

Queensland forest and timber industry research, development and extension framework



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Minister's foreword



The Queensland Government is committed to growing industry, driving innovation and optimising the value of forestry resources.

The government recognises that the forest and timber industry plays a vital role in Queensland's economic, social and environmental wellbeing, especially in rural and regional communities. In 2015-16, the forest growing sector is forecast to contribute \$211 million to the Queensland economy, while the first-round processing sector is forecast to contribute a further \$415 million. The overall forest and timber industry value chain has been estimated to employ approximately 19 000 Queenslanders and contributes around \$3.8 billion each year to the Queensland economy.

The forest and timber industry, while facing a number of challenges over recent years, has the potential to prosper and further contribute to Queensland's growing economy. Both the government and industry recognise that research, development and extension (RD&E) are a vital part of the industry's future.

To help address these challenges, an industry-based advisory committee has been focusing on future investment in RD&E and ensuring this aligns with industry priorities.

This framework is the first output of the advisory committee and it outlines a targeted RD&E program. The advisory committee will continue to guide industry priorities for RD&E, as well as oversee and contribute to projects arising from this framework.

The Queensland Department of Agriculture and Fisheries (DAF) will continue to realign our forest and timber industry RD&E program to support the framework and will provide funding support for new priority projects.

I am confident that the framework will lead to the successful implementation of a range of projects that will drive innovation, growth, sustainability and value in the forest and timber industry. I am committed to working with industry to deliver this outcome.

Honourable Leanne Donaldson MP
Minister for Agriculture and Fisheries



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Summary

This framework aims to better incorporate industry priorities in decisions about RD&E investment. It builds on the three key priorities of marketing, business support and resource development, which are critical to driving growth in the industry.

The framework focuses Queensland's RD&E investment on key themes that support the future development of the industry. It will guide DAF's existing RD&E program as well as new initiatives that may arise. It will also provide a basis for the Queensland Government to assess opportunities to contribute to national RD&E priorities and to identify sources of co-funding.

An industry-based advisory committee, supported by a consultant and in consultation with other industry and government stakeholders, has played a central role in developing the framework. The committee prioritised a series of industry-specific themes and within each one described the activity areas that should be considered for RD&E investment.

The identified themes are:

- native forests
- softwood plantations
- hardwood plantations
- forest protection
- wood residues
- logistics and processing
- timber products
- building systems.

RD&E projects will be developed and implemented to satisfy the specific needs identified within the themes. All projects will need to be developed in conjunction with an industry partner before the committee considers their implementation. In each case, DAF's capability as a research provider will be considered first, and where DAF does not have capability, external providers will be engaged or contributions will be made to national programs that have relevance to Queensland.

Industry co-investment will also be sought to leverage the direct government investment in RD&E. This co-investment demonstrates the value of the RD&E to industry and will fund the portion of the RD&E that delivers commercial benefits to individual businesses.

In developing the framework, the committee considered national RD&E directions, as some members also hold roles with Forest and Wood Products Australia (FWPA) and the national Forest and Wood Products Sector RD&E Forum. The framework also recognises Queensland's responsibilities for tropical and subtropical production forestry and timber RD&E. Under the National Primary Industries Research, Development and Extension Framework, DAF is required to coordinate national RD&E in these fields between the state agencies, universities and industry.

Purpose

The purpose of this framework is to guide the redirection of Queensland's RD&E investment by identifying the key themes to support future development of Queensland's forest and timber industry.

The framework provides a basis for developing and assessing potential projects within the priority themes. The Queensland Government is supporting this action with a \$1.4 million contribution, in addition to current funding of approximately \$3 million per year for forest and timber industry research.

The framework will also provide a reference for considering Queensland's contribution to national priorities and identifying potential sources of co-funding.

Development process

The advisory committee played a central role in developing the framework. They were supported by a consultant, who provided the majority of input into the technical review as well as stakeholder consultation, information organisation, priority setting and framework development.

