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# Landholder Practices, Attitudes, Constraints and Opportunities for Change in the Fitzroy Basin Region



**May 2007**

*by* R.A. Preston, P. Lawson and Dr T. Darbas  
*for* Fitzroy Basin Association, Department of Natural Resources and Water

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for

Fitzroy Basin Association  
PO Box 139  
Rockhampton Qld 4700  
Phone (07) 4999 2800  
Fax (07) 4921 2860  
Email: [info@fba.org.au](mailto:info@fba.org.au)

Department of Natural Resources and Water  
Community Partnerships  
Water and Sustainable Landscapes  
GPO Box 2454  
Brisbane Q 4000

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Forest Images Pty Ltd  
Visual Assessment, Social Research and Geographic Analysis  
PO Box 556  
Stones Corner QLD 4120  
Phone: 0417 272 218  
Fax: 07 3503 9092  
Email: [info@forestimages.com.au](mailto:info@forestimages.com.au)

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## Summary

### ***Introduction***

This report presents key findings from a self-administered survey completed by 412 landholders in the Fitzroy Basin Association NRM Region, which was distributed to a random selection of landholders in October 2006. The sample includes people from throughout the region with a wide range of ages, sources of income and levels of formal education, who own, manage or agist small, medium and large properties with a variety of enterprises and land uses.

The survey was designed to establish baseline information about social, economic and other factors relevant to the sustainable management of natural resources in the region that can be used for monitoring and evaluating changes in landholders' circumstances, attitudes and on-farm activities over time. The survey also sought to identify and explore opportunities and constraints which affect the adoption of key land management practices and the possible influence of property size, enterprise mix and landholders age.

Results of this survey can be used in conjunction with other scientific, social and economic data to refine NRM implementation and delivery strategies in the Fitzroy Basin Region and to help overcome real or perceived barriers to the achievement of sustainable natural resources management.

### ***Characteristics of the survey area***

The Fitzroy Basin NRM region is situated in Central Queensland between the Burdekin Dry Tropics NRM region and the Burnett Mary NRM region. The region includes all the lands drained by the Fitzroy, Water Park Creek, Styx River, Shoalwater Creek, Raglan, Calliope and Boyne River Basins and their tributaries and marine waters and islands to the 3 mile nautical limit.

The region covers an area of 156000 km<sup>2</sup> (9% of Queensland). The height above sea level in the region generally ranges from about 400 m to 900 m in western plateau areas, and falls rapidly to coastal plains of 50 m to 150m.

*Further information on characteristics of the survey area is provided in Section 2, page 4.*

### ***Survey methods***

A self-administered 16 page survey booklet was distributed to 3,270 landholders in early October 2006. Mapped localities and ABS 2001 census data were used to stratify residents of the region into peri-urban and rural districts. Some 89% of surveys were randomly distributed to people living in rural districts and the remaining 11% were sent to people in urban and peri-urban areas.

498 completed surveys were returned (18% of surveys) of which 412 (15%) responses were complete and valid. While this response rate is less than desirable, respondents covered a wide range of ages, localities and types of property. This sample provides a legitimate indication of landholder opinions in the region.

The survey included questions about the implementation of and knowledge about several key land management practices, as well as base data on land use and resources, social, lifestyle, financial and economic topics, preferred sources of information and advice. Key land management practices included management activities such as maintaining ground cover, soil health, efficient water use and moisture retention, weed control, management of waterways, the protection of remnant bushland and the identification and protection of cultural heritage, as well as planning practices such as resource identification and mapping, financial planning and succession planning.

The structure of the survey questionnaire and many of the survey questions were developed to approximate a survey undertaken for the Queensland Murray-Darling Basin NRM region in 2002/2004. Other sources were used to adapt the survey to meet the circumstances and conditions of the Fitzroy region including two focus group interviews of landholders and NRM professionals.

Most survey questions used a 7 point interval scale so that results would be amenable to parametric statistical analysis and comparisons between different landholder groups. An example of this scale is illustrated below.

|                          |                          |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Not Important            |                          |                          |                          | Very Important           |                          | N/A                      |
| 0                        | 1                        | 2                        | 3                        | 4                        | 5                        | 6                        |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Further information on survey methods is provided in section 3, page 6.

## **Diversity of landholders and properties**

### **Property characteristics**

Landholders were asked to provide background information on the size and land use of their property. This information is helpful to develop a profile of survey respondents and for cross-tabulation with information from other parts of the survey.

11% of survey respondents reported that their properties under 10 hectares, 47% were from properties between 10 and 1,000 hectares, 34% were from properties between 1,000 and 10,000 ha, and 9% of were from properties over 10,000 ha

Survey respondents reported that the most extensive land use in the survey area was grazing of dryland pasture (65% of property area). The second most extensive land use was grazing of native bushland (21% of property area).

Further information about the characteristics of properties is provided in section 4, page 15.

### **Social characteristics**

Landholders were asked to provide background information such as their gender, age, educational qualifications and occupation.

About 64% of survey respondents reported that they were farmers and 36% were non-farmers. About 71% of survey respondents were male, and the median reported age of survey respondents was 57.5 years. Most respondents (80%) reported having secondary school or higher qualifications. Some 13% of survey respondents who reported having a 'university or postgraduate qualification' are in the 18-40 yrs age category, compared to 6% of survey respondents 70+ yrs. Most landholders (82%) have lived in the same district for 10 or more years.

Further information about landholders social characteristics is provided in section 5, page 18.

### **Economic characteristics**

Landholders were asked to provide background information on their economic circumstances such as their major source of income, off farm income and on-farm profit.

Just over one half (57%) of survey respondents reported earning most of their income from their property and 43% of survey respondents reported earning most of their income off-property.

An analysis of 'source of income' data by 'property size' indicates that survey respondents on larger properties received most of their income from their property, whereas owners of smaller properties earned more of their income off-property.

Just over one quarter (28.3%) of survey respondents reported that they had worked between 1 and 20 hours per week on the property, 20.5% reported working 20 to 40 hours per week, 28.9% worked 40 to 60 hours per week and 22.2% worked 60+ hours per week.

More than one half (54.3%) of survey respondents reported that they employed nil (0) people on the property, 20.2% reported that they employed 1 person and 25.5% employed 2 or more people on the property.

Further information about landholders economic characteristics is provided in section 6, page 21.

## **Landholder characteristics by property category**

A 'property land use category' variable was created to provide the basis for detailed examination of landholder responses using reported estimates of the property land use and property size.

The mean area of properties in category 1 is 44 ha, of which 36 ha on average was grazed. Only 27% of the people on category 1 properties reported their occupation as farmers. Respondents in this category

reported that about 13% of their 'estimated disposable income' was derived from their anticipated property profit.

The mean area of category 2 properties was reported to be 6,497 ha, of which 53 ha was under crops and 5,632 ha on average was grazed. About 92% of people on category 2 properties reported their occupation as farmers. Respondents in this category reported that about 57% of their 'disposable income' was derived from their anticipated property profit.

The mean area of category 3 properties was 2,067 ha, of which 1,580 ha on average was grazed and 375 ha on average was under cropping. About 86% of people on category 3 properties reported their occupation as farmers. Respondents in this category reported that about 35% of their 'disposable income' was derived from their anticipated property profit.

*Further information about landholder characteristics by property land use category are provided in section 7, page 27 .*

## **Landholder values, attitudes, issues**

### **Values**

The four values of greatest importance to landholders were reported to be the satisfaction of working the land, the ability to enjoy the peace and quiet of a rural environment, the value of the property for raising a family and the value of the property as a sound investment.

Of lesser value to landholders were access to services, the value of bushland as wildlife habitat, the contribution of bushland to nature conservation of the district and the value of the property as a source of household income. The value of least overall importance was the preservation of heritage.

Landholders on larger grazing properties reported a higher level of importance than landholders on smaller grazing properties with respect to their satisfaction with working the property, the role of the property in preserving family heritage; the value of the property as a source of household income; and the value of the property as a viable agricultural business. Landholders on larger grazing properties also stated that they enjoyed the peace and quiet of a rural environment less than people on small grazing properties. Landholders on larger mixed enterprise properties also reported a higher level of importance than people on smaller grazing properties with respect to the role of the property in preserving family heritage; the value of the property as a source of household income; and the value of the property as a viable agricultural business.

*Further information about landholder values is provided in section 8.1, page 30.*

### **Attitudes**

Respondents reported highest agreement with the statement that farming on-contour reduced soil erosion. Landholders also reported a high level of agreement with statements about the benefits of watering stock off stream, the link between economic, social and environmental outcomes, the long term benefits of adopting new practices compared to short term loss of productive capacity, the lifestyle benefits of working and living on a rural property, the benefits of protecting remnant bushland, the benefits of weed and pest control in native bushland and the long term benefits of property planning.

Landholders reported less agreement with statements about the need to return marginal cropping country to grazing, the down-stream benefits of reducing the diversion of stream flows and the benefits of identifying sites of significance to Aboriginal communities.

Landholders on small grazing properties reported higher agreement than people on larger grazing properties and larger mixed enterprise properties regarding the statement that reducing the diversion of water flow provides important down-stream benefits. Landholders on small grazing properties also reported higher agreement than people on larger grazing properties regarding statements that the lifestyle benefits of rural living outweigh the challenges and that identify and protecting areas of remnant bushland is justified by the protection it affords to plants and animals.

Further information about landholder attitudes is provided in section 8.2 , page 32.

## **Current implementation of land management practices**

### **Land management practices**

In cropping systems, the three most extensively implemented practices were reported to be the implementation of minimum tillage, farming on-contour and the retention of ground cover. The least implemented practice in cropping systems was the application of improved water use efficiency techniques. The implementation of water use efficiency techniques was reported to be higher on small grazing properties than on large grazing properties and large mixed enterprise properties.

In grazing systems, landholders stated that the most widely implemented practice was the monitoring and management of stock numbers to maintain ground cover. Managing stock access to riparian areas was the least implemented practice in grazing systems.

Further information about the implementation of land management practices is provided in section 9.1, page 36.

### **Planning practices**

The most highly implemented planning practice was reported to be maintaining knowledge of advances in land management practices. The identification and protection of sites of cultural significance to Aboriginal communities was given the lowest rating.

Survey respondents on large grazing properties and large mixed enterprise properties reported a higher level of implementation than landholders on small grazing properties for resource mapping, succession planning and maintaining an up-to-date knowledge of practices. Survey respondents on large grazing properties also reported a higher level of implementation than landholders on small grazing properties for the identification of cultural sites and financial planning.

*Further information about the implementation of planning practices is provided in section 9.2, page 40.*

### **Monitoring of water resources**

About two thirds of landholders reported that they use bore water for agricultural purposes. Of those respondents who use bore water for agricultural purposes, just over half reported that the level of bore water had remained stable over the past 12 months.

Of those landholders who reported using bore water for agricultural purposes, one-half reported that they monitor the quality of bore water, and the majority indicated that the quality of bore water was stable. Some respondents reported that the quality of bore water had declined.

About 8% of landholders reported that they had naturally-occurring springs on their property. One half of landholders who reported having a naturally occurring spring also reported that they were willing for an ecologist to assess the quality of naturally-occurring springs on their property.

Only a small percentage of landholders reported that part of their property was affected by salinity.

*Further information about the implementation of water monitoring practices and salinity occurrence is provided in section 9.3, page 42.*

### **Self-assessed knowledge of practices**

Landholders stated that their highest level of knowledge of land management practices and benefits in cropping systems pertains to the contribution of ground cover to soil health and the reduction of soil erosion and the benefits of weed control for maintaining land productivity. Landholders reported that their lowest level of knowledge in cropping systems relates to the ability of water use efficiency techniques to maintain a low water table and reduce the risk of salinity. Landholders on larger cropping properties reported a higher level of knowledge than landholders on smaller grazing properties with respect to the benefits of farming on-contour, the contribution of ground cover to soil health and the reduction of soil erosion and opportunity cropping.

Landholders stated that their highest level of knowledge of land management practices and benefits in grazing systems relates to the effects of weed control on land productivity. Landholders reported their lowest level of knowledge in grazing systems relates to the effects of managing stock access to riparian areas and wetlands. Landholders on larger grazing properties reported a higher level of knowledge than those on smaller grazing properties with respect to the benefits of weed control.

Landholders reported a relatively high knowledge of the benefits of vegetation retention in riparian, wetland and erosion prone areas on water quality.

Landholders reported a relatively high level of knowledge of most property planning practices including the ability of financial planning to ensure sustainable economic outcomes for the property, the benefits of improving awareness and knowledge of advances in land management techniques and land processes, the benefits of succession planning and the benefits of identifying and protecting remnant bushland. Landholders reported a lower level of knowledge of the benefits of resource mapping and the lowest knowledge of the benefits of identifying and protecting Aboriginal sites. Landholders on larger mixed enterprise properties reported a higher level of knowledge than those on small grazing properties with respect to the benefits of resource mapping. Landholders on larger grazing properties reported a higher level of knowledge than people on small grazing properties with respect to the benefits of resource mapping, financial planning and maintaining an up-to-date knowledge of land management practices.

*Further information about the self-assessed knowledge of land management practices and benefits is provided in section 10, page 45.*

## **Land management opportunities and constraints**

### **Priorities for future implementation**

The land management objective reported to be of highest priority in cropping systems was weed control. The retention of ground cover was also a high priority. Practices of lesser priority include opportunity cropping and farming on-contour. Landholders on larger mixed enterprise properties and larger grazing properties reported a higher priority than landholders on smaller grazing properties for the implementation of farming on-contour. Landholders on mixed enterprise properties also reported a higher priority than those on smaller grazing properties for the implementation of opportunity cropping.

Landholders stated that the land management objectives of highest priority in grazing systems were weed control and monitoring and managing stock numbers. The management of stock access to riparian and other sensitive areas and fencing different land and soil types were reported to be of relatively lower priority.

The retention of riparian vegetation was reported to be a moderately high priority and the development of effluent management plans was a relative lower priority.

The land management practice of highest priority in remnant bushland was reported to be controlling the spread of introduced plants. Of lesser priority was the exclusion of stock.

Landholders stated that the property planning practice of highest priority was keeping up-to-date with advances in land management techniques. The planning practice of least priority was reported to be identifying and mapping sites of cultural significance to Aboriginal communities. Landholders on larger mixed enterprise properties and large grazing properties reported that succession planning and maintaining an up-to-date knowledge of advances in land management were a higher priority than for landholders on small grazing properties. Landholders on large grazing properties also reported that resource mapping and financial planning were a higher priority than for landholders on small grazing properties.

*Further information about landholder priorities for future implementation of land management practices is provided in section 11.1, page 51.*

### **Long term property options**

The most likely long term option was reported to be that the property will stay with the owner or family. Landholders on larger grazing properties and larger mixed enterprise properties reported it was less likely that the whole property will be sold than landholders on smaller grazing properties. Landholders on larger grazing properties and larger mixed enterprise properties also reported it was more likely that the property will be sold for mining than those on smaller grazing properties. Landholders on large grazing properties reported that was more likely that the size of the property will be increased or ownership of the property would stay with the current family or owner than landholders on small grazing properties.

*Further information about landholders' long term plans is provided in section 11.2, page 56.*

### **Constraints to the adoption of new practices**

Climate variability was reported to be the most important of the listed land resource factors considered when making decisions about the adoption of new practices. The need to reorganise the layout of the property was the least important of listed land resource factors. Climate variability and the viability of the property size were reported to be more important to landholders on large grazing properties than these items were to landholders on small grazing properties.

Landholders stated that the extent of family and partner support was the social factor of highest importance.

Financial factors reported by landholders as being most important to their decisions about the adoption of the new practices were cash flow, the cost of inputs and the cost of machinery. The availability of labour was the least important consideration. The cost of machinery and equipment and the delayed returns from the investment of new practices were reported to be more important constraints to landholders on larger mixed enterprise properties than landholders on smaller grazing properties. The cost of machinery and equipment, cash flow and the availability of labour were reported to be more important to landholders on large grazing properties than they were to people on small grazing properties.

Access to reliable information and advice about new practices, the time and effort needed to acquire new knowledge and the uncertainty about new practices were reported to be moderately important considerations. Landholders on larger grazing properties reported that access to reliable information was more important in decision-making about the adoption of new land management practices than it was to landholders on small grazing properties.

*Further information about constraints to the adoption of new practices is provided in section 11.4, page 58.*

### **Options for financial assistance**

A tax rebate from the Commonwealth Government was reported to be the most useful form of financial assistance. Landholders on larger grazing properties reported a higher level of utility than landholders on smaller grazing properties regarding grants of fencing and tax rebates from the Commonwealth Government.

*Further information about options for financial assistance is provided in section 11.5, page 62.*

### **Utility of learning about new practices**

Learning about controlling the spread of weeds in cropping systems was reported to be the most useful of all listed topics. The maintenance of ground cover was also reported to be a useful topic. Farming on contour and opportunity cropping were the least important of listed cropping practices.

Landholders reported that learning about weed control and the monitoring and managing of stock numbers were the two most useful topics in grazing systems. Learning about the development of an effluent management plan in intensive animal production systems was of relatively low utility.

Landholders stated that controlling the spread of introduced plants in remnant bushland was a very useful topic. The exclusion or management of stock in bushland areas was reported to be of lesser utility.

The most useful property planning topic was reported to be keeping up-to-date with land management techniques. Other important topics included resource mapping, financial planning and succession planning. Landholders stated that learning about identifying and protecting sites of significance to Aboriginal communities was the least useful of listed property planning topics. Landholders on large mixed enterprise properties and larger grazing properties reported that learning about succession planning was more useful than those on small grazing properties. Landholders on larger grazing properties also reported that learning about financial planning was more useful than it was to people on small grazing properties.

*Further information about the utility of learning about new practices is provided in section 11.6, page 64.*

### **Organisations or people for learning about new practices**

Landholders stated that neighbours or other farmers were the most useful group of people for learning about new land management practices. Landholders also reported that sellers or resellers of equipment

or agricultural supplies were moderately useful. State Government field officers, Officers from catchment organisations and private consultants were reported to be less useful than other listed organisations or groups of people.

Landholders on large grazing properties reported that the utility of learning from officers from catchment organisations was higher than it was for landholders on small grazing properties. Landholders on large mixed enterprise properties reported a higher level of utility in learning from neighbours or other farmers than landholders on smaller grazing properties.

*Further information about the utility of organisations or people for learning about new practices is provided in section 11.7, page 68.*

### **Sources of information for learning**

Landholders stated that the most useful sources of information about new land management practices were books and rural magazines and field days. Sources of information of lower utility were tertiary education courses, land management advisory officers coming to the property, telephone advice and front counter advice.

Landholders on larger grazing properties and larger mixed enterprise properties reported that field days had a higher utility than reported by landholders on smaller grazing properties. Landholders on large grazing properties also reported a higher level of utility for local workshops and than landholders on small grazing properties. Landholders on small grazing properties reported a higher level of utility for learning from the internet than landholders on large grazing properties.

*Further information about the utility of sources of information for learning about new practices is provided in section 11.8, page 70.*

### **Community initiatives**

Landholders stated that the listed community initiatives were of moderate and approximately equivalent utility.

*Further information about the utility of community initiatives is provided in section 11.9, page 72.*

### **Relationship between future priorities, values and constraints**

Information constraints, land resource constraints, financial values and social values are common factors which explain landholder priorities for the adoption of new land management practices. Particular factors include: the time and effort required to acquire knowledge, access to reliable information, climate variability and the need to reorganise the layout of the property.

*Further information about the relationship between future priorities, values and constraints is provided in section 12, page 74.*

### **Further investigations**

While this report provides detailed findings on the social, natural resource and economic dimensions of rural land management, the data collected by this survey are also amenable to further analyses and investigation.

*Further information about possible further investigations is provided in section 13 on page 79.*

### **Conclusions**

While all of the above factors and variables were of approximately equal relevance to landholders future priorities, four variables were found to frequently predict landholder priorities for the adoption of new practices. These are:

- the constraint of time and effort required to acquire knowledge of new practices
- the constraint of access to reliable information and advice about new practices
- the constraint of needing to reorganise the layout of the property.
- the constraint of climate variability.

Any future programs designed to increase landholders' efficient access to reliable information and advice should take into account findings that the two most useful organisations or groups of people for learning about new land management practices are:

- neighbours or other farmers and
- sellers or resellers of equipment or agricultural supplies.

These programs should also consider findings that landholders reported that the most useful sources of information about new land management practices were:

- books and rural magazines and
- field days.

Programs to increase the uptake of key management practices should take into account landholder priorities, constraints and values which are particular to each practice.

*Further information about conclusions of this study is provided in section 14 on page 80.*

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# 1. Introduction

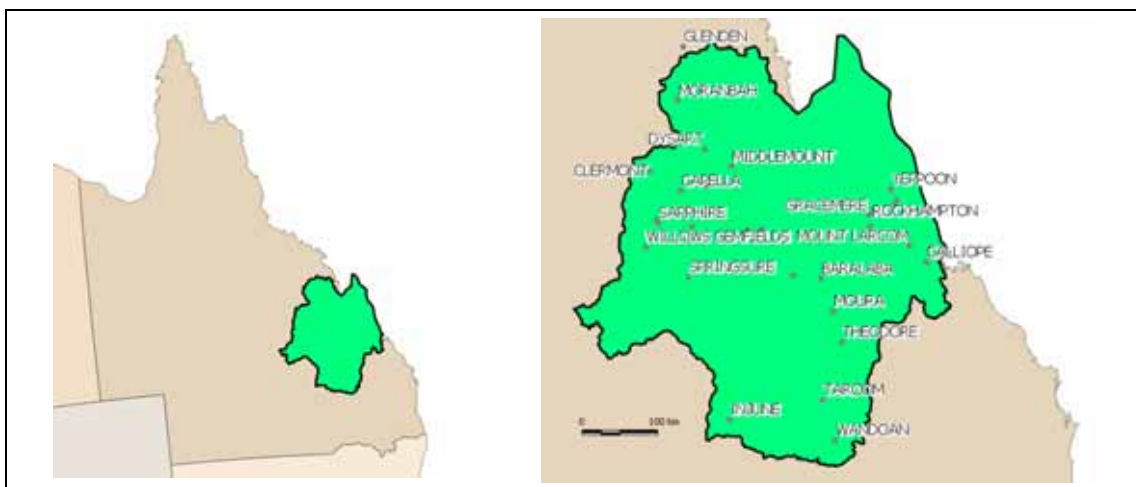
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## 1.1. Background

This report presents a summary of findings from a survey mailed to 7,600 landholders and residents of Queensland's Fitzroy Basin Association NRM Region in October 2006. This survey was designed to gather baseline information concerning the social and economic factors affecting landholder decision-making on the adoption of key land management practices relevant to sustainable management of natural resources in the Fitzroy Basin Association NRM Region (Figure 1).

Funding for this project has been made available under the National Action Plan for Salinity and Water (NAPSWQ) through the Queensland Department of Natural Resources and Water in accordance with a bilateral agreement signed by the Queensland and Australian Governments in March 2002.

The Fitzroy Basin Association is one of 14 Regional Bodies in Queensland established under the NAPSWQ program to advance achievement of the program's objectives.



**Figure 1. Fitzroy Basin Association NRM Region**

This project has sought to achieve a high level of relevance to activities of the Fitzroy Basin Association and landholders in the region, while maintaining consistency with survey methods used in two associated surveys conducted by the Bureau of Resources Sciences for the Queensland Murray-Darling Basin region (Byron, Curtis et al. 2004) and the Burnett-Mary region (Byron, Curtis et al. 2006). The survey questionnaire used in the Murray-Darling was also made available to this project courtesy of the Bureau of Resource Sciences. The current project has also sought to achieve a high level of standardisation with best practice survey methods which would facilitate the ability to undertake comparisons between regions and over time.

This survey of landholders in the Fitzroy Basin Association NRM region was conducted in tandem with a similar survey for the Condamine Alliance NRM region.

## 1.2. Social and economic data for NRM

The implementation of effective strategies by regional NRM bodies is greatly assisted by the availability of reliable and representative information about landholder attitudes and opinions on NRM matters and their social and economic circumstances.

While environmentally and economically successful rural land management is driven principally by the availability of limiting financial and natural resources, social and economic factors have a profound influence on landholders decisions to implement sustainable practices.

While some social and economic influences and constraints are beyond the scope of NRM regional bodies, these survey results can be used in conjunction with other scientific, social and economic data to refine NRM implementation and delivery strategies in the Fitzroy Basin Region aimed at overcoming real or perceived barriers to the widespread uptake of sustainable land management.

This survey has been designed to identify and explore these opportunities and constraints and to establish base line data for monitoring and evaluating changes in landholders' social and economic circumstances, attitudes and on-farm activities over time.

This survey forms an important tool for the achievement of sustainable land management in the Fitzroy Basin Region, when used wisely in conjunction with other mechanisms and information.

### **1.3. Previous NRM survey research in Queensland**

As noted above, this survey has been designed to be broadly consistent with structure and detail of two previous surveys undertaken by the Bureau of Resource Sciences, while also reflecting the current operating environment, issues and requirements of the Fitzroy Basin Association and rural landholders of this region.

A survey of landholders in the Queensland Murray-Darling Basin NRM Region undertaken by the Bureau of Resource Sciences (Byron, Curtis et al. 2004) provides a comprehensive data set that can be used to monitor landholder opinions about the uptake of land management practices. The study found that landholders' adoption of key land management practices is influenced by their association with their properties and rural land management. The study also found that practices with a broad range of environmental, social and economic benefits are more likely to be adopted than those with a narrow range of benefits.

Some of the important benefits of NRM practices are those that contribute to the wider community, landholder lifestyle and farm productivity. The study also found that no single option for government funding would influence the adoption of land management practices. The study concluded that a variety of measures are needed to engage the vast majority of landholders and that a simple and streamlined process for seeking funding would facilitate the adoption of sustainable practices.

A subsequent survey in the Burnett Mary NRM region (Byron, Curtis et al. 2006) identified similar constraints and issues to the Murray-Darling survey. The most important values associated with a landholder's property were lifestyle benefits, the satisfaction of passing the property on to future generations in a better condition and the contribution that the property makes to the environmental health of the district.

The Burnett Mary survey also found that increased efforts in targeted education and awareness presented major opportunities for achieving greater adoption of recommended land management practices. Some of the most effective options for improved education and awareness included the use of demonstration sites and trials, especially those involving local landholders and better access to advice and support networks. The survey found that the most widely adopted practices included weed and pest animal control, minimum tillage in cropping, cell and rotational grazing for animal production and trash blanketing for cane growing.

The two survey reports provide valuable information and insights about strategies for overcoming constraints to the uptake of key land management practices.

The structure of some sections and specific questions from these two earlier surveys were reproduced in the current project because of their relevance and the ability that this provides for comparing responses from landholders in different regions.

### **1.4. Research objectives**

While data on the spatial distribution and condition of many natural resources attributes and information on basic demographic variables attributes for the Fitzroy Basin Region are readily available, integrated social and economic data about landholders and their attitudes towards NRM are limited.

This survey has sought to alleviate this situation by pursuing the following objectives:

- a) To provide baseline data for key social and economic conditions/trends at a scale that is suitable for effective catchment planning by the Fitzroy Basin Association,
- b) To gain a better understanding of the limitations, barriers and constraints to the adoption of key land management practices,
- c) To assess and explore attitudes towards current tools and potential alternative tools (including incentives) for improved land management and

d) To provide information that will assist the assessment of NRM programs for capacity building, such as landholders awareness of issues, their knowledge, business and succession planning, confidence in recommended practices, adoption of practices for sustainable agriculture and biodiversity conservation.

## 2. Characteristics of the survey area

---

### 2.1. Geography

The Fitzroy Basin NRM region is situated in Central Queensland between the Burdekin Dry Tropics NRM region and the Burnett Mary NRM region (see Figure 1 below). The region includes all the lands drained by the Fitzroy, Water Park Creek, Styx River, Shoalwater Creek, Raglan, Calliope and Boyne River Basins and their tributaries and marine waters and islands to the 3 mile nautical limit.

The region covers an area of 156000 km<sup>2</sup> (9% of Queensland). The height above sea level in the region generally ranges from about 400 m to 900 m in western plateau areas, and falls rapidly to coastal plains of 50 m to 150m, as illustrated in Figure 2.

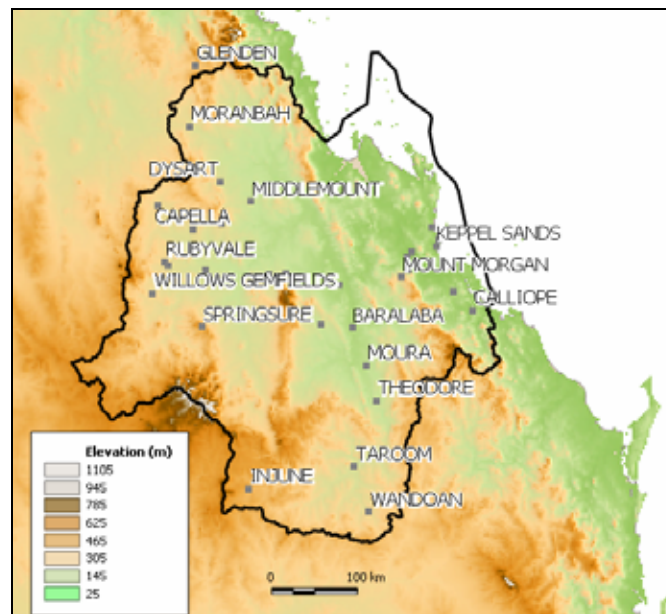


Figure 2. Topography of the Fitzroy Basin Association NRM Region

## 2.2. Sub-catchments

The main drainage system in the Fitzroy Basin Association NRM Region is the Fitzroy River and its tributaries. The Region has been divided into 12 sub-catchments as illustrated in Figure 3.

Western sub-catchments of the FBA Region (i.e. Nogoia River, Comet River) were excluded from the survey because of a coincident mail out survey of landholders in this area.

