status, size of forest property and the support of SFS. The influence of current available social, ecological and economic information on forest management decisions was lowest in the smallest properties. Decision making in properties with high numbers of forest tracts, or in properties where owners were not supported by SFS, as well as in all forms of private forest properties other than full-time farmers, was also much less influenced by the available information.



**Figure 3:** The distribution of forest owners' assessments of information relevancy in 4 forest property size categories

In addition, the heterogeneity of decision making in the smallest properties was approximately two times higher than in other size groups meaning that the smallest owners considered much more the integration approach in their decisions by including social, ecological and economic information equally (test for significance in mean range between the highest and the lowest valuing of the social, economic and ecological information (KW-H (3; 364) = 14.8;  $p = 0.002$ ). The smallest forest owners did not react to the decision support by SFS by more uniform profiling their management objectives; there was no significant difference in the decrease of the variability in considering economic, social and ecological information in the smallest holdings after the owners had been supported by the SFS (Table 2). However, the percentage of those not having any cooperation to SFS was remarkably high in the smallest holdings (Table 2).

Decision making in small-scale properties (1-5 ha of forest) could be described with the following characteristics:

- Significantly lower usage of available information when making management decisions (decision making is more stochastic in small-scale forestry).
- Significantly higher variability in usage of social, ecological and economic information (multi-objective forest owners, high diversity of management motives and objectives).
- Small contribution of economic information to decisions (7% of all considered information) and prevailing influence of social information (50 %).

Some other owners' characteristics were also prominent for the decision making characteristics. Full time farmers valued economic information significantly higher ( $P = 0.002$ ) than other socio-economic categories, but paid equal attention to social ( $P = 0.969$ ) and ecological information ( $P = 0.071$ ). Similarly, forest owners who lived on permanent incomes from forests or at least partially earned their money from forest management made their decisions mostly on economic and ecological criteria ( $P < 0.050$ ).

Any cooperation with SFS significantly contributed to the usage of the available information and thus diminished decision making by chance. Specifically, the communication between the forest owner and SFS significantly improved the use of economic ( $P = 0.000$ ) and ecological information ( $P = 0.003$ ) in management decisions.

We found no differences ( $P = 0.096$ ) in relevancy assessments between owners living nearby the property and those living away from their forest properties.

**Table 2:** Cumulative distribution of forest owners (in %) across the variability in relevancy assessments of economic, ecological and social information included in management decision making according to forest property size and decision support

Forest property size (ha)	Decision support	Range in relevancy assessments of economic, ecological and social information included in management decision making						
		$\leq \pm 0.5$	$\pm 0.5$ to $\pm 1.0$	$\pm 1.0$ to $\pm 1.5$	$\pm 1.5$ to $\pm 2.0$	$\pm 2.0$ to $\pm 2.5$	$\pm 2.5$ to $\pm 3.0$	$> \pm 3.0$
1.0-4.9	Not supported (N = 55)	20	56	80	96	98	98	100
	Decision supported by SFS (N = 13)	31	77	85	92	100	100	100
	Total (N = 68)	22	60	81	96	99	99	100
5.0-14.9	Not supported (N = 52)	37	71	83	100	100	100	100
	Decision supported by SFS (N = 48)**	54	81	96	100	100	100	100
	Total (N = 100)	45	76	89	100	100	100	100
15.0-30.0	Not supported (N = 54)	33	65	87	94	100	100	100
	Decision supported by SFS (N = 46)**	43	85	100	100	100	100	100
	Total (N = 100)	38	74	93	97	100	100	100
>30.0	Not supported (N = 17)	18	47	88	94	100	100	100
	Decision supported by SFS (N = 79)***	42	82	96	100	100	100	100
	Total (N = 98)	38	76	95	99	100	100	100
Total	Not supported (N=178)	29	62	84	97	99	99	100
	Decision supported by SFS (N=186)**	45	82	96	99	100	100	100
	Total (N=364)	37	73	90	98	100	100	100

Significant difference between supported and not supported at 0.01 level (\*\*\*), at 0.05 level (\*\*), at 0.10 level (\*)

## 4 DISCUSSION

Every decision a forest owner makes, takes place under certain circumstances, i.e. in the decision-making environment (Hujala et al., 2007). We tried to synthesize the decision pattern of private forest owners in forest management by putting the interviewees into a situational context where they were directly asked about the importance of management information for decision making. Decision making was represented as the process between management information as an input and management decision as an output. Traditionally, the engagement of forest owners in forest management activities was commonly considered as a purely economic issue originating from a profit maximization framework, which assumes that profit is the most important objective in any management activity (Hyberg and Holthausen, 1989). This perspective was followed by utility maximization modelling (e.g. Max and Lehman, 1988), which extended the management objectives from profit maximization or timber production to utility maximization. Recent studies of forest owner's behaviour (e.g. Conway et al., 2003; Hugosson and Ingemarson, 2004; Novais and Canadas, 2010) showed that forest management is a many-sided activity and a multi-objective task. We condensed the DME into a three-dimensional space, i.e. the social aspects, the ecological aspects, and the economic aspects of decision making.

The future challenges of European small-scale forestry stem from social, ecological and economic aspects of sustainability (Hytinen, 2001). Major problems in small-scale forestry in Europe, such as insufficient management intensity in private forests and poor realisation of silvicultural measures in private forests, could

partly result from inefficient forest management planning in private forests. In forest management planning concepts, where the public forest service makes plans for all forest area irrespective of ownership (e.g. Slovenia), such disproportion between the planned activities and the realised measures could lead to the conclusion that decisions forest owners make are not strongly influenced by the public forest service. Surprisingly, our study showed, that in more than 90% of forest properties, the decisions the forest owner made, were the result of a decision making process, i.e. they were rational. For less than 10% of the forest owners we found no transformation of the information into knowledge. In such cases forest management could not be considered as a decision making process, but can be described as a non-oriented, stochastic process and could not be addressed with common forest policy instruments.

However, we must point out some shortcomings of the study. The relatively small size of the sample (N=364) scarcely represents all forms of decision practices in private forest management in Slovenia. In addition, the analysis did not include the owners with less than 1 ha of forest land, where high diversity in management motives is one of their key characteristics (e.g. Harrison et al., 2002), and where forest owners would probably use more informal information channels (e.g. social networks) aimed at forest management. However, the properties with less than 1 ha of forest land cover only 9% of the total forest area in Slovenia (Medved et al., 2010) and should not be the subject of instant adaptation of forest policy when the sustainability of forests is taken as one of the principal goals in national forest policy (Resolution on National Forest Programme, 2008).

This study showed that in future forest management planning the public forest service should pay special attention to two aspects: 1) private forest owners are still not prepared to include mechanised harvesting into their working model and 2) the role of the forest land market in solving the problems in private forest management should not be overestimated. Owners were not interested in mechanised harvesting. This could be due to the fact that approximately one half of the owners in the sample come from the area where traditional farm forest properties often consist of only one big tract as a result of the traditional self-sufficiency of farmers living from wood production. More likely, the owners have to date not had many experiences in mechanised harvesting and were a little cautious about introducing it in the future.

Current market prices of forest land did not influence management decision patterns. It seems, that forest owners do not see the opportunities of a more developed forest land market, either by enlarging their properties by buying forest land or by giving up management by selling the land.

Relatively high assessments of information relevancy confirm that the influence of SFS on more rational and decisive management is positive. The impact of SFS is twofold; 1) the owners who are regularly supported by the SFS use the provided information as a source of management decisions significantly more often; 2) the management orientation of private forest properties is more distinctive after getting the SFS support. The influence of SFS is not significant for owners of forests smaller than 5ha.

Hujala et al. (2007) argue for more customer-oriented decision support services. Also in Slovenia (Ficko et al., 2005; Ficko et al., 2010), more differentiated forest management planning in private forests considering the individual characteristics of private forest owners was identified as one of the key tasks in the forest management planning concept. Our study confirmed that decision support by the SFS improves the rationality of decisions in forest management and stimulated the owners to become more self-dependant and objectively oriented. However, the low influence of SFS on the decisions of small-scale forest owners calls for an adaptation of the current private forest policy.

The fact that the owners valued social information as the most relevant type of information in forest management shows the hierarchy of management objectives. At first, owners need to get information about administrative and legal matters; for instance, how are rights and duties of forest possession defined, what the management restrictions due to nature protection are, or what the legal procedure is if they decided to harvest. The high relevancy of social information in all size classes shows that social information is the primary information needed for subsequent, more complex decisions, where the owners should respect also ecological or economic aspects.

Social information was followed by ecological information. This shows a high ecological consciousness of private forest owners and could be due to 38.7% of full time farmers and 55.2% of spare time farmers in the sample. A similar hierarchy of management goals could also be recognised from the studies of forest ownership objectives (e.g. Boon et al., 2004; Hugosson and Ingemarson, 2004; Hujala et al., 2007), which confirmed that economic benefits from the forest are not among the most important for non-industrial private forest owners.

Decision making in properties smaller than 5 ha stands out from the decision making pattern in bigger properties. Small-scale forest owners recognized the available information as only moderately relevant for forest

management. This indicates that owners with less than 5 ha are much less dependent on professional support or frequently make their decisions using self-determined criteria. The more probable reason for the only moderate relevancy assessment of available information is poor cooperation to the SFS; only 19% of forest owners with less than 5 ha of forests regularly and actively cooperated with the SFS. The moderate relevancy of available information by property owners with less than 5 ha of forest land, was probably the consequence of not having the information and was thus not a credible assessment of relevancy. We can speculate that being without this information, forest owners considered it irrelevant information.

The decision support of the SFS did not contribute to more distinctive management orientation of the owners of forests smaller than 5ha, either. This suggests that among the owners with less than 5 ha of forest there are more likely to be many who made their decisions on all three aspects, i.e. are multi-objective.

The complexity of current decision making in private forestry is evidently high. In a changing decision-making environment, adaptive forest policy making is a challenging task which policy makers should pay more attention to in order to keep the sustainability of private forests.

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## BIOFUEL PRODUCTION: LOCAL COMMUNITIES INCOME FROM *JATROPHA CURCAS* L. IN TERENGGANU, MALAYSIA

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### ABSTRACT

*Jatropha curcas* is known as a potential crop for producing biodiesel. This shrub species thrives well in a tropical and subtropical climate and is well adapted to the Malaysian climate and soils. *Jatropha* can yield about 1,000 barrels of oil per year per square mile. In such quantities, *Jatropha*, like other biofuel crops in general, can become a partial replacement for oil as it requires minimal inputs, stabilizes or even reverses deforestation, and can be used in a variety of products after the biofuel has been extracted. Biodiesel can be blended with diesel fuel for use in diesel engines as proposed by Malaysian Government who has mandated a 5 percent biodiesel mixture (B 5). *Jatropha* can be planted in degraded lands since it is drought-resistant and can grow in saline, marginal and even otherwise infertile soil, requiring little water and maintenance. Coastal Beach Ridges Intersperse with Swales (BRIS) soil areas are one of the potential areas that can be used for planting *Jatropha*, which are mainly located in the eastern coastal states of the Malay Peninsula such as Kelantan and Terengganu, as indicated by our initial planting trials of the species. These areas are mostly settled by poor income groups and therefore FRIM has proposed a cottage industry model based on *Jatropha* which will help to raise the socio-economic situation of the community.

**Keywords:** Biodiesel-plantation-soil-cottage industry-community

### INTRODUCTION

Under the National Agriculture Policy 3 (NAP3), the emphasis on food security towards increasing domestic food production (Ministry of Agriculture and Agro-based Industry Malaysia 2000) posed a dilemma for the planting of *Jatropha* for biofuel production. Due to the higher priority of food production, soil of classes 1 and 2 have been allocated to high yielding agricultural crops such as palm oil, cocoa, rubber, fruits and cash crops. Meanwhile classes 3 and 4 soils will be reserved for other nonfood crops especially forest tree species (Arshad 1979; Mitchell 1963) including *Jatropha curcas*. *Jatropha* is currently the first choice for biodiesel production. In order to resolve the land issues, NAP Policy emphasizes the use of problematic or degraded land. Owing to its large hectareage and availability, the BRIS area was selected for *jatropha* planting. Moreover, *Jatropha* can yield about 1,000 barrels of oil per year per square mile. The species requires minimal inputs, stabilizes or even reverses deforestation, and can be used in a variety of products after the biofuel (oil) has been extracted. Biodiesel produced from the oil can be blended with diesel fuel for use in diesel engines as proposed by Malaysian Government who has mandated a 5 percent biodiesel mixture (B 5).

BRIS refers to Beach Ridges Intersperse with Swales, and is a marine deposited soil type which formed in a continuous belt along the east coast of Peninsula Malaysia and the coastal area of Sabah. The total BRIS area in Malaysia is estimated to be about 200,000 ha, with 162,000 ha in Peninsular Malaysia and 40,400 ha in Sabah. In Peninsular Malaysia, the soil is distributed along the east coast zone from Kelantan, Terengganu, Pahang right down along the coast to the west coast of Johor. The biggest area of BRIS soil is in the State of Terengganu with 67,582.61 ha, followed by State of Pahang (36,017.17 ha) and State of Kelantan (17,806.20 ha).

There are some crops being cultivated such as coconut, cashew and fruits, and with some supplementary irrigation tobacco, groundnut, vegetables, rozelle and watermelon can also be cultivated. When economical methods to ameliorate the soils are available, they could become potential areas for future agricultural development. Management of crops on BRIS soils includes the incorporation of organic matter or compost, staggered application of fertilizers, prudent water management and the use of mulches on planting beds.

Tobacco cultivation is the major crop being planted in BRIS soil and became the main source of income to the rural farmers. About 1,200 ha of land have been dedicated to the cultivation of burley tobacco. Approximately

120,000 people are involved in tobacco farming and curing. Due to AFTA, the shift would be a great help for tobacco farmers as they would be less competitive following the Association of South-East Asian Nations (Asean) Free Trade Agreement which took effect in 2010. Currently, the tobacco farmers are given a guaranteed price. A majority of them will not be able to produce tobacco leaves competitively enough for the industry to buy from them as compared to other Asean countries.

This paper presents preliminary results on the biofuel production: local communities' income from *Jatropha curcas* L. in Terengganu, Malaysia growing on BRIS (Beach Ridges Interspersed with Swales) area which has low nutrients but has a very high silica content (Abdul Wahab 1986; Amir 2001), without any soil conditioning treatment. The objective of establishing the plot is to compare the growth performance of *J. curcas* from various provenances on BRIS soils.

## MATERIALS AND METHODS

The trial was established on BRIS soil (class 4) at SPF Setiu, Terengganu in August 2009. Both the *Jatropha* plots were established at an initial spacing of 2 x 2 m, with a stocking of 2500 stem ha<sup>-1</sup>. The seeds used in the planting trial were obtained from several sources in Malaysia and other countries. Collected seeds from the first planting will be used in the second phase of planting. Seeds would be collected at a weekly interval. Total survival rate of the plants would be monitored quarterly in the first year and at 6 monthly intervals thereafter. The monitoring is needed to produce a minimum of 4 tonnes seeds for the 2 hectares of land.

## RESULTS AND DISCUSSION

After 14 months planting, KEL and TRG provenances produced the highest seeds meanwhile JC 1, JC 2, JC 3 and JC 4 provenances were still not bearing fruits (Table 1). This could be due to a very low ratio of male and female flowers produced by the plants. Poor performance of growth was observed at both sites and could be due to poor soil conditions. Nevertheless, high survival percentage shown at both sites indicates that *Jatropha* can thrive on harsh soil conditions such as BRIS and compacted soils. The seeds from these trials have been collected and seedlings were raised at the Green House at SPF Setiu for the next phase (second phase) of planting.

**Table 1:** Seeds obtained from both trials (seeds/ha)

Code	Source	Fruits
IND	India	500 Kg
KEL	Kelantan	1300 Kg
TRG	Terengganu	2000 Kg
JC 1	Ciamis, Indonesia	n.a
JC 2	Dompur, Indonesia	n.a
JC 3	Bogor, Indonesia	n.a
JC 4	Lamongan, Indonesia	n.a

For the second phase of planting, ploughing in a mixture of top soil (undisturbed top soil obtained elsewhere) with chicken manure coupled with mulching treatment will be initiated to improve the soil fertility for a successful establishment of *Jatropha* on BRIS area. The aim is to make the planting viable, minimize the cost of production and to produce after two years yields of 2 tonnes / ha. At 3 tons / ha in year 3 the yield is expected to increase to 4 tonnes / ha and a further 6 tonnes / ha thereafter. In order to increase the seed production, high yielding materials and clones will be needed. The seed production may vary from 0.5 to 12 tons/year/ha depending on soil and rainfall conditions (Makkar and Becker 1999). An average of about 5 tons of seeds per hectare can be produced under optimum conditions. In addition, *Jatropha* requires minimal inputs, stabilizes or even reverses desertification, and has been used for a variety of products after the biofuel is extracted. Moreover, diesel fuel with biodiesel additives produces far less pollution (Openshaw 2000).

As biodiesel, oil from seeds of *Jatropha Curcas* can be used as a substitute or an additive to diesel. As an alternative fuel biodiesel can generate power similar to conventional diesel fuel and thus can be used in diesel engines. Biodiesel is a renewable liquid fuel that can be produced locally thus helping to reduce the country's



dependence on imported crude oil. In producing biodiesel, the largest cost element was the raw material cost (jatropha seeds) which takes up 59.74 percent of a total production cost. In term of value, as much as RM1.87 is spent to produce 1 liter of pure biodiesel. The second largest cost element is the overhead cost (salary). This cost accounts for 16.61 percent of the total production cost, which is RM0.52 per liter.

The value of depreciation was calculated based on the initial cost for capital investment and its economic life (in this case using a 25 year life span), using a straight-line technique. The residual/salvage value is assumed at 5 percent of its original value at the end of its economic life. The depreciation cost contributes 3.83 percent of the total production cost. In terms of value, it is recorded as RM0.12 per liter of production. Considering the cost of pure biodiesel production to be subsidized by the return from waste production (pellet and crude glycerol) which amounts to RM1.61 per liter of pure biodiesel production, the average total cost for producing 1 liter of pure biodiesel is RM1.52.

## CONCLUSION

The potential of *Jatropha curcas* on BRIS soil appears promising. However, before *Jatropha* can be recommended as an alternative crop, it is important to understand the optimum nutrient requirement of the species in order to optimise their growth potential and improve the plantation practices for greater yield. Results of the planting trials, however, do provide some guidance in achieving the plantation target for higher growth and greater fruit production in the next planting phase through the use of top soil and fortified with chicken manure and mulching treatment. Besides, high yielding planting materials are expected to improve growth and productivity. The restoration is accomplished by cultural and agronomic practices. The use of large quantities of organic matter, discriminatory fertilizer application, irrigation and intensive farming systems are among some of the measures used to rehabilitate such degraded land. Once, the key cultivation aspects of *Jatropha* have been resolved, FRIM will propose a cottage industry model based on *Jatropha* to be adopted, which will help to raise the socio-economic situation of the community in East Coast areas of Malay Peninsula.

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## FOREST EXTENSION SERVICES DEMAND AND COSTS

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### INTRODUCTION

Small-scale forests play a substantial role in Germany. 24 % of the forested area belongs to owners who have less than 20 ha. In Baden-Württemberg 14 % of the area belongs to owners with less than 5 ha. Moreover even these small woodlots are often, due to historical reasons, fragmented into different, non-connected parcels. It is common sense that these structures impede forest management. Besides these apparent biophysical reasons the weak or even irrelevant contribution to the family well-being can be seen as the main obstacles to forest management. Despite these difficult framework conditions forest policy in Germany since World War II has basically highlighted the objective of improving forest management in these private properties.

As forest policy is mainly a task of the federal states, the course of action differs between the individual states. But nevertheless besides different kinds of subsidy schemes, the offer of a wide range of consulting offers still plays a significant role in almost all states, with public bodies being the predominant provider of these offers. These state offers are frequently justified in a sense that only the availability of state offered consulting services can guarantee a balance between the different forest functions (economic, ecological and social dimension) of forestry. Mention is made that a wide range of forest consulting offers is needed to meet the demand of private smallholders. Equally important is the argument that especially the owners of the smallest holdings are dependent on the state forest administrations as the provider of advisory services. Urbanisation of smallholders is a fact (Härdter, 2003) and is seen as a trigger for an increasing demand for advice and assistance.

However, the situation is going to change. In the face of increasing budget constraints and in the context of a general neo-liberal discussion about the role of the states as such, consideration about denationalisation of these forest consulting activities started two decades ago (e.g. Bayerischer Oberster Rechnungshof, 2003). Additionally competing private consultants started legal disputes at the national and EU-level.

Despite the fact that a varying, but large part of the daily work of field foresters is related to these extension activities, little is known about the time and money required to deliver these services, especially with regard to the individual sorts of extension offers. In times of increasing public budget constraints such kinds of economic black boxes are more and more scrutinized. The same level of ignorance can be found with respect to the question of which kind of consulting meets the demands of small scale forest owners.

Guidance offers are defined as “help for self-help”. Guidance offers should be (in most cases) mere information about the management activities required. The forest owner is expected to do the respective operation by himself or to hire professional forest contractors to do it for him. This guidance is normally free of charge.

Different from that are so called “technical assistance” offers. In this case the consulting includes both the information and transaction of the respective work. In this case the owner will be charged, but the costs differ notably between the states (Table 1) and it can be stated that the fees mostly do not cover costs.

**Table 1:** Fees for different consulting offers

	Baden-Württemberg (PWaldVO B-W, 2004)	Saxony (SAC, 2003)	Hessen (HES, 2007)	North-Rhine Westfalia (NRW, 2009)
Full management	5 € / ha / a (< 30 ha)	5 € / ha / a (< 30 ha)	free (< 5 ha)	7,89 € / ha / a
Annual management plan		1 € / ha (min 50 €)	free (< 5 ha)	3,49 € / ha
Timber marking in felling areas	0,36 € / m <sup>3</sup>	50 € / ha	free (< 5 ha)	129,69 € / ha
Supervision of felling operations and timber grading		2 € / M <sup>3</sup>	free (< 5 ha)	
Supervision of felling operations	0,24 € / m <sup>3</sup>		free (< 5 ha)	1,73 € / m <sup>3</sup>
Timber grading and scaling	1 € / m <sup>3</sup>		free (< 5 ha)	2,58 € / m <sup>3</sup>

	Baden-Württemberg (PWaldVO B-W, 2004)	Saxony (SAC, 2003)	Hessen (HES, 2007)	North-Rhine Westfalia (NRW, 2009)
Timber sale on behalf of the owner	0,55 €/m <sup>3</sup>		actual costs	6,83 €/m <sup>3</sup> for a single owner 2,27 €/m <sup>3</sup> for more than three owners
Wage for other activities		18 €/h	actual costs	68,68 €/ha

## METHOD AND MATERIAL

### Method

Former studies mostly used questioning techniques to identify the demand for and cost of extension offers. Given the high satisfaction with the services offers and the long consulting tradition of the forest administration ‘tactical’ responses are not an unlikely outcome. Thus it was decided to use a combined methodology to assess the demand and the cost.

I. The former use and an assessment of the relevance of various consulting offers was firstly analyzed with a questionnaire (ex ante survey). This questionnaire consisted of 60 questions in six sections. Beside questions about the forest property (section one), demographic aspects (section five), there was a focus on 31 individual consulting offers. The interviewees were asked to evaluate the importance of these offers on the base of a forced four point Likert Scale. In addition it was questioned, whether the respondent had already made use of the respective offer. In section three, questions about future use were raised. Section four focussed on different institutions as providers and gathered information about the willingness to pay. In section six the respondents had the opportunity to make additional remarks or comments.

II. This traditional approach was combined with an almost three year long field study in which different extension services were executed by the researchers involved. Here we use the Activity Research Concept (Lewin, 1946) for the first time in the context of small-scale forestry consulting. During the field study an intensive documentation about the demand and the operation of these activities was carried out. The list of items related to the individual consulting job is presented in the appendix.

### Material

The most important information about the ex-ante survey is presented in table 2.

**Table 2:** Ex-ante survey

	Mecklenburg-West Pomerania	Baden-Württemberg
Total population	1029	1321
Responses	83	311
Response rate	8 %	24 %
Analysable responses	55	306

Of special interest is the wide difference between the response rates in the two case study regions. Besides the fact, that the contact details of forest owners in Mecklenburg-West Pomerania were of poor quality, a significant number of persons in Mecklenburg-West Pomerania assumed that there would be a interdependency between the survey and a levy collection process being concurrently run by the so called ‘Berufsgenossenschaft’ (professional association of forest owners) which all forest owners are obliged to join as financial members. This might be used as a hypothesis for the low participation in one case study region.

During the field study period the ‘consulting researchers’ carried out 1,365 consulting activities and gathered in addition about 1,800 datasets related to these consulting activities as time and costs required for paper work, social contacts, transportation ... were recorded as well.

## RESULTS

### Demand

#### Consulting topics

The real demand for different consulting topics during the field study phase provided evidence that the demand is highly focused on service-offers which are related to timber harvesting and selling. Additionally, a significant part of silvicultural consulting was timber marking in felling areas.



**Figure 1:** Demand for different consulting topics

These results are flanked by the results of the ex ante survey. It turned out that consulting offers which are related to timber felling and selling had been used more frequently and received more positive evaluations, based on respondents ranking them as very important or important on a forced four point Likert Scale (Table 3).

#### Drivers of demand

Here it could be additionally shown that small scale forest owners who sell timber to the market (instead of self sufficiency users or non-users) showed a higher use of consulting activities in general and more positively evaluated the importance of most of the different consulting offers. Table 3 depicts the differences of former use and positive evaluation of various consulting offers between timber sellers and owners who highlighted self-sufficiency-use and non users.

