

## **A compilation of major knowledge gaps for cypresses**

This list has been drawn from multiple sources, it needs to be prioritised and rigorously pruned down with industry input.

### **Seed source, breeding and propagation**

- Provenance evaluation of *lusitanica*. Only a small part of the genetic base of *lusitanica* is currently represented in New Zealand. Increasing awareness of the potential of this species and increased planting rates means that this project should have a high priority.
- Breeding for canker resistance. Cypress canker remains a major concern for growers. They want breeding for canker resistance to continue, and subsequently, planting stock with greater resistance made available. The inheritance of resistance needs to be better understood. Much of the data is already available, but needs to be analysed and interpreted.
- Clonal screening for cypress canker. Three years of data need to be analysed and interpreted, but there is currently a lack of resources to do this. To ensure durable resistance, cypress clones with multiple resistance mechanisms need to be identified, which can then be released to industry. This is complimentary to research for breeding for cypress canker, and must not be seen as a replacement for further breeding for resistance.
- Improvement of tree form. Growers have voiced particular concern over the higher costs of growing cypress, particularly with pruning. Breeding for lighter, more horizontal branching, which require less pruning is of interest to them. Are certain types of planting stock likely to have lower pruning costs?
- Heritability of heartwood development and heritability of durability in heartwood needs to be determined for all important cypress taxon in NZ.
- Breeding for wood quality. This is of particular interest to growers. Questions include: is it possible to breed for increased durability?
- Research on hybridisation should be a priority, especially crosses involving *lusitanica*, *macrocarpa* and *Chamaecyparis nootkatensis*. Industry feedback indicates a strong interest in this. There is good anecdotal evidence of hybrid vigour in cypresses, i.e., the hybrids may be superior and faster-growing than either parent, but this needs to be proven in field trials. There are opportunities to combine good traits such as canker resistance and superior wood properties. Cypress species are highly inter-fertile, but there are difficulties in synchronising flowering and pollen storage that require further research.
- Propagation of elite cypress genotypes requires further research. Inexpensive and effective methods are needed for technology transfer

to industry partners. Research into control of maturation in propagation systems should be a priority, so as to maximise both propagation success and field performance in vegetatively propagated planting stock.

### **Siting and establishment**

- The ideal range of fertility for cypresses needs to be quantified. There is a lack of a national nutrition data base for cypresses.
- Siting of cypress: industry expansion has been impeded by a lack of knowledge and confidence in the siting of cypress. There have been repeated requests by industry for decision-making tools to aid decisions on siting.
- Site indices for cypresses need to be determined.
- Toppling problems with cypress. The problem with toppling in cypress appears to be more extensive on exposed sites than first thought and is a major concern for lusitanica growers. Very limited research has been done. The extent of the problem needs to be quantified, e.g. is toppling a problem limited to lusitanica, and are seedlings more susceptible to toppling than rooted cuttings? Some trials have been initiated, but there has been limited analysis of data due to lack of resources. Growers need better guidelines for prevention of toppling.
- Cost-effective weed control options are a major priority for some growers who find that releasing costs have a significant impact on discounted cash flow analyses (Kent Chalmers, CFL, pers. comm.).

### **Health**

- Determine susceptibility to cypress canker in current planting stock. Feedback from industry indicates that this should be a priority. Questions include: how susceptible is lusitanica, and hybrids such as Ovensii?
- Interactions between thinning, pruning and canker infection need to be determined. Management practices, to reduce the impact of the disease, should subsequently be updated.
- Continue clonal screening programme for cypress canker. The existing data, from the current screening programme, needs to be analysed. Also, an effective, non-invasive testing technique needs to be developed to screen clones on a more operational scale - for example, spraying spores on to foliage, a standard technique used in other systems. Is it possible to obtain enough spores to enable to do this?
- Data from the clonal screening programme needs to be analysed – so as to quantify and interpret the complexity of the host-pathogen relationships.
- Determine the potential health threat from aphids. This is a major health problem in cypress stands overseas. Could it become a problem

here - if so, what mitigation options are available?

