Forest inventory for private native forestry, farm forestry and Indigenous forestry

Farm forestry sector report

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Foreword

Demand for sustainably sourced forest and wood products is increasing, both globally and in Australia. There are opportunities to capitalise on this growth in demand and increase the economic and social benefits from utilisation of the wood resources of Australia's forests.

However, access by the Australian forestry sector to publicly managed native forest resources has progressively diminished since the 1990s. The area of commercial plantations is also declining in some regions. There is therefore a need to understand more about the availability and commercial potential of other forest resources across Australia, including farm forestry plantations, privately managed native forests, and native forests owned and managed by Indigenous peoples.

The 'Forest inventory for private native forestry, farm forestry and Indigenous forestry' project was developed under the 2018 National Forest Industries Plan *Growing a Better Australia – A billion trees for jobs and growth* (DAWR 2018). Its goal is to improve the national description of Australia's forests in areas outside the publicly managed estate, and it delivers on one of the key actions identified in the plan, "*Working with state governments, private native forest owners and interested Indigenous communities to unlock potential timber supply, and to deliver economic returns to landowners*".

The project was designed to increase understanding of Australia's forest resources by assessing existing available information on three components outside the publicly managed estate, namely farm forestry plantations, privately managed native forests, and native forests owned and managed by Indigenous peoples. The results will thus provide a baseline of historical knowledge. Recommendations from the project will assist governments, landowners and managers in deciding the next steps in data collection and management that are required to determine the potential for such forests to produce commercial wood supplies.

This report on the farm forestry plantation component is one of three reports developed as part of this project, with separate reports for each privately managed native forest and Indigenous forestry.

The figures and areas presented in this report are based on data supplied by a range of stakeholders to ABARES for the purposes of this project. While every effort has been made to validate the data, including the use of satellite imagery and other independent datasets, the extent and location of the forest areas reported here are at a scale and accuracy best suited for national and regional reporting only.

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Acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACLUMP	Australian Collaborative Land Use and Management Program
AFG	Australian Forest Growers (now Forestry Australia)
AFPA	Australian Forest Products Association
AFWPS	Australian Forest and Wood Products Statistics
BRS	Bureau of Rural Sciences
CLUM	Catchment-scale land-use of Australia
DAF	Queensland Department of Agriculture and Fisheries
DAWE	Australian Government Department of Agriculture, Water and the Environment
DAWR	Australian Government Department of Agriculture and Water Resources (now DAWE)
GIS	Geographic information system
IFA	Institute of Foresters of Australia (now Forestry Australia)
FWPA	Forest and Wood Products Australia
MIS	Managed investment scheme
NFI	National Forest Inventory
NPI	National Plantation Inventory
NRM	Natural resource management
PFT	Private Forests Tasmania
PTR	Private timber reserve
RPC	Regional plantation committee
RIRDC	Rural Industries Research and Development Corporation
USC	University of the Sunshine Coast

Key terms

The following terms are used in this report for the purposes of consistency and transparency. Usage of these terms in this report may differ from usage elsewhere.

Commercial plantation	Area of hardwood or softwood plantations managed commercially to supply logs to wood-processing industries for the manufacture of wood products, with estates usually exceeding 1,000 hectares. Commercial plantations are reported through Australia's National Plantation Inventory.
Farm forestry	Establishment or management of planted trees, usually in rows and which meet the definition of forest, with timber production as a primary management intent, on individual private landholdings with a total area of plantings usually less than 1,000 hectares. Usage of native forests on individual private landholdings is described as private native forestry, and reported separately.
Forest	An area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding 2 metres and with existing or potential crown cover of overstorey strata about equal to or greater than 20%. This includes Australia's diverse native forests and plantations, regardless of age. It is also sufficiently broad to encompass areas of trees that are sometimes described as woodlands.
Indigenous forestry	Usage of areas of native forest on land owned and managed by Indigenous people and communities in which wood production can occur.
National Forest Inventory	Australia's system of integrated national forest data, compiled from state, territory and Australian government agencies and independent, remotely sensed data, using national standards and protocols for collation and reporting. Used to meet national and international forest-related reporting requirements. Includes the categories 'Native forest', 'Commercial plantation' and 'Other forest'[1].
National Plantation Inventory	Australia's national inventory of commercial forest plantations, compiled from data supplied by private growers and grower representatives and state and territory government agencies and authorities[2].

[1] See awe.gov.au/abares/forestsaustralia/australias-national-forest-inventory

[2] See awe.gov.au/abares/forestsaustralia/plantation-inventory-and-statistics

	The National Plantation Inventory is a program of the National Forest Inventory.
Plantation	Intensively managed stand of trees of either native or exotic species, created by the regular placement of seedlings or seeds usually planted at the same time and usually of the same species.
Plantation type	A description of whether a plantation is comprised of softwood or of hardwood species.
Private native forestry	Usage of areas of native forest on privately-owned land and privately managed leasehold land, excluding leasehold land in Queensland where the rights to the timber are retained by the Crown[3], in which wood production can occur. Includes areas on individual land holdings managed as part of farm enterprises.

[3] daf.qld.gov.au/business-priorities/forestry/state-native/forest-management-plan

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Thinning in an 18-year-old sugar gum (*Eucalyptus cladocalyx*) farm forestry stand. Lismore, Victoria. G. Featherston.

Executive summary

Rationale and methodology

Demand for forest and wood products sourced from sustainably managed forests is increasing both globally and in Australia. However, access by the Australian forestry sector to sustainably managed public native forest resources has progressively diminished since the 1990s, and the area of commercial plantations is currently declining in some regions. There is therefore a need to better understand the availability and commercial potential of other forest resources across Australia.

Australia's commercial plantation resource comprises plantation estates usually managed by large plantation companies and typically exceeding 1,000 hectares. This resource is reported through the National Plantation Inventory (NPI), and is reasonably well documented and understood. Less is known about the extent and nature of the smaller-scale resource, referred to in this report as farm forestry, of planted trees managed for wood production on individual private land holdings, typically managed as part of broader farm enterprises. As well as contributing to wood supply, farm forestry also diversifies farm incomes, and creates employment and indirect benefits in regional economies.

This report delivers an improved understanding of Australia's current farm forestry resource, through identification and compilation of existing available resource inventory data as collected by various programs over time. A complete inventory of Australia's current farm forestry resource was not undertaken in this project.

The consultation process for this project identified more than 300 farm forestry stakeholders, and led to the provision to ABARES of a wide range of datasets relating to farm forestry. The datasets were diverse, with a range of attributes and collection dates, and many were overlapping. Information was supplied primarily by farm forest owners and forestry associations, with additional information from local, state and Australian government agencies including water authorities, catchment management authorities, natural resource management bodies, forest management and processing companies, consultants, and Landcare and other groups.

There was limited coordination within, and among, the stakeholder groups in the supply of this data. This reflects the generally limited coordination in the measurement and reporting of farm forest information in Australia.

Farm forestry in Australia

After validation, 73,400 hectares of farm forestry in Australia was identified in 40 historical datasets, representing in the order of 3,000 landholders. This area is a subset of the total area of farm forestry in Australia, being the part for which historical inventory data has been collected by stakeholders. Of this identified area, 53,100 hectares are already known to be managed for wood production, having previously been identified and reported as commercial plantation in Australia's NPI. Since this study describes only the extent of farm forestry for which information was available, and is not a complete inventory, it cannot be compared with the 1.8 million hectares of commercial plantations or the 5.0 million hectares (net harvestable area) of multiple-use public native forests.

The data acquired during the study reveals that farm forestry occurs in all Australian states. The majority of the area of reported farm forestry is in Tasmania (45,600 hectares), with the balance in

Victoria (10,700 hectares), New South Wales (9,000 hectares), Queensland (3,800 hectares), Western Australia (3,200 hectares) and South Australia (1,000 hectares). No validated farm forestry data were available for the Australian Capital Territory or the Northern Territory.

A total of 69,300 hectares (94%) of reported farm forestry lies within ten of the eleven regional forestry hubs, with the largest area in the Tasmania hub (45,600 hectares). The balance is distributed across the hubs in Gippsland (8,300 hectares), North Queensland (3,200 hectares), South West Western Australia (3,200 hectares), South East New South Wales (2,900 hectares), Murray Region (2,100 hectares), Central West New South Wales (1,900 hectares) and North East New South Wales (1,200 hectares), with smaller areas in the South and Central Queensland (600 hectares) and Green Triangle (300 hectares) hubs. There is no reported farm forestry in the Northern Territory and Ord Valley forestry hub. A total of 70,600 hectares (96%) of farm forestry occurs within NPI regions.

Together with locational data, the most common information available describing the areas of farm forestry is type (hardwood or softwood), year of planting and species information. However, the availability of information for each of these three attributes is inconsistent.

Information on plantation type is available for 63,100 hectares of farm forestry, with 43,400 hectares (69% of the area for which type is known) hardwood species and 19,700 hectares (31%) softwood species.

Information on year of planting was supplied for 57,600 hectares of farm forestry. The area planted between 2011 and 2020 is 2,200 hectares (4% of the area for which planting date is known). A total of 33,400 hectares (58%) was planted between 2006 and 2010, and 8,400 hectares (15%) were planted between 2001 and 2005. The remaining 13,600 hectares (24%) were planted before 2000.

Species data are known for 52,000 hectares of farm forestry. A total of 32,900 hectares (63% of the area for which species is known) are *Eucalyptus nitens,* all except 100 hectares of which are in Tasmania. A further 1,700 hectares (3%) are *E. globulus*, of which 900 hectares are in Tasmania. There are 13,800 hectares (27%) of *Pinus radiata*, of which 7,300 hectares are in Tasmania. The balance of 3,700 hectares (7%) comprises other minor species including *E. camaldulensis, E. grandis, E. saligna* and *Corymbia maculata*, and areas planted with a mix of known species.

The 53,100 hectares previously reported as commercial plantation are likely to represent areas of farm forestry owned by individual landholders but reported to the NPI as part of aggregated datasets.

Recommendations

The following recommendations on farm forestry data were developed as a result of this work, to assist governments, landowners and managers in deciding the next steps in data collection and management that would be required to determine the potential for the farm forestry sector to produce commercial wood supplies, diversify farm incomes, and create employment and indirect benefits in regional economies. The recommendations would deliver on the policy requirement for data to support farm forestry analysis and development, as well as other matters such as carbon, water, agricultural stewardship and soil management. Such data will also support the agricultural sector and regional industry more broadly in planning and decision-making.

- Terms and definitions. A nationally standardised framework of terms and definitions is required to enable the efficient and effective collection, collation and analysis of consistent information on areas of farm forestry in Australia.
- Farm forestry inventory. This project has revealed the extent of historical data on the sector, but has also shown that there are substantial areas of farm forestry for which data are not recorded. Future policy development for the farm forestry sector requires knowledge of the full extent of farm forestry plantings; demand for more complete information also comes from regional stakeholders and Regional Forestry Hubs. This information would set a baseline for monitoring trends, inform whether policy programs are having the desired impacts, determine the potential for sector growth, and determine the capacity of the sector to produce commercial wood supplies.

  If a more accurate estimate of the area and attributes of farm forest plantations in Australia is therefore deemed valuable, then a number of inventory activities could usefully be undertaken. Three components are proposed, based on current processes:

  – Further analysis of the 73,400 hectares identified in this project to understand better the status of some of these areas.

  – Using ancillary datasets and remote sensing products to determine the status of a potential area of up to 60,000 hectares observed in this project as likely to represent farm forestry but inconclusive in available datasets.

  – Collection of new inventory data, coordinated through the Regional Forestry Hubs developed under the National Forest Industries Plan, which are well-placed to take a lead role in completing the collection and coordination of regional farm forestry data and information.
- Ongoing programs of data acquisition. There is a lack of coordination at local, state and territory, and national levels regarding the availability, management and use of farm forestry data, particularly regarding small-scale farm forestry activities. Depending on the results of the initial inventory described above, on the policy need for information on trends over time, and the commercial relevance of the farm forestry estate, ongoing programs of farm forestry data acquisition could be developed with the following attributes:

  – A nationally agreed set of guidelines for measuring, collecting and reporting data and information on farm forestry, together with a minimum set of metrics such as area, year of planting, species, silvicultural treatment and management intent. Guidelines should extend to the collection of spatial data.

  – An enduring national repository for all farm forestry data, developed in partnership with farm forest growers, managers and/or regional coordinators, and state and territory agencies, to provide a centralised and coordinated location for collected data. The NFI and NPI provide established models, with data protocols, and partnership arrangements for stakeholder engagement.

    - The alternative to agreed routine data collection methodologies and a data repository would be repeated data projects such as this study. However, infrequent and individual projects would not be able to collect data capable of demonstrating trends over time in the farm forestry estate.

- Collaboration of the Regional Forestry Hubs with state bodies with farm forestry interests, and with national organisations such as Forestry Australia (formerly the Institute of Foresters of Australia and Australian Forest Growers) as the peak body for farm forestry in Australia, and the National Farmers Federation, could enhance access to farm forestry data held by the broader farming community, particularly small-scale farm forestry enterprises not linked to larger programs.
- Organisations that collect and manage long-term farm forestry data using consistent protocols and enduring data licence agreements to ensure the ongoing utility of such data. Project agreements for publicly funded farm forestry projects should specify data management arrangements that endure after project closure, since most projects and data management arrangements are finite in duration and the priorities of government and other support agencies shift over time.

Farm forestry stand of Sydney blue gum (*Eucalyptus saligna*). Benalla, Victoria. A. Howell.

1 Introduction

There is increased global demand for sustainably sourced forest and wood products (FAO 2019), and Australia is part of this trend. However, access by the Australian forestry sector to publicly managed native forest resources has progressively diminished since the 1990s (MIG & NFISC 2018), and the area of commercial plantations is declining in some regions (ABARES 2020a).

Other areas of forest that could potentially be used as sources of forest and wood products include farm forests, privately managed native forests, and forests on Indigenous-managed land. The increasing need to better understand the availability and commercial potential of these forest resources led to the development of the 'Forest inventory for private native forestry, farm forestry and Indigenous forestry' project, developed under the 2018 National Forest Industries Plan, *Growing a better Australia – A billion trees for jobs and growth* (DAWR 2018). This report on the farm forestry sector is one of three reports developed as part of this project, with separate reports for privately owned and managed native forests and for Indigenous-managed forests.

A key step in the development of a national stocktake of Australia's farm forest estate is to identify and quantify the current state of knowledge of the estate. This project identified, and where possible sourced, existing data and information describing Australia's farm forestry estate. The resultant information will be integrated into Australia's National Forest Inventory (NFI), compiled by ABARES.

Farm forestry has been an important element of Australia's agricultural landscape over many decades. Momentum for developing farm forestry as an agricultural land use increased in the late 1990s with the development of the National Farm Forestry Program, the National Landcare Program and the National Afforestation Program, led by the Australian Government in coordination with state and territory governments, the forest industry and landholders. These initiatives also underpinned a joint government/industry vision to expand the commercial plantation estate. The commercial plantation estate is differentiated from the farm forestry estate in that it comprises larger, industrial-scale plantings of trees in estates typically exceeding 1,000 hectares.

During the late 1990s and early 2000s, the establishment of regional plantation committees (RPCs) to support the burgeoning area of farm forestry plantings led to regional centres of knowledge, and accumulation of regional inventory data. However, by 2010 most of these bodies had been discontinued, and much of the knowledge of the farm forest estate dissipated.

The first comprehensive national spatial inventory of farm forestry in Australia was published in 2001 (Wood et al., 2001). It drew strongly on information assembled by the various RPCs and state and territory government agencies. This compilation process ran in parallel with the first spatial update of commercial plantations for the National Plantation Inventory (NPI). While updates of spatial data on commercial plantations for the NPI have subsequently been undertaken every five years, there has not been a national update of farm forest inventory spatial data since 2001.

The establishment of regional forestry hubs under the National Forest Industries Plan presents a valuable model, and an opportunity to develop a new and coordinated approach to the collection of local, on-ground knowledge and inventory data to develop a more complete and contemporary national picture of farm forestry in Australia.

1.1 Project framework, scope and geographical coverage

The key purpose of the farm forestry component of the 'Forest inventory for private native forestry, farm forestry and Indigenous forestry' project is to identify and, where possible, source existing data and information describing Australia's farm forestry resource. Specifically, the aims are to:

- Identify, acquire and document existing relevant farm forestry resource inventory data. Potential sources of new information include state government databases, and information held by private industry, forest owners and forest managers.
- Assess, validate and reconcile spatial farm forestry resource inventory data provided by stakeholders, using remote sensing products where necessary, and prepare area figures and mapping products, with metadata where possible.
- Collate non-spatial farm forestry resource inventory data and cross-reference with spatial data to identify gaps in knowledge.
- Compile descriptions of the inventory programs that collected these data.

As a national stocktake of existing farm forestry data, the project did not create new data, map new farm forestry areas, or correct area boundaries in provided data.

1.2 Terminology and definitions

For the purposes of this project, farm forestry refers to:

> Establishment or management of planted trees, usually in rows and which meet the definition of forest, with timber production as a primary management intent, on individual private landholdings with a total area of plantings usually less than 1,000 hectares.

Farm forestry has been defined variously over the years. Definitions typically refer to farm-based activities related to the management of planted and/or native forest, for various purposes including the commercial production of wood, environmental benefits including environmental plantings and carbon sequestration, and farm management including animal welfare. Farm forestry can at times be taken to include management of native forest stands on farms; however, that activity is not covered in this report, but is addressed in the separate private native forestry report for this project.

Consistent with the definition used in the first National Farm Forest Inventory (Wood et al, 2001), farm forestry applies to planted forest stands that are owned outright by individuals with total estates generally less than 1,000 hectares. It excludes planted forest estates managed on industrial scales as commercial plantations, which typically exceed 1,000 hectares. Farm forestry estates usually comprise even-aged, single-species plantings, and can take many forms, including timber belts, alleys and dispersed tree plantings as well as more traditional block plantings. Farm forestry as defined only occurs on privately owned land or privately managed leasehold land (excluding leasehold land in Queensland) on which wood production can occur.

Issues associated with inconsistent definitions of farm forestry, and farm forestry terminology, were raised by several stakeholders during the consultation phase of the project, and are further discussed in Section 4.1.

1.3 Previous farm forestry inventory reports

The first attempt to measure and characterise farm forestry resources using spatially derived data was the National Farm Forestry Inventory, undertaken by the Bureau of Rural Sciences (BRS) between 2000 and 2001. That project collected data on trees planted up to 2000, and the results were published in *Plantations of Australia 2001 – A report from the National Plantation Inventory and the National Farm Forest Inventory of Australia* (Wood et al. 2002). The total area of farm forestry reported was 67,000 hectares (Table 1).