**Table 3:** Former use and evaluation related to different user-types

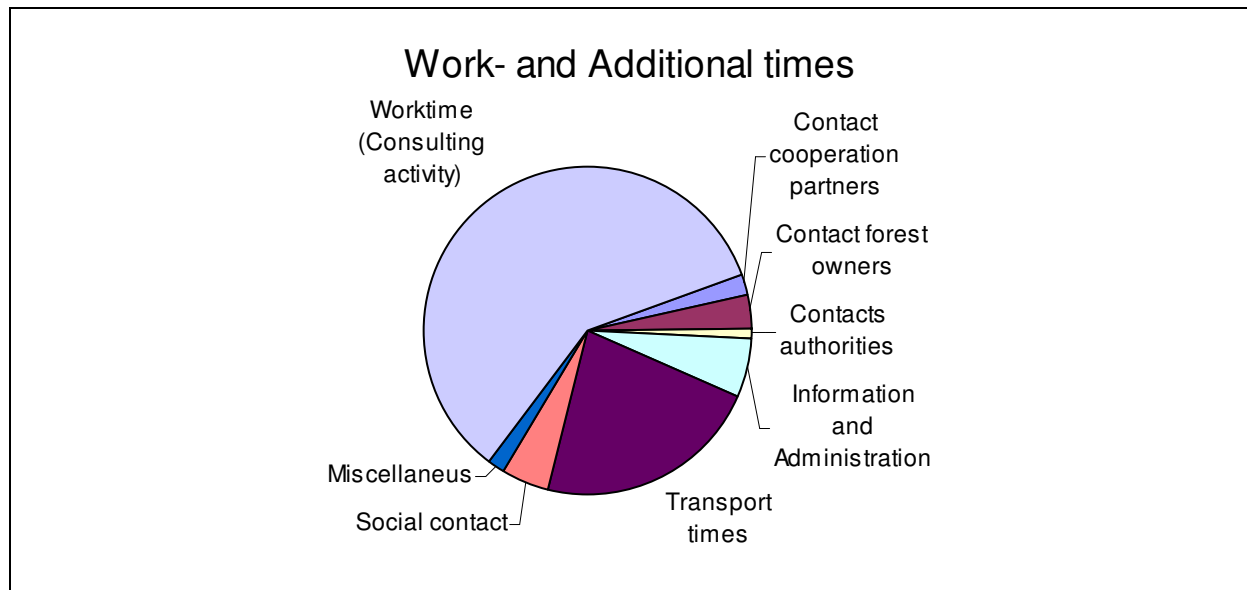
Consulting offer	Timber Sellers		Self-Sufficiency		Non Users	
	Use	Eval.	Use	Eval.	Use	Eval.
	[%]					
Timber marking in felling areas	100	100	28	58	6	33
Timber scaling and grading	100	18	18	45	4	28
Working techniques	40	80	27	57	8	38
Forest protection	75	80	22	75	11	64
Regeneration	75	100	16	64	6	55
Nature protection	25	75	4	45	0	46
Subsidies	25	75	6	55	4	57

In general the former use (respondents indicating that they have already made use of this kind of consulting activity) and positive evaluation (assessed as very important and important) is much higher in the group of sellers than in the self-sufficiency and non users groups. Except for consulting activities related to forest protection issues.

It can be additionally shown that intensity of use is strongly related to the size of the property. The larger the property is, the higher the former use and the more positive the evaluation is.

## Costs

As mentioned above, the projects were executed in regions where fragmented forest properties dominate and a considerable amount of so called additional time was expected. The field study proved this hypothesis. About 40 % of the time needed for forest consulting is related to supporting or logistical tasks like transportation. A notable amount of time is needed to maintain social relationships with forest owners. This was about 5 % of the total time or 12 % of the additional time.



**Figure 2:** Worktime (consulting activity) and additional times

Table 4 is an excerpt of the list of time required for individual consulting activities. Generally speaking it can be stated that worktime costs exceed the present financial contributions of forest owners significantly - in the range of 300 to 500 %. An analysis in detail provides evidence that the time needed for a single consulting activity varies notably. More details are provided in Hock und Hartebrodt (2011).

**Table 4:** Time required for individual consulting activities

	Worktime [Minutes]
Timber marking (demonstration)	53
Timber grading and scaling	38
Forest protection	52
Regeneration methods	42
Thinning operations	58
Subsidies	48

## DISCUSSION

Contrary to the prevalent justifications of subsidised forest consulting activities which highlight the need for a wide range of various consulting offers the results reveal that the present demand is highly focused on a small set of individual consulting offers. Five consulting activities (supervision of harvesting contractors, timber marking in felling areas, identification of boundaries of the forest property (as a precondition of legal forest harvesting), advice in thinning and harvesting techniques, forest valuation) cover 50 % of the demand. Thus it can be shown, that harvesting and selling is the key driver of the demand for advice. The topical structure of demand in the case study regions has been proven true by the results of the ex-ante survey. The formation of substrata of the

population provides evidence that the intention to sell the timber is the key motivation. It increases the use and improves the recognition of the importance of forest consulting. The idea that forest consulting will automatically improve the mobilisation of round timber in small scale forestry has to be (at least partially) replaced by the hypotheses that the mobilisation of round timber enhances the demand for forest consulting offers.

The results reveal that at present the consulting offers are much less likely to reach the owners of the smallest size-classes. Consulting offers seem to be more affected by the structural impediments of forest ownership than contribute to overcoming them.

New forest products and the increasing importance of issues like nature conservation or other sorts of societal use of forest have to date not led to an interest in related consulting offers. Thus it can not be expected that the increasing number of owners belonging to these 'new' types of forest owner groups, like conservationists, recreationists, uninterested, will increase the demand for advice.

Predictions that the present fees for consulting offers (when they are not offered for free) are not cost-recovering are confirmed. The differences between the present fees and the true full costs are high. Part of the problem is the structure of the forest ownership. Due to the fragmentation and parcellisation of forest holdings, a large part of the consulting activity is made up of additional time components which therefore increase the overall consulting costs.

## CONCLUSIONS

The perception of forest consulting under the framework of an urbanising ownership has to be changed. The loss of competence and interest in the traditional use of forests does not increase or enhance the demand for forest consulting offers. It is still the group of timber sellers that predominantly use these consulting offers. If we want to influence other groups of forest owners, be it the group of non-users or self-sufficiency users, it is not enough to maintain or increase the number of offers. It is necessary to change their perception of the helpfulness of the advisory offers. Once a first successful consulting has taken place, the probability of a continuing use of offers is high.

With regard to the present focus on consulting, which is related to (at present) highly profitable harvesting or thinning activities, it can be argued that the high subsidisation of these kind of consulting can not be justified any longer. A differentiation of consulting activities which are strongly related to societal benefits and those which improve the personal wealth of the owner, could be the basis for an optimized allocation of public means.

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## APPENDIX

Data related to each individual consulting activity

Owner related data		
Contact details	Membership forest association	Name of association
Size of forest property [ha]	Number of parcels	General Information about the forest holding
Certification yes/no, FSC / PEFC		
Data related to the individual consulting job		
ID-consulting-job	ID-Sub-consulting-job	ID_Type of consulting offer
ID_owner	Data	Method of consulting (e. g.: individual, group)
Cooperation partners involved	Comment cooperation	Information forest stand
Work time required	Name of consultant	Area treated [ha]
m³ treated	Number of Pieces	Meter (e. g. forest roads]
Material needed	Tools	Time required for driving
ID_car	General Comments	Number of consultants
Sub-Tasks		



# NECESSITY AND FEASIBILITY TO INCREASE SUPPLY OF TIMBER FROM THE PRIVATE FOREST SECTOR IN LATVIA

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## ABSTRACT

The forest sector is one of the dominating sectors in the national economy of Latvia. The yearly cutting volume from 2000 to 2007 ranged from 10 to 11 mil. m<sup>3</sup>. In this period the proportion of timber from state forests had increased from 34 % in 2000 to 46 % in 2007. The allocation of cutting volume between state and non-state forest sector marginally corresponded to the ownership structure - 50 % of the total forest area belongs to the state. The private forest sector supplied 7,5 mil. m<sup>3</sup> of timber in 2003, subsequently it slowly decreased to 5,4 mil. m<sup>3</sup> in 2007. In the next two years the harvesting volume in the private forest sector fell to 3 mil. m<sup>3</sup>. It led to the contradictory decision taken by the government in 2007 to increase the harvesting amount in state forests by 6 mil. m<sup>3</sup> in 3 years to provide industry with raw materials. In 2010 the harvesting amount was increased in both sectors - 5,3 mil. m<sup>3</sup> in private forests and 7,6 mil. m<sup>3</sup> in state forests.

Data from various opinion polls of private forest owners are analyzed to define factors influencing the decision making process in the matter of harvesting activities. Timber price is one of the dominating factors which has influence on the decision making process. Private forest owners also noted the lack of forest infrastructure and inaccessible forest stands in wet soils. The paper also discusses other factors not identified by private forest owners, but which have an influence on the timber supply.

Research was done to define effective policy implementation means to impact forest owners' behaviour and make them more interested in timber production. It is a very important issue to find prompt and effective solutions as the State Forest Service has reported that required cutting licenses in the first three months of 2011 in the private sector is slightly above 3 mil. m<sup>3</sup>.

**Keywords:** private forest owners, opinion poll, harvesting, decision making process

## DESCRIPTION OF FOREST SECTOR AND HARVESTING ACTIVITIES

### Forest industry

Since the restoration of Latvia's independence in 1991, the forest sector has been one of the most important areas of the national economy. It has developed successfully under conditions of a market economy. Experts estimated that the forest sector has contributed close to 5 % to Latvia's GDP. The forest sector was the largest export sector in Latvia. In the time period from 1999 to 2003 the forest sector represented more than 40 % of the total value of Latvian exports. In last 3 years this indicator has fallen to 20 %, but it is necessary to point that the structure of exported products has changed a lot. Due to investments in modern facilities it is possible to produce timber products with a high level of added value. In the 1990s roughly half of the export products was sawn timber, mainly no-dried. Today sawn timber forms only about 25 % of the export products and is deeper processed as before. Latvia exports about 90 % of pulpwood and 10 % of roundwood, the rest of the timber is used by the local industry.

Monitoring of the economic situation of the forest sector in 2009 included an analysis of the TOP 100 biggest forest enterprises by processing capacity. Just these companies used 4,2 mil. m<sup>3</sup> roundwood in 2007. During the last three years of the global economic crisis, the production amount decreased, but now wood processing enterprises have plans to revert to the previous production level of 2007. The majority of the entrepreneurs mentioned that a lack of resources in the last years was the essential reason for the limited production capacity and an inability to satisfy customers decreased the reputation and trust of the company. Experts rated that the flow of roundwood could not decrease below 10 mil. m<sup>3</sup> per year to satisfy the needs of the forest industry. It is very important to have a sufficient amount of timber, because the whole chain of value added of the forest sector

is based on availability of roundwood. Today possibilities to import roundwood are very limited and local resources are the base for the development of the forest industry.

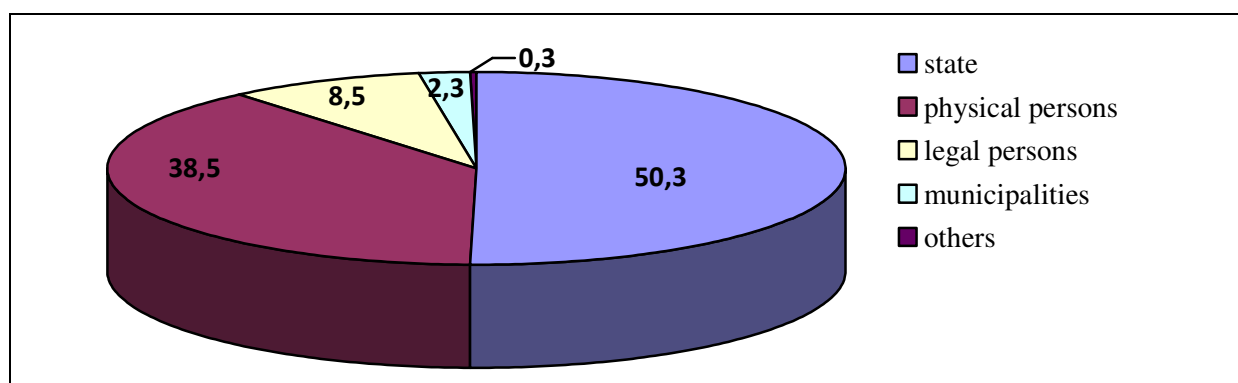
## Forest resources

Data of the State Forest Service (SFS) indicate that over the last 70 years, the size of the forest area in Latvia has doubled, while the amount of timber in the forest has increased by 3,6 times. Today forests cover 52 % of the total area. It can be expected that the amount of forest cover in Latvia will continue to increase a little thanks to increasing amounts of land that is not used for agriculture and is afforested instead.

According to the data from the National Forest Inventory the total volume of timber was 631 mil. m<sup>3</sup> in 2010. The net increment reached 25,5 mil. m<sup>3</sup> of timber in 2007. This represented an increase of 8,1 m<sup>3</sup>/ha in state owned forests and 7,6 m<sup>3</sup>/ha in privately owned forests. In the time period from 2000 to 2005 the cutting amount was 72 % from the total increment, but in the next 5 years, 63 %. The average volume of stands of cutting age is 281 m<sup>3</sup>/ha. In general there is a sufficient amount of forest resources to supply the forest industry with local raw materials.

## Ownership structure

Since the restoration of the independence of Latvia, there have been processes of land privatisation and restoration of property rights. Forest land distribution by ownership categories is shown in Figure 1. About 47 % of forest land is privatized and belongs to physical or legal persons.



**Figure 1:** Percentage distribution of forest land by ownership categories (the SFS, 2011)

According to the data of the State Land Service (the SLS) the total number of private forest owners reached 148,063 in 2010. Physical persons comprised the largest proportion of private forest sector – there are 144,069 private forest owners (PFO). About 60 % of the total number of forest properties are less than 5 ha. The average size of private forest property is roughly 7,8 ha.

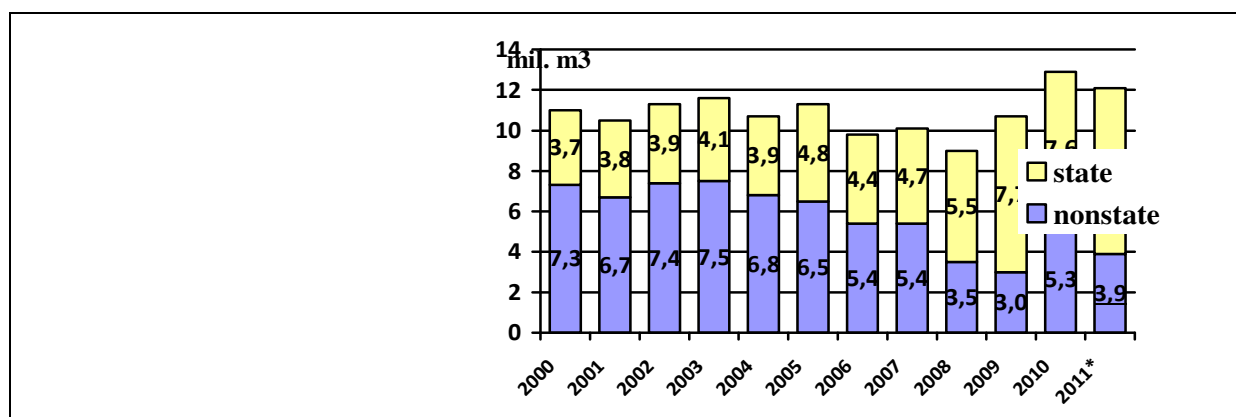
The analysis on the data base of the SLS gives characteristics of PFO (Vilkriste, 2008). The average age of PFO is 54. The proportion of male PFO is a little bit higher than for female ones – 54 %. About 73 % of PFO live in the region where their forest property is situated.

Both state and private sector are equally important providers of raw materials for the wood processing industry. The steady and balanced use of the forests is guaranteed by timber cutting policies in the state-owned forests. Each year about 4 mil. m<sup>3</sup> of timber are cut in such forests. Before the economic crisis in 2008 the private forest sector delivered more timber than state forests to the forest industry. It is possible to consider that today's development of the wood processing industry depends on the decisions on harvesting made by huge number of PFO.

## Forest harvesting

The increase of harvesting activities in the private forest sector started in 1997 and reached 4,1 mil. m<sup>3</sup>. It was close to double that in comparison with 1996. Later for several years the cutting volume in private forests was between 6,5 and 7,5 mil. m<sup>3</sup> of timber per year (Fig 2). In 2006 cutting volume in non state forests declined to 5,4 mil. m<sup>3</sup> of timber. There were several reasons for this, including low prices in the market for pulp wood,

which meant that not all types of timber could be sold at a profit. In 2008 and 2009 the harvesting amount in the private sector was about 3 mil. m<sup>3</sup>. In 2010 there was another increase in harvesting activities in the private forest sector, but ulterior plans of private forest owners are not predictable.



**Figure 2:** Harvesting volume in state and non state forests with the forecast for 2011, mil. m<sup>3</sup> (the SFS, 2011)

The decrease in the level of harvesting activities in the private forest sector causes problems for the local forest industry. The contradictory decision to increase the harvesting amount in state forests by 6 mil. m<sup>3</sup> over a 3 year period to provide industry with raw materials was made by the government in 2007. In 2010 the government accepted a maximum harvesting amount in final cuttings in state owned forests. It is 23,2 mil. m<sup>3</sup> for the time period from 2011 to 2015. It does not provide sufficient amounts for the timber processing industry, and resources from private forests will be of substantial importance.

Last data<sup>1</sup> from the SFS gives evidence that private forest owners are more active in harvesting planning than a year ago. In first four months of 2011 30,580 cutting licenses (about 20 % of the total number of private owners) for 4,5 mil. m<sup>3</sup> of timber were required by private forest owners. Also one year ago over the same time period private forest owners applied for 3,3 mil. m<sup>3</sup>, but at the end of the year actual harvesting amount was close to double that. At the same time in 2010 a total of 51,447 cutting licenses for 7,9 mil. m<sup>3</sup> were issued in non state forests, but only 67 % of the demanded and allowed amount was harvested.

## MATERIALS AND METHODS

Data collection and analyses from different sources were done for the research. Information from the Central Statistical Bureau (CSB) and the Forest Sector of the Ministry of Agriculture was the basis to describe the forest industry. The calculation of a required roundwood volume for industry was done based on monitoring of the economic situation of the forest sector (Domkins, 2009).

The SFS provides data on forest resources, ownership structure, actual and potential cutting volumes. The data base of PFO is established in two organizations – the SFS and the SLS. The SFS is responsible for the Forest State Register and contains information about inventoried forest properties, but the SLS holds the data base of all forest properties. The difference between records in both data bases is remarkable in regard to the total number of private forest owners and their properties. The analyses of the structure of forest ownership and properties done by the author in 2003 and 2007 were based on the records of the data base of the SLS.

The method of opinion poll of PFO (physical persons) was worked out by the author in 1998 in the frame of her doctors' thesis and was the starting point for observing forest owners' behaviour and its influencing factors in Latvia (Vilkriste, 2002). The surveys had to be carried out with the help of personal interviews and questionnaires at the owners' residence. Respondents were randomly selected from the data base of the SLS. In addition to the opinion polls of average PFO in 2001 and 2003 interviews with active PFO who visited forests of the SFS in a certain period of time were organized. Table 1 represents the number of respondents in each opinion poll.

<sup>1</sup> [www.vmd.gov.lv/?sadala=110](http://www.vmd.gov.lv/?sadala=110)

**Table 1:** Opinion polls of private forest owners in Latvia

Year	2001	2003	2007	2008
PFO (average)	264	420	162	364
Active PFO	2000	1260	-	-

A quantitative and qualitative analysis of data was done on the obtained information. A percentage distribution of answers and interconnections among different indicators formed the base for conclusions and identification of factors influencing forest management behaviour. The appraisal was done by using nonparametric tests such as t-tests and the criteria of Kolmagorov – Smirnov and Vilkokson-Mann-Vitnej and Kruskal-Wallis. Differences in the analysis of results were considered significant at 5 % of the level of significance  $p \leq 0,05$  (Vilkriste, 2002).

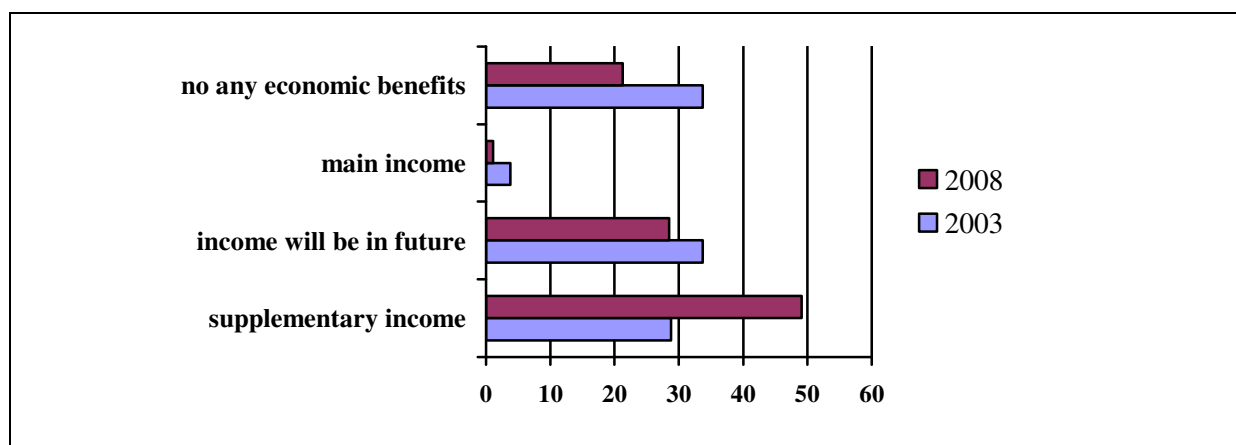
## RESULTS OF OPINION POLL

### Motivation and attitude of PFO

First of all it is necessary to study the motivation of PFO to understand and predict their forest harvesting behaviour. Also the value system of PFO plays an essential role in the decision making process. Asked about reasons why they became owners the majority of respondents firstly mentioned the way they got their property – inherited, by privatisation vouchers or purchased. In 2003 each third respondent also mentioned some economical motivation to become an owner. Four years later economic motives were only casually mentioned by 10 % of the respondents. It leads to the conclusion that the economic role of forests in private forest sector decreases. The evaluation of different forest functions and services confirmed that.

PFO were asked to value the importance of several forest benefits in a 5 point system. There is no significant difference between the estimation done in 2003 and 2008. Forest as an income source got the lowest value in 2008 – 2,4 points. The highest value (4,6 points) was given to “forest as heritage for next generations” and next was “forest as source for firewood” with 4 points. This evaluation corresponds to the fact that about 80 % of PFO collect firewood in their properties. This was the presumption made by the author that a wish to leave the forest property for the coming generation is one of the limiting factors for harvesting activities.

Only a few respondents considered that the forest is the main source of income for their families (Figure 3). In the period from 2003 to 2008 the proportion of PFO who got some income from forest management activities increased by 20 %. Almost a third of respondents had not got any income from their forests yet, but they were sure that they in the future. The proportion of PFO who thought there had been no benefit and ever would be any benefit from their forests decreased, but it was still comparatively high at 20 %.

**Figure 3:** Economic role of forestry in families of PFO (Vilkriste, 2008)

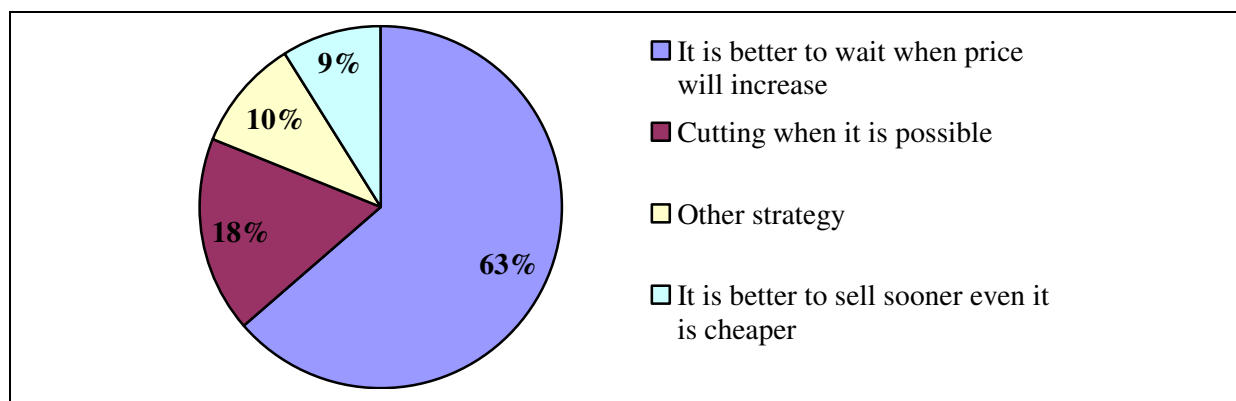
## Current and planned harvesting activities

In 2001 about 37 % of PFO mentioned that they had done forest harvesting. Two years later 29 % of PFO declared final cutting, but total activities related to forest harvesting were pointed by 62 %. PFO were asked in different ways about their forest harvesting activities to get real figures, because sometimes the information given by respondents was contradictory. For example, from Figure 3 it is possible to conclude that 30 % of PFO got some income from forest related activities in 2003. At the same time only 60 % of respondents pointed that they hadn't received any income from their forest. It is necessary to take in account that there are a lot of senior PFO with small forest properties and they do not always have the same understanding as forest specialists. For example, some PFO sold only a little amount of firewood and the income was such a pittance that they didn't considered it as income or forgot about this deal at the beginning of the interview. In 2008 about 70 % of PFO in interviews reported forest management activities in previous years, each fourth did forest harvesting in final cut.

13 % of respondents in 2003 affirmed that they had not done any forest management and there was no plan to do any also in future. The reasons for this were different: lack of money (20 %), plan to sell property (18 %), nothing to do in the property (16 %) and age (13 %). More than half (62 %) of PFO had plans for forest management activities. Forest harvesting was mentioned by 9 % of respondents, pre-commercial thinning by 7 % and "cleaning" by 15 % of PFO. A total of 24 % of respondents planned income from forest activities in the nearest future.

In 2008 more than half (54 %) of PFO did not plan any activity for the coming three years. The average size of a forest property for PFO who did not plan activities was more than 2 times smaller than for PFO who planned activities, respectively 6,1 and 12,7 ha. Final cutting was planned only by 12 % of PFO, but in total 21 % planned some income from forest harvesting. The average size of forest property in the income planner group exceeded 15 ha.

In 2001 PFO were asked to choose the most appropriate harvesting strategy from three probable forest harvesting strategies. Less than 18 % of respondents selected "fast" harvesting strategies – to cut a forest as soon as it is allowed to do so (Figure 4). 41 % of PFO believed that the price for timber would increase in future and they were ready to wait for it. 6 % of PFO had their own strategy of when to do harvesting. Astonishing for forest experts at that time was the 36 % of PFO who objected to this question. They explained that they had forests only for their own needs and didn't plan to sell anything or there was nothing for sale due to the stand quality aspects.



**Figure 4:** Percentage distribution of harvesting strategies of PFO (Vilkriste, 2002)

## Findings from opinion polls

Already the first two opinion polls in 2001 and 2003 presented the fact that differences between the active and average PFO and their management tendencies are significant and mainly determined by the size of the forest holding; sex and age of PFO and residence place of PFO. Correlations were found to be significant between PFO group and size of forest property ( $p=0.000$ ) and distribution by sex ( $p=0.042$ ). Significant interconnection exists between forest management activities and the size of the forest property ( $p=0.032$ ), sex of PFO ( $p=0.002$ ) and knowledge and experience of PFO in forestry ( $p=0.000$ ). Economic motivation of PFO increased together with the size of the forest property. Further research in 2008 verified the previous findings. It was possible to forecast

tendencies of the management of private forest sector based on monitoring changes in the structure of forest ownership and properties and the situation in the timber market.

