

Land management practices data collections

Ramona Dalla Pozza,
Bureau of Rural Sciences

Introduction

The purpose of this paper is to outline major systematic collections of land management practices information relevant to dryland and irrigated primary production in Australia. The outline draws substantially on a land management practices information source review completed by Lesslie *et al* 2000. Key information sources are:

Australian Bureau of Statistics (ABS)

- Agricultural Commodities Census
- Agricultural Commodities Survey
- Agricultural Finance Survey
- Population and Housing Census
- Land Management and Salinity Survey
- Water Survey
- Other ABS-derived Data

Australian Bureau of Agricultural and Resource Economics (ABARE)

- Annual Farm Surveys
- Supplementary Surveys

Other

- Training and Support Groups (such as the National Landcare Program)
- Accessibility and Remoteness Index of Australia (ARIA)
- National Land and Water Resources Audit
- FarmBis,
- Agriculture Advancing Australia (AAA),
- Bureau of Rural Sciences (BRS).

Australian Bureau of Statistics (ABS)

Agricultural Commodities Census

The principal source of Australian agricultural commodity statistics is the Agricultural Commodities Census. Census collections were completed annually until 1996/97, and then in 2000/01. Census collections are now completed every five years, the next scheduled for 2005-06. ABS collects information from all agricultural enterprises producing crops, fruit, vegetables or livestock with an Estimated Value of Agricultural Operations (EVAO) of at least \$5,000. Census data are collected through a survey of individual farm operators (approximately 145,000 in 2000-1). Data collected includes the area of the holding, production areas, numbers of livestock, wool production. The census includes information for all businesses engaged in agriculture in a database known as the Integrated Register Information System (IRS). The most precise spatial unit at which data are made available is the Statistical Local Area (SLA) (except in Victoria and South Australia where data are respectively available by Parish and Hundred) although the enterprise is the smallest accounting unit. Another limiting factor is the extent to which agricultural enterprises can be tagged to location. Currently survey forms are sent to business addresses that do not always correspond to the location of farms. A priority for the ABS and other Australian and State Government agencies is to improve the link between farm business mailing address and the actual farm site.

Land management practices questions have been included in census collections on an irregular basis. Questions included in the last census (2000-1) were paid for by a consortium of agencies with an interest in this area and there is no certainty over the continuity of the inclusion of these questions in future collections. However, an increasing number of environment and land management related questions are included in supplementary surveys, for example the Land Management and Salinity Survey (2002) and the Water Survey (2003).

Table 1: Questions relating to land management practices on the ABS Agricultural Commodities Census 1995-6, 1996-7 and 2000-1.

	NSW			VIC			QLD			SA			WA			TAS			NT			ACT		
	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00
Sown pasture (total ha) (sown or resown ha/yr) *																								
<i>Lucerne only</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Lucerne/pasture mixtures</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Pasture legumes</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Perennial grasses & legumes mix</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Annual grasses & legumes mix</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Sown grasses</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Fertilised pasture ha/yr</i>				4																				
Maintenance and management of established pasture (ha/yr)																								
<i>Top-dressing or fertilising</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Weed control/spraying</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Pest/disease control</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Slashing or burning</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
Production of hay (ha/yr) (t/yr) *																								
<i>Lucerne</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Other pasture</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Cereal</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Other crop</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Planted crops (ha/yr) (t/yr)																								
<i>Cereal (by listed type)</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Other (by listed type)</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

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	NSW			VIC			QLD			SA			WA			TAS			NT			ACT		
	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00
Cultivation for broadacre crops (ha/yr)																								
<i>More than 2 passes</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
<i>One or two passes</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
<i>No cultivation</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
Disposal crop and pasture stubbles (ha/yr)																								
<i>Burning</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Baling, grazing or fire harrowing</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Ploughing</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Mulching</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
<i>No cultivation</i>	4		4	4	4	4	4		4	4		4	4		4	4		4	4		4	4		4
Fallow land (ha/yr) (Period fallow in months 2000/01)																								
<i>Pasture topping</i>			4	4	4	4			4			4			4			4			4			4
<i>Chemical fallow</i>			4	4	4	4			4			4			4			4			4			4
<i>Cultivation</i>			4	4	4	4			4			4			4			4			4			4
Irrigation																								
<i>Total area irrigated (ha/yr)</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Pastures (native or sown) (ha/yr)</i>		4	4		4	4			4	4		4	4		4	4		4	4		4	4		4
<i>Cereals (ha/yr)</i>		4	4		4	4			4	4		4	4		4	4		4	4		4	4		4
<i>Vegetables for human consumption</i>			4			4			4			4			4			4			4			4
<i>Grapevines</i>			4			4			4			4			4			4			4			4
<i>Fruit (including nuts)</i>			4			4			4			4			4			4			4			4
<i>Other (listed by type) (ha/yr)</i>		4	4		4	4			4	4		4	4		4	4		4	4		4	4		4
<i>Scheduling tools (listed by type)</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
Fertilizers and soil conditioners (ha/yr) (tonnes/yr)																								
<i>Use of manufactured fertilizer (2000/01 only)</i>			4			4			4			4			4			4			4			4
<i>Nitrogenous fertilizers</i>	4			4			4			4			4			4			4			4		
<i>Phosphatic fertilizers</i>	4			4			4			4			4			4			4			4		
<i>Potassium fertilizers</i>	4			4			4			4			4			4			4			4		