Table 1 Farm forestry reported in BRS National Farm Forestry Inventory project, 2001

Jurisdiction	Area (ha)	Main species
New South Wales	7,862	*Eucalyptus nitens, E. grandis, Corymbia maculata, Pinus radiata* and cabinet timbers
Northern Territory	44	*E. pellita*, sandalwood, *Acacia* species
Queensland	3,292	Numerous eucalypt species and cabinet timbers, *P. caribaea*
South Australia	6,106	*E. globulus, Pinus radiata*
Tasmania	16,100	E. *globulus, E. nitens, P. radiata*
Victoria	21,086	*E. globulus, E. nitens, E. cladocalyx, P. radiata*
Western Australia	12,496	*E. globulus, P. radiata, P. pinaster,* eucalypt mallee species
Total	**66,983**	

Note: Total may not tally due to rounding.

A more recent report, *Farm Forestry Area and Resources in Australia* (URS Forestry 2008), identified farm forestry at state and regional levels, and described the major planted species. The URS project found that there was no identifiable unique source of information on farm forestry resources in Australia. The project identified 155,000 hectares of farm forestry in Australia (Table 2), a substantial increase from the 67,000 hectares reported by Wood et al. (2002). A key contributor to the reported growth in the area of farm forestry was 55,000 hectares of managed investment scheme (MIS) plantings on private land, mostly in Western Australia and Victoria. Additional detail on the data collated for the URS project, by state, region and species, is provided in Appendix C, Table C1.

Table 2 Farm forestry reported by URS Forestry (2008)

	Non-MIS farm forestry	MIS on farms	Total farm forestry
Jurisdiction	Area (ha)		
New South Wales [a]	27,950	0	27,950
Northern Territory	44	0	44
Queensland	4,759	0	4,759
South Australia	2,516	6,700	9,216
Tasmania	14,805	6,200	21,005
Victoria	11,577	20,200	31,777
Western Australia	38,680	22,000	60,680
Total	**100,331**	**55,100**	**155,431**

[a] Includes plantations in the ACT.
Note: Totals may not tally due to rounding.

An overview of Tasmania's private forest estate, *2020 Tasmanian Private Forests Resource Review: A regional review of privately managed native and planted forest resources in Tasmania* (Wilson and

Tys, 2020), provided an insight into the independently managed private forests in Tasmania that are not managed within industrial-scale estates. It reports 37,500 hectares of independently managed hardwood plantations distributed over 2,248 separate private land holdings or properties, as well as 8,000 hectares of independently managed softwood plantations distributed over 576 separate private land holdings or properties. These areas are reported here as farm forestry, and spatial data regarding these areas were supplied directly to ABARES.

Dryland farm forestry stand of lemon-scented gum (*Corymbia citriodora*). South East Queensland. A. Yates.

2 Farm forestry findings in this project

Farm forestry stakeholders supplied data that were used to develop a spatial dataset of the extent and distribution of farm forestry in Australia. The final dataset was compared with forest areas reported in other national spatial forest datasets published by ABARES. Descriptions of stand age, type and species were assembled where the data were available. Additional descriptive information such as management intent and productivity was also sought, with limited response.

2.1 Datasets supplied

More than 300 farm forestry stakeholders were contacted for this work, representing farm forestry associations, grower networks, forest industry, government agencies, professional associations and individual landholders. Most data were supplied by farm forest owners and regional farm tree bodies, supported by forestry associations, while the largest single-supplied areas came from government agencies (Table 3).

From this wide range of stakeholders, 80 datasets were received. However, only 40 of these datasets described farm forestry, were spatially referenced and did not overlap, and resulted in an area of 73,400 hectares validated as farm forestry, representing in the order of 3,000 landholders. Datasets not used described land uses other than farm forestry, such as oil mallees, sandalwood, carbon sequestration, environmental plantings, large-scale commercial plantations, or were not spatially referenced, or overlapped with more recently collected or more reliable datasets.

Table 3 Farm forestry datasets and area

Source or data custodian	Number of datasets	Validated farm forestry area (hectares)
Farm forest owners, grower and forestry associations	26	18,200
Local, state and Australian government agencies	3	45,900
Forest managers and processors	7	6,000
Consultants, Landcare and other tree-planting groups	4	3,300
Total	40	73,400

Notes:
Areas are rounded to nearest hundred hectares.
Details by organisation are given in Appendix D.

Farm forestry was identified in every state (Table 4), but no data were supplied for the Australian Capital Territory or the Northern Territory. Most of the area of farm forestry identified is in Tasmania (45,600 hectares), Victoria (10,700 hectares) and New South Wales (9,000 hectares). Over 90% of farm forestry areas are located in Regional Forestry Hubs (Figure 1).

Almost all of the 73,400 hectares validated as farm forestry occur on private freehold land (72,900 hectares, 99%). The balance of 500 hectares (1%) is on leasehold land, of which 400 hectares are in Western Australia and 100 hectares are in New South Wales.

Table 4 Input datasets and validated areas of farm forestry, by jurisdiction

State	Number of datasets	Validated farm forestry area (hectares)
Australian Capital Territory	0	0
New South Wales	6	9,000
Northern Territory	0	0
Queensland	10	3,800
South Australia	2	1,000
Tasmania	2	45,600
Victoria	17	10,700
Western Australia	3	3,200
Total	**40**	**73,400**

Note: Areas are rounded to nearest hundred hectares. Total may not tally due to rounding.

Detail on the data sources can be found in more detail in Section 3.2.3, and Section 3.3.3 gives a full description of the data validation process.

2.2 Reporting status of farm forestry areas in other inventories

Of the 73,400 hectares identified for the first time as the validated area of farm forestry in Australia, a proportion had already been recognised as forest by ABARES. The areas recognised as forest had been reported in either or both of the NPI and the NFI, as one of three national forest categories: 'Commercial plantation', 'Native forest' and 'Other forest'. The balance occurs on areas that have not previously been recognised as forest in either the NPI or the NFI.

Data describing 53,100 hectares (72%) of farm forestry holdings have previously been aggregated and reported to the NPI as commercial plantation as part of regional data collection processes (Table 5). In response to the farm forestry consultation process, these areas of plantations were subsequently identified by data custodians as farm forestry. This includes 44,700 hectares for Tasmania that are managed by independent landholders and distributed across 2,824 separate landholdings or properties (Wilson and Tys, 2020[4]).

Other areas identified and validated as farm forestry have also been reported as 'Native forest' in the NFI (4,800 hectares, 7% of the total area of farm forestry), or as 'Other forest' (4,500 hectares, 6%) (Table 5). The areas mapped as 'Native forest' in the NFI are likely to have been classified that way in the absence of additional information to identify them as farm forestry. The 4,500 hectares are correctly mapped as 'Other forest' in the NFI, as the national forest category 'Other forest' was developed to comprise non-commercial plantations, environmental plantings, sandalwood plantations and farm forestry.

[4] Details at treealliance.com.au/infohub/economics/news/2020_tasmanian_private_forests_resource_review

Figure 1 Distribution of farm forestry by Regional Forestry Hubs

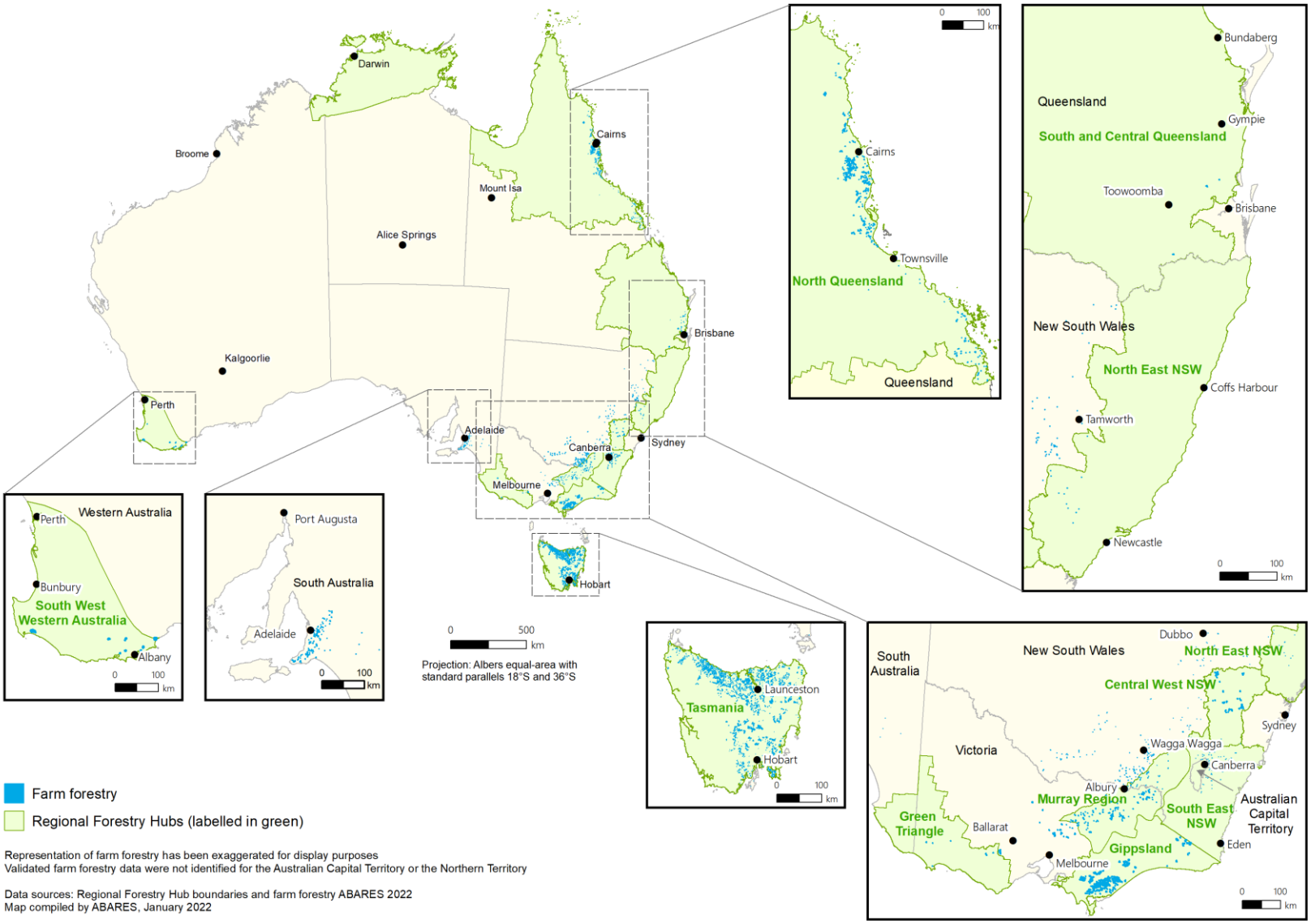


Table 5 Farm forestry area data, by state and reporting status in the National Plantation Inventory and National Forest Inventory

	Reporting status in NPI and NFI				Total farm forestry
	Commercial plantation	Native forest	Other forest	Non-forest	
State or territory	Area (ha)				
Australian Capital Territory	0	0	0	0	**0**
New South Wales	1,300	2,400	500	4,800	**9,000**
Northern Territory	0	0	0	0	**0**
Queensland	1,500	600	0	1,700	**3,800**
South Australia	0	100	0	900	**1,000**
Tasmania	44,700	300	300	400	**45,600**
Victoria	2,800	1,300	3,600	2,900	**10,700**
Western Australia	2,800	100	100	100	**3,200**
Total	**53,100**	**4,800**	**4,500**	**11,000**	**73,400**

Note: Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

The reason for 4,800 hectares of farm forestry being reported in the NFI as 'Native forest' requires further investigation. Possible reasons include:

- errors in the spatial location of farm forestry polygon boundaries, such that they are incorrectly positioned over native forest instead of nearby farm forestry
- incorrect reporting as native forest of older areas of farm forestry indistinguishable on satellite imagery
- retention of native forest within areas of farm forestry
- areas of private native forest being reported as farm forestry in the data supplied.

If either of the first two reasons apply, the areas are correctly farm forestry. If either of the second two reasons apply, the areas are correctly native forest. In each case, the attribution of these areas would improve with more accurate or up-to-date data.

The remaining 11,000 hectares of validated farm forestry had not been previously identified as forest in either the NPI or the NFI (Table 5). These areas may have several origins:

- land that carries farm forestry stands but is not captured in the NFI through error.
- previous farm forestry areas that have been harvested and not immediately replanted. The visual validation process suggested this may especially be the case in Victoria (see Section 3.3.3 for the data assessment and validation process).
- areas where the farm forestry trees were too small on satellite imagery to be recognised for the NFI.
- non-forest land within or adjacent to farm forestry plantings, not separated in the datasets provided for this project. The data analysed for northern Queensland contained several examples of this.

Areas would be correctly recognised as 'Other forest' if any of the first three reasons apply and will be considered as such in the next update of the NFI forest cover dataset. If the last reason applies, the

areas are correctly non-forest. In each case, the attribution of these areas would improve with more accurate or up-to-date data.

2.3 Farm forestry area by year of planting, plantation type and species

The collection of forest inventory data, especially at the time of planting, provides valuable insight into the nature of the farm forestry estate and the resource potential. The year of planting, the plantation type (hardwood or softwood), and the species planted, are important attributes to characterise the resource. Summarising knowledge of these attributes provides an insight into the extent of knowledge of the overall resource, and the coordination and effort invested by different farm forestry programs at the time of establishment. Information for each these attributes was provided for differing proportions of the farm forestry estate (Table 6).

Plantation type is the most commonly collected farm forestry data attribute, followed by year of planting. More detailed attribution is required for species, which is the least well documented of the three farm forestry data attributes.

Table 6 Farm forestry area, by state and knowledge of attributes

	Plantation type		Year of planting		Species		Total farm forestry
	Known	Not known	Known	Not known	Known	Not known	
State	Area (ha)						
New South Wales	8,400	600	5,600	3,500	8,500	500	**9,000**
Queensland	400	3,400	1,500	2,300	0	3,800	**3,800**
South Australia	1,000	100	100	1,000	0	1,000	**1,000**
Tasmania	45,600	0	42,000	3,600	41,300	4,400	**45,600**
Victoria	7,300	3,400	8,000	2,700	1,800	8,900	**10,700**
Western Australia	400	2,800	400	2,800	400	2,800	**3,200**
Total	**63,100**	**10,300**	**57,600**	**15,800**	**52,000**	**21,400**	**73,400**

Notes:
Validated data were not available for the Australian Capital Territory or the Northern Territory.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

Of the total validated farm forestry area of 73,400 hectares, data for plantation type were available for 63,100 hectares (86%), year of planting data were available for 57,600 hectares (79%), and species data were available for 52,000 hectares (71%).

Data on plantation type are available for all areas of farm forestry reported in Tasmania, 93% of the areas in New South Wales and South Australia, and 69% of the area in Victoria, but were less available for areas of farm forestry reported for Western Australia (13%) and Queensland (9%).

Data on year of planting are available for 92% of the area of farm forestry reported in Tasmania, 75% of the area in Victoria, and 62% of the area in New South Wales, but less is known about the year of planting in Queensland (40%), Western Australia (13%) or South Australia (7%).

Species data are more available in New South Wales (94% of the area of farm forestry reported) and Tasmania (91%), but less so for Victoria (17%), Western Australia (13%), and not available for Queensland or South Australia.

2.3.1 Plantation type

Of the 63,100 hectares of farm forestry for which plantation type data are available, hardwood species comprise 43,400 hectares (69%) and softwood species comprise 19,700 hectares (31%) (Table 7).

Table 7 Farm forestry area by plantation type and jurisdiction

State	Hardwood	Softwood	Unknown	Total
	Area (ha)			
New South Wales	3,100	5,300	600	**9,000**
Queensland	400	0	3,400	**3,800**
South Australia	0	1,000	100	**1,000**
Tasmania	37,500	8,200	0	**45,600**
Victoria	2,100	5,200	3,400	**10,700**
Western Australia	400	0	2,800	**3,200**
Total Area	**43,400**	**19,700**	**10,300**	**73,400**

Notes:
Validated data were not available for the Australian Capital Territory or the Northern Territory.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

2.3.2 Year of planting

Of the 57,600 hectares of farm forestry for which data on year of planting are available, most of the estate (33,400 hectares, 58%) was planted between 2006 and 2010, with a further 8,400 hectares (15%) planted between 2001 and 2005 (Table 8).

There are 13,500 hectares (24%) of older resource planted between the years 1961 and 2000, almost all of which (12,000 hectares, 21%) was planted in the 20-year period to 2000. A much smaller area of 2,200 hectares (4%) was planted more recently in the years between 2011 and 2020. Data on small areas with planting dates dispersed across the 30-year period to 1961 totalling less than 60 hectares, primarily in Victoria, were provided, however, these areas are not reported due to rounding.

Tasmania has the largest area (42,000 hectares) of farm forestry for which year of planting is known. Of this area, 31,300 hectares (74%) was planted during 2006–10, and 6,600 hectares (16%) was planted during 2001–05, with most of this area established under managed investment schemes (MISs). Data for year of planting is available for much of the area of farm forestry in Victoria (8,000 hectares, 75%) and New South Wales (5,600 hectares, 62%), but less information is available for areas in Queensland (40%), Western Australia (13%) and South Australia (7%).

The figures reported for areas of farm forestry describe the standing farm forestry estate now by its planting year, not the total area planted in a given year. Much of the areas planted, especially in the earlier years, will have been harvested or will no longer exist due to drought and other factors.

Table 8 Farm forestry area by year of planting and jurisdiction

Year of planting	New South Wales	Queensland	South Australia	Tasmania	Victoria [a]	Western Australia	Total
	Area (ha)						
1961–1965	0	0	0	0	100	0	100
1966–1970	200	0	0	0	100	0	300
1971–1975	200	0	0	0	400	0	600
1976–1980	100	0	0	100	300	0	500
1981–1985	300	0	0	400	1,400	0	2,000
1986–1990	300	0	0	900	1,100	0	2,300
1991–1995	200	1,400	0	600	1,000	0	3,200
1996–2000	1,400	200	0	1,500	1,400	0	4,500
2001–2005	1,600	0	0	6,600	300	0	8,400
2006–2010	1,200	0	0	31,300	600	200	33,400
2011–2015	0	0	100	300	700	0	1,100
2016–2020	100	0	0	400	500	200	1,200
Total area of known planting date	**5,600**	**1,500**	**100**	**42,000**	**8,000**	**400**	**57,600**
Area for which planting date is unknown	3,500	2,300	1,000	3,600	2,700	2,800	**15,800**
Total Area	**9,000**	**3,800**	**1,000**	**45,600**	**10,700**	**3,200**	**73,400**

[a] For reporting purposes, 200 hectares identified in Victoria as planted in 2021 are included in 2016–2020.
Note: Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

The national distribution of farm forestry areas by year of planting, and by plantation type for these areas where this is known, is shown in Figure 2a. Hardwood dominates the national farm forestry estate, and especially in the 2006–10 planting period. The large areas of farm forestry planted in Tasmania, especially between 2001 and 2010, exceed the areas planted in the years before and after this time, and reflects intensive planting activity undertaken through MIS.

