

# The future of planted forestry for the pulp & paper industry in South America

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A world civilisation based on paper utilisation will continue to demand fibres in the next millennium. Although paper recycling rates are expected to grow, virgin wood fibres are still the natural source of high quality and valuable fibres. Wood fibres harvested from managed forest plantations provide all specifications this market requires: cost, quality, homogeneity and productivity. Many people may imagine a world covered by plantations to supply the huge volume of wood for this purpose. They are far from understanding the real benefits accruing from these fast-growing forests.

Planted forests are very productive, mainly in some blessed areas of this planet. Countries such as Brazil, Chile, Australia, New Zealand, Argentina, Uruguay, Colombia, Venezuela, Portugal, Spain, and Mexico, were able to visualise the value of

plantation forests. They have developed scientific and technological procedures to allow wood and fibre production, and to minimise the environmental impact of the areas planted with a single species or sometimes, a single genome.

Eucalyptus and pines are the dominant species used in this activity. They are marvellous timber species. They also deserve our recognition, since they provide their bodies and their cells for the manufacture of products we like to use. They are productive and specialised in offering tailor made fibres to our needs.

In Brazil, good quality short fibre eucalyptus plantations grow 35 – 40 solid  $m^3$ /ha/y of wood. This means an equivalent of 10 admt/ha/y of pulp. If you recognise that today's annual world pulp demand is about 180 million air-dry metric tons (admt), an area of 18 million hectares

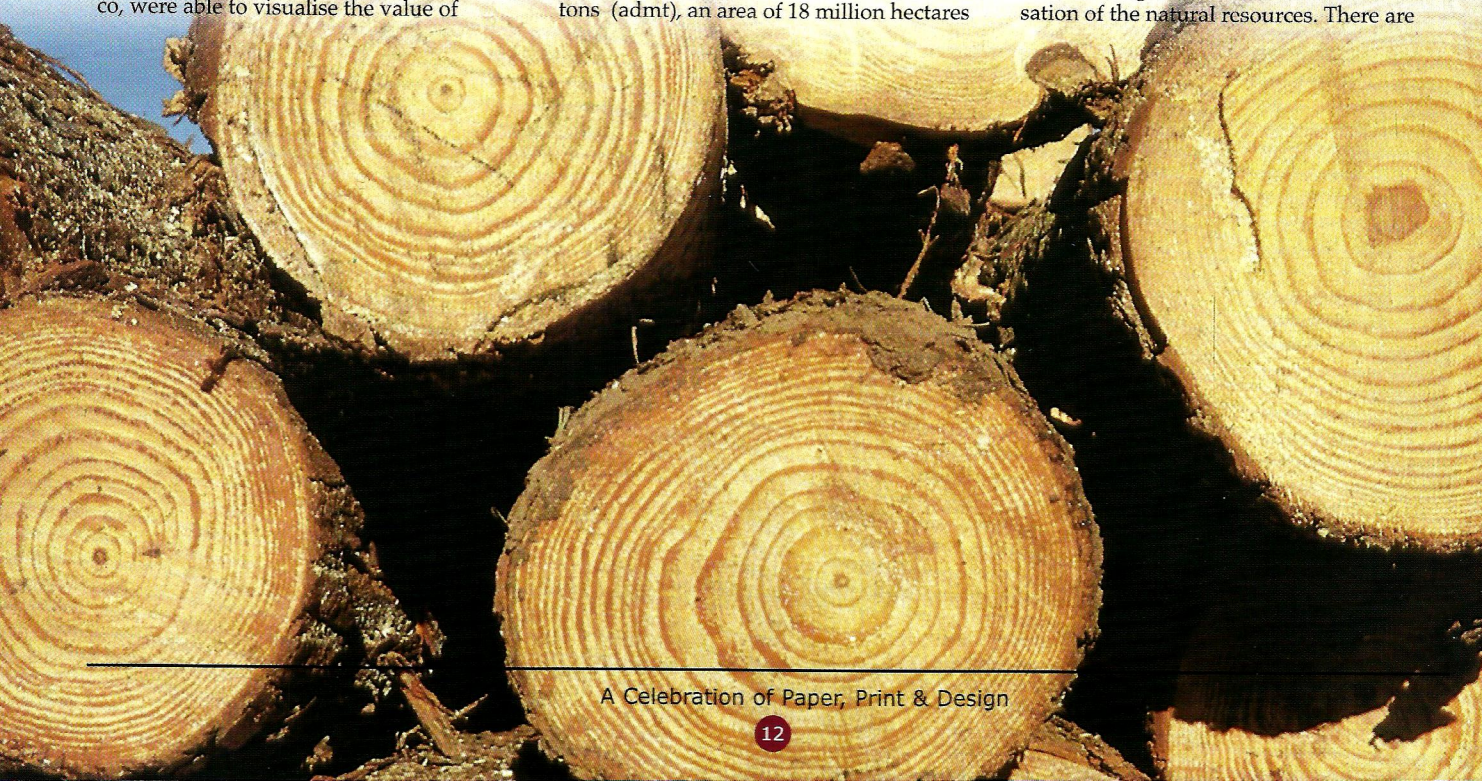
could supply this need. We are talking about 180,000  $km^2$ , or 2.1% of the Brazilian geographical area. This is very far from the six million hectares of planted forests available in Brazil today, for very many uses.

