"Sustaining the Future of Acacia Plantation Forestry" - Final Communiqué

Based on Rapporteur records of key points from each Theme presented and discussed in a final Plenary Session

The final session of the Conference consisted of presentations by three Rapporteurs charged with recording key points presented in talks on the three Conference themes: Plantation Management for Sustainable Wood Production, Risk Evaluation and Management, and Genetics and Breeding. An open discussion followed and key outcomes presented below. There are many cross links between points identified in each report underlining the desirability of a more integrated approach to solving common problems in the interests of sustainable and profitable plantation productivity. The importance of improved methods of technology transfer to growers both large and small is also emphasised.

A. Plantation Management for Sustainable Wood Production

Issues are summarised under four key headings - Site remediation/improvement; Productivity and profitability; Sustainability; and Adoption:

Site remediation/improvement

• Acacias are species of choice for site stabilization and mine site remediation, but there are questions as to what happens next. Acacias are typically pioneer species, so a longer term strategy may need to be developed to keep up the good work.

• The capacity of acacias to increase soil N and C is very encouraging:
  - Soil carbon sequestration is an environmental service that we have not yet recognised adequately.
  - After the acacia phase, sites may have higher productivity potential for other crops, either other tree species or agricultural species. More work is needed to understand where, when and why this occurs to be able to manage the system appropriately.
  - Acacias may be useful for rehabilitating native forest species, but this requires long-term investment to attain maximum benefits and minimise invasiveness.

Productivity and profitability

• The wide inherent site variability of acacia plantations is only now starting to be acknowledged/recognised. There is some potential to understand why this occurs in South Sumatra, but more work is needed to expand this into other regions.

• Phosphorus nutrition – the results of several studies show that some level of P is important for acacia establishment and N fixation, but acacias do not have a high ongoing external requirement.
• **Mycorrhizal associations** are important in this regard, but there is not much evidence yet of the capacity to manipulate mycorrhizae beyond the experimental situation.

• **N fixation** interactions are becoming apparent between site, genotype and Rhizobium species. More understanding about what, when and how this occurs is needed to determine utility in management practice.

• **Sawlogs** - there is some hope that a combined sawlog/pulpwood regime may be economically beneficial for growers and for rural development, but until more work is conducted to understand the best choice of genetics, stocking, nutrition and risk management, and **economic benefits** are thoroughly understood, wide scale implementation needs to be undertaken with caution.

• **Processing** - there are emerging options for processing of **smaller diameter trees** and this needs to be kept in mind when planning solid wood rotations. However, benefit is most likely to be for the processor (and regional development) as they can afford to buy solid wood logs at pulpwood prices. The growers will only receive indirect benefits if reduced supply of pulpwood results in higher prices.

• **Mixed species** - offer some promise for maximising benefits to site and stand, but more work is needed to understand when, why and what, and understanding how this translates to industry adoption.

**Sustainability**

• **Harvesting and inter-rotation management** - Plantation sites are at their most **vulnerable** from start of harvest to establishment to canopy closure of the next rotation. **Site management is critical** for setting up the site for the next rotation, and researchers need to work with harvesting operation managers to ensure an appropriate balance between harvesting efficiency and long term productivity.

• **Biofuels and bioenergy** are an emerging **opportunity/threat**. More work is needed to understand the mechanism for benefits from slash retention.

• **Productivity over multiple rotations** - industry expects to maintain productivity between the first and second rotations. A question mark hangs over the third rotation.

• Maintaining **stocking** is one of the keys to maintaining productivity but a more open dialogue between researchers and harvesting operators is needed to make sure that problems are not being created for that part of the operation.

• **Disease** is the big threat hanging over acacias.

**Adoption**

• Even though there are some issues with technology transfer, there is a **good track record of adoption** in acacia forestry.

• As the technology requires more **grower knowledge** to implement, and more **smallholder farmers** get involved, the adoption pathway is less clear. The forestry sector needs to learn from agriculture, and involve social scientists more directly to continue and improve the adoption of technology.
B. Risk Evaluation and Management

Issues are summarised under three key headings - Current status of pests and diseases of Acacia; Invasiveness and Engagement with plantation growers:

Current Status of pests and diseases of Acacia

Diseases and pests present ongoing and ever evolving challenges for plantation growers. Organisms discussed at the Conference were:

- *Ceratocystis* wilt, e.g. of *A. mearnsii* in Africa and *A. mangium* in SE Asia
- *Ganoderma* root rot
- Heart rots
- *Phytophthora* root rot
- Leaf and shoot rusts
- *Passalora* and other leaf blights
- *Ambrosia* beetle/*Fusarium* sp., e.g. *Fusarium* on *A. koa* on the Hawaiian Islands
- Defoliating insects in India, South East Asia and Africa

A cumulative increase in pests and disease problems of acacia species can be expected in the future. No single solution is available and a belief in quick fixes results can be counter-productive since opportunities for appropriate R&D are lost. Current research efforts in biological control offer some promise but need further field testing. Biological and chemical control must operate in a background of integrated management, incorporating breeding, silviculture, and land preparation.

A sound understanding of basic science, epidemiology and ecology of every target organism is critical for successful pest and disease management. Genetic solutions will be appropriate in many cases. Selection of disease/pest tolerant genotypes requires ‘big numbers’ from the outset. There is a need to assess expanded *A. mangium* populations. Closer collaborations are needed between breeders and pathologists/entomologists.

New technologies including genomics applications need more attention. This is long-term work and needs to start now.

Invasiveness

Acacias produce copious amounts of long lived seed, and can present a potential weediness problem and impact on biodiversity in certain environments. An invasion can start small, but if left alone, can become problematic. Acacia growers may need to consider procedures for managing these potential impacts. Acacia invasiveness is a controversial issue, it is not considered a problem in SE Asia where they have been grown in large scale plantations for several decades.