- Heartwood attack by borers – what is the extent of the problem? What mitigation options are available?

### **Forest management**

- Pruning and thinning and production thinning options need more research – for maximising growth, volume and wood quality. Industry feedback indicates concern over managing stands so as to secure good second logs.
- Crown management, including crown and branch modelling, is of particular interest to industry. How can stands be managed to keep branches live and of acceptable size? A major concern is the high cost of pruning – can this be reduced – or satisfactory prices for products modelled/attained to justify the high cost?
- Cypress regimes/modelling tools. Industry wants a Douglas-fir or radiata-pine calculator approach to evaluation and forest management. They want stand-based models to aid management decisions, with modelling extending out 20 to 30 years, estimating wood flows and predicting volumes by log grade, and associated costs. The existing prototype growth model needs improvement
- Continuous cover systems in cypresses need to be researched, for maximising carbon credits.
- Carbon sequestration in cypress needs to be quantified. The PSP data base can be used to evaluate national cypress productivity - biomass by age series for different cypress taxon.

### **Utilisation**

- Young log utilisation – wood quality in young cypress logs and the economic viability of short rotation cypress forestry needs to be researched. To date there has only been preliminary research on this.
- There is no national log grading system for cypresses, which is a concern for industry. Is there a big enough cypress resource to get adequate data for this?
- NZ building regulation requirements need to be better understood, for better utilisation and marketing of cypress.
- Cypress kiln-drying regime – is a review needed?

### **Wood Quality/Timber properties**

- Wood quality of lusitanica and cypress hybrids, particularly Ovensii. Analysis of silviscan data.
- Quantify durability in all cypress taxon. How durable is the heartwood

of lusitanica and the cypress hybrids compared with macrocarpa heartwood? There is currently no information on the durability of hybrids such as Leyland and Ovensii.

- Examine heartwood development and age/durability relationships

## **Economics and Policy**

- Economic package - internal rates of return are difficult to calculate because there is not enough information on the economics of growing cypress species, including a lack of information on recoverable yields. This has hindered investment. An economic analysis has recently been completed, but more data collection is needed with full details of revenue and costs from harvested, well-tended cypress stands. This would allow for a more complete analysis to validate the preliminary estimates.
- Forest management options and subsequent economic returns need to be quantified. Discounted cash flow analyses for cypress need to be examined with the aim of decreasing costs and improving cash flow relative to radiata-pine forestry. Development of an economic evaluation tool?
- The economic viability of both production thinning and short rotation cypress forestry need to be researched. Limited preliminary research and first-hand grower experience have given promising results.
- Government policy on carbon sequestration – how will this impact the cypress industry? How efficient are the cypress species at fixing carbon compared with other species such as radiata pine, Douglas-fir, the eucalypts, and the redwoods? Will cypresses become a more profitable option?

## **Marketing**

- Current markets need to be better described and quantified for cypress logs and timber products (housing, interior joinery, interior and outdoor furniture, landscape supplies, etc). Statistics for planting, harvesting, production, trade, consumption, and price trends need to be analysed.
- Drivers of change need to be identified in markets for cypress products, e.g. increased interest in naturally durable timbers as opposed to chemically-treated timber products, and increased preference for sustainably-grown timber products - are these sustainable market opportunities?
- Threats, risks, opportunities, and competitors need to be identified in cypress product markets (local and export). How much of the imported western red cedar market can be substituted for locally-grown cypress? What is the potential market share for NZ-grown cypress in the Pacific Rim – as a substitute for a group of timbers that include yellow cedar, Port Orford cedar, incense cedar, sitka spruce, western red cedar and

redwood?

- Analysis of potential Pacific Rim markets. Some preliminary work was done to assess the Japanese market for NZ-grown cypress – this research indicated that there was considerable market potential for NZ-grown cypress. Export prospects in Taiwan and South Korea also need to be explored.
- Explore the potential for a national cypress brand for raising the profile of NZ-grown cypress, providing some unity and infrastructure for the cypress industry, and some consistency in returns to growers.