The golden plantations of *Pinus radiata* in Chile show incremental rates of 20-30 solid  $m^3$ /ha/y. This corresponds to five admt/ha/y of pulp.

Plantation forests for commercial purposes are recent in our history. They became necessary when the inventory of natural forests decreased, and when more quality-oriented fibres were required. The technological development achieved in less than a century could be ranked as outstanding. There are still not too many planted forests on a worldwide basis. One should consider that pulp and paper are not the sole uses expected of the timber from plantations. In many developing countries, fuel-wood production is the main goal. According to FAO (Food and Agriculture Organisation of the United Nations), there are 119 million hectares of planted forests, being 57.5% for industrial utilisation. China and India are the leading countries in plantation areas. Brazil has 4.6 million hectares for industrial use, and Chile from 1.5 to 2 million.

Although considered an economical segment oriented to nature and to photosynthesis, the forestry sector has some bottlenecks from a business viewpoint: a) it is a long-term activity, which means, in many situations, long pay back periods or low rates of capital return; b) the products show, in most cases, a commodity-like behaviour; c) it is dependent on scale of production; d) low costs are fundamental; e) it is capital intensive; f) as a reflex of the previous items, it is a business resistant to assume risks.

The forest sector of the economy is very much fragmented: many different kinds of activities, many end-uses (furniture, panels, construction wood products, pulp & paper). The lack of integration in production chains make the segment less efficient in the utilisation of the natural resources. There are





thousands of opportunities to improve and to guarantee the environmental and business sustainability. The forester has to understand that a 'business cluster' in forestry is not a group of sawmills, harvesting an area to make timber products for exporting. In cases such as this, almost nothing is aggregated as value to the product. At the same time, the yield in finished saw-timber products is very low, and more than 50% of the wood is discarded as residue. A cluster needs integration among many wood users, one supplying the other with products or residues (by-products). The next millennium will soon teach the forest industry to work collectively. Since inventories and logistics correspond to more than 30% in wood costs, it is clear that the fragmented model has to be switched to clusters.

The needs for sustainability are growing. A lot has been done in a very short time. However, a lot more is required, mainly in the social aspects in the developing countries. It is completely unfair that, in many cases, the papermill forest worker has a very basic and strenuous occupation in order to earn a salary that does not allow



Four year old *Eucalyptus Saligna* clonal forest.

him to buy tissue paper for his family! Something has to be done, and soon. I'm convinced that the moves towards forest and environmental certification, and social responsibility in the corporations should correct these social distortions. The environmental and social waves; the population worries about sustainability and loss in biodiversity; the legal environmental restrictions - every day more strict; corporation awareness; the understanding that environmental improvements lead to better profits due to eco-efficiency; all these trends will grow in intensity in the next millennium.

