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## RESOURCES

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# Changes in Australian Forestry and Forest Products Research 1985-2013



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# **Changes in Australian Forestry and Forest Products Research 1985-2013**

**John Turner and Marcia Lambert**

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## **Summary**

Estimates of expenditure provide an index of overall commitment of industry to research and development. Expenditure in 2013 on forestry research was estimated to be about \$38 m and about \$9.9m on forest products research or \$49 m in total which is a reduction from about \$122 m (2013) in the mid 1980s. These estimates do not include administrative costs and overhead charges. The number of staff (scientists, technicians, support and graduate students) involved in forestry and forest products research is about 280 compared to 795 in the mid 1980s. There have been further declines since 2013. At the time of the initial assessments in the mid-1980s, the forest resources and research were largely under the stewardship of State Governments and research was also supported by the Commonwealth Government through CSIRO and Universities. There were strong links between the timber producers and the timber processes. Research was fundamental to supporting development and improvement in all aspects of forest management and production. The linkages between forest management and research organisations have moved away from State and Commonwealth support for forestry, that is the move from science based management has reduced support for continued research. For research to develop, there need to be well defined, long term industry objectives with an understanding by industry that these may be achieved with the support of research.

## **Introduction**

Scientific research in Australian forests and their products is a basis for continued improvement and competitiveness. Analyses of research undertakings, expenditure, capacity and outcomes are fundamental components of integrated research planning and implementation. The Australian State of the Forests Report (BRS 2013) which reports on the Criterion and Indicators of Sustainable Forest Management, states in its rationale for its indicator on research that:

*“This indicator reports on the scientific understanding of Australian forest ecosystem characteristics and functions needed to underpin sustainable forest management. Research, inventory and the development of assessment methodologies provide the basis for sustainable forest management.”*

Assessment of the research effort provides an indication of commitment and innovation either within the industry generally or within various sectors. The expenditure on Australian forestry and forest products research has been analysed and reported on a five yearly basis since 1985 using comparable definitions and methodologies (AFC 1985; Lambert and Turner 1992; Quick and Booth 1987; Turner and Lambert 1997; 2005; 2011) and with the current assessment provides a indication of long term trends.

Detailed analysis of research expenditure was initially undertaken by John Quick and Harry Booth (Quick and Booth 1987) at the request of the Standing Committee on Forestry (SCF) formalizing a preliminary study by AFC in 1985. A basic premise of SCF was that scientific research was fundamental to sound forest management and to the optimum utilisation of products from the forest, and that forests were a perpetual, renewable resource when managed properly. At that time the terms of reference of the study were to find out:

- How much was being spent on forestry and forest products research and by whom?
- What areas were being researched and on what basis were these decisions made?
- Were there areas of expertise lacking or limited (that is, were there areas of risk?)

### **Methodology**

The approach of Quick and Booth was to:

- (1) Ask research administrators what was spent and the funding sources (mainly to limit double counting).
- (2) Review and interview staff to consider what was being done, their expertise and organisational structures. This information was also used by applying some standardised cost estimates (salary bands) to overcome problems of organisations not being comparable in reporting mainly in relation to inclusion/exclusion of overheads.

*The same approach was used in subsequent evaluations and while there have been some issues related to the type of research to be included, they have had little effect on the overall analyses. It is difficult to comment on whether the amount of research being undertaken is adequate or appropriate at any given time but the trends over time are an indicator of the "health" of the industry. Obtaining an index of the interest in, or uptake by the industry, of research findings, is difficult. The results of the methodology of Quick and Booth, which closely define the areas of research, are lower than the broader research expenditure estimates reported by BRS but the patterns are comparable.*