	NSW			VIC			QLD			SA			WA			TAS			NT			ACT		
	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00	95	96	00
Fertilizers and soil conditioners (ha/yr) (tonnes/yr)																								
<i>Compound fertilizers</i>	4			4			4			4			4			4			4			4		
<i>Lime (lime or dolomite 96/97)</i>	4		4	4		4	4		4	4		4	4	4	4	4		4	4		4	4		4
<i>Dolomite for acidity</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Dolomite for structure</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Gypsum</i>	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4		4
<i>Ammonium (Urea, Ammonium sulphate, Ammonium nitrate, Anhydrous ammonia)</i>			4			4			4			4			4			4			4			4
<i>Phosphatic (Single, double and triple superphosphate)</i>			4			4			4			4			4			4			4			4
<i>Potassium (Muriate potash, Potassium sulphate, Potassium nitrate)</i>			4			4			4			4			4			4			4			4
<i>Compounded/blended (Mono Ammonium Phosphate, Di Ammonium Phosphate)</i>			4			4			4			4			4			4			4			4
<i>Other manufactured fertilizers</i>			4			4			4			4			4			4			4			4
Soil Salinity (2000/01)																								
<i>Saline land</i>			4			4			4			4			4			4			4			4
<i>Use of salinity management strategies</i>			4			4			4			4			4			4			4			4
Fencing for grazing management 95/96 & 2000/01 (fencing km/yr) (total ha) 96/97 (fencing km/yr)																								
<i>Saline areas</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Other degraded areas</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Creeks and rivers</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Remnant native vegetation</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Planted trees and shrubs</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Forestry on cleared agricultural land																								
<i>Trees planted/sown for timber/pulp (total ha)</i>	4		4	4		4	4		4	4		4	4		4	4		4	4	4	4	4		4
<i>Trees planted/sown for other purposes (total ha)</i>	4		4	4		4	4		4	4		4	4		4	4		4	4	4	4	4		4
<i>Seedlings: timber/pulp (no/yr)</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Seedlings: other purposes (no/yr) (ha/yr)</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Seed sown (kg/yr) (kg/ha/yr)</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
<i>Trees harvested from planted area (t/yr)</i>	4	4		4	4		4	4		4	4		4	4		4	4		4	4		4	4	

Agricultural Commodity Survey

The Agricultural Commodity Survey supplements the Agricultural Census data by asking the same questions to a smaller sample of enterprises around Australia every year. The surveys occur in intervening years to the Census and sample up to 60,000 farm enterprises.

Agricultural Finance Survey

To complement the commodity statistics produced through the Agricultural Census, the ABS also conducts an annual Agricultural Finance Survey (AFS). This survey is conducted on a sample of approximately 2,500 agricultural management units with an EVAO of \$22,500 or more, primarily for the purpose of obtaining estimates of the financial performance of agricultural industry groups as well as the agricultural sector as a whole. This survey provides estimates of turnover, expenditure, cash operating surplus, indebtedness, value added and net worth of the various industries. While the statistics from this survey are useful for assessing the economic viability of agricultural industries, they are of limited relevance to management practice at the farm level.

Population and Housing Census

The Australian Census of Population and Housing is a national count of population and dwellings characteristics conducted at five yearly intervals. The most recent census was completed in 2001. The Population and Housing Census provides relatively consistent time series data on key family and household characteristics. Data are available Australia-wide at the census collector district (CD) level. The census is not, however, specifically directed at farmers or farm enterprises, and useful information for these groups cannot be readily extracted without the careful cross-tabulation of specific variables. Table 2 shows the limited primary data concerning social factors pertaining to farm management practice included in the Population Census (Fenton *et al* 2000).

Table 2 Social factors pertaining to farm management practice included in the Population and Housing Census.

Management Attribute	Census Item	Derivation
Age of farmer	- Occupation - Age	crosstabulation of occupation as farmer or farm manager and age.
Farmer education and skill	- Occupation - Education	crosstabulation of occupation as farmer or farm manager and highest level of education achieved.
Number of children	- Occupation - No. of family members	crosstabulation of occupation as farmer or farm manager and number of family members.

It is desirable that linkage between the Population and Housing and Agriculture Censuses be improved. For example, an additional question that establishes a link between farms and farming households could improve understanding of factors affecting land managers behaviour (for example, the relationship between factors such as age, education, number and age of children, country of origin and household income on farm management practices, the uptake of new techniques and undertaking environmental protection work on the farm.