Constructive dialogue among interested parties is essential on this road in the direction of the future. The forest industry has to learn to communicate better and to listen more. On the other hand, the NGOs are also

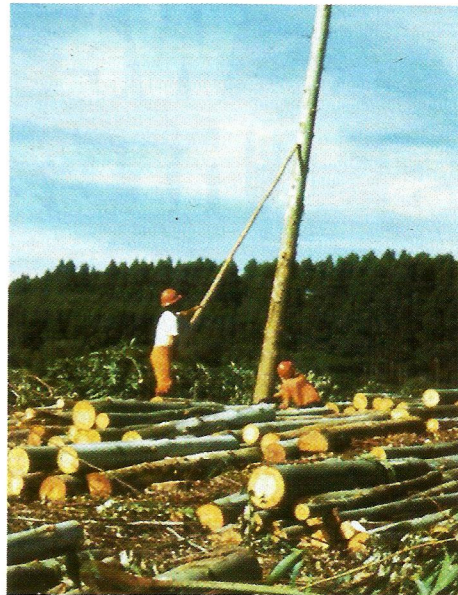
invited to co-operate with positive proposals and not just complaints.

The most important driving forces that switched environmental behaviour in the paper industry were surely the 'dioxin panic', the definition of sustainable development, and the voluntary programmes for sustainable forestry and certification of management systems. My opinion is that all three forces were complemented, in a magic way, that brought the corporations to understand strong emotions and to start making economical calculations about environmental protection and pollution prevention (environmental accountability).

The lack of profits in the past few years, the low economical return on investments, the fear of business sustainability, the market pressures for clean products, and many other emotional subjects, had to be combined to establish a new life style in the forestry and pulp and paper industry.

Perhaps, the most important of all forces involved in developing the sense of environmental protection was the understanding of the definition of sustainable development. This concept, spread throughout the world due to the 1992 Rio de Janeiro World Summit, involves three legs to be equally valued: environmental, social, and economical. With this in mind, the development of strategies started to consider the economical value of environment (raw material losses, soil erosion, losses in site quality, investment in end-of-pipe controls, environmental fines, restrictions and delays in projects due to environmental reasons). At the same time, the NGOs also changed their attitude, understanding that the economical leg has its own valuable importance. The romantic view of environmental and wildlife protection has switched to eco-efficiency, pollution prevention, waste minimisation, cleaner production and cleaner technologies. All this came suddenly, in a very short space of time.

Another positive point that drove these enormous moves in terms of environment has been the human motivation factor. Every single person working in a mill or in the forest feels happier and more motivated to work towards sustainability and to improve environmental quality. They feel happier working for better living standards, to reduce wastes, and to protect nature. It is much simpler to motivate an employee to work towards sustainability than to moti-



Harvesting seven year old *Eucalyptus Grandis*.

vate him to work hard to add value for the shareholders. Shareholders and investors have also to be convinced that profits will come more easily by adopting conceptual sustainability approaches. When we say sustainability, we are considering the sustainability of mankind, including ourselves and our forestry and pulp and paper businesses.

In simple terms, cleaner production or eco-efficiency means 'to do more with less',

or 'to use environmental resources more efficiently in economical processes'. We are all very proud of the fact that the pulp and paper business is based on renewable natural resources. Perhaps, due to this fact we are used to waste and so easily discard raw materials. For many years, the natural resources were abundant, and abundance generates waste. It is notable the amount of raw materials still discarded and wasted 'through innocence' in the forestry-based industry. As a result, we have stupid levels of water, energy, wood, labour and oxygen, consumption. At the same time, we are used to generating huge tonnages of solid residues in our mills (bark, sawdust, ash, agro-chemicals, sludge, dregs, grit, paper broke, plastic drums, scrap iron). As soon as we face these residues as a synonym with our inefficiency, we will start to change our attitude. The prevailing view in many companies is that these residues are inherent to the process. The consequence is a great number of imperceptible 'forestry and industrial nonsenses'.