The main stages of the framework development were:

- **review** of previous and current investment in forest and timber industry RD&E relevant to Queensland (including state and national programs)
- **consultation** with around 50 stakeholders (including forest growers, processors, manufacturers, builders, policymakers, industry associations and researchers)
- **integration** of the consultation findings with views of the committee to develop a comprehensive framework of possible RD&E themes and activity areas
- **prioritisation** of themes and activity areas by the committee (eight priority themes identified; other themes considered but not determined to be priorities)
- **framework development** to reflect the priorities established by the committee and to outline DAF's ongoing project development process.

Structure

The framework identifies a series of RD&E themes and potential activity areas. RD&E projects will be developed within these.

Themes

The eight high-level RD&E themes represent key priorities for the Queensland forest and timber industry. They are:

- native forests
- softwood plantations
- hardwood plantations
- forest protection
- wood residues
- logistics and processing
- timber products
- building systems.

Potential activity areas

Potential activity areas are identified within each theme. These areas will be reviewed as part of the project development process.

RD&E projects

RD&E projects will be developed to deliver on the specific needs identified within the themes. Consideration may be given to projects outside of the themes where clear benefits can be established.

Links

The themes and potential activity areas frequently align with national priorities and corresponding national RD&E projects. Additional Queensland funding may not be required where priorities are already covered by national projects. However, Queensland investment in national RD&E projects may be contemplated where it can deliver an improved focus on Queensland-specific issues.

Summary table and discussion

The priority RD&E themes, potential activity areas and national links are outlined in the table on page 5. They are described in more detail on pages 6–13.

Project development process

The process for developing specific RD&E projects will be based on the priority themes but will also build on the industry input that was a feature of the framework development process.

In each case, DAF's capability to deliver on the identified RD&E needs will be considered first. Project proposals will be developed by DAF researchers in consultation with industry before they are considered by the committee. The industry partner may or may not be a co-funder of the proposed project.

External providers will be sought where DAF's internal capability is not well aligned to addressing a research need. A competitive process will generally be used to seek suitably qualified research providers in these cases.

The committee will be consulted where the Queensland Government intends to contribute significant funding or resources to national programs that align with Queensland's RD&E priorities.

Priority RD&E themes and potential activity areas

	Potential activity areas	Strong national links
Native forests	<ul style="list-style-type: none"> • Native forest resources • Private native forest systems 	<ul style="list-style-type: none"> • FWPA's <i>Investment plan: maximizing product yields and values from current forest resources.</i>
Softwood plantations	<ul style="list-style-type: none"> • Tree improvement • Silviculture • Wood properties assessment • Sustainability 	<ul style="list-style-type: none"> • National genetics database (for tree improvement) • FWPA's <i>Investment plan: maximizing product yields and values from current forest resources</i>
Hardwood plantations	<ul style="list-style-type: none"> • Genetic trials maintenance 	<ul style="list-style-type: none"> • FWPA's <i>Investment plan: maximizing product yields and values from current forest resources</i> • FWPA's <i>Investment plan for improving wood quality and yield, and tools for forest management</i>
Forest protection	<ul style="list-style-type: none"> • Monitoring • Potential threats • Fire management 	<ul style="list-style-type: none"> • Plant Health Australia and Plant Biosecurity Cooperative Research Centre • FWPA's <i>Investment plan: forest biosecurity and preparedness</i>
Wood residues	<ul style="list-style-type: none"> • Supply • Bioenergy 	
Logistics and processing	<ul style="list-style-type: none"> • Logistics • EWP markets and manufacturing • Small-diameter logs • Infield processing • Novel products • Technology transfer • Case studies 	<ul style="list-style-type: none"> • FWPA's <i>Investment plan for improving wood quality and yield, and tools for forest management</i>
Timber products	<ul style="list-style-type: none"> • Timber quality and utilisation • Timber durability and service • Large-section alternatives 	<ul style="list-style-type: none"> • FWPA's <i>Investment plan: timber construction in commercial and industrial buildings</i> • FWPA's <i>Investment plan: solid-wood and engineered wood products: performance and yield</i>
Building systems	<ul style="list-style-type: none"> • Timber-based building systems • Building codes and technical support • Market analysis and information 	<ul style="list-style-type: none"> • A series of national projects addressing future building systems

Native forests

Substantial areas of cypress and hardwood native forests are owned by the Queensland Government and private landholders. Most of the cypress and around 40% of the hardwood harvested is from native forests on state-owned land.