Special attention in the opinion polls was paid to PFO's knowledge of tax related issues and use or need of state support. In 2003 about 28 % of PFO knew something about tax reduction in regard to forest management. Five years later 52 % of respondents declared that they didn't know about tax reductions, 33 % were sure that there was no tax reduction and only 15 % knew something about them. Also qualitative analyses of answers had shown that most PFO had no sense about the tax system, for example, 22 % of PFO who considered the tax rate too high offered opinion to have them higher in the future. It lead to the conclusion that in practice tax reduction for forest related activities was too small to be considered as an important tool in changing harvesting behaviour and to influence forest management activities of PFO.

PFO were also asked about the need for state support in forest management. A positive answer was given by 37 % of respondents. The majority mentioned that state support was needed for planting and pre-commercial thinnings. It was interesting that a total of 12 % of PFO pointed out financial support, but couldn't explain for which purposes. Tax reductions were mentioned by a total of 13 % of PFO.

Lack of forest infrastructure, wet stands and beaver damage as well as small and valueless forest property were mentioned by several respondents in discussions about problems PFO had in forest management. In general PFO didn't point out that limited possibilities to harvest or get income from their forests were important problems and should be solved with the help of the government.

## DISCUSSION

It has been proved that based on monitoring changes in ownership structure it is possible to forecast the tendencies of forest management activities in the private forest sector. While harvesting activities in the private forest sector were at a sufficiency level for the forest industry, after 2003 no funds were given for monitoring the situation and carrying on the started research. The economic crisis in 2007 sent timber prices down and led to a sharp decrease of harvesting activities in the private forest sector. Two new research projects were started to get information on available timber resources in the private forest sector and the interest of PFO to harvest. Both of them include opinion polls of PFO, but it is necessary to note that respondents were selected from the group of "active" PFO – persons who left their telephone numbers with the SFS during their last visit to a forest specialist.

Monitoring of the economic situation in the forest sector (Domkins, 2009) included telephone interviews with two groups of PFO. The first group (324 PFO) planned harvesting activities in the coming year and had received a cutting license and the second one (583 PFO) was recently chosen by random selection of active PFO. The fact that only 12 % of respondents had not done any harvesting was an endorsement that the selection was done from the most active PFO. The second research, based on the data base of the SFS, gave evidence that final harvesting was in total done in 46,162 forest properties (Jansons, 2010). It means that final felling was done by less than half of PFO. If we relate the number of active PFO to the total number of PFO recorded in the data base of the SLS it appears that only one third of PFO had done forest harvesting activities<sup>2</sup>. This case demonstrates that it isn't possible to organise an opinion poll of active PFO to get information about planned harvesting activities. In comparison the research of average PFO done by the author in 2008 testified that only 12 % of PFO had plans for final cutting and in total 24 % planned some income from forest activities in the nearest future. In practice, the harvesting amount in the private sector in 2009 was really low and it started to increase only with the increase in timber prices at the end of 2010.

However the opinion poll of active PFO provided information on motivation factors. Reasons to do final cutting were several: own need for firewood or raw materials (38 %), it was recommended by the forest inventory plan (29 %), necessity to cover household expenses (21 %), need for investment in business (15 %) and to pay a loan to the bank (12 %) (Domkins, 2009). Quite similar findings were obtained one year later (Jansons, 2010). A need of firewood or raw materials for their own needs was mentioned by 52 % of PFO and need to cover expenses of household by 39 %. The research led to the conclusion that a PFO who has a forest property less than 20 ha (92 % of total number of PFO and 54 % of private forest land) mentioned their own

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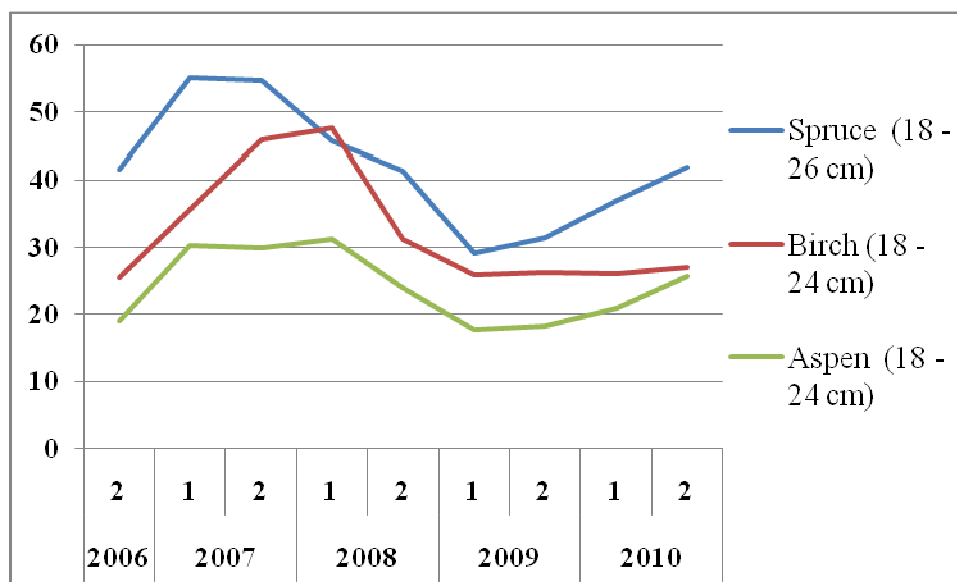
<sup>2</sup> It includes only harvesting activities when cutting license was necessary. Each PFO can collect 10 m<sup>3</sup> dry trees from property yearly without asking cutting licence.

needs as the most important motivation for harvesting activities. Regular forest management activities and selling of timber were considered in a group of PFO with more than 50 ha (20 % of private forest land and 2 % of total number of PFO).

It was established that not always taking up a cutting license means real activity. In the group of PFO that had already taken up cutting licenses 35 % accepted that they planned to do harvesting, 43 % of PFO had the opposite view point, but 22 % had not decided. Also data of the SFS based on issued cutting licenses in the first three months of 2010 presented the planned harvesting activities for 2010 in the private forest sector would be about 3 mil. m<sup>3</sup>. In practice it was 5,3 mil. m<sup>3</sup>. It means that it isn't possible to foresee harvesting activities based on cutting licenses required by PFO. Additionally the validity of cutting licenses from 2011 is three years instead of one year as was previously the case.

Reasons for the decision not to harvest were several (Domkins, 2009): prognoses for low market price (34 %), no stands ready for harvesting (37 %), no need for income from forest (15 %). Research done by Jansons (2010) also revealed that about 1/3 of PFO mentioned nonbeing of suitable stands for harvesting. The answers "no need for harvesting" and "no need for income from forestry" were mentioned by 38 % of PFO. Only 6 % of respondents mentioned too high tax rate as a limiting factor for harvesting. Each third PFO mentioned that they had stands ready for harvesting, but it was not possible due to poor forest road infrastructure (Domkins, 2009).

It was forecast (Domkins, 2009) that there would be no significant changes related to the timber supply of private forest sector in 2010 because half of the PFO did not plan harvesting. It would cause a deficit of timber in the local market and an increase in the price of saw logs. The situation would be beneficial to PFO, but not for the wood processing industry, because the price of final products did not change. The price of saw logs is really the strongest factor in motivating PFO to make a decision to do harvesting. It was also approved by numbers from the research. Asked about the price which would make them interested in harvesting, 38 % of PFP mentioned that it should be 10<sup>3</sup> LVL/m<sup>3</sup> more than at the moment of the opinion poll. 27 % mentioned a level of price increase from 6 to 10 LVL/m<sup>3</sup>, but 8 % from 3 to 5 LVL/m<sup>3</sup>, would be needed to interest them in selling timber from their properties. The information about roundwood market price is collected by the CSB and shows (Fig 5) a great fluctuation in the 5 year period. It correlates with the harvesting amount in the private forest sector.



**Figure 5:** Price of sawlogs by time period (the CSB, 2011)

Calculations of available timber resources from the private forest sector indicate that the volume of stands of a cutting age is 21 mil. m<sup>3</sup>. It was forecasted for 2011 (Jansons, 2010) that the cutting volume in private forest sector would be about 4,4 mil. m<sup>3</sup> if there were no significant changes in the timber market and legislative

<sup>3</sup> 1 LVL = 0,7028 EUR (by Bank of Latvia)



system. It is expected that in the time period from 2012 to 2016 the average cutting volume per year in the private forest sector could be 2,9 mil. m<sup>3</sup>. It is too small to satisfy the needs of the wood processing industry.

PFO has enough forest resources to be active players in the timber market and providers of resources for the forest industry. Research done by the author and other experts gives evidence that PFO are not interested in active selling of their timber. In most cases PFO of small properties consider their property as a deposit for themselves and coming generations and are not interested in selling timber. Cutting is planned in the case that there is a real need for income from forestry. It means that PFO's calculation systems when it is profitable to harvest stand differs from general economic theories and it is very hard to predict the level of harvesting activities in the private forest sector.

It is important to bear in mind that the majority of PFO did not obtain their property for money. One part of PFO inherited their property, but the second part got them by privatization vouchers given by the state to each citizen of Latvia after regaining independence. A comparatively small portion of forest properties were obtained in the market. This fact explains why PFO do not behave as investors and don't plan forest management on the basis of the market situation and economic calculations.

It is indisputable that higher timber price increases the interest of PFO in harvesting. Once there was very high market price for timber, today nobody wants to sell anything for a cheaper price. It is a "waiting" time for a relevant part of PFO due to the fact that in small properties income from harvesting is possible only once or a few times in an owners' life and than it should be "real" income.

In the situation where the forest sector plays such an important role in the development of the national economy and a half of the forest resources belongs to PFO the government has to find effective tools how to influence the harvesting behaviour of PFO. The decision to increase cutting volumes in state forests is the solution for short time period; in the long run it will be in conflict with Forest Policy of Latvia and the principles of sustainability. An income tax reduction for PFO could be the motivation to sell timber in the legal market not to dealers who avoid paying taxes, but experience shows that it is not enough to increase the total harvesting volume from the forest sector.

Today when the importance of energy from renewable resources is increasing one option is to support the use of logging residues. Technically, the available amount of harvesting residues in a year is about 2–2,5 mil. m<sup>3</sup> according to calculations by experts at the Forest Research Institute "Silava". In this case, forest harvesting in private forests will be more effective from the viewpoint of use of resources and PFO will also get extra income from selling harvesting residues. Studies done by the author in the framework of a project "AFO – Activating private forest owners to increase forest fuel supply", led to the conclusion that there is also a great need to support cooperation of PFO so that they can do certain activities together and reduce harvesting costs and increase the amount of resources for selling. It is the way to increase income for PFO in the situation when an increase in timber price is limited by market conditions.

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## SMALL - SCALE PLANTING OF TEAK (*TECTONA GRANDIS*) AGAINST RISING PRICE OF RUBBER (*HEVEA BRASILIENSIS*) IN MALAYSIA

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### ABSTRACT

Teak (*Tectona grandis*) a globally emerging forest resource is known for its high quality and valuable timber products has been selected as one of the species for large scale planting under the Forest Plantation Programme in Malaysia. The programme under the purview of Ministry of Primary Industries and Commodity (KPPK) was launched in 2006 with the main objective of continuous supply of valuable and general utility timber for the existing wood and furniture industries in the country. The investors have the right to choose either to plant forest tree species or rubber depending on the availability of labourers, site suitability and site location. To encourage intensive establishment of commercial timber plantations, a number of incentive has been allocated by the government including the provision of soft loan of MYR 8000 ha<sup>-1</sup> (2700 USD) at 3.5 % rate of interest payable after 15 years. However, since 2010 with the increasing trend in rubber prices in the world market has put the small scale timber planters in dilemma, either to continue planting teak or rubber for latex and timber production after specified time period. With ever increasing latex prices (MYR 11.90 kg<sup>-1</sup> as of January 2011), the rubber growers on the average production and tapping days of 30 kg and 12 days month<sup>-1</sup> earned about MYR 51,000 annually. In comparison with teak, even under intensive management may be ready for harvesting after 25 years, and the situation of wood industry in Malaysia has no market demand for small size timber produced from thinnings. However, despite having no return even after the first thinning in 5 years, and increasing timber prices and value-added timber products, the small-scale teak growers still considering teak planting as a lucrative business. The growth and yield information from small-scale teak cultivation at 14-years after planting is presented. Overall the average production (MAIv) of teak cultivation in Peninsular Malaysia and Sabah lies between 10 and 20 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup> after 13 years.

**Keywords:** Plantation programme – intermediate income – soft loan

### INTRODUCTION

Teak or *Tectona grandis* Linn F, belongs to the family Verbenaceae, and is predominantly tropical and subtropical. The genus is represented by three species, viz: *Tectona grandis* Linn F, *Tectona hamiltona* Wall. and *Tectona philippinesis* Benth and Hooker. F. The natural distribution is in South East Asia spreading from India, Myanmar, Thailand to the Philippines, however there is no natural teak stands in Malaysia. *Tectona hamiltona* is found in the dry zones of Myanmar while *Tectona philippinesis* is found in the islands of Batangas and Mindoro in the Philippines. The area under teak plantation in Asia was reported to be around 94 % of the total world teak plantations (5.7 million ha). India boasts with the greatest area of 3.2 million ha of teak plantations while Myanmar and Thailand has over 14 and 6 million ha of mixed deciduous forests with teak. The ever increasing need for teak timber has therefore resulted in large scale plantations beyond its native countries in Asia (Indonesia, Malaysia) Africa (Ivory Coast, Congo, Nigeria), and Latin America (Brazil, Costa Rica, Panama and Honduras). It now constitutes an estimated 75 % of the world's high-quality tropical hardwood plantations (Nakata & Isoda, 2005). Indonesia has over 800,000 ha of planted teak forests while Laos has over 70,000 ha (Manmohan & Dugaya 2010).

Teak has been introduced in various parts of Malaysia as early as 1950s especially in the northern states of Perlis, Kedah, Langkawi (Hashim *et al.* 2005) eastern and northern part of Sabah, but the actual commercial planted teak stands hardly reached more than 10,000 ha. The research results obtained (A. Zuhaidi *et al.* 2010) clearly indicated teak has satisfactory growth and suitable for planting within the country. The paper highlights

the current scenario of teak planting in Malaysia actively competing with rubber and alternative measures to encourage stakeholders venturing in the planting of the species.

## Ecological requirements

The species is one of the world's most valuable tropical timbers (Sibomana *et al* 1997) and prefers deep riverine alluvium, and does not tolerate flooding or infertile lateritic soils (Phengkai *et al.* 1994). Seth & Yadav (1959) noted that the best growth of teak occurs on deep, moist, fertile and well drained sandy loam soils. Trees occur on steep slopes, normally do not reach large size due to shallow and poor soil condition. Teak thrives on a wide range of soils derived from limestones, schist, gneiss and shale growing at elevations from sea-level to 1,000 m above sea level (Pandey 1983). However, teak forests planted in well drained deep alluvium with soils pH values in a range of 6.5 and 7.5 carry the best stands of teak.

Previous experience especially in Peninsular Malaysia showed teak has promising growth in the early 5 years and slowly declines due to various reasons,

- i. Improper species to site matching; teak planted on infertile sites
- ii. Techniques of establishment; teak planted at too high density, size of planting holes, application of unnecessary weedicides, method of site clearing
- iii. Selection of planting materials; old planting stock, quality of planting materials
- iv. Knowledge on the silviculture and management of the species; the concept of tending after planting, thinning and stand improvement felling are not well understood

The experience from the PLUS Expressway Berhad, the largest toll expressway company in South East Asia venturing into planting of teak along the expressway should be highlighted. The initial main objectives were to ensure that the timber from this planting project will contribute towards a steady supply of small diameter high-quality sawlog for the local wood craft industry and at the same time as landscape purposes. The establishment of planted forests along both ways anticipates creating of an environmental and aesthetic benefit to the road users. After 12 years of, and despite schedule applications of fertilizers and weed control, the stands hardly reached average diameter of 15 cm and production of sawlogs is still uncertain.

Since the government initiative to encourage the small scale (4 to 40 ha) and commercial (> 2500 ha) planting of teak, a number of issues have been observed relating with the scenario of teak industry in the country.

## Management objectives

Jackson (1984) has pointed out the causes and failures of plantation projects, among the observation that known techniques are not applied. Often the approach of designing plantation projects is too narrow. Economic considerations are given particular emphasis, while the design of stand management operations is not given the attention needed. In the case of Malaysia, a number of well established companies including Lembaga Urusan Tabung Haji and Modal Jati Sdn. Bhd. have established vast areas of teak plantation especially in East Malaysia. However, most of the projects were abandoned a few years after planting and replanted with other agricultural species.

There are a number of reasons namely, the yields or production from planting other competing crop such as rubber (latex) trees starts early and with increasing in quality of the planting materials, the current tapping of rubber trees for latex starts as early as five years after planting. With ever increasing latex prices (MYR 11.90 kg<sup>-1</sup> as of January 2011), the rubber growers on the average production and tapping days of 30 kg and 15 days month<sup>-1</sup> earned about MYR 60,000 annually. The planters are more attractive towards plantations that give early cash returns to serve the initial cost of investments in particular financial loans from any institutions. In comparison with teak, there is no market demand and low value of small diameter logs after first thinning from timber stands. The situation is reversed in Indonesia or Thailand, where small diameter teak logs are highly demanded for manufacturing of furniture components, wood crafts down to wooden souvenirs. The lack of clear management objectives by the investors and financial strength has major influence on the sustainability of the plantation projects that caused the company for the sudden change in direction from forestry to agriculture.

## Government policy

In 2006, the government of Malaysia through the Ministry of Plantation Industry and Commodities (KPPK) has launched the Forest Plantation Programme in an effort to sustain the production of raw materials for the wood based industry and reduce pressure from continuous logging on natural forests. A Special Purpose Vehicle (SPV) known as Forest Plantation Development Sdn. Bhd. Was launched (a wholly owned company of Malaysian Timber Industrial Board (LPKM) on the 13 February 2006. The main functions are as follows:

- To promote the establishment of forest plantations for future timber supply.
- To manage the disbursement of soft loans, carry out auditing process of the plantation and to provide technical support
- Monitoring and auditing the development progress of forest plantation programme
- To create a proper trading centre for timbers produced by man-made forests.

The government through LPKM provides financing and loans for forest plantation projects. To attract and encourage the private sector to participate in the forest plantation programme, they are provided with fiscal incentives such as soft loans at 3.5 % interest rate payable after 15 years and investment tax allowance. The quantum of loan given to a successful applicant is RM 10,000 per ha for rubber wood and RM 8,000 (2700 USD) per ha for teak.

As of 31 December 2010, no loan has been approved to finance the development of teak forest plantation, while a total of 24,959.75 ha of forest plantations species have been established with more than 70 % planted by rubber trees.

Across the board and surveyed done, the small-scale cultivators have indicated that teak needs longer rotation periods preferably over 25 years compatible with its high quality wood properties. The rate of failures and poor performance of teak stands by small holders or small scale planters further extend the gap and the lack of passion towards planting of teak.

## Species preference

The current scenario of small-scale forest plantation focuses on two main species, *Hevea brasiliensis* (rubber) and sub-tropical hardwood *Acacia mangium*. Both species are initially being exotic and after years of planting has been marketability accepted as raw materials for general-utility timber, medium density fibre board and furniture components. To add to their selection criteria, both species are more robust in terms of site-species suitability, wider range of adaptability and early cash returns from the latex and can be utilized either for industrial woods or quality products. In comparison, teak requires longer growing period, preferably more than 20 years for production of high quality timber products.

*Hevea brasiliensis* is grown in Malaysia not only for latex but also for sawlogs. On the average it takes 4-5 years for the tree (selected clones RRIM 2000 series) to reach the desired size and latex extraction continues until the age of 25 years, and later felled for timber production. The first 6 m logs are used for sawnwood and the remaining can be manufactured into various forms of reconstituted wood. About 80 % of the furniture manufactured in Malaysia used rubberwood; and this industry is currently estimated to be worth RM 6 billion annually while the furniture industry itself is worth more than RM 4 billion (Anon, 2009). Furniture from rubberwood is also manufactured in Thailand, and the industry is being developed in China, India, Indonesia and Viet Nam. Rubber wood has in fact become so valuable that the results of more than 100-years of research the Malaysia Rubber Board (LGM) is now breeding dual-purpose latex/timber clones, which have recently been released for planting.

## Silvicultural requirements

Site-matching: Small holders were very often having enough prior knowledge on the site requirements or the site-species matching. The effect of malpractice of improper site-species matching will only be realized years after planting when growth of teak is below the expectation (Figure 1). Teak planted on areas undergoing heavy disturbances such as along roads or highways are totally had any topsoil left. Despite using the big hole planting, trees just could not able to grow and no longer justified for further maintenance and had to be removed.

Tending: The information on the tending treatments after planting often not fully understood especially among small holders and the concept of intermediate removals or waste thinning commonly not accepted.

Stands often left growing in mixture between the suppressed, intermediate, co dominant and dominant trees (Figure 1). To date, there is no market demand of small diameter size teak trees in Malaysia, and with the current areas, there is no guarantee of continuous of supply of small logs if the government to create small-scale business solely on processing of small logs.

## Constraints

**Planting materials:** The limitations exist if plantations are established from unselected planting materials including seeds:

The limited supply of quality seeds as the flowering regime is irregular and the germination rate varies from 30 to 50 % over a certain period. Teak plantation establishment using seeds is no longer an option due to a number of problems such as low germination rates and variability in growth among individuals (Kaosa-ard *et al.*, 1998). With the unknown and unpredictable yield, high initial stocking rate in per ha is needed. The non-homogenous growth and development as some seeds may be of good genetic makeup from superior mother trees while some may possess poor traits such as immense branchiness or slow growth.



**Figure 1:** Teak stands often neglected without any tending treatments after planting

Challenges and difficulties associated with using seeds to establish plantations have stimulated much interest amongst public organizations and private investors to consider the clonal option for large scale teak plantation establishments. Where seed supply is limited, vegetative propagation through clonal option is a promising alternative for plantation development. Although growth and yield of the plantation can be largely improved through site selection and proper silviculture management, stem quality in terms of bole straightness, persistence of stem axis, branching is strongly controlled by genetic make-up (Kjaer & Foster, 1993). While the use of improved seed from seed production areas, seed orchards and plus trees is instrumental to the improvement of growth and stem quality, the limited availability of such improved seed, either from seed production areas (SPA) or clonal seed orchard (SCO), suggests clonal option as the alternative to initiating plantation establishment with quality materials (So *et al.* 2009)

**Cash flow:** The pertinent problem for forestry plantation investment is the long-term horizon between incurring the costs of establishment and receipt of the returns from harvest. The absence of cash flow is a disincentive for any company or individual without resource to other income. Not surprisingly, several case identified lack of cash flow as a major impediment. In Malaysia, several companies requested that they be allowed to allocate portion of land leased for plantation establishment to the raising of agricultural crops. This was considered a necessary activity to cushion the long waiting period before plantation harvests.

**Pests, diseases and fire protection:** Incidence of pests and diseases also varies with region of plantations. In Indonesia, three major pests have been recorded; *Hyblaea puera* (defoliator), *Eutectona machaeralis* (skletonizer) and *Neotermes tectonae* (termite). There are no serious pests and diseases of teak in Malaysia, unlike other region where teak trees, either in natural forests or plantations, face threats of native or introduced pests and diseases. Few insect pests such as *Xyleutis ceramica*, *Paliga damastesalis* and *Hyblaea puera* are recorded in Malaysia. *Xyleutis ceramica* is a stem borer reported to attack trees in Sabah, including in Peninsular Malaysia while *Zeuzera coffeae* is more common as sapling stem borer. Teak skletonizer, *Paliga*

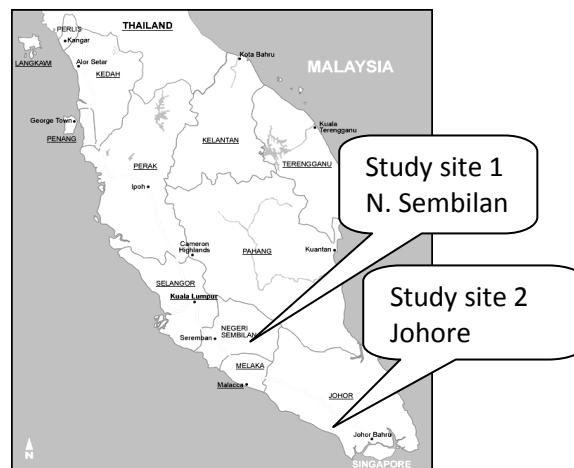
*damastesalis* and leaf roller, *Hyblaea puera* are more common defoliators in Malaysia. However, their attacks, in many cases, are sporadic and localize.

## Growth and yield of planted teak

Despite little attention by the investors, a number of small scale farmers in Peninsular Malaysia and state agency in Sabah still considering teak as the profitable long term investment. As a common example, the Sinaran Delima Enterprise and PLUS Private Ltd. have established 5 ha teak since 1997 and utilized most of the small diameter logs from thinning for furniture components and even as timber production .

## Study sites

Two study sites were established in Negeri Sembilan and Johore in 13 and 12 years old *Tectona grandis* stands. The area is located in the south of Peninsular Malaysia at 102° 14 East and 3° 25 North (Figure 2). Mean daily temperature ranges from 27 to 32 ° C. The annual rainfall is between 1800 and 2050 mm indicating the middle range of rainfall in the humid tropics. The area is located at about 80 m above sea level. The terrain is level. During planting 100 g of Christmas Island Rock Phosphate was applied, and 2 rounds of 300 gram of NPK yellow (12:12:17:2) carried out twice annually. The stands were planted at an initial spacing of 1111 trees ha<sup>-1</sup>.



**Figure 2:** Study sites, Peninsular Malaysia

## RESULTS

At 13 years, after undergoing a selective thinning treatment, the stand has an average volume of 160.92 m<sup>3</sup> ha<sup>-1</sup> with an annual production of 12.54 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup>. The achieved average diameter at breast height and total height were 19.1 cm and 17.39 m, equivalent to an annual diameter increment of 1.4 cm respectively (Table 1).

Subsequently in site 2, at 12 years after planting and thinned down to different final crop regime, the average diameter from the unthinned to the heaviest varies from 14.6 to 24.3 cm. The average total height was 13.87 to 18.93 m with an average MAI<sub>v</sub> production of 10.16 to 21.15 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup>.

The figures do not represent the performance of the species as a whole, but give a clear indication and provides some answers of its potential if carefully planted and managed under commercial plantations. The graphs in Figure 3 shows the diameter size-age relationship collected from different sites in Peninsular Malaysia.