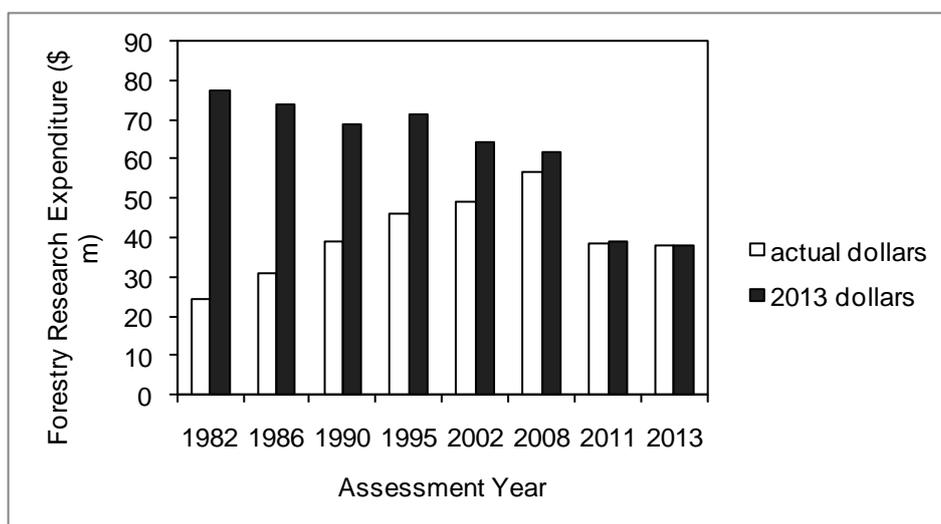
### **Forestry Research Expenditure**

Research expenditure in forestry for the year 2013 was estimated at about \$38 million (Table 1). Broadly, estimates on non-staff overheads and administration were made recognising different methods of inclusion and estimations were made between organisations, but overall it is about \$6.3 m. An estimated \$12.2 m was obtained from sources external to the research provider organisation; however, a part of this is contract funds passed from one research organisation to another. Universities obtain the largest amount of external funds, much of this supporting graduate student research. During this period, direct payments to scientific research projects by FWPA were \$99.4 k in forest products and \$1.543 m in forestry related projects, a total of \$1.6 m or approximately 4% of research total expenditure.

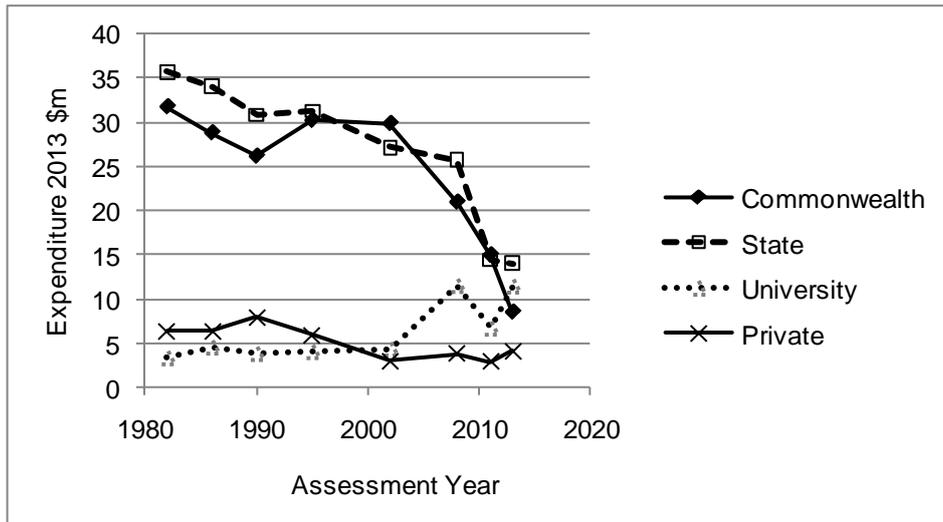
**Table 1.** Estimated expenditure on forestry research in the 2013 financial year.