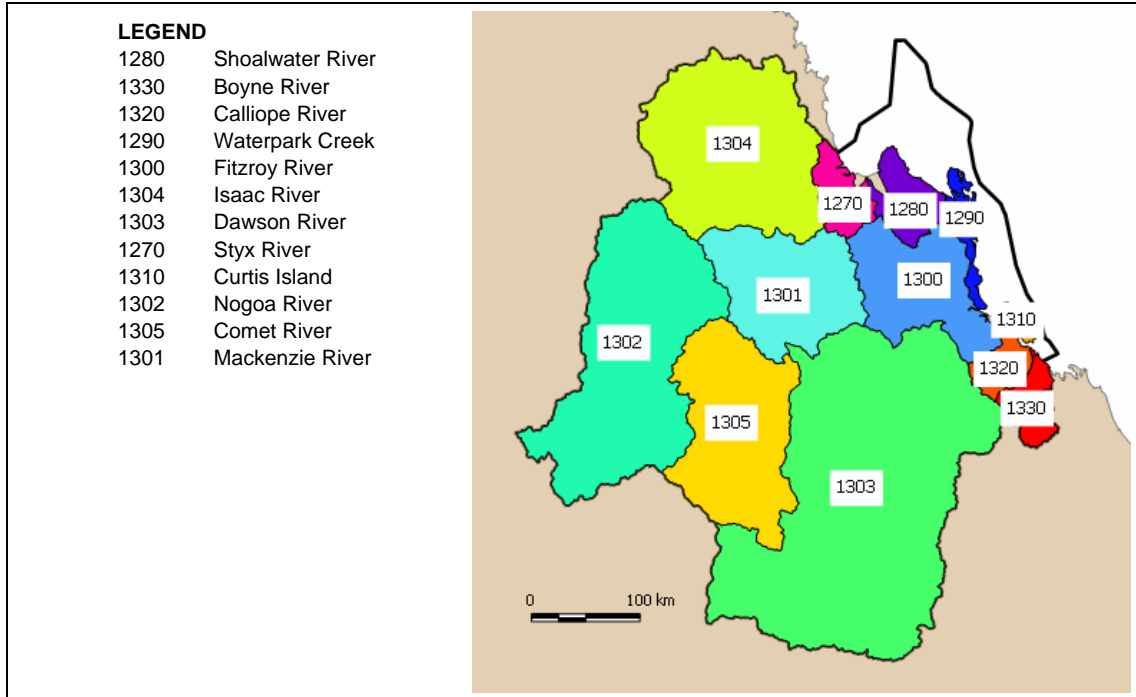


Figure 3. Sub-catchments in the Fitzroy Basin NRM Region

### 3. Survey methods

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#### 3.1. Design of the survey questionnaire

Four sets of information were considered during drafting of the survey questionnaire including:

- Focus group interviews of landholders (see below),
- The Central Queensland Strategy for Sustainability: 2004 and Beyond (Christensen and Rodgers 2005) and Regional Investment Strategy, including advice from Fitzroy Basin Association staff,
- Surveys undertaken in the Queensland Murray-Darling Basin (Byron, Curtis et al. 2004) and Burnett Mary NRM region (Byron, Curtis et al. 2006) and
- Advice from officers of the Community Partnerships Unit of the Queensland Department of Natural Resources and Water.

##### 3.1.1. Focus group workshops

Three focus group workshops were held to provide an initial source of information about landholder's values, knowledge, views, practices, objectives, constraints and future plans. Previous surveys have also followed a similar approach for involving local landholders in the design of an appropriate survey instrument.

Two of these workshops (at Rockhampton and Emerald) included a variety of landholders including people who derive most income from non-farming activities and people involved in commercial agriculture. Workshop participants also included people from a range of ages, incomes, and gender. A third workshop was also held with NRM officers from the Fitzroy Basin Association to elicit their thoughts about the circumstances, attitudes, and practices of landholders. Individual and small group interviews were also held with NRM officers at Emerald and Rockhampton.

Participants were invited to discuss 20 different topics, including their general perceptions about the district, management practices, property goals and assistance in reaching those goals (Table 1).

**Table 1. Questions used to lead discussion at focus group workshops**

|   |
|---|
| <p><i>General perceptions about your district</i></p> <ol style="list-style-type: none"><li>1. What do you like about living in this district?</li><li>2. What are some of the changes in your district that concern you?</li><li>3. What groups have you been involved in that you found effective and enjoyable?</li><li>4. What land in your district has major productivity problems?</li><li>5. What land in your district is in poor environmental condition?</li><li>6. What are some of the key productivity and environmental improvements you would like to see in your district in the next 10 years?</li></ol> <p><i>Management practices</i></p> <ol style="list-style-type: none"><li>7. What are some land management practices you use that have improved the productivity of your property?</li><li>8. What are some land management practices you use that have improved the environmental condition of your property?</li><li>9. What are the reasons you or other people in your district adopt new practices, or stay with old ones?</li><li>10. Where do you obtain information and advice about land management practices?</li><li>11. How do you assess the reliability and trustworthiness of that information and advice?</li></ol> <p><i>Property goals</i></p> <ol style="list-style-type: none"><li>12. How does your family influence your decisions about your property?</li><li>13. What are your long-term economic goals for your on-property enterprises and how do you plan to achieve them?</li><li>14. What gets in the way of making your on-property enterprises economically viable?</li><li>15. What economic risk management strategies do you have in place?</li><li>16. What are your long-term goals to improve the environmental condition of your property and how do you plan to achieve them?</li><li>17. What frustrates or hinders you in improving the environmental condition of your property?</li></ol> |
|---|

18. What strategies do you have in place to manage environmental risks?

*Industry, Government, Community organisations*

19. What help you would like to see governments or community organisations offer to improve the economic and environmental viability of your property?

20. What hinders your use of that assistance?

Insights from the landholder workshops included the precarious viability of particular enterprises and challenges for rural landholders such as the extended drought, competition for labour, peri-urban expansion and financial circumstances. Landholders at these workshops clearly demonstrated their ability to meaningfully engage with and contribute to topics raised at these workshops. The workshop of NRM officers also provided valuable suggestions about landholder issues, natural resource management and social, economic and environment issues in their region. A detailed and confidential report of workshops was developed to assist the translation of landholder and NRM officer experiences and knowledge into new survey questions, or to modify questions from previous surveys.

### **3.1.2. Strategy for Sustainability and Regional Investment Strategy**

The Central Queensland Strategy for Sustainability: 2004 and Beyond (Christensen and Rodgers 2005) and Regional Investment Strategy were reviewed with the assistance of NRM staff to identify key issues and questions that were most relevant to key management action targets and the process of survey research. Priorities were based on an appraisal of strategies that are most likely to be effective in building landholder capacity to adopt improved land management practices.

Sections of the plan dealing with Regional Vision, Targets and Actions were most useful and relevant. Themes developed in the plan as expressed in the Regional Investment Strategy (RIS) and their associated Management Action Targets (MATs) for water, land use and management, community involvement, nature conservation, and salinity influenced the choice and wording of questions included in the survey instrument.

These priorities were used to highlight survey questions of greatest relevance to the current NRM operating environment of the Fitzroy Basin Association.

### **3.1.3. Previous survey questionnaire**

The structure, land management practices and wording of specific survey questions from two previous surveys were compared with outputs of the focus group workshops and NRM planning reports to identify relevant and applicable questions and topics.

The Queensland Murray-Darling survey (Byron, Curtis et al. 2004) was divided into eleven sections as follows:

1. Your property
2. Your assessment of issues
3. Why your property is important to you
4. Long term plans for your property
5. Your views
6. Your knowledge of different topics
7. Land use / enterprise mix
8. Constraints to change
9. Management practices on your property
10. Ways forward
11. Background (social and economic data)

The Burnett Mary survey (Byron, Curtis et al. 2006) used a similar structure and format, as follows

1. Your property
2. Your assessment of issues
3. Why your property is important to you
4. Plans for your property
5. Your views
6. Your knowledge of different topics
7. Land use / enterprise mix
8. Changing your production system
9. Management practices on your property

10. Ways forward
11. Background (social and economic data)

These surveys included various assessments of a number of 'Current Recommended Management Practices' (CRP's). For example, the Queensland Murray-Darling survey (Byron, Curtis et al. 2004), included questions about 15 recommended practices as listed below.

1. Time-controlled or cell grazing.
2. Varying crop rotation according to soil test results.
3. Cropping using a rotation with ley pasture.
4. Reducing machinery or stock traffic.
5. Cropping with reduced chemical usage as a result of applying integrated pest management or GPS technology.
6. Only watering stock from troughs or tanks.
7. Using low pressure overhead or drip irrigation systems.
8. Fencing waterways to manage stock access.
9. Fencing native bush to manage stock access.
10. Encouraging regrowth of native vegetation.
11. Cropping using minimum tillage practices.
12. Sowing introduced perennial pasture.
13. Planting trees and shrubs.
14. Time spent to control non-crop weeds and pest animals.
15. Capping and piping bores and bore drains.

#### **3.1.4. Department of Natural Resources and Water**

Officers from the Community Partnerships Unit of the Department of Natural Resources and Water provided helpful suggestions about the balancing of inputs to the survey design process (esp. focus group workshops, NRM Plans, previous surveys) to ensure the survey questionnaire was relevant and applicable to current NRM requirements and the study objectives.

### **3.2. Structure of the survey questionnaire**

#### **3.2.1. Alignment with previous survey questionnaires**

The survey questionnaire was divided into 12 sections which approximate the structure of the survey questionnaire used for the Queensland Murray-Darling Basin NRM region (Byron, Curtis et al. 2004) (Table 2). The consistent structure was helpful when making regional comparisons and may lead to consideration of opportunities for standardisation of methods and measures.

**Table 2. Comparison of structure used in the current and previous survey**

| <i>Current survey</i>                             | <i>QMDB Survey</i>                       | <i>Changes</i>  |
|---|--|---|
| 1. Your property                                  | 1. Your property                         | Minor changes   |
| 2. Why your property is important to you          | 2. Why your property is important to you | Few or no changes   |
| 3. Your views on land management topics           | 5. Your views                            | Few or no changes   |
| 4. Land use of your property                      | 7. Land use / enterprise mix             | Minor changes   |
| 5. Your knowledge of land management topics       | 6. Your knowledge of different topics    | Few or no changes   |
| 6. Land management of your property               | 9. Management practices on your property | Minor changes to question on current management practices. Addition of new sub-section on planning practices. |
| 7. Land management objectives and long term plans | 4. Long term plans for your property     | Minor changes to question on long term plans. Addition of new sub-section on management objectives.           |
| 8. Constraints to managing your property          | 8. Constraints to change                 | Minor changes   |

| <i>Current survey</i>                      | <i>QMDB Survey</i>           | <i>Changes</i>   |
|--|------------------------------|--|
| 9. Ways forward                            | 10. Ways forward             | Minor changes to question on financial incentives. Addition of new sub-sections on learning opportunities and community initiatives. |
| 10. Background information                 | 11. Background information   | Most questions identical   |
| 11. About water resources on your property |                              | New section added to assess key water issues raised by Regional NRM Plan   |
| 12. About other issues                     | 3. Your assessment of issues | Few or no changes  |

The new survey questionnaire has adopted a ‘horizontal rating scale’ (de Vaus 2002), sometimes also known as an approximate interval scale, whereby respondents were asked to respond on a scale between 0 and 6 (Figure 4). Previous survey questionnaires asked respondents to record a number between 1 and 5 on a verbal ‘likert scale’. Adoption of the ‘horizontal rating scale’ response format allows for the application of parametric statistical analysis techniques that are not applicable to responses recorded using a likert scale response format.

|  |                          |                          |                          |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|  | Not<br>Important         |                          |                          |                          | Very<br>Important        |                          | N/A                      |
|  | 0                        | 1                        | 2                        | 3                        | 4                        | 5                        | 6                        |
|  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Figure 4. Horizontal rating scale used to record responses**

### 3.2.2. Key land management practices

As in previous surveys, a series of key land management practices were identified for evaluation in the survey to explore the responses of landholders to various survey constructs (Table 3). These were derived from practices used in previous surveys, responses from focus group workshops and suggestions from Fitzroy Basin Association officers. Practices were also selected to coincide with management practices used in the Fitzroy Basin Association region, to the extent this was possible.

Practices evaluated in the survey include both management and planning activities. Management activities include those aimed at maintaining ground cover, soil health, efficient water use and moisture retention, weed control, management of waterways and the protection of remnant bushland and cultural heritage. Planning practices include resource identification and mapping, financial planning and succession planning. Practices were grouped according to the agricultural system that they apply to, so as to facilitate accurate responses from landholders and to enable ready interpretation of results. The six agricultural systems used to group practices were:

- Cropping systems
- Grazing systems
- Intensive livestock systems
- Riparian, wetland and erosion-prone areas
- Remnant bushland areas
- Overall property resource

Key management practices are included in four sections of the survey as follows:

- Section 5. Your knowledge of land management topics
- Section 6. Land management of your property
- Section 7. Land management objectives and long term plans
- Section 9. Ways forward

**Table 3. Key land management practices and perceived benefits**

| <i>Practice</i>   | <i>Perceived benefits to landholder</i>  |
|---|--|
| <i>Cropping systems</i>   |  |
| A. Farming on-contour (e.g. topographic contour cropping)   | Reduced soil erosion and increased soil moisture   |
| B. Water use efficiency techniques (especially irrigation scheduling)                                   | Lower water table and reduced risk of salinity.  |
| C. Use of minimum or zero till  | Soil health improved (structure, organic matter content, etc.) and higher retention of moisture                        |
| D. Maintaining ground cover (e.g. stubble retention)  | Soil health improved (structure, organic matter content, etc.), higher retention of moisture and prevention of erosion |
| E. Opportunity cropping   | Improved agricultural productivity and reduced soil erosion  |
| F. Controlling spread of weeds  | Improved land productivity   |
| <i>Grazing systems</i>  |  |
| G. Monitoring and managing stock numbers (including cell grazing, rotation grazing, strategic spelling) | Improved pasture condition and reduced soil erosion  |
| H. Controlling spread of weeds  | Improved land productivity   |
| I. Fencing different landscapes and soil types to control grazing pressure.                             | Better stock management to improve productivity, keep ground cover and reduce erosion                                  |
| J. Managing stock access to riparian areas, wetlands (incl. off-stream watering points, fencing )       | Improved water quality and reduced erosion   |
| <i>Intensive livestock systems</i>  |  |
| K. Development and operation of an effluent management plan   | Improved water quality and soil condition  |
| <i>Riparian, wetland and erosion-prone areas</i>  |  |
| L. Retention of vegetation  | Improved water quality and reduced soil erosion  |
| <i>Remnant bushland areas</i>   |  |
| M. Controlling spread of introduced plants  | Improved condition of existing native vegetation   |
| N. Exclusion / management of stock  | Improved condition of existing native vegetation   |
| <i>Overall property resource</i>  |  |
| O. Resource mapping (e.g. infrastructure, pastures, land condition, soil types, bushland, streams)      | Improved resource management and productivity  |
| P. Identifying and protecting sites of cultural significance to Aboriginal communities                  | Cultural heritage protected  |
| Q. Identifying and protecting remnant bushland  | Important wildlife and plants protected  |
| R. Financial planning   | Improved likelihood of achieving sustainable economic outcomes for your property                                       |
| S. Succession planning  | Improved likelihood of achieving a goal of transfer of your property to the next generation                            |
| T. Maintaining awareness and knowledge of advances in land management techniques and land processes     | Improved likelihood of achieving desired outcomes for your property for a range of goals                               |

### 3.2.3. Questionnaire Framework

The survey questionnaire was also structured to provide coverage of general topics such as land use and resources, social and lifestyle, financial and economic, information and advice and property planning, as well as providing basic data on land resources, social and economic attributes (Table 4). Land categories used in section 4 of the survey were based on the Australia Land Use and Management (ALUM) system (Leslie 2004).

**Table 4. Overall survey questionnaire framework**

| TOPIC                                     | Section of Questionnaire |  |   |                              |  |                                     |   |  |                 |                            |  |  |
|---|--------------------------|--|---|------------------------------|--|-------------------------------------|---|--|-----------------|----------------------------|--|--|
|   | 1. Your property         | 2. Why your property is important to you | 3. Your views on land management topics | 4. Land use of your property | 5. Your knowledge on land management practices | 6. Land management on your property | 7. Land management objectives and long term plans | 8. Constraints to managing your property | 9. Ways forward | 10. Background information | 11. About water resources on your property | 12. Your views on land management issues |
| <b>General</b>                            |                          |  |   |                              |  |                                     |   |  |                 |                            |  |  |
| Land use and resources                    |                          | ✓  | ✓                                       |                              |  |                                     |   | ✓  |                 |                            |  | ✓  |
| Social and lifestyle                      |                          | ✓  | ✓                                       |                              |  |                                     |   | ✓  |                 |                            |  | ✓  |
| Financial and economic                    |                          | ✓  |   |                              |  |                                     |   | ✓  |                 |                            |  | ✓  |
| Information and advice                    |                          |  |   |                              |  |                                     |   | ✓  |                 |                            |  | ✓  |
| Property planning                         |                          |  | ✓                                       |                              |  |                                     |   |  |                 |                            |  | ✓  |
| <b>Key practices</b>                      |                          |  |   |                              |  |                                     |   |  |                 |                            |  |  |
| Cropping systems                          |                          |  |   |                              | ✓  | ✓                                   | ✓   |  | ✓               |                            |  |  |
| Grazing systems                           |                          |  |   |                              | ✓  | ✓                                   | ✓   |  | ✓               |                            |  |  |
| Intensive animal production systems       |                          |  |   |                              | ✓  | ✓                                   | ✓   |  | ✓               |                            |  |  |
| Riparian, wetland and erosion-prone areas |                          |  |   |                              | ✓  | ✓                                   | ✓   |  | ✓               |                            |  |  |
| Remnant bushland areas                    |                          | ✓  |   |                              | ✓  | ✓                                   | ✓   |  | ✓               |                            |  |  |
| Overall property resource                 |                          |  |   |                              | ✓  | ✓                                   | ✓   |  | ✓               |                            |  |  |
| Water resources                           |                          |  |   |                              |  |                                     |   |  |                 |                            | ✓  |  |
| <b>Social &amp; economic data</b>         |                          |  |   |                              |  |                                     |   |  |                 |                            |  |  |
| Land resources data                       | ✓                        |  |   | ✓                            |  |                                     |   |  |                 |                            |  |  |
| Social data                               |                          |  |   |                              |  |                                     |   |  |                 | ✓                          |  |  |
| Economic data                             |                          |  |   |                              |  |                                     |   |  |                 | ✓                          |  |  |

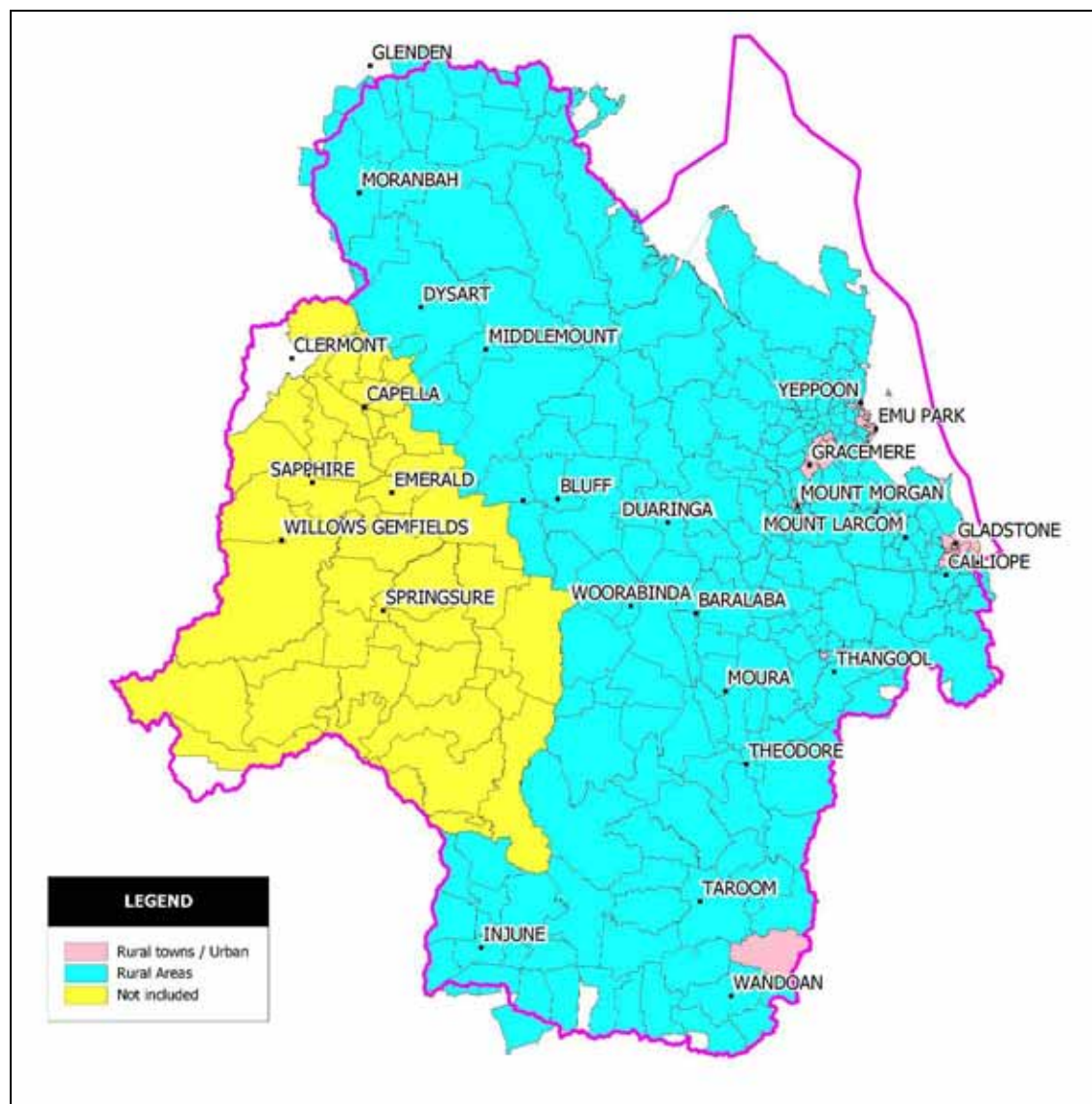
**3.2.4. Survey questionnaire**

The survey questionnaire (Appendix 3) was prepared as a 16 page self-administered questionnaire with the above structure. The survey includes 46 questions (Table 44).

### 3.3. Distribution of the survey

#### 3.3.1. Sampling frame

Mapped localities maps (supplied by Department of Natural Resources and Water) were used to provide the main geographical stratum for the project. Each locality was classified as either (a) Predominately Rural or (b) Mixed land use areas including rural towns, Urban and Rural land (Figure 5).



**Figure 5. Survey Area – Fitzroy Basin**

Two commercially available lists of landholders and rural residents were used as the basis for the mailouts, as publicly available address lists from the Department of Natural Resources and Mines for the region was limited. The two commercial lists are:

- Residential list (from Data Solutions Australia). This list includes principally peri-urban residents and residents in or near towns
- The Farmers List (from Prime Prospects List Marketing) This list includes agricultural producers compiled from sources including the electoral roll, Yellow Pages, rural magazines, and organisation membership lists.
- A total of 3,270 surveys were sent to residents of the Fitzroy Basin Region (Table 5). Some 89% (2,898) of surveys were distributed to people living in locality category (a) rural areas, with the

remainder going to people in locality area (b) mixed areas including rural towns, urban, and rural land.

In the case of the farmers List, all available records were accessed for use in the survey, whereas a random selection of available records was used to select names and addresses from the residential listing. The selection was limited to a maximum of 100 records for highly populated localities. All available records were used as a sampling base in less populated localities.

**Table 5. Number of surveys distributed during the first mail-out**

|                | <i>(a) Rural</i> |                |              | <i>(b) Rural town / urban</i> |                |              | <i>Total</i> |
|----------------|------------------|----------------|--------------|-------------------------------|----------------|--------------|--------------|
|                | <i>DSA</i>       | <i>Farmers</i> | <i>Total</i> | <i>DSA</i>                    | <i>Farmers</i> | <i>Total</i> |              |
| <i>Number</i>  | 1,302            | 1,596          | 2,898        | 196                           | 176            | 372          | 3,270        |
| <i>Percent</i> | 40%              | 49%            | 89%          | 6%                            | 5%             | 11%          | 100%         |

Some 55% of surveys in the Fitzroy Basin Association Region were sent to residents of 3 Local Government Areas, being Livingstone Shire (25%), Fitzroy Shire (15%), and Banana Shire (15%) (Table 6).

**Table 6. Number of surveys distributed during the first mail-out – LGA Summary**

| <i>Region / LGA</i> | <i>Number</i>           |                                      |              | <i>Percentage</i>       |                                      |                |
|---------------------|-------------------------|--------------------------------------|--------------|-------------------------|--------------------------------------|----------------|
|                     | <i>Rural localities</i> | <i>Rural town / urban localities</i> | <i>Total</i> | <i>Rural localities</i> | <i>Rural town / urban localities</i> | <i>Total %</i> |
| LIVINGSTONE SHIRE   | 693                     | 134                                  | 827          | 21%                     | 4%                                   | 25%            |
| FITZROY SHIRE       | 473                     | 14                                   | 487          | 14%                     | 0%                                   | 15%            |
| BANANA SHIRE        | 400                     | 86                                   | 486          | 12%                     | 3%                                   | 15%            |
| CALLIOPE SHIRE      | 383                     | 27                                   | 410          | 12%                     | 1%                                   | 13%            |
| TAROOM SHIRE        | 334                     |                                      | 334          | 10%                     | 0%                                   | 10%            |
| BUNGIL SHIRE        | 179                     |                                      | 179          | 5%                      | 0%                                   | 5%             |
| DUARINGA SHIRE      | 175                     |                                      | 175          | 5%                      | 0%                                   | 5%             |
| BROADSOUND SHIRE    | 114                     |                                      | 114          | 3%                      | 0%                                   | 3%             |
| NEBO SHIRE          | 106                     |                                      | 106          | 3%                      | 0%                                   | 3%             |
| ROCKHAMPTON CITY    |                         | 85                                   | 85           | 0%                      | 3%                                   | 3%             |
| GLADSTONE CITY      |                         | 26                                   | 26           | 0%                      | 1%                                   | 1%             |
| MOUNT MORGAN SHIRE  | 18                      |                                      | 18           | 1%                      | 0%                                   | 1%             |
| BELYANDO SHIRE      | 12                      |                                      | 12           | 0%                      | 0%                                   | 0%             |
| PEAK DOWNS SHIRE    | 11                      |                                      | 11           | 0%                      | 0%                                   | 0%             |
| Total               | 2,898                   | 372                                  | 3,270        | 89%                     | 11%                                  | 100%           |

### 3.3.2. Mail-outs and responses

The survey was sent out to 3,270 people on 9 October 2006 (Table 7). All people were sent a short reminder card 3 days after the first mail out. A second copy of the survey was then sent to respondents who had not replied to the initial mailout in late October 2006. Surveys were received for data entry and processing until 17 November 2006.

All survey participants were provided with an incentive to complete the survey by having the chance to win a \$50 voucher to purchase agricultural produce. A '1800' survey helpline was also promoted in all survey correspondence.

**Table 7. Mailing dates**

| <i>Date</i> | <i>Event</i>          | <i>Days since first mailout</i> |
|-------------|-----------------------|---------------------------------|
| 9 Oct 2006  | First survey mailout  | 0                               |
| 12 Oct 2006 | Reminder card         | 3                               |
| 25 Oct 2006 | Second survey mailout | 16                              |

A total of 419 valid surveys were received and tallied in three batches (Table 9). About 38% percent of responses were received in the first batch of responses, within 10 days of the first mailout.

**Table 8. Completed and validated surveys by receipt date**

| <i>Batch</i> | <i>Receipt dates</i> | <i>Number of surveys</i> | <i>Percent</i> |
|--------------|----------------------|--------------------------|----------------|
| 1            | 11 Oct – 19 Oct      | 157                      | 38.1           |
| 2            | 20 Oct – 6 Nov       | 210                      | 51.0           |
| 3            | 7 Nov – 17 Nov       | 45                       | 10.9           |
| Total        |                      | 412                      | 100.0          |

Approximately 14% of distributed surveys were returned because of invalid addresses (Table 9). A total of 2811 surveys out of 3270 surveys sent to valid addresses were returned (i.e. 14%). A further 3% of surveys were not completed or were not applicable (e.g. properties under 1 ha), leaving 412 validated returned surveys (i.e. 15%). While this response rate is less than desirable, it provides a valid sample of landholder options in the Fitzroy Basin Association region.

**Table 9. Response rate**

|            | <i>Distributed</i> | <i>Invalid mail</i> | <i>Valid distributed</i> | <i>All returns</i> | <i>Validated returns</i> |
|------------|--------------------|---------------------|--------------------------|--------------------|--------------------------|
| Number     | 3270               | 459                 | 2811                     | 498                | 412                      |
| Percentage | 100%               | 14%                 | 86%                      |                    |                          |
|            |                    |                     | 100%                     | 18%                | 15%                      |

### 3.4. Statistical methods

A series of descriptive statistics and some inferential statistics were calculated for each attribute. Descriptive statistics may include the mean, median, proportion of cases, standard deviation, frequency distribution by class and number of valid cases for specific variables.

Some of the inferential statistics calculated for variables include confidence intervals and significance tests between variable means using the Scheffe ANOVA post-hoc tests. This method performs simultaneous joint pairwise comparisons for all possible pairwise combinations of means, using the F sampling distribution.

Since the frequency of some variables may not be normally distributed, these results should be viewed with caution and inferences using these statistics may not be valid. It is suggested that further investigation of sample distributions should be conducted for any critical variables, supported by transformation of variables or application of non-parametric tests, prior to critical evaluation of survey findings.

## 4. Property characteristics

### 4.1. Property area by ownership category

This variable (Question 1.1) describes the area of each property by ownership category (i.e. owned, managed (but not owned, leased, share-farmed or agisted), leased, share-farmed or agisted).

