

Global Wood Markets and the New Zealand way¹

Scenario 2025

It is the year 2025. The *World Convention of Forestry and Forest Products* is meeting in New Zealand and is reflecting back on the success of the host country's sector. The attendee list includes world-renowned experts who are speaking to a range of topics that have proven to be instrumental in New Zealand's success. The following abstracts are from but some of the talks:

Plenary Address — "The New Zealand Way":

New Zealand has developed a perfect interrelationship between tourism, recreation, natural food production and a highly sophisticated advanced materials industry — the latter built almost entirely from a cellulose base. This symbiotic relationship has created both a world leading industry, and an environment so desirable that it acts as a magnet for tourists. New Zealand's clean-green atmosphere is so different from the degraded environment in the Northern Hemisphere that it has become the "perfect escape" for nature lovers.

A major part of the attraction is the plethora of recreational pursuits such as walking, rafting, fishing, kayaking, climbing and biking. These activities take place in the heavily forested landscape, which not only creates a perfect backdrop, but also provides the habitats for a game industry that is second to none. Deer, wild pigs and trout abound of a size that leaves visitors in awe — with its wild and alluring taste being redolent of how food used to be. As such, New Zealand has become a haven for gourmands, and those reminiscent of the past.

Much like its environment, New Zealand's wood fibre-based industries are admired world-wide. "Crafted in New Zealand" has become synonymous with natural, environmentally-friendly products of the highest quality.

The wood fibre-based industries realised they could not play the volume game against the bigger nations with far greater resources. Instead they concentrated on developing niche markets, focussing on very high value products and utilised their strengths in versatility, speed to market, and an intimate knowledge of their customers' needs. Some of these key successes will be described during the course of this conference.

Meeting Customers' Needs — The Global Wood Fibre Markets:

Increasing eco-sensitivity at the customer and political level has led to the recognition that plantation forestry, and the sustainable management of natural growth forests, provide the only viable options for producing truly environmentally sustainable structural material. As a result, wood fibre-based products have increasingly

substituted for the use of steel, aluminium, concrete and plastic in many areas.

Almost all the shelter construction styles are based on the ancient concept of "log cabins" — although this description does not do justice to the sophistication in design, material and construction technique. The construction industry has prepared for this trend and has worked alongside the forest growers and processors to develop wood-based solutions — such as kit-set housing and prefabricated household interiors — that meet not only the required performance standards, but also offer exciting new design and marketing opportunities.

In addition, the environmental consciousness of societies has promoted wood as increasingly fashionable. This fact, together with the widespread appreciation of the superior fire-stress properties of engineered wood-based products, has led to greater use of wood fibre in domestic and commercial interiors — both on its own and as a high value aesthetic finish to other products. The economic advantage of wood over other raw material has also led to an increasing use of wood fibre as a structural matrix within composite products. Wood is substituting in a range of hitherto inaccessible usages including high-rise buildings, car and boat bodies, bridges, road building and other new applications.

Valuation of the resource has also evolved to be based on objective measures of fitness for purpose and end-use value. The ability to verify the use of sustainable management practices has also gained international acceptance. Logs from the middle of the tree no longer attract high export prices and are increasingly processed within New Zealand into reconstituted products and in remanufactured components.

A New Paradigm — Carbon Trading:

A definitive system has been developed for measuring carbon emissions from industry as well as carbon sequestered in growing tree stocks, soils and wood-based products. As a result, a comprehensive tradeable carbon credits system has evolved which enhances the competitive advantage of wood relative to competing materials. This has attracted a completely new spectrum of multi-national investors to New Zealand. Major fossil fuel companies and energy-intensive industries have recognised the need to obtain carbon credits. These companies view New Zealand's open economy, stable political environment and modern infrastructure as having a competitive edge over other countries. This investment helped spawn the growth of the processing facilities required to cope with the increasing plantation base. Leveraging off the multi-national networks of these new investors has also served to increase the market penetration of New Zealand's wood fibre-based products.