These cypress and hardwood forests both have a number of RD&E needs. In particular, a better understanding of the opportunities to use remote sensing and other inventory techniques could reduce the costs of and improve the reliability of resource projections. Such RD&E could also benefit other forest resources, including private native forests and plantations.

Private native forests supply a substantial proportion to the hardwood sector. However, they have a history of poor management, and a recent review by the Department of Natural Resources and Mines highlights concerns about the long-term capacity of private native forests to supply the timber industry without more active silvicultural management. Appropriate management of private forests and improved tree management within grazing enterprises would increase the supply of wood products from private native forests. A sound understanding of silvicultural options and their financial benefits would help provide the evidence required to encourage landholders to adopt more effective management of this resource.

Potential activity areas

Native forest resources: A better understanding of the most effective and efficient methods of resource mapping, inventory assessment and yield modelling will improve estimates of likely future wood flows for native forests.

Private native forest systems: A better understanding of the costs, benefits and constraints of forest management systems that are suitable for private native forests could improve wood production and generate other benefits for landholders.



Blackbutt stand

Softwood plantations

The vast majority of Queensland's softwood plantation estate is privately held by HQPlantations. Their plantations supply more than 80% of the log volume in Queensland and underpin a diverse processing sector including sawn timber, engineered wood products (EWP), panels and a range of landscaping and lower grade end uses such as pallets.

The softwood plantation estate comprises southern pines and araucaria species.

The southern pine estate, situated on the infertile coastal lowlands, includes slash pine (*Pinus elliottii*), Caribbean pine (*P. caribaea*) and a locally developed hybrid of these species, which has been the main variety planted for the last 25 years.

The major RD&E focus for HQPlantations has been on genetic improvement of southern pine to increase both productivity and product quality. Significant advances have been made with the development of hybrids, but ongoing investment is required for continued genetic improvement. Also, site productivity and related sustainability issues require ongoing investment.

The wood properties vary between different southern pine taxa, and this in turn impacts the properties of the sawn timber. Processors have identified the need to better understand differences in wood properties as the species mix changes, to allow them to better plan production. Also, the impact of harvest age, site characteristics and silviculture (e.g. spacing, thinning, burning and fertiliser regimes) on plantation productivity, product value and enterprise profitability require further investigation.

Acoustic and remote sensing technologies are expected to continue to improve grower and processor understanding of the nature of variation in wood properties. This will create opportunities to improve genetics, silviculture, harvesting and production scheduling.

North of the Tropic of Capricorn, plantation management issues develop principally around the risk of cyclones and the nature of the tropical environment. Because of this, a key ongoing research opportunity is the development of suitable wind-firm or stable crop types.

The araucaria estate, generally located in the more fertile and steeper headwaters of the Mary, Brisbane and Burnett rivers, is dominated by the indigenous rainforest emergent *Araucaria cunninghamii* (hoop pine). Despite araucaria's unique properties, the long rotations (45+ years) significantly impact the profitability of the estate and some of the poorer performing sites are being converted to alternative species after harvest. Ongoing research by HQPlantations staff is focused on reducing input costs (including site preparation and herbicide costs) as well as developing the genetic base.

Potential activity areas

Tree improvement: Continued softwood tree improvement and breeding (including hybrid pines for South East Queensland and Central Queensland and wind-firm varieties of Caribbean pine for cyclone-prone North Queensland) will increase productivity. The development of suitable genetics will improve yield, wood properties and tree characteristics.

Silviculture: Improved silviculture will help to address site fertility and maximise productivity of the softwood estate while minimising the cost of management. An important area for investigation is the potential for mid-rotation fertilising to boost productivity in southern pines—this is widely practised in temperate radiata pine plantations in southern Australia and in loblolly pine plantations in southern parts of the United States. More cost-effective control of difficult woody weeds, and quantification of their impacts on long-term productivity, will also improve productivity.