From the previous points, it is clear that R&D and a good business strategy is fundamental to the success of the forestry business. In a recent TAPPI (Technical Association of the Pulp and Paper Industry, 1999) meeting in Atlanta, a CEO panel of discussions stated, as a conclusion, that the forest industry needs technological breakthroughs to become more competitive and sustainable. At the same time, for cost reduction reasons, the industry is moving to discontinue or sharply reduce R&D investment. Although a consequence of the years of poor financial results, is that the future depends on new technological developments, both in forestry, processes, products and services.

Clonal forestry is no longer a technological breakthrough. It was the last, more impressive, technological advance being implemented in plantation forests, but now more than two decades ago. What kind of breakthroughs are being seen for the next century: biotechnology or genetic engineer-



ing, for instance?

Let us see what happens to a forest physiology: no more than 2% of the sun's total energy is being absorbed by plants through photosynthesis (cell-walls, fibres, extractives). Many people want more. It is my understanding that this rate is very appropriate to them. This is what trees deserve, since they are very fortunate to know how to operate photosynthesis, something that we humans are not able to do. In case we double this percentage, are we sure that the plants could be controlled in an adequate way? How do we avoid a forest becoming an aggressive weedy crop?

Let us now have a look at today's productivity in plantations. In general we measure productivity as volume of the wooden trunk, under-bark. For a Brazilian planted eucalyptus with 7 years of age, only 72% of the total tree weight is trunk wood. Another 11% is root, 6% is bark, the rest is branches and leaves. We are not considering here the other bio-mass generated in the forest, we are only placing the focus on the planted trees. Today, we pay little attention to the other possible uses for the planted forest. We act as a commodity maker: we



*Pinus Elliottii* managed for wood and resin products.

want high wood volume and low wood cost. We are blind to other alternative and differentiated features, other valuable products and services the forest may provide. We tend to see a plantation as a crop of a single species of tree, or a single genome (clone) monoculture.

The next millennium forest plantation may be different: two or more species, not only trees, planted together or in mosaic, giving a more relaxing and sustainable landscape. From this forest we may use the lower trunk from the trees for timber, the residues and the top-wood to pulp and paper, the bark may produce tannin, the

leaves essential oils or phyto-medicines, the flowers may provide food for honey bees, the fungi may grow in the fertile ground giving 'umbrellas' to be sold as edible mushrooms. Multi-purpose forestry for multiple products, uses and services.

In a forestry model such as this the social uses may also be well-valued: eco-tourism, weather stabilisation, protection of water flow. Are we placing high wood productivity into a second level in a model like this? Certainly not!

We have plenty of room to create even more productive plantations. Today, most of the forest scientists are placing emphasis on the genome of the trees. Based on genetic engineering, there are speculations about 'lignin-free' trees, higher pulp-yield trees, high wood density, trees resistant to pests and diseases and better photosynthetic efficiency.

I cannot remain silent. When someone tells me about 'lignin-free' trees, I make, in my mind, a correlation with breeding cattle without bones, to be more productive of beef!