On average, 91% of the properties of survey respondents were reported as owned. A further 4% was reported as leased, and the remaining 6% was agisted, share-farmed or managed (but not owned or leased) (Figure 6). The mean property size across all ownership categories was reported to be 3,344 ha and the mean area of owned properties was reported as 3,042 ha (Figure 7, Table 45).

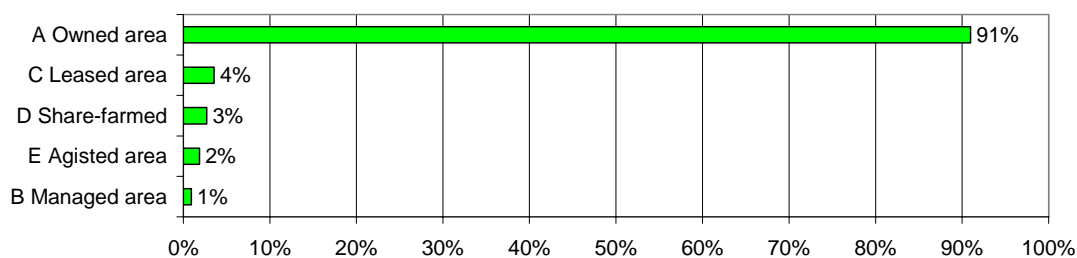


Figure 6. Percentage of property by ownership category (Q1.1)

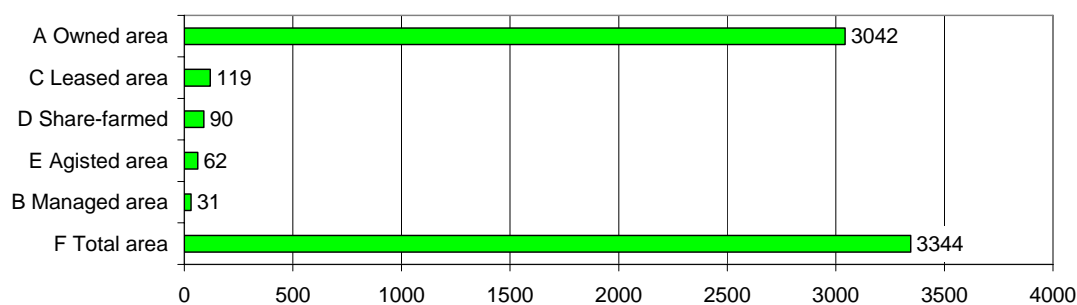
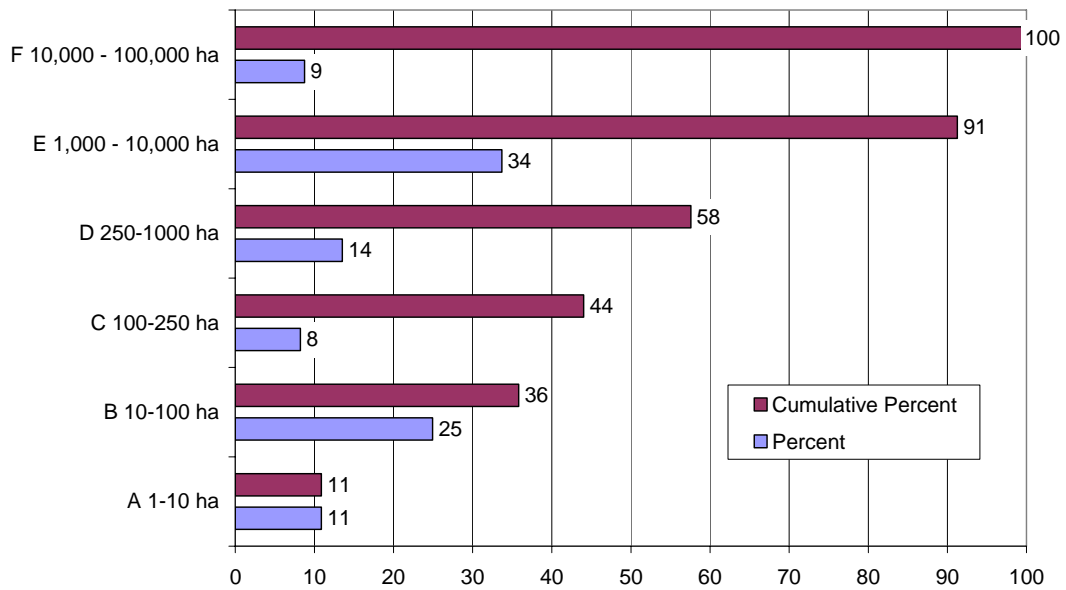


Figure 7. Mean area (ha) by Property land use category (Q1.1)

### 4.2. Property area by size category

The property ownership variable (Question 1.1) also includes an estimate of the total property area. This variable has been grouped into 6 size categories being A 1-10 ha, B 10-100 ha, C 100-250 ha, D 250-1000 ha, E 1,000 - 10,000 ha and F 10,000 - 100,000 ha.

11% of survey respondents reported that their properties under 10 hectares, 47% were from properties between 10 and 1,000 hectares, 34% were from properties between 1,000 and 10,000 ha, and 9% of were from properties over 10,000 ha (Figure 8).

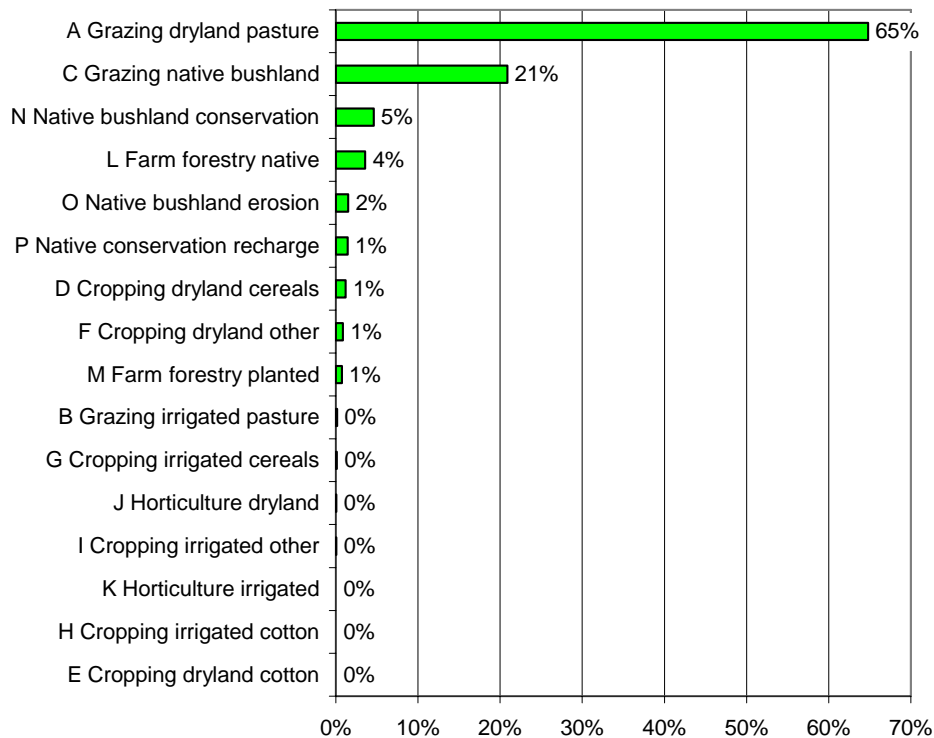


**Figure 8. Percentages of survey respondents by total property size category (Q1.1F)**

### 4.3. Property land use

The area of the property within 29 land use sub-categories and 5 primary categories (grazing, cropping, horticulture, farm forestry, native vegetation for resource protection) was recorded in the property land use variable (Question 4.1).

Survey respondents reported that the most extensive land use in the survey area was grazing of dryland pasture (65% of property area), followed by grazing of native bushland (21% of property area) (Figure 9, Table 46).



**Figure 9. Mean proportion of property by land use (Q4.1)**

#### **4.4. Key points**

- 11% of survey respondents reported that their properties under 10 hectares, 47% were from properties between 10 and 1,000 hectares, 34% were from properties between 1,000 and 10,000 ha, and 9% of were from properties over 10,000 ha
- Survey respondents reported that the most extensive land use in the survey area was grazing of dryland pasture (65% of property area). The second most extensive land use was grazing of native bushland (21% of property area).

## 5. Landholder social characteristics

### 5.1. Occupation group

The occupation group variable was determined by classifying landholders reported occupation (Q 10.3) into three groups being (a) farmers (e.g. grazier, agricultural producer) (b) non-farmers (e.g. teacher, retired) and (c) Not specified.

Some 64% of survey respondents reported occupation falls within the 'farmers' group and just over one third (36%) are within the 'non-farmers' group (Figure 10, Table 56).

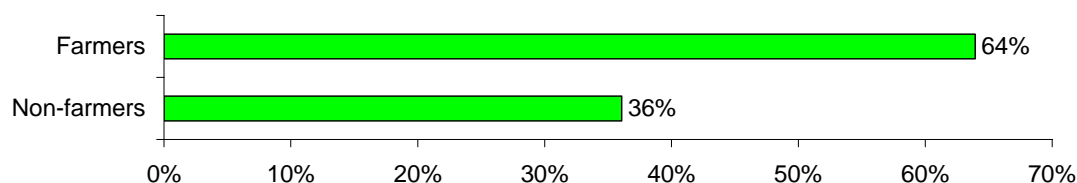


Figure 10. Percentage of respondents by occupation group (Q10.3)

### 5.2. Gender

The gender variable, derived from Question 10.1 has two response categories, male and female. About three-quarters of survey participants (71%) reported their gender as male (Figure 11,

Table 57).

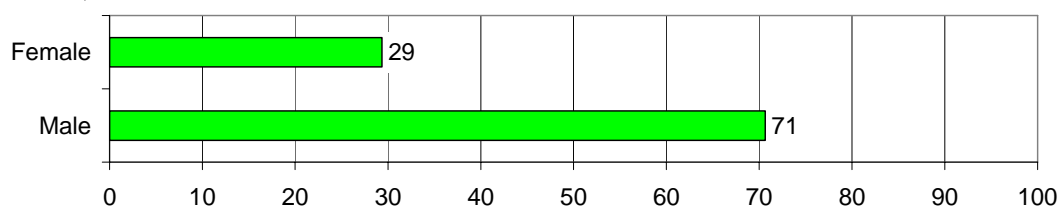


Figure 11. Percentage of respondents by Gender (Q10.1)

### 5.3. Age

The age category variable was created by allocating a mid-value of each 5 year age class in the survey questionnaire (Q 10.2).

Some 13% of survey respondents were between 19 and 39 years of age, 22% were between 40 and 49 yrs, 26% were between 50 and 59 yrs, 28% were between 60 and 69 yrs and 11% were 70 yrs or older. The median reported age of survey respondents was 57.5 years (Figure 12, Table 10, Table 58, Table 59).

Table 10. Number and percentage of responses by broad age class

| Age class | Number | Percentage | Cumulative Percentage |
|-----------|--------|------------|-----------------------|
| 18-39 yrs | 54     | 13%        | 13%                   |
| 40-49 yrs | 87     | 22%        | 35%                   |
| 50-59 yrs | 103    | 26%        | 61%                   |
| 60-69 yrs | 114    | 28%        | 89%                   |
| 70+ yrs   | 45     | 11%        | 100%                  |
| Total     | 403    | 100%       |                       |

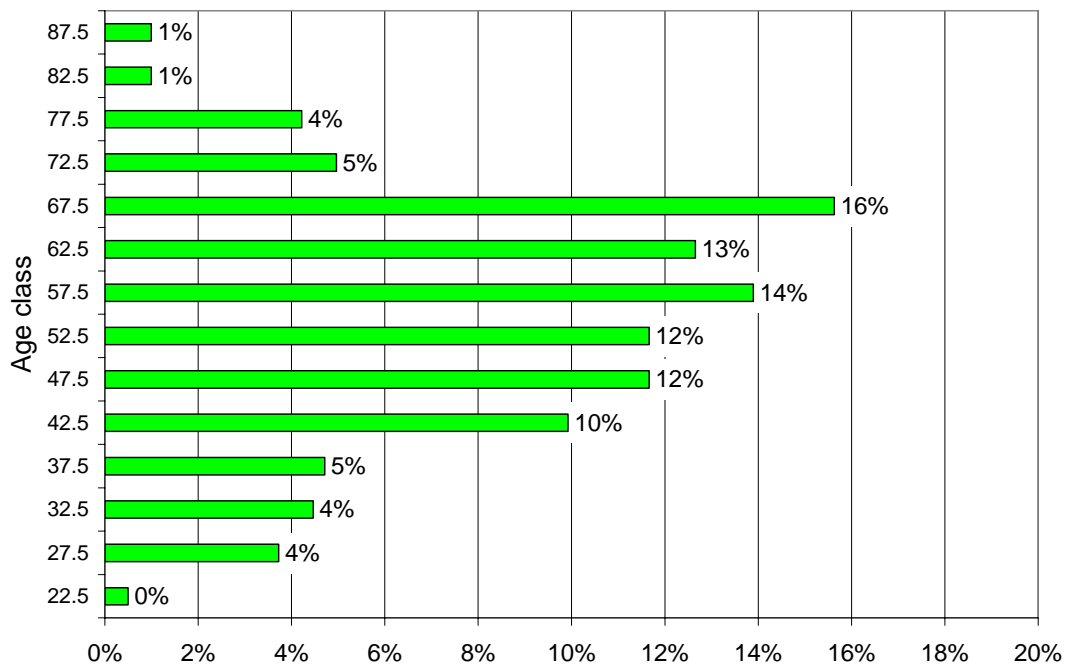


Figure 12. Percentage of respondents by age class

#### 5.4. Educational qualifications

The educational qualifications variable was created from survey question 10.4 which asked respondents “What is the level of the highest educational qualification you have completed?” People were provided with five alternatives being primary school, secondary school certificate, certificate or diploma, university degree or post-graduate qualification and other.

43% of survey respondents reported completing secondary school, 16% completed a university or higher degree, 22% completed a certificate or diploma and 16% completed primary school (Figure 13, Table 60).

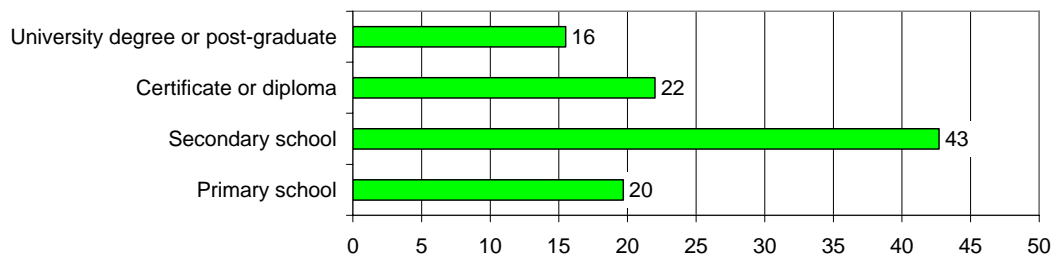


Figure 13. Percentage of respondents by educational qualification (Q10.4)

#### 5.5. Age by educational qualifications

An additional variable, ‘age by educational qualifications’ was created by grouping age categories from Question 10.2 into five year age classes (18-39, 40-49, 50-59 yrs, 60-69 yrs and 70+) and intersecting these classes with the ‘educational qualifications’ variable from Question 10.4.

Some 18% of survey respondents who reported having a ‘university or postgraduate qualification’ are in the 18-39 yrs age category, compared to just 6% of survey respondents 70+ yrs. 25% of survey respondents with a ‘certificate or diploma’ are in the 18-39 yrs age category compared to 2% of landholders 70+ yrs. 25% of landholders with only primary school education are in the 70+ yrs age category compared to nil in the 18-40 age category. Landholders with secondary qualifications are mainly in the 40-49 yrs age category (27%) or the 50-59 yrs age category (29%) (Figure 14, Table 61).

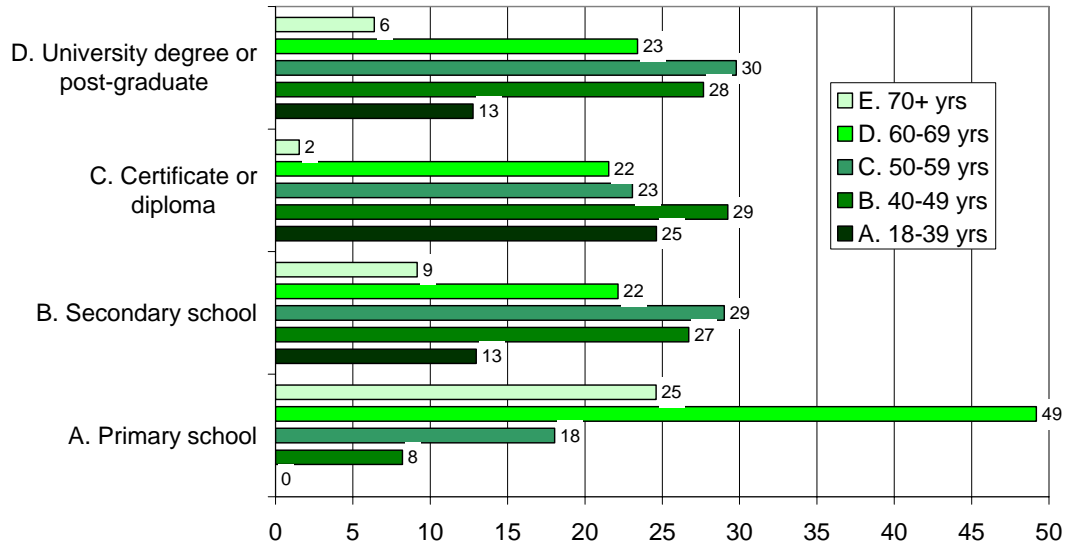


Figure 14. Percentage of respondents by age category (Q10.3)

### 5.6. Period in district

The 'period in district' variable was created by allocating responses to Question 10.8 into four categories, being A 1-9 years, B 10-29 years, C 30-49 years and D 50+ years.

About 18% of survey respondents have lived in the district for less than 10 years, 31% for 10 to 30 years, 29% for 30 to 50 years, and 22% for 50 or more years (Figure 15, Table 62).

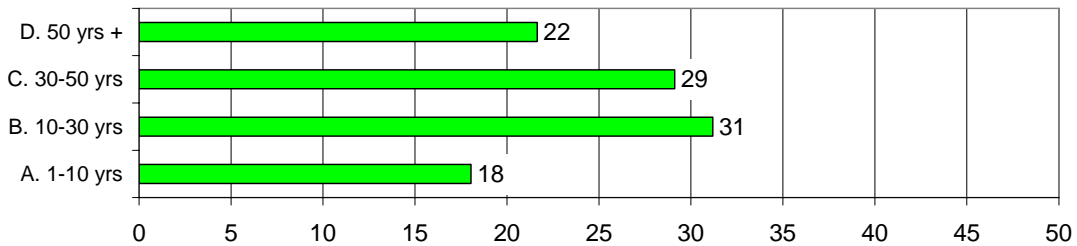


Figure 15. Percentage of respondents by 'period in district' (Q10.8)

### 5.7. Key points

- About 64% of survey respondents reported that they were farmers and 36% were non-farmers.
- About 71% of survey respondents were male.
- The median reported age of survey respondents was 57.5 years.
- Most respondents (80%) reported having secondary school or higher qualifications. Some 13% of survey respondents who reported having a 'university or postgraduate qualification' are in the 18-40 yrs age category, compared to 6% of survey respondents 70+ yrs.
- Most landholders (82%) have lived in the same district for 10 or more years.

## 6. Landholder economic characteristics

### 6.1. Equity in property

The variable 'equity in property' is derived from Question 10.10 which asked survey respondents 'What is the estimated level of equity in your property?'. Five equity categories were provided as optional responses (A. Less than 20%, B. 21% to 40%, C. 41% to 60%, D. 61% to 80% and E. 80% to 100%)

The majority of survey respondents (66%) reported having between 80% and 100% equity in their property. Only 3% of survey respondents have less than 20% equity. (Figure 16, Table 63).

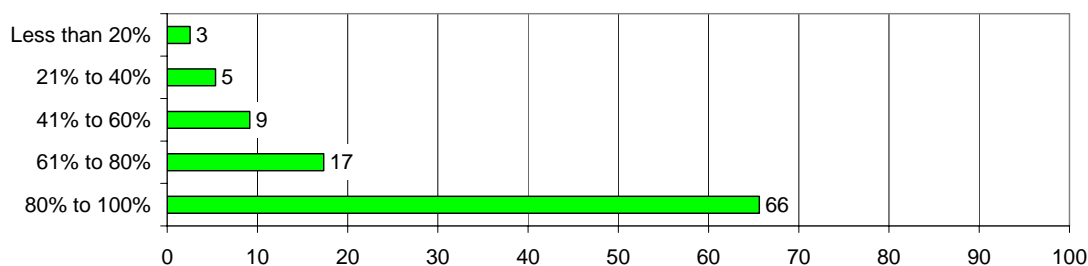


Figure 16. Percentage of responses by equity in property (Q10.10)

### 6.2. Major income source

The variable 'major income source' represents responses by survey participants to Question 10.11 "Is most of your income earned on the property or off the property?" Two responses were provided A. 'mostly on-property' and B. 'mostly off-property'.

Just over one half of survey respondents (57%) reported earning most of their income from their property and 43% reported earning most of their income off-property (Figure 17, Table 64).

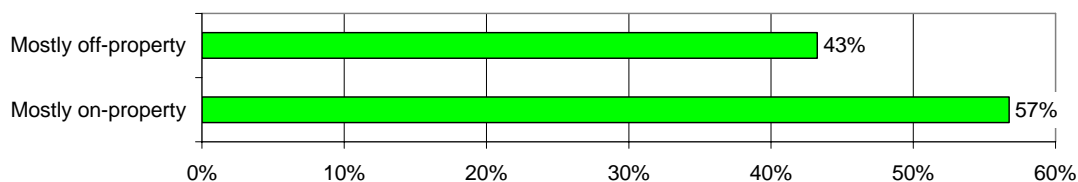


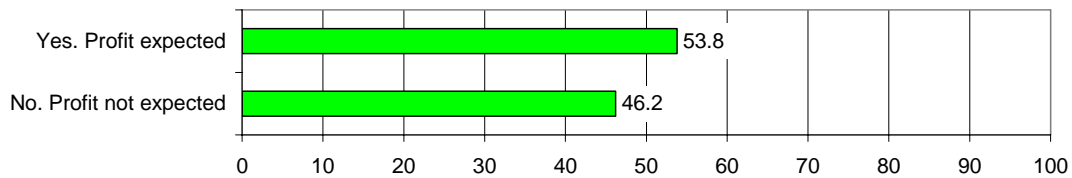
Figure 17. Percentage of responses by major source of income (Q10.11)

### 6.3. Anticipated profit from property

Two variables relate to the landholders anticipated profit from their property. The first variable, 'anticipated profit from property (y/n)' was developed from Question 10.12 'Do you anticipate that your property will return a profit for the last financial year (2005/06)?' Respondents were provided with two choices to this question, 'yes' or 'no'.

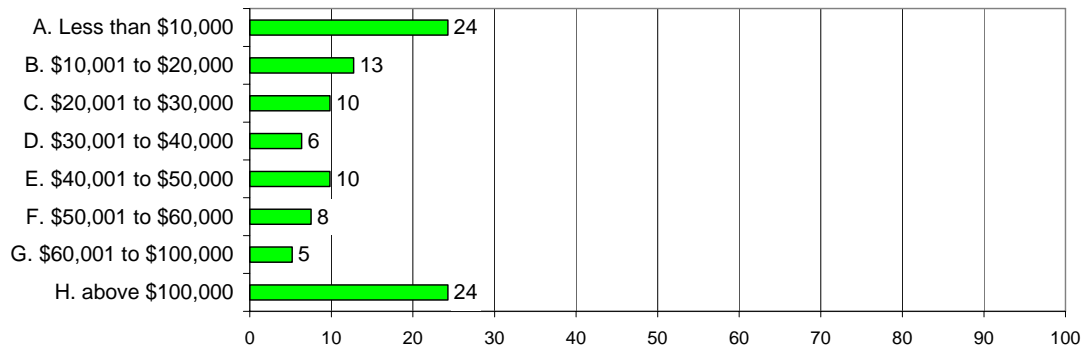
The second variable 'anticipated profit from property (amount)' was developed from Question 10.13 "If yes, what do you anticipate the approximate figure for profit will be (before tax) from your property for the last financial year (2005/06)?" Respondents were provided with eight choices being A. Less than \$10,000, B. \$10,001 to \$20,000, C. \$20,001 to \$30,000, D. \$30,001 to \$40,000, E. \$40,001 to \$50,000, F. \$50,001 to \$60,000, G. \$60,001 to \$100,000 and H. above \$100,000.

Just over one half (53.8%) of the survey respondents reported that they expect to make a profit in 2005/06, compared with 46.2% of survey respondents who expect not to make a profit (Figure 18, Table 65).



**Figure 18. Percentage of responses by anticipated profit (y/n) (Q10.12)**

The 53.8% of survey respondents who reported that they anticipate making a profit in 2005/06, gave a broad range of responses. About 24% of these respondents reported that they expect to receive a profit of less than \$10,000 and about 24% expect a profit of more than \$100,000 (Figure 19). The mean anticipated profit for all landholders was \$47,225 (Table 66, Table 67).



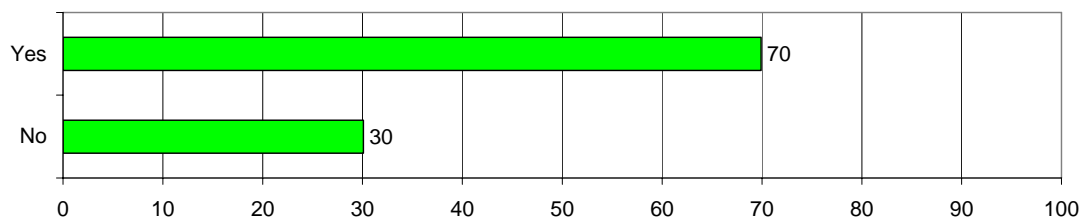
**Figure 19. Percentage of responses by anticipated profit (amount) (Q10.13)**

#### 6.4. Off-property income

Two variables relate to the landholders off-property income. The first variable, 'off-property income (y/n)' was developed from Question 10.15 'Did you or your partner receive any off-property income (after expenses and before tax) last financial year (2005/06)?' Respondents were provided with two choices to this question, 'yes' or 'no'.

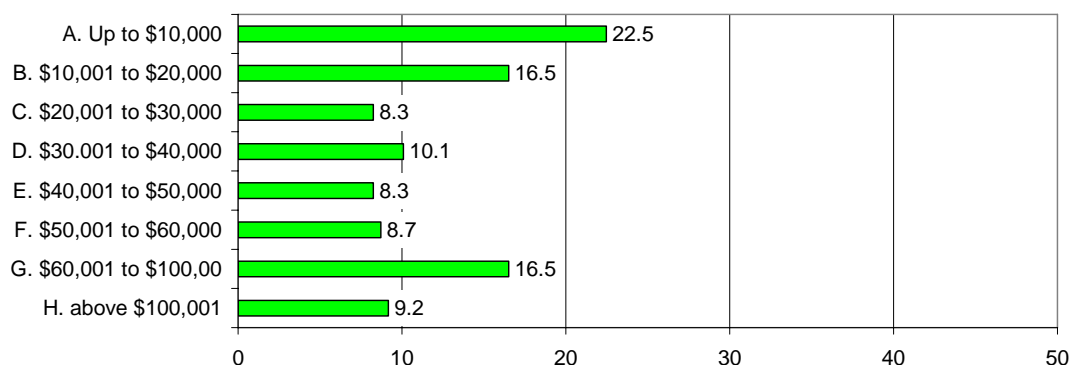
The second variable 'off-property income (amount)' was developed from Question 10.16 "If yes, please indicate an approximate figure for the total off property income (before tax) for you and your partner for the last financial year (2005/06)?" Respondents were provided with eight choices being A. Less than \$10,000, B. \$10,001 to \$20,000, C. \$20,001 to \$30,000, D. \$30,001 to \$40,000, E. \$40,001 to \$50,000, F. \$50,001 to \$60,000, G. \$60,001 to \$100,000 and H. above \$100,000.

About three-quarters of survey respondents (70%) reported earning some off-property income in 2005/06 (Figure 20, Table 68).



**Figure 20. Number and percentage of respondents by off-property income (n/y) Q10.15)**

Survey respondents who reported having some income from off-property sources reported a broad range of off-property incomes, for example, 22.5% of respondents reported an off-property income of less than \$10,000 and 9.2% reported an income of over \$100,000 (Figure 21). The mean off-property income for all survey respondents was \$47,225 (Table 69, Table 70).



**Figure 21. Percentage of respondents by off-property income (amount) (Q10.16)**

## 6.5. Source of income by property size

It is possible to create a new variable ‘major source of income’ to provide an integrated overview of the above two variables ‘off-property income (amount)’ and ‘anticipated profit from property (amount)’ by calculating which variable was the highest for each survey respondent. The new ‘major source of income’ variable has two categories ‘A. Mostly off-property’ and ‘B. Mostly on-property’.

An analysis of ‘source of income’ data by ‘property size’ indicates that survey respondents on larger properties reported receiving most of their income from their property, whereas owners of smaller properties reported earning more of their income off-property, for example, 96% of survey respondents in properties between 1 and 10 ha reported that their income source was ‘A. Mostly off-property’, over half (54%) of landholders on properties between 100 ha and 250 ha reported that their source of income was ‘B. Mostly on-property’ and just 8% of landholders on properties between 1,000 ha and 10,000 ha reported that most of their source of income was ‘B. mostly on- property’ (Table 11)..