Wood properties assessment: Better understanding of the wood properties of the changing southern pine resource and their impact on timber production will improve processing. There is also an opportunity for the development of non-destructive and other tools to improve the rapid prediction of key wood properties in trees and wood samples.

Sustainability: Extension activities need to continue to demonstrate that plantation production systems are sustainable and support local communities.

Hardwood plantations

There has been a significant investment in the development of a hardwood plantation resource to supply the hardwood processing sector in the future. This has included a considerable investment over the last decade into hardwood plantation RD&E to underpin the future industry.

Previously the Queensland Government committed to establishing 20 000 hectares of hardwood plantations as part of its plan for the hardwood sector. Around 15 000 hectares have been established to date and HQPlantations is committed to establishing the remaining 5000 hectares.

A further 40 000 hectares of hardwood plantations were also established in Queensland through various managed investment schemes. These were predominantly planned to supply the export woodchip market. However, most of these plantations failed to perform and have been liquidated. There are no signs of significant further investment in hardwood plantations in the near future.

Over the last decade, DAF's RD&E program was strongly focused on the development and genetic improvement of plantation eucalypts. Around 230 taxa trials and seed orchards covering 300 hectares were established throughout Queensland and in northern New South Wales. The highly productive *Corymbia* hybrids were developed for commercialisation, although their high cost of production has severely limited their uptake.

The taxa trials and genetic material involved a significant investment by the Queensland Government and represent important DAF assets. The DAF trial and tree improvement assets should be assessed to determine the business case for continued management.

Potential activity areas

Genetic trials maintenance: In support of potential future hardwood plantations, the DAF trial and tree improvement assets should be assessed for their potential value and continued management.



Hardwood plantation in South East Queensland

Forest protection

Protection of forests from pests and diseases is recognised as a key activity by Queensland's forest managers. Queensland is considered to have a high biosecurity risk due to its tropical/subtropical climate, proximity to Asia and high level of port activity. Importantly, biosecurity and asset monitoring in the community and at various entry points is a key responsibility of both state and federal governments.

Queensland's forests are at risk from pests and diseases. This is evident in the recent detection of Sirex wasp in the exotic softwood estate near Stanthorpe and the failure of hardwood plantations as a result of *Kirramyces* and *Quambalaria*, as well as the recent introduction of myrtle rust.

There needs to be capacity within Queensland and Australia to effectively monitor and respond to biosecurity threats. Current resources can be enhanced by the ongoing development of cost-effective technologies and non-intensive methods for monitoring forest health. These include remote sensing (such as the use of satellite imagery, lidar, aerial imagery and unmanned aerial systems) and the use of insect monitoring traps. The potential to integrate forest health monitoring with broader resource inventory systems also deserves further consideration.

Integration with national initiatives such as Plant Health Australia and the Plant Biosecurity Cooperative Research Centre will be important to optimise outcomes for Queensland.

Wildfire is also a significant risk to the Queensland forest estate, with high-value plantations and fire-sensitive cypress being most at risk. Increasing urban encroachment on the forest estate means that ongoing investment in fire protection measures will also benefit the community.

Potential activity areas

Monitoring: Development and/or adaptation of technology will allow more cost-effective monitoring for and response to pests, diseases, nutritional disorders and other damaging agents or events such as droughts, floods, cyclones and windthrow.

Potential threats: Queensland's high biosecurity risk creates the need to prepare for potential future pests, diseases and weeds and their management requirements. This includes maintaining capacity to respond to incursions.

Fire management: A better understanding and refinement of the use of fire in plantation and native forest management will benefit the industry. This could include:

- risk assessment and priority setting
- prescribed burn planning and implementation
- evaluation of the results of planned burns (including impacts on the community, assets, wood properties, ecosystems and air quality)
- wildfire surveillance, detection and response
- planning for the likely impacts of climate change on fire risk.



Sawfly larvae on a young eucalypt

Wood residues

Wood residues arise from forest operations, processing and manufacturing activities. Production costs and access to reliable and high-value markets for residues generally have a major impact on their financial viability.

Larger plantation estates and larger processing facilities tend to have well-developed markets for their residues, whereas residue markets for smaller operations and more remote locations are limited.