Land Management and Salinity Survey

The Land Management and Salinity Survey was first conducted by the ABS in May 2002 as a supplement to the 2001 Agricultural Census. The survey was targeted at farms establishments (with a EVAO over \$5,000) that were identified in the 2001 Agricultural Census as having land affected by salinity or using salinity management strategies (approximately 20,000 farms). The survey collected information from farmers on three main topics:

1. Extent of land showing signs of salinity;
2. Strategies used to manage or prevent salinity;
3. Drivers and barriers to land management change.

Table 3 Questions included in the ABS Land Management and Salinity Survey 2002

Changed land management practices because of salinity or to prevent salinity
How long ago did the change occur (years)
In what areas did the change occur: <ul style="list-style-type: none"> - crop type, - pasture type, - grazing management, - earthworks, - irrigation methods, - tree establishment.
Reasons for making the change and relative importance: <ul style="list-style-type: none"> - increased productivity, - increased land value, - improved risk management, - farm sustainability, - improved environmental protection.
Factors that assisted the change and relative importance: <ul style="list-style-type: none"> - tax advantages, - Government financial assistance, - financial resources, - information, - community groups (e.g. Landcare), - previous success, - other factors.
Barriers to changing land management practices and how limiting they are: <ul style="list-style-type: none"> - lack of financial resources, - lack of time, - insufficient or inadequate information, - doubts about likely success, - age or poor health, - other barriers.
Intending to change land management practices because of salinity or to prevent salinity in the next year: <ul style="list-style-type: none"> - crop types, - pasture types, - grazing management, - earthworks, - irrigation methods, - tree establishments.
Currently grow any crops, pasture and/or fodder plants because of salinity or to prevent salinity: <ul style="list-style-type: none"> - salt tolerant crops (e.g. barley), - pastures with lucerne (pure or mixed), - other deep rooted perennials, - salt tolerant pastures (e.g. tall wheat grass, kikuyu, puccinellia, veldt grass etc.), - saltbush, bluebush or like, - other fodder species (e.g. tree lucerne/tagasaste).
Wooded or treed areas (including new plantings and remnant vegetation). Area (Ha) by major purpose or type: <ul style="list-style-type: none"> - for salinity or for prevention of salinity, - for wood or pulp production, - for other reasons (e.g. shade, shelter belts, erosion control), - remnant vegetation (including regrowth).
Earth works or water pumping systems because of salinity or to prevent salinity: <ul style="list-style-type: none"> - length of levees/banks (e.g. contour, graded, interceptor banks, etc.) (km), - length of shallow open drains (e.g. less than 1 metre deep) (km), - length of deep open drains (e.g. greater than 1 metre deep) (km), - length of subsurface drains (e.g. excavator built buried tyre, pipe or tube drains) (km), - groundwater pumping, - water re-use system, - water diverted to natural drainage lines or constructed waterways.
Area of land showing signs of salinity (ha) <ul style="list-style-type: none"> - area of land unable to be used for agricultural production, - has this area increased or decreased in the last 5 years.
Area of land fenced from grazing because of salinity or to prevent salinity (ha)
Soil tested for salinity
Water tested for salinity
Monitoring height of water table: <ul style="list-style-type: none"> - compared to 5 years ago has the height increased, decreased or stayed the same.
Irrigation methods used last year:

<ul style="list-style-type: none"> - spray, - drip or micro spray, - furrow or flood, - other
<p>Sources of information on salinity:</p> <ul style="list-style-type: none"> - Government agencies (including agricultural departments), - educational and research institutions (e.g. TAFE, universities, CSIRO, etc.), - community groups (e.g. Landcare), - agricultural companies and industry organisations, - agronomists and consultants, - family, staff and other farmers, - other
<p>Farm management plan</p>
<p>Do you have any of the following for your farm:</p> <ul style="list-style-type: none"> - a salinity management strategy, - a map or aerial photo, - details on soils and land capability, - information on existing or proposed landcare works, - details of existing and/or intended structural and capital improvements, - information on areas of conservation value, - water holding structures and watercourses, - farm operating budget, - alternative management strategies in the event of drought.

ABS Water Survey

ABS conducted a survey of water use and management on Australian farms between 1 July 2002 - 30 June 2003. The survey was sent to 7,500 farm identified in the 2001-2 Agricultural Census which will allow water use information to be linked at the unit record level to agricultural production data. Questions included on the survey are listed in Table 4. The Water Survey and other supplementary natural resource management surveys will be repeated periodically, depending on user demand for information and the performance of the survey in 2003.