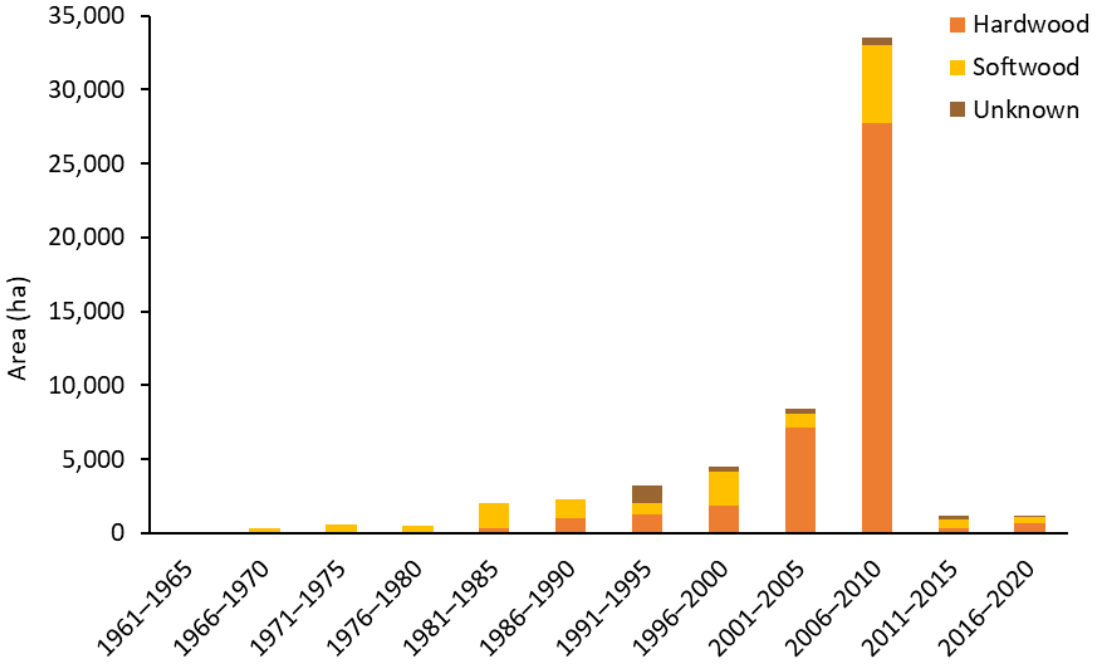
The distribution of farm forestry by year of planting, and by plantation type for areas and where this is known, is also presented in two companion figures to illustrate the nature of the larger extent in Tasmania (Figure 2b) and the smaller extent outside Tasmania (Figure 2c).

Of the 31,300 hectares of the area of farm forestry in Tasmania known to have been planted in 2006-10, hardwood plantations comprise 26,200 hectares (84%) and softwood plantations comprise 5,100 hectares (16%). Of the 6,600 hectares established in Tasmania in 2001–05, hardwood plantations comprise 6,200 hectares (94%) and softwood plantations comprise 400 hectares (6%). The distribution of farm forestry areas by planting year for Tasmania is shown in Figure 2b, with plantation type for these areas where this is known.

The area of farm forestry outside Tasmania for which year of planting is known is 15,600 hectares. The distribution of this area by five-year planting period is shown in Figure 2c, together with plantation type where known. Of this area, the largest proportion was established in 1996–2000 (3,000 hectares, 19% of the area for which year of planting is known). A total of 4,600 hectares of

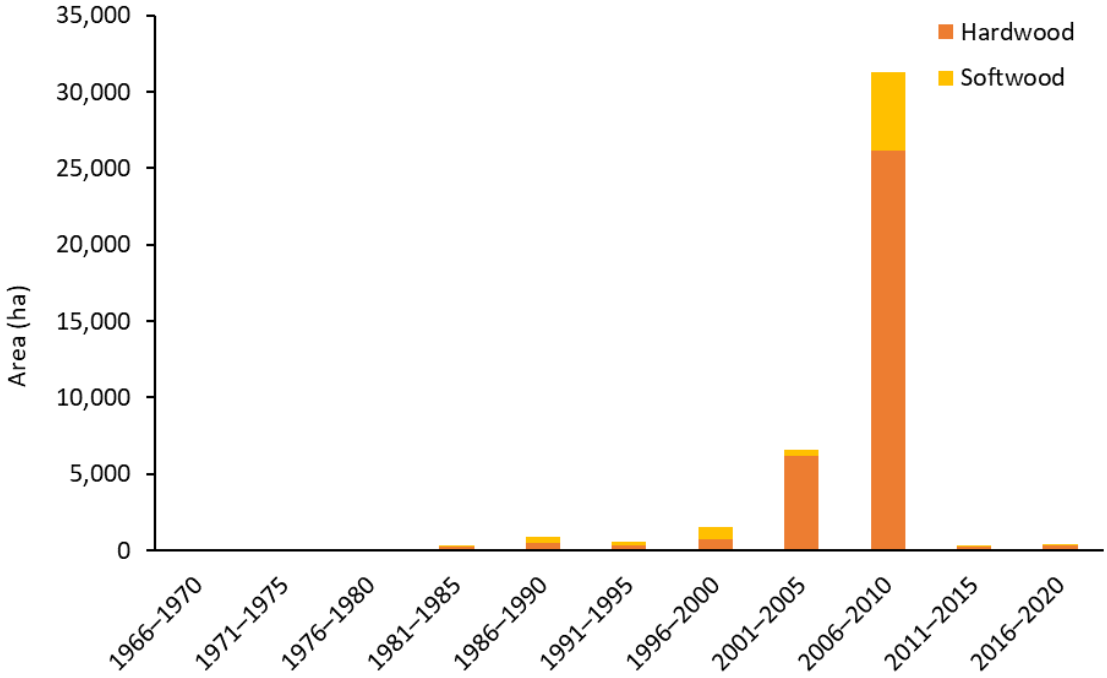
hardwood were established between 1991 and 2010 (80% of the hardwood estate for which year of planting is known). Relatively large areas of softwood were established in 1981–85 (1,600 hectares) and 1996–2000 (1,500 hectares).

Figure 2a Farm forestry area by planting period and plantation type, Australia



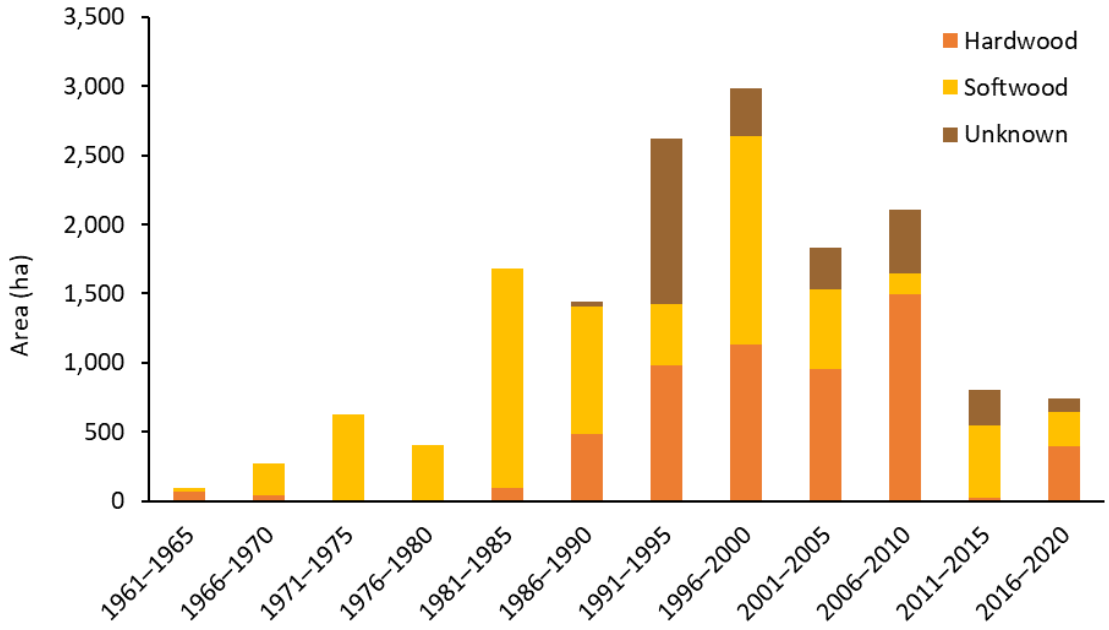
Note: This chart shows the area of farm forestry in Australia for which year of planting is known (57,600 hectares). Plantation type is known for a further 5,500 hectares of farm forestry not included on this chart. For reporting purposes, an area of 200 hectares for 2021 is included in 2016–2020.

Figure 2b Farm forestry area by planting period and plantation type, Tasmania



Note: This chart shows the area of farm forestry in Tasmania for which year of planting is known (42,000 hectares). Plantation type is known for a further 3,600 hectares of farm forestry in Tasmania not included on this chart.

Figure 2c Farm forestry area by planting period and plantation type, for all states except Tasmania



Note: This chart shows the area of farm forestry in all states except Tasmania for which year of planting is known (15,600 hectares). Plantation type is known for a further 4,500 hectares of farm forestry in states outside Tasmania not included on this chart. An area of 200 hectares for 2021 is reported under 2016–2020.

2.3.3 Species

Species data are known for 52,000 hectares (71%) of the 73,400 hectares of farm forestry (Table 9).

Eucalyptus nitens accounts for 32,900 hectares of the farm forestry estate (45% of total farm forestry), almost all of which (99.7%) is in Tasmania. *E. globulus* accounts for a further 1,700 hectares, of which 900 hectares (53%) are in Tasmania. A further 13,800 hectares (19% of total farm forestry) are *Pinus radiata*, of which just over half (53%) is in Tasmania. Other hardwood species include *Corymbia maculata, E. camaldulensis* and *E. grandis*. An area of 2,100 hectares of 'Mixed known species' includes areas established as farm forestry research trials.

2.4 Farm forestry area by Regional Forestry Hubs

Eleven Regional Forestry Hubs have been established under the National Forest Industries Plan. Their purpose is to identify economic and social opportunities and benefits in recognised forestry regions with existing concentrations of wood supply resources, processing and/or manufacturing operations, established transport links, and strong potential for growth (DAWR 2018). One or more hubs are located in each of the states and territories.

A total of 69,300 hectares (94%) of validated areas of farm forestry is in Regional Forestry Hubs (Table 10). The greatest area of farm forestry (45,600 hectares) is in the Tasmania hub. All of the farm forestry estate in Queensland, Tasmania and Western Australia is within hubs, and most of the estate in Victoria (95%) and New South Wales (73%). There is no farm forestry in the Northern Territory and Ord Valley forestry hub or in the South Australian component of the Green Triangle hub.

Table 9 Farm forestry species by jurisdiction

Species	New South Wales	Queensland	South Australia	Tasmania	Victoria	Western Australia	Total	Proportion of total farm forestry
	Area (ha)							
Softwood species								
Pinus radiata	5,200	0	0	7,300	1,300	0	**13,800**	19%
P. pinaster	100	0	0	0	0	0	**100**	0%
Hardwood species								
Corymbia maculata	300	0	0	0	0	0	**300**	0%
Eucalyptus camaldulensis	300	0	0	0	0	0	**300**	0%
E. grandis	300	0	0	0	0	0	**300**	0%
E. globulus	0	0	0	900	300	400	**1,700**	2%
E. nitens	0	0	0	32,800	100	0	**32,900**	45%
Minor known species	300	0	0	200	100	0	**600**	1%
Mixed known species	2,100	0	0	0	0	0	**2,100**	3%
Total known species	**8,500**	**0**	**0**	**41,300**	**1,800**	**400**	**52,000**	**71%**
Unknown species	500	3,800	1,000	4,400	8,900	2,800	21,400	29%
Total farm forestry	**9,000**	**3,800**	**1,000**	**45,600**	**10,700**	**3,200**	**73,400**	**100%**

Notes:
Validated data were not available for the Australian Capital Territory or the Northern Territory.
Minor known species are where a single species occurs within a single known area. Mixed known species are where a mix of known species occur within a single known area.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

Table 10 Validated farm forestry area by state, and area inside or outside Regional Forestry Hubs

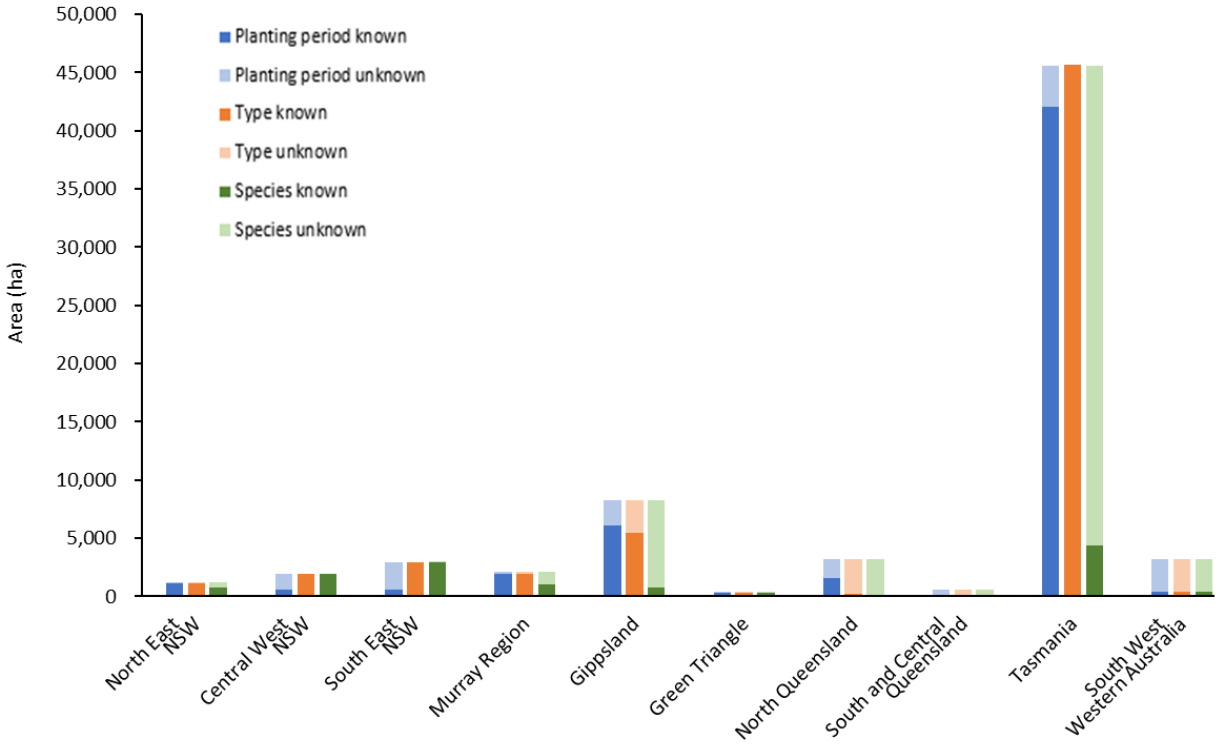
State	Inside hubs	Outside hubs	Total farm forestry	Proportion inside hubs
	Area (ha)			
New South Wales	6,500	2,500	9,000	73%
Queensland	3,800	0	3,800	100%
South Australia	0	1,000	1,000	0%
Tasmania	45,600	0	45,600	100%
Victoria	10,200	600	10,700	95%
Western Australia	3,200	0	3,200	100%
Total	**69,300**	**4,100**	**73,400**	**94%**

Notes:
Four Regional Forestry Hubs cross state borders. In these cases, areas of farm forestry have been allocated to the state in which the areas are located.
Validated data were not available for the Australian Capital Territory or the Northern Territory.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

An analysis of farm forestry areas and the availability of attribute data for each hub is discussed in the sections below, with further detail provided in Appendix A, Table A1.

Understanding the age distribution of the farm forest resource in a hub can provide context for future industry opportunities with the resource for harvest. Information about year of planting is available for areas of farm forestry in all hubs except the South and Central Queensland hub (Figure 3). Species information by hub is provided in Table 12.

Figure 3 Farm forestry area by availability of information for year of planting, plantation type and species, by Regional Forestry Hub



Notes:
Validated data were not available for the Northern Territory and Ord Valley Regional Forestry Hub.

Table 11 Farm forestry area by Regional Forestry Hub, by species

	Regional Forestry Hub												
	North East NSW	Central West NSW	South East NSW	Murray Region	Gippsland	Green Triangle	North Qld.	South and Central Qld.	Tasmania	South West WA	Total in hubs	Out side hubs	Total
Species	Area (ha)												
Softwood													
P radiata	0	1,900	2,900	700	700	100	0	0	7,300	0	13,600	200	**13,800**
P pinaster	0	0	0	0	0	0	0	0	0	0	0	100	**100**
Hardwood													
C maculata	100	0	0	0	0	0	0	0	0	0	100	200	**300**
Eucalyptus camaldulensis	0	0	0	0	0	0	0	0	0	0	0	300	**300**
E grandis	0	0	0	0	0	0	0	0	0	0	0	300	**300**
E globulus	0	0	0	0	0	200	0	0	900	400	1,600	0	**1,700**
E nitens	0	0	0	0	100	0	0	0	32,800	0	32,900	0	**32,900**
Minor known species	0	0	0	100	0	0	0	0	200	0	300	300	**600**
Mixed known species	700	0	0	200	0	0	0	0	0	0	900	1,200	**2,100**
Total known species	**800**	**1,900**	**2,900**	**1,100**	**800**	**300**	**0**	**0**	**41,200**	**400**	**49,300**	**2,600**	**52,000**
Unknown species	400	0	0	1,100	7,500	100	3,200	600	4,400	2,800	20,000	1,500	**21,400**
Total farm forestry	**1,200**	**1,900**	**2,900**	**2,100**	**8,300**	**300**	**3,200**	**600**	**45,600**	**3,200**	**69,300**	**4,100**	**73,400**

Notes:
Minor known species are single known species with known area. Mixed known species are several known species within single known areas.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

The area of validated farm forestry, by reporting status in the NPI and NFI, is shown in Table 12 and described in each of the hub summaries below.