Developing Strengths — The Evolution of Technology Clusters:

Paralleling the rapid growth within the sector has been the development of an increased number of subsidiary industries. These

¹ Editor's Note: Extracts from "Wood Fibre SolutionNZ: A customer-focused research strategy for New Zealand's wood fibre-based industries". Produced by the New Zealand Forest Industries Council, PO Box 2727, Wellington.

industries have commercially exploited the technological expertise and innovation developed within the sector through extending and adapting it to meet other needs. These service industries are diverse in their scope and are now leaders in innovation in their own right with significant foreign exchange earnings. Areas include:

- + *Energy*— The increasing reliance on renewable energy sources has led to the development of more efficient co-generation and biomass-derived energy generation systems. Such systems provide sufficient energy for processing plants, with the surplus being sold to the national grid. The energy-related industries that initially established expertise in these areas are clustered around large plantations and processing plants, and their skills are increasingly sought after by other primary industries both in New Zealand and globally.
- + *Civil and Environmental Engineering* — The necessity to demonstrate sustainable forest management regimes and comply with environmental protocols has led to the development of world-class expertise in minimising environmental impacts. These skills have helped overcome major challenges such as providing road / haulage access through fragile environments as well as over rugged terrain and understanding the impacts of forest management on ecosystems and their functioning. A network of global consultancy services that assess and advise on a wide range of environmental resource consents have spun-off from this skill base.
- + *Electronics and Manufacturing* — The need for technologically advanced mensuration, resource evaluation and in-line resource segregation and processing capability has catalysed the convergence of state-of-the-art machine vision and non-invasive wood property measurement technology, with heavy machinery manufacturing expertise. This has led to the development of both hardware and software industries that specialise in producing equipment, as well as adapting software for client-specific parameters.
- + *Information Technology and Geographic Information Systems* — Expertise in these disciplines has combined in order to develop the technologies necessary to coordinate spatially separated harvesting operations and complex transport and resource segregation/allocation logistics. Demand for these expertise and technology packages has extended into areas such as dairying, horticulture and freight management companies.
- + *Biological and Chemical Control* — New Zealand's primary industries have developed a world leading ability in developing environmentally safe biological and chemical control systems to control weed, pests and diseases. This expertise is also used to manage New Zealand's indigenous forests and is in high demand by industry and biosecurity agents from overseas countries.

Fibre Technology:

A series of breakthroughs with fibre separation, re-assembly and *in-vitro* culture have opened up large and unforeseen opportunities in the fibre-processing industries. These technologies are both energy efficient and use minimal chemical inputs. Included in the list of new products are:

- + Super soft tissues which have unequalled absorbency properties.

- + Waterproofed newsprint with excellent printability and that is re-printable in its original form.
- + Fibre matting which is waterproof, durable and provides superior thermo and audio insulation — this is used in exterior cladding for roofs and walls, and can be pre-coloured, requires minimum maintenance and is simply rolled on and fixed in place.
- + Wood composites that are the norm in mouldable panels, piping, ducting, home decor and even textiles.
- + High value photographic films and unique paper stocks (e.g., forgery-proof currency) using mono-cultured fibres.

Adding Value — Advances in Post-Harvest Modifications and Gluing:

The ability to introduce bends, as well as simultaneously preserve, harden, stiffen and strengthen radiata pine wood in the solid form, has opened the door to a raft of new applications in quality furniture, solid wood flooring and pavements, wide-span beams and modular bridges. These techniques have been complemented by the development of innovative material jointing technologies that effectively liquefy the building blocks that make up wood and allow it to be welded back together - with a resulting bond that is as complete as the original structure and almost invisible. Similar performance advances in the gluing of wood to a range of other materials has opened the door to a vast spectrum of engineering and design opportunities for the industry. Advances in chemical and biological treatment processes also allow for colouration and even fragrance impregnation, which enables manufacturers to tailor individual products for customer preferences.

These technologies have provided the platform for a blossoming remanufacturing sector that is renowned for both its ability to engineer wood fibre into applications never thought possible, as well as its cost competitiveness - through its capacity to utilise parts of the tree that it once discarded.

Thinking Outside the Square - Innovative Wood Fibre Uses:

New uses for trees and wood-based fibres have been developed, including:

- * Wood fibre-based products that are designed to selectively absorb oil rather than water. These are blown onto oil spillages as part of the clean up operation. As the fibre floats, it is easily skimmed up and then re-processed to retrieve the oil. Other modifications to these fibre-based products allow them to be used in a range of commercial fractionation techniques.
- * The development of pre-harvest revenue streams through integrated land-use options - such as through tourism and recreation opportunities, as well as through the development of supplementary crops.
- * Increasing use as of trees as tools to remediate contaminated and/or high salinity sites through their ability to sequester toxins and minerals from the environment.
- * The extraction of high value chemicals such as natural oils and nutraceuticals.

- * The use of wood fibres in the agriculture industries as a feed-stock and a source of organic carbon enrichment to improve pasture nutrition.
- * The use of wood fibres as a means of mitigating nitrogen leaching from intensively managed farmlands, dairy shed effluent and industrial factories.
- * Wood fibre-based products being used in the textile industry to provide a source of non-synthetic matting, padding and loft.
- * The use of wood residues in biofuel manufacture.