Table 4: Questions included in the ABS Water Survey 2003

Water entitlement (megalitres)
Allocation above entitlement (megalitres or percent)
Water sold on a permanent or temporary basis, including amount in megalitres, number of trades and money received.
Purchase of extra irrigation water on a permanent or temporary basis, including amount in megalitres, number of trades and money received.
<p>Pastures and crops irrigated (Area irrigated in hectares and volume applied in megalitres):</p> <ul style="list-style-type: none"> - pasture for grazing, - pasture for seed production, - pasture for hay and silage (including lucerne for hay), - cereal crops cut for hay (including wheat, oats and forage sorghum), - cereal crops for grain or seed (e.g. for silage or fed off), - rice, - sugar cane, - cotton, - other broadacre crops (e.g. canola, field beans, lupins, sunflowers) - fruit trees, nuts, plantation or berry fruits, - vegetables for human consumption, - vegetables for seed, - nurseries, cutflowers or cultivated turf, - grapevines, - other
<p>Irrigation methods used (ha):</p> <ul style="list-style-type: none"> - surface (e.g. furrow, flood, basin, border check), - drip or trickle irrigation (above ground or subsurface), - sprinkler irrigation (microspray, portable irrigators, hose irrigators, large mobile machines and/or solid set).
<p>Sources of irrigation water (sources metered and not metered in megalitres):</p> <ul style="list-style-type: none"> - surface water (e.g. rivers, dams, channels), - groundwater (e.g. bores, springs, wells), - town or country reticulated mains supply, - recycled/re-used water from off-farm sources (e.g. sewage water, mines), - other sources.

<p>Tools used to decide when to irrigate or how much water to apply:</p> <ul style="list-style-type: none"> - evaporation figures or graphs - tensiometers, - soil probes, e.g. neutron probes, capacitance probes, - Government or commercial scheduling service, - calender/rotational scheduling, - knowledge/observation, - other.
<p>On-farm water storage (megalitres):</p> <ul style="list-style-type: none"> - percentage of total capacity.
<p>On-farm recycling or re-use of water for agricultural production.</p>
<p>Area of land laser levelled for irrigation (Ha)</p>
<p>Changes made to irrigation practices in the last 5 years:</p> <ul style="list-style-type: none"> - introduced more efficient irrigation application techniques, - implemented more effective irrigation scheduling, - installed piping or covered open channels to reduce water loss, - constructed levee banks and/or drains to improve irrigation water efficiency, - laser levelled areas to improve irrigation efficiency, - introduced irrigation water re-use or recycling, - introduced on-farm soil moisture monitoring, - developed a documented farm water plan, - other, - no changes.
<p>Intended changes to irrigation practices or water management in the next year:</p> <ul style="list-style-type: none"> - introduce more efficient irrigation application techniques, - implement more effective irrigation scheduling, - install piping or covered open channels to reduce water loss, - construct levee banks and/or drains to improve irrigation water efficiency, - laser level areas to improve irrigation efficiency, - introduce irrigation water re-use or recycling, - introduce on-farm soil moisture monitoring, - develop a documented farm water plan, - other, - no intended changes
<p>Significant barriers to changing irrigation or water management practices:</p> <ul style="list-style-type: none"> - inadequate water quality, - uncertainty of water allocation, - lack of financial resources, - lack of time - insufficient or inadequate information - doubts about likely success, - age or poor health, - inadequate water availability, - other barriers, - no barriers.
<p>Irrigation expenses current and capital:</p> <ul style="list-style-type: none"> - water licence/application charges - irrigation water volumetric/usage charges (include both your allocation and extra water purchased), - irrigation fees and charges (e.g. brokerage, delivery, environmental, drainage), - purchase of irrigation equipment (e.g. pumps, bores, pipes, sprinklers), - irrigation operating expenses (e.g. pump running expenses, fuel or electricity, repair and maintenance), - construction of earthworks for irrigation purposes (e.g. dams, levee banks, channels), - other expenses, - total irrigation expenses.
<p>Total capital expenditure on irrigation infrastructure in last 5 years (\$).</p>
<p>Gross value of agricultural production (\$).</p>
<p>Gross value of irrigated agricultural production (\$).</p>
<p>Net profit or loss from agricultural production (\$).</p>

Other ABS-derived Data

The ABS produces a set of standard census-derived indicators of relative socio-economic disadvantage. The Socio-Economic Indexes for Areas (SEIFA) comprise five indices that have been constructed from each census since they were first produced in their present form in 1990, and these are:

- Urban index of relative socio-economic advantage (centres with a population of 1,000 and over);
- Rural index of relative socio-economic advantage (all remaining areas);
- Index of relative socio-economic disadvantage;
- Index of economic resources;
- Index of education and occupation.

The first three indexes are general socio-economic indexes. They summarise variables relating to the economic and social characteristics of families and households, as well as personal education qualifications and occupation. The index of economic resources reflects the economic resources of families, including income and expenditure, home ownership and other non-income assets. The index of education and occupation reflects the educational and occupational structure of families.