**Figure 2b:** Well-managed 13-year-old teak stands

**Table 1:** Stand and stock table of 13.5 year-old teak stand, Peninsular Malaysia

SITE 1 (inland soils)

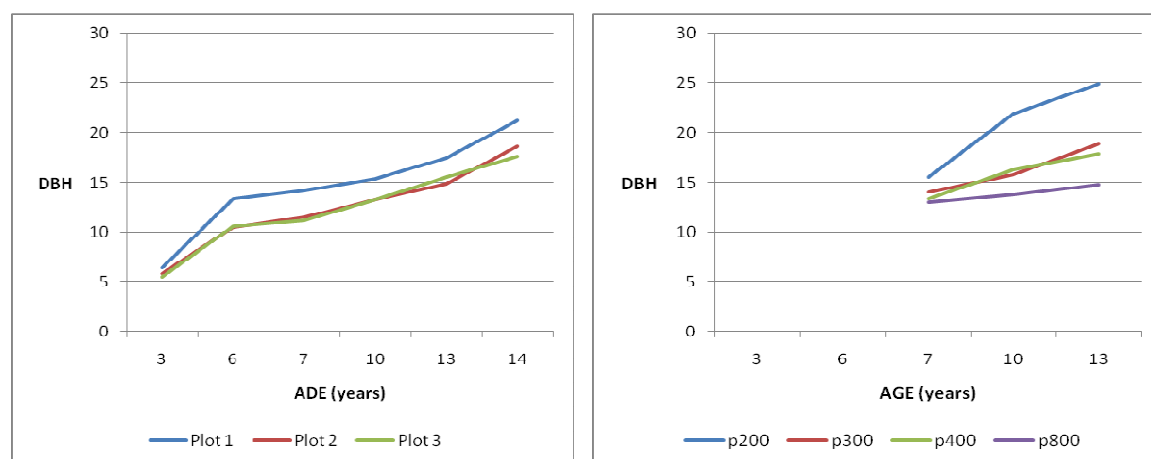
Plot	N	$D_{dom}$ (cm)	$D_g$ (cm)	$H_g$ (m)	$G$ ( $m^2 ha^{-1}$ )	$V$ ( $m^3 ha^{-1} y^{-1}$ )	$v$ ( $m^3 ha^{-1} y^{-1}$ )
1	537	28.5	21.6	16.8	19.68	214.91	15.92
2	537	24.0	18.9	14.5	15.04	141.75	10.50
3	661	25.6	18.4	13.3	17.46	150.94	11.19
<b>Ave:</b>	<b>578</b>	<b>26.0</b>	<b>19.1</b>	<b>14.87</b>	<b>17.39</b>	<b>169.20</b>	<b>12.54</b>

SITE 2 (both inland and cut soils)

Treatments	N	$D_{dom}$ (cm)	$D_g$ (cm)	$H_g$ (m)	$G$ ( $m^2 ha^{-1}$ )	$V$ ( $m^3 ha^{-1} y^{-1}$ )	$v$ ( $m^3 ha^{-1} y^{-1}$ )
1	400	23.5	18.1	16.00	10.11	97.76	16.76
2	300	25.4	20.5	17.24	10.70	110.87	18.45
3	200	28.1	24.3	18.93	9.49	108.15	21.15
4	800	20.6	14.6	13.87	14.00	117.25	10.26

**Remarks**

N	number of trees $ha^{-1}$
$D_{dom}$	100 biggest trees $ha^{-1}$
$D_g$	mean diameter at breast height
$H_g$	total tree height
$G$	basal area $ha^{-1}$
$V$	total volume $ha^{-1}$
$v$	mean annual volume production $ha^{-1} year^{-1}$



**Figure 3:** Diameter size-age relations between two study sites

## CONCLUSION

Little attention on the planting of teak is the results from various factors including the availability of alternative species such as *H.brasiliensis* and *A. mangium*, proven to produce yields in shorter time period. The previous records on the poor performances of teak and ecological requirements of the species further widen the preference of small-scale investors. Despite, with the ever increasing price of rubber, the small-scale teak plantation (< 40 ha) is still being practised in the midst of serious field workers shortages and personal preference for timber plantations. And Malaysia as one of the participating countries of the producer of tropical hardwood from plantations will continue to support local investors and work closely with neighbouring countries towards achieving the objectives. As the constraints prevailing in the natural forests are likely to increase and pressure from international bodies to conserve the natural forests, tropical forest plantations offer an excellent alternative to compensate and increase available resources to meet the world market demand. In the long term it is likely that the demand for tropical hardwood will exceed the supply, thus there is a good market potential for valuable hardwood plantations. These potentials can only be materialized with the assistance from the governments in creating the sound environment and expanding investor's confidence and commitments to grow more quality hardwoods.

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## ASSESSMENT OF SPECIES DIVERSITY, YIELD AND BENEFITS OF SMALL-SCALE NATURAL FORESTS TO OWNERS IN ONDO STATE, NIGERIA

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### ABSTRACT

This paper examined the present status of small-scale natural forests in terms of tree species diversity, abundance, and yields in Ondo State, Nigeria. The contributions of the forests to owners' livelihood and the various forms of restrictions were highlighted. Data on tree species diversity and growth variables were collected from five plots (25 x 25m) randomly located in six different locations across the State. Information on benefits and restrictions were obtained from informants, officials of Forestry Department, literatures, annual reports and files. A total of 344 stems/ha of 29 families and 99 species, (Shannon Index = 4.10, Evenness = 0.90) were encountered. The most abundant species and family were *Celtis zenkeri* and Sterculiaceae respectively. The forests were in form of woodlots, relics of natural forests, cocoa agroforest and highly economic tree species purposefully retained on farmlands. The dbh varied between 16.58 and 41.60cm, height between 15.99 and 18.40m, basal area between 12.13 and 48.05cm<sup>2</sup>/ha and volume between 117.47 and 307.73m<sup>3</sup>/ha. About 45% of the trees were merchantable. The social, economic and ecological benefits of these forests to owners and the various personal and institutional restrictions, in order of importance, were enumerated. It was suggested therefore that the effective use of forest extension agents could remove some of the restrictions and promote small-scale forest management in Nigeria.

**Keywords:** Species diversity, farmland, diameter at breast height, tree volume Diversity indices

### INTRODUCTION

In Nigeria, about 200 hectares of the forest are being destroyed annually through many human activities that include accelerated urbanization, conversion of forest reserves to farmlands and housing estates. Forests are essential parts of rural livelihood. Income from private small-scale forests is able to boost rural economy. In the developing countries, an estimated 80% of the population depends on the forest resources for their daily survival. The timber products from these forests are very valuable for construction purposes and furniture works while the non-timber forest products (NTFPs) are harvested for primary health care delivery and food. For these reasons, communities dwelling in or near forests have in the past ensured that the rich and diverse forest areas are preserved and protected for the continuous production of these goods and services (Tiwari et al., 2010). Their proximity and total dependence on forest resources has enabled them to be willing to conserve the resources and use them judiciously. Therefore, rural farmers had always and deliberately retained trees on their farmland, planted trees in woodlots, left behind some relics of forest and protect trees that were planted. These old practices are some of the modern day agroforestry systems.

This study therefore examined the diversity and abundance of tree species in these small-scale forest types. The forests were quantified in terms of volume and basal area. The benefits of the forests to the owners and the constraints to sustainable forest management were also examined. This was done through field inventory of small scale forests and administration of well structured questionnaire to the forest owners in Ondo State, Nigeria.

## METHODOLOGY

### The study area

The present study was carried out in Ondo State, Nigeria. The State was created on 3rd February 1976 as one of the 36 States of Nigeria and it is located in southwest Nigeria. It is an agrarian state with 18 Local Government Areas. Six different locations were randomly selected across the state and forests were selected in each location for data collection. The locations were selected to ensure the coverage of the entire state.

### Method of Data Collection

#### Field inventory exercise

Systematic line transect was adopted for plot location in each of the sites. Four plots of 25 x 25m were located in each of the selected forests. In each field plot, all living trees with dbh >10 cm were recorded by species and assigned to families, the dbh, diameters at the base, middle and top and their total height were also measured. Community diversity indices were calculated from a mathematical formula that takes into account both species richness and relative abundance of each species in the community.

The equation for the Shannon-Weaver diversity index used is:  $H' = -\sum_{i=1}^s p_i \ln p_i$  and the Evenness (E) index is  $E = \frac{H'}{\ln S}$ .  $H'$  is the Shannon diversity index,  $P_i$  is the relative density and  $\ln$  is natural logarithm and  $S$  is the total number of species in the community (Magurran, 2004; Lu et al. 2010).

#### Basal Area Calculation

The basal area of all trees in the sample plots was calculated using the formula:  $BA = \frac{\pi D^2}{4}$

Where BA = Basal area (m<sup>2</sup>), D = Diameter at breast height (cm) and  $\pi$  = Pie (3.142).

#### Volume Calculation

The volume of each tree was calculated using the Newton's formula of Husch *et al* (2003):  $V = (h/6) (A_b + 4A_m + A_t)$ . where:  $V$  = Tree volume (in m<sup>3</sup>),  $A_b$ ,  $A_m$  and  $A_t$  = tree cross-sectional area at the base, middle and top of merchantable height, respectively (in m<sup>2</sup>) and  $h$  = total height (in meters).

All variables and calculation were extrapolated to the values on per hectare basis by multiplying sample plot values with the number of 25 x 25 plots in one hectare (16).

#### Socio-economic data

Data on the socioeconomic characteristics of the small-scale natural forest owners in the study area were obtained with the use of a well-structured questionnaire. A total numbers of 117 questionnaires were administered to the farmers in the six randomly selected locations. The questionnaire was designed to obtain information on respondents' background, land holding, benefits of trees to owners and the restrictions to plantation establishment and sustainable forest management. Additional information was obtained from forestry staff, office records, files and reports. These set of data were analyzed with descriptive statistics and one-way analysis of variance.

## RESEARCH FINDINGS

Table 1 reveals the results of tree species diversity and abundance for the selected small-scale natural forests by private owners in Ondo state, Nigeria. The table also shows the summary of tree growth variables of these

forests. The total number of stems encountered per hectare was 344, belonging to 99 species and distributed among 29 families. The Shannon Weiner and Evenness indices were very high (4.10 and 0.91 respectively). For the tree growth variables, a mean dbh and height of 38.47cm and 17.11m respectively were obtained. The mean basal area and volume per hectare were 32.18m<sup>2</sup> and 245.79m<sup>3</sup> respectively. High proportion of the trees encountered was of merchantable size (45%). The most abundant species is *Celtis zenkeri* in the family of Ulmaceae (18 stems/ha), this is followed by *Albizia zygia* and *Pycnanthus angolensis* with 14 stems per hectare each. Sterculiaceae family has the highest number of species (5 species) while Moraceae family has 3 species.

Table 2 reveals the socio-economic characteristics, sources of land for farming and forestry activities and the land holding capacity of the forest owners. The results show that all the respondents were males, married, mature adults and breadwinners. None of them was below the age of 30 years. The majority of the respondents (30%) were in the age group of 41- 50 years while the least proportion has their ages to be above 60 years (18%). A very high proportion of the respondents (67%) were without formal education, while 15% had primary education, only 8 and 1% had secondary and tertiary education respectively. Generally, the majority of the respondents have large family size. Sixty-six percent had a family size of between 8- 11 persons. This was followed by those with a family size of 4-7 persons. Their primary occupation was farming (87%) and the main source of land for farm and forest works was family land obtained through inheritance. However, 20% claimed to purchase land while 15% rented the land for farming and tree planting. In addition, most of them were of small land holding as about 89% had a land holding that ranged between 1 and 4 hectares while very few (11%) had a land size that is more than 4ha. All the respondents have trees that scattered on their farm lands and relics of forest. However, about 10% claimed to have wood lots and abandoned farmlands left to fallow. The average size of this type of forest was about 0.8ha.

The reasons for deliberately retaining some specific tree species on farm lands, planting of trees among crops and taking care of those planted varied (table 3). The majority of them reported that these actions were taken for economic reasons (66%). Trees were retained and cared for so that they could be felled and sold as timber to meet some family emergency needs. This was followed by those who retained or planted trees among young crops to serve as shade and protection for crops like cocoa and coffee. Also, trees on farm lands are indicator of wealth for forest owners in the study area as reported by 25% of the respondents. Other benefits reported by the respondents include soil fertility enrichment, control of erosion, provision of non timber forest products (fruits, soap condiments, ethno-medicinal, etc) and fire wood.

There are some limitations and constraints to tree planting and small-scale forest management by rural communities in the study area. These constraints, as indicated by the respondents (table 4), include land tenure system, scarcity of planting materials, lack of technical-know-how, the usual long gestation period for tree species and institutional and government policies. The result of the one-way analysis of variance show a significant difference ( $p < 0.05$ ) in all the socio-economic characteristics of the respondents

## DISCUSSION

The roles of small-scale forests to rural livelihood cannot be dispensed with. Rural communities are aware of these numerous roles. So, they are determined to protect the forest, use it judiciously, deliberately retain trees on farmland, plant important species and take care of those planted. Small-scale forests are therefore very common in rural communities of Ondo State, Nigeria. These forests are inform of cocoa agroforest, deliberate retention of trees on farm land during land preparation for arable or permanent crop cultivation, abandoned farm land (fallow system), relics of forest especially around the streams, rivers and rocky areas during land clearing, family wood lot and tree species for boundary demarcation and fencing. Oke and Odebiyi (2007) reported on the deliberate retention of tree species on farm by rural farmers to serve as shade to young cocoa seedlings, referred to as cocoa agroforest.

The results of this work showed that these forests were of indigenous hardwood tree species of very economic and social importance to the owners. They were made up of species that are durable, highly sought by loggers and have high prize in timber markets. Tree species in this category include *Melicia excels*, *Khaya spp*, *Afzelia Africana*, *Terminalia superb*, *Sterculia rhinopetala*, *Celtis zenkeri* and *Annogacius leucarpus*. As a result, they are sources of emergency income to the owners to meet contingencies such as funeral ceremonies, payment of children school fees and construction purposes. These forests are very rich in tree species diversity. The diversity, abundance, mean dbh, height, basal area/ha and volume/ha of these forests compared favourably with

what was obtained by Adekunle *et al* (2010) in a government managed forest reserves of Ondo state, Nigeria and also by Lu *et al* (2010) in a tropical forest ecosystem of Xishuangbanna, southwest China.

The species that were retained or planted by the forest owners depended on the types of resources and benefits to be derived from them by the owners. Species in the Leguminosidae family has the ability to improve soil fertility while species like *Ficus mucosa*, *Pycnanthus angolensis* and *Alstonia boonei* were retained for their medicinal values. The medicinal values of tree species, the ailments they cure and mode of use have been reported by Jimoh (2009). To the rural people, the use of herbs to cure various ailments has stood the test of time. It is affordable and readily available in areas where government health facilities are grossly inadequate. In addition, some species like *Irvingia spp*, *Chrysophyllum albidum*, *Vitex doniana* and *Vitellaria paradoxa* were retained to provide edible fruits and soup condiments. Bello *et al* (2008) reported on the nutritional and mineral contents of some indigenous fruit species in this ecological zone. Most of the rural people cannot afford the cost of animal protein. These fruits could supplement their food quality which is mainly of carbohydrate. This can go a long way to reduce malnutrition and other nutrient deficient diseases like kwashiorkor and marasmus in children.

Small-scale forests, in form of trees retained on farmlands, woodlots, relics of forest left after land clearing and secondary forests, could reduce soil erosion and leaching, create micro-climate, sequester carbon and help to reduce global warming, prevent biodiversity loss and reduced emission through forest degradation and deforestation (REED) due to anthropogenic activities. Forest degradation practices include unsustainable commercial logging and over-harvesting of fuelwood (Essama-Nssah and Gockowski 2000), and degradation is commonly a driver of deforestation as reported by DeFries *et al.* (2007) and Angelsen (2008). Also, trees are used as stakes for yam, handles for farm implements, poles, and as house construction materials. Leaves of some tree species are used as mulch materials, animal folders, wrapping and preservation. Leaves of *Mitragyna cylindrical* and *Tomatococcus danieli* are valuable for wrapping and preservation in the study area.

Despite the numerous benefits to forest owners, there are restrictions and limitations to forest creation and tree planting by rural communities in Nigeria. The most important one is the scarcity of land due to tenurial system. Rural farmers in the study area, and generally in developing countries are of fixed small land holding (less than 2ha) as reported by Adekunle (2009). Their lands are barely enough for growing food crops to feed their large families, sharing it between arable cropping and tree planting becomes difficult. Only those with family lands, obtained through inheritance, and those that purchase lands could plant trees but those that rented lands are not allowed to plant permanent crops. Compensations are paid by the lessees to landlords in form of cash, share of crops or both. Ignorance, due to their level of education is another limitation to forest management. Most of the respondents believed that the trees are gift of nature and so could be harvested and used indiscriminately. Such people are not always willing to plant trees.

The usual long gestation period of tree species was also seen as hindrance to plantation development. The growth rate of indigenous trees is usually very slow, so most of the farmers are not willing to wait for this long period. The institutional restriction is the government policy that made it mandatory for tree owners to obtain permit and pay all necessary fees before they can fell their trees (Adekunle and Olagoke, 2008). In Nigeria, the control of the government over the free areas (trees outside forest reserves) is limited to the issuance of permit after the payment of all levies unlike in the reserves where allocation of logs to loggers is fully controlled by the government. There is the scarcity of planting materials, lack of the necessary expertise for those willing to plant and the cost of plantation establishment is very prohibitive. In Nigeria, only the government and very few rich individuals could embark on afforestation projects. None of the respondent has ever enjoyed the services of forest extension agents. There are no forest extension agents that could sensitise the communities on tree planting and provide some informal training in Nigeria. Extension services have the potential to remove some of these limitations and educate the masses on the sustainable use of forest resources.

## CONCLUSION AND RECOMMENDATION

Rural communities realised the importance of trees and therefore are conserving them. This study examines the potentials of small-scale natural forest to owners in Ondo State, Nigeria. Forest owners retained or planted trees on their farmland for various reasons. The species planted are according to the benefits intended from the tree species. The various restrictions and limitation are set backs to private forestry in the study areas. It is

recommended that there should be forest extension service and in formal education to reduce the effect of the restrictions

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**Table 1:** Biodiversity indices and tree growth variables of small-scale private forests in Ondo State, Nigeria

s/n	Biodiversity indices		Tree growth variable	
	Indices	Values	Variables	Values
1	No of stems per ha	344	Mean DBH	38.47
2	No of species	99	Mean Height (m)	17.11
3	No of families	29	Mean Basal Area/ha (m <sup>2</sup> )	32.18
4	Shannon Weiner Index (H')	4.10	Mean Volume/ha (m <sup>3</sup> )	245.79
5	Evenness (E)	0.90	% merchantable	45

**Table 2:** Demographic characteristics of small scale forest owners in Ondo State, Nigeria

Variables	% of respondents	Statistic results	Variables	% of respondents	Statistic results
<b>Age (Yrs)</b>			<b>Primary Occupation</b>		
<30	0	F-calculated = 22.85, df = 4, P<0.05 (significant)	Farming	83	F-calculated = 112.34, df = 3, (P < 0.05)
31-40	24		Civil Service	12	
41-50	30		Trading	2	
51-60	29		Artisans	3	
>60 above	18				
<b>Level of Education</b>			<b>Farm sizes with small- scale forests</b>		
*1	67	F-calculated = 103.01, df = 3, P<0.05	< 1	16	F – calculated = 17.84, df = 3 (P < 0.05)
2	15		1 – 2	54	
3	8		3 – 4	35	
4	1		> 4	11	
<b>Household size</b>			<b>Sources of farm/forest Land</b>		
1-3	12	F-calculated = 45.06, df = 3, P<0.05	Family Land	65	F – calculated = 56.12, df = 3
4-7	32		Purchase	20	
8-11	66		Rented	12	
> 11	21		Gift	3	

1- \* No formal Education, 2- Primary education, 3- Secondary Education & 4 – Tertiary education

**Table 3:** Benefits from small-scale forests to owners in Ondo State Nigeria

S/N	Benefits	% of respondents*
1	Income generation	66%
2	Shade for young crops	42%
3	Soil fertility enhancement and erosion control	35%
4	Indicator of wealth	28%
5	Provision of fuel wood and poles	25%
6	Others- supply of NTFP (fruits, leafy vegetables, medicinal plants etc)	33%

\*addition is not equal to 100 because the respondents indicated more than a benefit

**Table 4:** Restrictions to small scale forest ownership in Ondo State, Nigeria

S/N	Restriction	% of respondents*
1	Scarcity of land for tree planting	69
2	Illiteracy and ignorance	24
3	Long gestation period of tree species	35
4	Institutional and government policies	26
5	Lack of planting materials, technical-know-how	20
6	Cost of plantation establishment	35

\*addition is not equal to 100 because the respondents indicated more than a restriction

# MANAGING COMMONS: COMMON AND INDIVIDUAL INTERESTS IN TIMBER PILOT TEST OF A FOREST GAME IN THE AGRARIAN COMMON RAVNIK-ORLOVŠE, SLOVENIA

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## ABSTRACT

Commons are type of properties that are collectively owned by commons' members. Commons members traditionally originate from nearby settlements in rural areas and hold ideal shares of property. Commons are managed by common rules, a result of long-term experience in steering between member's rights and duties on one side and the sustainability of a common pool resource, on the other side. The main decision-making body is the assembly of members which takes place once a year. It adopts an annual management strategy which represents a political decision made by a majority of the members. Every four years there is an election assembly where the management committee is elected with the aim of taking day-to-day decisions.

Authors of this article studied the case of Agrarian Common Ravnik-Orlovše. The focus of their research was how individual members' tendencies correspond with the interests of the common policy on managing the timber of common forest, here understood as a common pool resource. The aim was to test co-operation readiness among members in the process of managing their common resources. Their overcoming of individual personal interests and benefits was examined by three methods, economic experiment, inquiry and interviews.

A Forest Game was tested as a policy and economics experiment tool. Selected members of the common played the forest game according to different scenarios, described in the literature, mimicking real forest management decisions in a forest common. Further data were gathered by an inquiry and open end interviews with participants of the Forest Game.

Our test proved to be structured properly as results gathered by all three used methods correspond. The decision making process reveal a social responsible character, developed through history in regular face to face communication with low transaction costs. Results of the pilot test will be presented and discussed in the framework of Agrarina Common Ravnik-Orlovše. Our approach is an example of linking the details of decision-making processes with the long-term evolution of forest management.

**Keywords:** Commons, Forest Game, Common Pool Resources, Slovenia, community, forest management

## 1 INTRODUCTION

Commons, agrarian commons, forest commons, community, common pasture communities, urbariats are some of the words, which define the concept of a common-land under collective management and private ownership. Such types of ownership, as in other countries, can also be found in Slovenia. We only use the expression common which includes all these names understood as an organization of people who are managing a property by principles of common management.

The concept of commons is widely known in common pool resources literature (Ostrom 1999, Janssen, Ostrom, 2008 etc.), (Cornes, Richard; Sandler, Todd, 1986). Commons has been in practiced in Slovenia for centuries, however there have not been studied yet or incorporated in a government driven forest management system e.g. to cope with a huge number of forest owners.

The history of this form of ownership or management organization is very long. In Slovenia it originates from the time of Slavic settlements from the eight century. Originally commons' land belonged to the members of a community of one settlement or more precisely to the farms or households of one settlement which had a common economic interest and need in that land (pasture, fire wood etc.). Farming methods in medieval times

led to feudalization of productive lands, while pastures and forest resource use were given to inhabitants, usually peasants, granting them servitude rights. In the late medieval period time servitude rights of farmers in rural areas were shrinking to benefits of new cities and mining industry. In the second half of the 19<sup>th</sup> century farmers got theirs back, usually as a collective property. After the Second World War the territory of Slovenia was a part of Yugoslavia where the communist system was in power. Commons were nationalized in the years after the war and owners were excluded from the management of their land for decades. In the 1990s with Slovenia independence and restitution, original owners of commons received the right to re-establish their commons and get their land back in ownership and management. The history of agrarian reforms of different states in the territory of Slovenia led to the present situation, where only a minority of this once usual organisational form still exists.

As we see, nearly a half century long break in the organic development of commons did not entirely erase this ancient form of land ownership, although its impact was considerable. Of the former almost one thousand commons only 665 have been reestablished. Altogether, 71,790 hectares were returned to commons by 2007, which represents almost 3.5% of all the land in Slovenia. Judging from cadastre records the majority of returned land is farm land; however, the actual proportion of returned forest is larger because the cultivation of farm land was abandoned and it was intensively overgrown by forest. It is accepted that there are some changes in the above mentioned numbers from geographic based research (Petek and Urbanc 2007) about commons, but in general they present the current situation in Slovenia.

## Management of commons

Nowadays commons manage their land according to their internal management rules. The basic management rules originate from ancient times and are based on equality, solidarity and mutuality among members. From the rules we can see that they dealt with these issues and with problems of free riders - individuals consuming a common resource without paying or earning it. Free riders are recognised as a problem which can impact expand on others members and lead to conflict situations among members of the common. This could lead to the excessive use of a common property resource and to un-sustainability of the common. In the commons' rules we can also find keys how to deal with these issues and share commons' common resources e.g. wood, hay and profit coming from resources sales. Distributive rights are therefore incorporated in the commons' rules. Sharing of common resources can be illustrated on the example of fire wood distribution where members interested in fire wood get their harvesting plots by draw and with marking and measuring of the trees on the plot limited potential free riders.

Long-term care for commons' resource, in our case forest, proved to be a priority in the common studied. This way we touched on economic theory, which pre-supposes individual decision making on the basis of informed rational choice, enabling a free rider problem and the question of how to limit it for the sake of resource preservation. The functioning of commons unity among members is very important since important decisions (buying, selling land, and changing the use of land) have to be passed by consensus of all members, while for others regular works, e.g. harvesting, at least a majority or two thirds of the members have to support it.

To get an insight into the internal processes of a common we selected the Agrarian Common Ravnik Orlovše that had already been studied (Premrl, 2008). In this common we tested a policy experiment, based on behavioural approaches, experimental techniques, game theory and a theory of public goods externalities. We examined participants' viewpoints by a pilot inquiry and open-ended interviews.

## Agrarian Common Ravnik -Orlovše

The Agrarian Common Ravnik -Orlovše (ACRO) was re-established in 1995. At the time of re-establishment 88 members had ideal shares (*pars pro diviso*), nowadays as a result of inheritance there are 112 members with different shares. Shareholders are mostly small scale forest owners, coming from the nearby town of Vipava, while 24 % of the members live in other places in Slovenia e.g. the capital city. Another trend is also the division of the original share in the inheritance process so according to ACRO evidence one third of the original shares has already been divided into smaller pieces, so commons' land is owned by members with half, third, quarter or smaller shares of the original ideal share. This inheritance process is in this and other commons recognized as a problem, because it presents organization and management problems on one hand and lose of common interests



with people not living in Vipava and people owning an insignificant share of the common property on the other one.