**Table 11. Number and percentage of landholders by major source of income and property size**

| Size of property      | Statistic  | Major source of income |                        | Total |
|-----------------------|------------|------------------------|------------------------|-------|
|                       |            | A. Mostly on-property  | B. Mostly off-property |       |
| A 1-10 ha             | Number     | 1                      | 24                     | 25    |
|                       | Percentage | 4%                     | 96%                    | 100%  |
| B 10-100 ha           | Number     | 2                      | 63                     | 65    |
|                       | Percentage | 3%                     | 97%                    | 100%  |
| C 100-250 ha          | Number     | 13                     | 15                     | 28    |
|                       | Percentage | 46%                    | 54%                    | 100%  |
| D 250-1,000 ha        | Number     | 27                     | 21                     | 48    |
|                       | Percentage | 56%                    | 44%                    | 100%  |
| E 1,000 - 10,000 ha   | Number     | 110                    | 10                     | 120   |
|                       | Percentage | 92%                    | 8%                     | 100%  |
| F 10,000 - 100,000 ha | Number     | 32                     |                        | 32    |
|                       | Percentage | 100%                   |                        | 100%  |

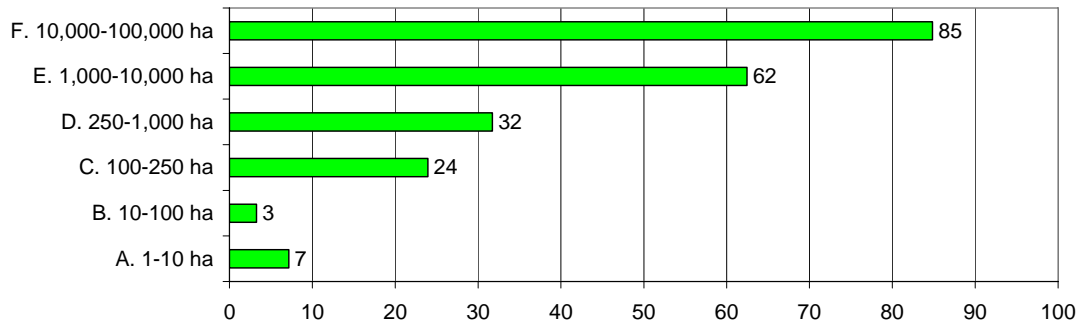
## 6.6. Anticipated property profit by property size

An indication of mean disposable income can be calculated by adding landholders reported ‘anticipated property profit’ and their reported ‘off-property income’. For this calculation of ‘estimated disposable income’ respondents who reported that they would not earn any on-property income (Q10.12) were assumed to have an ‘anticipated property profit of zero and landholders who reported that they did not earn any ‘off-property income’ (Q10.15) were also assumed to have an ‘off-property income’ of zero.

The percentage of ‘estimated disposable income’ earned from ‘anticipated property profit (amount)’ has also been calculated to provide a coarse indication of property profitability (Table 72).

The percentage of ‘estimated disposable income’ earned from ‘anticipated property profit (amount)’ can also be compared against the reported ‘property size’ The mean ‘anticipated profit from property’ reported by landholders on small properties of 1 to 10 ha was only 7% of their ‘estimated disposable

income’, whereas on properties between 250 and 1000 ha is was 32%,and for properties between 10,000 and 100,000 it was 85% (Figure 22, Table 73).

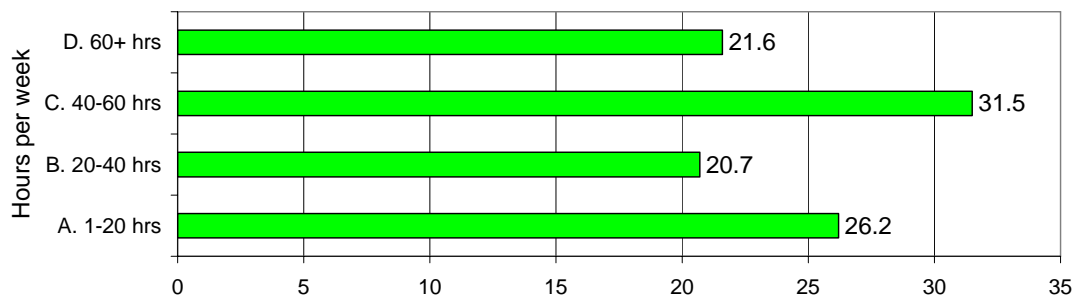


**Figure 22. Mean anticipated property profit as a percentage of estimated disposable income**

### 6.7. Hours worked on property

The variable ‘hours worked on property’ was created from the duration reported by survey respondents to Question 10.9 ‘How many hours per week have you worked on the property or farming related activities, on average over the last 12 months?’

Just over one quarter (26.2%) of survey respondents reported that they had worked between 1 and 20 hours per week on the property, 20.7% reported working 20 to 40 hours per week, 31.5% reported working 40 to 60 hours per week and 21.6% reported working 60+ hours per week (Figure 23, Table 74).

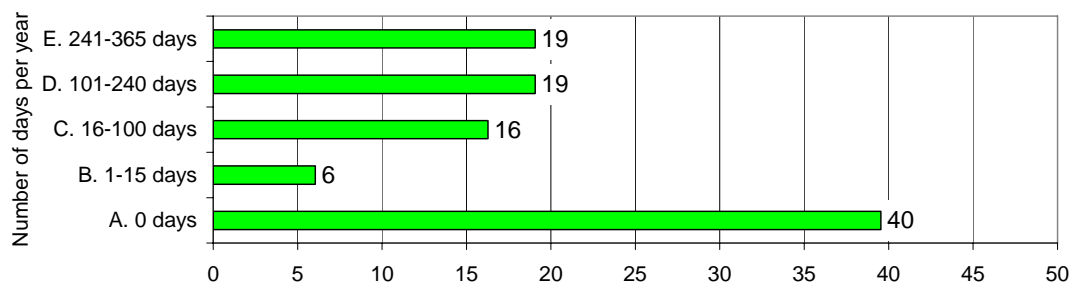


**Figure 23. Percentage of respondents by hours worked on property (per week) (Q10.9)**

### 6.8. Days worked off property

The variable ‘days worked off property was calculated from landholder responses to Question 10.18 ‘Estimate the number of days you were involved in paid off-property work in the past 12 months?’

40% of survey respondents reported that they did not work off-property in the last 12 months, 6% reported that they worked between 1 and 15 days, 16% reported working between 16 and 100 days, 19% reported working 101 to 240 days and 19% reported working 241 to 365 days off-property (Figure 24, Table 75).



**Figure 24. Percentage of respondents by days worked off-property per year**

### 6.9. Family supported by property income

The variable ‘family supported by property income’ was created from landholder responses to Question 10.14 ‘How many members of your family, including you and those living off-property, are supported, at least partly, from on-property income?’.

15.2% of survey respondents reported that 0-1 people were supported from property income, 36.8% reported that property income supported 2 people, 26.8% reported that 3-4 people were supported by property income and 21.2% reported that 5 or more people were supported from property income (Figure 25, Table 76)

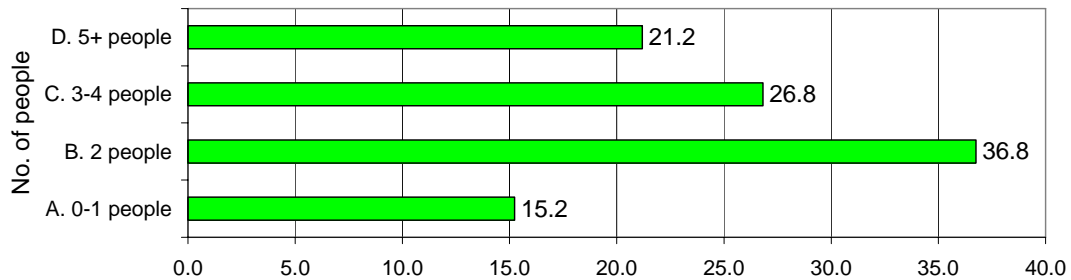


Figure 25. Percentage of respondents by number of people supported by property income (Q10.14)

### 6.10. People employed on property

The variable ‘people employed on property’ was created from landholder responses to survey Question 10.19 ‘How many people have you employed continuously (full or part-time) for at least 3 months to assist in on-property work over the past 12 months?’

More than one half (54.3%) of survey respondents reported that they employed nil (0) people on the property, 20.2% reported that they employed 1 person and 25.5% of survey respondents reported that they employed 2 or more people (Figure 26, Table 77).

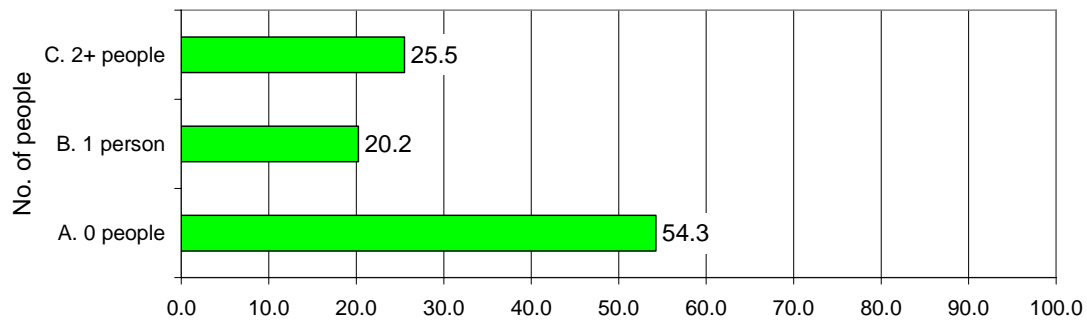


Figure 26. Percentage of respondents by number of people employed on property (Q 10.19)

## 6.11. Key points

- The majority of survey respondents (57%) reported having between 80% and 100% equity in their property. Only 3% of survey respondents have less than 20% equity.
- Just over one half (57%) of survey respondents reported earning most of their income from their property and 43% of survey respondents reported earning most of their income off-property.
- Just under one half (46.2%) of the survey respondents reported that they expect they will not make a profit in 2005/06, compared with the 53.8% who do expect to make a profit from the property.
- About three-quarters of survey respondents (70%) reported earning some off-property income in 2005/06.
- An analysis of 'source of income' data by 'property size' indicates that survey respondents on larger properties received most of their income from their property, whereas owners of smaller properties earned more of their income off-property.
- The mean 'anticipated profit from property' reported by landholders on small properties of 1 to 10 ha was only 7% of their 'estimated disposable income' compared to 85% for landholders on large properties between 10,000 and 100,000.
- Just over one quarter (28.3%) of survey respondents reported that they had worked between 1 and 20 hours per week on the property, 20.5% reported working 20 to 40 hours per week, 28.9% worked 40 to 60 hours per week and 22.2% worked 60+ hours per week.
- 40% of survey respondents reported that they did not work off-property in the last 12 months, 6% reported that they worked between 1 and 15 days, 16% worked between 16 and 100 days, 19% worked 101 to 240 days and 19% worked 241 to 365 days off-property.
- 15.2% of survey respondents reported that 0-1 people were supported from property income, 36.8% reported that property income supported 2 people, 26.8% reported that 3-4 people were supported by property income and 21.2% reported that 5 or more people were supported from property income.
- More than one half (54.3%) of survey respondents reported that they employed nil (0) people on the property, 20.2% reported that they employed 1 person and 25.5% employed 2 or more people on the property.

## 7. Landholder characteristics by property category

### 7.1. Introduction

A 'property land use category' variable was created to provide the basis for detailed examination of landholder responses using reported estimates of the property land use (Question 4.1). The two variables used for this classification were the size of the property and the proportion of the property under dryland cropping or horticulture.

The three categories and criteria used to derive them are:

- Category 1 – Smaller property < 250 ha
- Category 2 – Larger property > 250 ha with < 10% dryland cropping or horticulture
- Category 2 – Larger property > 250 ha with > 10% dryland cropping or horticulture

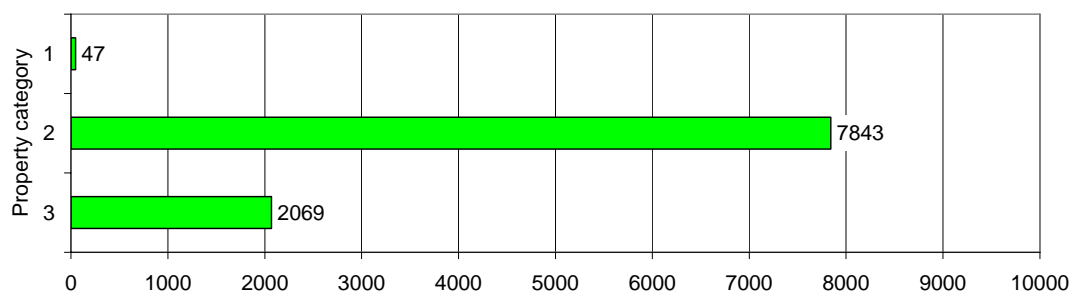
Some 37.8% of survey respondents were from small grazing properties (category 1), 48.5% were from larger grazing properties (category 2) and 13.7% from larger mixed enterprise properties (category 3) (Table 12).

**Table 12. Percentage of respondents by Property land use category (Q4.1)**

| Type | Description                      | Respondents |        |
|------|----------------------------------|-------------|--------|
|      |                                  | Percentage  | Number |
| 1    | Smaller grazing property         | 37.8        | 120    |
| 2    | Larger grazing property          | 48.5        | 158    |
| 3    | Larger mixed enterprise property | 13.7        | 46     |

### 7.2. Property size by land use category

The mean property size reported by landholders for each land use category was 47 ha for category 1, 7,943 ha for category 2 and 2069 ha for category 3 (Figure 27).



**Figure 27. Mean property size (ha) by land use category**

### 7.3. Land use by property land use category

Category 1 properties have mean area of 44 ha. Their major land use was reported to be grazing (36 ha). Category 2 properties have a mean area of 6,497 ha and their major use was grazing (mean area 5632 ha). Category 3 properties have a mean area of 2,067 ha and their major land use is also grazing (mean area 1,580 ha) (Figure 28, Table 78).

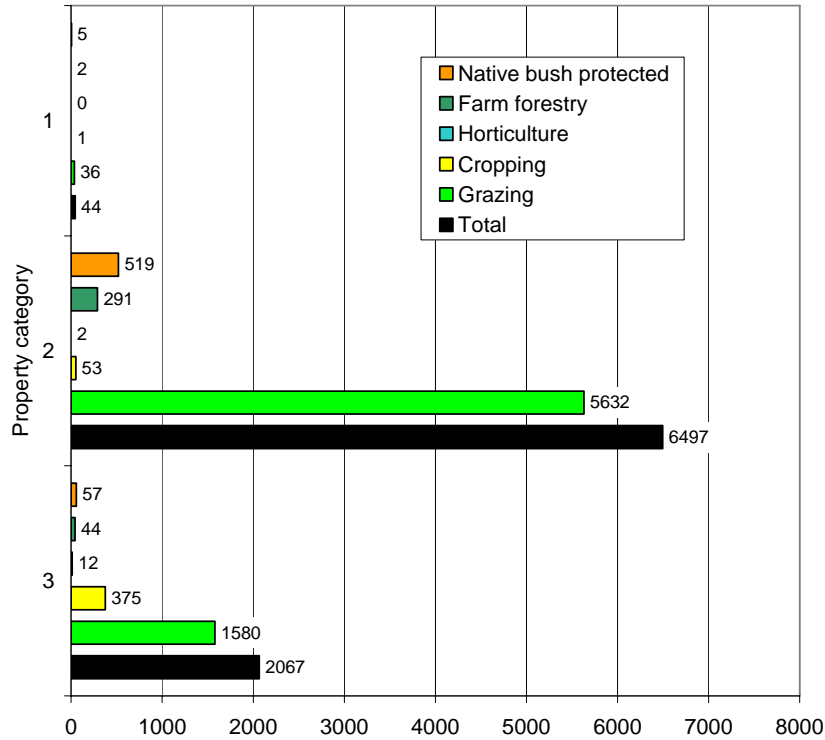


Figure 28. Mean land use area (ha) (Q4.1) by property land use category

### 7.4. Occupation group by property land use category

Some 73% of survey respondents on category 1 properties reported that they hold occupations that classify them as ‘non-farmers’. Only 8% of landholders on category 2 properties also hold occupations within the ‘non-farmer’ occupation group. Most survey respondents on category 3 properties (86%) hold occupations that classify them as farmers (Figure 29, Table 79).

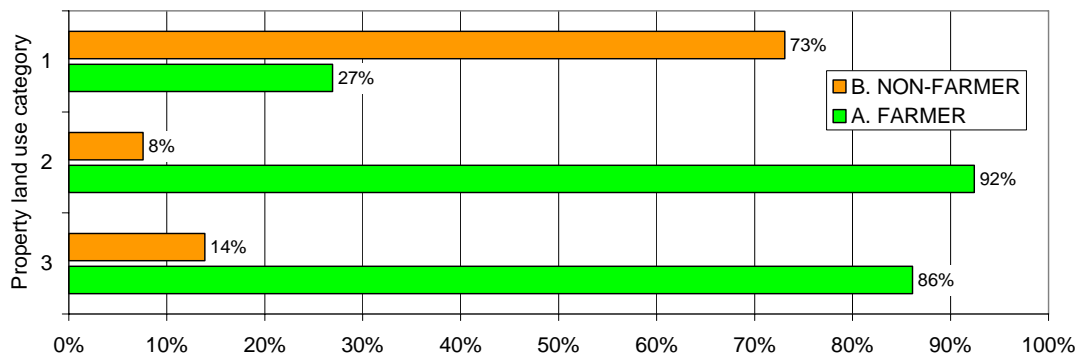
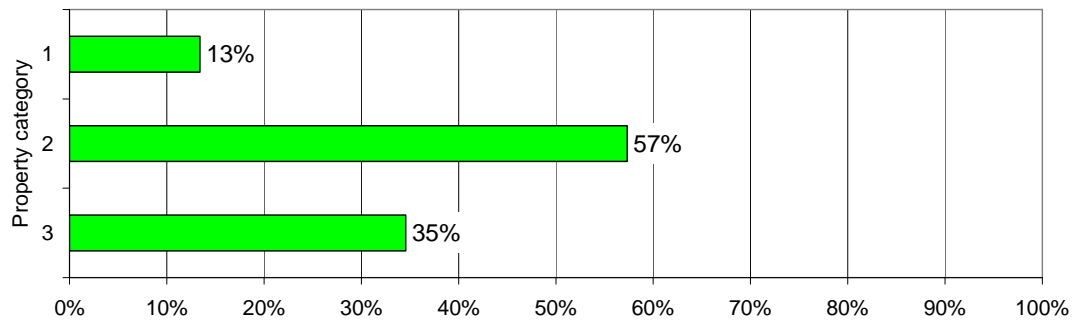


Figure 29. Percentage of respondents by occupation group (Q10.3) and property land use category (Q4.1)

## 7.5. Anticipated property profit by property category

Survey respondents on land use category 1 properties reported that 13% of their ‘estimated disposable income’<sup>1</sup> was derived from ‘anticipated on-property profit’. Landholders on category 2 properties derived 57%, and people on category 3 properties derived 35% (Figure 30, Table 80).



**Figure 30. Mean percentage of disposable income from on-property profit by Property land use category**

Landholders on larger properties were found to derive a higher proportion of their disposable income from their anticipated property profits than landholders on smaller properties. For example, landholders on category 3 properties with a size of 250 ha to 1,000 ha reported producing 21.4% of their ‘estimated disposable income’ from their property, compared to 95.8% for landholders on larger properties of 10,000 to 100,000 ha (Table 13).

**Table 13. Property profit as a percentage of disposable income and property size**

| Property Size        | Property Land Use Category |      |      |
|----------------------|----------------------------|------|------|
|                      | 1                          | 2    | 3    |
| A. 1-10 ha           | 5.0                        |      | 0.0  |
| B. 10-100 ha         | 0.9                        |      | 4.2  |
| C. 100-250 ha        | 31.6                       |      | 0.0  |
| D. 250-1,000 ha      |                            | 30.3 | 21.4 |
| E. 1,000-10,000 ha   |                            | 62.9 | 57.8 |
| F. 10,000-100,000 ha |                            | 82.6 | 95.8 |
| Total                | 13.0                       | 59.0 | 34.7 |

## 7.6. Key Points

- *Category 1 properties.* The mean area of properties in category 1 is 44 ha, of which 36 ha on average was grazed. Only 27% of the people on category 1 properties reported their occupation as farmers. Respondents in this category reported that about 13% of their ‘estimated disposable income’ was derived from their anticipated property profit.
- *Category 2 properties.* The mean area of category 2 properties was reported to be 6,497 ha, of which 53 ha was under crops and 5,632 ha on average was grazed. About 92% of people on category 2 properties reported their occupation as farmers. Respondents in this category reported that about 57% of their ‘disposable income’ was derived from their anticipated property profit.
- *Category 3 properties.* The mean area of category 3 properties was 2,067 ha, of which 1,580 ha on average was grazed and 375 ha on average was under cropping. About 86% of people on category 3 properties reported their occupation as farmers. Respondents in this category reported that about 35% of their ‘disposable income’ was derived from their anticipated property profit.

<sup>1</sup> Reported off-farm income plus on-farm profit

## 8. Landholder values, attitudes and issues

### 8.1. Rural and property values

#### 8.1.1. All landholders

A series of interval variables relating to the 'rural and property values' were created from 11 survey items within Question 2.1 "How important are each of the following characteristics of your property?" Response scale anchors for this survey item are 'Not important (0) and Very important (6). These items were:

##### *Social / Lifestyle values \**

- A. I find satisfaction in working the land to raise stock, grow crops, produce milk, etc
- B. It gives me the opportunity to enjoy the peace and quiet of a rural environment
- C. It allows me to be part of a rural community.
- D. It has reasonable access to services (e.g. schools, health, banks).
- E. It allows me to preserve the family heritage of the property.
- F. It is a good place to raise a family.

##### *Natural values \**

- G. Remnant bushland on my property provides a habitat for native wildlife
- H. The remnant bushland on my property makes a contribution to the nature conservation values of the district.

##### *Economic values \**

- I. It provides most of our household income
- J. It gives me the opportunity to build or maintain a viable agricultural business
- K. It provides a sound long-term investment

\* Note that these sub-headings were not displayed on the questionnaire forms.

The four values of greatest importance to landholders were reported to be: the satisfaction of working the land (Item A, mean rating 5.2), the ability to enjoy the peace and quiet of a rural environment (Item B, mean rating 5.3), the value of the property for raising a family (Item F, mean rating 5.2) and the value of the property as a sound investment (Item K, mean rating 5.2).

Of slightly lesser importance were being part of a rural community (Item C, mean rating 4.5) and the value of the property as an agricultural business (Item J, mean rating 4.6).

**Table 14. Descriptive statistics for rural and property values (Q2.1)**

| Item                             | Mean | 95% CI for Mean |       | Median | Std Dev | 'N'<br>(applicable) |
|----------------------------------|------|-----------------|-------|--------|---------|---------------------|
|                                  |      | Lower           | Upper |        |         |                     |
| <i>Social / lifestyle values</i> |      |                 |       |        |         |                     |
| A Satisfaction in working        | 5.2  | 5.1             | 5.3   | 6.0    | 1.3     | 357                 |
| B Enjoy peace and quiet          | 5.3  | 5.2             | 5.4   | 6.0    | 1.1     | 404                 |
| C Part of community              | 4.5  | 4.4             | 4.7   | 5.0    | 1.6     | 396                 |
| D Access to services             | 4.3  | 4.1             | 4.4   | 5.0    | 1.6     | 395                 |
| E Preserve family heritage       | 3.9  | 3.7             | 4.2   | 5.0    | 2.1     | 323                 |
| F Raise a family                 | 5.2  | 5.1             | 5.3   | 6.0    | 1.2     | 364                 |
| <i>Natural values</i>            |      |                 |       |        |         |                     |
| G Bushland for wildlife          | 4.3  | 4.2             | 4.5   | 5.0    | 1.7     | 379                 |
| H Bushland for conservation      | 4.2  | 4.0             | 4.4   | 5.0    | 1.7     | 372                 |
| <i>Financial values</i>          |      |                 |       |        |         |                     |
| I Provides household income      | 4.3  | 4.0             | 4.5   | 5.0    | 2.0     | 326                 |
| J Agricultural business          | 4.6  | 4.4             | 4.8   | 5.0    | 1.9     | 329                 |
| K Sound investment               | 5.2  | 5.1             | 5.3   | 6.0    | 1.3     | 388                 |

Of lesser value to landholders were access to services (Item D, mean rating 4.3), the value of bushland as wildlife habitat (Item G, mean rating 4.3), the contribution of bushland to nature conservation of the district (Item H, mean rating 4.2) and the value of the property as a source of household income (Item I, mean rating 4.3). The value of least overall importance was the preservation of heritage (Item E, mean rating 3.9) (Table 14, Figure 31).

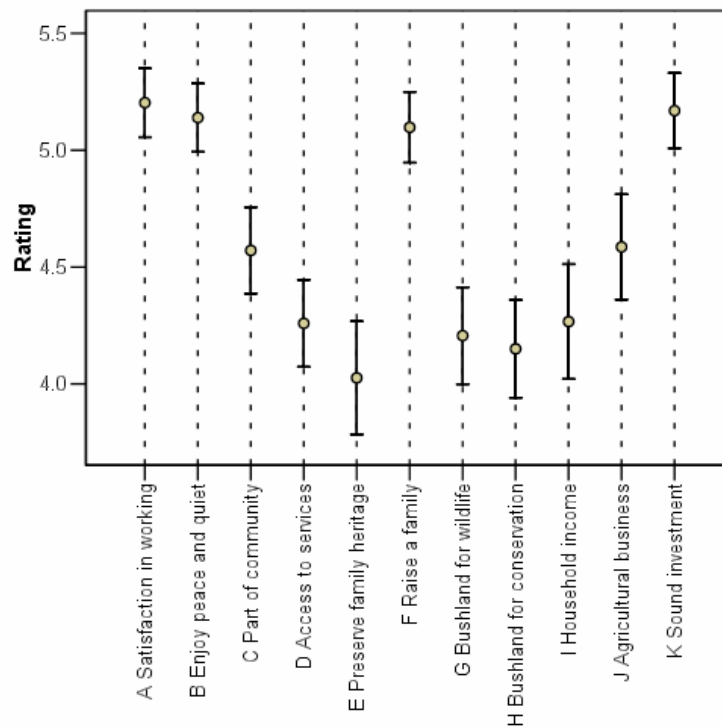


Figure 31. Confidence interval for mean ratings of rural and property values (Q2.1)

### 8.1.2. Property land use category

Landholders on larger grazing properties (category 2) reported a higher level of importance than landholders on smaller grazing properties (category 1) with respect to several survey items including their satisfaction with working the property (Item A), the role of the property in preserving family heritage (Item E); the value of the property as a source of household income (Item I); and the value of the property as a viable agricultural business (Item J). Landholders on larger grazing properties category (2) also stated that they enjoyed the peace and quiet of a rural environment less than people on small grazing properties (Table 15, Table 81, Table 94).

Table 15. Rural and property values (Q2.1) by Property land use category (Q4.1)

| Item                        | 1 Smaller grazing property | 2 Larger grazing property | 3 Larger mixed enterprise property |
|-----------------------------|----------------------------|---------------------------|------------------------------------|
| A Satisfaction in working   | 4.8 <sup>(1)</sup>         | 5.5 <sup>(1)</sup>        | 5.3                                |
| B Enjoy peace and quiet     | 5.5 <sup>(1)</sup>         | 5.1 <sup>(1)</sup>        | 5.2                                |
| C Part of community         | 4.4                        | 4.6                       | 4.7                                |
| D Access to services        | 4.4                        | 4.2                       | 4.3                                |
| E Preserve family heritage  | 3.2 <sup>(1)(2)</sup>      | 4.3 <sup>(1)</sup>        | 4.2 <sup>(2)</sup>                 |
| F Raise a family            | 5.0                        | 5.2                       | 5.2                                |
| G Bushland for wildlife     | 4.6                        | 4.1                       | 4.2                                |
| H Bushland for conservation | 4.3                        | 4.1                       | 4.3                                |
| I Household income          | 2.4 <sup>(1)(2)</sup>      | 5.2 <sup>(1)</sup>        | 4.7 <sup>(2)</sup>                 |
| J Agricultural business     | 3.1 <sup>(1)(2)</sup>      | 5.4 <sup>(1)</sup>        | 4.9 <sup>(2)</sup>                 |
| K Sound investment          | 4.9 <sup>(1)</sup>         | 5.5 <sup>(1)</sup>        | 5.2                                |

<sup>(1)(2)</sup> Differences significant at the 0.05 level (95%)

Landholders on larger mixed enterprise properties (category 3) also reported a higher level of importance than people on smaller grazing properties (category 1) with respect to the role of the property in preserving family heritage (Item E); the value of the property as a source of household income (Item I); and the value of the property as a viable agricultural business (Item J).

There were no substantial differences between landholders from different property categories with respect to: being part of a rural community (Item C); access to services (Item D); a place to raise a family (Item F), the value of remnant bushland as a place for wildlife habitat (Item G), the contribution of remnant bushland to nature conservation values of the district (Item H) and the value of the property as a long term investment (Item K).

### **8.1.3. Key points**

- The four values of greatest importance to landholders were reported to be: the satisfaction of working the land (Item A, mean rating 5.2), the ability to enjoy the peace and quiet of a rural environment (Item B, mean rating 5.3), the value of the property for raising a family (Item F, mean rating 5.2) and the value of the property as a sound investment (Item K, mean rating 5.2).
- Of slightly lesser importance were being part of a rural community (Item C, mean rating 4.5) and the value of the property as an agricultural business (Item J, mean rating 4.6).
- Of lesser value to landholders were access to services (Item D, mean rating 4.3), the value of bushland as wildlife habitat (Item G, mean rating 4.3), the contribution of bushland to nature conservation of the district (Item H, mean rating 4.2) and the value of the property as a source of household income (Item I, mean rating 4.3). The value of least overall importance was the preservation of heritage (Item E, mean rating 3.9).
- Landholders on larger grazing properties (category 2) reported a higher level of importance than landholders on smaller grazing properties (category 1) with respect to several survey items including their satisfaction with working the property (Item A), the role of the property in preserving family heritage (Item E); the value of the property as a source of household income (Item I); and the value of the property as a viable agricultural business (Item J). Landholders on larger grazing properties category (2) also stated that they enjoyed the peace and quiet of a rural environment less than people on small grazing properties.
- Landholders on larger mixed enterprise properties (category 3) also reported a higher level of importance than people on smaller grazing properties (category 1) with respect to the role of the property in preserving family heritage (Item E); the value of the property as a source of household income (Item I); and the value of the property as a viable agricultural business (Item J).
- There were no substantial differences between landholders from different property categories with respect to: being part of a rural community (Item C); access to services (Item D); a place to raise a family (Item F), the value of remnant bushland as a place for wildlife habitat (Item G), the contribution of remnant bushland to nature conservation values of the district (Item H) and the value of the property as a long term investment (Item K).