There are a range of traditional residue markets, such as panel plants, export woodchips for paper manufacturing, landscaping and some limited energy markets. There are also emerging markets for primary biofuels (such as wood pellets for export) as well as for secondary liquid and gas biofuels. However, a constrained regulatory environment currently limits the opportunity for developing these markets.

There are well-developed industry players in the marketing of residues, as well as in the traditional and emerging technologies. Further development of wood-based secondary biofuels or alternative bioproducts is generally considered beyond the scope of the Queensland forest and timber industry. However, there may well be other industry groups that have the resources to develop and/or adapt emerging opportunities for wood-based resources in Queensland.

Potential activity areas

Supply: Characterising current and potential residues and exploring opportunities to extract the maximum value from this resource will reveal possible future benefits.

Bioenergy: The potential for bioenergy generation in association with processing offers significant opportunities to reduce energy costs and reduce future reliance on fossil fuels.



Wood residue operation

Logistics and processing

Log harvesting, transport and processing are key elements of the forest and timber industry. Efficiency is critical to the profitability and long-term viability of Queensland's timber processing sector, which faces a number of challenges and opportunities, including:

- regulatory constraints
- a shift to mill-door sales
- increasing costs of production
- increasing competition from low-cost overseas processors
- a trend towards smaller logs
- development of new products
- evaluation and adoption of new technologies.

The logistics and processing sectors are relatively well serviced by machinery manufacturers and private service providers. However, well-targeted RD&E that addresses specific industry issues could help overcome some of these challenges.

Each element of the supply chain—including harvesting, log optimisation, log handling and log transport systems—impacts on the cost, timing, delivery and suitability of products. Ensuring an efficient supply chain is critical to the profitability of both growers and processors.

The possibility of harvesting and processing smaller and lower grade logs into existing or new higher value products may open opportunities for processors and increase flexibility for forest managers. Opportunities could include slicing or peeling small logs for veneer production and use in EWP, production of bioenergy or bioproducts, and infield processing.

There is potential for increased demand for a range of new products to complement the likely change in building systems, creating an opportunity for the Queensland forest and timber industry. A better understanding of market trends could help industry to adapt and develop new products to meet the market.

New product opportunities include mixing different species to produce composite plywood with the target mechanical strengths and with appearance/decorative grades on the board faces. There is also potential for the use of timber composites.

Research into processing should include a detailed analysis of costs, benefits and markets. In some cases, a preliminary analysis should be undertaken before any investment in technical research.

Potential activity areas

Logistics: Understanding of the most efficient supply chain options for an operation is vital. This includes considering the nature of the site, sustainability imperatives, resources and markets.

EWP markets and manufacturing: A better understanding of potential markets for EWP and improved EWP manufacturing systems will help this sector grow.

Small-diameter logs: To be able to recover commercial products from smaller logs, current and alternative technologies need to be developed.

Infield processing: The industry needs to know the economic viability of infield processing of logs.

Novel products: There may be opportunities to explore new products, such as multispecies plywood products and mixed-material engineered products.

Technology transfer: The industry could benefit from the development of business support tools to help assess and adopt new plant and equipment.

Case studies: Appropriate case studies will help to evaluate the opportunities for establishing new wood-processing businesses and for investment in Queensland.



Processing of plantation pine

Timber products

Optimising the use of the available timber resource is essential for the timber industry, with improved use of lower grade timber being a major challenge. Revised grading rules offer an opportunity to better match the timber products and building systems to the resource available, potentially improving grade recovery and building efficiency. Similarly, matching timber structural properties to the application (e.g. using non-structural material for noggings) allows optimum use of the wood resource.

Timber markets can expand by increasing consumer confidence in the durability of timber-based solutions and improving the longevity of timber finishes. Recent advances in termite treatment systems combined with manufacturer guarantees have helped to address one of timber's perceived weaknesses. However, concerns about service life are exacerbated by poor implementation of industry and manufacturer guidelines. Builder risk can be partly managed by the development of improved preservative systems to enhance durability. Further development of clear timber finishing systems and cost-effective fire retardants would help to improve confidence in and application of timber products. A better understanding of the effects of detailing on durability could help to underpin technical guidance to designers and builders.