Table 12 Farm forestry area by Regional Forestry Hub and reporting status in the National Plantation Inventory and National Forest Inventory

	Reporting status in NPI and NFI				
	Commercial plantation	Native forest	Other forest	Non-forest	Total farm forestry
Regional Forestry Hub	Area (ha)				
North East New South Wales	1,100	0	0	100	**1,200**
Central West New South Wales	0	900	400	600	**1,900**
South East New South Wales	0	1,300	0	1,600	**2,900**
Murray Region	100	200	900	900	**2,100**
Gippsland	2,600	1,100	2,600	2,000	**8,300**
Green Triangle	200	100	0	0	**300**
North Queensland	1,300	500	0	1,400	**3,200**
South and Central Queensland	200	0	0	300	**600**
Tasmania	44,700	300	300	400	**45,600**
South West Western Australia	2,800	100	100	100	**3,200**
Total Hubs	**52,900**	**4,500**	**4,300**	**7,500**	**69,300**
External to Hubs	200	300	200	3,400	**4,100**
Total	**53,100**	**4,800**	**4,500**	**11,000**	**73,400**

Notes:
Validated data were not available for the Australian Capital Territory or the Northern Territory.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

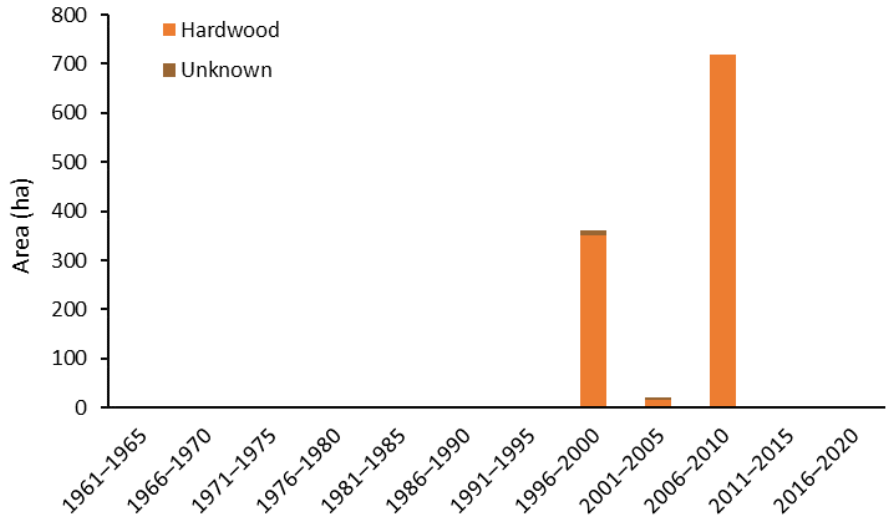
2.4.1 North East NSW

Information about year of planting is available for 1,100 hectares (93%) of the 1,200 hectares of farm forestry reported for the North East NSW hub, of which all is hardwood (Figure 4). Almost all the resource was established in 2006–10 (700 hectares) or in 1996–2000 (400 hectares).

Species data are known for two-thirds of the area with 700 hectares of mixed known species such as *Eucalyptus nitens* mixed with *E. saligna*, E. *globulus* mixed with *E. saligna*, and *E. muelleriana* mixed with *E. botryoides*, and a further 100 hectares of *Corymbia maculata* (Table 11).

Of the total area reported in this hub, 1,100 hectares a reported as commercial plantation in the NPI (Table 12).

Figure 4 Farm forestry area in the North East NSW hub for which year of planting is known, by plantation type



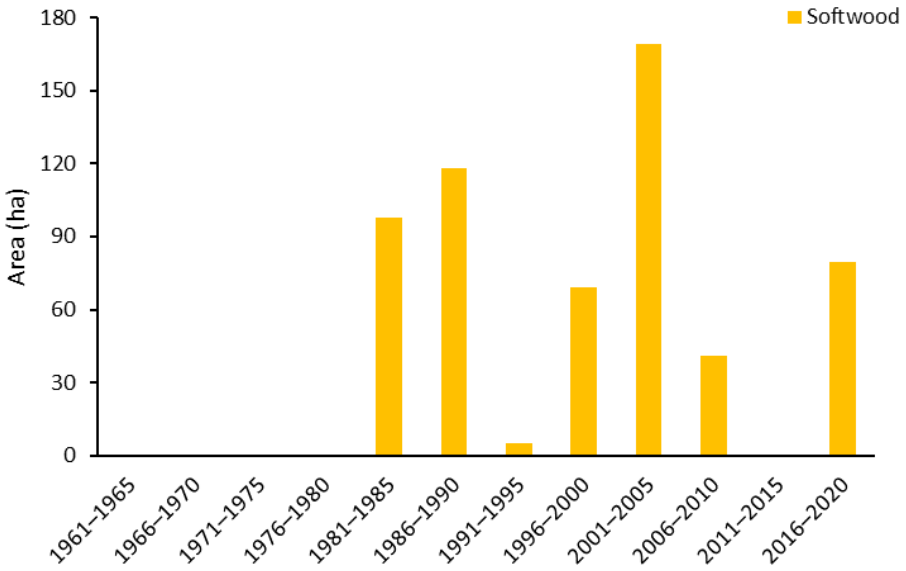
Note: Graphic shows only the 1,100 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 1,200 hectares.

2.4.2 Central West NSW

Data for year of planting are available for 600 hectares (31%) of the total 1,900 hectares of farm forestry in this hub. The areas known were planted variably between 1981 and 2020 (Figure 5). All the farm forestry reported for the Central West NSW hub is *Pinus radiata*.

Of the 1,900 hectares of farm forestry in the Central West NSW hub, none is reported as commercial plantation through the NPI (Table 12). A total of 1,300 hectares is reported by the NFI, of which 900 hectares are native forest and 400 hectares are other forest. An area of 600 hectares represents forest not previously reported in either the NPI or NFI.

Figure 5 Farm forestry area in the Central West NSW hub for which year of planting is known, by plantation type



Note: Graphic shows only the 600 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 1,900 hectares.

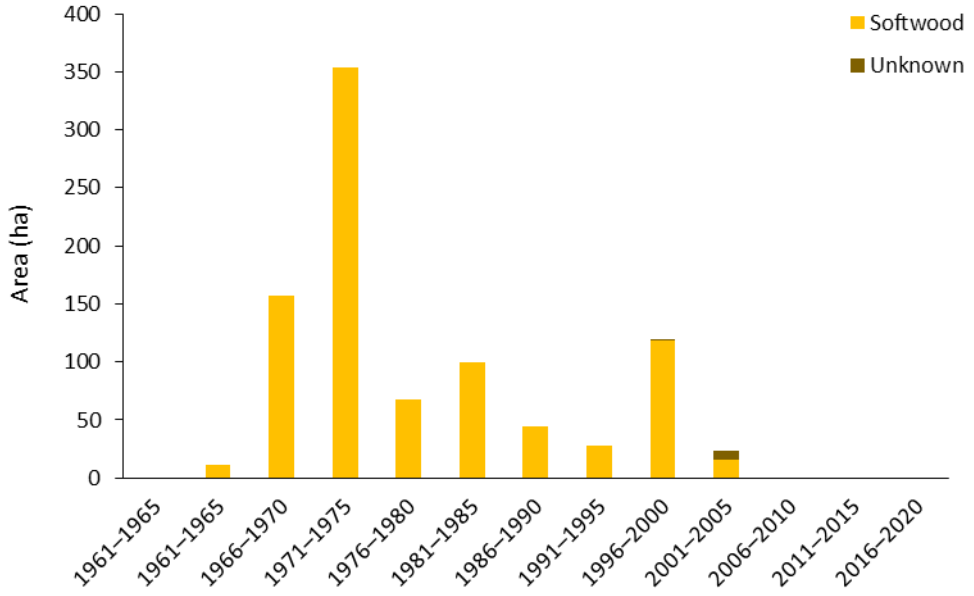
2.4.3 South East NSW

The South East NSW regional forestry hub is located predominantly in New South Wales, with a small area extending into Victoria, and it also includes all the Australian Capital Territory. The 2,900 hectares of farm forestry in this hub is entirely in New South Wales, of which all is softwood plantation, *Pinus radiata*, except for 10 hectares of hardwood plantation (Table 12).

Data for year of planting are available for 31% (900 hectares) of the total area. Of that area with year of planting reported, most was established between 1971 and 1975, with smaller areas established across the period between 1976 and 2005 (Figure 6).

More than half of the area of farm forestry (1,600 hectares, 55%) in this hub has not previously been reported as forest in the NFI, and the balance of 1,300 hectares (45%) was previously reported in the NFI as native forest.

Figure 6 Farm forestry area in the South East NSW hub for which year of planting is known, by plantation type



Note: Graphic shows only the 900 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 2,900 hectares.

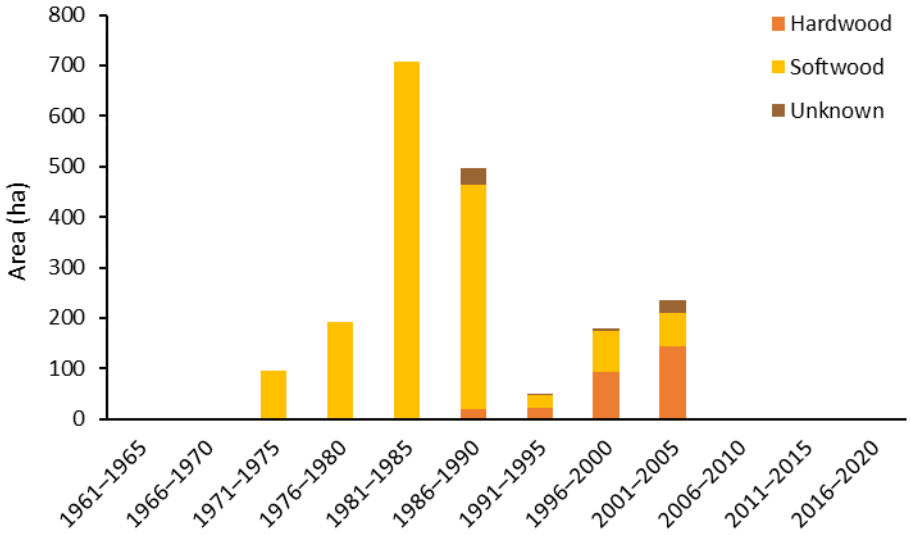
2.4.4 Murray Region

The Murray Region forestry hub extends across south-eastern New South Wales and north-eastern Victoria. There are 2,100 hectares of farm forestry in this hub, of which 1,600 hectares are softwood plantation, 300 hectares are hardwood plantation, and 300 hectares are unknown plantation type. Information on year of planting is available for 2,000 hectares (92%). Most areas are softwood plantation established between 1981 and 1990, with 700 hectares planted in 1981–1985 and 400 hectares in 1986–1990. The 300 hectares of hardwood species were planted more recently, with most between 2001 and 2005 (Figure 7).

Species data are available for 1,000 hectares, with 700 hectares recorded as *P. radiata*. The 300 hectares of hardwood plantation estate comprise 100 hectares of minor known hardwood species, including *E. saligna*, and a further 200 hectares of mixed known species.

A total of 900 hectares (43%) of the area of farm forestry reported in this hub is reported as other forest in the NFI. A further 900 hectares (43%) represent areas of forest that have not previously been reported in the NFI or NPI (Table 12).

Figure 7 Farm forestry area in the Murray Region hub for which year of planting is known, by plantation type



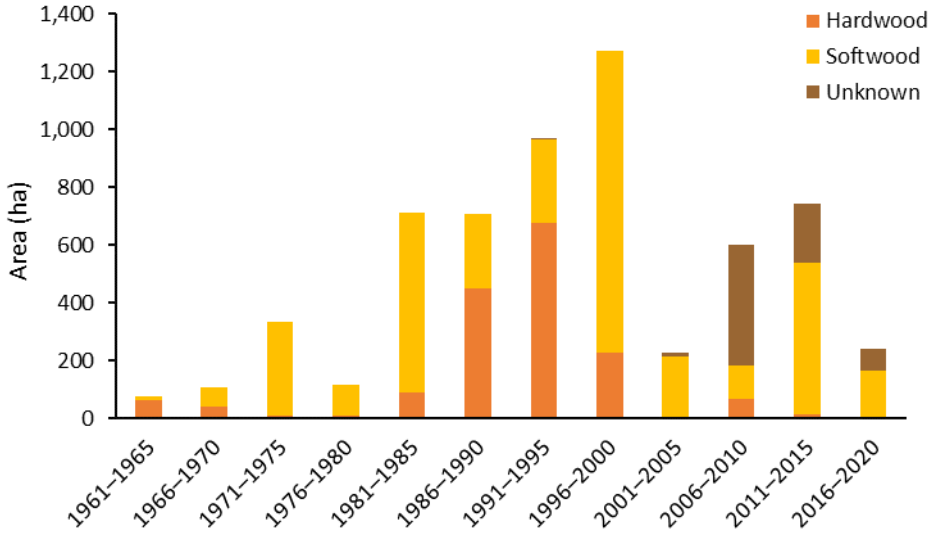
Note: Graphic shows only the 2,000 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 2,100 hectares.

2.4.5 Gippsland

A total of 8,300 hectares of farm forestry are reported for the Gippsland hub, of which information on year of planting is available for 6,100 hectares. These areas were variably planted from 1961 to 2020, peaking in 1996–2000 with 1,300 hectares planted in that period (Figure 8).

Information on plantation type is available for 5,400 hectares of this area, with 1,700 hectares hardwood and 3,800 hectares of softwood. Plantings of softwood peaked in 1981–85 (600 hectares) and 1996–00 (1,000 hectares). The areas of hardwoods were planted between 1986 and 2000 (Figure 8).

Figure 8 Farm forestry area in the Gippsland hub for which year of planting is known, by plantation type



Note: Graphic shows only the 6,100 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 8,300 hectares.

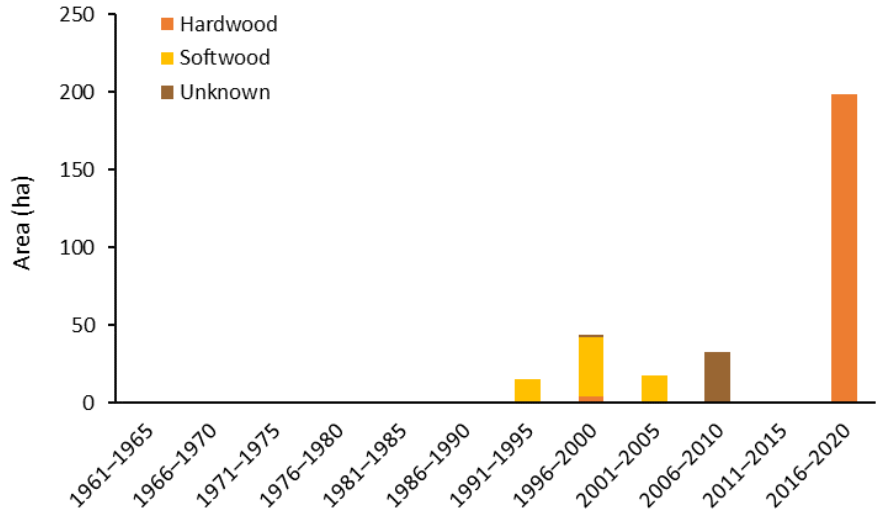
Species information was only available for 800 hectares in the Gippsland hub. Of this, 700 hectares is *P. radiata* and a further 100 hectares are split between *E. globulus* and *E. nitens*.

Of the total farm forestry area reported for Gippsland, 2,600 hectares are reported as commercial plantations in the NPI, 2,600 hectares are reported by the NFI as other forest, 1,100 hectares are reported as native forest, and the balance of 2,000 hectares are not reported as forest in the NPI or NFI (Table 12). More recent data, and on-ground liaison would assist further investigation of the 1,100 hectares identified in the NFI as native forest.

2.4.6 Green Triangle

The Green Triangle hub extends across south-eastern South Australia and south-western Victoria. The 300 hectares of farm forestry estate in this hub are located in Victoria. Data on year of planting and species information are available for this total area (Figure 9).

Figure 9 Farm forestry area in the Green Triangle hub for which year of planting is known, by plantation type



Note: Planting year is known for all the 300 hectares of farm forestry in the Green Triangle Hub. Data on the 200 hectares planted in 2021 is reported under 2016–2020.

The majority of the area (200 hectares) is *E. globulus*. The remaining area is predominately *P. radiata* (100 hectares).

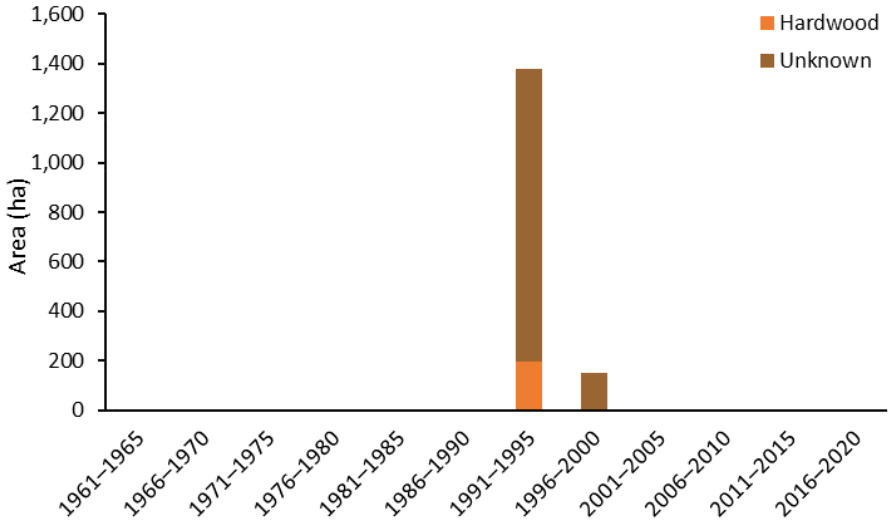
Of the total area of 300 hectares of farm forestry in this hub, 200 hectares are reported as commercial plantations in the NPI and 100 hectares are reported through the NFI as native (Table 12).

2.4.7 North Queensland

Less than half (1,500 hectares, 48%) of the 3,200 hectares of farm forestry reported for the North Queensland hub has data on year of planting. Almost all this area (1,400 hectares) was established between 1991 and 1995. Very little of the area has information on plantation type (Figure 10). No species information is available for North Queensland.

Just under half (1,400 hectares, 44%) of the total area reported in this hub represent new areas of forest that have not been previously reported as forest by the NPI or NFI (Table 12); 1,300 hectares are reported as commercial plantation by the NPI, with the balance of 500 hectares reported as native forest in the NFI.

Figure 10 Farm forestry area in the North Queensland Regional Forestry hub for which year of planting is known, by plantation type



Note: Graphic shows only the 1,500 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 3,200 hectares.