Harnessing Nature's Potential - Engineering the Resource:

The ability to genetically manipulate the resource has enhanced the cost efficiency of operations by producing faster growing, disease resistant species that require minimum silviculture. This expertise has also enabled the production of genotypes that are tailored for specific end-uses.

The once problematic issue of juvenile wood is also a thing of the past. Molecular biologists and plant physiologists have worked in concert to develop tree stocks and plant hormone management regimes that produce only high value sapwood, thereby producing superior wood properties across the radius of the log.

Biotechnologists have also developed a pine variant that could produce not only wood but also latex, syrups and biopolymeric materials. This ability to "harvest" each tree twice has given the New Zealand forest industry a massive boost in terms of harvesting economics, and a wood material price advantage that was unprecedented in plantation forestry. These products themselves fetch very high value, particularly the syrups which are used as sugar replacements, and the latexes which surpass the properties of synthetic rubbers. The polymeric materials are used as the basis of a small but dynamic natural plastics industry.

Scenario 2025 and the Context of Wood Fibre SolutioNZ

New Zealand's wood fibre-based industries are going through a critical period. Widely publicised data documenting the expansion of the resource base, on-going economic crises around the world and continuing instability in global commodity prices have prompted participants to debate the sector's future direction and potential.

Many of the major issues facing the industry today are little different from those profiled in the 1992 document New Zealand Forest Industries Strategy Study (M. J. Edgar, D. Lee & B. P. Quinn). The re-establishment of the New Zealand Forest Industries Council (NZFIC) in 1994 - as a pan industry association spanning the wood fibre value chain - has brought with it increased cohesion within the industry. NZFIC now provides a more robust structure for stakeholders throughout the sector to develop and implement such strategies.

These circumstances have helped highlight the necessity for the sector to plan strategically for the future and have catalysed the development of several new pan-industry initiatives. The NZFIC Research and Development Project is one such initiative. This project initially established the 1997/98 Research and Technology Strategy (R&T Strategy) that defined the major infrastructure- and research,

science and technology- (RS&T) related needs of the forestry-related sector over the immediate and intermediate term, and has since gone on to establish a pan-industry RS&T Committee. Key objectives of this committee are to develop a longer-term strategic vision - via Wood Fibre SolutioNZ 2 - and coordinate the implementation of the sector's research strategy.

Wood Fibre SolutioNZ complements and extends the R&T Strategy by profiling some of the critical issues³ that the sector faces, and provides a strategic framework by which the R&T Strategy can respond to these issues. To achieve this, Wood Fibre SolutioNZ documents:

- * key principles and outcomes required to realise the sector's potential;
- * the strategies to address these principles and outcomes; and,
- * the processes by which these strategies will be implemented, and the competencies required to deliver on the desired outcomes defined.

The NZFIC also provides key platforms that will assist in advancing the research strategy by:

- * Providing a forum whereby RS&T priorities and opportunities can be linked to issues of uppermost importance via interaction with sister committees for Market Access⁴, Safety, Environment & Energy, Communications and Education & Training.
- * Coordination of market knowledge projects such as Wood New Zealand - through which RS&T priorities can be further refined and/or new initiatives determined.

Conclusion

New Zealand's wood fibre-based products face significant hurdles relative to competing materials. New Zealand's distance from market will continue to make commodity-based trading difficult to sustain. The inevitable increase in wood volumes reaching maturity, coupled with the current international political and economic uncertainty, will require the New Zealand forestry-based sector to access new markets, with innovative wood-based solutions in order to survive and thrive in the future. The necessity to link research to market needs will be critical to achieving such success. Without innovative products and processing operations that meet current or expected market demands, the processing and manufacturing industries are unlikely to attract the necessary investment required to capitalise on the huge potential that the expanding resource offers. For these reasons, increased investment in RS&T will be vital to generate the innovations necessary for realising this potential.

1 Editor's Note: Extracts from "Wood Fibre SolutioNZ: A customer-focused research strategy for New Zealand's wood fibre-based industries". Produced by the New Zealand Forest Industries Council, PO Box 2727, Wellington.

2 "Fibre" in this context refers to the individual units that make up the raw material and not solely the constituents of pulp and / or reconstituted panel products.

3 Issues such as political investment policies, tariffs and taxation regimes all will have significant impacts on the future success of the sector. Discussions relevant to these issues fall outside of the scope of this document but are well documented in the Forest Industries Strategy Study (Edgar, et al., 1992).

4 An example of this interaction is the recent issue of APHIS restricting importation of New Zealand kiln-dried timber into the USA and the role that NZFIC committees had in coordinating a scientifically defensible response.