There was a survey made among members of the ACRO in 2008 (Premrl, 2008) which included a socio-economic component. The survey analysis showed that more than half of the members are over 60 years old with a primary school education. 60 % of members are women. It also showed that the majority of them live on the non-farming estate and that they do not depend on farming or forestry income. The common said they have around fifty active members. Those members are members who regularly come to annual assemblies. Half of them have an interest in using common pastures and fire wood and can be defined as more active in management, organization and the decision making process.

The common manages 657 hectares of land, mainly forest which is the main income for the common. The Forest Management Plan Podkraj - Nanos 2006-2015 for the common forest prescribes 33.350 m<sup>3</sup> of allowable cut. A rough estimation of income for this decade period is 1.3 million EUR (Premrl, T., Krč, J., 2010). Shareholders expect to obtain certain financial benefits from their share in the ACRO (e.g. dividends, fire wood, saw logs or hay), even though those benefits are not exposed as the only shareholders benefits comparing with feeling of affiliation with local community.

Decisions are made at the annual assemblies, while elected management board has to carry out the assembly's decisions. Members, especially those from the town of Vipava, are in daily contacts and exchange opinions about the common on an informal basis and this also influences formal decisions. There are not a lot of members left who are dependent on using timber or hay (resources) from common land compared with the period before nationalization, which is partly also the consequence of socio-economic changes in rural areas over the last decades. These changes can provide a different point of view on commons from changed socioeconomic structure of commons' members.

## 2 AIMS OF THE STUDY

The first goal was to test a policy experiment Forest Game, method used in research conducted by Zikos, Kluvankova-Oravska and Slavikova (Zikos et. al. 2010) which include group game, inquiry and interviews.

The second goal was to test a facing informed, rational individuals with making a rational decision, by an inquiry and face-to-face interviews. Questionnaires consist of twenty five questions, ten general (identification, region, forest ownership) and fifteen focused on the description and viewpoints of decision-making practice, characteristics of good practice of forestry management and learning to be a good manager. The inquiry was tested in January, performed in April 2011 and followed up by face-to-face interviews in May 2011.

The third goal, to gain an insight into decision making behaviour in forest management with particular attention to the balancing of timber production earnings and care for forest sustainability, was supported by the group game.

## 3 METHODS

### Forest Game description

The Forest Game is one of three economic experiment settings referring to common pool renewable resources (forestry, irrigation and fishery) with the possible risk of open access situations (Cardenas et al 2008). We used the variant of the Forest Game from research (Zikos et. al 2010) with growing stock represented as a resource, measured in gross volume (m<sup>3</sup>) of wood. In the Forest Game ecological dynamics are represented by regeneration (increment of wood) at a certain rate reflecting a real situation but omitting other forest roles. Communication between players was not welcome in the first game to test individual behaviour uninterrupted by decisions of others. Communication was introduced with limitations in the second game, while in the third game it was encouraged.

The scenario of the game requires that players individually harvest timber from a limited common pool (forest) that regenerates slowly depending on the amount of the timber growing stock remaining at the end of each round.

The game involves a situation in which people withdraw resources to secure short-term gains without regard for the long-term consequences which leads to the situation where individual and social (group) optimum may clash. In this case degradation of the common forest can be described as a “tragedy of the common” (Hardin 1968).

In the experiment we have characterized individuals who harvested more than allowed or harvested when they were not allowed to as free riders - the term known from economics, psychology, and political science define individuals who consume a resource without paying for it as free riders.

Parts of the experiment are also question-forms, interviews and discussion with participants, which help to evaluate decisions from the game when players or group of players take harvesting decisions.

## Rules of the game

Each game consists of three parts, each having 10 rounds and it focuses on growing stock as a forest resource. Five players participate in a group. The target of the players is to get as much volume of wood as possible, as their harvest is reimbursed at the end of the game with a monetary fee that is paid to them. The fee was calculated on the basis of a student's hourly rate in Slovenia (approx. 4 EUR) so that each player can win at least the amount of money equivalent to their time spent playing the game. This minimum fee corresponds to the value of a coffee token, (0,25 EUR), which we took as the value of 1 m<sup>3</sup> of harvested wood.

After every round the remaining amount of growing stock is put on the board. Players are playing a game by different rules. Each individual takes harvesting decisions in every game secretly.

### First game – individual decision making

Players manage a forest with the optimal growing stock 100 m<sup>3</sup>. After the fifth round and at the end of the game rounds there is a 10 percent increment of the starting growing stock (10 m<sup>3</sup>). Players can harvest a maximum of 5 m<sup>3</sup> per round and they have to leave at least 20 m<sup>3</sup> of growing stock in the forest after the end of the game, otherwise they have to pay a fine of 0.25 EUR/m<sup>3</sup>. Communication among players is not allowed.

### Second game – introduction of a voting decision and inspection

In the Second game a playing rule is voted. Players vote on three different rule options. The first option is that harvesting is allowed to two players in a lottery, the second option is to allow harvesting to two players at the same time according to turn order, and the third option is to allow harvesting to all players of the group with a maximum harvesting limit set at 2 m<sup>3</sup> per round per player. Breaking the chosen rule is possible, but includes a certain risk of inspection (1 out of 6 – playing dice). In such cases the illegal harvesting is confiscated and an additional sanction of 3 m<sup>3</sup> is imposed on the cheating player. After every round there is a 10 percent increment of the remaining growing stock from that round.

### Third game – communication allowed

In the Third game harvesting decisions are taken together in the group. There is an option to play by the three rules from the second game or by the rule of the first game all with an option to change the rule every third round. Breaking the chosen rule is possible, but includes a certain risk of inspection (1 out of 6 – playing dice). After every round a 10 percent increment of the remaining growing stock is added in to the next round.

## Pilot test of a Forest game in the Agrarian Common Ravnik Orlovše

The experiment was performed with three groups, each with five participants, all coming from the Vipava valley region. In the first group there were members of the study circle, the second group was a mix of students and study circle members and in the third group there were representatives of the ACRO. The selection of participants of the common was made according to four criteria:

1. Members of the common with an original share of 1/88, from Vipava town.
2. More active members of the common, meaning those who attend annual assemblies or are members of the management board or actively use their right to fire wood from the common forest.

3. Members of common in the same age category as participants of study circle.
4. Members willing to participate in the experiment.

The rest of the experiment participants were students and local study circles members. As they regularly attend this non-formal learning forum, live in the nearby settlements and do not intentionally educated about forest, we regard them as relatively independent, but living in the same cultural environment. In this way experiment participants represented a rural population between the ages of fifty and seventy, with the exception of students. There were three groups participate in the game: study circle (SC) group, agrarian common (AC) group and mixed (M) group with students and study circles members. Among five players per group there were three men in the AC group and one in the M group, while in the SC group there were only women.

The experiment started with a discussion aiming to establish a certain trustworthy “climate” within the group. Participants and experiment leaders got to know each other, they shared general views about nature, forest, common resources, relations among people and the general developmental situation. They were introduced to the game, game rules were presented and a test game played as an opportunity to clarify rules.

The experiment started with the First game, then the Second and Third game was played. At the end the final results were presented, a discussion started and all the participants filled in a questionnaire. Later open-end interviews were held with the participants of the AC group in the following days to get feedback about the game and their reaction to it.

## 4 RESULTS AND DISCUSSION

As this was a pilot test analyse we can only present and discuss the preliminary results and compare them with findings from Cyprus, Czech and Slovakia (Zikos et al., 2010).

### First game- individual decision making

This game ended with the lowest remaining of the “re”-sources (wood growing stock) compared to the Second and Third game for all groups on the one side and also with the highest group and individual earnings on the other side. The harvested volumes were higher in the second half of the game rounds.

The absence of restrictive rules may very well lead to devastation or overexploitation of forest as a common pool resource, what happened in all three groups. This situation illustrates a typical tragedy of the commons (Hardin, 1968), where one or more individuals act independently and rationally consulting their own self-interest (profit) on the account (loss) of other co-users with the right or need to use the same resource.

The results of the First game show the lowest remaining growing stock and the highest profit of individuals with an interesting circumstance, where harvesting was higher in last 5 rounds than in the first rounds. This can be explained by at least three explanations:

1. With the presumption that the players, who did not harvest so intensely at the beginning, started to harvest more when they realized that some individuals (free riders) were making money on their expense. This was also stressed by one of the participants when she realised this situation.
2. Awareness by players that forest stock can regenerate.
3. Lack of limitation and control.

Other research (Zikos et al., 2010) results show that the groups’ earnings peak in this game, there is the lowest remaining growing stock and the greatest variation between players’ earnings.

### Second game – introduction of a voting decision and inspection

The difference from the First game is the majority voting decision to introduce some additional rules and with this the appearance of inspections. One of the results of the Second game is that the amount of remaining stock is higher than in the other games (the First and the Third), while the harvesting amount varies between groups the most.

Cheating – free riding only occurred twice in the AC group, while in the SC and M groups it occurred more often. In the SC group one player cheated in the first and second round, but in the third round, when inspection occurred, he could legally harvest. After that he cheated only once more. We can call the M group the “group of the cheaters”, as only one member never cheated and all the others cheated three times each. Some of the

cheaters were harvesting illegally small amounts of wood, while others were harvesting the maximum volume of 5 m<sup>3</sup> per round when cheating. The amount of profit corresponded with the level of cheating so that bigger cheaters earned more than fair players. Cheaters were caught only once. This happened to two cheaters from the third group while they were harvesting 5 and 1 m<sup>3</sup>. Due to the low occurrence of inspections we could not observe if issuing of fines reduced the cheating.

Introducing the harvesting rule together with the inspector influenced the players' behaviour which resulted in a more protective way of managing the common pool resource. A "free rider problem" occurred when some players were harvesting wood, when they were not allowed to harvest it, however the majority followed the rules and harvesting was reduced compared to the First game.

In this game the main differences between the AC group and other groups were in fair play. As in other research (Zikos et al 2010) where results show a reduction of group earnings on account of the greater preservation of the resource, our results show the same trend as well. Free riders were present in both experiments and gained the highest profit.

### Third game- communication allowed

The Third game introduced cooperation among players and resulted in the largest harvesting. The remaining growing stock is still higher compared to the First game. This game was played as a team game with consensus and collaboration among the players. Players mostly respected team decisions and harvested according to the chosen strategy. Players achieved the highest earnings compared to the other games and "profit" was shared equally among all players. Players in all the groups earned on average more in this game as in the others two.

The results of the Third game are an example of good collective action. Communication and more team work led to more equal earnings among players, while players in the AC group stuck with the chosen strategy and had equal earnings. Compared with research (Zikos et al., 2010) our results show the highest group earnings in this game, while they found highest earnings in the First game. The resources were generally better maintained (higher remaining) in this game than in the First game for our case. Like research from Cyprus, Czech and Slovakia (Zikos et al., 2010), we also found out that equity between players was achieved to a larger extend.

## Overview of the games

### Inspector

The Inspector was in our cases quickly recognized as a local forester who had also a repressive role in the past forestry management organization system in nowadays Slovenia. Forest owners' rights were more regulated and forest owners were tempted to break the regulations to get more profit for their wood and with that risk a punishment. It is open for discussion what was the important factor in the game that resulted in the forest being not so harvested in the Second game than in the First game. Is it the role of the inspector or a chance to take part in the decision-making process and consequently respect the rules more than if you do not participate and orders come from top? In the open discussion players recognized that the inspector has a certain role in holding their harvesting appetite back, which is also visible from the results if we compare individual's harvesting in the First and Second game.

In research (Zikos et al., 2010) members of a common were also involved in a case from Slovakia. They stressed that those groups showed a progressively resource-sustainable oriented logic to the three parts of the game. Compared with our cases the AC group also showed this orientation in the first two games. In the last one the situation was different, as the process was mainly led by more dominant player with experience in forestry, who convinced others of a more profitable approach to managing their forest. In Slovakia researcher also found examples of such results from games in communities, where the game was led by professional foresters (Zikos et al 2010).

Analyzing the Forest Game we can see that we had free riders with a low impact on the common group profit, we had profit oriented players and dominant players who led the Third game. In real life the ACRO has had five management boards since its reestablishment. The management policy of the common to harvesting has changed during that period. In the years after reestablishment harvest was the highest because there were some costs to be cover from the reestablishment process. In the next years, with the exception of higher harvesting because of infrastructure requirements (new power line), harvesting was one third of the allowable harvesting prescribed in the management plan. In the last four years harvesting has been much higher and represents three quarters of the

allowable cut. From the management policy of the common we can say that they use their resources, but they do not over-harvest them, they are managing them according to the Forest Act and the Forest Management Plan Podkraj - Nanos 2006-2015. In the common there are a few individuals who can be described as free riders, but their influence on the commons' profit, when their impact is evaluate and divided among all members, is low. The common has indirectly warned them with stressing importance of fair play and collective behaviour, but it is hard to prevent them acting like this.

### Free riding evaluation

Free riding occurred several times in our games. In the First game free riders were individuals who harvested irrespective of the growing stock situation which led groups one and two into the situation where the growing stock was harvested above the set limit of 20 m<sup>3</sup>.

In the Second game free riders were those who did not respect the rules and also harvested when it was not allowed. In this game we also had an inspector who appeared only once, when a six was rolled with the dice. The inspector caught two players from the second group, who got a fine to the value of the harvested volume plus 3m<sup>3</sup>. These two players lost 8 and 4 m<sup>3</sup>, but they still had the highest profit among all the players in the game and in their group.

From that point of view free riding is profitable, which is also confirmed in research (Zikos et al 2010). But the question is, to what extent is this true. We can find out from the First game that those who kept themselves back in terms of harvesting, started harvesting more during the last rounds when they realised that someone else was making money on their account what can lead to devastation of the resource.

Not all players who cheated were caught. Altogether there were six people who cheated sixteen times in total and harvested 45 m<sup>3</sup> of wood, mostly 5 m<sup>3</sup> per move.

In the Third game there were only two cheaters (in M group), who cheated once each. We can explain this as a result of communication among players and awareness of group control, where free riders can hardly hide.

### Interview and general discussion

After concluding the experiment we conducted a general discussion about the topics of managing common pool resources and the players also filled in a questionnaire on their view on managing common property. This information helps us in the interpretation of individual behaviour. Open-end interviews proved to be a very good source of information, which can be used for the interpretation of experimental results and for the improvement of experiment settings.

Players from the common characterized themselves in interviews as countryside inhabitants, although most of the players come from the small town of Vipava and for them, farming means only an additional income source. All participants are small forest owners and see forests as an additional income for the family. This is comparable with the findings of research for Slovaks (Zikos et al 2010), who "have a long established connection to nature" and "representing community land co-ownership showed progressively resource-sustainable oriented logic".

From our inquiry we see that most of them live independently, only two of them depend on others in terms of time, family, information/knowledge, emotional support. Interviewed ACRO members report a constant and lively interaction in the family and neighbourhood on a mutual basis, illustrated by the statement: "We have to help each other." A certain local culture developed through centuries providing norms and informal rules which are taken very seriously by the most. These norms and rules are linked with social behaviour and resource management.

Resources are usually understood as something common. Even in the case of income they consider it as a common resource for the household. The same goes for their house and land. Only two participants saw water and air as a common resource and only one said forest. We can conclude that they focused mainly on their family and not on wider society. We do not speculate on interpretation about the reasons for this as the ACRO part of the sample is really small (five people), relatively old (experienced decades of nationalised property and an undemocratic regime) and we did not make any further explanatory analyses.

Participants, according to their own opinion, mostly learned good manager skills at home, from neighbours and influential others. They characterise good resources management is when priority is given to sustainable

(long-term) benefit followed by preservation of resource. We understood such a homogeneous viewpoint as a possible indicator of high responsibility for the common. Profit, with benefit for all, was in last place.

Participants confirmed the importance of communication as found in the Forest Game experiment. In the inquiry they agreed that the benefits of resources are higher if users of those resources can harmonize their individual needs, e.g. through regular meetings or other types of communication.

Their decisions are mostly made in a non-conflicting way and even when it comes to conflict, they find solutions. Good relations occasionally predominate before material equity. The majority tolerates some “cheating” or tolerates free riders. The level of tolerance can be seen from the First game, when the majority realised that they were being double-crossed by some individuals. On that point they also started to harvest what leads to forest over-exploitation. Decisions at the household level are mostly made by consensus, at the common or neighbourhood level they are used to making decisions at meetings. Participants said: “You have to know what is right and what is not” and that “in the long term we can survive only if we harmonize the using of resources”.

## 5 CONCLUSIONS

Our pilot test shows some principles of individual behaviour in managing common pool resources in the case of the forest of the ACRO.

1. Individuals’ interests are not more important than the common interest.
2. Communication with co-users is essential when decisions with consequences for others (e.g. shareholders) are planned.

With certain reservations it shows comparable results with research on the same topic in Slovakia, the Czech Republic and Cyprus. Key elements of the game were communication, introduction of rules and control, all coping with forest regeneration and free riders. For the explanation of individual behaviour open-end interviews and the right organization of the experiment are important. Some dilemmas remain:

1. The relation between earnings and motivation. Earnings for our players for the experiment were around 15 EUR. With a value of 0.25 EUR per m<sup>3</sup> of wood was not really motivating.
2. Value of the remaining growing stock which recognises the other roles of the forest not just wood; was not evaluate in the experiment

Our proposals to solve these dilemmas, which consider remarks from the participants and bring the game closer to reality, are:

- Addressing first dilemma: At the beginning of the game players should invest the value of the starting growing stock and then play for that money in the game. As one of the participants remarked: “We inherited these shares, so they were a gift, providing us with a starting value”.
- To the second dilemma, the value of the remaining stock should be defined after further analysis.

The Forest Game results, inquiry and open-end interviews all lead to the conclusion that participants of our test were informed and rational, but made decisions (when allowed) dependent on common rules. These rules correspond to local norms and were not always rational or unbreakable – cheating occurred and was traced, communication provided consensus and was more usually followed by the common group than by other groups. The ACRO proved itself as a functional, old, autochthon institution, developed over centuries, keeping its norms despite social changes (e.g. decades of nationalised property, decline of farming etc.) and developing them through communicative process between local inhabitants. These findings argue for the ACRO - Agrarian Common Orlovše-Ravnik as a common and a special institutional type of forest owners in Slovenia. This and the others commons are worthy of recognition and further analysis.

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# FACTORS IMPACTING MARKETPLACE SUCCESS OF COMMUNITY FOREST ENTERPRISES: THE CASE OF TIP MUEBLES, OAXACA, MÉXICO

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## ABSTRACT

In most developing countries where local community ownership is common, successful forest conservation initiatives must be adapted to engage and train rural communities. Decentralization of decision-making and stewardship by the State is required to maintain forests as a common good with extended benefits to society.

Despite a tendency to operate in isolation, three Oaxacan community forest enterprises (CFEs), Textitlán, Ixtlán and Pueblos Mancomunados, have vertically integrated from forest management to retailing furniture through a company: TIP Muebles. The case illustrates the factors impacting the ability of CFEs to succeed in the marketplace. The results of this research suggest that the main challenges are related to human capital, regulatory challenges and centralized forest policy for forest product production, the taxation system for timber production, and endogenous factors such as the forest quality and the decisions based on tradition rather than efficiency. In this context, the integration of chains of production is a fact in only a few cases and financial success continues to be slow. The studied CFEs are resilient and slightly surpassing the profitability threshold despite the challenges identified. Adaptation of their decision-making structure allows them to face the changing dynamics of the market. More democratic approaches to decentralization of Mexican forest policy, trust development between social and private enterprises, and an improvement in internal CFEs systems could offer opportunities for improved competitiveness for CFEs. CFE strategies need to be understood as part of a complex rural livelihood where diversification of income generating activities often conflicts with competitive and specialized production.

**Keywords:** Community forest enterprise, forest products, small scale forestry, secondary wood products, cargo system

## 1 INTRODUCTION

In developed countries approximately 40% of forestland is under the control of family and community owners. There are around 30 million families who are well organized to interface with larger-scale, efficient production and processing enterprises, including pulp and paper manufacturers (IFFA 2009). In developing countries, the transfer of commercial rights to communities has faced difficulty (Macqueen 2010).

Based on the argument that local ownership will exacerbate environmental problems due to an individual's tendency to maximize personal benefits, policies promoting privatization of the rural commons in Mexico were influenced by "the tragedy of the commons" argument, making collective tenancy responsible for forest degradation (World Bank 1995 in Ross 2005). Although community forest operations have challenges, **market-oriented policies without including local support or lacking sound management practices can lead to diminished natural resources, increased political instability, and poverty** (Ross 2005). We should take care not to romanticize communities because many are not sustainable, and do not have inclusive approaches. Those patterns partially relate to their genesis. In Mexico, former corporate-oriented forest policies often lead to degraded forests and further marginalized communities (Ross 2005).

However, Community Forest Enterprises have generally been found to be positive forces for forest conservation since the commercial interest and sustainability of their families depend on standing forest. The research of Elionor Ostrom, 2009 Nobel Prize winner in economics, shows that communities can successfully set rules and monitor resource extraction. With appropriate communication among community members they can effectively build management institutions, establish rules, patrol boundaries of the resource, sanction people who break rules, and manage the commons sustainably (Bray 2010).

Mexican timber production and the forest industry are not considered to be internationally competitive because, according to the World Bank, production costs (including transport) are high, community-managed

forests are inefficient, few forests are actively managed, and a lack of infrastructure makes most of the timber inaccessible (Ross 2005). Still, an impressive number of community forest enterprises (CFEs) in Mexico, most likely numbering in the hundreds, have successfully developed community managed operations that deliver social and economic contributions to the community and maintain the ecosystem functions of the forests (Antinori 2005).

The three CFEs in this study have similar levels of organization, management and manufacturing technology, and are vertically integrated from forest silviculture through to furniture distribution. The lesson to learn from the three communities comprising the TIP Muebles venture: Ixtlán, Pueblos Mancomunados and Textitlán is to take a critical approach to the model of development cooperation through interventional practices that denies the complex, interactive and contingent nature of the local process of forest communities in developing countries. TIP Muebles represents a strategy toward sustainable capitalism within a communal operative structure. Its activities have given indigenous communities of Oaxaca the tools to compete in local interconnected-world markets while managing their forest for future generations (Bray 2010). To strive to achieve sustainability, the three communities have created a joint venture company, ICOFOSA, to distribute their furniture and share costs. The creation was based more on the commercialization needs of the three factories than on a real demand for Forest Stewardship Council (FSC) certified wood (Anta 2004). TIP Muebles is seen as creating opportunities to open new markets and enhance revenues for their communities (Pérez 2007). ICOFOSA is facing challenges to follow the transition towards more competitive markets while taking new measures in order to maintain job opportunities, forest productivity, forest stewardship, biodiversity, and forest cover in their communities.

ICOFOSA illustrates a suitable model of vertical integration and cooperation among three communities for the benefit for their people, as stated in their General Assemblies. The survival of TIP Muebles even when its profitability is not always a top priority, is only explained by the benefits that the social enterprise gives to its stakeholders in a variety of forms, such as participation, common-pool distribution and networking (Merino 1997). Moreover, the tendency of Mexican CFEs has been strongly oriented to operate in isolation, unless an external situation threatens them collectively (ASETECO 2002). The challenge of competition has been enough to make this group of organizations look for income alternatives within an increasingly open economy.

## 2 STUDY OBJECTIVES

The objectives of this research, were to

- a) Identify lessons derived from CFEs such as ICOFOSA to integrate multiple communities within forest efficient operations with a community-based operation, and
- b) Outline the opportunities and market challenges for its economic success.

## 3 RESEARCH METHODS

### 3.1 Data Collection

Data for this study consists of participant observation and key informant interviews. To facilitate data collection and to gain an “insiders view” of the organization, the researcher assumed the functional role of the Marketing Assistant position in TIP Muebles for six months to participate in the phenomenon being studied.

Because of the relevance of the integration of three CFE enterprises in a common-pool base with commercial purposes in Mexico, TIP Muebles was selected to explore the scope and limitations of their entrepreneurial firm.

#### 3.1.1 Participant Observation

Worker behavior, organizational communication, conditions of reciprocity, and values underlying non-spoken rules and actions were all clues that provided additional information for understanding what makes it possible for these heterogeneous communities to integrate. The process of observation included planning, recording, reflecting, and authenticating the marketing practices of TIP Muebles. To illustrate the decision-making process, direct observation of a seasonal promotion campaign strategy during six months and its outcomes (pilot changes in branding strategies, promotional participation on the local market and trade shows) was monitored and recorded. Weekly meetings were captured in meeting minutes.

In order to develop trust and a sense of reciprocity with TIP Muebles staff, the researcher developed an additional component of the study, an evaluation of TIP Muebles' clientele. By assessing the needs of consumers and observation of local competitors, additional information consisting of 29 in-depth interviews were performed to validate the preliminary observations regarding their decision-making process.

This small-scale market research based on observation and data collection in the field offered a source of information on the decision-making dynamics in the company. (See Table 1)

### 3.1.2 Key informant Interviews

As an invaluable source of information in real phenomena, key informants confirmed data or provided a primary source of data in its own right (O'Leary 2005). The process to establish contact with key informants was 1) to identify potential informants based on the relevance of their contributions to the CFE field, 2) to confirm the status of those identified, and 3) continuing with the snowball technique it was possible to identify other informants, their location, availability and negotiate the potential informant agendas. With a volume of data of 60 hours of Spanish interviews, a total of 40 key informant interviews were performed. From those, 11 correspond specifically to manufacturers and 29 to key informants across the country in a broad range of groups including: government employees, consultants, NGOs, customers, members of the communities, management positions in ICOFOSA-TIP Muebles, local and international academics, private managers in Mexico, industry brokers and ICOFOSA end-users and competitors (Table 1).

**Table 1:** Strategy designed to collect primary data for the Case Study

	Area	Sample	Target	4 Protocols
<b>Real world-insights</b>	<b>Local</b>	Assessment of clientele	Needs assessment 29 company's end consumers	In-home depth interviews
	<b>Regional</b>	Competitors observation	Retailer operations	Observational indicators
<b>Key informants</b>	<b>Across the country</b>	Manufacturers in trade shows	11 manufacturers, private managers in Mexico, wholesalers, and industry brokers	Open interviews and key informants interview
		Key informants	29 government players, consultants, NGOs, customers, members of the communities, management positions in the three factories and in TIP Muebles, local and international academics	Key informants semi-structured interview guide

The interview protocol for the key informant interviews was adapted from IIED Small and Medium Forestry Enterprise methodology (Macqueen 2008) because this British initiative is aimed to research industrial demand as mechanism for bringing together forest certification and fair trade.

For the 29 key informants knowledgeable about CFEs in general or ICOFOSA in particular, the following semistructured protocol was used:

#### Key Informants Semistructured Conversation Guide

1. What do you believe are the buyer perceptions of certified furniture?
2. At which level of development do you consider the community forest enterprises?
3. What is the potential for companies such as ICOFOSA in the market and suggestions for marketing strategies?
4. Which challenges and limitations for its success do you see?
5. What lessons have been learned about ICOFOSA as a Community Forest Enterprise in the market?