2.4.8 South and Central Queensland

The only data available for the 600 hectares of farm forestry reported for the South and Central Queensland hub are that 100 hectares are hardwood. No species information is available, nor data on year of planting. Of the 600 hectares, 200 hectares are reported as commercial plantation through the NPI and 300 hectares represent areas of forest not previously reported through the NPI or NFI (Table 12).

2.4.9 Tasmania

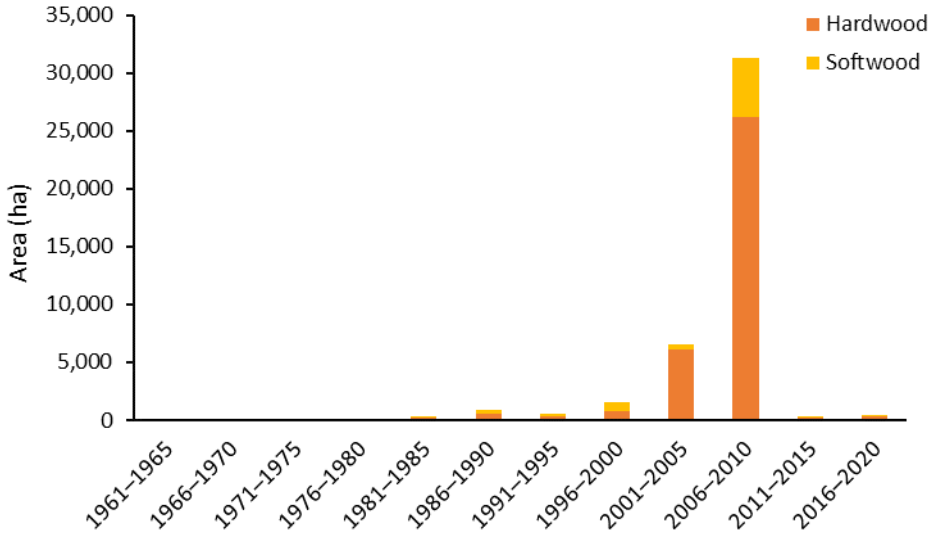
Data for year of planting (92%) and plantation type (100%) are available for almost all the 45,600 hectares of farm forestry identified in the Tasmania hub (Figure 11). Most of the resource for which data are available was established between 2001 and 2005 (6,600 hectares) and between 2006 and 2010 (31,300 hectares), under managed investment schemes (Wilson and Tys, 2020). The balance of the estate was planted variably across the 30-year period from 1971 to 2000, and between 2011 and 2020.

Most of the resource in this hub is hardwood (34,700 hectares). This was planted primarily in 2001-05 period (6,600 hectares) and 2006–10 (26,200 hectares). Of the 7,300 hectares of softwood, most (5,100 hectares) was established in 2006–2010, with 2,000 hectares planted variably between 1976 and 2000.

The majority of the hardwood species are *Eucalyptus nitens* (97%), with a further 900 hectares of *E. globulus* and the remaining 200 hectares are *E. obliqua*, *E. saligna* and *E. regnans*. The area of softwood is almost all *Pinus radiata* (99%), with the remaining area comprising *Cupressus* species.

A total of 44,700 hectares identified as farm forestry in Tasmania are reported in the NPI as commercial plantation (Table 12). A further 300 hectares were mapped as native forest, 300 hectares as other forest and 400 hectares were not mapped as forest in the NFI.

Figure 11 Farm forestry area in the Tasmania hub for which year of planting is known, by plantation type



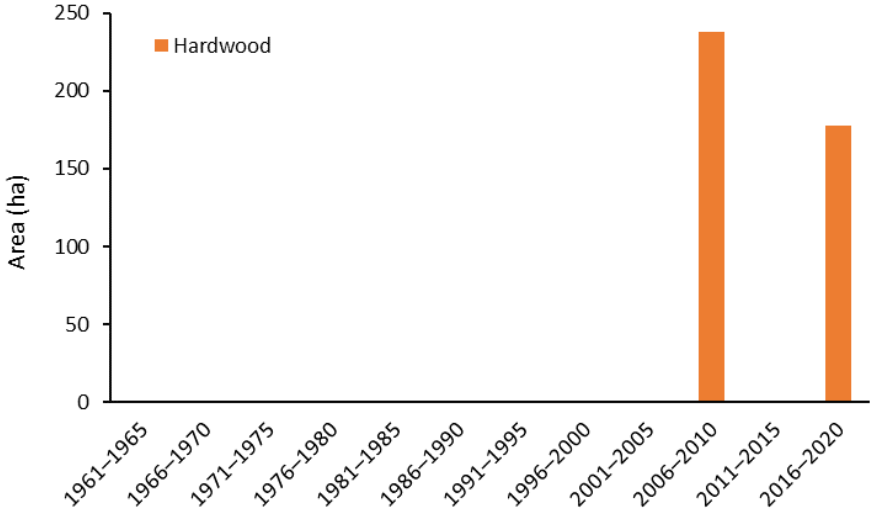
Note: Graphic shows only the 42,000 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 45,600 hectares.

The report by Wilson and Tys (2020) identifies the areas of private independent plantations in Tasmania are managed by 2,824 private independent landholders on separate landholdings or properties, which thereby meet the definition of farm forestry and not commercial plantation. The holdings are comprised of 2,248 hardwood estates and 576 softwood estates.

2.4.10 South West Western Australia

A total of 3,200 hectares of farm forestry are reported for this hub. Year of planting and species are identified for only 400 hectares (13%). Of this area, 200 hectares were planted in 2006–10, and a further 200 hectares were planted in 2016–20 (Figure 12). All 400 hectares are *E. globulus*.

Figure 12 Farm forestry area in the South West Western Australia hub for which year of planting is known, by plantation type



Note: Graphic shows only the 400 hectares of farm forestry in this hub for which planting year is known. The total area of farm forestry in this hub is 3,200 hectares.

Of the total 3,200 hectares of farm forestry in this hub, 2,800 hectares are reported as commercial plantation in the NPI (Table 12).

2.5 Farm forestry area by National Plantation Inventory regions

Almost all (96%) of the validated farm forestry estate occurs inside fourteen of the fifteen NPI regions (ABARES, 2016) in the six states of Australia (Table 13). There was no farm forestry identified as occurring in the Northern Territory NPI region. The areas of farm forestry located outside an NPI region are mostly in NSW or Queensland.

Table 13 Validated farm forestry area by state, and status inside or outside NPI regions

	Inside NPI regions		Outside NPI regions		Total farm forestry
State	Area (ha)	Proportion	Area (ha)	Proportion	Area (ha)
New South Wales	7,800	86%	1,200	14%	**9,000**
Queensland	2,700	71%	1,100	29%	**3,800**
South Australia	900	90%	100	10%	**1,000**
Tasmania	45,600	100%	0	0%	**45,600**
Victoria	10,400	97%	300	3%	**10,700**
Western Australia	3,200	100%	0	0%	**3,200**
Total	**70,600**	**96%**	**2,800**	**4%**	**73,400**

Note: Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

Two of the three NPI regions that cross state borders do not have farm forestry in one of the states comprising the region: for both the East Gippsland and Bombala NPI region, and the Green Triangle NPI region, all the farm forestry area is located in Victoria (Appendix A, Table A2). Table A2 also shows plantation type, and data availability for year of planting and species for areas of farm forestry by NPI region.

Table 14 shows the areas of farm forestry that align with areas mapped either as commercial plantation in the NPI or as native forest or other forest in the NFI, or not previously mapped as forest, by NPI region. The North Coast, Tasmania and Western Australia NPI regions have all or almost all their validated areas of farm forestry also reported as commercial plantations through the NPI. On the other hand, most of the areas of farm forestry in the Southern Tablelands and Murray Valley NPI regions align with areas of forest mapped as other forest in the NFI or not mapped as forest. Areas of farm forestry mapped as native forest in the NFI occur mostly in the Central Tablelands, Southern Tablelands and Central Gippsland NPI regions.

Table 14 Areas of farm forestry by National Plantation Inventory region and reporting status in the National Plantation Inventory and National Forest Inventory

National Plantation Inventory region	Reporting status in NPI and NFI				Total farm forestry
	Commercial plantation	Native forest	Other forest	Non-forest	
	Area (ha)				
Central Tablelands	0	900	400	900	2,200
North Coast	1,100	0	0	0	1,100
Northern Tablelands	0	0	0	500	600
Southern Tablelands	0	1,300	0	1,600	2,900
Northern Queensland	300	500	0	1,300	2,100
South East Queensland	100	100	0	300	600
Mount Lofty Ranges and Kangaroo Island	0	100	0	800	900
Tasmania	44,700	300	300	400	45,600
Central Gippsland	2,500	900	2,400	2,000	7,800
Central Victoria	0	0	0	100	100
East Gippsland and Bombala	100	100	200	0	500
Green Triangle	200	100	0	0	300
Murray Valley	100	300	1,000	1,300	2,700
Western Australia	2,800	100	100	100	3,200
External to NPI regions	1,100	200	100	1,500	2,800
Total	**53,100**	**4,800**	**4,500**	**11,000**	**73,400**

Note: Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

2.6 Management intent

The farm forestry data supplied included a variable range of attributes and a mix of data quality and collection ages. There was limited to no information directly relating to the management intent of the forest owner or manager for the trees in the farm forest estate.

It is likely that areas of farm forestry reported as commercial plantation through the NPI are managed commercially for wood production. For these cases, however, it is generally not possible to determine the silvicultural regime applied to the planted forest, and whether the trees are being managed to produce sawlogs or pulplogs, even when the plantation type (hardwood/softwood) or species is known. Investigating the proximity of components of the farm forestry estate to processing facilities may indicate the possibility of particular future commercial uses.

In some cases, satellite imagery inspected during the data validation process showed that an area identified in the supplied data as farm forestry had been recently harvested. However, it was not possible to determine whether the land was to be replanted as farm forestry, or converted to some other land use.

3 Data collection and methodology, and stakeholder feedback

3.1 Interpretation of farm forestry during data collection

The purpose of this study was to identify existing inventory data that describe Australia's farm forestry sector. The scope was trees planted on farms and other private land that are managed for their commercial potential or value in producing wood. To ensure the supply of such information, three key principles were made clear during the consultation phase:

- the term 'farm forestry' applies only to planted forest of native or exotic species, and excludes native forest
- farm forestry holdings are typically small-scale enterprises, managed either by an individual landholder (who may or may not be part of a grower cooperative or some other coordinating body), or a larger entity but for which the planted area is not the primary business focus (such as a water authority). This excludes areas of commercial plantations which typically exceed 1,000 hectares and are managed for industrial-scale wood production
- the management intent of the farm forestry estate includes wood production.

The first two principles were relatively easy to assess during the call for data and the subsequent data analysis and validation process, but management intent was less obvious. The focus on resource available for wood production was emphasised during the consultation process, to exclude as far as possible areas such as environmental plantings.

Datasets received were assessed for suitability for further analysis. This assessment included whether the area was reported as planted or could visually be assessed as planted. It was sometimes difficult to identify mature stands of native species as planted farm forestry when these were located near or adjacent to visually similar native forest.

A key criterion for farm forestry is the scale of planting. Farm forestry applies to small-scale enterprises by private landholders or businesses/organisations. These areas are distinct from the larger, industrial-scale commercial plantation estates, which typically exceed 1,000 hectares and are reported through the NPI. The project has identified that spatial data for some individual large areas of farm forestry and some aggregations of farm forestry holdings have been provided to the NPI and are thereby reported as commercial plantation; these areas were also correctly reported to this project as farm forestry. The knowledge of such experienced landholders is likely to be of considerable interest and value to regional communities seeking to expand the area of farm forestry.

3.2 Data custodians and data supplied

3.2.1 Engagement of consultants for stakeholder consultation

ABARES began this project by compiling a list of relevant forestry stakeholders and potential data providers across government, private industry, grower representatives and academia, who might have insight into data available for the farm forestry sector. ABARES promoted the project and its

proposed activities and goals through Australian industry associations (AFPA, Forestry Australia), and through the publication of articles in industry-focused media portals and newsletters.

Following discussion with stakeholders in all states and territories, ABARES subsequently contracted three consulting organisations with relevant qualifications, experience, and professional networks with sufficient reach to undertake the required data identification and sourcing activities for farm forestry inventory data. The consultants were:

- **PF Olsen Australia**, led by Stephen Rymer and David Bennett, to cover farm forestry in the Australian Capital Territory and New South Wales
- **Sylva Systems**, led by Braden Jenkin with David Geddes, Gary Featherston and David Wettenhall, to cover farm forestry in Tasmania, South Australia, Victoria and Western Australia
- **Verterra Ecological Engineering**, led by Andrew Yates and Glenn Dale, with Alex Lindsay, Ian Rob, Neil Halpin, Daryl Killin, David Skelton and Max Grimbacher, to cover farm forestry in the Northern Territory and Queensland.

3.2.2 Stakeholder provision of farm forestry data

The consulting organisations sourced data from a range of participants engaged in the farm forestry sector. To improve understanding of the sector, stakeholders were classified into four main categories.

- **Farm forest owner, grower and forestry associations** are significant sector stakeholders with substantial potential data. This group includes national peak bodies (such as the Institute of Foresters of Australia and Forestry Australia) and regional farm tree bodies and grower associations.

  The former AFG has traditionally represented small forest growers. Following an amalgamation with the IFA to form Forestry Australia, the new organisation has been in the process of seeking data from members about their respective farm forestry and native forest estates. ABARES was advised that the membership of the former AFG peaked at around 1,000 members before the collapse of managed investment schemes in 2009. Earlier RIRDC work[5] noted 20,000 farm forestry participants, including 8,000 in Victoria and 5,000 in Tasmania.

  Most regional farm tree associations also have membership data, but not necessarily data on trees planted. In some cases, membership is more focussed on permanent revegetation plantings rather than trees for commercial wood production.

- **Local, state and Australian government agencies**
  - Water authorities: The primary responsibility of water authorities is the management of water supplies, including storage, infrastructure, retail connections, and treatment and disposal of wastewater. Plantations and woodlots have been used by some

[5] Personal communication, Kevin Harding (AFG)

authorities to protect water storage areas through planted areas around reservoirs, or have used irrigated woodlots as a mechanism to manage wastewater.

- Natural Resource Management (NRM) bodies: These bodies promote NRM activities at the local level, which can include the establishment of farm forests in partnership with landholders. NRM bodies provided a range of different responses. In general, NRM bodies in Western Australia and South Australia do not hold records of small farm forestry projects. Early indications were promising with NRM bodies in Victoria and Tasmania, however the opportunity to engage fully was limited.
- Local Government: Most organisations require planning consent to change land use to forestry, even where this is a permitted land use. Planning consent is usually not necessary to revert plantations, including farm forestry, to grazing or cropping. None of the local government bodies surveyed maintained a spatial database for areas of farm forestry. In Victoria, local government bodies make use of GIS layers from the state government, however the process of capturing and managing data for planning requirements varies.
- State agencies: State and territory government agencies have at different stages undertaken farm forestry inventory activities. However, while some have endured, others have not been maintained. Data were provided where available.
- Australian Government: Forest-related datasets and information are described in four key products that are maintained at a national level by ABARES: forest cover and forest tenure under the NFI, commercial plantations under the NPI, and land use under the Australian Collaborative Land Use and Management Program (ACLUMP).

- **Forest managers and processors:** This stakeholder category potentially has knowledge of the farm forestry sector but provided limited information and data. This reflects scale, as most large forest management companies do not provide services to small farm forest owners, and processors usually do not source logs directly from individual farm forestry estates.
- **Consultants, and Landcare and other tree-planting groups:** Historical projects identified through forestry consultants, geospatial data professionals and Landcare projects were sources of some data and information, mostly in reports. Privacy and confidentiality issues related to data provision were reported by this stakeholder category. Work is required to establish the processes for overcoming these issues.

3.2.3 State-based activities relating to farm forestry programs and data

The consultation process resulted in the supply of 80 datasets together with insight and intelligence into the farm forestry sector.

- **Australian Capital Territory:** There is limited farm forestry activity in the ACT. No farm forestry inventory programs or data sources were identified.
- **New South Wales:** Preliminary contacts included universities, forestry consultants and contractors, nurseries, Landcare organisations and government agencies such as Local Land Services NSW. Several of the individuals and agencies required additional liaison to ensure successful identification of their datasets.

It became apparent that approaches to farm forestry vary significantly across New South Wales and that, even where tree establishment is funded through government initiatives, there is no consistent framework for recording data on plantings and/or evaluating the success or failure of a project. The majority of Landcare projects include reporting requirements and such reports may contain additional information about trees planted on farms. Landcare groups may therefore be a valuable source of data.

Seventeen datasets were identified for New South Wales from 76 contacts. Nine of these datasets were spatially referenced.

- **Queensland and the Northern Territory:** Based on previous ABARES data-sourcing exercises for the NFI and NPI, as well as sector and primary stakeholder knowledge, the consultancy team concentrated on government agencies, individual forest growers, grower groups and associations, and companies and businesses for Queensland and the Northern Territory.

  The stakeholders consulted indicated reliable farm forestry information existed for the early 2000s, but much of this information is now out of date. Some updated data were identified, primarily from government-led investments and commercial initiatives. However, repeated inventory of forest stands is no longer common, so there are no ancillary data on current size, growth rate, or stand condition.

  Industry knowledge led to a database owned and administered by the Queensland Department of Agriculture and Fisheries (DAF) Forest Research and the University of the Sunshine Coast (USC). The database contains 30 years of data on growth rates, timber products, carbon sequestration, and the effects of management, pests, disease, and climate on stand condition across Queensland, the Northern Territory and areas of northern New South Wales. However, access to the database was denied due to privacy issues.

  Two contacts were identified for Queensland, resulting in 11 spatial datasets.

- **South Australia, Tasmania, Victoria and Western Australia:** A total of 223 potential farm forestry contacts were identified across South Australia, Tasmania, Victoria, and Western Australia. The majority were businesses and industry or grower associations. Of these, 98 contacts confirmed that they have datasets covering farm forestry sector, resulting in 41 datasets. Thirty-one of these were spatial datasets.

Of the 80 datasets provided, 40 were spatially referenced and described areas within scope as farm forestry (candidate datasets). Farm forest owners, grower and forestry associations supplied 65% of the candidate datasets, and represented the largest area before validation (Table 15). Government agencies provided three datasets, representing a large portion of the area, much of which was from a Tasmanian state government forestry agency.

Table 15 Number of datasets and area of farm forestry area described, by stakeholder category

Stakeholder category	Number of datasets	Sum of dataset areas (hectares)
Farm forest owners, grower and forestry associations	26	180,900
Local, state and Australian government agencies	3	138,800
Forest managers and processors	7	13,200
Consultants, Landcare and other tree-planting groups	4	5,000
Total area assessed as useful for further investigation	**40**	**337,800**

Note: Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

Some 'orphaned' datasets also exist, resulting from program discontinuation and staffing changes. Information for historic projects may exist across several individuals or organisations. Where possible, these datasets have been identified and further consultation may result in access.