## **8.2. Land management attitudes**

A series of interval variables relating to various ‘land management topics’ was created from 11 survey items within Question 3.1 “How closely do you agree or disagree with the following statements?” Response scale anchors for this survey item were Strongly agree (0) and Strongly disagree (6). These items were:

### *Land use and resources*

- A. The time and expense involved in watering stock off-stream or off-wetlands is justified by the reduction in soil erosion and improvements in water quality.
- B. There is a strong link between economic, social and environmental outcomes for the management of properties.
- C. The long-term benefits from adoption of new practices justify any short-term loss in productive capacity.

- D. In our district there is a substantial area of marginal cropping country that should be returned to grazing.
- E. Reducing the diversion of water flows from streams and reducing on-property water storage provides important benefits to down-stream landholders and the environment.
- F. The benefits of farming on contour (contour banks, contour cropping) by reducing soil erosion and increasing soil moisture outweigh the time and cost involved.

*Social and lifestyle*

- G. The lifestyle benefits of working and living on a rural property outweigh the economic and environmental challenges of managing an agricultural business.

*Property planning*

- H. The effort required to identify and protect sites of significance to Aboriginal communities in this district is justified by the contribution they make to Australia's cultural heritage.
- I. Efforts to identify and protect remnant bushland in my district are justified by the protection of native plants and animals it affords.
- J. The benefits of weed, pest animal and stock control in remnant bushland justify the time & effort involved.
- K. The long-term benefits of property planning (mapping, financial planning, succession planning) outweigh the cost & effort of developing these plans.

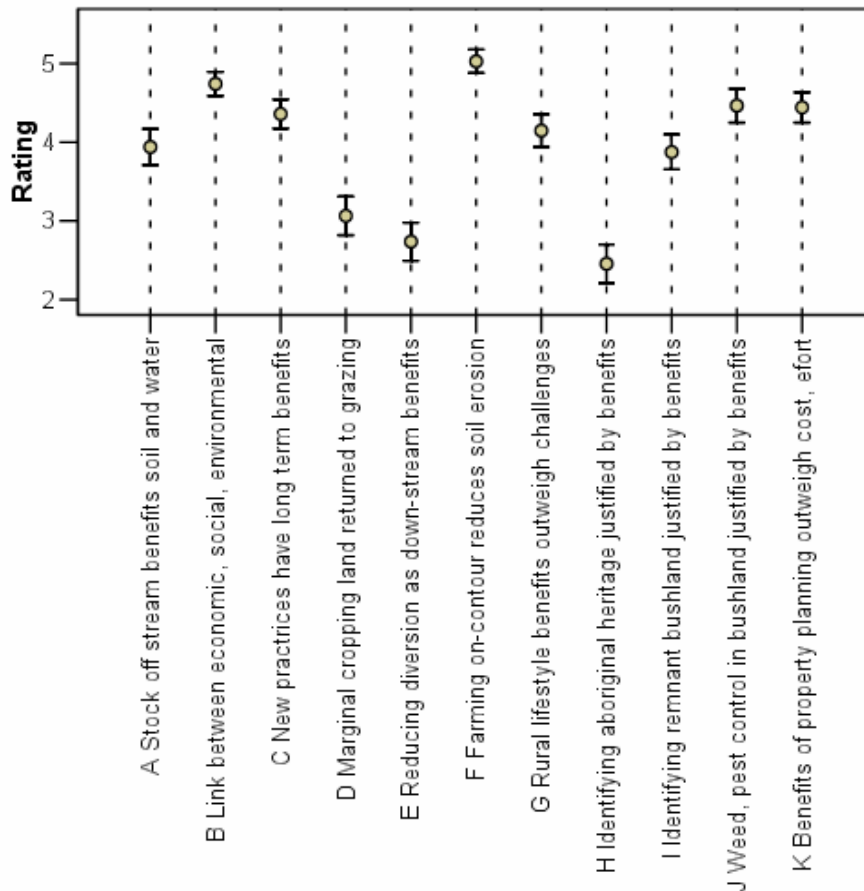
Respondents reported highest agreement with the statement that farming on-contour reduced soil erosion (Item F, mean rating 5.0). Landholders also reported a high level of agreement with statements about the benefits of watering stock off stream (Item A, mean rating 3.9), the link between economic, social and environmental outcomes (Item B, mean rating 4.6), the long term benefits of adopting new practices compared to short term loss of productive capacity (Item C, mean rating 4.3), the lifestyle benefits of working and living on a rural property (Item G, mean rating 4.2), the benefits of protecting remnant bushland (Item I, mean rating 3.9), the benefits of weed and pest control in native bushland (Item J, mean rating 4.5) and the long term benefits of property planning (Item K, mean rating 4.4) (Table 16, Figure 32).

**Table 16. Descriptive statistics for land management topics (Q3.1)**

| Item  | Mean | 95% CI for Mean |       | Median | Std Dev | 'N'<br>(applicable) |
|---|------|-----------------|-------|--------|---------|---------------------|
|   |      | Lower           | Upper |        |         |                     |
| <i>Land use and resources</i>                           |      |                 |       |        |         |                     |
| A Stock off stream benefits soil and water              | 3.9  | 3.8             | 4.1   | 4.0    | 1.7     | 337                 |
| B Link between economic, social, environmental          | 4.6  | 4.5             | 4.8   | 5.0    | 1.3     | 380                 |
| C New practices have long term benefits                 | 4.3  | 4.2             | 4.5   | 5.0    | 1.4     | 367                 |
| D Marginal cropping land returned to grazing            | 3.0  | 2.8             | 3.2   | 3.0    | 1.9     | 309                 |
| E Reducing diversion as down-stream benefits            | 2.7  | 2.5             | 2.9   | 3.0    | 1.9     | 341                 |
| F Farming on-contour reduces soil erosion               | 5.0  | 4.9             | 5.2   | 5.0    | 1.2     | 320                 |
| <i>Social and lifestyle</i>                             |      |                 |       |        |         |                     |
| G Rural lifestyle benefits outweigh challenges          | 4.2  | 4.0             | 4.3   | 4.0    | 1.7     | 359                 |
| <i>Property values</i>                                  |      |                 |       |        |         |                     |
| H Identifying aboriginal heritage justified by benefits | 2.4  | 2.2             | 2.6   | 2.0    | 1.9     | 341                 |
| I Identifying remnant bushland justified by benefits    | 3.9  | 3.7             | 4.1   | 4.0    | 1.7     | 381                 |
| J Weed, pest control in bushland justified by benefits  | 4.5  | 4.3             | 4.7   | 5.0    | 1.6     | 385                 |
| K Benefits of property planning outweigh cost, effort   | 4.4  | 4.2             | 4.5   | 5.0    | 1.5     | 369                 |

Landholders reported less agreement with statements about the need to return marginal cropping country to grazing (Item D, mean rating 3.0), the down-stream benefits of reducing the diversion of

stream flows (Item E, mean rating 2.7) and the benefits of identifying sites of significance to Aboriginal communities (Item H, mean rating 2.4).



**Figure 32. Confidence interval for mean ratings of agreement / disagreement with land management topics (Q3.1)**

### 8.2.1. Property land use category

Landholders on small grazing properties (category 1) reported higher agreement than people on larger grazing properties (category 2) and larger mixed enterprise properties (category 3) regarding the statement that reducing the diversion of water flow provides important down-stream benefits (Item E). Landholders on small grazing properties (category 1) also reported higher agreement than people on larger grazing properties (category 2) regarding statements that the lifestyle benefits of rural living outweigh the challenges (Item G) and that identify and protecting areas of remnant bushland is justified by the protection it affords to plants and animals (Item E).

There was no substantial difference between landholders from different property land use categories with respect to statements regarding the benefits of watering stock off-stream (Item A), the link between economic, social and environmental outcomes (Item B), the long term benefits of new practices (Item C), a substantial area of marginal cropping country that should be returned to grazing (Item D), the reduction of soil erosion resulting from farming on-contour (Item F), identifying and protecting sites of cultural significance to Aboriginal communities is justified (Item H) and the benefits of property planning outweigh the cost and effort involved (Item K) (Table 17, Table 82, Table 95).

**Table 17. Land management topics (Q3.1) by Property land use category (Q4.1)**

| <i>Item</i>  | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|--|-----------------------------------|----------------------------------|---|
| A Stock off stream benefits soil and water                         | 4.0                               | 3.9                              | 4.4                                       |
| B Link between economic, social, environmental                     | 4.6                               | 4.6                              | 4.8                                       |
| C New practices have long term benefits                            | 4.5                               | 4.2                              | 4.5                                       |
| D Marginal cropping land returned to grazing                       | 3.1                               | 3.0                              | 3.0                                       |
| E Reducing diversion as down-stream benefits                       | 3.6 <sup>(1) (2)</sup>            | 2.3 <sup>(1)</sup>               | 2.2 <sup>(2)</sup>                        |
| F Farming on-contour reduces soil erosion                          | 5.0                               | 5.0                              | 5.4                                       |
| G Rural lifestyle benefits outweigh challenges                     | 4.5 <sup>(1)</sup>                | 4.0 <sup>(1)</sup>               | 4.2                                       |
| H Identifying aboriginal heritage justified by benefits            | 2.7                               | 2.2                              | 2.4                                       |
| I Identifying remnant bushland justified by benefits               | 4.4 <sup>(1)</sup>                | 3.5 <sup>(1)</sup>               | 3.9                                       |
| J Weed, pest control in bushland justified by benefits             | 4.8                               | 4.4                              | 4.5                                       |
| K Benefits of property planning outweigh cost, effort              | 4.3                               | 4.5                              | 4.6                                       |
| <sup>(1) (2)</sup> Differences significant at the 0.05 level (95%) |                                   |                                  |   |

### 8.2.2. Key points

- Respondents reported highest agreement with the statement that farming on-contour reduced soil erosion (Item F, mean rating 5.0). Landholders also reported a high level of agreement with statements about the benefits of watering stock off stream (Item A, mean rating 3.9), the link between economic, social and environmental outcomes (Item B, mean rating 4.6), the long term benefits of adopting new practices compared to short term loss of productive capacity (Item C, mean rating 4.3), the lifestyle benefits of working and living on a rural property (Item G, mean rating 4.2), the benefits of protecting remnant bushland (Item I, mean rating 3.9), the benefits of weed and pest control in native bushland (Item J, mean rating 4.5) and the long term benefits of property planning (Item K, mean rating 4.4).
- Landholders reported less agreement with statements about the need to return marginal cropping country to grazing (Item D, mean rating 3.0), the down-stream benefits of reducing the diversion of stream flows (Item E, mean rating 2.7) and the benefits of identifying sites of significance to Aboriginal communities (Item H, mean rating 2.4).
- Landholders on small grazing properties (category 1) reported higher agreement than people on larger grazing properties (category 2) and larger mixed enterprise properties (category 3) regarding the statement that reducing the diversion of water flow provides important down-stream benefits (Item E). Landholders on small grazing properties (category 1) also reported higher agreement than people on larger grazing properties (category 2) regarding statements that the lifestyle benefits of rural living outweigh the challenges (Item G) and that identify and protecting areas of remnant bushland is justified by the protection it affords to plants and animals (Item E).
- There was no substantial difference between landholders from different property land use categories with respect to statements regarding the benefits of watering stock off-stream (Item A), the link between economic, social and environmental outcomes (Item B), the long term benefits of new practices (Item C), a substantial area of marginal cropping country that should be returned to grazing (Item D), the reduction of soil erosion resulting from farming on-contour (Item F), identifying and protecting sites of cultural significance to Aboriginal communities is justified (Item H) and the benefits of property planning outweigh the cost and effort involved.

## 9. Current implementation of land management practices

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### 9.1. Management practices

#### 9.1.1. Introduction

A series of interval variables relating to the 'implementation of land management practices' was created from 16 survey items within Question 6.1 "Which of the following management practices have you been able to implement on your property?". These items were:

##### *Cropping systems*

- A. Area of cropping using farming on-contour (e.g. maintaining contour banks, contour cropping)
- B. Area of cropping using techniques with improved water use efficiency (e.g. irrigation scheduling)
- C. Area of cropping using minimum / Zero till
- D. Area of cropping where ground cover is maintained (e.g. stubble retention)
- E. Area of opportunity cropping
- F. Estimated hours spent on controlling spread of weeds in the last 12 months

##### *Grazing systems*

- G. Area of stock paddocks where monitoring and managing stock numbers to maintain ground cover and pasture condition (e.g. cell grazing, rotational grazing, strategic spelling) is undertaken
- H. Area of stock paddocks fenced by land and soil type
- I. Area of stock paddocks where access to riparian areas, wetlands and erosion-prone areas is managed (incl. off-stream watering points, fencing waterways)
- J. Estimated hours spent on controlling spread of agricultural weeds in the last 12 months

##### *Riparian, wetland and erosion-prone areas*

- K. Area of riparian, wetland and erosion-prone areas where vegetation has been retained

##### *Remnant bushland areas*

- L. Area of remnant bushland where stock numbers are managed or stock excluded
- M. Estimated hours spent on controlling spread of introduced plants in the last 12 months

#### 9.1.2. All landholders

##### ***Cropping systems***

In cropping systems, the three most extensively implemented practices were reported to be the implementation of minimum tillage (Item C, 52% of cropped area), farming on-contour (Item A, 47% of cropped area) and the retention of ground cover (Item D, 44% of cropped area) (Figure 34, Table 18, Figure 33).

Opportunity cropping (Item E, 34% of cropped area) was also reported to have a moderate level of implementation.

The least implemented practice in cropping systems was the application of improved water use efficiency techniques (Item B, 17% of cropped area).

Implementation of weed control practices in cropping systems (Item F) was reported to be less than other forms of weed control, with the mean number of hours per year spent on this practice being 28 hours.

##### ***Grazing systems***

In grazing systems, landholders stated that the most widely implemented practice was the monitoring and management of stock numbers to maintain ground cover (Item G, 68% of grazed area). Fencing of paddocks by land and soil type was also moderately well implemented (Item H, 39% of grazed area).

Managing stock access to riparian areas (Item I) was the least implemented practice in grazing systems (15% of grazed area). Weed control in grazing systems was reported to be practised for an average of 53 hours per year.

**Other**

The retention of vegetation in riparian, wetland or erosion prone areas (Item K) was implemented in 33% of grazed or protected bushland.

**Bushland systems**

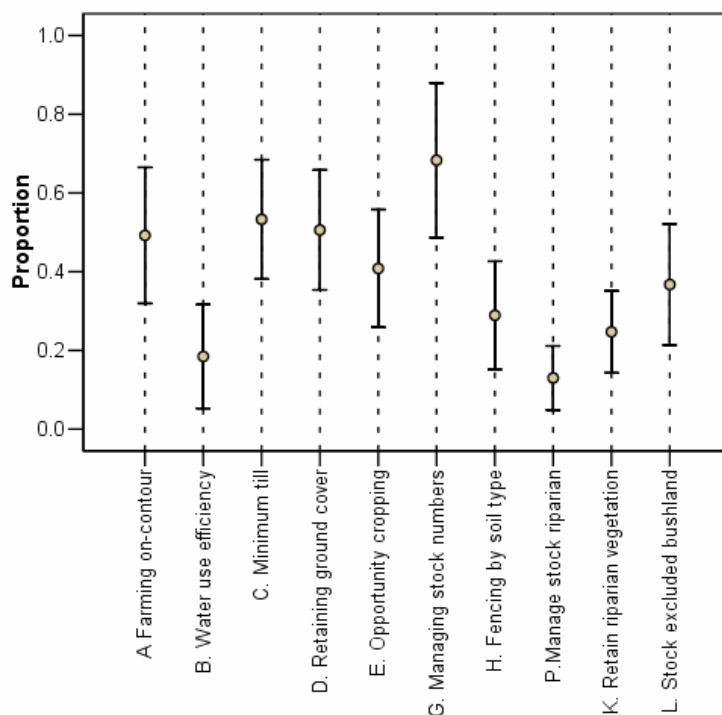
Landholders stated that the management or exclusion of stock numbers in remnant bushland (Item L) was reported to be practised in 37% of the total area of bushland used for grazing or resource protection.

The control of introduced plants in remnant bushland (Item M) was reported to be practised for 47 hours per year on average.

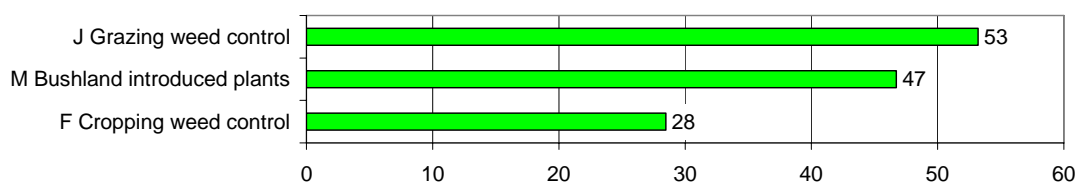
**Table 18. Descriptive statistics for implementation of land management practices (Q6.1)**

| Item  | Mean | 95% CI for Mean |       | Median | Std Dev | 'N'<br>(applicable) |
|---|------|-----------------|-------|--------|---------|---------------------|
|   |      | Lower           | Upper |        |         |                     |
| A Farming on-contour <sup>(1)</sup>         | 47%  | 35%             | 59%   | 13%    | 54%     | 79                  |
| B Water use efficiency <sup>(1)</sup>       | 17%  | 8%              | 25%   | 0%     | 39%     | 79                  |
| C Minimum till <sup>(1)</sup>               | 52%  | 41%             | 62%   | 50%    | 47%     | 79                  |
| D Retaining ground cover <sup>(1)</sup>     | 44%  | 33%             | 54%   | 25%    | 48%     | 79                  |
| E Opportunity cropping <sup>(1)</sup>       | 34%  | 23%             | 45%   | 0%     | 50%     | 78                  |
| G Managing stock numbers <sup>(2)</sup>     | 68%  | 61%             | 74%   | 96%    | 49%     | 247                 |
| H Fenced soil type <sup>(2)</sup>           | 39%  | 34%             | 45%   | 10%    | 45%     | 247                 |
| I Riparian stock management <sup>(2)</sup>  | 15%  | 11%             | 19%   | 0%     | 31%     | 248                 |
| K Retain riparian vegetation <sup>(3)</sup> | 33%  | 24%             | 42%   | 2%     | 56%     | 153                 |
| L Bushland stock excluded <sup>(3)</sup>    | 37%  | 29%             | 45%   | 2%     | 51%     | 155                 |

Notes: Area where practice was implemented is expressed as a percentage of (1) total cropped area (irrigated and dryland) (2) all grazed land (3) total grazed and protected bushland.



**Figure 33. Mean area (ha) of implemented land management practice (Q6.1)**



**Figure 34. Mean time (hrs) on implementation of land management practices (weed control) (Q6.1)**

### 9.1.3. Property land use category

#### **Cropping systems**

The implementation of water use efficiency techniques (Item B) was reported to be higher on small grazing properties (category 1, 65%) than on large grazing properties (category 2, 14%) and large mixed enterprise properties (category 3, 8%) (Table 19, Table 83, Table 96).

There was no substantial difference between landholders from different property land use categories with respect to other cropping practices (i.e. farming on-contour (Item A), minimum tillage (Item C), retention of ground cover (Item D) or opportunity cropping).

#### **Grazing systems**

No substantial difference between landholders from different property land use categories with respect to listed grazing practices (i.e. implementation of stock management to maintain ground cover (Item G), fencing by soil type (Item H), stock management of riparian areas (Item I)).

#### **Other**

No substantial difference between landholders from different property land use categories with respect to the retention of riparian vegetation (Item K).

#### **Bushland**

The exclusion of stock from remnant bushland areas (Item L) was reported to be higher on small grazing properties (category 1, 57%) than on large grazing properties (category 2, 23%).

**Table 19. Percentage of property area where key land management practices were implemented (Q6.1) by Property land use category (Q4.1)**

| <i>Item</i>                   | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|-------------------------------|-----------------------------------|----------------------------------|---|
| A Farming on-contour          | 22%                               | 35%                              | 64%                                       |
| B. Water use efficiency       | 65% <sup>(1)(2)</sup>             | 14% <sup>(1)</sup>               | 8% <sup>(2)</sup>                         |
| C. Minimum till               | 55%                               | 47%                              | 55%                                       |
| D. Retaining ground cover     | 32%                               | 44%                              | 46%                                       |
| E. Opportunity cropping       | 11%                               | 45%                              | 30%                                       |
| G. Managing stock numbers     | 75%                               | 63%                              | 71%                                       |
| H. Fencing by soil type       | 43%                               | 40%                              | 29%                                       |
| I. Riparian stock management  | 10%                               | 18%                              | 15%                                       |
| K. Retain riparian vegetation | 23%                               | 37%                              | 40%                                       |
| L. Stock excluded bushland    | 57% <sup>(1)</sup>                | 23% <sup>(1)</sup>               | 46%                                       |

<sup>(1)(2)</sup> Differences significant at the 0.05 level (95%)

### 9.1.4. Key points

#### **Cropping systems**

- In cropping systems, the three most extensively implemented practices were reported to be the implementation of minimum tillage (Item C, 52% of cropped area), farming on-contour (Item A, 47% of cropped area) and the retention of ground cover (Item D, 44% of cropped area).

- Opportunity cropping (Item E, 34% of cropped area) was also reported to have a moderate level of implementation.
- The least implemented practice in cropping systems was the application of improved water use efficiency techniques (Item B, 17% of cropped area).
- Implementation of weed control practices in cropping systems (Item F) was reported to be less than other forms of weed control, with the mean number of hours per year spent on this practice being 28 hours.
- The implementation of water use efficiency techniques (Item B) was reported to be higher on small grazing properties (category 1, 65%) than on large grazing properties (category 2, 14%) and large mixed enterprise properties (category 3, 8%).
- There was no substantial difference between landholders from different property land use categories with respect to other cropping practices (i.e. farming on-contour (Item A), minimum tillage (Item C), retention of ground cover (Item D) or opportunity cropping).

### ***Grazing systems***

- In grazing systems, landholders stated that the most widely implemented practice was the monitoring and management of stock numbers to maintain ground cover (Item G, 68% of grazed area). Fencing of paddocks by land and soil type was also moderately well implemented (Item H, 39% of grazed area).
- Managing stock access to riparian areas (Item I) was the least implemented practice in grazing systems (15% of grazed area). Weed control in grazing systems was reported to be practised for an average of 53 hours per year.
- No substantial difference between landholders from different property land use categories with respect to listed grazing practices (i.e. implementation of stock management to maintain ground cover (Item G), fencing by soil type (Item H), stock management of riparian areas (Item I)).

### ***Other systems***

- The retention of vegetation in riparian, wetland or erosion prone areas (Item K) was implemented in 33% of grazed or protected bushland.
- No substantial difference between landholders from different property land use categories with respect to the retention of riparian vegetation (Item K).

### ***Bushland***

- Landholders stated that the management or exclusion of stock numbers in remnant bushland (Item L) was reported to be practised in 37% of the total area of bushland used for grazing or resource protection.
- The control of introduced plants in remnant bushland (Item M) was reported to be practised for 47 hours per year on average.
- The exclusion of stock from remnant bushland areas (Item L) was reported to be higher on small grazing properties (category 1, 57%) than on large grazing properties (category 2, 23%).

## 9.2. Planning practices

### 9.2.1. All landholders

A series of interval variables relating to the ‘implementation of land management planning practices’ were created from 7 survey items within Question 6.2 “Please indicate the extent that you have been able to implement the following planning practices on your property?”. Response scale anchors for this survey item were Not implemented (0) and Fully implemented (6). These items were:

#### *Intensive animal production systems*

- A. An effluent management plan

#### *Property resource planning*

- B. Resource mapping (e.g. land condition, soil types, bushland, streams)
- C. Identifying and protecting sites of cultural significance to Aboriginal communities
- D. Identifying and protecting remnant bushland
- E. A financial plan to ensure sustainable economic outcomes for your property
- F. A succession plan to manage the transfer of your property to the next generation
- G. Maintaining your knowledge of advances in land management techniques and land processes

The most highly implemented planning practice was reported to be ‘maintaining knowledge of advances in land management practices (Item G, mean rating 3.9). Three other practices had similar levels of implementation. These were financial planning (Item E, mean rating 3.5), identifying and protecting bushland (Item D, mean rating 3.3) and succession planning (Item F, mean rating 3.1). Landholders report a lower level of implementation for effluent management planning (Item A, mean rating 1.8) and property mapping (Item B, mean rating 2.6). The identification and protection of sites of cultural significance to Aboriginal communities was given the lowest rating (Item C, mean rating 1.0) (Table 20, Figure 35, Table 84).

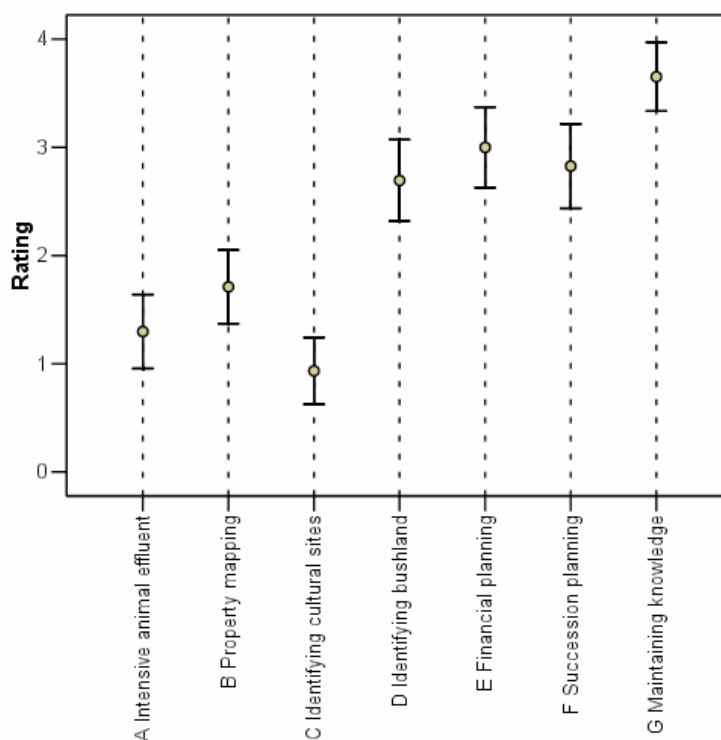


Figure 35. Confidence interval for mean rating of land management planning practices (Q6.2)

**Table 20. Descriptive statistics for implementation of planning practices (Q6.2)**

| <i>Item</i>                  | <i>Mean</i> | <i>95% CI for Mean</i> |              | <i>Median</i> | <i>Std Dev</i> | <i>'N'</i><br><i>(applicable)</i> |
|------------------------------|-------------|------------------------|--------------|---------------|----------------|-----------------------------------|
|                              |             | <i>Lower</i>           | <i>Upper</i> |               |                |                                   |
| A Intensive animal effluent  | 1.8         | 1.4                    | 2.1          | 1.0           | 2.1            | 166                               |
| B Property mapping           | 2.6         | 2.3                    | 2.8          | 3.0           | 2.1            | 308                               |
| C Identifying cultural sites | 1.0         | 0.8                    | 1.2          | 0.0           | 1.7            | 224                               |
| D Identifying bushland       | 3.3         | 3.1                    | 3.5          | 4.0           | 2.0            | 316                               |
| E Financial planning         | 3.5         | 3.2                    | 3.7          | 4.0           | 2.1            | 321                               |
| F Succession planning        | 3.1         | 2.8                    | 3.3          | 3.0           | 2.2            | 313                               |
| G Maintaining knowledge      | 3.9         | 3.8                    | 4.1          | 4.0           | 1.7            | 348                               |

### 9.2.2. Property land use category

Survey respondents on large grazing properties (category 2) and large mixed enterprise properties (category 3) reported a higher level of implementation than landholders on small grazing properties (category 1) for resource mapping (Item B), succession planning (Item F) and maintaining an up-to-date knowledge of practices (Item G). Survey respondents on large grazing properties (category 2) also reported a higher level of implementation than landholders on small grazing properties (category 1) for the identification of cultural sites (Item C) and financial planning (Item F).

There was no major difference by survey respondents from different property land use categories in the reported level of implementation for effluent management plans (Item A) or the identification of bushland (Item D) (Table 21, Table 84, Table 97).

**Table 21. Mean rating for implementation of planning practices (Q6.2) by property land use category (Q4.1)**

| <i>Item</i>                  | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|------------------------------|-----------------------------------|----------------------------------|---|
| A Intensive animal effluent  | 1.7                               | 1.7                              | 2.1                                       |
| B Property mapping           | 1.6 <sup>(1) (2)</sup>            | 3.0 <sup>(1)</sup>               | 2.8 <sup>(2)</sup>                        |
| C Identifying cultural sites | 0.6 <sup>(1)</sup>                | 1.3 <sup>(1)</sup>               | 0.8                                       |
| D Identifying bushland       | 3.1                               | 3.3                              | 3.5                                       |
| E Financial planning         | 2.8 <sup>(1)</sup>                | 3.8 <sup>(1)</sup>               | 3.6                                       |
| F Succession planning        | 2.5 <sup>(1)</sup>                | 3.5 <sup>(1)</sup>               | 3.2 <sup>(2)</sup>                        |
| G Maintaining knowledge      | 3.5 <sup>(1) (2)</sup>            | 4.2 <sup>(1)</sup>               | 4.3 <sup>(2)</sup>                        |

<sup>(1) (2)</sup> Differences significant at the 0.05 level (95%)

### 9.2.3. Key points

- The most highly implemented planning practice was reported to be 'maintaining knowledge of advances in land management practices (Item G, mean rating 3.9). Three other practices had similar levels of implementation. These were financial planning (Item E, mean rating 3.5), identifying and protecting bushland (Item D, mean rating 3.3) and succession planning (Item F, mean rating 3.1). Landholders report a lower level of implementation for effluent management planning (Item A, mean rating 1.8) and property mapping (Item B, mean rating 2.6). The identification and protection of sites of cultural significance to Aboriginal communities was given the lowest rating (Item C, mean rating 1.0).
- Survey respondents on large grazing properties (category 2) and large mixed enterprise properties (category 3) reported a higher level of implementation than landholders on small grazing properties (category 1) for resource mapping (Item B), succession planning (Item F) and maintaining an up-to-date knowledge of practices (Item G). Survey respondents on large grazing properties (category 2) also reported a higher level of implementation than landholders on small grazing properties (category 1) for the identification of cultural sites (Item C) and financial planning (Item F).