Engagement with plantation growers

Although some progress has been made in the application of effective pest and disease control measures but continuing development and field testing is required.

There is a need to recognise the importance and needs of small growers who are unable to finance required R&D

Benefits will flow from increased collaboration between researchers and growers in this and all other areas of Acacia R&D.
C. Genetics and breeding
Issues are summarised under five headings - Progress in acacia breeding; Dealing with the threat of disease; Deployment issues; Polyploid breeding and Prospects for molecular genetics applications in acacia breeding.

Progress in acacia breeding
• Most current breeding populations generally incorporate fewer than 100 unrelated families. Maintenance and expansion of genetic diversity in breeding populations requires attention.
• There are few examples reported of large acacia breeding populations being advanced beyond the first or second generation of improvement. There are some indications of decreasing genetic variance in second/third generation breeding populations.
• Breeding populations are being advanced by open pollination with the exception of some polyploid breeding and hybrid breeding programmes.
• The issue of cross-contamination of breeding populations is emerging for A. mangium and A. auriculiformis breeding in countries where the two species and their hybrid are grown together. This offers the opportunity for advanced-generation hybrid breeding.
• Successful interspecific hybridization is restricted to one combination (A. mangium / A. auriculiformis). This contrasts with the situation in Eucalyptus where many different interspecific hybrid combinations are feasible and interspecific hybrid varieties (deployed clonally) dominate tropical plantations.

Dealing with the threat of disease
• The emergence of serious disease threats to acacia plantations during the last decade presents the most important challenge that breeding must address.
• The most important priority for breeders, working with forest pathologists, is to focus on breeding for disease resistance/tolerance and mass-deployment of resistant planting material.
• The ability to clone breeding and deployment populations will be very advantageous for systematic screening against major diseases and effective delivery of improved resistance

Deployment issues
• For Acacia mangium and A. crassicarpa, deployment remains primarily seed-based because of maturation issues. Clonal family forestry (CFF) has been evaluated, gain in early growth has been demonstrated but there are problems with field performance of CFF plants.
• It would be desirable to develop clonal deployment for these two species – a challenge for researchers.
• Acacia auriculiformis and acacia hybrid (A. mangium / A. auriculiformis) can be successfully deployed as clones.
• Because of hybrid breakdown, seed-based deployment of the hybrid must be avoided.

Polyploid breeding
• Substantial progress has been made in developing polyploid varieties and associated deployment issues.
• Growth of the first polyploid varieties is slower than diploids, but there are interesting changes in wood properties and prospects for reduced fertility.
• On-going effort in polyploid breeding is warranted.

Prospects for molecular genetics applications in acacia breeding

• There are immediate applications for molecular markers in male pedigree recovery in OP breeding populations, checking validity of CP crosses and checking clone identity.
• Substantial work on genomics and gene action of acacias is now underway but there appears to be no clear route to operational application in breeding, in the short term.
• There is a need for close collaboration between molecular geneticists and tree breeders to successfully implement marker-assisted selection and genomic approaches to genetic improvement.

Forest Industry Forum on: Science for management applications and policy decisions

This initiative aimed to foster discussion between the key stakeholders for advancing sustainable plantation forestry and value adding through wood processing in Vietnam.

The forum was informal but structured and facilitated. There were four panellists: a senior policy officer representing the Ministry of Agriculture and Rural Development (MARD), a Director of the Provincial Forestry providing a regional perspective, a Director of a wood processing enterprise and a senior scientist from Vietnam Academy of Forest Science (VAFS).

First each member of the panel gave brief position statement on key issues as they see them. These were then opened for discussion with an additional suggestion that the forum consider ways to improve the productivity of plantations managed by small growers and bring greater value to them.

Following are the key messages from the forum.

• There is a need for implementing policies which promote investment.
• It is necessary to develop more technological innovations for processing with concomitant market development. There was strong view to reduce the dependence on the chip export market.
• It is essential to achieve potential rates of production from plantations thus supporting increased processing capacity, and reducing the dependence on import of logs. Regional managers were especially concerned about the “low levels” of production in their area and wanted advice (and access to relevant technology) to develop better practices.
• Some form of insurance program is needed to cover losses in production caused by increasing incidence of typhoons, which impose a harsh penalty on small growers who manage 50% of the national area under acacia resource.
• There is a need for a coherent policy approach to monitor and quarantine diseases.
• While there have been some examples of successful technology transfer, the need for a more planned and systematic effort needs to be emphasised.
• One point which emerged throughout the conference and rose again at the forum is the urgent need for deliver and promotes integrated approaches to production (including the use of correct germplasm and holistic system management which conserves site/soil resources and improves production, together with techniques to minimise risks from biotic threats).
• For supporting small growers, co-operative programs for technology delivery, well designed demonstrations of good practices and simple but appropriate training, were high on the agenda.

Finally, several contributors raised the need for developing strategies for joint investments between public and private organisations to working on shared and agreed problems.

Additional Points Raised in Plenary Discussion:
The expectations of management and policy makers for delivery of benefits from R&D are not always realistic. Perceived disappointments can have a deleterious effect on sustained support. All scientists have a responsibility to:
- actively seek closer dialogue with policy makers and encourage their participation in Conferences such as Acacia 2014.
- sustain active engagement with industry partners
- strengthen regional collaboration to maximise effort on priority issues

Concern was expressed about maintaining current research capacities and capabilities. There is a need to:
- retain skills and experienced manpower within research institutes and companies
- increase in-country training of young scientists within the region
- maintain emphasis on science in University curricula promote greater scientific literacy among future forest management personnel.

Prof Rod Griffin – Conference Co-coordinator

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