During the interviews there were two priorities: 1) following the line of inquiry dictated by the protocol, and 2) asking conversational questions in an unbiased manner, particularly about the interviewee interest and opinions (Yin 2009). In some instances interview insights were used for further inquiry.

During the field immersion, the researcher had access to a wide range of secondary information.

Examination of materials such as official data and records, corporate data: sales reports, consultancy reports, media, forest program diagnostics, previous market research reports; ongoing information and worker documented perceptions. Also, institutional letters, agendas, minutes, administrative records, evaluations from the company, and media coverage were all utilized.

### 3.2 Data analysis

The analytical procedures for generating theory from empirical data involve a systematic process of induction (Strauss 1990). Based on this analytic strategy, empirical conclusions were drawn. Data collection and analysis were not separate activities but emerged at the same time (Strauss 1987). Analysis was present throughout the interviews themselves in the form of making notes during and after the interviews. The 40 Key Informant interviews were transcribed from audio recording and analyzed through Content Analysis methodology, where the researcher worked each transcript assigning codes to specific characteristics within the text. The categories were designed both by reading through each transcript and letting them emerge from the data and based on a list derived from the theoretical background. Based on contradictions among interviews, documents, and observations during data collection, more data were collected and analyzed. Interview transcriptions were organized in a database using the computer-assisted tool QSR NVivo 7 to manipulate the information. The process of grouping data into conceptual categories is called coding. The coding scheme proceeded in three steps: open coding, axial coding and selective coding or story line generation (Yin 2009).

To enhance construct validity and increase causal inferences from the informant's insights, the predicted overall pattern of outcomes (families) was related to the initial topics indicated in the interview protocol. As certain patterns were produced and more complex categories or groups of codes were built (Yin 2009), rival explanations and contrasting positions among interviewees offered threats to certain predicted assumptions. The most relevant groups were selected and ranked into families according to source frequency.

## 4 RESULTS

### 4.1 Shades of social capital: human and social capital as opportunities for long term development.

Networking within the community, and relations with government and non-government institutions are essential factors to increase social capital and CFE opportunities for participation in the marketplace. It is suggested that the public forest policy has not fully decentralized a heterogeneous CFE sector and a higher degree of collaboration among institutions. A hypothetical sense of trust and understanding of needs among CFEs and private players could enhance competitiveness within the industry. On the other hand, CFEs face serious problems due to a lack of professionalism and qualified personnel as well as lack of leadership, training and a strategy of maintaining low wages to reduce costs. These collectively result in a lack of competitiveness and profitability for CFEs.

#### Creating trust and networking within in the supply chain

The lack of trust among national traders, both CFEs and private manufacturers, results in an advantage for intermediaries to assume commercial risks and to integrate the value chain. Too often, CFEs are unable to satisfy volumes or quality standards in the time frame demanded by buyers. Because of ICOFOSA's inconsistencies perceived by manufacturers, the trustworthy intermediary then becomes a necessary component of the value chain.

Indeed, competing in the modern forest sector requires a degree of customer interaction and service, the core of consumer orientation that may be foreign to a CFE. There is a generalized perception among private buyers that *ejidos* and *comunidades* have a lack of training and capability to satisfy the demands of the value chain:

I buy my wood from private companies. In my experience, *ejidos* only sell roundwood and because they are *ejidatarios* they do not know how to dry, how to transform. [high-end furniture manufacturer].

For some *ejidos*, there is an interest and opportunity for CFEs to learn the “business language” of buyers in terms of dimensions, quality grading, packaging requirements, volume calculations, documentation terminology, delivery schedules, and labelling in order to establish “business credibility” (Macqueen 2006).

The private companies need to have long term guarantees to cover longer-term investments. Short-term contracts allow neither the communities, nor the private companies to invest in the required infrastructure, machinery and roads that could enhance their competitiveness. Productive chain integration will only be possible as a result of financial access for different players. Actually, from the CFEs perspective, the risk that manufacturers face is passed on to CFEs because of little cash flow in the overall business:

They [private companies] want credit, to fund themselves with suppliers [...] and then they pay back little by little, causing lack of cash flow [*Community administration*]

The communities have a deep distrust regarding practices against which they had to fight from the concessionaires in the past (Zabin 1992). After the historical process to regain control over their forest, CFEs prefer a diverse portfolio of customers, beyond the most profitable option of long term relationships with few buyers, causing an increase in administrative costs. On a larger scale, the trust factor has limited trade and creates a lack of security along the entire processing and supply chain of forest products.

Often, the practice of *cargo system* held by CFEs to its administrative operation is not easily understood by people in the industry, which prioritizes efficiency in seeking customer satisfaction. In fact, a form of trust building within the community supporting the social enterprise is the practice of three year rotate managers in *cargo* service across the community division’s enterprises (including the CFEs units’ business management). To perform in different stages of the community ‘corporation’ creates social pride as well as other responsibilities towards the community.

Again, the gap between those levels of values have been filled by a group of brokers that in a practical way, have found a niche where they satisfy the demands of the market. They offer an interface between CFEs and the manufacturers.

My business happens precisely because of the lack of responsibility of the national sawmills regarding delivering and quality [...]. I preview the risks of the manufacturer. I work with 15 [CFEs] sawmills and when it is hard to find the wood, I know how to organize each order [...] all those problems with sawmills they [manufacturers] used to have are the ones we [brokers] face. Few sawmills are trustworthy [Sawnwood broker].

Even in a highly fragmented market, the opportunity for CFEs to take advantage of their social capital and find their market niche represents a collaborative effort rarely seen in the context of CFEs.

## 4.2 Lessons of social capital in CFEs

During the development of this research, ICOFOSA social networks and norms of reciprocity facilitated cooperation for mutual benefits. This was shown by the response after the Mancomunados fire incident on December 13th, 2009 where the furniture factory (and other assets) of Pueblos Mancomunados was destroyed by fire. The immediate response by ICOFOSA’s members was to agree to utilize Ixtlan’s spare manufacturing capacity to enable the community of Mancomunado to continue manufacturing. This swift act of mutual assistance is the clearest indication of the value of the “Integradora” model. In itself, mutual assistance among economically fragile communities may be reason enough to selectively adopt such a model, even when the commercial benefits of integration are unlikely to be realized. Moreover, the ICOFOSA venture has the political significance to allow rural people to build political alliances that bypass industrial forestry institutions and find sympathetic urban audiences and environmental allies, undermining extrinsic forces over their resources. To maintain the integration of ICOFOSA despite its challenges seems to be a tradition of communitarian organization and accountable representation within the community.

## 4.3 Workers and owners. Shades of Human capital

As explained earlier, the *cargo system* based on position rotation also creates representative turnover in the Board of Directors of ICOFOSA, thus on the decision-making process. This is a frequent pattern in communities where the management is still traditional as compared to those with a clear boundary between the political realm and economic areas of the business management. Particularly for Textitlán, where the factories are still operating under *cargo system*, which implies a high level of influence from the community, their industry manager rotates

every three years. This practice has created problems such as a high turnover rate. This pattern of a lack of leadership and vision causes a loss of their investment in specialized training. An important contention of the *cargo system* (service) is the one affecting the ownership of the production process. A common trait of the three communities that form ICOFOSA, and potentially the majority of CFEs, is that the organizational behavior performs as a result of property relations. CFE workers are typically owners, although this pattern can change by attracting an outside labor force.

In the case of Textitlán, some workers coming from the community are at the same time owners. They are in charge of the operation and logistics. They are also responsible for on-time deliveries to the retailers. However, far from the idea of being more engaged on the process given their ownership, the traditional organizational model of Textitlán causes more complaints among TIP Muebles than any other ICOFOSA community.

Nobody wants to work, everyone wants to be a boss, and they do not cooperate [Local imports wholesaler].

Similar to the rotation of managers every three years, Textitlán factory workers also experience high personnel turnover, losing time and investment in core production steps such as wood drying and furniture finishing.

CFEs are criticized by policymakers and private business owners for being inefficient and lacking management and business sense. Often, they are supposed to offer social capital among the community but their financial instability puts their ultimate goal at risk. This provokes high turnover and great losses of human capital investment for the CFEs. The relatively low wages and the few incentives to retain workers are the main reasons why workers may choose to leave (Ixtlán worker, personal communication). The strategy of maintaining low salaries instead of training and retaining their labor force has been prevalent.

ICOFOSA's recent technology acquisition and inefficient administration, is putting pressure on finances of the three CFEs. High technology is not always required, especially when the company satisfies a local market. A local manufacturer mentioned that with the same machinery private firms could have been producing three times what the ICOFOSA factories are producing.

#### 4.4 TIP Muebles' social capital adaptation to the market

The clarity of an organizational goal determines the degree of its workers' engagement and its ultimate accomplishment. TIP Muebles as a retail strategy is in the process of developing a clear vision about distribution goals and the desired business culture in order to make it happen.

When *strategic marketing* is developed over a long period, it forms a spirit or atmosphere. That spirit is the internal goal of marketing, to create a state of mind coming from inside the company (Hansen and Juslin 2011). In TIP Muebles, uncertainty and weak social capital seems to negatively impact the corporate culture. However ICOFOSA represents a laboratory and a place for learning for the three companies. A close look at the common-pool decisions made in ICOFOSA can illustrate this organizational model.

##### 4.4.1 Governance structure adaptation

The community structure (agrarian, municipal and religious) has been adapted as a result of extrinsic and intrinsic changes. In some communities, the General Assembly has lost decision power and has given it to key service people. The nature of decision making of CFEs causes the corporate spirit to diffuse along the multiple steps to be done before any decision. In terms of the adequacy in which agreements are taken, there is a young generation of managers perceiving the lack of organizational orientation. However, ICOFOSA has relatively fast-track decision-making process compared to most CFEs.

In some communities, the decision-making process is more traditional and is slower and more detailed. Even when the power is transferred to a manager the process is still slow. In the most developed CFEs, decisions have to go from the Council analysis to the Assembly. I would say this model is shared by Mancomunados, then by San Juan, then Ixtlán, then Textitlán, then El Balcón and then Milpillás. Ixtlán has an Advisor Body, Mancomunados has delegates, the difference is that in Mancomunados there are eight communities giving the power to the manager who takes the decisions. In Ixtlán, decisions are taken by the managers and the Advisor Body, a group of *comuneros*. In Textitlán, their Advisor Commission make decisions slower, depending on the urgency of the issue [...] depending on the importance of the affair. While in Mancomunados the

manager takes decisions regarding money, in other communities investments are decided between managers and the council [*International NGO representative, engaged on the integration since it started*].

In other communities the problem resides in the amount of activities and communitarian responsibilities of the authorities. The agrarian communities, responsible for the enterprise activities are seldom professionally trained for industrial manufacturing and in some cases with a “business toolkit” to communicate effectively along the value chain.

#### 4.4.2 Dilemma: tradition vs. efficiency

An everyday challenge for ICOFOSA representatives is to make decisions adapting the business environment to the politics involved within the community. The bottom-line of their risk management relies on efficiency versus community support; here is the dilemma of tradition vs. efficiency. The nature of a social business relies on the challenge to integrate two mentalities that seem to be exclusive: the business management philosophy and the communal governance system. Differences among ICOFOSA’s three members make commercial integration a complex decision-making process.

This dilemma (tradition vs. efficiency) is faced equally by managers of the three factories as well as the representatives in ICOFOSA, on a daily basis. Managers try to politically satisfy the community expectations by looking at similar cyclic patterns or traditions that allowed them to be successful, resilient and maintain their culture in the past while trying to satisfy the day-to-day efficiency requirements (Jack Corbett, personal communication).

For CFEs, the communitarian goal is often stated as employment generation. However, the driving market pushes CFE managers to adapt decisions of incremental loss, forest mismanagement, and risk of bankruptcy. The adaptation path deals from the manager’s adaptation to the requirements of the industry and those of the community, to a slower and more significant factor of community governance structure. The characterization of this adaptation shows that it is emerging from a complex dilemma between the traditional culture and the new business mentality required to stay in the industry. The core of the CFE challenge lies in this duality of being stewards of society and having few capabilities to efficiently manage their business. On the one hand an ICOFOSA managers’ function is to balance the risks among financial assets of the factories by taking cost-oriented decisions, on the other, he has to gain trust and support from the community towards its main objective, their welfare.

#### 4.4.3 Innovative strategies favoring social capital integration within the community

A rarely discussed, but existing, bonding social capital pattern in community governance is the legacy of *comunero* (commons) power. There are privileges reserved to male inheritors of *comuneros*. Some of those privileges are the right to qualify for positions along the *cargo system*. Critics point out that current positions depend more on the *comunero* legacy than on skills and capabilities.

Especially in communities, more than in *ejidos*, this practice is directly affecting the decision-making process of CFEs. Some communities like Ixtlán are conscious about this pattern and have taken steps to adapt to the changing environment. Since 2004 the General Manager does not need to be “*comunero* son of a *comunero*”, however, the legacy practice continues.

Within the community, the idea to involve outsiders is not always well received. Values and mentality might differ or even threaten the existing ones. Outsiders are perceived to not fully engage while people from the community are supposed to give more than what is requested.

The General Assembly, in most cases, is traditionally dominated by the most senior members. In Ixtlán this structure has been adapted and young people are incorporated to give them voice in the CFEs administration both as a regenerating practice and as an option to retain younger generations that may potentially migrate elsewhere. Another innovation in their traditional structure has been the Advice Council, which as a technical assistance group is able to evaluate the CFE manager’s decisions before being presented to the General Assembly.

## 5 FUTURE CHALLENGES FOR CFES IN THE MARKETPLACE

In this study the potential for CFEs in the marketplace is explained by the internal decision making systems of CFEs. While CFEs struggle with their responsibility to optimize their availability of natural resources and human capital to sustain its participation in the market; there are extrinsic factors limiting their participation. Some of them are the current trade liberalization policy and resulting low cost imports. The tax reduction in wood extraction encourages CFEs to see forest harvesting as a more profitable business than manufacturing. The public forest policy bureaucracy to obtain permits and its lack of articulation with other institutions increases the response time of the industry and reduces its overall competitiveness. The possibility to transfer power to local institutions, to decentralize the future of their forest could work if the conditions of citizenship and responsibility associated with education were met. An overall mentality of distrust and even confrontation among CFEs and private companies reflects the degree of fragmentation in the industry. While illegal logging and land conflicts continue to deforest CFEs resources at a significant rate, the alternative of forest certification has not been met due to a lack of consumer education and market awareness.

In response to this gap of information, in June 2010, 10 former *ejidos* and *comunidades* in Mexico integrated an initiative called *Alianza EcoForce de México* (Alianza de las Comunidades y Ejidos Forestales certificados A.C.) to act as a *push* driving force in the certified forest products market. *The Alianza EcoForce de México* aims to be a collaborative strategy among government, society and the private sector. They are pushing public purchases such as the agreement from the federal government to buy 80% of its office furniture from community industries as stated in the current Purchases and Acquisitions Law [*Researcher in international public policy issues*].

There is a need to propel synergies [...] the certification is not going to work until we have a production and marketing strategy [Forest NGO representative and environmental advocate].

## 6 DISCUSSION/CONCLUSIONS

CFEs are not necessarily a panacea, however they offer an ongoing model of social dynamism with potential for enhancement. Community members within CFEs are developing a powerful tool: the ability to participate in communitarian organization leading to their transformation, to maintain forest cover instead of deforesting, to negotiate decisions which take advantage of their local resources and to create income opportunities. Community forestry, after emerging in developing countries about two decades ago, has grown into a worldwide phenomenon due to evidence of the reciprocal relationship between community involvement and forest sustainability (Bray 2002). CFEs, under the market demands of reducing costs to become more competitive, are facing a structural crisis related to their nature of social orientation and balancing their purpose of bringing social benefits and forest sustainability. However, communitarian industry remains a challenge unless government agencies and private industry actively promote community participation in forest management (Lee 2005). Reaching market competitiveness in the wood industry is directly linked to the future of the economic resilience of people living in the forest and to the forest resources availability. CFEs in Mexico must understand competitiveness while maintaining sustainability. Competitiveness should be seen as a function of forest quality. In many situations, the forest quality is declining (Zabin 1992) and could not only depend on the market contingency but on alternatives capable of influencing the social preferences of consumers. Moreover in a long-term Governmental Working Plan -beyond Governor's Plan- to maintain forest sustainability. Such planning is emerging from the communities, engaged citizens and should continue to be stimulated and further developed by institutional leadership with a strategic vision.

The institutions in charge of the forest policy have enormous potential to influence the sustainability of the industry and the communities linked to its maintenance by creating a national industry dialogue among the players in the value chain. This initiative can establish alliances among private companies interested in a secure and qualified (goal) supply for their manufacturing and the CFEs, interested in diversifying and consistent agreed upon prices for their harvesting and in particular cases, to establish distribution alliances with private companies.

One-fourth of the most forested developing countries have lands owned or managed by local communities (White and Martin 2002). Consequently, it is unlikely that a forest conservation initiative could be achieved without adapted strategies to engage rural people in commercial forestry operations (Scherr et al 2003).



Whenever markets are incomplete and imperfect, government schemes are almost always needed to guarantee competitiveness in the industry (Stiglitz 2002). Then, forest sustainability by long term strategies could be enhanced by increasing the participation of CFEs through state schemes. Intervention must be integrated with education, values, research and culture reached by their population and reflected in behaviors, visions of sustainability and long term strategic planning (Gallardo 2005). State participation has the potential to be less costly than allowing the community forest sector to disappear. The state intervention mechanisms could add to the emerging CFEs alliances to improve the fiscal policy for timber products transformation. Forest management, planning, social negotiation, administration, lobbying skills and marketing capabilities are the human capital skills that the state should enhance through opportunities of non-formal education to forest owners and industry professionals in order to promote informed decision-making.

Many CFEs face common inefficiency patterns such as moderate marketing and design capabilities, high production costs due to lack of training in the operation, high turnover based on traditional governance structures, and lack of management competencies. However, they also offer opportunities for local development such as the generation of economies of scale with multiplication effects within the communities, retention of younger generations from migration patterns, and generation of leadership in the community to negotiate, organize and participate in decisions regarding the use of their natural resources.

Some highly industrialized CFEs in Mexico show that their forests are currently subsidizing the forest products industry and machinery to an unsustainable degree. Social capital creation could give the community the tools to professionalize the production process to a safe and continuous output. There must be a “reengineering” of the processes of production, investment, and distribution of profits (Bray et al 2005). Also, to break down the current “vertical nature” of the regulatory framework into a more democratic decentralization, there is a call for action in capacity building, planning and transversal collaboration among different actors of the state, municipalities, private firms, and communities. Integration of the private sector with CFE producers in a trustworthy relationship is urgently needed if the national forest industry is to gain competitiveness in the current competitive market environment. Both, the CFE sector and the private industry are looking for cost-reduction opportunities and, should take the responsibility to establish more direct relationships, and organize a trade initiative. Otherwise, the outcome may be a gradual shrinkage of the sector.

The adaptation and innovative strategies of decision-making processes are allowing communities to maintain resiliency and, in few exceptional cases, to go beyond the profitability threshold. There is no such model to convey the tradition vs efficiency dilemma. The perception of tradition and efficiency in the market is transforming the numerous ways in which traditional communities enter the market to compete in the forest products industry. Every CFE case has its own dynamic and its own social rationality. To stereotype and create vertical strategies for a few CFEs ignores the need of the bulk of not-so-well developed ones (rentistas and roundwood sellers). There is no particular solution for every CFE. In order for CFEs to differentiate in the market, find their niche, and have access to markets, the composition through levels of planning, organization, bargaining capacity, product quality and distribution of power should be studied in each individual community. To precipitate those dynamics in order to accomplish institutional goals could involve risks and damage the relationships with the players within the communities and lead to distrust of the business environment surrounding CFEs.

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## ECONOMIC VIABILITY OF NEEM PRODUCTION (*AZADIRACHTA INDICA* A. JUSS) ON SMALL FARMS OF THE STATE OF SÃO PAULO, BRAZIL

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### ABSTRACT

Cultivation of Neem (*Azadirachta indica* A. Juss) has been implemented in several regions of Brazil and the oil obtained from its seeds is the main product. By having multiple uses, the production has attracted the attention of farmers and its products have been increasingly used in agriculture, livestock, medicine and cosmetic manufacturing. The main demand arises from the organic-based agriculture that uses its oil as an important defense against pests and diseases. In this context, this study targeted evaluating the economic feasibility of Neem farming in small farms in the state of São Paulo and characterizing the corresponding productive chain. The economic feasibility analysis method used was the Internal Rate of Return (IRR), calculated from primary data collected in connection with the generation of technical production coefficients, production costs and revenues. The description of the production chain was based on the Manual for Prospecting Technological Demands of the Brazilian Agricultural Research Enterprise – EMBRAPA. The flowchart of the production chain was described and the "markup" of the marketing process has also been calculated. The results indicated that the activity has economic viability with IRR ranging from 15.18% to 23.63% per annum, higher than the minimum rate of attractiveness used as an alternative investment. The analysis of the value-added production chain also indicated the possibility of superior returns for farmers in the event the oil is processed on the property, as shown by the industry, which had an oil marketing markup of 75%. Another important aspect observed is in connection to the generation of jobs and income provided by the crop, since the harvest, similar to coffee, requires more manpower. Neem is a culture that in addition to providing income to farmers also generates employment and environmental benefits for society.

**Keywords:** productive chain, organic-based agriculture, organic-based pesticides

### INTRODUCTION

Neem (*Azadirachta indica* A. Juss.), a tree originally from India, has been farmed in the North, Northeast, Southeast and Midwest of Brazil. The main product obtained from this species is the oil taken from its seeds, which contains a high number of active compounds, with azadirachtin being the most important (NEVES, 2004).

This species was initially introduced in Brazil, through seeds from the Philippines, by the Instituto Agrônomo do Paraná (IAPAR), in 1986, with the objective of researching this plant species's insecticide action. Later, in 1989 and 1990, this same institute obtained seeds from India, Nicaragua and the Dominican Republic, which were planted, respectively, in the regions of Londrina, Paranavaí (PR), Jaboticabal (SP) and Brasília (DF), for development appraisal (MARTINEZ, 2002). Given its multiple uses, Neem has attracted a lot of attention and its products increasingly more deployed in agriculture, herding, medicine and in manufacture of cosmetics. Practically every part of the plant can be used. In addition to the seeds, roots and wood also have known uses (CHATURVEDI; RAZDAN; BHOJWANI, 2004). Martinez (2002) states that organic farming comprise the main demand for products free of pesticides in the current market, and Neem-based products, with their efficiency and low human and environment toxicity, fully address this demand.

Given the environmental issues in connection to the deployment of pesticides, there is a growing demand on the national and international markets for organic foods, which has changed the behavior of farmers, who have been trying to find more effective production forms without chemical residues, thus reducing the impact on the environment. In Brazil, most organic foods come from small farms, requiring inputs free of chemicals harmful

for man and the environment. In this market, Neem stands out and is seen by small farmers as an alternative for additional income with reduced costs in chemical pesticides, in addition to bringing benefits for society which consumes healthier foods with less impact on the environment.

In the region of the study, the demand for Neem grows as a function of the consumption of organic inputs for pest and disease control on crops, in particular for citrus and coffee. In this context, this paper targets analyzing the economic feasibility of Neem farming in small properties and characterizing its production chain in the northwest region of the state of São Paulo – Brazil.

## METHODOLOGY

### Area of study

The northwest region of the state of São Paulo, in particular the Administrative Region of São José do Rio Preto, is the biggest producer of Neem in the state of São Paulo. The municipality of Catanduva, the main regional producer, has an area of 292 km<sup>2</sup> and is located at latitude 21°08'16" South and longitude 48°58'22" West, at an altitude of 503 meters (IBGE, 2006). The municipalities visited were: Urupês, Ariranha, Catanduva, Ibirá, São José do Rio Preto and Jales.

### Source of data

The raw data used in this research are in connection to the technical coefficients, costs and income obtained from the implementation, management and harvest of Neem plantations. The data was obtained by applying a questionnaire to nine Neem farmers in the region under study. Since there is no official information about the population of farmers in these regions, statistical inference was not possible in the analysis, thus characterizing this research as a case study. Average prices for inputs and products were obtained from agricultural companies located in the regions visited, which were identified prior to the visits, as well as when applying the questionnaire to the farmers.

The secondary data obtained was comprised of a review of the literature in connection to the topic, from titles found in physical and virtual libraries in teaching, research and extension institutions in the states of Paraná and São Paulo.

### Investment Analysis Method

The economic feasibility analysis tool set used was based on the determination of technical production coefficients and on the cost and income budget for activities and operations performed in the production system. The methodology established by Graça, Rodigheri and Conto, (2000) was applied, which proposes the use of computer spreadsheets for the economic analysis of pure forestry plantations or mixed forest farming and agricultural plantations systems. By using the internal return rate (taxa interna de retorno - TIR), one of the most traditional criteria for evaluation of investments, it is possible to analyze the economic profitability or the return of the investment in Neem farming in the Northwest region of the state of São Paulo. The TIR method requires calculation of the rate that zeros the present value of cash flows for the alternative analyzed, with the investment with the TIR higher than the minimum attractiveness rate (taxa mínima de atratividade - (TMA) considered profitable and liable of investment (CASSAROTO; KOPITKE, 2000).

Expressed as a percent, the TIR is one of the most often used economic criteria to measure and compare the efficiency of forestry investments. It provides the real profitability of the investment and, for this reason, is considered the internal rate for the venture, and according to Rezende and Oliveira (2001) it can be obtained by applying the following formula:

$$VPL = \sum_{j=0}^n R_j (1+i)^{-j} - \sum_{j=0}^n C_j (1+i)^{-j} = 0$$

Where:

R<sub>j</sub> = Revenue for the period of time j;

C<sub>j</sub> = Costs for the period of time j;

n = Duration of the Project in years or number of time periods.

This paper considers one hectare of Neem with a production cycle of 15 years and a Minimum Attractiveness Rate (TMA) of 12% a year. This rate, in addition to being compatible with the profile of the small and medium farmer in these regions, is also based on the literature on economic studies in the area of forestry, coming close to the return obtained from investments in capital funds available in the country, such as fixed income funds. Three scenarios were analyzed:

- Scenario 1: includes initial investment in land factor for planting.
- Scenario 2: considers leasing the land.
- Scenario 3: does not consider the land factor in the economic analysis.

## Method to Characterize the Productive Chain

Semi-structured questionnaires were used in obtaining qualitative and quantitative information about the Neem market in the study area. The description of the productive chain was based on EMBRAPA's Manual for Prospection of Technology Demands (1995). This methodology is described by the main in the stages of the productive chain prospection study for agricultural products. For administrative reasons, only some of the stages of this methodology were analyzed in this paper, which results in some constraints and generalizations must be made carefully when transposing them to other regions.