Community Sensitivity Indices (CSI) (Fenton, 1999) also use population and housing census data to show sensitivity to change in relation to: (a) unemployment and income, (b) family and housing, (c) education and occupation and (d) age dependency. These indices have been used to show the level of community and regional variation in vulnerability to change in a number of rural industry sectors.

Summary

A summary the agricultural data collected by ABS related to land management practices is presented in Table 5.

Table 5: All data related to the environment and land management practices collected by ABS. (Source: Allan Nicholls, ABS)

All ABS LM related questions	Year ending June 30													
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Irrigation (Y/N)				4	4		4	4	4	4	4			4
Total area irrigated (ha)							4			4	4	4	4	4
Area irrigated by crop (ha)	4	4	4	4	4			4	4	4	4	4	4	
Irrigation methods (ha)	4										4			
Irrigation scheduling tools (tickbox)							4					4		
Water volume by source (ML)	4	4			4			4			4			
Volume water by crop (ML)														
Water trading (Y/N)													4	
Water allocation (Y/N)													4	
Water entitlement (ML)													4	
Laser levelled area (ha)					4									
Flood irrigated area (ha)					4									
Irrigation water reuse (Y/N)					4									
Tree planting (ha)						4	4	4	WA	4	4	4	4	
Fencing for protection (km)									VIC	4	4	4	4	
Fertilizer use (ha & t)			4	4	4		4					4	4	
Lime use (ha & t)							4					4	4	
Dolomite use (ha & t)							4					4	4	
Gypsum use (ha & t)							4					4	4	
Soil conditioners (ha & t)			4	4	4									
Cultivation methods (ha)									VIC	VIC	VIC	4	4	
Stubble treatment (ha)									VIC	VIC	VIC	4	4	
Fallow land preparation (ha)									VIC	VIC	VIC			
Fallow land area (ha)												4	4	
Pasture management (ha)												4	4	
Awareness of programs:														
• FarmBis													4	
• Landcare													4	
• Rivercare													4	
• Bushcare													4	
• Coastcare													4	
• Natural Heritage Trust													4	
• National Action Plan for Salinity													4	
Participation in programs:													4	4
• FarmBis													4	4
• Landcare													4	4
• Rivercare													4	4
• Bushcare													4	4
• Coastcare													4	4
• Natural Heritage Trust													4	4
• National Action Plan for Salinity													4	4
• Murray Darling Initiative 2001														4

Background paper - **Land management practices data collections**

• Other NHT initiatives or programs														4
														4

ABARE

Annual Farm Surveys

The Australian Bureau of Agricultural and Resource Economics (ABARE) has conducted surveys of agricultural industries since the 1950s. The two principal annual surveys conducted by ABARE are the Australian Agricultural and Grazing Industries Survey (AAGIS) and the Australian Dairy Industry survey (ADIS). The former provides a wide range of information on land management practices relevant to broadacre dryland agriculture. The results of both surveys are presented annually in 'Australian Farm Surveys Reports', providing an overview of farm financial performance at the state zone and industry level. The most recent surveys have focused on the impact of drought on farms including reliance on feed grain and fodder, farm debt, and farm management see table 6 for specific topics.

Broadacre dryland agricultural industries represented in the AAGIS are: (a) Wheat and other crops, (b) Mixed livestock-crops (c) Sheep-beef and (d) Sheep-beef (based on the Australian and New Zealand Standard Industrial Classification (ANZSIC). Three broadacre agricultural zones are also recognized: (a) Pastoral zone (b) Wheat-sheep zone and (c) High rainfall zone.

ABARE surveys are based on personal and telephone interviews with producers chosen as representative of operators in targeted industries with an EVAO of \$22,500 or more. A weakness of the AAGIS survey is that application of these data at finer geographic scale is limited. The relatively small sample numbers means that sampling error effectively precludes the use of these data for spatial units smaller than the SLA. In some cases greater aggregation is appropriate (Fenton *et al.*, 2000).

The main attribute groups collected routinely by ABARE in the AAGIS include a broad range of socio-economic and production information that pertains to farm management practice. This includes land area and tenure, labour, farm family characteristics, farm capital, crop type and production, fertilizer use, irrigation, farm receipts, farm costs, farm performance measures, farm debt and farm equity. Data collected by the AAGIS have the benefit of a considerable time series for a number of specific attributes that have been collected annual since 1977-78.

Table 6: Attributes relating to farm management practice in ABARE annual farm survey 2003, in all broadacre industries.