Real estate agencies active in the agricultural and forestry sector were also contacted. Some of these businesses have extensive networks of serviced farm forestry landowners and internal databases identifying farm forestry properties, but confidentiality precluded any further engagement.

3.2.4 Coordination among growers

The stakeholder consultation process engaged a diverse group of forestry sector stakeholders, both individuals and organisations. The majority of stakeholders recognised the value of being a member of a grower association or group, although some perceived the benefits to be limited to informal meetings and discussions, and not always providing access to the appropriate level of technical advice and support. Several grower groups were identified as having strong credentials and able to act as a representative voice for their members. These groups were coordinating the sourcing and sharing of machinery and equipment among members, as well as organising training in silvicultural techniques and providing market access support.

Limited information was sourced from grower associations maintaining farm forestry inventory data. Data held by associations primarily captured member identities and contact details, but not the nature of their farm forestry enterprises such as area planted, species, commercial value, or management intent.

Most data provided to ABARES came from historical inventory projects, with fewer datasets sourced from grower associations, tree management companies or regional consultants, and only in a few cases directly from landowners.

3.3 Spatial data assessment and validation process

Most data made available for the project was a result of the stakeholder consultation process. However, the data supplied varied in type and quality. Extensive analysis was required to assess the accuracy and the attributes of the datasets, and to determine the extent and distribution of farm forestry in Australia described by these datasets. Existing ABARES spatial datasets were used to provide context and aid validation of the supplied datasets.

3.3.1 Farm forestry data types

Spatial farm forestry data were supplied as either polygon or point data. Polygon datasets describe the spatial boundaries of an area of farm forestry, with its geographic location and area. Point datasets identify a single geographic location associated with an area of farm forestry, but not its spatial boundary. Some point datasets included a farm forestry area statement connected to that point.

Non-spatial farm forestry data were supplied as tabular data, descriptive text, or hand-drawn or digital maps. These data formats did not contain latitude and longitude to enable geolocation or spatial analysis. These data were not used, as it could not be determined whether they overlapped datasets supplied by other stakeholders, nor could not they be spatially validated as currently reflecting farm forestry. Some of these datasets hold data on area, species and stand type and could potentially, with further work, contribute to the stocktake of farm forestry knowledge.

The raw spatial data comprised 50 datasets. The total area described as potential farm forestry was 416,500 hectares, with a range of attributes and collection dates. After excluding low-quality data and datasets not related to farm forestry, the 40 datasets assessed for further investigation as candidate farm forestry comprised 337,800 hectares (Table 15), with 324,800 hectares from 34 polygon datasets and 13,000 hectares from six point datasets (Table 16). These datasets were estimated to represent 3,000 landholders, based on 2,824 landholders in Tasmania and in the order of a further 180 participants estimated across the other regional areas in each of the states.

The process used to assess these input datasets and reach the final validated 73,400 hectares of farm forestry is explained in Section 3.3.3 and summarised in Table 16.

3.3.2 Datasets used to validate the supplied farm forestry datasets

The following spatial datasets were used as part of the process to validate data supplied for this project:

- *Forests of Australia (2018)*[6]
- *Tenure of Australia's Forests (2018)*[7]
- *Australia's plantations 2016*[8]
- *Catchment scale land use of Australia—Update December 2020*[9]

The *Forests of Australia (2018)* and *Tenure of Australia's forests (2018)* datasets are key datasets assembled in the NFI. The NFI is the repository for national data about Australia's forests. Data is supplied to the NFI by state, territory and Australian government agencies, and integrated into national data products using national classifications. ABARES is the custodian of the NFI.

Australia's plantations 2016 is a spatial dataset of commercial plantations. It was developed from spatial data supplied by plantation growers and managers, under the auspices of the NPI. It builds on information obtained for previous releases of this dataset every five years, and is managed by

[6] awe.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/forest-cover

[7] awe.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/forest-tenure

[8] awe.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/australias-plantations

[9] awe.gov.au/abares/aclump/catchment-scale-land-use-of-australia-update-december-2020

ABARES. *Australia's plantations 2021* spatial dataset was not available to incorporate into the spatial analysis undertaken for this project.

The *Catchment scale land use of Australia—Update December 2020* dataset (CLUM) is the national compilation of catchment-scale land-use data for Australia. It is a product of the Australian Collaborative Land Use and Management Program (ACLUMP), a consortium of Australian, state and territory government partners, coordinated by ABARES. It was used to exclude supplied farm forestry data that occurred in intensive land-use areas. Intensive land-uses are grouped under Class 5 in the Australian Land Use and Management Classification version 8[10] used in CLUM.

Satellite imagery was used in the data validation process in conjunction with the above spatial datasets, including Bing Maps and Google Earth, using time-series data where available.

3.3.3 Spatial data assessment and validation process

The sum of the areas described by the 50 polygon and point datasets supplied for this project was 416,500 hectares. A process of review, exclusion and validation of these data was undertaken, resulting in the final validated farm forestry area of 73,400 hectares. This process, summarised in Table 16 and Appendix E, was as follows.

1) Locate and procure candidate farm forestry data

    i. Data describing areas of farm forestry were obtained from a range of sources between May and August 2020.

    ii. Non-spatial data, including areas reported in tables, text in documents and hardcopy maps, were not included to avoid possible double counting.

    iii. Spatial data included both polygon data (where the boundary of the farm forestry polygon defines the enclosed area) and point data (where a single point locates farm forestry but its boundaries are not described; an area statement may be attached).

    Result: sum of areas of individual spatial datasets = 416,500 hectares.

2) Perform initial assessment of data quality

    Datasets were assessed and rated, where 5 = best, 0 = worst, against the following criteria:

    i. Spatial accuracy (polygons closely aligned with farm forestry areas visible and points were 500 metres of farm forestry as visible on satellite imagery)

    ii. Age of dataset (more recent considered more reliable)

    iii. Attributes within the dataset (more relevant attributes were considered more desirable; relevant attributes were year of establishment, plantation type, and species).

    Datasets rated 3, 4 or 5 were utilised; those rated 0, 1 or 2 were discarded.

    Point datasets without an area statement were discarded.

    Datasets describing environmental plantings, carbon sequestration plantings, sandalwood, oil mallee and private native forestry were excluded as not representing farm forestry. This

[10] awe.gov.au/abares/aclump/land-use/alum-classification

was determined by reading the metadata supplied with datasets, examining attributes within datasets and examining satellite imagery. Environmental plantings tend to be non-uniform in appearance and often placed in the landscape to control erosion or manage water tables. Carbon sequestration plantings were also typically non-uniform in appearance.

Result: sum of areas of individual retained spatial datasets = 337,800 hectares.

The resultant 337,800 hectares were intersected with the spatial coverage in the NPI 2016 dataset. A total of 278,700 hectares of candidate farm forestry areas were identified as also being reported through the NPI. These areas were processed separately from the 52,500 hectares of candidate farm forestry areas not reported through the NPI.

3) Areas also reported through the *Australian Plantations 2016* (NPI) dataset as 'Commercial plantation'

Potential farm forestry also reported through the NPI = 285,300 hectares.

a. Retain only farm forestry plantings:

i. Plantings managed by individuals or small companies.

ii. Plantings of total area less than 1,000 hectares, calculated by company/owner, identified from data custodians.

iii. Plantings established under managed investment schemes in Tasmania that are now identified as farm forestry, as advised by the data custodian (45,300 hectares).

This excludes areas reported through the NPI that are large-scale commercial plantations, not considered to be farm forestry on above criteria. However, it is possible that limited information may have led to the inadvertent exclusion of some areas of farm forestry, including 600 hectares in north-east NSW.

Result: candidate farm forestry areas = 57,300 hectares.

b. Consider areas on basis of tenure and land use:

i. Retain areas on Private or Leasehold land tenure (*Tenure of Australia's forests 2018*).

ii. Exclude areas of intensive land-use (urban, industrial and transportation zones, from *Catchment scale land use of Australia—Update December 2020*).

Result: validated farm forestry also reported through the NPI = 53,100 hectares.

4) Areas not reported through the *Australian Plantations 2016* (NPI) dataset

Potential farm forestry not reported through the NPI = 52,500 hectares.

a. Retain areas with high-quality input data.

Spatially intersect all datasets.

i. Where polygon datasets overlap, retain more recent dataset or dataset with better spatial accuracy as judged using independent imagery.

ii. Retain polygon datasets in preference to point datasets where they overlap.

iii. Remove road and conservation/management areas where relevant data were included in datasets.

Result: high-quality data = 51,000 hectares

b. Consider areas on basis of tenure and land use.

   i. Retain areas on Private or Leasehold land tenure (*Tenure of Australia's forests 2018*).

   ii. Exclude areas of intensive land-use (urban, industrial and transportation zones, from *Catchment scale land use of Australia—Update December 2020*).

   Result: high-quality data on appropriate tenure and land use = 40,700 hectares.

c. Visually validate datasets using recent, high-resolution satellite imagery, Google Earth Pro and *Forests of Australia (2018)* forest cover.

   i. Visual validation was undertaken on a portion of individual polygons and points within each dataset to ascertain that the datasets did describe farm forestry. Datasets were discarded if no farm forestry was geographically close to the area or point location identified in the datasets. Point data were often not located directly over a farm forestry area, but were usually within a fixed distance associated with spatial projection differences or rounding of coordinates.

   Area statements associated with point datasets were assessed by measuring the approximate area of associated farm forestry on high-resolution imagery. With some points and datasets it was difficult to tell which group of trees were associated with which area statement; in such cases, the area statement value used was that supplied.

   ii. Make minor modifications by excluding horticulture, houses, gardens, roads, stream revegetation, wind breaks, and areas cleared of trees for more than five years (identified using time-series data in Google Earth Pro).

Result: 20,300 hectares.

This process gave a total of 73,400 hectares of validated farm forestry, used for analysis in this report.

Table 16 Data processing to produce validated farm forestry area data

Step	Activity	Polygon	Point	Total
		Area (ha)		
1	Spatial data supplied	336,300	80,200	416,500
2	Exclude low-quality data and datasets not related to farm forestry	324,800	13,000	337,800
3	Areas within *Australian Plantations 2016* (NPI) dataset	278,700	6,600	285,300
	a. Retain candidate farm forestry areas	54,800	2,500	57,300
	b. Retain areas on private/leasehold land; exclude areas of intensive land-use	51,600	1,500	53,100
	Total reported as 'Commercial plantation' within the *Australian Plantations 2016* dataset	51,600	1,500	53,100
4	Areas outside the *Australian Plantations 2016* dataset	46,100	6,400	52,500
	a. Retain areas with high-quality input data	44,600	6,400	51,000
	b. Retain areas on private/leasehold land; exclude areas of intensive land-use	34,500	6,200	40,700
	c. Retain areas visually validated using satellite imagery	14,500	5,800	20,300
	Validated total not reported as 'Commercial plantations' through the *Australian Plantations 2016* dataset	14,500	5,800	20,300
	Validated total	**66,100**	**7,300**	**73,400**

Note: Areas are rounded to nearest hundred hectares

4 Discussion and recommendations

Farm forestry stakeholders in the farm forestry sector were enthusiastic as to the project's scope and potential outcomes, and provided valuable feedback, insight, and data about the sector. Even with a short consultation period (May to September 2020), it was clear that knowledge and data describing this sector are highly fragmented, non-uniform in terms of the attributes describing forest resources, and with varying historical coverage and currency. The farm forestry sector has a large number of participants, many of whom were previously unreported or not captured in other forest data inventories.

4.1 A nationally agreed definition for farm forestry

A common message conveyed by stakeholders was the lack of a commonly accepted definition for farm forestry. Acceptance and implementation of a common definition of farm forestry by the wider forest industry, the farm sector and other stakeholders would enable the development of a more structured and consistent approach for sector development as well as for future farm forestry inventory work.

The definition of farm forestry used in this project (see Section 1.2) is:

> Establishment or management of planted trees, usually in rows and which meet the definition of forest, with timber production as a primary management intent, on individual private landholdings with a total area of plantings usually less than 1,000 hectares.

This definition is based on that used in the first National Farm Forest Inventory (Wood et al., 2001), which describes farm forestry as:

> 'applying to plantations that are owned outright by individuals with total plantation estates less than 1,000 hectares. It does not include other recognised elements of farm forestry such as private native forest management, and joint ventures and annuity schemes',

and is a subset of the definitions in *Australia's forests and forestry glossary* (ABARES 2020b):

> 1. Establishment or management of trees or forest stands (either plantation or native forest) on private agricultural land, generally for commercial benefit including wood production but also for farm management, environmental or aesthetic reasons.
> 2. A land use system that integrates trees with agricultural crops or animals in the same land management unit.

The ABARES glossary definition would be strengthened by noting that, for planted stands, the term 'farm forestry' applies to areas generally less than 1,000 hectares, to differentiate farm forestry from larger-scale industrial commercial plantations.

The National Farm Forestry Program 1993 defined farm forestry as "…the incorporation of commercial tree growing into farming systems. It can take many forms: plantations on farms; woodlots; timberbelts; alleys and wide-spaced tree plantings" (DAWR 2019). The former Australian Forest Growers (AFG, now Forestry Australia) define farm forestry as "the commitment of resources by farmers, alone or in partnerships, towards the establishment or management of forests on their

land"[11]. The AFG also note that most definitions of farm forestry cover the function, location or arrangement of trees (plantation on farms, woodlots, timber belts, alleys, wide-spaced plantings and native forests), and emphasise expected benefits for farmers, stock and the environment such as shelter for stock and crops, water table and salinity control, soil conservation and a supplementary source of income through wood sales. In this work, farm forestry comprises only planted forests on farms; management of native forests on farms for wood production is included in a separate report on private native forestry.

Further discussions may be needed on components of the farm forestry sector outside the national definition of forest, such as oil mallee plantings or widely spaced plantings.

The consolidation of the above into a nationally agreed definition of farm forestry, that captures the wide array of planted forests grown with wood production as one of the management objectives, will improve transparency and consistency for future data collection processes.

4.2 Overlap between farm forestry and areas reported through the National Plantation Inventory and National Forest Inventory

The classification system of the NFI contains three national categories, 'Native forest', 'Commercial plantation', and 'Other forest'. The 'Other forest' category was developed to include various types of forest, mostly non-commercial plantations and planted forests of various types. Farm forestry, with landholdings of less than 1,000 hectares, could therefore be expected to be reported through the NFI forest category 'Other forest'.

The NPI reports on commercial plantations managed by industrial-scale forest management organisations (see full definition on p.vi). As such, it is not expected to include farm forestry holdings owned by small private landholders with plantation estates typically less than 1,000 hectares. However, it has become apparent through this project that certain areas reported through the NPI are areas that meet the definition of farm forestry. The 53,100 hectares of farm forestry reported in this work (72% of the total reported area of farm forestry) that are also present in the NPI are likely to represent areas of farm forestry owned by individual landholders, but reported to the NPI as part of aggregated datasets.

Areas considered to be commercial plantations were excluded as part of the farm forestry data validation process. However, it is likely that some small areas of plantation on private individual landholdings but reported through the NPI may have inadvertently been excluded from the farm forestry dataset due to limited information available to validate these areas as farm forestry. Further investigation of areas reported in the NPI could reveal additional areas of farm forestry.

Of the 53,100 hectares previously been reported as commercial plantations through the NPI, 44,700 hectares corresponds to approximately 2,800 properties in Tasmania (Wilson and Tys, 2020) and, based on their individual scale, are likely to correctly represent farm forestry. Further investigation is needed to understand the status of the other 8,400 hectares of farm forestry reported

[11] awe.gov.au/agriculture-land/forestry/policies/rfa/publications/deferred/wood-paper/plantations-farm

as commercial plantations through the NPI. As the data were supplied to this work as areas of farm forestry, the expectation is that these areas do indeed represent the farm forestry sector.

Further investigation is warranted for areas of farm forestry previously mapped in the NFI as native forest. There are a number of possible explanations, some of which might see the area remain classified as farm forestry, as described in Section 2.2.

The area of validated farm forestry in each Regional Forestry Hub, by reporting status in the NPI and NFI (Table 12), provides an insight into the variability associated with the reported areas of farm forestry. The Gippsland hub, for example, has a mix of arrangements with areas reported previously as commercial plantations through the NPI (2,600 hectares), or as native forest (1,100 hectares) or other forest (2,600 hectares) through the NFI, and areas that have not previously been identified in the NPI and NFI as forest (2,000 hectares). Reconciling these various areas will be regionally important.

These outcomes each require further investigation to better understand and, where appropriate, consider mechanisms to reconcile any issues for future reporting arrangements of areas of farm forestry currently also reported through the NPI and NFI. Establishing a system to enable reporting of these areas in the 'Other forest' category of the NFI will be important in consolidating the characterisation of Australia's farm forestry estate. Similarly, there may need to be a mechanism by which areas known to be farm forestry that are reported in the NPI are attributed within the NPI as farm forestry. Key to all considerations is the prevention of double counting of areas of farm forestry between the NPI and the NFI.

Preparation of the 2021 spatial update of the NPI was undertaken at the time of the preparation of this report. A reconciliation will be needed between the new data reported through that NPI update and the spatial data collected and reported for farm forestry as part of this project.

4.3 Coordination at regional and national levels for measurement and reporting

The numerous grower associations active throughout forestry regions generally do not include inventory as a regular activity or priority. In some cases, associations have ceased to exist or have been incorporated into other structures, resulting in loss of historical datasets. The development of agreed inventory protocols and guidelines for grower associations would create efficiencies and benefits for consistent reporting and analysis.

A variety of government agencies have over time collected farm forestry data for the purpose of complying with state government regulations (e.g. Plantation Development Notices under planning laws in Victoria). Such data have been generally collected and managed at the state level, and compiled into purpose-built datasets without use of consistent attributes. The same applies to numerous other projects and inventory work completed across the country. The development of ongoing coordination among various parties to assemble and standardise the available information would create enduring efficiencies and economic benefits.

The development of Regional Forestry Hubs under the National Forest Industries Plan has given considerable momentum and activity at the local level towards building economic opportunities for forestry communities and stakeholders, and to a strong demand for information about the forest

resource, including farm forestry. The hubs are currently organising activities for data identification and resource inventory, as well as identifying and addressing skills-related issues. There is an opportunity for these hubs to plan and coordinate enduring farm forestry resource inventory activities to enable the collection of regional data using consistent inventory processes, data collection procedures and data attributes into the future.