Marketing margins and mark-ups were calculated as described by Kotler (2000). According to this author, Gross Sales Margin (Margem Bruta de comercialização - MB) refers to the percent share for each of the levels of sales in establishing the final price for the product. The Total Margin (Margem Total - MT) on the other hand refers to the difference in price paid by the end consumer and the price paid to the farmer. Table 1 shows this relationship.

**Table 1** – Formulas for calculating the sale margin

Sale Margin	Absolute Value	Relative Value
Farmer	$P_p - CP$	$[(P_p - CP) / P_v] * 100$
Primary Processing Industry	$P_{pp} - P_p$	$[(P_{pp} - P_p) / P_v] * 100$
Wholesale	$P_a - P_{pp}$	$[(P_a - P_{pp}) / P_v] * 100$
Retail	$P_v - P_a$	$[(P_v - P_a) / P_v] * 100$
Total	$P_v - P_p$	$[(P_v - P_p) / P_v] * 100$

Source: Santos et al. (2002), adapted by the author. Note:  $P_p$  (price at farm gate);  $CP$  (cost of production);  $P_{pp}$  (price at primary processing industry);  $P_a$  (wholesale price);  $P_v$  (retail price).

Calculation of markup is important in analyzing the sale of Neem, since this makes it possible to understand the role of the middleman in establishing the price over the course of the productive chain (Table 2).

**Table 2** - Formulas for calculation of sale markup

Sale Margin	Absolute Value	Relative Value
Farmer	$P_p - CP$	$[(P_p - CP) / CP] * 100$
Primary Processing Industry	$P_{pp} - P_p$	$[(P_{pp} - P_p) / P_p] * 100$
Wholesale	$P_a - P_{pp}$	$[(P_a - P_{pp}) / P_{pp}] * 100$
Retail	$P_v - P_a$	$[(P_v - P_a) / P_a] * 100$
Total	$P_v - P_p$	$[(P_v - P_p) / P_p] * 100$

Source: Santos et al. (2002), adapted by the author. Note:  $P_p$  (preice at farm gate);  $CP$  (cost of production);  $P_{pp}$  (price at primary processing industry);  $P_a$  (wholesale price);  $P_v$  (retail price).

## RESULTS AND DISCUSSION

Neem farming costs are highest in the first year when the crop is planted and then after the third year, when the fruit begin to be harvested. Present value costs for the first year (year zero), i.e., of implementation, were of US\$ 3,896.30 per hectare, including costs of acquisition of seedlings, preparation of the soil, planting, control of invasive plants, fertilization, taxes, technical assistance and funding interest rate (Table1). In the next two years, the amounts drop to US\$ 1,550.35 and US\$ 1,681.54. From the third year on, there is an increase in the total cost per hectare as a function of, in particular, the beginning of harvesting the fruit. In this year, the cost per hectare

reaches US\$ 2,123.50 and rises to the tenth year, reaching US\$4,414.46. After the tenth year, this amount drops to US\$ 4,055.46, remaining constant until the end of the 15-year cycle.

**Table 3** – Cash flow of Neem farming in the Northwest region of the state of São Paulo.

Year	Annual cost/hectare	Annual income/hectare	Net income/hectare
0	\$3,896.30	\$0.00	-\$3,896.30
1	\$1,550.35	\$0.00	-\$1,550.35
2	\$1,681.54	\$0.00	-\$1,681.54
3	\$2,123.50	\$1,641.38	-\$ 482.12
4	\$2,415.35	\$2,872.41	\$ 457.06
5	\$3,734.57	\$4,513.79	\$ 779.23
6	\$3,667.26	\$5,744.83	\$2,077.57
7 to 9	\$4,055.46	\$7,386.21	\$3,330.75
10	\$4,414.46	\$7,386.21	\$2,971.75
11 to 14	\$4,055.46	\$7,386.21	\$3,330.75
15	\$4,055.46	\$11,731.03	\$7,675.58

Source: Bittencourt et al (2009).

With a view to simplifying the make-up of labor costs, for each forestry operation the required labor for the undertaking, including all labor charges, such as the thirteenth salary, disease aid, overtime, holiday bonus, fund for time of service guarantee, social security and other charges. The average amount for the land in a 60 km radius around the municipality of Catanduva, with good quality road access, was surveyed for the region and later confirmed with data from the Instituto de Economia Agrícola (IEA), which undertakes systematic tracking of the price of land in the state of São Paulo. The average amount taken for the region took into account the average value of the bare land (Valor da Terra Nua - VTN) for the activity of reforestation in the region of Catanduva so was US\$ 4,841.82/hectare. So, in calculating the annual cost of the land, payment in kind was selected for the best agricultural alternative presented in the region at the time the data was collected, i.e., leasing for sugar cane farming, at a cost of US\$ 395.00/hectare. The information shown on table 3 and in the following ones are in reference to the scenario that takes into account the cost of leasing the land. If the land were to be bought, this disbursement would be in the first year cash flow, and the same amount would be considered in the fifteenth year. It should also be stressed that there may be a valuing on the price of the land over the course of the cycle, however, this is ignored in this analysis.

The income from the production Neem may come from sale of leaves, fruit and wood. In the Northwest region of the state of São Paulo no market was found for Neem leaves, which are mostly used in animal feed and in control of ectoparasites, and this region has a low aptitude for herding. In this way, the main revenue for this crop comes for the fruit, from whose seed the oil is extracted and widely using in agriculture.

In this region, fruit begin to be produced in the third year after planting and the production has risen to date, when the oldest plantations are eight years old and produce close to 6.5 tons of fruit per hectare/year.

The management system adopted by the farmers visited is for 15 years, with plantations being cut to the stump at the end of this cycle and the wood produced sold. This management scheme was taken into account in this paper since there are no papers on defining the most suitable forms of management for this species. Therefore, since in Brazil plantations are recent and there are no studies in connection with the progress of productivity in Neem on Brazilian soils, the choice was made to use constant production level after the eighth year. This choice is based on prudence in not over estimating production and consequently estimating unreal returns for the culture under analysis.

Considering the previously mentioned aspects, the economic analysis of this study considered that future sales of Neem fruit in the region will be in kilograms (kg), with the average price paid to farmers by the industry that consumes this raw material being around US\$ 1.15. However, this figure may vary between US\$ 0.86/kg and US\$ 1.44/kg, driven by seed quality and moisture content. Amounts paid for the fruit are compatible with the figures found by

Falesi; Ferreira; Carvalho (2000), of US\$ 1,44/kg.

During the first three years there is no income, because the trees have not yet matured enough to start producing fruit. After the third year fruit production begins and increases all the way to the eighth year and then remains constant from then on to the end of the cycle. However, when this income is discounted at present value,



the behavior obtained is shown in table 3, since the longer the term for a series of equal payments (income in the different years) the lower its present value will be.

In our study region there is still is no market for Neem wood; bearing in mind that the oldest plantations are eight years old. However, there are comments about the high value of the wood which, according to local producers, can reach US\$ 100/m<sup>3</sup>, but there is little actual information about the real possibility of achieving this value by the end of the cycle. So, the reference value used for the income generated from the wood at the end of the cycle, is the local Market price for standing *Eucalyptus* spp. logs. These are used in energy generation, a market that will certainly absorb the Neem wood at least at the same price paid for eucalypts wood of US\$ 24.14/m<sup>3</sup>. Here, it should be stressed that Neem wood has characteristics that qualify it to compete with hardwoods, like mahogany, also from the Meliaceae family, which is a protected species and protected by law. However, Neem still has not reached a level of supply enabling the establishment of a specific demand for this wood species, implying there a market price has not been formed for its sale. Another factor that should be observed is that in most plantations visited in the region pruning is not being adequately done in order to obtain good quality wood at the end of the cycle.

### Economic viability of the scenarios proposed

In general terms, all the scenarios proved to be viable from the stand point of analysis of investment as compared to the minimum attractiveness rate used of 12% a year, as shown in table 4.

**Table 4** – Internal Return Rate (Taxa Interna de Retorno - TIR) of investment in producing Neem in the northwest region of the state of São Paulo

Scenarios	Internal Return Rate (%)
Acquisition of the land	15.2
Leasing the land	18.5
W/out cost of land	23.6

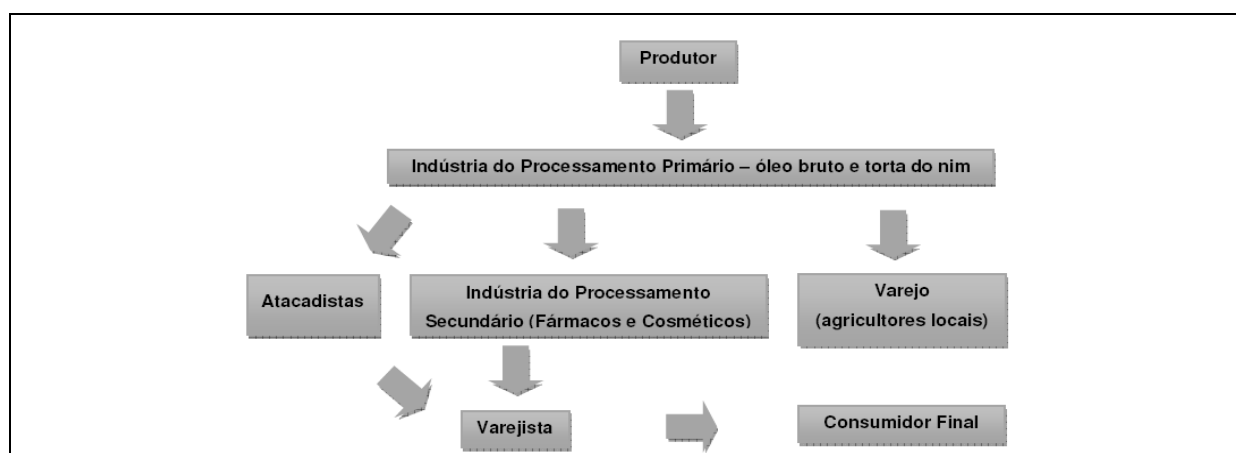
Source: Bittencourt et al (2009).

Note: Minimum Attractiveness Rate (Taxa Mínima de Atratividade - TMA) of 12% a year.

Table 4 shows that the scenario which showed the best economic return on the capital invested was the one that proposed leasing the land. This is justifiable once the lands in the northwest of the state of São Paulo are very productive and consequently of economic value. In the scenario with acquisition of the land, a high amount of capital is immobilized in the beginning of the production cycle. In the scenario with lease of the land, there are disbursements throughout the production cycle in proportion to the best alternative for use of the land in the region. The scenario that does not include the cost of land in the analysis was the one with the best return, however it is a given that this production factor must be remunerated, with this scenario being analyzed solely for the purpose of visualizing the impact of the price of the land in the economic viability in this production option.

### Characterization of the Productive Chain for Neem in the Northwest region of the state of São Paulo – Brazil

The following players are part of the Neem production process in the northwest region of the state of São Paulo: farmer; industry responsible for primary processing of crude oil; industry responsible for secondary processing, wholesalers and retailers. Figure 1 shows the flowchart for this activity in the region being analyzed.



**Figure 1** – Flowchart of the production chain of Neem in the northwest region of the state of São Paulo. Source: Bittencourt (2006).

The beginning of the productive chain is on the farm, where farmers harvest the Neem fruit and take them to the yard of the primary processing industry, with farmers being accountable for unloading. The primary processing unit extracts the oil and processes the by-product, Neem pie. The oil extracted is placed in 1 or 5 liter containers and Neem pie in 5 kilo packages for later sale. The oil and the pie are sold locally to other farmers and as well as to wholesalers, retailers and pharmaceuticals and cosmetic industries in different regions around the country (figure 1). The latter, in their turn, sells their products to retailers who in turn market them to the final consumer. Final consumers can be farmers and herders distant from the primary processing industry and also people who use products with Neem-based formulations in their homes, vegetable gardens and in treating diseases in small animals, like cats and dogs (as a flea repellent and vermifuge). The first two links of the production chain are farmers and the primary processing industry. The harvest is collected directly from the tree or from the ground, with the first type ensuring better quality oil. After harvesting, the fruit must be dried by exposure to the sun to facilitate removal of the pulp surrounding the nut. After drying, the shell is separated from the seed (or nut) which is then used for oil extraction. The seeds are pressed and Neem pie is obtained from the pressing (shell and seed residue) as well as crude oil, which will later go through filter processes that vary according to the intended use. The oil meant for the pharmaceuticals industry, for instance, requires a stricter filtering process.

### Sales margin and mark-up for Neem oil

Prices for the raw material (fruit) and Neem oil, obtained during the visit to the regions surveyed (farmers) as well as from the information given by the companies contacted, are shown in table 5.

**Table 5** – Prices in connection with raw materials and Neem oil in different segments of the production chain

Product	Sales Tier	Sales Price
Fruit (U\$/kg)	Farmer	1.15
Neem Oil (U\$/0.1liter)	Primary Processing Industry	2.01
Neem Oil (U\$/0.1liter)	Wholesale	2.79
Neem Oil (U\$/0.1liter)	Retail	3.16

Source: field survey (2006)

Prices are in reference to the production of 0.1 liter of oil. This unit was adopted to enable analysis for the entire production chain, given that 1 kg of raw fruit is needed to produce 0.1 liter of crude Neem oil. Table 5 shows a price level increase along the production chain. This increase can be better discussed by calculating sale margins and markups. In this calculation, the option was made not to include the Secondary Processing Industry (pharmaceuticals and cosmetics), given that they have a broad range of products with different concentrations and formulations. Another reason is that this paper focuses on Neem oil as an input to farming and herding activities. Table 6 shows the gross sale margins for Neem oil for agricultural and veterinary uses along the production chain.

**Table 6** – Gross sale margin for Neem oil

Sale Margin	Product Price	Margin (%)
Farmer	1.15	5.30
Primary Processing Industry	2.01	27.30
Wholesale	2.79	24.50
Retail	3.16	11.80
Total	-	63.60

Source: pesquisa de campo (2006)

This shows that 27.3% of the margin is appropriated by the primary processing industry, with wholesalers taking on average 24.5%, retailers approximately 11.8% and finally farmers with 5.3%. The total sale margin is of 63.6%, i.e., it is the difference between the price paid by consumers and the price paid to farmers. Table 7 shows the “mark-ups” in sale of Neem oil for agricultural and veterinary use.

**Table 7** – Mark-up in sale of Neem oil

Sale Mark-up	Product Price (US\$/0.1 l)	Mark-up (%)
Farmer	1.15	17.00
Primary Processing Industry	2.01	75.00
Wholesale	2.79	38.60
Retail	3.16	13.40
Total	-	175.00

Source: field survey (2006)

The primary processing industry receives a remuneration of 75% over the purchase price, i.e., the price paid to the farmer. With a lower remuneration, wholesale comes in at 38.6% and Retail with 13.4%. The higher figure found for the primary processing industry can be explained by the fact that it has higher production costs, including sale-related tax burden, packaging, specific machinery and specialist labor. So, these costs must be compensated through the amount charged for the product.

A curious situation can be seen here that usually does not occur in the non-wood forestry product production chains, which is that farmers (17.0%) are better remunerated than retail (13.4%). This is owed to the fact that the cost of fruit production is lower in comparison to the add-on prices in going from wholesale to retail. In the analysis of the chain as a whole, prices paid to farmers increase by 175% on their way to the final consumer.

## CONCLUSIONS AND RECOMMENDATIONS

The production of Neem in the northwest region of the state of São Paulo has been proven feasible from the economic stand point as compared to the minimum attractiveness rate proposed with internal return rates varying from 15.2% to 23.6% a year.

The Neem production chain is usually shown in a very simplified way, comprised by wholesalers, retailers, primary processing industry, secondary processing industry and final consumers.

Most of the value added to the Neem productive chain, similar to what happens in most non-wood forestry product production chains, is appropriated by middlemen. In this case represented by the primary processing industry, the one that most adds value to the product and with the highest sale “mark-up” in the production chain. The other components of the chain are: farmers, wholesalers, secondary processing industry, retailers and final consumer.

The region shows potential for growth since it has the required infrastructure for production, established industries as well as local and regional markets for consumption and movement of production.

Association and cooperative based forms of operation are recommended for Neem farmers so that economies of scale can be achieved for production and in this way reduce costs and increase the power of negotiation with respect to the buying industries. The acquisition of a primary processing unit to produce Neem oil is also suggested as a way to add value and potential for profit. The search for new markets for the produce, as well as increasing participation in the other market niches, detected;

As more studies about forestry management, traits and exploration techniques are undertaken and new Neem-based products, not just for agricultural uses, become available in the market, the trend is for more farmers to become interested in the crop and start producing Neem on a larger scale.

Better distribution of the profit margin among the members of the production chain via a minimum price policy by the industries, with a view to not making Neem farming unfeasible in the short term.

In general, we can conclude that Neem appears to be a good economic soil use alternative; diversifying production on small farms, generating income, employment in the field, and environmental benefits from the reduced deployment of harmful chemical pesticides in agriculture.

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## TRADITIONAL AND UPCOMING TYPES OF FIGURES AND THEIR USE

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### INTRODUCTION

Recording and utilising figures as indicators of forestry activities has a long tradition, especially in the European forest sector. The first indicators which represent forestry in Germany date from the medieval age (Brandl 1970, Hövell 1993). Before the 1992 Earth Summit in Rio, forest management predominately used and produced traditional, mostly retrospective, financial or silvicultural key ratios for management purposes. Evolving trends like strategic sustainability management and sustainability reporting triggered the need for new types of measures and indicators. (HM-WVL 1999, Clausen et al. 2001, Cahyandito 2005, PLEON 2005).

This was – on one hand – related to the three pillar approach where a lack of social and ecological indicators was especially identified. On the other hand it became obvious that inter alia globalisation fostered the dynamic and complexity of forests and resulted in a need for new indicators, especially in order to optimize the relations between an enterprise and its societal and political environment.

These mega-trends described above led to the development of a relevant number of different types of figures and subsequently to “more opportunities” for misuse and misinterpretation.

### NEW TYPES OF FIGURES

Predominantly during the last two decades the development and classification of forest figures started. Related to different purposes, various types of data have been classified, most of them indicator form series. Next an overview of the different series and their related types will be presented. A more detailed description will be provided in Hartebrodt (planned) 2012.

#### Ecological – Social – Economical

Beginning with the work of the so called Brundtland commission of the UN the three-pillar approach has become more and more popular. For that reason the search for indicators in these dimensions started. The structure of this indicator-series is almost self-explanatory.

- § Ecological indicators are used to monitor ecological facts and developments.
- § Social indicators are used for the documentation and controlling of social aspects. It has to be kept in mind that this social dimension can be split up into an internal social sphere, which focuses on issues related to the members of the organisation and external social indicators which depict societal affairs.
- § The economical dimension is the most traditional one, here we find monetary information but data about products and required resources are mostly linked to this dimension as well.

In the case that developments in a country's political system are assessed, frequently a so called institutional dimension, which deals with different kinds of institutional arrangements, e. g. legislation, democratic or participatory processes and management instruments, is added to the three dimensions mentioned above. At the individual enterprise level or when assessing different instruments, decisions about these institutional aspects are mostly already made or implicit. Therefore this type does not matter in this paper.

#### Input - Output - Outcome

A frequently used typology of indicators is the input – output – outcome series.

- § Input – indicators show the input made or required to achieve goals or to execute operations.
- § Output – indicators give an overview about products or services produced or their monetary equivalent.

- § Outcome indicators describe the effects of the activities or processes. In upcoming literature outcome indicators are divided into outcome indicators in a narrower sense as those which measure direct effects and impact indicators which include indirect effects as well.

This differentiation is used for example for the assessment of EU-Programs and plays a relevant role in strategic management and performance measurement systems. Most authors accept that there is a clear qualitative hierarchy from input to outcome or impact indicators. The latter ones are seen as desirable in any case.

### **Pressure – State – Response**

The Organisation of Economic Cooperation and Development (OECD) developed the Pressure-State-Response Framework (the PSR Framework) in the late 1980s (OECD 1993, UN 1997). It is intended to classify figures related to ecological aspects.

- § Indicators of pressure depict the range of stresses or pressures from (mostly) human activities that result in environmental change
- § Indicators of state monitor changes or trends in the physical or biological state of the natural world
- § Indicators of response are figures that are suited to show and assess actions adopted in response to environmental problems and concerns.

### **Leading - Lagging - Coincident**

A fourth series can be structured by the time relation between the figure and the underlying fact or information.

- § Lagging indicators do not change direction until a few quarters after the related issue does.
- § Leading indicators are indicators which change before the related development changes. Thus they are needed to predict future developments and very useful for all kinds of controlling aspects.
- § Coincident indicators change at approximately the same time as the related situation, thereby providing information about the current state.

There is a wide consensus that in the past mostly lagging or retrospective figures have been collected and used and that it is desirable to have more information about future developments. Thus it can be stated that we have here again a qualitative hierarchy which starts with lagging indicators at the bottom and ends with leading indicators at the top.

### **Other Typologies and Remarks**

In addition to the types discussed above there are a considerable number of different stratifications, relevant are *inter alia* the following three pairs:

- § Operative – Strategic
- § Effectiveness – Efficiency
- § Processes – Status

Moreover different structures can be found which group the individual types differently. It seems to be difficult, probably useless, to discuss which typology is the best. Finally it seems to be more the scope of the application that counts in the choice of an individual system of typification. Mention must be made, that the classification of an individual indicator can be more or less undisputable or may depend and vary with its context. E.g. the number of species can be the description of a state but as a consequence of habitat management activities a response indicator. In terms of biodiversity of a region it is an ecological indicator, however for a pet shop it may be an economic indicator, highlighting the product-diversity of his goods. Classifying indicators is thus strongly context related. If not (as done in the present study) it has to be executed in a way that the most frequent or probable application has to be used.

Furthermore it has to be noted that the typifications can be used simultaneously. A social indicator can be a leading indicator which monitors potential outcomes. Thus we have multidimensional typing systems in which the number of dimensions depends on the typing-series.

## METHODOLOGY

During different research projects where sustainability management systems and sustainability reporting systems were assessed and developed, a database was built up where the contents of these systems were gathered. Issues of interest have been how the systems are structured, e.g. in terms of levels and dimensions and which indicators are used to document and monitor these different aspects. The data base can be used to characterize the individual indicator or topic in terms of the typology presented above. The data base can be used to search for topics which are related to various sustainability issues and for the analysis of the use of different types of indicators. The latter aspect is of relevance for the results presented here.

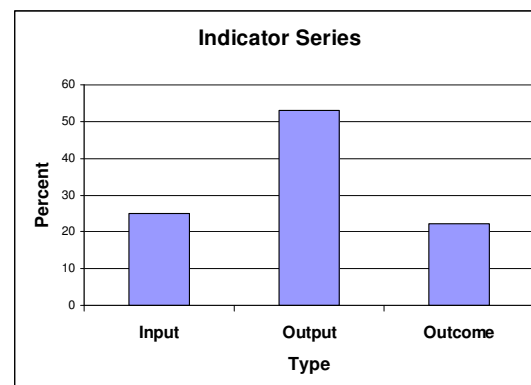
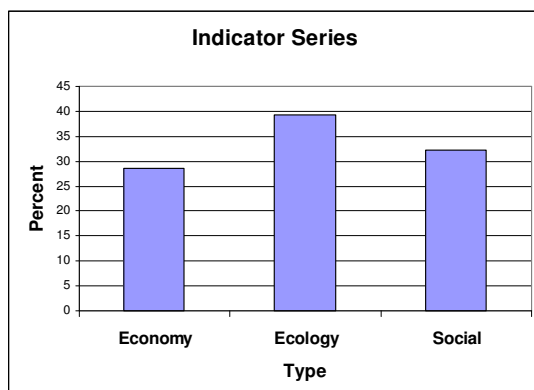
At present some 1300 datasets from 36 individual management and reporting systems are available in the database, but the number will increase notable during the next years because of the increasing use of these systems. Figure 1 gives an overview over the contents of the database.

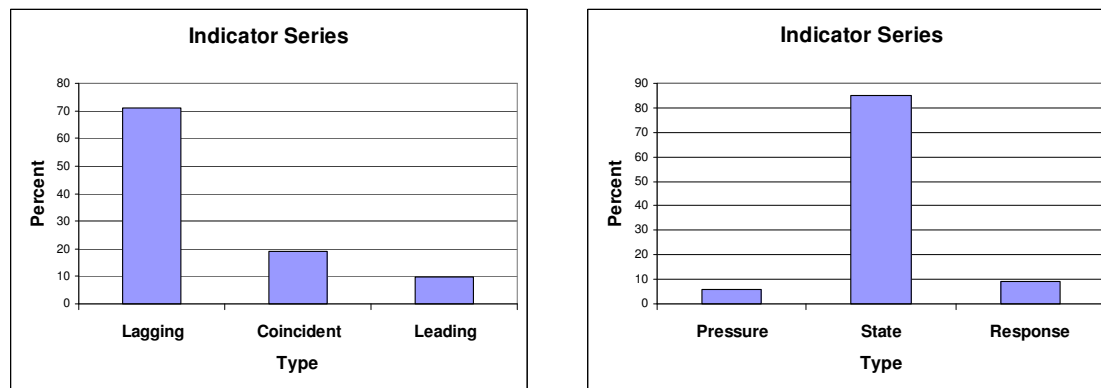
**Figure 1:** Structure and content of the indicator database.

These 1300 datasets have been typed to data in terms of the four typing-series described above.

## RESULTS

The share of the different indicator-types in the various series varies notably. The figures 2 to 5 show the individual frequency distribution of types in the individual series.





**Figures 2-5:** Share of different indicator-types in different indicator series

The percentage of economic, ecological and social indicators is almost balanced with a slight predominance of ecological indicators. With regard to the input – output – outcome series it is visible that all types are used, but that output indicators are twice as frequently as the other ones. In respect of the timing of indicators it can be shown that most (70%) of the indicators are lagging indicators and only 10 % of the indicators can be classified as leading indicators. Coincident indicators play a subordinate role too. From the ecological point of view the series pressure state response plays an important role. Here it has to be stated that the indicators used are mostly suited to depict state but not to monitor pressures (or driving forces) and responses of the actors or the systems.

## DISCUSSION AND CONCLUSION

Together with the environmental and later the sustainability debate the three pillar approach became more and more prominent. The invention of sustainability management and reporting systems were a consequence of this. At present the use of indicators reflects the Rio-dimension and is already almost evenly balanced. With significant differences in the systems of individual institutions it turns out that on average economic, ecological and social aspects are represented more or less equally. As sustainability management and reporting systems have been assessed, which focus frequently on social and ecological issues, it is not surprising that the economic dimension seems to be slightly underrepresented. Thus one objective of the sustainability debate, the equitable consideration of the ‘three pillars’ is reached, at least quantitatively.