Total farm area (ha)
Wheat sown (ha)
Sheep flock (no.)
Beef herd (no.)
Area harvested:
- wheat
- barley
- grain legumes
- other cash crops
Sales (\$)
Off-farm share farming (\$)
Off-farm contracts (\$)
Other cash receipts (\$)
Hired labour (\$)
Fertilizer (\$)
Crop and pasture chemicals (\$)
Fuel, oil and grease (\$)
Interest (\$)
Rent (\$)
Payments to sharefarmers (\$)
Farm cash income (\$)
Farm business profit (\$)
Farm capital (\$)
Farm business debt (\$)
Change in debt over year (\$)
Farm business equity (\$) (%)
Harvest loans (\$)
Farm liquid assets (\$)
Off-farm income (\$)
Owner managers (no.)
- Age (yrs)
- Hours worked on farm (hrs/wk)

- Hours worked off-farm for wages (hrs/wk)
Spouses (no.)
- Age (yrs)
- Hours worked on farm (hrs/wk)
- Hours worked off-farm for wages (hrs/wk)
Dependant children (no.)
Family share of farm income (\$)
Total family income (\$)

ABARE Supplementary Surveys

Supplementary questions are regularly added to the annual ABARE survey by arrangement with government agencies, industry organizations and researchers. A series of supplementary surveys that directly address relationships between the extent and costs of land degradation, farmer attitudes and the adoption of best farm management practices were conducted in 2001-2, 1998-9, 1995-6 and 1992-3. The data collected in these surveys are broadly comparable and offers some potential for time series analyses.

- A 2001-2 resource management survey was designed to provide input into the monitoring and evaluation activities of government programs and activities. The survey focused on land degradation and actions undertaken to address this, participation in Landcare and other NHT programs, AAA programs, NAP and farm management.
- A 1998-9 resource management survey was undertaken on behalf of the Natural Heritage Trust, the Farm Forestry Program and the National Land and Water Resources Audit (NLWRA). Approximately 1,600 farms were sampled.
- A 1995-6 Landcare survey was commissioned by the National Landcare Program to collect data about the adoption of farm management programs included in Commonwealth-State partnership agreements as a common Landcare performance reporting area. Approximately 1,600 farms were sampled.
- In 1992-3 DPIE commissioned ABARE to collect data on Landcare and land management practices for monitoring and evaluating key aspects of the Decade of Landcare. Approximately 1,800 farms were sampled.

Details of information on land management practices pertaining to dryland broadacre agriculture obtained through these three supplementary surveys are presented in Table 7.

Table 7 Attributes relating to farm management practice in resource management in the Landcare supplementary surveys (1992-9) and the Natural Resource Management supplementary survey 2001-2.

Management Practice	Agricultural zone		ABARE Supplementary Survey			
	Pastoral	Other	2001-2	98-9	95-6	92-3
Education/training						
Landcare membership a	.	.	4	4	4	4
Length of Landcare membership (yrs)	.	.	4	4	4	
Participation in Landcare activities b	.	.	4	4	4	4
Landcare group workshops a	.	.	4	4	4	
Member of production group – involves sustainable resource component	.	.	4			
Involvement in National Heritage Trust and the National Action Plan for Salinity and Water Quality	.	.	4			
Grower or crop/pasture checking groups a	.	.	4	4	4	
Property management planning courses a	.	.	4	4	4	
Short courses a	.	.	4	4	4	
TAFE courses a	.	.	4	4	4	
Distance education a	.	.	4	4	4	
Other tertiary studies a	.	.	4	4	4	
Information Sources	.	.				
Media c						
Relations/neighbours c	.	.			4	
Field days c	.	.	4		4	
Technical journals c	.	.			4	
Govt departments c	.	.			4	
Accountants c	.	.			4	
Landcare groups c	.	.	4		4	
Property management planning courses c	.	.			4	
Farm management courses c	.	.	4		4	
Farm management consultants c	.	.	4		4	
Farm plan						
A farm plan in place a	.	.	4	4	4	4
A farm map or aerial photo a	.	.			4	4
Soils/land capacity information a	.	.	4	4	4	4
Structural and capital improvements a	.	.			4	4
Landcare works a	.	.	4	4	4	4
Farm operating budget a	.	.	4	4	4	4
Crop/livestock paddock performance records a	.	.	4		4	4
Personal or family goals (succession planning) a	.	.	4		4	
Areas of conservation value a	.	.	4		4	4
Drought management strategies a	.	.			4	4
Salinity management strategies	.	.	4			
Timetable a	.	.			4	4
Reference to neighbours layout/farm plan a	.	.			4	
Reference to district, catchment or regional plan a	.	.	4		4	
Capital Works						
Landcare related earthworks	.	.	4(\$)	4(\$)	4d	4(\$)g
Fencing of land according to land capability, protection of remnant vegetation, water courses	.	.	4(\$)	4(\$)	4d	4(\$)g
Planting of trees/shrubs/grasses to control land degradation	.	.	4(\$)	4(\$)	4d	4(\$)g
Control of animal pests or weeds	.	.	4(\$)	4(\$)		4(\$)g
Water storage and reticulation systems	.	.	4(\$)			4(\$)g

Table 7 Attributes relating to farm management practice in resource management in the Landcare supplementary surveys (1992-9) and the Natural Resource Management supplementary survey 2001-2 con't.