<b>Organisations</b>	<b>Research Expenditure \$m</b>	<b>Overheads/ Administration \$m</b>	<b>External Funding \$m</b>
Commonwealth	8.44	1.42	1.30
State	14.02	2.00	3.91
Private	14.00	0.41	0.35
University	11.53	2.46	6.91
<b>Total</b>	<b>38.15</b>	<b>6.29</b>	<b>12.47</b>

The pattern of total forestry research expenditure in unadjusted dollars shows there was a peak in 2008 and there have been declines in funding since then (Figure 1), and while the focus was on the 2012-2013 year, the indications from discussions are that the estimates are still declining. The distribution of expenditure between Commonwealth, State, private and Universities in recent times show reduced expenditure by CSIRO and the States and increases within Universities (Figure 2). There is a slight over-estimate for Universities as it captures some of the State research expenditure such as that for Victoria and Queensland, however the patterns are consistent.

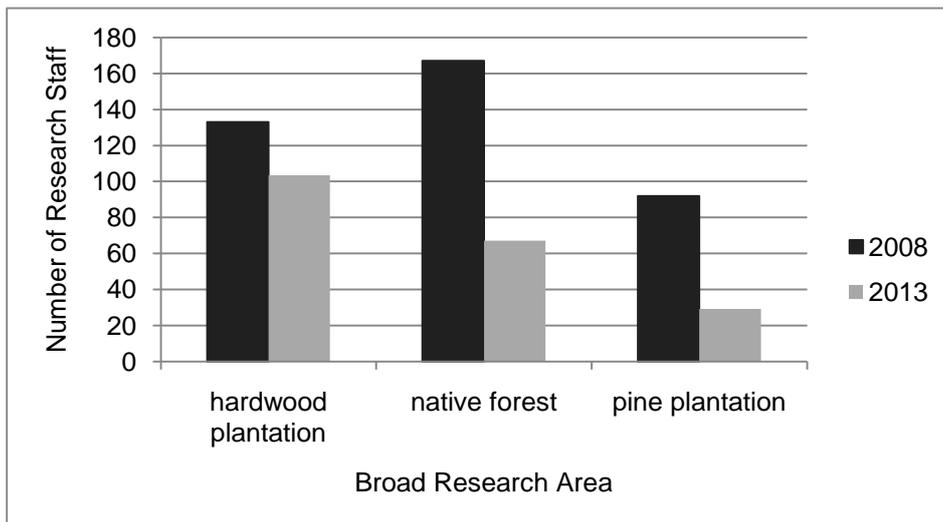


**Figure 1.** Total expenditure on forestry research between 1982 and 2013 in both unadjusted dollars and 2013 dollars.

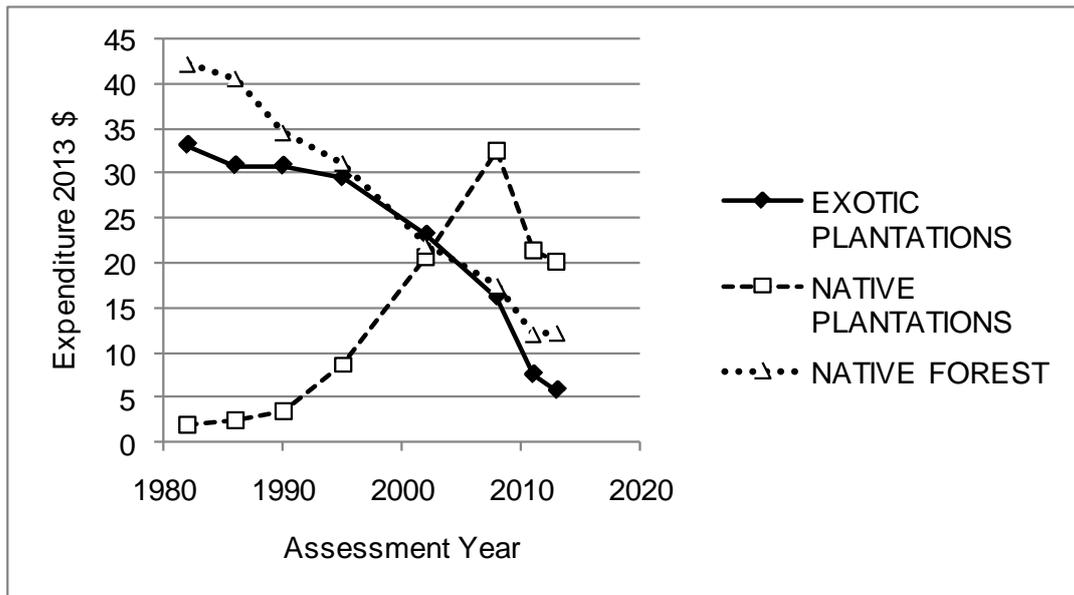


**Figure 2.** The pattern of forestry research expenditure over time in 2013 dollars.

The broad areas of research were addressed in similar terms as previously, identifying research in native forests, exotic plantations and native species plantations comparing 2013 with 2008. The largest declines have occurred in native forest research and pine plantations (Figure 3). The longer term patterns between 1982 and 2013 are shown in Figure 4.



