Sustainability of Wood Supply: Risk Analysis for a Pulp Mill in Guangxi, China

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“Fast-wood” plantations (1/3)

- The global planted forests area was 271 million ha in 2005
- Productive plantations constituted 110 million ha, with an annual increase of 2.4 mill. ha (growth rate 2000–2005)
- The significance of planted forests is likely to increase in coming decades especially in Asia, which already has 49% of the world’s planted forests
- Most of the area increase will occur in forests planted for production purposes
- Industrial plantations in the South will play increasingly important role in future global wood production
- Between 1996-2003 the greatest pulp capacity growth occurred in Asia and Latin America (Brazil, Indonesia, Chile, China) and this trend is likely to continue
“Fast-wood” plantations (2/3)

- In order to make an investment workable and profitable, companies have to establish or purchase large-scale plantations to supply raw material for their pulp mills.
- Land may be owned by the company, but is often leased from the government under a long-term contract.
- Large industrial forest plantations consist of monocultures of a few, or maybe only one, tree species using varieties of clones that are very intensively managed.
- The most commonly used tree genera are eucalypts, acacias, pines and poplars.
“Fast-wood” plantations (3/3)

- Both expansions of existing pulp mills and new projects tend to be large and so is their demand of roundwood and plantation area
  - in Sumatra, Indonesia, a 2 million ton per year pulp mill requires over 700 000 ha of fast-growing plantations to run at capacity
  - producing 1 million ton of pulp needs 4.0 million–5.0 million m³ of roundwood overbark
- Fibre cost at the mill has become a globally critical factor determining profitability and company survival and achieving a sustainable wood supply will become more and more essential
- Although China has made significant progress in plantations, how its tremendous appetite for wood supply will be filled still remains challenging and uncertain
• Because of its unique raw material basis forest industry has a crucial role in global sustainable development
• As the central role of business has extended from the traditional economic actor to a political and social actor, concerns about corporate responsibility (CR) have become an increasingly high profile issue
• An interest in and global consciousness about environmental and social issues has intensified pressure on forest industry companies to effectively balance potentially conflicting stakeholder demands
• As the forest industries are experiencing significant consolidation and globalisation, their role in global sustainable development have become more and more salient
• In addition to the economic assessment, the environmental and social impacts from international operations should also be integrated in the decision making
• E.g. in China, plantation projects are increasing competition for land
  – concurrently with the government’s move to expand domestic industrial plantations, local people’s livelihoods and the lands upon which they depend are frequently threatened
  – destruction of natural forests, illegal logging and trade, and land disputes
The Guangxi case study: investment plan

- The Finnish-based Stora Enso is planning to establish an integrated pulp and paper mill with a production capacity of about 1 million tonnes of eucalypt pulp annually on the southern coast of Guangxi Province in China.
- The plantation area needed for the planned pulp mill is estimated to be 160,000 ha.
- Stora Enso is still assessing the industrial process – whether Chemical Thermo Mechanical Pulp (CTMP) or Bleached Hardwood Kraft Pulp (BHKP) or both – to be used.
  - The industrial process is of primary importance for future wood supply and total plantation area required to sustain the mill.
The Guangxi case study: growth data (1/2)

- Growth rate estimates for eucalypt species, expressed as mean annual volume increment (MAI) and rotation length (RL), are based mostly on experimental sites.
- There is a large variation in growth rates of the main commercial eucalypt species:
  - FAO estimated that in China, the MAI of eucalypts might vary from 8 m³/ha (min) to 21 m³/ha (max) and a rotation length from 7 to 15 years.
  - Every 10% change in MAI for any reason is equivalent to about 5000 to 40000 ha of land, depending on the average MAI in question.
The effects of silvicultural treatments and genetically improved planting stock on growth are unclear:

- in Brazil due to intensive silviculture (a tree-breeding program with tree selection, the use of hybrids and clonal plantings) the average MAI rose from 28 to 45 m³/ha
- genetic gains are often estimated, but not necessarily realised in operational forestry

Biotic (insects, diseases, invasive species, human interventions) and abiotic (hurricanes, floods, extreme weather) damages can severely affect productivity
The Guangxi case study: what should be considered?

- Long-term sustainability of wood supply for the pulp mill and security of land rental
- The growth rate of plantations vary
  - according to tree species used, site, initial stocking, silvicultural operations, genetic origin and many biotic and abiotic factors
- Environmental factors affecting productivity in order of importance: water deficit, nutrient deficiency, soil depth and strength
- The subsequent generation often has a higher growth rate than the previous one
- MAIs given in the literature come mostly from experimental plots that usually represent better management and even the best part of a stand
The Guangxi case study: factors affecting total wood supply (1/3)

• The amount of bark, the effect of upper end diameter used for volume estimation and wastewood should be estimated when calculating the total wood demand

• In forest inventories, volumes are usually expressed as overbark values but the wood demand of the pulp mill is expressed as wood without bark (underbark). This means, in eucalypt species, a possibility for misinterpretation of about 15% or even more

• All stemwood is not used in pulping and usually a certain limit for upper diameter is given
  – utilisable volume of E. grandis varied from 75% to more than 95% depending of the stem size
The Guangxi case study: factors affecting total wood supply (2/3)

- Wood use efficiency in pulping
  - consumption of eucalypt wood to produce 1 ton of pulp has decreased from 4.9 m³ to 4.1 m³ wood overbark as a result of efficient tree breeding and clonal plantation programs
- Unusable or rotten wood or wood lost between plantation and mill gate must also be taken into account
- All the plantation-based wood is not used for pulping as there exist many competing uses for wood
The Guangxi case study: factors affecting total wood supply (3/3)

• There is also competition over land for other purposes (such as food production), which causes fragmentation, increases the distance of the wood supply, and pushes up the price of land, the cost of transport, and the cost of wood
  – potentially, it would be cheaper to grow eucalypt in plantations outside China where land prices and wood production costs are lower

• Other sources like wastewood, branches and sawmill and plywood mill residues cannot serve as raw material for large-scale pulp mills
The Guangxi case study: corporate governance issues

• Determinants for the long-term success include:
  – land availability, tenure security and solid fibre base
  – transparency in the process of acquiring plantations through land concessions or by acquiring the ownership of the land
  – effective and direct dialogue with all stakeholder groups, especially villagers and local communities from whom land is rented

• Without national macroeconomic planning and management backed by a systematic, focused and institutionalised approach to CR, the pulp and paper industry in China will inevitably be grounded in the context of unsustainable actions