Management Practice	Agricultural zone		ABARE Supplementary Survey			
	Pastoral	Other	2001-2	98-9	95-6	92-3
Farm practices						
Conservative stocking rate	.	.				4
Preserve or enhance areas of conservation value a	.	.	4	4	4	
Monitor pasture/vegetation condition a	.	.	4	4	4	4
Maintain vegetation cover along drainage lines a	.	.	4	4	4	
Stock exclusion from degraded areas a	.	.	4	4	4	4
tree/shrub establishment & maintenance a		.	4	4	4	4
Conduct regular soil testing/monitoring a		.	4	4	4	4
Conduct regular water quality monitoring a	.	.	4			4
Conduct regular watertable monitoring a		.	4	4	4	
Use deep-rooted perennial pasture species a		.	4	4	4	4
Use stubble retention or mulching a		.			4	4
Crop rotation to minimise land degradation a		.	4		4	4
Incorporate crop or pasture legumes into cropping rotation a		.	4	4	4	
Cropping using contour banks a		.	4	4	4	
Undertake strip cropping a		.	4	4	4	
Controlled flow bore water supply a	.		4	4	4	
Piped reticulation of bore water a	.		4	4	4	
Pitting and opposed disk ploughing a	.		4	4	4	
Controlled grazing by excluding access to water a	.		4	4		
Collection of dairy shed effluent a			4	4		
Paddock runoff into drainage/reuse system a			4	4		
Area feeding into drainage/reuse system (farm%)				4		
Store and reuse of drainage water b	.	.	4	4	4	
Other practices to control/prevent land and water degradation	.	.	4			
Cultivation						
Spring/bare fallow cultivation		.				4
Direct drilling f		.			4	4
Minimum/reduced tillage f		.			4	4
Traditional cultivation f		.			4	
Direct drilling - single pass f		.		4		
Direct drilling –stubble burnt/cut/grazed f		.		4		
Minimum tillage, stubble ploughed in f		.		4		
Minimum tillage, stubble burnt/cut/grazed f		.		4		
Traditional cultivation, stubble ploughed f		.		4		
Traditional cultivation, stubble burnt/cut/grazed f		.		4		

a applicability to farm situation (y/n/ha)

b increase/same/decrease

c high/moderate/little/not used

d no need/not started/early stages/well advanced

f on farms which harvested crops in survey period – % of crop area sown

g expenditure under 75B or 75D

Other supplementary surveys administered by ABARE since 1995 that include information of relevance to farm management practices in dryland broadacre agriculture are:

1998-99	Sustainable grazing, attitudes and practices
1997-98	Government assistance Best practices in the sheep and beef industry Vegetation management on broadacre farms in Qld Pasture management on grain growing farms
1996-97	Government assistance Land management NSW irrigation
1995-96	Grain growing and land management practices Government assistance Farm families

Other

A wide range of survey and other data relevant to land management practice has been assembled by agencies, research institutions, community groups and private firms with an interest in agriculture and sustainable land management practice.

Training and support groups

A review of the projects undertaken through the National Landcare Program and National Heritage Trust programs could provide an indication of the level and the geographic distribution of institutional support for the implementation of best farm management practice. Relevant data from Commonwealth and State agencies suggested by Fenton *et al* (2000) include:

- The number and distribution of organised farm institutions (including Landcare, farmer organisations, farm co-operatives etc);
- Membership size of farm institutions;
- The length of time institutions have been in operation;
- The number of farmer contacts and information requests.

Accessibility and Remoteness Index of Australia (ARIA)

An index of remoteness and a database of road, locality and service information (ARIA) has been developed by the Department of Health and Aged Care and the National Key Centre for Social Applications of Geographic Information Systems (GISCA) – (Department of Health and Aged Care, 1999). ARIA interprets remoteness as accessibility to 201 service centres across Australia, and derives remoteness values for 11,340 populated localities according to road distance to these service centres. These values are grouped as follows:

- Highly accessible – relatively unrestricted accessibility to a wide range of goods and services and opportunities for social interaction;
- Accessible – some restrictions to accessibility of some goods, services and opportunities for social interaction;
- Moderately accessible – significantly restricted accessibility of goods, services and opportunities for social interaction;
- Remote – very restricted accessibility of goods, services and opportunities for social interaction;
- Very remote – very little accessibility of goods, services and opportunities for social interaction.

The Department of Agriculture, Fisheries and Forestry (DAFF)

The Department of Agriculture, Fisheries and Forestry (DAFF) commissioned the Centre for Research and Learning in Regional Australia, University of Tasmania to conduct a FarmBis survey (see Kilpatrick and Guenther, 2002). The project enables a comparison to be made between the education and training priorities of industry and National Action Plan for Salinity and Water Quality groups and the types of courses undertaken through FarmBis education and training activities and strategies. The Farm Business Improvement Program aims to increase profitability, competitiveness and sustainability of farm and fishing businesses. Other studies that contribute toward an overall assessment of the effectiveness of the program in achieving its goals include:

- Collection of information through application and course review forms;
- An annual follow-up survey of FarmBis participants;
- An annual survey of industry organisations and;
- A biennial Agriculture Advancing Australia (AAA) survey of primary producers.