### 9.3. Monitoring water resources

#### 9.3.1. Level of bore water

The variable ‘level of bore water’ was created from landholder responses to Question 11.1 ‘Do you use bore water for agricultural purposes on your property?’ which provided three possible responses ‘yes’ or ‘no’ or ‘n/a’.

A second variable ‘changes in level of bore water’ was also created from landholder responses to Question 11.2 ‘If yes, has the level of bore water changed over the last 12 months?.’ This question provided four possible responses ‘A. The water level has risen’, ‘B. The water level has remained stable’, ‘C. The water level has dropped’, or ‘n/a’.

About two thirds of landholders (65%) reported that they do use bore water for agricultural purposes (Figure 36, Table 48)

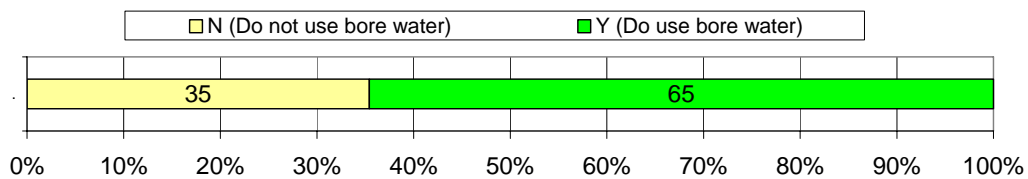


Figure 36. Percentage of respondents who use bore water for agricultural purposes (Q11.1)

Of those respondents who reported using bore water for agricultural purposes, just over half (53.8%) stated that the level of bore water had remained stable over the past 12 months and just under half (45.4%) said that the level had fallen over the last 12 months (Figure 37, Table 49).

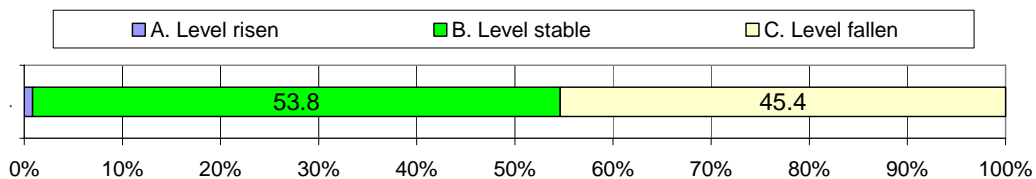


Figure 37. Percentage of respondents who reported changes in the level of bore water (Q11.2)

#### 9.3.2. Bore water quality

The variable ‘monitor bore water quality’ was created from landholder responses to Question 11.3 ‘Do you monitor the quality of bore water on your property?’ which provided three possible responses ‘yes’ or ‘no’ or ‘n/a’.

A second variable ‘changes in bore water quality’ was also created from landholder responses to Question 11.4 ‘If yes, has the quality of bore water changed over the last 12 months?.’ This question provided four possible responses ‘A. Water quality has improved’, ‘B. Water quality has remained the same’, ‘C. The water quality has declined’, or ‘n/a’.

Of those landholders who reported using bore water for agricultural purposes, one-half (50%) reported that they do not monitor the quality of bore water (Figure 38, Table 50)

Of those landholders who reported using bore water for agricultural purposes, the majority indicated that the quality of bore water is stable (75%). Some respondents (22.1%) reported that the quality of bore water had declined. The percentage of respondents who report a rise in bore water levels was negligible (Figure 39, Table 51).

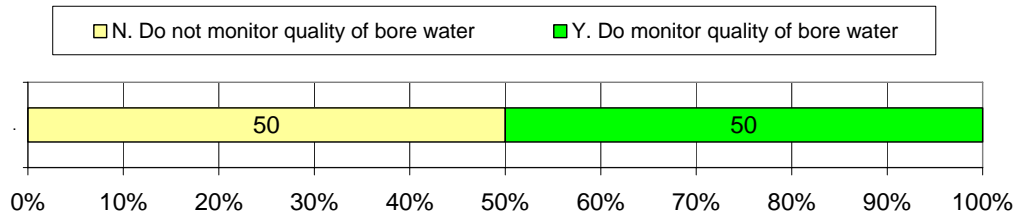


Figure 38. Percentage of respondents who monitor bore water quality (Q11.3)

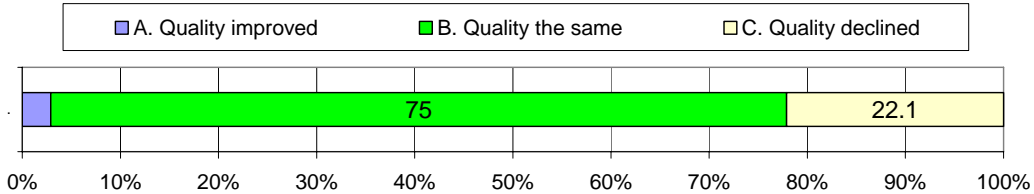


Figure 39. Percentage of respondents who report changes in the quality of bore water (Q11.4)

### 9.3.3. Surface water quality

The variable ‘monitor surface water quality’ was created from landholder responses to Question 11.5 ‘Do you monitor the quality of surface water on your property (esp. streams, billabongs, etc)?’ which provided three possible responses ‘yes’ or ‘no’ or ‘n/a’.

Just under one-half of landholders (48.4%) reported that they monitor the quality of surface water. (Figure 40, Table 52)

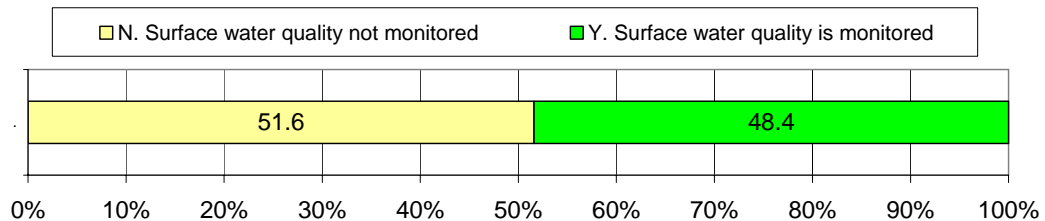


Figure 40. Percentage of respondents who monitor the quality of surface water (Q11.5)

### 9.3.4. Naturally-occurring springs

The variable ‘naturally-occurring springs’ was created from landholder responses to Question 11.6 ‘Do you have any naturally occurring springs on your property?’ which provided three possible responses ‘yes’ or ‘no’ or ‘n/a’.

8.1% of landholders reported that naturally-occurring springs occur on their property. (Figure 41, Table 53).

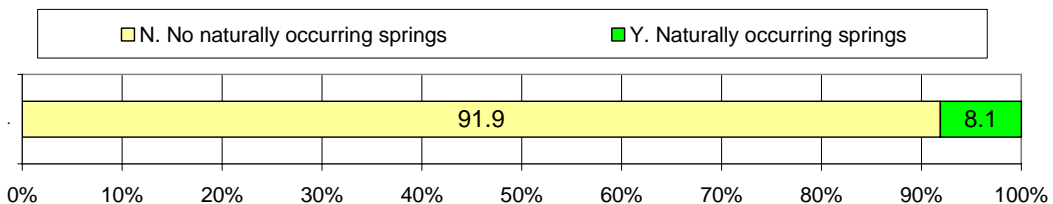
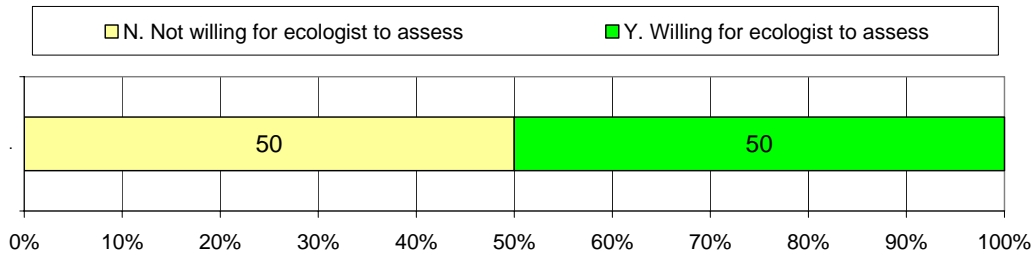


Figure 41. Percentage of respondents who report naturally occurring springs (Q11.6)

### 9.3.5. Ecologist to inspect naturally-occurring springs

The variable ‘ecologist to access naturally-occurring springs’ was created from landholder responses to Question 11.7 ‘If yes, would you be willing for an ecologist to assess the condition of the spring?’ which provided three possible responses ‘yes’ or ‘no’ or ‘n/a’.

One- of the landholders who reported having a naturally-occurring spring (50% also reported that they were willing for an ecologist to assess the quality of naturally occurring springs on their property. (Figure 42, Table 54).

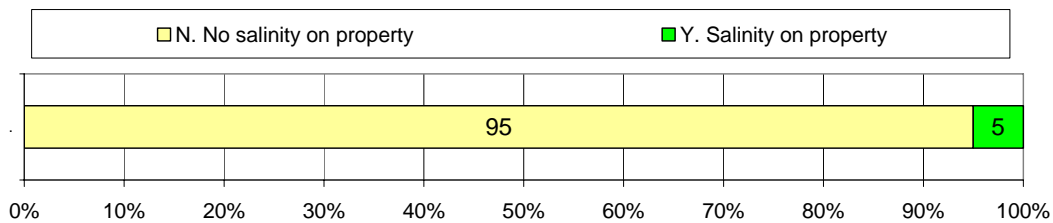


**Figure 42. Percentage of respondents who report being willing for an ecologist to assess naturally occurring springs (Q11.7)**

### 9.3.6. Salinity on property

The variable ‘salinity on property’ was created from landholder responses to Question 11.8 ‘Is any of your property affected by salinity?’ which provided three possible responses ‘yes’ or ‘no’ or ‘n/a’.

Only a small percentage of landholders (5% reported that part of their property was affected by salinity (Figure 43, Table 55).



**Figure 43. Percentage of respondents who report that part of their property was affected by salinity (Q11.7)**

### 9.3.7. Key points

- About two thirds of landholders (65%) reported that they use bore water for agricultural purposes.
- Of those respondents who use bore water for agricultural purposes, just over half (53.8%) reported that the level of bore water had remained stable over the past 12 months.
- Of those landholders who reported using bore water for agricultural purposes, one-half (50.0%) reported that they monitor the quality of bore water.
- Of those landholders who reported using bore water for agricultural purposes, the majority indicated that the quality of bore water was stable (75%). Some respondents (22.1%) reported that the quality of bore water had declined. The percentage of respondents who report a rise in bore water levels was negligible.
- 8.1% of landholders reported that they had naturally-occurring springs on their property.
- One half of landholders (50%) who reported having a naturally occurring spring also reported that they were willing for an ecologist to assess the quality of naturally-occurring springs on their property.
- Only a small percentage of landholders (5%) reported that part of their property was affected by salinity.

## 10. Self-assessed knowledge of land management

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### 10.1. Self-assessed knowledge of land management

#### 10.1.1. All landholders

A series of interval variables relating to 'self-assessed knowledge of land management' was created from 20 survey items within Question 5.1 "How would you rate your knowledge of the following land management practices and their effects?" Response scale anchors for this survey item were Not good (0) and Very good (6). These items were:

##### *Cropping practices*

- A. The contribution of farming on-contour (e.g. maintaining contour banks, contour cropping) to the reduction of soil erosion and increase in soil moisture
- B. The ability of water use efficiency techniques (esp. scheduling) to maintain a low water table and reduce the risk of salinity.
- C. The effects of minimum / Zero till on soil health and retained moisture
- D. The contribution of ground cover (e.g. stubble retention) to soil health and the reduction of soil erosion
- E. The ability of opportunity cropping to improve productivity and reduce soil erosion
- F. The benefits of controlling the spread of weeds to maintain land productivity

##### *Grazing practices*

- G. The benefits of monitoring and managing stock numbers (incl. cell grazing, rotational grazing, strategic spelling) to maintain pasture condition and reduce soil erosion.
- H. The effects of controlling the spread of weeds on land productivity
- I. The benefits of fencing different land and soil types to stock management and to maintain ground cover and pasture condition.
- J. The effects of managing stock access to riparian areas and wetlands (e.g. off-stream watering points, fencing waterways) on water quality and soil erosion.

##### *Intensive animal production systems (other systems)*

- K. The contribution of an effluent management plan to improving water quality

##### *Riparian, wetland and erosion-prone areas (other systems)*

- L. The benefits of vegetation retention on water quality and soil erosion

##### *Remnant bushland areas*

- M. The effects of controlling introduced plants on the condition of existing native vegetation
- N. The effects of excluding or managing stock on the condition of existing native vegetation

##### *Overall property resource*

- O. The benefits of resource mapping (e.g., land condition, soil types, bushland, streams) to improve resource management and utilisation
- P. The benefits from identifying and protecting Aboriginal sites to protect cultural heritage
- Q. The benefits of identifying and protecting remnant bushland to maintain the diversity of wildlife and plants.
- R. The ability of financial planning to ensure sustainable economic outcomes for your property
- S. The benefits of succession planning to successfully manage the transfer of your property to the next generation
- T. The benefits of improving your awareness and knowledge of advances in land management techniques and land processes

##### ***Cropping systems***

Landholders stated that their highest level of knowledge of land management practices and benefits in cropping systems pertains to the contribution of ground cover to soil health and the reduction of soil

erosion (Item D, mean rating 4.8) and the benefits of weed control for maintaining land productivity (Item F, mean rating 5.0) (Table 22, Figure 44).

Landholders also reported a relatively high knowledge of the contribution of farming on-contour to reducing soil erosion and increasing soil moisture (Item A, mean rating 4.5), the effects of minimum till on soil health and retained moisture (Item C, mean rating 4.4) and the ability of opportunity cropping to improve productivity and reduce soil erosion (Item E, mean rating 4.5).

Landholders reported that their lowest level of knowledge in cropping systems relates to the ability of water use efficiency techniques to maintain a low water table and reduce the risk of salinity (Item B, mean rating 4.0).

### **Grazing systems**

Landholders stated that their highest level of knowledge of land management practices and benefits in grazing systems relates to the effects of weed control on land productivity (Item H, mean rating 5.1).

Landholders also reported a relatively high level of knowledge about the benefits of monitoring and managing stock numbers to maintain pasture condition (Item G, mean rating 4.9) and the benefits of fencing different land and soil types (Item I, mean rating 4.8).

Landholders reported their lowest level of knowledge in grazing systems relates to the effects of managing stock access to riparian areas and wetlands (Item J, mean rating 4.4).

**Table 22. Descriptive statistics for self-assessed knowledge of land management practices (Q5.1)**

| <i>Item</i>                     | <i>Mean</i> | <i>95% CI for Mean</i> |              | <i>Median</i> | <i>Std Dev</i> | <i>'N'</i><br><i>(applicable)</i> |
|---------------------------------|-------------|------------------------|--------------|---------------|----------------|-----------------------------------|
|                                 |             | <i>Lower</i>           | <i>Upper</i> |               |                |                                   |
| <i>Cropping</i>                 |             |                        |              |               |                |                                   |
| A Farming on-contour            | 4.5         | 4.3                    | 4.8          | 5.0           | 1.4            | 166                               |
| B Water use efficiency          | 4.0         | 3.8                    | 4.3          | 4.0           | 1.7            | 164                               |
| C Minimum till                  | 4.4         | 4.2                    | 4.7          | 5.0           | 1.5            | 163                               |
| D Retaining ground cover        | 4.8         | 4.6                    | 5.0          | 5.0           | 1.3            | 176                               |
| E Opportunity cropping          | 4.1         | 3.9                    | 4.4          | 4.0           | 1.6            | 158                               |
| F Weed control                  | 5.0         | 4.8                    | 5.2          | 5.0           | 1.3            | 180                               |
| <i>Grazing</i>                  |             |                        |              |               |                |                                   |
| G Managing stock - pasture      | 4.9         | 4.8                    | 5.1          | 5.0           | 1.3            | 318                               |
| H Weed control                  | 5.1         | 4.9                    | 5.2          | 5.0           | 1.1            | 320                               |
| I Fencing soil types            | 4.8         | 4.7                    | 5.0          | 5.0           | 1.3            | 312                               |
| J Stock access riparian         | 4.4         | 4.3                    | 4.6          | 5.0           | 1.5            | 288                               |
| <i>Other</i>                    |             |                        |              |               |                |                                   |
| K Intensive animal effluent     | 3.6         | 3.4                    | 3.9          | 4.0           | 1.9            | 244                               |
| L Retain riparian vegetation    | 4.4         | 4.2                    | 4.6          | 5.0           | 1.5            | 330                               |
| <i>Bushland</i>                 |             |                        |              |               |                |                                   |
| M Controlling introduced plants | 4.4         | 4.2                    | 4.6          | 5.0           | 1.5            | 360                               |
| N Excluding stock               | 4.3         | 4.1                    | 4.4          | 4.0           | 1.5            | 342                               |
| <i>Property planning</i>        |             |                        |              |               |                |                                   |
| O Resource mapping              | 3.9         | 3.7                    | 4.0          | 4.0           | 1.5            | 347                               |
| P Identifying Aboriginal sites  | 2.8         | 2.6                    | 3.0          | 3.0           | 1.7            | 300                               |
| Q Identifying bushland          | 4.1         | 3.9                    | 4.2          | 4.0           | 1.5            | 358                               |
| R Financial planning            | 4.5         | 4.3                    | 4.6          | 5.0           | 1.4            | 344                               |
| S Succession planning           | 4.1         | 4.0                    | 4.3          | 4.0           | 1.7            | 331                               |
| T Maintaining knowledge         | 4.3         | 4.2                    | 4.5          | 5.0           | 1.5            | 357                               |

### **Other**

Landholders reported a relatively high knowledge of the benefits of vegetation retention in riparian, wetland and erosion prone areas on water quality (Item L, mean rating 4.4). Landholders reported a

slightly lower level of knowledge about the contribution of effluent management plans for improving water quality (Item K, mean rating 3.6).

### **Bushland**

Landholders reported a relatively high level of knowledge of practices in remnant bushland areas including the effects of controlling introduced plants (Item M, mean rating 4.4) and the effects of excluding or managing stock on the condition of native vegetation (Item N, mean rating 4.3).

### **Property planning**

Landholders also reported a relatively high level of knowledge of most property planning practices including the ability of financial planning to ensure sustainable economic outcomes for the property (Item R, mean rating 4.5), the benefits of improving awareness and knowledge of advances in land management techniques and land processes (Item T, mean rating 4.3), the benefits of succession planning (Item S, mean rating 4.1) and the benefits of identifying and protecting remnant bushland (Item Q, mean rating 4.1).

Landholders reported a lower level of knowledge of the benefits of resource mapping (Item O, mean rating 3.9) and the lowest knowledge of the benefits of identifying and protecting Aboriginal sites (Item P, mean rating 2.8).

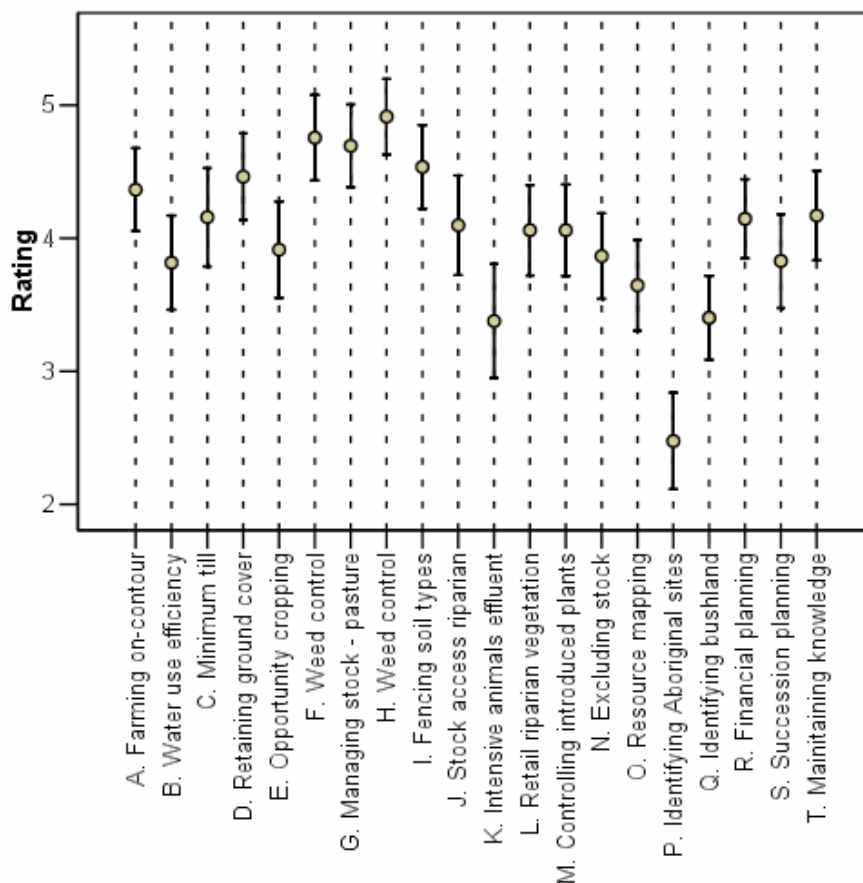


Figure 44. 95% confidence interval for mean ratings of self-reported knowledge (Q5.1)

## **10.1.2. Property land use category**

### **Cropping systems**

Landholders on larger cropping properties (category 3) reported a higher level of knowledge than landholders on smaller grazing properties (category 1) with respect to the benefits of farming on-contour (Item A), the contribution of ground cover to soil health and the reduction of soil erosion (Item D) and opportunity cropping (Item E).

There were no substantial differences between different property categories with respect to self-assessed knowledge of water use efficiency techniques (Item B), the effects of minimum tillage on soil health, the reduction of soil erosion (Item C) and weed control (Item F) (Table 23, Table 34, Table 85, Table 98).

### **Grazing systems**

Landholders on larger grazing properties (category 3) reported a higher level of knowledge than those on smaller grazing properties (category 1) with respect to the benefits of weed control (Item H).

There were no substantial differences between landholders from different property groups with respect to their self-assessed knowledge of benefits of stock management to maintain pasture condition (Item G), fencing by soil and land types (Item I) and managing stock access to riparian zones (Item J).

**Table 23. Self-assessed knowledge of land management practices and benefits (Q5.1) by Property land use category (Q4.1)**

| <i>Item</i>   | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|---|-----------------------------------|----------------------------------|---|
| <i>Cropping systems</i>   |                                   |                                  |   |
| A. Farming on-contour   | 3.9 <sup>(1)</sup>                | 4.6                              | 5.2 <sup>(1)</sup>                        |
| B. Water use efficiency   | 3.8                               | 4.1                              | 4.3                                       |
| C. Minimum till   | 4.1                               | 4.2                              | 4.9                                       |
| D. Retaining ground cover   | 4.5 <sup>(1)</sup>                | 4.7                              | 5.2 <sup>(1)</sup>                        |
| E. Opportunity cropping   | 3.6 <sup>(1)</sup>                | 4.2                              | 4.6 <sup>(1)</sup>                        |
| F. Weed control   | 4.8                               | 5.2                              | 5.2                                       |
| <i>Grazing systems</i>  |                                   |                                  |   |
| G. Managing stock - pasture                                       | 4.8                               | 5.1                              | 4.8                                       |
| H. Weed control   | 4.9 <sup>(1)</sup>                | 5.2 <sup>(1)</sup>               | 5.2                                       |
| I. Fencing soil types   | 4.7                               | 5.0                              | 4.7                                       |
| J. Stock access riparian  | 4.4                               | 4.5                              | 4.6                                       |
| <i>Other systems</i>  |                                   |                                  |   |
| K. Intensive animals effluent                                     | 3.7                               | 3.4                              | 3.9                                       |
| L. Retail riparian vegetation                                     | 4.4                               | 4.4                              | 4.6                                       |
| <i>Bushland</i>   |                                   |                                  |   |
| M. Controlling introduced plants                                  | 4.5                               | 4.4                              | 4.4                                       |
| N. Excluding stock  | 4.2                               | 4.3                              | 4.3                                       |
| <i>Property planning</i>  |                                   |                                  |   |
| O. Resource mapping   | 3.5 <sup>(1)(2)</sup>             | 4.1 <sup>(1)</sup>               | 4.2 <sup>(2)</sup>                        |
| P. Identifying Aboriginal sites                                   | 2.9                               | 2.8                              | 2.5                                       |
| Q. Identifying bushland   | 4.3                               | 4.0                              | 3.8                                       |
| R. Financial planning   | 4.1 <sup>(1)</sup>                | 4.7 <sup>(1)</sup>               | 4.5                                       |
| S. Succession planning  | 3.9                               | 4.3                              | 4.2                                       |
| T. Maintaining knowledge  | 4.0 <sup>(1)</sup>                | 4.6 <sup>(1)</sup>               | 4.4                                       |
| <sup>(1)(2)</sup> Differences significant at the 0.05 level (95%) |                                   |                                  |   |

### **Other**

There were no substantial differences between landholders from different property groups with respect to the benefits of intensive effluent management plans (Item K) or the retention of riparian vegetation (Item L).

### **Bushland**

There were no substantial differences between landholders from different property groups with respect to the benefits of managing stock in remnant bushland (Item N) or the self-assessed knowledge of the benefits of controlling introduced plants in remnant bushland (Item M).

### ***Property planning***

Landholders on larger mixed enterprise properties (category 3) reported a higher level of knowledge than those on small grazing properties (category 1) with respect to the benefits of resource mapping (Item O).

Landholders on larger grazing properties (category 2) reported a higher level of knowledge than people on small grazing properties (category 1) with respect to the benefits of resource mapping (Item O), financial planning (item R) and maintaining an up-to-date knowledge of land management practices (Item T).

There were no substantial differences between landholders from different property groups with respect to other property planning practices including the benefits of, identifying cultural sites (Item P), identifying remnant bushland (Item N) or succession planning (Item S).

### **10.1.3. Key points**

#### ***Cropping systems***

- Landholders stated that their highest level of knowledge of land management practices and benefits in cropping systems pertains to the contribution of ground cover to soil health and the reduction of soil erosion (Item D, mean rating 4.8) and the benefits of weed control for maintaining land productivity (Item F, mean rating 5.0).
- Landholders also reported a relatively high knowledge of the contribution of farming on-contour to reducing soil erosion and increasing soil moisture (Item A, mean rating 4.5), the effects of minimum till on soil health and retained moisture (Item C, mean rating 4.4) and the ability of opportunity cropping to improve productivity and reduce soil erosion (Item E, mean rating 4.5).
- Landholders reported that their lowest level of knowledge in cropping systems relates to the ability of water use efficiency techniques to maintain a low water table and reduce the risk of salinity (Item B, mean rating 4.0).
- Landholders on larger cropping properties (category 3) reported a higher level of knowledge than landholders on smaller grazing properties (category 1) with respect to the benefits of farming on-contour (Item A), the contribution of ground cover to soil health and the reduction of soil erosion (Item D) and opportunity cropping (Item E).
- There were no substantial differences between different property categories with respect to self-assessed knowledge of water use efficiency techniques (Item B), the effects of minimum tillage on soil health, the reduction of soil erosion (Item C) and weed control (Item F)

#### ***Grazing systems***

- Landholders stated that their highest level of knowledge of land management practices and benefits in grazing systems relates to the effects of weed control on land productivity (Item H, mean rating 5.1).
- Landholders also reported a relatively high level of knowledge about the benefits of monitoring and managing stock numbers to maintain pasture condition (Item G, mean rating 4.9) and the benefits of fencing different land and soil types (Item I, mean rating 4.8).
- Landholders reported their lowest level of knowledge in grazing systems relates to the effects of managing stock access to riparian areas and wetlands (Item J, mean rating 4.4).
- Landholders on larger grazing properties (category 3) reported a higher level of knowledge than those on smaller grazing properties (category 1) with respect to the benefits of weed control (Item H).
- There were no substantial differences between landholders from different property groups with respect to their self-assessed knowledge of benefits of stock management to maintain pasture condition (Item G), fencing by soil and land types (Item I) and managing stock access to riparian zones (Item J).

### ***Other***

- There were no substantial differences between landholders from different property groups with respect to the benefits of intensive effluent management plans (Item K) or the retention of riparian vegetation (Item L).

### ***Bushland***

- Landholders reported a relatively high knowledge of the benefits of vegetation retention in riparian, wetland and erosion prone areas on water quality (Item L, mean rating 4.4). Landholders reported a slightly lower level of knowledge about the contribution of effluent management plans for improving water quality (Item K, mean rating 3.6).
- There were no substantial differences between landholders from different property groups with respect to the benefits of managing stock in remnant bushland (Item N) or the self-assessed knowledge of the benefits of controlling introduced plants in remnant bushland (Item M).