There is ongoing demand for large-section round timbers for electricity transmission poles and bridge components. Within Queensland there is estimated to be around 1200 timber bridges in need of replacement, as well as ongoing maintenance and repairs to the remaining road and rail bridges. Ergon Energy replaces around 12 000 hardwood poles annually. The development of cost-effective alternative timber pole and bridging systems (such as composite poles and EWP bridge elements) presents an opportunity to maintain the use of timber in these applications.

Potential activity areas

Timber quality and utilisation: Timber grading and manufacturing systems must match available resources to markets. New section sizes with associated grading systems could be developed to meet new building systems, and non-structural timbers could be used in truss and frame structures where appropriate.

Timber durability and service: Improved reliability and durability of treated and non-treated timber products will help regain specifier/user confidence.

Large-section alternatives: Alternative power pole options and bridge components are needed to expand wood-based options and address reduced availability of large-section hardwoods. Opportunities include using different species, EWP options and joining of components (all of which must meet Australian Standards).



Peeled hoop pine

Building systems

The detached housing market using lightweight timber framing has been the traditional consumer of most of Australia's timber products. However, this market has been under continuing pressure from alternatives such as concrete, steel and emerging composite materials, as well as an ongoing trend towards higher density housing. Additionally, large volumes of finished building products are now being imported into Australia.

The development and adoption of improved timber-based building systems offers the opportunity for the timber industry to maintain markets in traditional areas, as well as penetrate alternative multilevel residential, commercial and industrial applications.

A range of existing and emerging technologies can make timber-based building systems viable alternatives to the predominant steel and concrete building systems. These technologies include products such as pretensioned timber beams, cross-laminated timber (CLT) and cassette flooring systems, which increase the span, strength and reliability of building elements.

Panel housing systems offer reduced building times, reduced need for skilled trades, less waste, higher quality and improved work health and safety outcomes. These systems are already being used in remote areas of Queensland, where labour costs are often prohibitive, but steel framing systems are generally used. This sector is an emerging opportunity in residential markets.

Developing and introducing new building systems brings with it the challenge of ensuring that building regulations deal appropriately with the use of timber products. For timber building systems to be readily adopted, they must comply with building regulations and ideally be offered as 'deemed to satisfy' solutions that offer the simplest option for designers and builders.

Exploring market opportunities for alternative timber-based building systems in Queensland as well as possible barriers to their adoption could help to demonstrate the potential of timber systems and improve uptake.

Potential activity areas

Timber-based building systems: A range of existing and emerging timber products and building systems, many of which are common building systems in other (international) markets, could be developed for the local market.

Building codes and technical support: Emerging timber-based building systems need suitable technical data and support as well as appropriate treatment within building codes.

Market analysis and information: Better understanding of the future direction of potential timber markets and the opportunities for and barriers to penetration of timber into these markets will help the industry. During market analysis, building designers and builders can be made aware of timber-based systems to enhance their confidence in these products.



Prefabricated flooring system used in housing construction. Source: Pryda

Advisory committee members

Name	Role	Position
Mr Scott Spencer	Chair	Deputy Director-General, Fisheries and Forestry Department of Agriculture and Fisheries
Mr Brian Farmer	Plantation grower	Chief Executive Officer HQPlantations Pty Ltd
Mr Barry Underhill	Forest policy and native forest timber producer	Acting Director Forestry Department of Agriculture and Fisheries
Mr John McNamara	Sawn timber processor	Chief Executive Officer Parkside Group Milling
Mr Andy McNaught	Plywood and EWP technical manager	Technical Manager Engineered Wood Products Association of Australasia
Mr Bruce Robb	End user and builder	General Manager Kalka
Mr Geoff Stringer	Sawn timber processor	Product Development Manager Hyne & Son Pty Limited
Dr Chris Lafferty	National RD&E manager	Research and Development Manager Forest and Wood Products Australia Limited
Dr Michael Kennedy	Queensland RD&E manager	General Manager, Horticulture and Forestry Science Department of Agriculture and Fisheries





HQPlantations softwood plantation