Initiatives to create a nationally coordinated approach implemented at the regional level can include:

- development of protocols for ongoing data collection programs that ensure that data are made available in an enduring manner
- identification of a long-term, enduring national data repository or archive system for farm forestry data, especially for data collected by publicly funded projects
- mechanisms for incorporation of data into established forest information reporting processes
- agreement on minimum farm forestry data attributes required for industry development
- the inclusion of sunset clauses specifying ownership of data and intellectual property after project completion.

4.4 Reconciliation of errors

Errors were observed during the data investigation and validation processes. These included the incorrect location of farm forestry polygons, such that they were positioned over native forest instead of nearby farm forest areas; and areas of farm forestry observed in satellite imagery that had not been mapped for the project. They also included small areas of native forest growing on embankments and easements within some farm forestry plantings that were reported as farm forestry. Correction of errors identified in the supplied spatial boundary data during the data investigation and validation process was outside the scope of the project. Thus, areas of apparent farm forestry identified visually from satellite imagery were not included in the final figures, and areas of native forest fully contained within farm forestry polygons were not excluded.

Issues were also identified with some of the point data supplied for the project which, if addressed, could have removed errors of omission and commission and refined the reported areas of farm forestry. Some point data contained a linked area statement but did not specify the associated property boundary. For example, further investigation of 600 hectares of hardwood farm forestry supplied as point data for north-east New South Wales could result in an increase in the total validated area of farm forestry. Comparison of these point data with satellite images revealed areas of adjacent planted forestry, but at times the geographic locations of the points were instead located in nearby native forest or in areas identified as commercial plantation, rather than on the observed farm forestry planting.

Another explanation for areas of farm forestry that overlap with native forest in the NFI is that the area planted with native hardwood eucalypt species may have grown and matured such that the plantings are now visually indistinguishable from mature native forest. This especially could occur in areas in which the farm forest holding is adjacent to native forest. A portion of the 4,800 hectares of farm forestry that correspond with areas mapped as native forest in the NFI were indeed identified areas of native forest. This latter issue supports the need for a consistent and well understood national definition for farm forestry.

4.5 Identification of additional areas of farm forestry

Additional data collection, validation and refinement may identify additional farm forestry areas or increase the accuracy of the data presented in this report.

Inspection of satellite imagery during the area validation process revealed additional farm forestry plantings in areas not captured in the data supplied to this project. Ancillary data from the *Catchment scale land use of Australia—Update December 2020* dataset and other products suggest that these further areas of farm forestry may be in the order of 60,000 hectares (Table 17), but no further information is yet available. The creation of new spatial data to map farm forestry areas detected visually on satellite images during the data validation process, but not currently mapped as farm forestry, was outside the scope of the project.

Any future consultation with stakeholders on additional areas of farm forestry could usefully include questions to obtain further detail about management intent for farm forestry holdings. For example:

- Is the farm forestry area intended for commercial harvesting?
- What is the date of planting, plantation type, species and management practices?
- Is the farm forest still standing and, if so, what is its condition? If it is not still standing, then has it been cleared for more than 5 years?

Examples of data gaps identified during the investigation, with associated opportunities to improve the data, are presented in Table 18.

Table 17 Potential additional areas of farm forestry

Information gaps	Nominal area (ha)*
Fallow forest areas currently classified as non-forest but for which replanting is planned.	2,000
'Plantation' areas identified in the *Catchment scale land use of Australia—Update December 2020* dataset but outside the data collected for this project, indicating possible additional farm forestry areas.	50,000
Additional areas of farm forestry observed during the validation process (such as in the Adelaide Hills) but not included in this project. The areas could be captured remotely using satellite imagery and through direct contact with relevant regional stakeholders.	5,000
Non-spatial datasets supplied for the project that remain to be analysed.	5,000
Total	60,000

* Figures are estimates based on preliminary assessments and non-spatial datasets. Totals may not tally due to rounding.

Table 18 Steps to address information gaps in existing farm forestry data

Information gaps	Solutions
Digitise point datasets	Digitise farm forestry boundaries relating to point datasets using high-resolution satellite imagery. This will improve area values and reduce inaccuracies to provide an improved product.
Improve polygon boundary accuracy	Edit supplied polygon boundary data where it does not exactly match farm forest boundaries. This will exclude areas that are not farm forestry (e.g. native forest or paddock) and include areas immediately adjacent to identified farm forestry that are not captured in the dataset. This will improve area values and reduce inaccuracies to provide an improved product.
Improve accuracy of National Forest Inventory (NFI)	Digitise boundaries of farm forestry from point locations, and edit supplied polygons, to feed into the NFI, enabling accurate allocation of forest categories, particularly the 'Native forest' and 'Other forest' categories.

4.6 Recommendations and future approaches to farm forestry inventory programs

Recommendations from the project will assist governments, landowners and managers in deciding next steps in data collection and management required for determining the potential for farm forests to produce commercial wood supplies and contribute to regional economies. The recommendations would also deliver on the policy requirement for data to support farm forestry analysis and development, as well as other matters including carbon, water, agricultural stewardship and soil management. Such data will also support the agricultural sector and regional industry more broadly in planning and decision-making.

Terms and definitions. A nationally standardised framework of terms and definitions is required to enable the efficient and effective collection, collation and analysis of consistent information on areas of farm forestry in Australia for regional and national reporting.

Farm forestry inventory. This project has revealed the area of farm forestry described by historic available inventory data, in the knowledge that this is only a subset of the total farm forest estate in Australia. Future policy development for the sector would require completion of the regional farm forestry resource knowledge base; demand for more complete information also comes from regional stakeholders and Regional Forestry Hubs. This information would set a baseline for monitoring trends, inform whether policy programs are having the desired impacts, determine the potential for sector growth, and determine the capacity of the sector to produce commercial wood supplies.

If a more accurate estimate of the area and attributes of farm forest plantations in Australia is therefore deemed valuable, then a number of inventory activities could usefully be undertaken. Three components are proposed, based on current processes:

- Further analysis of the 73,400 hectares identified in this project to understand better the status of some of these areas, particularly those mapped as 'Native forest' by the NFI.
- Using ancillary datasets and remote sensing products to determine the status of areas that might represent farm forestry and observed visually on satellite images during the data validation process, but which were not present in the provided datasets. This includes validation of a potential area of up to 60,000 hectares identified as plantings in the Catchment Scale Land Use of Australia dataset, and correction of boundary errors observed during the validation process for other datasets.
- Collection of new inventory data, coordinated through the Regional Forestry Hubs developed under the National Forest Industries Plan. These hubs are well-placed to take a lead role in completing the collection and coordination of regional farm forestry data and information, including management intent and productivity metrics. Field visits and coordination with local growers may be necessary to verify the status of existing and new farm forests in regions with higher levels of establishment and management activities.

Ongoing programs of data acquisition. There is a lack of coordination at local, state, territory and national levels regarding the availability, management and use of farm forestry data, particularly regarding small-scale farm forestry activities. Depending on the results of the initial inventory described above, on the policy need for information on trends over time, and the commercial relevance of the farm forestry estate, ongoing programs of farm forestry data acquisition could be developed with the following attributes:

- A national agreed set of guidelines for measuring, collecting and reporting data and information on farm forestry, together with a minimum set of metrics such as area, year of planting, species, silvicultural treatment and management intent.
- An enduring national repository for all farm forestry data, developed in partnership with farm forest growers, managers and/or regional coordinators, and state and territory agencies, to provide a centralised and coordinated location for collected data. The NFI and NPI provide established models, with data protocols, and partnership arrangements for stakeholder engagement.
- A range of government agencies collect data to comply with state-based regulations and reporting requirements. These data are variably managed and not usually centralised, but could be a useful addition to farm forestry inventory coordination processes.
    - Organisations that collect and manage long-term farm forestry data require consistent protocols and enduring data licence agreements to ensure the ongoing utility of such data. Project agreements for publicly funded farm forestry projects should specify data management arrangements that endure after project closure, since most are finite in duration and the priorities of government and other support agencies shift over time.
    - The alternative to agreed routine data collection methodologies and a data repository would be repeated data projects such as this study. However, infrequent and individual projects would not be able to collect data capable of demonstrating trends over time in the farm forestry estate.
    - Remote-sensing information can also be used to identify land-use change and keep inventory data current. This would require development of a program that draws farm forestry information from recurrent remote-sensing data flows.
- Collaboration of the Regional Forestry Hubs with state bodies with farm forestry interests, and with national organisations such as the Forestry Australia as the peak body for farm forestry in Australia, and the National Farmers Federation, could enhance access to farm forestry data held by the broader farming community, particularly small-scale farm forestry enterprises not linked to larger programs.
    - Private grower associations can have relatively short lifespans and may lack governance capabilities, and could benefit from the connection to organisations with longevity such as national forest inventory programs, and representative bodies such as Forestry Australia. Feedback provided by consultant groups regarding small-scale farm forestry properties also suggested that participation by Forestry Australia in data discovery would be more likely to yield information about these areas.

Appendix A – Knowledge of farm forestry attributes by region

Table A1 Knowledge of attributes for areas of farm forestry, by Regional Forestry Hub and state

Regional Forestry Hub	Year of planting		Plantation type			Species		Total
	Known	Unknown	Hardwood	Softwood	Unknown	Known	Unknown	
	Area (ha)							
New South Wales	**5,600**	**3,400**	**3,100**	**5,300**	**600**	**8,500**	**500**	**9,000**
Central West NSW	600	1,300	0	1,900	0	1,900	0	1,900
Murray Region [a]	600	0	200	300	100	600	0	600
North East NSW	1,100	100	1,100	0	100	800	400	1,200
South East NSW [b]	900	2,000	0	2,900	0	2,900	0	2,900
External to Hubs	2,400	100	1,800	300	400	2,400	100	2,500
Queensland	**1,500**	**2,300**	**400**	**0**	**3,400**	**0**	**3,800**	**3,800**
North Queensland	1,500	1,700	200	0	3,000	0	3,200	3,200
South and Central Queensland	0	600	100	0	500	0	600	600
External to Hubs	0	0	0	0	0	0	0	0
South Australia	**100**	**1,000**	**0**	**1,000**	**100**	**0**	**1,000**	**1,000**
Green Triangle [c]	0	0	0	0	0	0	0	0
External to Hub	100	1,000	0	1,000	100	0	1,000	1,000
Tasmania	**42,000**	**3,600**	**37,500**	**8,200**	**0**	**41,300**	**4,400**	**45,600**
Tasmania	42,000	3,600	37,500	8,200	0	41,300	4,400	45,600
External to Hub	0	0	0	0	0	0	0	0
Victoria	**8,000**	**2,700**	**2,100**	**5,200**	**3,400**	**1,800**	**8,900**	**10,700**
Gippsland	6,100	2,200	1,700	3,800	2,800	800	7,500	8,300
Green Triangle [c]	300	0	200	100	100	300	100	300
Murray Region [a]	1,400	200	100	1,300	200	500	1,000	1,500
South East NSW [b]	0	0	0	0	0	0	0	0
External to Hubs	200	400	100	100	400	200	300	600
Western Australia	**400**	**2,800**	**400**	**0**	**2,800**	**400**	**2,800**	**3,200**
South West WA	400	2,800	400	0	2,800	400	2,800	3,200
External to Hub	0	0	0	0	0	0	0	0
Australia	**57,600**	**15,800**	**43,400**	**19,700**	**10,300**	**52,000**	**21,400**	**73,400**
Total Hubs	55,000	14,400	41,500	18,400	9,400	49,400	20,000	69,300
External to Hubs	2,700	1,400	1,900	1,300	900	2,600	1,500	4,100

[a] The Murray Region Regional Forestry Hub crosses the border between New South Wales and Victoria.
[b] The South East New South Wales Regional Forestry Hub includes the Australian Capital Territory, and a small area of north-east Victoria.
[c] The Green Triangle Regional Forestry Hub crosses the border between South Australia and Victoria.
Notes:
Validated farm forestry data were not available for the Australian Capital Territory, the Northern Territory, or for the area of the Northern Territory and Ord Valley Regional Forestry Hub in Western Australia.
Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

Table A2 Knowledge of attributes for areas of farm forestry, by National Plantation Inventory region

National Plantation Inventory region	Year of planting		Plantation type			Total
	Known	Unknown	Hardwood	Softwood	Unknown	
	Area (ha)					
New South Wales	**5,600**	**3,500**	**3,100**	**5,300**	**600**	**9,000**
Central Tablelands	900	1,300	200	1,900	100	2,200
East Gippsland and Bombala [a]	0	0	0	0	0	0
Murray Valley [b]	1,000	0	500	400	100	1,000
North Coast	1,100	0	1,100	0	0	1,100
Northern Tablelands	500	100	500	0	100	500
Southern Tablelands	900	2,000	0	2,900	0	2,900
External to NPI regions	1,200	0	800	200	300	1,200
Queensland	**1,500**	**2,300**	**400**	**0**	**3,400**	**3,800**
Northern Queensland	1,500	600	200	0	1,900	2,100
South East Queensland	0	600	100	0	400	600
External to NPI regions	0	1,100	0	0	1,100	1,100
South Australia	**100**	**1,000**	**0**	**1,000**	**100**	**1,000**
Green Triangle [c]	0	0	0	0	0	0
Mount Lofty Ranges and Kangaroo Island	0	900	0	900	0	900
External to NPI regions	100	0	0	0	100	100
Tasmania	**42,000**	**3,600**	**37,500**	**8,200**	**0**	**45,600**
Tasmania	42,000	3,600	37,500	8,200	0	45,600
External to NPI region	0	0	0	0	0	0
Victoria	**8,000**	**2,700**	**2,100**	**5,200**	**3,400**	**10,700**
Central Gippsland	5,800	2,000	1,600	3,500	2,700	7,800
Central Victoria	100	0	100	0	0	100
East Gippsland and Bombala [a]	300	100	100	300	100	500
Green Triangle [c]	300	0	200	100	0	300
Murray Valley [b]	1,500	200	100	1,400	200	1,700
External to NPI regions	0	300	0	0	300	300
Western Australia	**400**	**2,800**	**400**	**0**	**2,800**	**3,200**
Western Australia	400	2,800	400	0	2,800	3,200
External to NPI region	0	0	0	0	0	0
Australia	**57,600**	**15,800**	**43,400**	**19,700**	**10,300**	**73,400**
Within NPI regions	56,400	14,300	42,700	19,500	8,500	70,600
External to NPI regions	1,300	1,500	800	200	1,800	2,800

[a] East Gippsland and Bombala NPI region crosses the border between south-east New South Wales and east Victoria.

[b] Murray Valley NPI region crosses the border between southern New South Wales and north-east Victoria.

[c] Green Triangle NPI region crosses the border between south-east South Australia and south-west Victoria.

Notes:

Validated data were not available for the Australian Capital Territory or the Northern Territory.

Areas are rounded to nearest hundred hectares. Totals may not tally due to rounding.

Appendix B – Farm forestry reports and data

ABARES maintains a variety of well-documented spatial and tabular datasets that have been developed over the last two decades as part of the National Forest Inventory (NFI) and the National Plantation Inventory (NPI). Historical and current inventory data are derived from state, territory and Australian government agencies, and private plantation growers and managers, as the result of well-established stakeholder consultation processes and data sourcing, management, and analysis systems. Table B1 and Table B2 summarise the main ABARES datasets and published reports identified for this project, while Table B3 lists publications and reports relevant to the farm forestry sector in Australia identified from a literature review and web search.

Table B1 ABARES national datasets describing forest resources relevant to farm forest inventory

Dataset	Year	Data	Attributes and individual dataset components
National Forest Inventory [a]	2018	Spatial and tabular data	Forest area by tenure, forest categories and forest type Indigenous land and forest estate Forest area by height and crown cover categories Wood production, saw log yields, commerciality
National Plantation Inventory [b]	2016	Spatial data (every five years)	Commercial plantation area by species, plantation type, year of planting; wood supply forecasts
	2016–2019	Tabular data (annual update)	Commercial plantation area by species, plantation type and year of planting

[a] awe.gov.au/abares/forestsaustralia/australias-national-forest-inventory
[b] awe.gov.au/abares/forestsaustralia/plantation-inventory-and-statistics

Table B2 Reports from ABARES and precursors relevant to the farm forestry sector

Report	Source	Year
Downham R, Gavran M 2019, Australian plantation statistics 2019 update	ABARES	2019
Whittle L, Downham R 2019, Upscaling the Australian softwood sawmill industry: Feasibility and implications for future plantation investment	ABARES	2019
Whittle L, Lock P, Hug B 2019, Economic potential for new plantation establishment in Australia: Outlook to 2050	ABARES	2019
ABARES 2017, Australia Forest Industry Map	ABARES	2017
ABARES 2016, Australia's Plantation Log supply 2015–2059 (Dec 2016)	ABARES	2016
Parsons M 2001, Annotated bibliography: wood resources on private land – Farm forestry	ABARES unpublished internal report	2001
ABARE 2000, Outlook 2000: Managing forest resources – farm forestry	ABARE	2000
Grant A, Keenan R 2001, Implications of the Kyoto Protocol for Plantation Development	BRS	2000

Keenan R, Barry S, Stephens N, Annandale M 2000, Measuring carbon sequestration in small-scale farm forestry and environmental plantings	BRS	2000
ABARE 1999, Determining the regional potential for plantations and farm forestry	ABARE	1999

Table B3 Papers and reports relevant to the farm forestry sector

Report	Source	Year
Department of Industry, Science, Energy and Resources 2020, Measurement Based Methods for New Farm Forestry Plantations – Methodology Determination (method)	DISER	2020
Mendham D et al. 2020, Trees on farms project. Lifting farmgate profitability through high-value modular agroforestry. FWPA Project number: RRD401-1516	FWPA	2020
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Appendix C – Historical project data

Previously published data on the farm forestry sector provides historical context to guide understanding of the location of the current farm forest estate.

The URS Forestry (2008) report, *Farm Forestry Area and Resources in Australia*, identified farm forestry plantations at the state and regional level, described the major planted species, and provided information on 155,000 hectares of farm forestry plantations in Australia (Table C1). It was published at a time when extensive areas of farm forestry were being established under managed investment schemes. Some of these areas were bought by forestry companies, but many of these areas were not effectively managed or commercially viable, and either did not develop into fully established stands of trees or were subsequently abandoned. Some have since been cleared.

The URS report made no reference to the spatial distribution of the farm forestry resource. There is therefore no direct correlation between the areas reported by URS Forestry and those reported in this report.