**Figure 3.** Comparison of forestry research between 2008 and 2013 in broad areas.



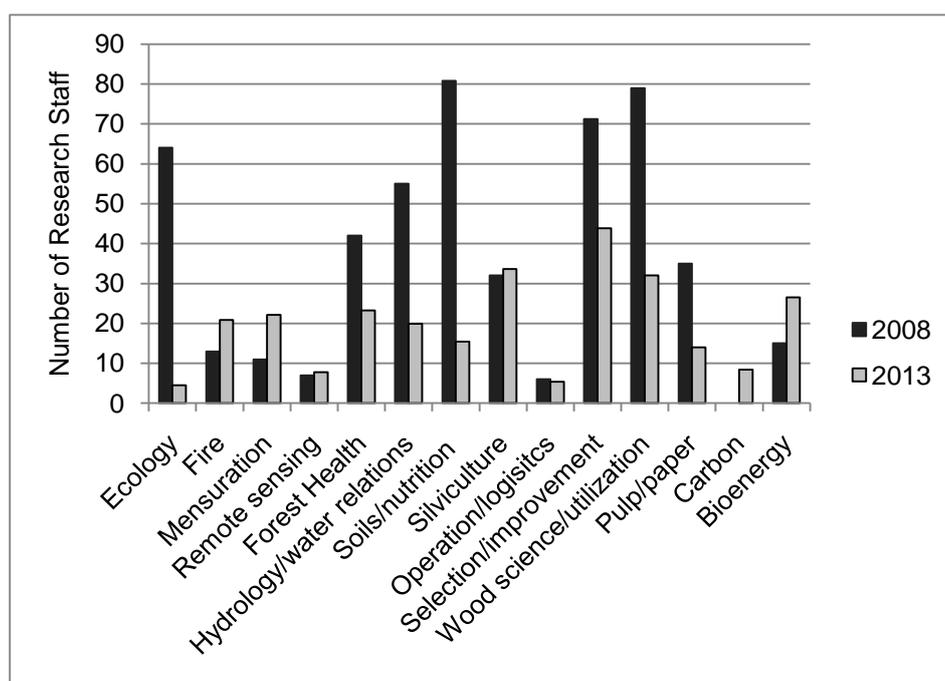
**Figure 4.** Expenditure over time in broad areas of research (2013 \$).

The number of research staff, as scientists, support staff and graduate students working on aspects of forestry research, was estimated. The total number of researchers for Commonwealth, State, Private and Universities in forestry and forest products was estimated at 276 staff of which 98 were in Universities (Table 3). A significant component of university research is undertaken by graduate students and this represents a more mobile pool of research effort. Of the total figure, 70% are involved in forestry research. Commonwealth researchers had declined from 325 in 1985 to 48 in 2012-2013, States had declined from 432 to 93 in the same period while private company and university research staff had increased.

The broad fields of research effort are shown in Figure 5 comparing 2008 and 2013.. The ecological area has declined and this represents an actual reduction in some Departments, non-reporting by some Universities and the present survey more explicitly focusing on research in commercial forests rather than including broader forest areas. There have been some fields with reported increases such as remote sensing, fire, silviculture, carbon and bio-energy. Other areas have declined although part of these declines may be movement of staff into other related, areas such as changes from forest health into silviculture or remote sensing.