The respondents were sampled from a range of organisation types identified by DAFF as part of the market for FarmBis funded training programs including: Industry Training Advisory Boards; National Action Plan groups; Women's organisations; Youth organisations; NESB groups; Landcare and environment groups; Indigenous groups; R & D corporations; and commodity groups.

Charles Sturt University and Bureau of Rural Sciences (BRS)

Catchment scale surveys of social factors affecting landholder decision-making about the adoption of practices expected to improve the management of natural resources have been undertaken by Charles Sturt University and BRS. Surveys have been completed for:

- Goulburn Broken Catchment, Vic;
- Ovens Catchment, NE Vic;
- Glenelg Hopkins Catchment, Vic;
- Wimmera Catchment, NSW;
- Lachlan Catchment, NSW;
- Murray Darling, Qld.

The topics covered in the surveys are listed in Table 8. A sample of landholders from each catchment, with properties greater than 10 ha in size, were surveyed by mail. Studies in the Goulburn Broken and Ovens Catchment focussed on landholder response to and willingness and capacity to manage dryland salinity (see Curtis *et al*, 2001; Curtis *et al*, 2003). Future surveys are planned for the Burnett-Mary Catchment in Queensland.

Table 8: Topics covered in surveys of social factors affecting landholder decision-making about the adoption of practices undertaken by Charles Sturt University and BRS.

Assessment of issues affecting property and district
Self-assessment of knowledge for different topics
Awareness of on-property salinity and soil acidity
Views about the importance of factors affecting decision making about new enterprises
Attitudes towards conservation
Response to stronger cost sharing for revegetation and protecting remnant vegetation
Involvement in planning related to family succession, property and business
Long-term plans for property
Adoption of recommended practices
Other property data, including: property size, number of paddocks, broad enterprise mix, remnant bush, area under specific enterprises (now and in 5 years)
Background socio-economic data, including: age, gender, education, occupation, on and off property hours worked (respondent and partner), on and off-property income (respondent and partner), Landcare membership, funding through government programs, time lived in district, level of equity in property.

Bureau of Rural Sciences (BRS)

BRS is working collaboratively with the National Land and Water Resources Audit and other State and Commonwealth agencies to promote the development of land use data sets for Australia at catchment, regional and national scales. Catchment scale land use mapping is produced by combining State cadastre, public land databases, fine-scale satellite data, other land cover and use data, and information collected in the field. The ALUM Classification has been used to produce nationally consistent Australia-wide land use data sets.

Coarse-scale satellite data (pixel size of 1.1 km²) and Agricultural Census data from the ABS for agricultural land uses, coupled with pre-existing finer resolution (principally 1:250,000 scale) data for other use has been used to produce a national scale (1:2,500,000) data set providing an overview of land use activities (BRS, 2002).

Land management practices information collections – summing up

While there are a number of sources of information concerning the biophysical, social and economic aspects of land management practice at the farm level, few data are amenable to mapping at a scale that is operationally relevant at the landscape or farm level. The main method of data collection are mail-out/mail-back surveys which have been able to provide data on a wide range of issues with an increasing focus on environmental and natural resource management in Australia's agricultural industries. The ABS and ABARE are the main suppliers of survey data, which can be provided within relatively short time frames and can be easily repeated. In terms of land management practices, only ABS currently supplies data that can be applied on a national scale, however survey design needs to be improved to allow greater integration of the results of different surveys to enhance the application of data. For instance, the farm enterprise data obtained by ABARE, while comprehensive in scope, are limited in their utility by the sampling strategy.

The key to improving the usability of survey data is understanding what the data are going to be used for and how the data may be interpreted (Vardon *et al.*, 2004). Integration should be a priority in survey design so that the many surveys and data collection activities carried out in Australia are linked or at least comparable - for instance the ABS Agricultural and Population and Housing Censuses. Recent natural resources and land management information collections by the ABS (e.g. Land Management and Salinity Survey 2002 and Water Survey 2003) will improve the range of data available on land management practices, but to provide maximum benefit these surveys will need to be repeated periodically to create time series data.

Future Opportunities for data collection

One area of future opportunity for land management practices data collection is remote sensing. For instance:

- Techniques developed for bare ground identification could be used to collect information on tillage, stubble or vegetation change – inexpensive or freely provided imagery available at high temporal frequency, for example MODIS, may be particularly useful in these applications.
- Gamma rays, which are currently used to indicate for salinity, also reveal the properties of the soil like sodicity and the composition of soils (clayey or sandy), which could provide information on recharge rates for groundwater.

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