Genetic research is important, there is no doubt about it. Since man has already discovered the mechanisms to manipulate DNA, it is impossible to contain this desire to play God in developing new organisms. This trend will continue in the next millennium. However, the forester should understand that genetics are not the only way to improve the productivity and homogeneity of the trees. The 'site', the environment, where and how the trees are growing, is also a factor to be evaluated, and to be improved. By site, we should not understand only soil and climate. Many other operational factors can be upgraded and productivity may be raised to unexpected levels. Based on today's level of forestry growth knowledge, it is possible to predict eucalyptus forest yields of 100 solid m<sup>3</sup>/ha/y in Brazil. Today's average in good stands is 35-40. There are situations where 60-70 have been reached, but not in sustained commercial plantations. It is a potential growth that does not depend on a great deal of investigation, but a huge effort to become more efficient in silvicultural operational practices. Several eucalyptus clones have proved to produce the equivalent to 15-16 adm<sup>3</sup>/ha/y of pulp, 60% more productive than today's average.

The main reasons for this: forest homogeneity; good tree survival; very good efficiency in utilising nutrients, water and sunlight; good quality rooting; very good operational management

What about genetic engineering? Is it helpful? Surely yes! As a supporting tool to map genomes, to allow early tree selection, to assist hybridisation and controlled crossing programmes, to help understanding of the genome architecture. There are also

possibilities as an agent for changing the DNA structure, by gene insertion or genome rehabilitation. However, in long-term plants such as forest trees, this research is more difficult to be understood and evaluated. The consequences are, in some cases, unpredictable. For this reason,



*Eucalyptus Saligna* – 12 years old.

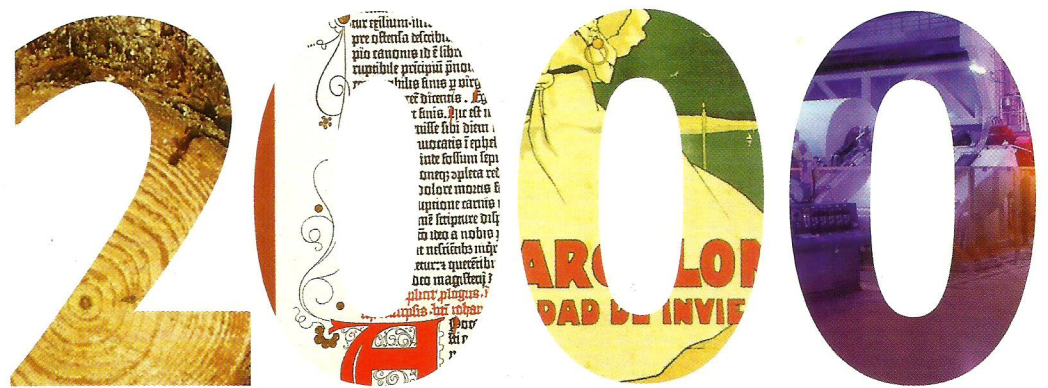
the potential utilisation of genetic engineering in forestry is more limited than in short cycle plants such as soya beans, corn, lettuces and carrots.

Summarising, forest plantations are to become more and more frequent in order to supply wood and other valuable products and services to mankind. We have to plant forests. It is a way to protect the remaining natural forests available on Earth. The next millennium's plantation forests will surely be more flexible and have multiple functions. They will be integrated with other economical and social activities. Agro-forestry and community forests - forests planted by small and medium-sized farm owners will gain importance. Plantation forests are not to be seen only as a source of wood, but promoters of social, economical and environmental development. It is suggested that they are planted in exhausted soils, degraded land, intensively cultivated pastures. Planted forests will not be a consequence of a particular industry located in a specific region. On the contrary, the integrated model of planted forests and agriculture will attract multiple types of industries. Clusters of industries, each one fully integrated with the others and with the whole, will simplify production chains, to reduce production costs, and to allow product prices to be less expensive to society. The clusters will offer thousands of opportunities to entrepreneurs, and not only the conventional type of employment.

Diversification of services, products, and functions; social justice; complete integration, and acceptance by society: is this a dream or a reality in the next millennium forestry? The reductionism of the commodity, single product, manufacturing concept is the major barrier to be overcome. However, the proposed dream is much more vital, because it is linked to the sustainable development definition: it adds value to people, environment and to the business. Let us work together to reach this.



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