**Table 3.** Estimates of research capacity for forestry and forest products in Australia. The adjusted estimate is based on limitations for research discussed above and is a subjective modification.

Year	1985	2008	2011	2013
<b>CSIRO</b>				
Scientists	145	75	38	32
Technical Staff	132	81	39	16
Support	48	17	4	0
Total	325	173	81	48
<b>State</b>				
Scientists	180	117	77	56
Technical Staff	206	109	71	37
Support	46	21	9	0
Total	432	247	156	9
<b>Private</b>				
Scientists	659	30	21	
Technical Staff	357	30	15	
Support		1	14	7
Total	10	129	65	37
<b>Total Non University</b>				
Scientists	331	251	132	109
Technical Staff	341	247	76	69
Support	95	52	20	1
Total	467	549	287	178
<b>University</b>				
Scientists	11	90	72	54
Technical Staff	10	47	39	21
Graduate students	646	39	23	
Total	27	183	149	98



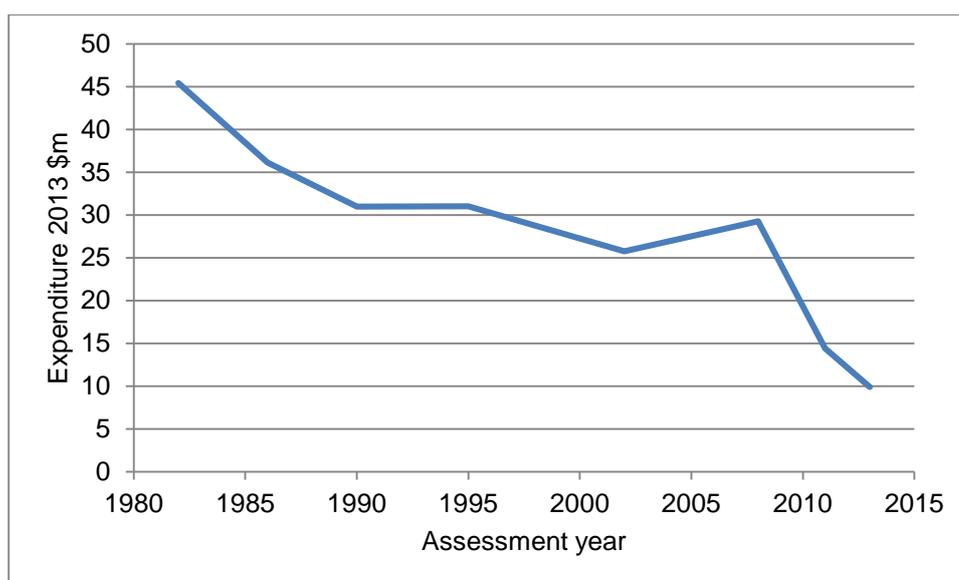
**Figure 5.** Research staff in broad research fields in 2008 and 2013.

## Forest Products Research

The actual extent of forest products research is more difficult to define than forestry but is broadly considered in terms of utilisation of products from forests (milling, pulp and paper, composite products, bioenergy) but not engineered products or products such as furniture. Further, test runs in mills are not included while they may be in other, broader assessments. The same criteria as previously have been used although some new areas, particularly bio-energy and oil production, have evolved. The estimate of total expenditure is about \$9.9 million dollars (Table 2) and this is a decrease of about \$15 m since 2008 and is following the longer term pattern of decline (Figure 6). The major reduction has been as a result of the reduced Commonwealth effort.