### ***Property planning***

- Landholders also reported a relatively high level of knowledge of most property planning practices including the ability of financial planning to ensure sustainable economic outcomes for the property (Item R, mean rating 4.5), the benefits of improving awareness and knowledge of advances in land management techniques and land processes (Item T, mean rating 4.3), the benefits of succession planning (Item S, mean rating 4.1) and the benefits of identifying and protecting remnant bushland (Item Q, mean rating 4.1).
- Landholders reported a lower level of knowledge of the benefits of resource mapping (Item O, mean rating 3.9) and the lowest knowledge of the benefits of identifying and protecting Aboriginal sites (Item P, mean rating 2.8).
- Landholders on larger mixed enterprise properties (category 3) reported a higher level of knowledge than those on small grazing properties (category 1) with respect to the benefits of resource mapping (Item O).
- Landholders on larger grazing properties (category 2) reported a higher level of knowledge than people on small grazing properties (category 1) with respect to the benefits of resource mapping (Item O), financial planning (item R) and maintaining an up-to-date knowledge of land management practices (Item T).
- There were no substantial differences between landholders from different property groups with respect to other property planning practices including the benefits of, identifying cultural sites (Item P), identifying remnant bushland (Item N) or succession planning (Item S).

## 11. Land management opportunities and constraints

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### 11.1. Priorities for future implementation

#### 11.1.1. All landholders

A series of interval variables relating to 'priority land management objectives' were created from 20 survey items within Question 7.1 "What are your priority land management objectives over the next 5 to 10 years?" Response scale anchors for this survey item were Not a Priority (0) and High priority P6). These items were:

##### *Cropping systems*

- A. Farming on-contour (e.g. maintaining contour banks, contour cropping)
- B. Water use efficiency techniques (e.g. irrigation scheduling)
- C. Minimum / Zero till
- D. Maintaining ground cover (e.g. stubble retention)
- E. Opportunity cropping
- F. Controlling spread of weeds

##### *Grazing systems*

- G. Monitoring and managing stock numbers (incl. cell grazing, rotational grazing, strategic spelling)
- H. Controlling spread of agricultural weeds
- I. Fencing different land and soil types
- J. Managing stock access to riparian areas, wetlands and erosion-prone areas (incl. off-stream watering points, fencing waterways)

##### *Intensive animal production systems (Other systems)*

- K. Development of an effluent management plan

##### *Riparian, wetland and erosion-prone areas (Other systems)*

- L. Retention of vegetation

##### *Remnant bushland areas*

- M. Controlling spread of introduced plants
- N. Exclusion / management of stock

##### *Property resource planning*

- O. Resource mapping (e.g. land condition, soil types, bushland, streams)
- P. Identifying and protecting sites of cultural significance to Aboriginal communities
- Q. Identifying and protecting remnant bushland
- R. Development of a financial plan
- S. Development of a succession plan
- T. Keeping up-to-date with advances in land management techniques and land processes

#### ***Cropping systems***

The land management objective reported to be of highest priority in cropping systems was weed control (Item F, mean rating 5.2). The retention of ground cover (Item D, mean rating 5.0) was also a high priority. Practices of moderate priority include the adoption of minimum or zero till (Item C, mean rating 4.2) and the adoption of water use efficiency techniques (Item B, mean rating 4.1) Practices of lesser priority include opportunity cropping (Item E, mean rating 3.4) and farming on-contour (Item A, mean rating 3.7) (Table 24, Figure 45).

#### ***Grazing systems***

Landholders stated that the land management objectives of highest priority in grazing systems were weed control (Item H, mean rating 5.2) and monitoring and managing stock numbers (Item G, mean rating 5.1). The management of stock access to riparian and other sensitive areas (Item J, mean rating

3.6) and fencing different land and soil types (Item I, mean rating 3.6) were reported to be of relatively lower priority.

### **Other practices**

The retention of riparian vegetation (Item L, mean rating 4.2) was reported to be a moderately high priority and the development of effluent management plans was a relative lower priority (Item K, mean rating 2.3).

### **Bushland**

The land management practice of highest priority in remnant bushland was reported to be controlling the spread of introduced plants (Item M, mean rating 4.8). Of lesser priority was the exclusion of stock (Item N, mean rating 4.0).

### **Property planning**

Landholders stated that the property planning practice of highest priority was keeping up-to-date with advances in land management techniques (Item T, mean rating 4.4). Other planning practices of moderately high priority include financial planning (Item R, mean rating 4.0), succession planning (Item S, mean rating 3.7), identifying and protecting bushland (Item Q, mean rating 3.6) and resource mapping (Item O, mean rating 3.3). The planning practice of least priority was reported to be identifying and mapping sites of cultural significance to Aboriginal communities (Item P, mean rating 1.6).

**Table 24. Descriptive statistics for priority land management objectives (Q7.1)**

| <i>Item</i>                     | <i>Mean</i> | <i>95% CI for Mean</i> |              | <i>Median</i> | <i>Std Dev</i> | <i>'N'</i><br><i>(applicable)</i> |
|---------------------------------|-------------|------------------------|--------------|---------------|----------------|-----------------------------------|
|                                 |             | <i>Lower</i>           | <i>Upper</i> |               |                |                                   |
| <i>Cropping systems</i>         |             |                        |              |               |                |                                   |
| A Farming on-contour            | 3.7         | 3.3                    | 4.1          | 5.0           | 2.4            | 125                               |
| B Water use efficiency          | 4.1         | 3.6                    | 4.5          | 5.0           | 2.1            | 95                                |
| C Minimum till                  | 4.2         | 3.8                    | 4.6          | 5.0           | 2.1            | 125                               |
| D Retain ground cover           | 5.0         | 4.7                    | 5.2          | 6.0           | 1.4            | 139                               |
| E Opportunity cropping          | 3.4         | 3.0                    | 3.8          | 4.0           | 2.2            | 118                               |
| F Weed control                  | 5.2         | 5.0                    | 5.4          | 6.0           | 1.2            | 171                               |
| <i>Grazing systems</i>          |             |                        |              |               |                |                                   |
| G Manage stock numbers          | 5.1         | 4.9                    | 5.2          | 6.0           | 1.3            | 309                               |
| H Weed control                  | 5.2         | 5.1                    | 5.4          | 6.0           | 1.2            | 312                               |
| I Fencing soil types            | 3.6         | 3.4                    | 3.8          | 4.0           | 2.0            | 285                               |
| J Stock access to riparian      | 3.6         | 3.3                    | 3.8          | 4.0           | 2.0            | 247                               |
| <i>Other</i>                    |             |                        |              |               |                |                                   |
| K Intensive animal effluent     | 2.3         | 2.0                    | 2.7          | 2.0           | 2.3            | 148                               |
| L Riparian retention vegetation | 4.2         | 3.9                    | 4.4          | 4.5           | 1.8            | 282                               |
| <i>Bushland</i>                 |             |                        |              |               |                |                                   |
| M Control introduced plants     | 4.8         | 4.6                    | 4.9          | 5.0           | 1.6            | 342                               |
| N Exclusion stock               | 4.0         | 3.8                    | 4.2          | 4.0           | 2.0            | 300                               |
| <i>Property planning</i>        |             |                        |              |               |                |                                   |
| O Resource mapping              | 3.3         | 3.1                    | 3.6          | 4.0           | 2.0            | 310                               |
| P Identifying cultural sites    | 1.6         | 1.4                    | 1.9          | 1.0           | 1.9            | 246                               |
| Q Identifying bushland          | 3.6         | 3.4                    | 3.8          | 4.0           | 1.9            | 311                               |
| R Financial plan                | 4.0         | 3.8                    | 4.2          | 4.0           | 1.9            | 322                               |
| S Succession plan               | 3.7         | 3.5                    | 4.0          | 4.0           | 2.0            | 309                               |
| T Maintain knowledge            | 4.4         | 4.3                    | 4.6          | 5.0           | 1.5            | 351                               |

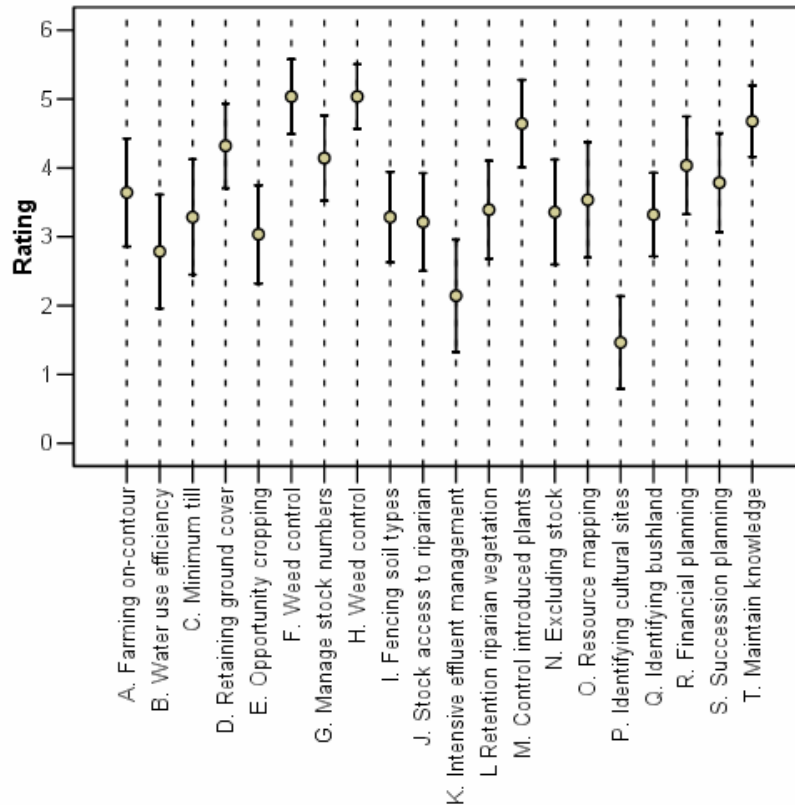


Figure 45. Confidence interval for mean rating of land management objectives (Q7.1)

### 11.1.2. Property land use category

#### **Cropping systems**

Landholders on mixed enterprise properties (category 3) and larger grazing properties (category 2) reported a higher priority than landholders on smaller grazing properties (category 1) for the implementation of farming on-contour (Item A). Landholders on mixed enterprise properties (category 3) also reported a higher priority than those on smaller grazing properties (category 1) for the implementation of opportunity cropping (Item E) (Table 25, Table 86, Table 99).

There was no substantial difference in reported priorities for landholders in various property categories with respect to other practices in cropping systems i.e., water use efficiency (Item B), minimum or zero till practices (Item C), the retention of ground cover (Item D) and weed control (Item F).

#### **Grazing systems**

There were no substantial differences among groups of landholders on different property categories as regards reported priorities for monitoring and managing stock numbers (Item G), weed control (Item H), fencing different land and soil types (Item I) and managing stock access to riparian areas (Item J).

#### **Other systems**

There were no substantial differences between landholders from various property categories with respect to the development of intensive effluent management plans (Item K) and the retention of riparian vegetation (Item L) by landholders from various property categories.

#### **Bushland**

There were no substantial differences between landholders from various property categories with respect to the management of introduced plants in bushland (Item M) and the exclusion of stock from remnant bushland (Item N).

#### **Property planning**

Landholders on larger mixed enterprise properties (category 3) and large grazing properties (category 2) reported that succession planning (Item S) and maintaining an up-to-date knowledge of advances in

land management (Item T) were a higher priority than for landholders on small grazing properties (category 1). Landholders on large grazing properties (category 2) also reported that resource mapping (Item O) and financial planning (Item R) were a higher priority than for landholders on small grazing properties (category 1).

There were no substantial differences between landholders from various property categories with respect to identifying cultural sites (Item P) and identifying bushland areas (Item Q).

**Table 25. Land management objectives (Q7.1) by Property land use category (Q4.1)**

| <i>Item</i>   | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|---|-----------------------------------|----------------------------------|---|
| <i>Cropping systems</i>   |                                   |                                  |   |
| A. Farming on-contour   | 2.3 <sup>(1)(2)</sup>             | 3.9 <sup>(1)(2)</sup>            | 4.4 <sup>(1)(2)</sup>                     |
| B. Water use efficiency   | 4.4                               | 3.9                              | 4.0                                       |
| C. Minimum till   | 3.9                               | 3.9                              | 4.6                                       |
| D. Retaining ground cover   | 4.7                               | 5.0                              | 5.2                                       |
| E. Opportunity cropping   | 2.3 <sup>(1)</sup>                | 3.1                              | 4.3 <sup>(1)</sup>                        |
| F. Weed control   | 5.2                               | 5.3                              | 5.3                                       |
| <i>Grazing systems</i>  |                                   |                                  |   |
| G. Manage stock numbers   | 5.1                               | 5.1                              | 5.1                                       |
| H. Weed control   | 5.4                               | 5.2                              | 5.2                                       |
| I. Fencing soil types   | 3.5                               | 3.6                              | 3.7                                       |
| J. Stock access to riparian                                       | 3.5                               | 3.6                              | 3.8                                       |
| <i>Other systems</i>  |                                   |                                  |   |
| K. Intensive effluent management                                  | 2.0                               | 2.4                              | 3.2                                       |
| L. Retention riparian vegetation                                  | 4.2                               | 4.1                              | 4.4                                       |
| <i>Bushland</i>   |                                   |                                  |   |
| M. Control introduced plants                                      | 4.8                               | 4.8                              | 4.6                                       |
| N. Excluding stock  | 4.1                               | 3.9                              | 4.0                                       |
| <i>Property planning</i>  |                                   |                                  |   |
| O. Resource mapping   | 2.6 <sup>(1)</sup>                | 3.7 <sup>(1)</sup>               | 3.5                                       |
| P. Identifying cultural sites                                     | 1.7                               | 1.6                              | 1.4                                       |
| Q. Identifying bushland   | 3.8                               | 3.5                              | 3.7                                       |
| R. Financial planning   | 3.2 <sup>(1)</sup>                | 4.4 <sup>(1)</sup>               | 3.9                                       |
| S. Succession planning  | 2.9 <sup>(1)(2)</sup>             | 4.3 <sup>(1)</sup>               | 3.8 <sup>(2)</sup>                        |
| T. Maintain knowledge   | 3.9 <sup>(1)(2)</sup>             | 4.7 <sup>(1)</sup>               | 4.6 <sup>(2)</sup>                        |
| <sup>(1)(2)</sup> Differences significant at the 0.05 level (95%) |                                   |                                  |   |

### 11.1.3. Key points

#### ***Cropping systems***

- The land management objective reported to be of highest priority in cropping systems was weed control (Item F, mean rating 5.2). The retention of ground cover (Item D, mean rating 5.0) was also a high priority. Practices of moderate priority include the adoption of minimum or zero till (Item C, mean rating 4.2) and the adoption of water use efficiency techniques (Item B, mean rating 4.1) Practices of lesser priority include opportunity cropping (Item E, mean rating 3.4) and farming on-contour (Item A, mean rating 3.7).
- Landholders on mixed enterprise properties (category 3) and larger grazing properties (category 2) reported a higher priority than landholders on smaller grazing properties (category 1) for the implementation of farming on-contour (Item A). Landholders on mixed enterprise properties (category 3) also reported a higher priority than those on smaller grazing properties (category 1) for the implementation of opportunity cropping (Item E).
- There was no substantial difference in reported priorities for landholders in various property categories with respect to other practices in cropping systems i.e., water use efficiency (Item B),

minimum or zero till practices (Item C), the retention of ground cover (Item D) and weed control (Item F).

### ***Grazing systems***

- Landholders stated that the land management objectives of highest priority in grazing systems were weed control (Item H, mean rating 5.2) and monitoring and managing stock numbers (Item G, mean rating 5.1). The management of stock access to riparian and other sensitive areas (Item J, mean rating 3.6) and fencing different land and soil types (Item I, mean rating 3.6) were reported to be of relatively lower priority.
- There were no substantial differences among groups of landholders on different property categories as regards reported priorities for monitoring and managing stock numbers (Item G), weed control (Item H), fencing different land and soil types (Item I) and managing stock access to riparian areas (Item J).

### ***Other practices***

- The retention of riparian vegetation (Item L, mean rating 4.2) was reported to be a moderately high priority and the development of effluent management plans was a relative lower priority (Item K, mean rating 2.3).
- There were no substantial differences between landholders from various property categories with respect to the development of intensive effluent management plans (Item K) and the retention of riparian vegetation (Item L) by landholders from various property categories.

### ***Bushland***

- The land management practice of highest priority in remnant bushland was reported to be controlling the spread of introduced plants (Item M, mean rating 4.8). Of lesser priority was the exclusion of stock (Item N, mean rating 4.0).
- There were no substantial differences between landholders from various property categories with respect to the management of introduced plants in bushland (Item M) and the exclusion of stock from remnant bushland (Item N).

### ***Property planning***

- Landholders stated that the property planning practice of highest priority was keeping up-to-date with advances in land management techniques (Item T, mean rating 4.4). Other planning practices of moderately high priority include financial planning (Item R, mean rating 4.0), succession planning (Item S, mean rating 3.7), identifying and protecting bushland (Item Q, mean rating 3.6) and resource mapping (Item O, mean rating 3.3). The planning practice of least priority was reported to be identifying and mapping sites of cultural significance to Aboriginal communities (Item P, mean rating 1.6).
- Landholders on larger mixed enterprise properties (category 3) and large grazing properties (category 2) reported that succession planning (Item S) and maintaining an up-to-date knowledge of advances in land management (Item T) were a higher priority than for landholders on small grazing properties (category 1). Landholders on large grazing properties (category 2) also reported that resource mapping (Item O) and financial planning (Item R) were a higher priority than for landholders on small grazing properties (category 1).
- There were no substantial differences between landholders from various property categories with respect to identifying cultural sites (Item P) and identifying bushland areas (Item Q).

## 11.2. Long term property options

### 11.2.1. All landholders

A series of interval variables relating to 'long term property options' was created from 7 survey items within Question 7.2 "How likely are the following long term options for your property?" Response scale anchors for this survey item were Not Likely (0) and Very likely (6). These items were:

- A. The whole property will be sold.
- B. All or part of the property will be sold for subdivision.
- C. All or part of the property will be sold to a mining company.
- D. All or part of the property will be leased/share farmed.
- E. Ownership of the property will stay within the family or with the current owner.
- F. The size of the property will be increased by purchasing, leasing or share-farming additional land.

The most likely long term option was reported to be that the property will stay with the owner or family (Item E, mean rating 4.2). Landholders also reported that it was moderately, but less likely, that the whole will be sold (Item A, mean rating 2.4).

Landholders stated that it was less likely that the size of the property will be increased (Item F, mean rating 1.9), that the property will be sold for subdivision (Item B, mean rating 0.9) or that the property will be leased or share-farmed (Item D, mean rating 0.7). Landholders stated that selling their property to a mining company (Item C, mean rating 0.6) was the least likely of the listed long term options (Table 26, Figure 46).

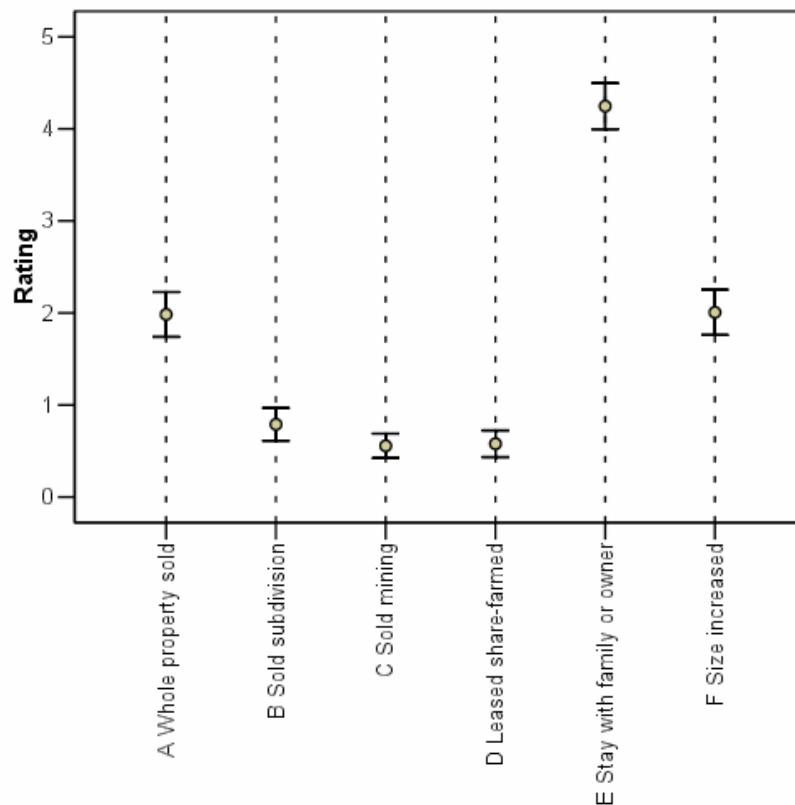


Figure 46. Confidence interval for mean rating of long term options

**Table 26. Descriptive statistics for long term property options**

| Item                        | Mean | 95% CI for Mean |       | Median | Std Dev | 'N'<br>(applicable) |
|-----------------------------|------|-----------------|-------|--------|---------|---------------------|
|                             |      | Lower           | Upper |        |         |                     |
| A Whole property sold       | 2.4  | 2.2             | 2.6   | 2.0    | 2.4     | 377                 |
| B Sold subdivision          | 0.9  | 0.7             | 1.1   | 0.0    | 1.7     | 336                 |
| C Sold mining               | 0.6  | 0.5             | 0.8   | 0.0    | 1.3     | 339                 |
| D Leased share-farmed       | 0.7  | 0.5             | 0.8   | 0.0    | 1.4     | 347                 |
| E Stay with family or owner | 4.2  | 4.0             | 4.4   | 5.0    | 2.3     | 373                 |
| F Size increased            | 1.9  | 1.7             | 2.1   | 1.0    | 2.2     | 355                 |

### 11.2.2. Property land use category

Landholders on larger grazing properties (categories 2) and larger mixed enterprise properties (category 3) reported it was less likely that the whole property will be sold (Item A) than landholders on smaller grazing properties (categories 1). Landholders on larger grazing properties (categories 2) and larger mixed enterprise properties (category 3) also reported it was more likely that the property will be sold for mining (Item C) than those on smaller grazing properties (categories 1) (Table 27, Table 87, Table 100).

Landholders on large grazing properties (category 2) reported that was more likely that the size of the property will be increased (Item F) or ownership of the property would stay with the current family or owner (Item E) than landholders on small grazing properties (category 1).

There was no substantial difference between landholders from various property land use categories with respect to other long term options i.e. the sale and subdivision of the property (Item B) or leasing or share-farming the property (Item D).

**Table 27. Long term options (Q7.2) by Property land use category (Q4.1)**

| Item                        | 1 Smaller grazing property | 2 Larger grazing property | 3 Larger mixed enterprise property |
|-----------------------------|----------------------------|---------------------------|------------------------------------|
| A Whole property sold       | 3.2 <sup>(1)(2)</sup>      | 1.7 <sup>(1)</sup>        | 2.1 <sup>(1)(2)</sup>              |
| B Sold subdivision          | 1.3 <sup>(1)</sup>         | 0.6 <sup>(1)</sup>        | 0.7                                |
| C Sold mining               | 0.3 <sup>(1)(2)</sup>      | 0.7 <sup>(1)</sup>        | 0.8 <sup>(2)</sup>                 |
| D Leased share-farmed       | 0.4                        | 0.8                       | 0.9                                |
| E Stay with family or owner | 3.8 <sup>(1)</sup>         | 4.5 <sup>(1)</sup>        | 3.9                                |
| F Size increased            | 1.4 <sup>(1)</sup>         | 2.4 <sup>(1)</sup>        | 2.0                                |

<sup>(1)(2)</sup> Differences significant at the 0.05 level (95%)

### 11.2.3. Key points

- The most likely long term option was reported to be that the property will stay with the owner or family (Item E, mean rating 4.2). Landholders also reported that it was moderately, but less likely, that the whole will be sold (Item A, mean rating 2.4).
- Landholders stated that it was less likely that the size of the property will be increased (Item F, mean rating 1.9), that the property will be sold for subdivision (Item B, mean rating 0.9) or that the property will be leased or share-farmed (Item D, mean rating 0.7). Landholders stated that selling their property to a mining company (Item C, mean rating 0.6) was the least likely of the listed long term options
- Landholders on larger grazing properties (categories 2) and larger mixed enterprise properties (category 3) reported it was less likely that the whole property will be sold (Item A) than landholders on smaller grazing properties (categories 1). Landholders on larger grazing properties (categories 2) and larger mixed enterprise properties (category 3) also reported it was more likely that the property will be sold for mining (Item C) than those on smaller grazing properties (categories 1).
- Landholders on large grazing properties (category 2) reported that was more likely that the size of the property will be increased (Item F) or ownership of the property would stay with the current family or owner (Item E) than landholders on small grazing properties (category 1).

- There was no substantial difference between landholders from various property land use categories with respect to other long term options i.e. the sale and subdivision of the property (Item B) or leasing or share-farming the property (Item D).

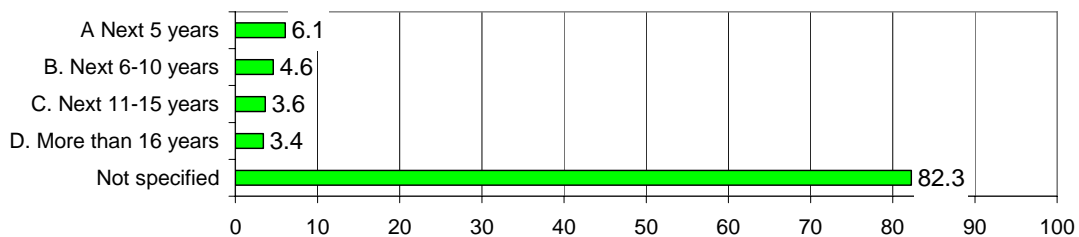
### 11.3. Year of likely sale

The variable ‘year of likely sale’ was derived from landholder responses to Question 7.2G “If you indicated a high likelihood (i.e. 5 or 6) for either A, B or C above, in what year do you think the sale would take place?”

Approximately 6.1% of landholders stated that they were likely to sell in the next 5 years. About 82.3% did not report a year when they were likely to sell; and a further 8.2% reported they were likely to sell in the next 6 to 15 years (Table 28, Figure 47).

**Table 28. Descriptive statistics for year of likely sale**

| Item               | Mean | 95% CI for Mean |       | Median | Std Dev | 'N'<br>(applicable) |
|--------------------|------|-----------------|-------|--------|---------|---------------------|
|                    |      | Lower           | Upper |        |         |                     |
| G Year sale likely | 2013 | 2012            | 2015  | 2011   | 6.7     | 73                  |



**Figure 47. Percentage of respondents by period of most likely sale of property (Q7.2G)**

### 11.4. Constraints to adoption of new practices

#### 11.4.1. All landholders

A series of interval variables relating to ‘constraints to adoption of new practices’ was created from 19 survey items within Question 8.1 “Please indicate how important each of the following factors is when making decisions about adopting new practices on your property?” Response scale anchors for this survey item were Not Important (0) and Very Important (6). These items were:

#### *Land resource factors*

- Variable climate
- Surface water storage capacity
- Area of land required to make an enterprise viable, compared to the size of your property
- Availability of ground water
- The need to reorganise the physical layout (e.g. fencing, watering points) of the property

#### *Social and lifestyle factors*

- Extent that new practices fit your lifestyle
- Extent of commitment or support from family or partner
- Your stage-of-life

#### *Financial and economic factors*

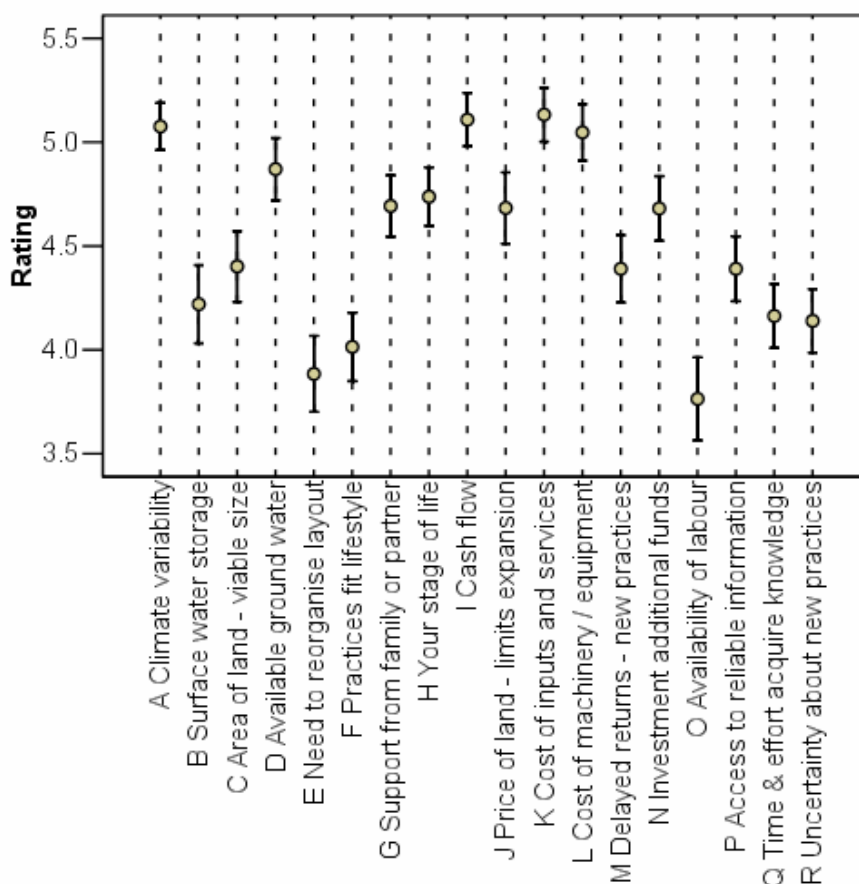
- Cash flow
- Price of land that limits expansion of your property to a viable size
- Cost of inputs (e.g. fuel, fertilisers) and services (e.g. mechanics)
- Cost of machinery/equipment
- Delayed returns from any new practices
- The investment of additional funds needed to support new practices
- Availability of labour

*Information and advice factors*

- P. Access to reliable information and advice about the new practices
- Q. The amount of time and effort needed to acquire new knowledge or skills about new practices.
- R. Uncertainty that new practices would successfully address environmental problems.