Table C1: Farm forestry area and species from URS Forestry (2008) *Farm Forestry Area and Resources in Australia*

State/region	Area of farm forestry (ha)	Species and notes	Area (ha)
New South Wales	**27,950**		
North Coast	7,632	Mixed hardwood species	1,400
		Other	1,081
		Hardwood plantations (joint venture with private)	5,151
Northern and Central Tablelands	2,760	*Pinus radiata*	2,760
Murray Valley	9,011	*E. globulus, E. nitens*	2,396
		Other *Eucalyptus* species	491
		Mixed species	61
		P. radiata	6,021
		Unknown species	42
Southern Tablelands	7,641	*Eucalyptus* mixed species	416
		P. radiata	7,225
South East New South Wales	906	Hardwoods	665
		Softwoods	4
		Mixed species	237
Northern Territory	**44**		
Queensland	**4,759**		
Central and North Queensland	1,375	*Araucaria cunninghamii*	31
		P. caribaea	220
		Mixed hardwood species	784
		Other unknown species	340
South East Queensland	3,384 [a]	*Araucaria* spp.	94
		Other softwood species	43
		Eucalyptus species	2,777
		Other hardwood species	283
		Mixed species	187
		(*Eucalyptus* species includes joint venture plantations of 2,178 ha)	

State/region	Area of farm forestry (ha)	Species and notes	Area (ha)
South Australia	**9,216**		
South East South Australia	7,371	*Corymbia maculata*	25
		E. cladocalyx	279
		Other hardwoods	152
		Unknown species	215
		Leasehold MIS plantations on farms	6,700
Mt Lofty Ranges and Kangaroo Island	1,845	*P. radiata*	837
		E. globulus	370
		Other *Eucalyptus* species	630
		Other softwood species	8
Tasmania	**21,005**		
Tasmania	21,005	Hardwood	9,363
		Softwood	5,442
		Leasehold MIS plantations on farms – unknown species	6,200
Victoria	**31,777**		
North West Victoria	4,640	*Casuarina cunninghamiana*	150
		E. sideroxylon	2,500
		E. cladocalyx	1,500
		E. occidentalis	200
		E. polybractea	240
		P. pinaster	50
Central and Western Victoria	21,530	*E. globulus*	344
		Eucalyptus species	765
		P. radiata	184
		Mixed species	37
		Leasehold MIS plantations on farms – unknown species	20,200
Gippsland	5,607	*P. radiata*	4,294
		E. nitens	187
		Mixed species	303
		Unknown species	823
Western Australia	**60,680**		
South West Western Australia	60,680	*Corymbia species*	97
		Other *Eucalyptus* species	924
		P. pinaster	15,497
		P. radiata	8,556
		Other softwoods	32
		Mallee eucalypts	12,126
		Sandalwood	1,448
		Leasehold MIS plantations on farms – unknown species	22,000
Total	**155,431**		

[a] Includes some small areas of softwood plantations for which the management status is unknown.

Appendix D – Public information on key stakeholders and data custodians

The following tables list publicly available literature and web-based information on farm forestry and associated stakeholders.

Table D1 Public information on industry associations

Coverage	Organisation	Description	Status of data availability
National	Australian Forest Products Association	Peak national industry body representing the resources, processing, and pulp, paper and bioproducts industries	No data
National	National Timber Councils Association	Incorporated local government association representing the interests of member municipal, regional councils concerning forestry on both public and private land	Further consultation recommended
National	Regional Forestry Hubs in each state (NT regional forestry hub not established at time of writing)	Regional industry stakeholder group that includes forest growers, forest managers, sawmillers, processors and contractors	Further consultation recommended

Table D2 Public information on grower associations and groups

Coverage	Organisation	Description	Data provision for this project
National	Institute of Foresters Australia / Australian Forest Growers	Professional association with approximately 1,000 members.	No data available
	Agroforestry Network / Australian Agroforestry Foundation	Not-for-profit organisation providing education and extension support to farmers	No data available
	Greening Australia	Organisation providing mainly environmental services (restoration, conservation planning and science, carbon offsetting, native seed services)	Deemed not in scope
New South Wales	Super Forest Plantations	Company that manages hardwood plantations in the Northern Rivers NSW – 3,300 hectares managed for sawlog production.	Further consultation recommended
	Plantation Pine Products (a Borg Company)	Plantation Pine Products (a Borg company) manage and harvest radiata pine for use in the panel industry of Australia. Offering full-service and bespoke forestry management.	Further consultation recommended
	Quality Timber Traders (QTT)	Small groups formed for mutual support including Community Rainforest Reforestation Program (CRRP 1993–2000) in north	Data supplied

		Queensland, Subtropical Farm Forestry Association (SFFA) in northern NSW and more recently the Specialty Timber Growers (STG) in south-east Queensland, which has since led to the creation of Quality Timber Traders.	
Queensland	Subtropical Farm Forestry Association / Quality Timber Traders (QTT)	As for QTT above	Data supplied
South Australia	AFG Mount Lofty Ranges / Kangaroo Island	Australian Forest Growers Association branch – Grower association	Data supplied
	Farm Forestry Kangaroo Island	10–12 independent timber growers currently under an MOU with KI Plantation timbers for harvest and haulage work for their blue gum and pine plantations.	Data supplied
Tasmania	Tasmanian Farmers and Graziers Association	Includes a farm forestry interest with farmers managing native and smaller plantations and woodlots.	Further consultation recommended
Victoria	Corangamite Farm Forestry Network	Grower association, part of Corangamite CMA	Further consultation recommended
	Farm Forestry Growers Victoria (FFGV)	Farm Forestry North East, the Gippsland Agroforestry Network, the Box Ironbark Farm Forestry Network, the Ballarat Region Tree growers Network, and the Otways Agroforestry Network. Together these represent more than 300 landowners across Victoria growing hardwoods such as ironbark, spotted, blue and sugar gums in plantations ranging from 24 to 21,000 trees.	Further consultation recommended
	Farm Forestry North East (FFORNE)	Established in late 1980s as North East Agroforestry Network, Victoria	Data supplied
	Northern United Forestry Group (NUFG)	A community-based organisation working to establish commercial low-rainfall farm forestry and sustainable land management in north-central Victoria.	Further consultation recommended
	South West Agroforestry Network (SWAN)	Branch of the AFG that supports approximately 100 members of tree growers and landowners.	No data available
Western Australia	Australian Sandalwood Cooperative (*Santalum spicatum*) – ASC	Registered since 2017, a legal structure to enable its growers/members to be professionally supported.	Data supplied
	Australian Sandalwood Network (Avon Sandalwood Network)	Formed in 2003 as the Avon Sandalwood Network, ASN is now an incorporated association. It has over 50 members, mainly private growers from WA and SA.	Data supplied

	Oil Mallee Association of Australia (OMA)	An industry body funded by member contributions as well as grants and collaborative projects. It promotes the use of oil mallees for integrated agroforestry and sustainable land management.	Data supplied
	Sandalwood Growers Co-op (*Santalum album*)	Registered since 2017, it is a legal structure providing professional support to the growers. It also has the ability to provide services and distribute the profits to its members. Main service offerings: forestry management, marketing and sales, legal compliance and litigation support, advocacy and support	Data supplied

Table D3 Public information on Landcare and other tree planting groups

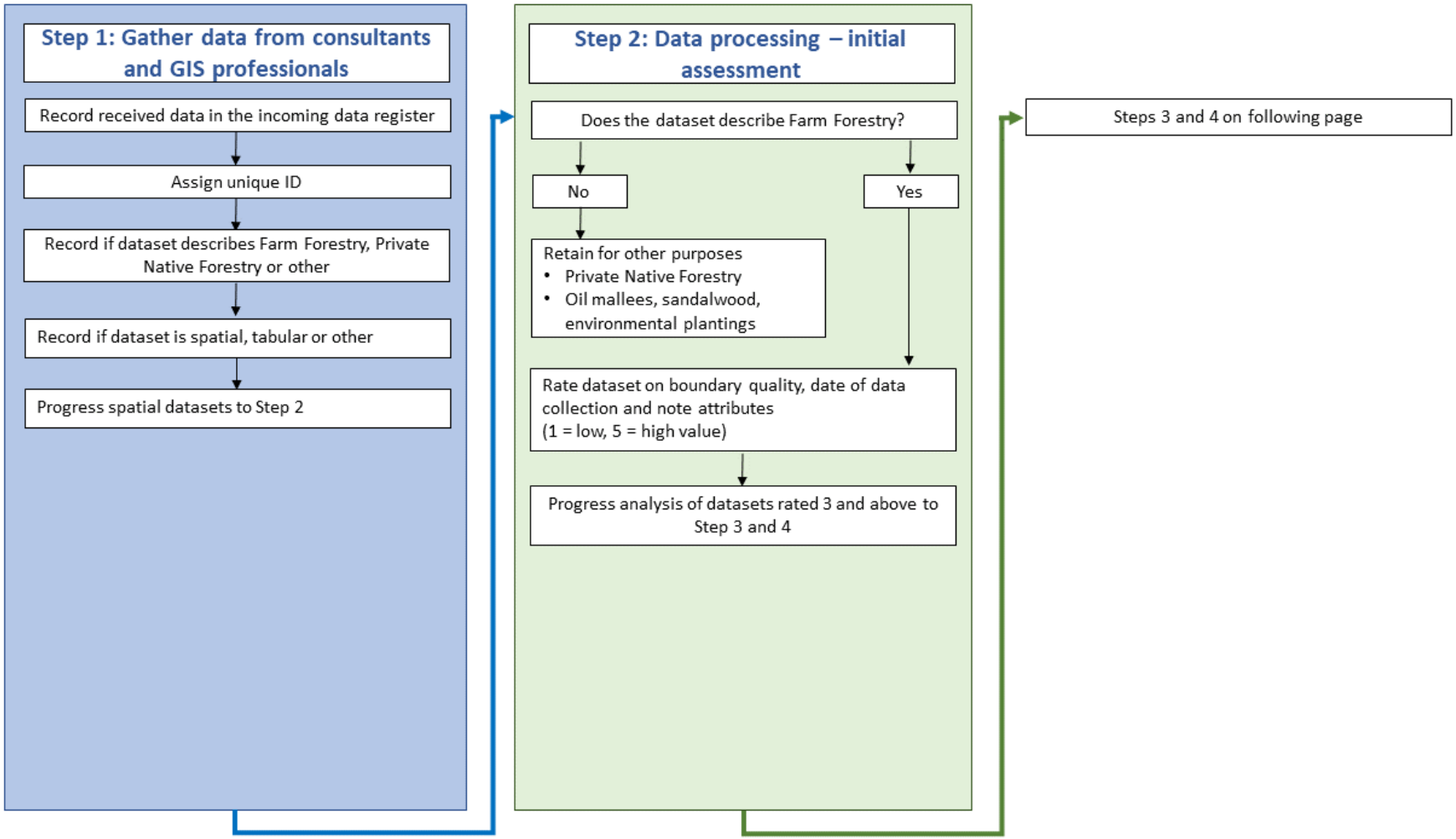
Location	Group	Description	Data availability / status
National	Farm Forestry Landcare Network (FFLN)	Landcare group with a focus on sharing farm forestry knowledge and opportunities	Data supplied
	Farm Forestry Landcare Network (Murray Mallee)	Landcare group with a focus on sharing farm forestry knowledge and opportunities – Local Action Planning Group	Data supplied
	Master TreeGrower (MTG)	Program developed from within the Otways Agroforestry Network and initially hosted by the University of Melbourne; associated with the Australian Agroforestry Network Foundation.	Further consultation recommended
Australian Capital Territory	Environment ACT	Historical private forestry, as well as environmental/creekside government plantings information is potentially available.	Further consultation recommended
New South Wales	Softwoods Working Group (SWG)	It was formed in 1987 with a focus on supporting the industry in the south-west slopes region. It includes the major plantation growers, processors, local government, regional development boards and the Forestry Corporation of NSW.	Further consultation recommended
	Hunter Farm Forestry Network	Over 60 members; a community organisation whose members are concerned about the environment and the role of forests.	No data available
	Murray Landcare	Jointly funded program between Landcare, CSIRO and the Murray Darling Basin Commission	Data supplied
	Landcare NSW	Landcare NSW is currently working on setting-up a mobile app to be used by the local Landcare programs to provide a better informed overview of the state of farm forestry resource.	Further consultation recommended
	South West Landcare	Historical information is available, however it is mentioned that it would be a massive job to access the archived information.	Further consultation recommended

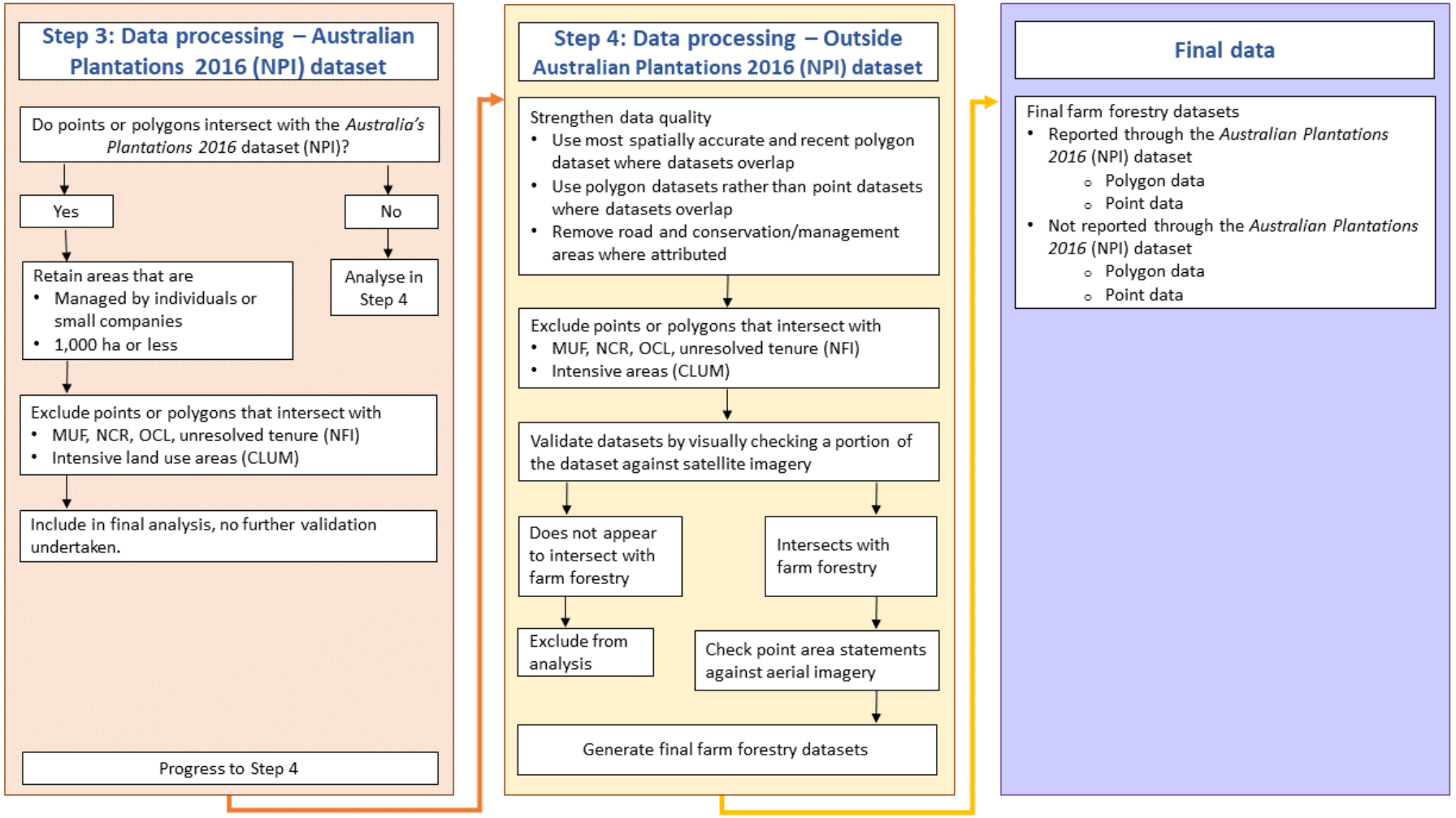
	Western Landcare	No plantings reported for the Western region, mainly due to lack of water for plantation establishment and development.	Further consultation recommended
Northern Territory		Historically, several attempts to grow plantations in NT (eucalypt species) have failed. Only African Mahogany and Indian sandalwood plantations as well as some slow-growing hardwoods and native cypress pine remain and are showing good results. Tiwi Plantations Corporation Trust grows and manages *Acacia mangium* plantations on Melville Island for wood chip production.	Data supplied
Queensland	Private Forestry Service Queensland (PFSQ)	Originally one of the 18 Regional Plantation Committees (RPC) established with Australian Government funding.	Data supplied
	South East Queensland Mixed species	The QLD Government through DPI Forestry (1996 – 1999) led a joint venture tree planting scheme with private landholders.	Data supplied
	Central Queensland	Various hardwoods plantations in the Central QLD – the establishment of many of these occurred when MISs were active. 1000 hectares are identifiable, mostly timber and grazing properties.	Data supplied
	North Queensland Mixed Species	Several hundred small growers located within 200 km of the east coast between Cooktown and Mackay – mostly plantation established in the 1990s. 1,500 hectares with 300 hectares at harvesting age.	Data supplied
	Ex-company estate	10,000 hectares of hardwood plantations established in the 2000s in the QLD Wet Tropics. After Cyclones Larry (2006) and Yasi (2011), areas have not been replanted.	Data supplied
	Santos	One of the Asia–Pacific's leading oil and gas producers, established 1,100 hectares plantations in Central QLD to treat coal seam gas water. Plantation registered under the ERF as carbon sequestration project so is outside of the scope of this project	No data available
	Fraser Coast	Fraser Coast Regional Council (FCRC) has established 600 hectares of effluent irrigated plantations of mixed-species	Data supplied
South Australia	Landcare SA	Independent, non-government and not-for-profit community organisation that supports and advocates for community Landcare	Further consultation recommended
Tasmania	Private Forests Tasmania	Government agency responsible for private forestry. Provides field days, research and advice related to forest practices and government and regulatory environment.[12]	Data supplied
Victoria	Ballarat Region Tree Growers (BRT)	Victorian Landcare group promoting the concept of bio-rich plantations.	No data available

[12] FPC WA / Indufor 2017, Growing the Softwood Estate—Final report

	Box Ironbark Farm Forestry Network	No relevant data found.	Further consultation recommended
	Gippsland Agroforestry Network (GAN)	Gippsland Agroforestry Network Landcare (started in the early 1990s). Sub-group of the Latrobe Catchment Landcare Network	No data available
	Otway Agroforestry Network (OAN)	Landcare group that encourages its members to establish and manage trees for multiple purposes: environmental and commercial	Further consultation recommended

Appendix E – Farm forestry spatial data processing steps





NPI, National Plantation Inventory; MUF, Multiple-use public forest; NCR, Nature conservation reserve; OCL, Other Crown land; NFI, National Forest Inventory; CLUM, Catchment scale land use of Australia dataset.

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