**Table 2.** Expenditure in forest products research (\$ millions).

	<b>2008</b>	<b>2013</b>
Commonwealth	12.33	0.68
State	4.36	2.84
Universities	3.42	3.79
Private	4.75	2.75
<b>Total</b>	<b>24.86</b>	<b>9.95</b>



**Figure 6.** Change in expenditure (\$2013) overtime in forest products research.

## ***Discussion***

The analysis of the expenditure and number of researchers involved in research in the forest industry has been undertaken for 2012-2013 extending a five yearly assessment commenced in the 1980s. Expenditure in 2013 on forestry research was estimated to be about \$38 m about \$9.9 m on forest products research or \$49 m in total which is a reduction from about \$122 m (2013 \$) in the mid 1980s. These estimates do not include administrative costs and overhead charges. The peak of research effort was in the 1980s and while there have been changes in the emphasis in areas of research there has been a continued decline in the equivalent of 2013 dollars since that time. That peak was associated with the strong focus of the industry on self sufficiency and the Commonwealth-State Softwoods Agreement with the associated investment of pine plantations. At that time, forestry research was divided between softwood plantations and native forests. The increase in investment in hardwood plantations resulted in an increase interest in hardwood plantation research and an increase in expenditure in actual dollars and a slowing of decline in expenditure in 2013 dollars. Basically, the hardwood research plantation program was a net redistribution of resources from softwood plantations and native forests into hardwood plantations. While it is difficult to place a value on the managed forests, according to BRS, about 26.6 million cubic metres of timber were harvested in the assessment period and which, on conservative estimates is worth about \$750 million. That is, there is about 1% of the value of the harvest spent on research.

The number of staff (scientists, technicians, support and graduate students) involved in forestry and products research is about 280 compared to 795 in the mid 1980s. There have been further declines since 2013. These changes represent the Commonwealth Government, through CSIRO, departing from or reducing direct research efforts in forestry and especially in forest products research. State organisations have also reduced their efforts in both products and forestry. Much of the State products research was to support consumer protection legislation, such as the NSW Timber Marketing Act, through the provision of Community Service Obligation funds (CSO), but much of the legislative component has become the responsibility of Standards organisations.

The estimates of expenditure are principally an index of overall commitment to research and development. When the first assessments were undertaken, the forest resources and research were largely under the stewardship of State Governments and research was also supported by the Commonwealth Government through CSIRO and also Universities. There were, through various mechanisms, strong links between the timber producers and the timber processes. Critically, the underlying philosophies were that forests were to be managed and continually improved based on science, that management was a long term (in perpetuity) industry and that it was for the benefit of the Australian community. Forest development would support and be a component of forest industries. Research was therefore fundamentally supporting development and improvement in all aspects of forest management and production. The loss of linkages between forest management and research organisations, the lack of political interest in forest industries, the move from science based and resource development driven industry to one which has external economic drivers and the

general philosophy of forest products being secondary to other values, have produced the perfect situation for considering research as not relevant

At the time of the first reported assessment in 1985 (Quick and Booth 1987) the situation was that:

- Assessment of research involved States, CSIRO, two Universities and several private companies. Most research was directly or indirectly government supported.
- Standing Committee on Forestry with the supporting bodies of Research Priorities Committee (RPC) and the Research Working Groups (RWGs) plus the Forest Products Working Groups (FPWGs) were effectively working in the coordination and implementation of research.
- Most forest resources were State owned and managed.
- Plantations, particularly conifers were being expanded supported by the Commonwealth-State Softwoods Agreement). The objective was national self sufficiency.
- Research was improving the technology for timber utilisation with examples such as timber drying schedules and development of the machine stress grader.
- Export and sale of woodchips was expanding increasing utilization of forests.
- Environmental issues were arising in intensively managed hardwood forests.
- States and CSIRO had significant forest products research and technical laboratories.
- State level forest products research funded by CSO (supporting consumer legislation such as Timber Marketing Act).
- There was strong interest in forest protection especially following irruptions of *Phasmatids*, *Sirex*, *Dothistroma* and *Phytophthora*.
- Restrictions of conversion of indigenous forest to plantations were being developed.
- Access to rainforest resources in Queensland and NSW were being reduced.
- Prescribed burning as a forest management tool was being refined and expanded.
- Forest hydrology was important especially as many water supply catchments were in forest area.
- Plantation management was becoming more intensive.
- Re-organisation of land management agencies including the division of forest management and National Parks entities was occurring.
- Timber processing was changing from using mature forests to re-growth resources.
- Increased efficiency of marketing of local products.