One of the most frequent criticisms in the controlling and management literature was the use of so called input indicators, which show only the input made, ignoring whether there are appropriate results linked to that input. Particularly public bodies and households focused for decades on this type of indicator. The results show that this situation seems to have been overcome for the most part. The remaining 25% seems to be close to the almost unavoidable portion of input indicators. The documentation of the output achieved meanwhile dominates management and reporting systems. However it has to be kept in mind that ultimately it is the outcome that matters. From this point of view the fact that barely a quarter of the indicators are outcome indicators shows that there is still a lot of work to do in terms of development of indicators.

We find a similar, maybe a worse situation with regard of the time dimension of the indicators used. In the most part it is still lagging indicators which are used. The systems are insofar capable of using or depicting information from the past. In 20 % of the cases the indicators are more or less able to date and provide information about the present state. But the aim of having information about expected future developments is still rare. Despite the fact that it is not realistic to have leading indicators a present share of only 10 % is far from satisfactory.

Equally unsatisfying is the distribution between pressure-, state- and response indicators. Here we have predominately state indicators. It seems to be difficult to gather information about the driving forces and the reactions of systems and actors at present.

The use of new types of management, measurement and reporting systems clearly promoted the development of new, more comprehensive, more informative figures to be used as indicators. It can be said that the era of pure monetary indicator systems has come to an end or that these systems have to be seen as partial systems used for internal managerial economics. Whenever communication with stakeholders is intended the use of new types of



indicators is a must. Efforts during the last two decades have resulted in notable success in developing and using these indicators.

However it has also to be stated, that deficiencies remain as well. There is still a lack of figures that are applicable to forecasting future developments and there is still a need to focus more on the outcome of our activities in the future.

## OUTLOOK

It is foreseen to broaden the database gradually. The analysis of the data will be extended to additional indicator-series and related types. Of special interest will be a comparative analysis of different systems, potentially regional with regard to different types of figures.

As figures should not be ends in themselves the interest of various stakeholder groups and users has to be evaluated. Initial results reveal that significant distinctions can be expected when we look at the requirements of different groups (Hartebrodt & Kenntner, 2008). A straightforward collection and communication of new types of figures must be reflected in the eye of senders and recipients.

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## EXAMINING SYNERGIES AND CONFLICTS IN SOCIAL, ECOLOGICAL AND ECONOMIC INTERACTIONS OF STAKEHOLDER GROUPS IN MULTIETHNIC MOUNTAIN COMMUNITIES OF THE SLOVENSKÝ RAJ NATIONAL PARK

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### ABSTRACT

Countries located in the Carpathian region have valuable forest resources. Previously, they were owned and managed almost exclusively by the state, under the principles of a planned economy that also secured jobs and supported local communities by creating a heavily subsidized socio-economic system. In the majority of these countries (currently, EU member states), the restitution of forest to private ownership began in the mid-1990s, and is now almost completed. However, transitional changes, including the emergence of private companies in timber production, wood processing, non-timber forest production and forest tourism and recreation, have resulted in a significant drop in the level of employment in the forest sector, largely leading to impoverishment of local communities located in the vicinity of forests (Soloviy and Cubbage, 2007; Nijnik *et al.*, 2009).

Stakeholder involvement in defining policies for sustainable provision and use of ecosystem services is regarded as an essential part of sustainable forestry development (Kouplevatskaya-Yunusova and Buttoud 2007). Effective implementation of sustainable development policies requires community participation, human capacity development and well-established institutions linked to strong social capital. However, it is generally accepted that in former command-and-control economies, state monopoly, administrative regulation, and more or less absolute control over all actions resulted in the dramatic decline of trust in formal institutions (Putnam, 1995), and in the erosion of effective participation and collaboration in planning and decision-making (Lin 2000a; Nijnik and Van Kooten, 2000 and 2006). As a result, various 'grey/black' networks were at times created (see more in Paldam and Svenson, 2000; Portes and Landolt, 2000), and these networks and their reliance on personal relationships and sometimes on 'politonomy' (Nijnik and Oskam, 2004), rather than on multi-stakeholder and multi-institutional cooperation, have slowed down the process of democratisation, particularly in remote rural areas, decreasing the effectiveness of sustainable resource/forest management.

Since the early 1990s, countries of the Carpathian region have undergone significant political transformations, with their small-scale (often private) forestry growing. However, at times, the low social capital and closed 'grey/black' networks with weak formal institutions (Portes and Landolt, 2000; Nijnik and Oskam, 2004) have excluded from decision-making many of those who are not members of political elites, rejecting their energy, skills, knowledge, and their potential constructive criticism which might have encouraged the system to change (Gatzweiler and Hagedorn, 2002).

As individuals participate more in communities and civic activities, they learn to trust each other. Trust arising from individual and civic interactions has a positive effect on the increase of confidence in new governance structures. These structures, community networks and bottom-up cooperation to enhance social capital are considered by the authors to be particularly important for the policy reforms in the Carpathian countries and in relation to small-scale forestry development. 'Soft measures' such as cross-scale cooperation, competitiveness and innovations are particularly useful when dealing with ethnic minority issues (Baláž, 2006).

Communities with a multicultural and ethnically diverse population located in valuable forest areas of the Carpathian Mountains are often facing serious social and economic problems, including high unemployment rates, weak social support and institutions with a low level of stakeholder participation in decision-making. A case study of communities in the Slovensky Raj National Park (SRNAP) is being analysed by us, and with a special focus on the involvement of the Roma minority in sustainable forest management. We seek to address the *following questions*:

- What are stakeholder preferences and insights into future developments in this mountain region with a particular focus on sustaining multifunctional forest management and the promotion of participation in local decision-making?
- What are the key vertical and horizontal ways of participation and collaboration between different stakeholder groups, particularly in multiethnic communities in the two municipalities of Letanovce and Spišské Tomášovce, and how effective are the participatory processes?
- How do the identified ways of participation and collaboration contribute to the development of trust, especially between Romas and non-Romas, and to their engagement in participation to sustain multiple forest ecosystems?
- What types of participation and collaboration between and within Roma and non-Roma in these communities can be identified as needed in the future in order to progress participatory governance and sustainable forest management (SFM)?

Social capital, cooperation and community development are being addressed and potential scenarios linking sustainable forestry with sustainable livelihoods are being investigated. We specifically focus on identifying opportunities for enlarging trust and improving cooperation through repeated interactions between stakeholders and capacity development. The major hypothesis tested in our research is that, in areas with initially low trust and weak social networks, especially in localities inhabited by ethnic minorities, sustainable forest policy strategies need to create opportunities for repeated interactions between individuals who are to become willing to cooperate, to learn from one another (Brehm and Rahn, 1997), and to provide space for communities to express their needs rather than impose visions that often reflect on the views of those with better access to decision-making (Lin, 2000b).

A sequence of *methods* was applied to investigate the types of interactions and level of participation in multifunctional forest management by the Roma and non-Roma population<sup>1</sup> in the studied communities of the SRNAP. The focus was on horizontal and vertical participation in stakeholder decision-making concerning SFM. During our initial discussions with stakeholders, including representatives of the Roma groups and small scale forest (SSF) owners, it became clear that they were very concerned about the worsening quality of natural resources impacting both the quality of local environments and potential revenues from tourism in the park, and the lack of cooperation between key players that could influence any further decisions and actions. The stakeholders were specifically interested in comparison of experiences in participation between the majority and minority populations in the two involved municipalities to learn about their successes and failures. Because of municipal leaders' increasing interest in resource management and in sustainable multifunctional SSF, forestry related stakeholders were also interested in developing the basis of a potential plan that could be advanced and turned into a local SFM management plan. Stakeholders' demands created a specific focus for an overall research approach. These demands necessitated an elaboration of a participatory scenario development methodology to enable a structured dialogue among stakeholders in targeted municipalities about their futures, means of participation and interactions, and about the role of forests and their sustainable management.

A wider scope of the research, its methodology and its *major findings* are presented in our full paper (Bizikova *et al.*, in press). In this paper, we demonstrate that the advance of local institutions and promotion of participation to increase social capital would result in more sustainable multifunctional management of forests in the Carpathian mountain region. The identified development scenarios provide examples of what types of participatory actions are needed and are relevant to different groups of stakeholders and across different issues. **To conclude**, the results provide evidence that the way towards sustainability lies in the integration of forest management with community development and that important preconditions for success are learning, repeated stakeholder interaction, horizontal and vertical cooperation of forest owners and users, and building up of trust between and within local communities.

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<sup>1</sup> In this research we focused on two major groups Roma and non-Romas. By the term non-Roma population we refer the population that is not member of the Roma minority. Specifically, in the by the term non-Romas area we include different nationalities including Slovaks, Czechs, Polish, Ukrainian. In the two case studies specific stakeholders under non-Roma population included mayors, council members, SSF owners, local business owners and civil society members.

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## SMALL SCALE FOREST OWNERS' RESPONSIBILITIES STAKEHOLDERS' EXPECTATIONS

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### ABSTRACT

In Sweden, as in many other Western countries, small scale forest owners play an important role in the roundwood market and for the supply of other forest utilities. A successfully implemented forest policy requires knowledge about the owners' goals for their enterprises and how they are to be accomplished. Knowledge is also needed about the similarities and differences between owners' and interested parties' expectations of responsibilities. Taking responsibility refers to balancing economic, social and environmental concerns. This paper focuses on stakeholders' expectations of small scale forest owners' responsibilities and the potential conflicts between owners and stakeholders and between stakeholders. Results from an explorative study are reported. Interviews were made with a handful of stakeholders (representatives of the ministry of forestry, county administrative board, municipal executive board, Swedish forest agency, WWF, forest owners association, sawmill, "public").

The stakeholders were selected to represent different views and to give a basis for a more general study. The interviews were held during the spring of 2011 in Uppsala county or where applicable in Stockholm or Uppsala. The interviews were recorded and later transcribed to facilitate the analysis. The discussions lasted about one hour. Comparisons will be made with an earlier study of small scale forest owners. The results show that much of the requirements with respect to responsibilities are based on the Forestry Act and the ideology of the organizations. Differences exist between stakeholders' expectations concerning responsibilities and the responsibilities that forest owners take.

**Keywords:** CSR, corporate social responsibility, sustainable, cutting behavior, supply, non-market utilities, local communities





## **SOCIAL SYNERGIES AND TENSIONS IN PRIVATE FOREST PROPERTY RIGHTS**

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### **ABSTRACT**

This paper analyzes the ongoing transitions in public and private rights related to private forest ownership and management in the United States. The paper begins with a discussion of theories and social trends that have historically influenced American ideas pertaining to property rights. The paper then turns to the concept of 'common' resources in relation to private lands, traces the ongoing social redefinition of these resources, and discusses the related expansion of public influence over them. The authors conclude that many current policymaking efforts in the United States largely neglect the issue of distributive rights. Although policymakers often seek public input in framing desired ecological outcomes, stakeholders are typically left to define and defend their separate rights through litigation or other means as the policies are implemented. We suggest that the emergent trend toward more collaborative policymaking can help resolve this problem if policymakers and stakeholders begin the process with an earlier, more focused consideration of distributive rights and social responsibility.

**Keywords:** Forest policy; property rights; private forests; environmental rights; common resources



## **FACTORS INFLUENCING A FARMER'S DECISION TO AFFOREST**

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### **ABSTRACT**

To encourage farmers to transfer land into forestry, a generous premium scheme supporting farmers who afforest was implemented in Ireland in 1996. In the period from 1996 to 2006, however, only half of the targeted area was planted. As financial returns for many farmers would improve when joining the scheme a number of studies have been conducted to find out why the response to the scheme was not as expected. However, to date the phenomenon has not been explained.

Amongst the studies undertaken so far a clear lack of qualitative approaches was identified. To understand the farmer's decision-making process regarding farm afforestation in-depth interviews with 63 farmers in the northwest of Ireland were conducted in Winter/Spring 2010/2011. The interviews were based on the theory of behavioural assumptions underlying policy tools developed by Schneider and Ingram (1990). In the paper we present preliminary results of about half of these interviews and focus on the main reasons given for staying in farming and not joining the forestry scheme.



## THE PROMISE OF NEW COMMONS – A COMPARATIVE STUDY

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### ABSTRACT

As a result of subdividing land in cases of succession and political processes, like the land reform in socialist Eastern Germany, about two million people in Germany own small pieces of forestland. Today the management of these forests is often decoupled from agriculture. Some regions are almost characterised by this structure, which offers unsuitable conditions for sustainable forest management and some ecosystem services. Today several political initiatives, like close cooperation in forestry associations or the regrouping of land, aim to overcome the disadvantages of fragmentation. However, many of them fail when it comes to urban forest owners and extremely small ownership. Therefore the establishment of management regimes across property lines (“new commons”) is often perceived to be an ideal way of achieving far reaching cooperation in small scale forestry. Some regions in Germany have offered specific legal instruments and extension to foster this development for many years. Nevertheless, such projects often fail at an early phase.

The paper describes the successful establishment of two organisations following the idea of “new commons” in two regions in Germany which differ in ownership and forestry conditions and administrative and policy situations. Both projects ended up with very specific organisational and institutional solutions taking into account the interests of the members and their policy environment. A comparative study is done using several empirical data derived from forest owner surveys, personal observation and the analysis of documents. The authors suggest a list of factors explaining the success of these initiatives and compare them with literature explaining the sustainable management of commons.

**Keywords:** cooperation, small holders, Germany



## THE RATIONALITY OF SMALL-SCALE FOREST OWNERS' IRRATIONAL DECISIONS

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### ABSTRACT

When viewed through the lens of economic theory or other highly quantitative approaches, the decisions made by individual small-scale forest owners often appear not to conform with the theoretically appropriate or rational behaviors. For example, the decision to harvest a stand of trees can be modeled based on purely financial objectives. An optimal rotation length can be calculated and a “rational” landowner should decide to harvest at this point. One obvious flaw is that many small-scale forest owners own, and manage or choose not to manage, their land based on objectives other than strictly financial reasons. Utility maximization theory can be used to incorporate amenity and other values. This is a partial solution, but it is still far short from being able to fully account for their behaviors. It fails to account for the imperfect information that owners possess, the transaction costs involved, and the trials and tribulations that make up the owners’ lives. While many of these factors can never be modeled, understanding the broad set of factors can help elucidate why the seemingly irrational decisions are in fact rational. This is important for not only academic purposes, but for how we interact with and influence owners’ behavior. Embracing the complexity can lead one to adopt Thaler and Sunstein’s concepts of nudging and paternal libertarianism. Owners’ decisions are complex, but they can be nudged or encouraged to make “better” decisions once we better understand their values and the factors influencing their decisions. This presentation will use forest inventory data coupled with landowner survey data to explore the management decisions of small-scale forest owners in the United States. This analysis will then be used to discuss the broader implications towards landowner decision processes.





## LONGITUDINAL STUDIES OF SMALL-SCALE FOREST OWNERS

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### ABSTRACT

Small-scale forestry is an important component of many forested ecosystems around the world. The number of surveys of small-scale forest owners is staggering. There is the need for a central repository or archive so that the full depth of this vast body of information can be shared from the study objectives to the methods and survey instruments to the final results. This will facilitate not only sharing of information and meta-analyses, but also has the potential to lead to increased consistency, i.e., the same methods being used and the same questions being asked at different times or in different places. This will allow us to do a better job of addressing one of the emergent themes of these studies: the dynamic nature of forest ownership. Unfortunately, most studies are ill equipped to truly address long-term. There are a handful of long-term studies of small-scale forest owners, such as the accountancy networks that exist in a few European countries. These studies have proven very valuable as both a data source and a model for others to build upon. In the United States, the U.S. Forest Service has been conducting the National Woodland Owner Survey for over two decades, but trend analyses have been difficult to conduct. The next iteration of the NWOS, beginning in 2011, will be attempting to resolve some of these issues. This talk will discuss the advantages of establishing an archive of forest owner survey research and present the historic and planned activities of the NWOS as we try to make it a truly longitudinal study.



## INNOVATIVE SMALLHOLDER PRODUCTION STRATEGIES FOR ALTERNATIVE DEVELOPMENT IN AMAZONIA

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### ABSTRACT

The smallholder farmers of Amazonia, including Brazil's *caboclos*, and Peru's *ribereños*, have long employed and continue to develop a broad repertoire of resource management knowledge, practices, and institutions. These patterns, integrating diverse models of agriculture and forest management, have allowed Amazonian communities to adapt and in some cases prosper despite social and political disregard and challenging agricultural environments in parts of the region. Smallholder livelihood patterns, including both technological and social patterns, have nonetheless been frequently misunderstood or proved virtually invisible both to national and regional governmental entities and to the many other agencies and agents that seek to bring development and conservation to Amazonia.

In fact, smallholders are the main providers of food and affordable timbers to urban areas throughout much of Amazonia. Their communities, descended from indigenous peoples and early settlers, have resided in Amazonia for many generations, often integrating newcomers from other regions who successfully adopt and adapt their productive strategies and also maintain productive and biodiverse landscapes. However, smallholder models for managing Amazon environments and resources have not been valued as legitimate alternatives to rural development. When trying to establish the resource rights of these groups as Amazonians, both researchers and activists have tended to emphasize the traditional or unchanging aspects of local resource use rather than its dynamism, and the vulnerability of communities when faced with economic or environmental perturbation rather than their remarkable abilities to deal with change.

In this article we suggest that while much smallholder knowledge and practice is locally developed and based upon indigenous Amazonian patterns, its most notable feature is its "hybridity" as well as its flexibility and resilience in dealing with recurrent change. We present several examples of local experimentation, adaptation, and innovation in agriculture, agroforestry, and forest management and timber processing. These examples feature change in both technologies and social and economic arrangements in response to new opportunities and problems. We argue finally that continuing ignorance or misinterpretation of the resource management knowledge, practice, and institutions of Amazonian smallholder farmers and their communities are retarding rather than advancing processes of development as well as effective resource conservation.



## **EXPLORING FOREST REGENERATION ISSUES ON PRIVATE FORESTS THROUGH THE EYES OF PROFESSIONAL FORESTERS**

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### **ABSTRACT**

Forests and woodlands in the eastern United States are changing. Many issues have come together to initiate this change, but some of the primary issues that are commonly discussed at forestry training sessions and landowner “walks in the woods” are invasive species, deer herbivory, and climate change. Most of these discussions are based on observational experiences by professional foresters so no clear understanding of forest regeneration in our state (West Virginia) is known. In this paper, we will discuss the results of a study that we carried out using professional foresters as experts. Our intent in this project was to cast a broad net to glean information concerning issues that are in the forefront of forestry professionals’ minds. Our target population was made up of foresters that have had recent experiences with timber harvesting and subsequently observed regeneration of harvested lands. In this paper we will explore the spatial variability of regeneration issues in WV and discuss potential future policy and research opportunities that might help assure abundant and desirable forest regeneration in the state.



## **LANDOWNERS' DECISION-MAKING AND SMALL-SCALE COMMERCIAL FORESTRY IN PAPUA NEW GUINEA**

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### **ABSTRACT**

The livelihoods of the 85% of Papua New Guineans depend on both subsistence farming and participation in the cash economy. Although trees are grown as part of traditional farming systems, and cocoa and coffee are important cash crops for some landowners, there are few examples of landowners growing trees for commercial wood products. The successful balsa industry of East New Britain province is an exception, and demonstrates the potential of commercial tree growing to improve PNG landowners' livelihoods.

We conducted detailed case study research in three contrasting regions of PNG, interviewing and observing landowners, their households and communities, to explore landowner decision processes relevant to the adoption of commercial tree growing. Despite substantial cultural and regional differences, landowners' decision processes were largely consistent across regions.

The principal outcomes landowners sought from their land management activities were subsistence food production, cash income generation, risk management, fulfilment of social obligations, and pursuit of entrepreneurial opportunities. Landowners' decisions in relation to these outcomes focused on three time horizons: the immediate future, principally in terms of food production; annual or similar cycles, principally in relation to recurring cash requirements; and the much longer-term, which was associated with both intermittent cash requirements and significant legacy dimensions.

Commercial tree growing fits well with the second and third of these time horizons, particularly when labour requirements can be integrated with other work. Our results demonstrate that PNG landowners' decision processes about the adoption of commercial tree growing are largely consistent with those of farmers elsewhere, and that commercial tree growing activities compatible the two longer time horizons would be most likely to facilitate adoption and enhance livelihoods. Contrasting results for adoption of and withdrawal from commercial tree growing in two of the case study regions illustrate these conclusions.





## **FACTORS PUSHING OR IMPEDING SMALL-SCALE FORESTRY IN GERMANY**

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### **ABSTRACT**

The reasons small-scale forest owners are motivated to harvest timber are varied with access to relevant economic data considered of particular importance. It is generally believed that a higher market price for timber leads to increased harvesting behaviour. During 2010, the price for a cubic metre of timber in Germany increased on average from 67 Euro/m<sup>3</sup> to 83 Euro/m<sup>3</sup>. In spite of this growth rate of 24% Black Forest small scale owners only raised their cut from 9.1 m<sup>3</sup> (2009) to some 10.5 m<sup>3</sup> in 2010.

To find out why the owners did not respond to the timber price increase as expected, semi-structured interviews were held with small-scale forestry owners in the Black Forest. A questionnaire is currently being pre-tested. Anecdotal evidence suggests forest owners are not only influenced by timber market prices, but think in a much more complex framework considering future interests related to the whole farm and the interests of their successors. They weigh many factors, besides timber prices, before starting their harvesting activities.

This leads to the question of if it is possible to estimate the cut rate of private woodland owners in the near future having an idea of the future plans of the farm forest heads as a control sample.



## SMALLHOLDER-BASED CLIMATE CHANGE MITIGATION IN THE AMAZON: FORESTRY VERSUS AGRICULTURAL OPTIONS

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### ABSTRACT

Reducing emissions from land use, land-use change and forestry (LULUCF) is essential for an effective strategy to mitigate global warming. The required changes in land use and forestry practices, however, often imply foregoing returns from locally more attractive resource use strategies. Payments for Environmental Services (PES), a voluntary and conditional mechanism to compensate land users for the opportunity costs of adopting environmentally more benign practices, are thus often proposed as promising on-the-ground incentive vehicles for LULUCF-based climate change mitigation. This paper looks at the prospects of paying smallholders for carbon storage and sequestration in one specific region: the Amazon. Official statistics and case study material from both old frontiers and more recent agricultural colonization areas are used to identify the scope for smallholder based carbon mitigation, in terms of potential additionality, opportunity costs, technological complexity, transaction costs, and risks of economic and environmental spillover effects. Results are discussed against the backdrop of past and ongoing -- primarily smallholder-focused -- attempts to introduce PES-type incentives in the region. Our findings point to a clear comparative advantage in the Amazon of forest-based over agricultural mitigation options, in terms of higher additionality in emission reductions. Low-cost mitigation options do exist also in agriculture, but forestry options and avoided deforestation in particular are often technologically less complex and demanding, and thus probably more likely to be adopted. While transaction costs can work either way, negative environmental spillover effects tend to be more likely for agricultural mitigation options, with the notable exception of intensive reforestation schemes. We conclude that pilot initiatives to avoid deforestation and to set aside marginal agricultural land would currently appear as most promising for PES-led climate change mitigation in the Amazon.

**Keywords:** climate change, environmental services, incentives, Brazil, Latin America.



## **CHALLENGES IN PLANNING FOREST LANDSCAPES DOMINATED BY PRIVATE LAND OWNERSHIP AND MASS TOURISM - A CASE STUDY FROM NORTH EAST FINLAND**

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### **ABSTRACT**

A regional approach is one of the main challenges facing today's forest planning. E.g. ecosystem and nature tourism services call for decision making and planning that coordinates efforts across estate boundaries. In Finland the forest planning system has turned out to be powerful from the large scale timber production point of view but weak from the regional or local multiple-use perspective. The inevitable reason is the fact that to date forest uses other than timber production have not been economically attractive for land owners.

Recently several forest policy instruments have been launched to increase the attractiveness of land-uses which do not have direct economic benefits to the landowner, but still have special importance from the view of society. Many studies have demonstrated how sermon policy interventions – like monetary incentives and information delivering processes - have not always had the anticipated influence. This is due to the underlying conflict over property rights. In other words, there is an enduring tendency among forest owners to react with skepticism towards all processes where outsiders participate in decisions dealing with private property. The content of information delivered via extension or the monetary value of incentives are not the only success factors in such policy interventions, the quality of the process also matters.

In this presentation we will describe a forest owner led regional informing and decision support process. This theoretically justifiable process is now being applied in north-east Finland, near one of the most popular nature tourism areas in North Europe. During the spring of 2011 the pre-designed model will be consistently considered and re-designed with forest owners and other stakeholders. For this presentation we will analyze planning meetings and individual discussions to understand the potential sources of process conflicts which hinder regional cross-boundary considerations in forest decision making in landscapes dominated by private land ownership.



## FARMERS' MOTIVATION TO ADOPT TEAK TREE GROWING: A CASE STUDY IN SOUTH KONAWE DISTRICT, INDONESIA

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### ABSTRACT

Small-scale teak tree growing has been widely adopted by farmers in the tropics for subsistence and commercial purposes. In Indonesia, the demand for teak timber produced from private land is high and promises potential for future expansion. However, little is understood about the factors that motivate farmers to integrate teak into their farming system, which consequently frequently results in ineffective promotion of teak tree growing.

This research sought to characterize and analyse factors that motivate farmers to grow teak trees. It takes as a case study, the Hutan Jaya Lestari Cooperative (KHJL) in South Konawe District of Southeast Sulawesi Province, Indonesia; the KHJL is the first cooperative in Indonesia granted a Forest Certification Council (FSC) Certification (in 2005), and has been promoted nationally and internationally as a model of successful community tree growing management. The study was conducted through interviews with key informants, direct observation and document study. The analysis was based on observations that the first author made during field trip and during work with the KHJL as a consultant for its timber marketing. The main fieldwork for the research was conducted from 15 December 2008 – 15 January 2009, followed by several short trips from August-October 2009.

This study identifies a number of factors which might limit the adoption of small-scale teak tree growing. A number of background factors includes farmers characteristics, principally low levels of education, low average household income, level of prior knowledge of growing particular timber trees, off-farm jobs and cultural norms; and farm characteristics, including small landholding size, unclear land ownership status and restrictive regulations for marketing timber trees from private land.

The study found that the motivations for a farmer member of the KHJL to grow teak is generally be a combination of attractiveness of teak tree growing and incentives and benefits provided by the KHJL. The attractiveness of teak tree growing comprises direct factors such as the high market price for its timber, the presence of an established market, its role as a means of de-facto saving, its ease of planting and establishing; and indirect factors such as its potential to increase land value, to secure land ownership and to improve environmental conditions. Incentives provided by the KHJL include seeds and seedling subsidies, technical and financial support for harvesting and transporting timber from teak farms and timber marketing facilitation, loan facilities, and dividend/benefit sharing, whereas benefits of becoming the member of the KHJL consist of simpler timber marketing procedure, potential for securing land ownership and potential access to additional land offered under People Plantation Forest program.

**Keywords:** farmers' motivation, small-scale teak tree growing, *hutan jaya lestari* cooperative, South Konawe