These and other factors both set directions for and place the focus of the importance of research within organisations. At the time of the more recent assessments, many of the early factors had changed and along with them so had the perceptions of research. Many of these are detailed in the BRS State of the Forests Report (2013).

- The SCF has been modified and RPC, RWGs and FPWGs basically disbanded affecting coordination.
- Future directions and objectives of the forest industry are unclear.
- There have been declines in the world economy directly affecting exports
- State forest resources and their managing agencies have been re-structured, corporatised or sold.
- Many private companies, including those under the MIS schemes, have declined or been sold.
- A number of Cooperative Research Centres have been developed and finalised.
- Changes in funding agencies.
- Native forest management systems have changes through factors such as Certification or environmental requirements (e.g. approvals for operations required through EPA).
- Change in importance of species being planted (conifer to hardwood) and now much reduced new plantings.
- Developments in tropical forestry (mahogany, sandalwood)
- New Industries related to carbon and energy are developing.
- Greater interest in smaller scale forestry.
- Disease outbreaks occur (e.g. myrtle rust) and do show lack of capacity to deal with such problems.

The changes that have occurred indicate changes in emphasis of the industry and that some early areas of research are no longer relevant for commercial forestry (e.g. studies on rainforest silviculture) but new areas should be addressed (e.g. new species in the tropics).

In the assessments, three main types of research were identified which have longer term implications for forestry. Operational research addresses immediate issues (e.g. weed control) and is short term, with low risks and requires low to moderate expertise. Developmental research addresses ongoing issues which are medium to long term (e.g. later aged fertilizing), had moderate risks of success and requires higher levels of expertise. Returns on success are moderate to high. Basic research addresses fundamental problems such as genetic improvement of a species and is long term with high risks and requires high levels of expertise. The returns on success are high. In the past, State agencies and private companies focused on the first two areas which CSIRO addressed the second and third areas, that is, it undertook or coordinated the basic research. Universities covered a range

of areas depending on specific interests of staff and graduate student. The basic research was expensive but many of the results that are presently being utilised are derived from such programs that were established several decades ago. No such programs are currently being developed and, with the reductions in CSIRO, there are few ways left to develop and maintain a long term, basic research program. Research grants are only short term and do not assist in this area. In the forest products areas two innovative areas are in use of cellulose and development of bio-fuels. It is expected the implementation of this work will not be by traditional processors of forest products but by new organisations.

A review and some analysis of the history and progress of forest and forest products research was undertaken by Kile *et al.* (2015). Part of the discussion was a lament for the declines in support for forestry and considered ways in which funding and resources could be increased for research. While well argued, it did not address the positions that research does not stand alone and needs to be addressing longer terms issues affecting the industry and with full support of industry.

. Basically, the areas that have been underpinning the forest industry objectives are:

1. Increase the productivity and yield of existing forests.
2. Increase the extent of manageable forests.
3. Increase value of products from forests.
4. Improve utilization of products from forests.
5. Improve economics of operations (reduce costs).
6. Reduce impacts of biological and environmental risk factors.
- 7.

Currently, the key areas of focus of forest organisations (not the research effort) are in reducing costs and reducing risk. Without some incentive to support and implement the full range of objectives, which will mean continuing investment in forestry and to again take a long term view of forest management then interest in and support of research will continue to decline. Attempting to maintain research in isolation of these other key factors is going to be met with limited success.

The figures on expenditure and numbers of researchers present only a partial picture of loss of infrastructure, knowledge and resources. Research in the forestry industry has declined significantly and is continuing to do so. The loss of researchers leaving the industry through retirement, redundancy or other reasons means a loss of expertise, usually a loss of access to information and loss of capacity to interact and pass on knowledge to younger researchers. This is not just a reflection on research but on the forest industry generally. For research to develop it needs to see clear directions from the timber and processing industry and it needs to have some basic objectives which fall in developmental and fundamental areas. Those objectives need to be looking at the future, not the short term. For dealing with both the sectors of the industry and politicians there needs to be an identifiable focus or centre with scientists who will speak up for research.

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