**Land resource factors**

Climate variability (Item A, mean rating 5.0) was reported to be the most important of the listed land resource factors considered when making decisions about the adoption of new practices. The availability of ground water (Item D, mean rating 4.9) and surface water storage (Item B, mean rating 4.3) were also reported to be important considerations. The area of land required to make the enterprise viable compared to the current size of the property (Item C, mean rating 4.6) was of moderately high importance. The need to reorganise the layout of the property (Item E, mean rating 4.0) was the least important of listed land resource factors (Table 29, Figure 48)



**Figure 48. Confidence interval for mean rating of constraints to adoption (Q8.1)**

**Social factors**

Landholders stated that the extent of family and partner support (Item G, mean rating 4.8) was the social factor of highest importance. The extent that new practices affect landholders’ lifestyle (Item F, mean rating 4.0) and landholders’ stage of life (Item H, mean rating 4.4) were of moderate but less importance than other social factors.

**Financial factors**

Financial factors reported by landholders as being most important to their decisions about the adoption of the new practices were cash flow (Item I, mean rating 5.1), the cost of inputs (Item K, mean rating 5.0) and the cost of machinery (Item L, mean rating 4.9). Of moderate importance were the price of land (Item J, mean rating 4.7), the investment of additional funds (mean rating 4.6) and the delayed returns from investments (Item M, mean rating 4.3). The availability of labour was the least important consideration (Item O, mean rating 4.0).

### Information factors

Access to reliable information and advice about new practices (Item P, mean rating 4.4), the time and effort needed to acquire new knowledge (Item Q, mean rating 4.2) and the uncertainty about new practices (Item R, mean rating 4.1) were reported to be moderately important considerations.

**Table 29. Descriptive statistics for constraints to adoption of new practices**

| Item                                 | Mean | 95% CI for Mean |       | Median | Std Dev | 'N'<br>(applicable) |
|--------------------------------------|------|-----------------|-------|--------|---------|---------------------|
|                                      |      | Lower           | Upper |        |         |                     |
| <i>Land resources</i>                |      |                 |       |        |         |                     |
| A Climate variability                | 5.0  | 4.9             | 5.1   | 6.0    | 1.4     | 365                 |
| B Surface water storage              | 4.9  | 4.7             | 5.1   | 6.0    | 1.6     | 356                 |
| C Area of land - viable size         | 4.6  | 4.5             | 4.8   | 5.0    | 1.7     | 327                 |
| D Available ground water             | 4.9  | 4.7             | 5.1   | 6.0    | 1.7     | 357                 |
| E Need to reorganise layout          | 4.0  | 3.8             | 4.2   | 4.0    | 1.9     | 346                 |
| <i>Social and lifestyle</i>          |      |                 |       |        |         |                     |
| F Practices fit lifestyle            | 4.0  | 3.8             | 4.2   | 4.0    | 1.7     | 348                 |
| G Support from family or partner     | 4.8  | 4.7             | 5.0   | 5.0    | 1.6     | 357                 |
| H Your stage of life                 | 4.4  | 4.3             | 4.6   | 5.0    | 1.7     | 356                 |
| <i>Financial</i>                     |      |                 |       |        |         |                     |
| I Cash flow                          | 5.1  | 4.9             | 5.2   | 6.0    | 1.4     | 352                 |
| J Price of land - limits expansion   | 4.7  | 4.5             | 4.9   | 6.0    | 1.9     | 311                 |
| K Cost of inputs and services        | 5.0  | 4.8             | 5.1   | 6.0    | 1.4     | 350                 |
| L Cost of machinery / equipment      | 4.9  | 4.8             | 5.1   | 6.0    | 1.4     | 346                 |
| M Delayed returns from new practices | 4.3  | 4.1             | 4.5   | 5.0    | 1.8     | 329                 |
| N Investment additional funds        | 4.6  | 4.4             | 4.8   | 5.0    | 1.6     | 331                 |
| O Availability of labour             | 4.0  | 3.8             | 4.2   | 5.0    | 2.0     | 332                 |
| <i>Information</i>                   |      |                 |       |        |         |                     |
| P Access to reliable information     | 4.5  | 4.3             | 4.6   | 5.0    | 1.6     | 350                 |
| Q Time & effort to acquire knowledge | 4.2  | 4.1             | 4.4   | 5.0    | 1.7     | 351                 |
| R Uncertainty about new practices    | 4.1  | 4.0             | 4.3   | 4.0    | 1.6     | 346                 |

### 11.4.2. Property land use category

#### Land resource factors

Climate variability (Item A) and the viability of the property size (Item C) were reported to be more important to landholders on large grazing properties (category 2) than these items were to landholders on small grazing properties (category 1).

There were no substantial differences between landholders from different property categories regarding the reported importance of surface water storage (Item B), the availability of ground water (Item D) or the need to reorganise the layout of the property (Item E) (Table 30, Table 88, Table 101).

#### Social factors

There were no substantial differences between landholders from various property categories regarding any of the listed social factors i.e. the extent that new practices fit your lifestyle (Item F), the extent of commitment or support from family or partner (Item G) and landholders' stage-of-life (Item H).

#### Financial factors

The cost of machinery and equipment (Item L) and the delayed returns from the investment of new practices (Item M) were reported to be more important constraints to landholders on larger mixed enterprise properties (category 3) than landholders on smaller grazing properties (category 1).

The cost of machinery and equipment (Item L), cash flow (Item I) and the availability of labour (Item O) were reported to be more important to landholders on large grazing properties (category 2) than they were to people on small grazing properties (category 1).

There were no substantial differences between landholders from various property categories regarding the price of land (Item J), cost of inputs and services (Item K) or the investment of additional funds needed to support new practices (Item N).

### **Information and advice**

Landholders on larger grazing properties (category 2) reported that access to reliable information (Item P) was more important in decision-making about the adoption of new land management practices than it was to landholders on small grazing properties (category 1).

No substantial differences between landholders from various property categories were reported about the time and effort involved in accessing reliable information (Item Q) or the uncertainty of environmental benefits from new practices (Item R).

**Table 30. Constraints to adoption of practices (Q8.1) by Property land use category (Q4.1)**

| <i>Item</i>   | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|---|-----------------------------------|----------------------------------|---|
| <i>Land resources</i>   |                                   |                                  |   |
| A. Climate variability  | 4.8 <sup>(1)</sup>                | 5.2 <sup>(1)</sup>               | 5.3                                       |
| B. Surface water storage  | 4.8                               | 5.0                              | 5.1                                       |
| C. Area of land - viable size                                     | 4.3 <sup>(1)</sup>                | 5.0 <sup>(1)</sup>               | 5.0                                       |
| D. Available ground water   | 4.9                               | 5.1                              | 4.5                                       |
| E. Need to reorganise layout                                      | 3.8                               | 4.2                              | 3.8                                       |
| <i>Social and lifestyle</i>                                       |                                   |                                  |   |
| F. Practices fit lifestyle  | 3.8                               | 4.1                              | 4.1                                       |
| G. Support from family or partner                                 | 4.6                               | 5.0                              | 5.0                                       |
| H. Your stage of life   | 4.2                               | 4.5                              | 4.6                                       |
| <i>Financial</i>  |                                   |                                  |   |
| I. Cash flow  | 4.5 <sup>(1)</sup>                | 5.4 <sup>(1)</sup>               | 5.1                                       |
| J. Price of land - limits expansion                               | 4.4                               | 4.8                              | 5.0                                       |
| K. Cost of inputs and services                                    | 4.6                               | 5.2                              | 5.3                                       |
| L. Cost of machinery / equipment                                  | 4.6 <sup>(1)(2)</sup>             | 5.0 <sup>(1)</sup>               | 5.4 <sup>(1)</sup>                        |
| M. Delayed returns from new practices                             | 3.9 <sup>(1)</sup>                | 4.5                              | 4.6 <sup>(1)</sup>                        |
| N. Investment of additional funds                                 | 4.3                               | 4.8                              | 4.9                                       |
| O. Availability of labour   | 3.4 <sup>(1)</sup>                | 4.5 <sup>(1)</sup>               | 3.7                                       |
| <i>Information</i>  |                                   |                                  |   |
| P. Access to reliable information                                 | 4.2 <sup>(1)</sup>                | 4.7 <sup>(1)</sup>               | 4.6                                       |
| Q. Time and effort to acquire knowledge                           | 4.1                               | 4.4                              | 4.5                                       |
| R. Uncertainty about new practices                                | 3.9                               | 4.3                              | 4.4                                       |
| <sup>(1)(2)</sup> Differences significant at the 0.05 level (95%) |                                   |                                  |   |

### **11.4.3. Key points**

#### **Land resource factors**

- Climate variability (Item A, mean rating 5.0) was reported to be the most important of the listed land resource factors considered when making decisions about the adoption of new practices. The availability of ground water (Item D, mean rating 4.9) and surface water storage (Item B, mean rating 4.3) were also reported to be important considerations. The area of land required to make the enterprise viable compared to the current size of the property (Item C, mean rating 4.6) was of moderately high importance. The need to reorganise the layout of the property (Item E, mean rating 4.0) was the least important of listed land resource factors.
- Climate variability (Item A) and the viability of the property size (Item C) were reported to be more important to landholders on large grazing properties (category 2) than these items were to landholders on small grazing properties (category 1).

- There were no substantial differences between landholders from different property categories regarding the reported importance of surface water storage (Item B), the availability of ground water (Item D) or the need to reorganise the layout of the property (Item E)

### **Social factors**

- Landholders stated that the extent of family and partner support (Item G, mean rating 4.8) was the social factor of highest importance. The extent that new practices affect landholders' lifestyle (Item F, mean rating 4.0) and landholders' stage of life (Item H, mean rating 4.4) were of moderate but less importance than other social factors.
- There were no substantial differences between landholders from various property categories regarding any of the listed social factors i.e. the extent that new practices fit your lifestyle (Item F), the extent of commitment or support from family or partner (Item G) and landholders' stage-of-life (Item H).

### **Financial factors**

- Financial factors reported by landholders as being most important to their decisions about the adoption of the new practices were cash flow (Item I, mean rating 5.1), the cost of inputs (Item K, mean rating 5.0) and the cost of machinery (Item L, mean rating 4.9). Of moderate importance were the price of land (Item J, mean rating 4.7), the investment of additional funds (mean rating 4.6) and the delayed returns from investments (Item M, mean rating 4.3). The availability of labour was the least important consideration (Item O, mean rating 4.0).
- The cost of machinery and equipment (Item L) and the delayed returns from the investment of new practices (Item M) were reported to be more important constraints to landholders on larger mixed enterprise properties (category 3) than landholders on smaller grazing properties (category 1).
- The cost of machinery and equipment (Item L), cash flow (Item I) and the availability of labour (Item O) were reported to be more important to landholders on large grazing properties (category 2) than they were to people on small grazing properties (category 1).
- There were no substantial differences between landholders from various property categories regarding the price of land (Item J), cost of inputs and services (Item K) or the investment of additional funds needed to support new practices (Item N).

### **Information factors**

- Access to reliable information and advice about new practices (Item P, mean rating 4.4), the time and effort needed to acquire new knowledge (Item Q, mean rating 4.2) and the uncertainty about new practices (Item R, mean rating 4.1) were reported to be moderately important considerations.
- Landholders on larger grazing properties (category 2) reported that access to reliable information (Item P) was more important in decision-making about the adoption of new land management practices than it was to landholders on small grazing properties (category 1).
- No substantial differences between landholders from various property categories were reported about the time and effort involved in accessing reliable information (Item Q) or the uncertainty of environmental benefits from new practices (Item R).

## **11.5. Options for financial assistance**

### **11.5.1. All landholders**

A series of interval variables relating to 'options for financial assistance' was created from four survey items within Question 9.1 "How useful would the following forms of financial assistance be in helping you to achieve your objectives?" Response scale anchors for this survey item were Not Useful (0) and Very Useful (6). These items were:

- A. Grants for fencing and other on-ground works
- B. Local government rate relief for specific environmental works
- C. Tax rebate administered by the Commonwealth government.
- D. Annual payment for environmental services (e.g. carbon credits).

A tax rebate from the Commonwealth Government (Item C, mean rating 5.0) was reported to be the most useful form of financial assistance. Landholders reported that all other forms of financial assistance were very useful i.e. grants for fencing and other on-ground works (Item A, mean rating 4.7), annual payments for environmental services (Item D, mean rating 4.8) and Local Government rate relief (Item B, mean rating 4.5) (Table 31, Figure 49).

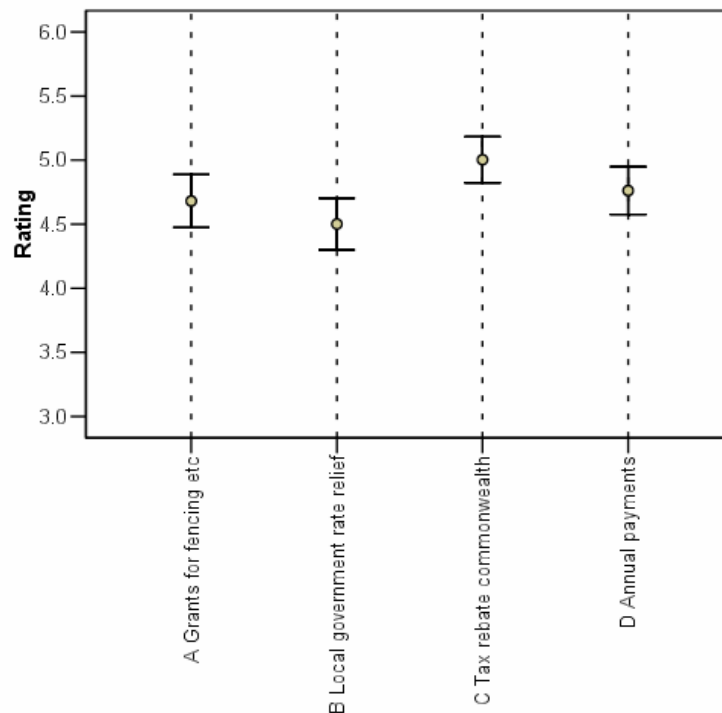


Figure 49. Confidence interval for mean rating of financial assistance options (Q9.1)

Table 31. Descriptive statistics for opportunities for financial assistance

| Item                           | Mean | 95% CI for Mean |       | Median | Std Dev | 'N' (applicable) |
|--------------------------------|------|-----------------|-------|--------|---------|------------------|
|                                |      | Lower           | Upper |        |         |                  |
| A Grants for fencing etc       | 4.7  | 4.5             | 4.9   | 6.0    | 1.8     | 338              |
| B Local government rate relief | 4.5  | 4.3             | 4.7   | 5.0    | 1.8     | 336              |
| C Tax rebate commonwealth      | 5.0  | 4.9             | 5.2   | 6.0    | 1.6     | 340              |
| D Annual payments              | 4.8  | 4.6             | 4.9   | 5.0    | 1.7     | 319              |

### 11.5.2. Property land use category

Landholders on larger grazing properties (category 2) reported a higher level of utility than landholders on smaller grazing properties (category 1) regarding grants of fencing (Item A) and tax rebates from the Commonwealth Government (Item C). There was no substantial difference in the importance of other financial assistance options (Items B, D) between landholders on different property categories (Table 34, Table 89, Table 102).

Table 32. Financial assistance options (Q9.1) by Property land use category (Q4.1)

| Item                           | 1 Smaller grazing property | 2 Larger grazing property | 3 Larger mixed enterprise property |
|--------------------------------|----------------------------|---------------------------|------------------------------------|
| A Grants for fencing etc       | 4.3 <sup>(1)</sup>         | 5.0 <sup>(1)</sup>        | 4.9                                |
| B Local government rate relief | 4.5                        | 4.4                       | 4.9                                |
| C Tax rebate commonwealth      | 4.4 <sup>(1)</sup>         | 5.4 <sup>(1)</sup>        | 5.1                                |
| D Annual payments              | 4.6                        | 5.0                       | 4.9                                |

<sup>(1)</sup> <sup>(2)</sup> Differences significant at the 0.05 level (95%)

### 11.5.3. Key points

- A tax rebate from the Commonwealth Government (Item C, mean rating 5.0) was reported to be the most useful form of financial assistance. Landholders reported that all other forms of financial assistance were very useful i.e. grants for fencing and other on-ground works (Item A, mean rating 4.7), annual payments for environmental services (Item D, mean rating 4.8) and Local Government rate relief (Item B, mean rating 4.5)
- Landholders on larger grazing properties (category 2) reported a higher level of utility than landholders on smaller grazing properties (category 1) regarding grants of fencing (Item A) and tax rebates from the Commonwealth Government (Item C). There was no substantial difference in the importance of other financial assistance options (Items B, D) between landholders on different property categories

## 11.6. Utility of learning about new practices

### 11.6.1. All landholders

A series of interval variables relating to 'Utility of learning about new practices' was created from 20 survey items within Question 9.2 "How useful would it be to learn more about any of the following topics?" Response scale anchors for this survey item were Not Useful (0) and Very Useful (6). These items were:

#### *Cropping systems*

- A. Farming on-contour (e.g. maintaining contour banks, contour cropping)
- B. Water use efficiency techniques (e.g. irrigation scheduling)
- C. Minimum / Zero till
- D. Maintaining ground cover (e.g. stubble retention)
- E. Opportunity cropping
- F. Controlling spread of weeds

#### *Grazing systems*

- G. Monitoring and managing stock numbers (incl. cell grazing, rotational grazing, strategic spelling)
- H. Controlling spread of agricultural weeds
- I. Fencing different land and soil types
- J. Managing stock access to riparian areas, wetlands and erosion prone areas (incl. off-stream watering points, fencing waterways)

#### *Intensive animal production systems (other systems)*

- K. Development of an effluent management plan

#### *Riparian, wetland and erosion-prone areas (other systems)*

- L. Retention of vegetation

#### *Remnant bushland areas*

- M. Controlling spread of introduced plants
- N. Exclusion or management of stock in bushland areas

#### *Property resource planning*

- O. Resource mapping (e.g. land condition, soil types, bushland, stream)
- P. Identifying and protecting sites of cultural significance to Aboriginal communities
- Q. Identifying and protecting remnant bushland
- R. Development of a financial plan
- S. Development of a succession plan
- T. Keeping up-to-date with advances in land management techniques and land processes.

### ***Cropping systems***

Learning about controlling the spread of weeds in cropping systems (Item F, mean rating 4.7) was reported to be the most useful of all listed topics. The maintenance of ground cover (Item D, mean

rating 4.4) was also reported to be a useful topic. Other topics of lesser utility included minimum or zero till (Item C, mean rating 3.9) and water use efficiency techniques (Item B, mean rating 3.9). Farming on contour (Item A, mean rating 3.6) and opportunity cropping (Item E, mean rating 3.7) were the least important of listed cropping practices (Table 33, Figure 50).

### **Grazing systems**

Landholders stated that learning about weed control (Item H, mean rating 4.8) and the monitoring and managing of stock numbers (Item G, mean rating 4.3) were the two most useful topics in grazing systems. Learning about fencing by land and soil types (Item I, mean rating 4.0) and managing stock access to riparian and other sensitive areas (Item J, mean rating 3.9) were of slighter lower utility.

### **Other**

Learning about the development of an effluent management plan in intensive animal production systems (Item K, mean rating 2.7) was reported to be of relatively low utility. The retention of vegetation in riparian, wetland or erosion-prone areas (Item L, mean rating 3.9) was reported to be of moderate utility.

### **Bushland**

Landholders stated that controlling the spread of introduced plants in remnant bushland (Item M, mean rating 4.8) was a very useful topic. The exclusion or management of stock in bushland areas (Item N, mean rating 3.6) was reported to be of lesser utility.

### **Property planning**

The most useful property planning topic was reported to be keeping up-to-date with land management techniques (Item T, mean rating 4.8). Other important topics included resource mapping (Item O, mean rating 4.0), financial planning (Item R, mean rating 4.1) and succession planning (Item S, mean rating 4.0). Identifying and protecting bushland was less important than other topics (Item Q, mean rating 3.5). Landholders stated that learning about identifying and protecting sites of significance to Aboriginal communities (Item P, mean rating 1.9) was the least useful of listed property planning topics.

**Table 33. Descriptive statistics for utility of learning about practices (Q9.2)**

| <i>Item</i>                        | <i>Mean</i> | <i>95% CI for Mean</i> |              | <i>Median</i> | <i>Std Dev</i> | <i>'N' (applicable)</i> |
|------------------------------------|-------------|------------------------|--------------|---------------|----------------|-------------------------|
|                                    |             | <i>Lower</i>           | <i>Upper</i> |               |                |                         |
| <i>Cropping systems</i>            |             |                        |              |               |                |                         |
| A Farming on-contour               | 3.6         | 3.2                    | 3.9          | 4.0           | 2.2            | 140                     |
| B Water use efficiency             | 3.9         | 3.6                    | 4.3          | 5.0           | 2.2            | 129                     |
| C Minimum till                     | 3.9         | 3.6                    | 4.2          | 4.0           | 2.0            | 148                     |
| D Maintaining ground cover         | 4.3         | 4.0                    | 4.6          | 5.0           | 1.9            | 152                     |
| E Opportunity cropping             | 3.7         | 3.4                    | 4.0          | 4.0           | 2.0            | 141                     |
| F Weed control                     | 4.9         | 4.7                    | 5.1          | 5.0           | 1.5            | 174                     |
| <i>Grazing systems</i>             |             |                        |              |               |                |                         |
| G Monitoring and managing stock    | 4.3         | 4.1                    | 4.5          | 5.0           | 1.8            | 297                     |
| H Weed control                     | 4.8         | 4.6                    | 5.0          | 5.0           | 1.5            | 310                     |
| I Fencing soil types               | 4.0         | 3.8                    | 4.2          | 4.0           | 1.8            | 290                     |
| J Managing stock access riparian   | 3.9         | 3.6                    | 4.1          | 4.0           | 1.9            | 263                     |
| <i>Other</i>                       |             |                        |              |               |                |                         |
| K Intensive animal effluent        | 2.7         | 2.4                    | 3.0          | 3.0           | 2.2            | 166                     |
| L Retain riparian vegetation       | 3.9         | 3.7                    | 4.1          | 4.0           | 1.9            | 292                     |
| <i>Bushland</i>                    |             |                        |              |               |                |                         |
| M Control spread introduced plants | 4.8         | 4.6                    | 5.0          | 5.0           | 1.6            | 350                     |
| N Exclude stock                    | 3.6         | 3.4                    | 3.8          | 4.0           | 1.9            | 310                     |
| <i>Property planning</i>           |             |                        |              |               |                |                         |
| O Resource mapping                 | 4.0         | 3.8                    | 4.2          | 4.0           | 1.8            | 324                     |
| P Identifying cultural sites       | 1.9         | 1.7                    | 2.1          | 1.0           | 2.0            | 260                     |
| Q Identifying bushland             | 3.5         | 3.3                    | 3.7          | 4.0           | 1.9            | 321                     |
| R Financial planning               | 4.1         | 3.9                    | 4.3          | 4.0           | 1.8            | 322                     |
| S Succession planning              | 4.0         | 3.8                    | 4.2          | 4.0           | 1.9            | 308                     |
| T Maintaining knowledge            | 4.8         | 4.6                    | 4.9          | 5.0           | 1.4            | 350                     |

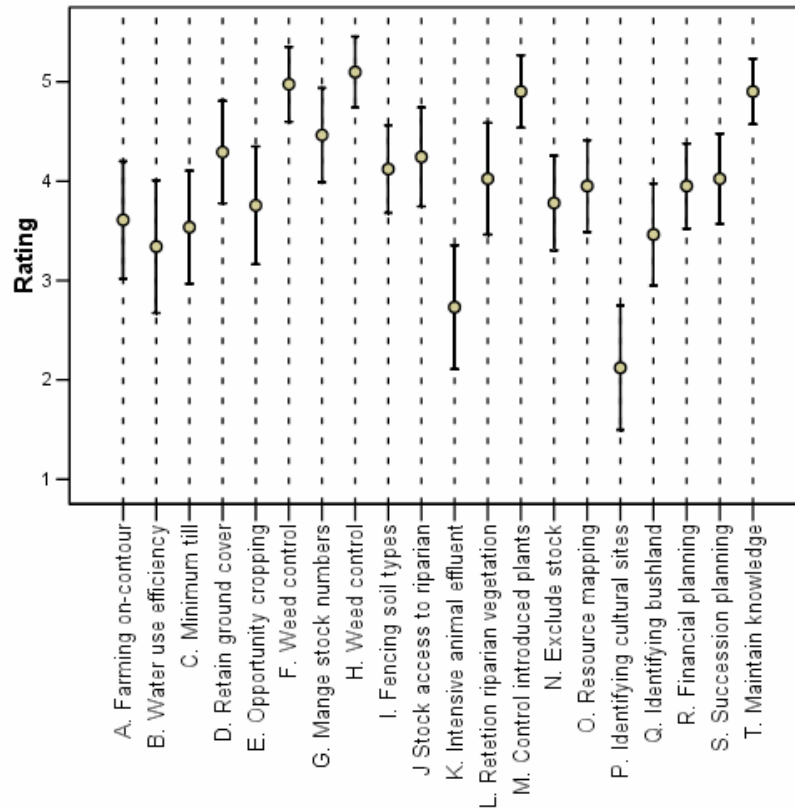


Figure 50. Confidence interval for mean rating of utility of learning about practices (Q9.2)

## 11.6.2. Property land use category

### ***Cropping systems***

There were no substantial differences between landholders on different property categories with respect to the reported utility of topics to learn about practices related to cropping systems (Table 34, Table 90, Table 103).

### ***Grazing systems***

There were no substantial differences between landholders on different property categories with respect to the reported utility of topics to learn about practices related to grazing systems.

### ***Bushland***

There were no substantial differences between landholders on different property categories with respect to the reported utility of topics to learn about practices related to remnant bushland.

### ***Other***

There were no substantial differences between landholders on different property categories with respect to the reported utility of topics regarding the retention of riparian vegetation (Item L) or the development of an effluent management plan (Item K).

### ***Property planning***

Landholders on large mixed enterprise properties (category 3) and larger grazing properties (category 2) reported that learning about succession planning (Item S) was more useful than those on small grazing properties (category 1). Landholders on larger grazing properties (category 2) also reported that learning about financial planning (Item R) was more useful than it was to people on small grazing properties (category 1).

There was no substantial difference between landholders on different property categories with respect to the utility of learning about property resource mapping (Item O) or identifying sites of significance to Aboriginal communities (Item Q), identification of remnant bushland (Item Q) or keeping up to date with advances in land management practices (Item T)

**Table 34. Utility of topics to learn about practices (Q9.2) by property land use category (Q4.1)**

| <i>Item</i>   | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|---|-----------------------------------|----------------------------------|---|
| <i>Cropping systems</i>   |                                   |                                  |   |
| A. Farming on-contour   | 3.5                               | 3.4                              | 4.2                                       |
| B. Water use efficiency   | 4.1                               | 3.6                              | 4.3                                       |
| C. Minimum till   | 3.5                               | 3.9                              | 4.6                                       |
| D. Retain ground cover  | 4.0                               | 4.2                              | 4.7                                       |
| E. Opportunity cropping   | 3.4                               | 4.0                              | 3.9                                       |
| F. Weed control   | 5.3                               | 5.0                              | 4.6                                       |
| <i>Grazing systems</i>  |                                   |                                  |   |
| G. Mange stock numbers  | 4.3                               | 4.2                              | 4.9                                       |
| H. Weed control   | 5.0                               | 4.8                              | 4.9                                       |
| I. Fencing soil types   | 3.9                               | 3.9                              | 4.5                                       |
| J Stock access to riparian  | 3.7                               | 3.8                              | 4.6                                       |
| <i>Other systems</i>  |                                   |                                  |   |
| K. Intensive animal effluent                                      | 2.9                               | 2.4                              | 3.1                                       |
| L. Retention riparian vegetation                                  | 4.0                               | 3.8                              | 4.2                                       |
| <i>Bushland</i>   |                                   |                                  |   |
| M. Control introduced plants                                      | 4.9                               | 4.8                              | 4.7                                       |
| N. Exclude stock  | 3.8                               | 3.4                              | 4.0                                       |
| <i>Property planning</i>  |                                   |                                  |   |
| O. Resource mapping   | 3.7                               | 4.1                              | 4.5                                       |
| P. Identifying cultural sites                                     | 2.0                               | 1.7                              | 2.0                                       |
| Q. Identifying bushland   | 3.7                               | 3.3                              | 3.7                                       |
| R. Financial planning   | 3.7 <sup>(1)</sup>                | 4.4 <sup>(1)</sup>               | 4.1                                       |
| S. Succession planning  | 3.3 <sup>(1)(2)</sup>             | 4.4 <sup>(1)</sup>               | 4.1 <sup>(2)</sup>                        |
| T. Maintain knowledge   | 4.6                               | 4.9                              | 5.0                                       |
| <sup>(1)(2)</sup> Differences significant at the 0.05 level (95%) |                                   |                                  |   |

### 11.6.3. Key points

#### ***Cropping systems***

- Learning about controlling the spread of weeds in cropping systems (Item F, mean rating 4.7) was reported to be the most useful of all listed topics. The maintenance of ground cover (Item D, mean rating 4.4) was also reported to be a useful topic. Other topics of lesser utility included minimum or zero till (Item C, mean rating 3.9) and water use efficiency techniques (Item B, mean rating 3.9). Farming on contour (Item A, mean rating 3.6) and opportunity cropping (Item E, mean rating 3.7) were the least important of listed cropping practices

#### ***Grazing systems***

- Landholders stated that learning about weed control (Item H, mean rating 4.8) and the monitoring and managing of stock numbers (Item G, mean rating 4.3) were the two most useful topics in grazing systems. Learning about fencing by land and soil types (Item I, mean rating 4.0) and managing stock access to riparian and other sensitive areas (Item J, mean rating 3.9) were of slighter lower utility.

#### ***Other***

- Learning about the development of an effluent management plan in intensive animal production systems (Item K, mean rating 2.7) was reported to be of relatively low utility. The retention of vegetation in riparian, wetland or erosion-prone areas (Item L, mean rating 3.9) was reported to be of moderate utility.

## **Bushland**

- Landholders stated that controlling the spread of introduced plants in remnant bushland (Item M, mean rating 4.8) was a very useful topic. The exclusion or management of stock in bushland areas (Item N, mean rating 3.6) was reported to be of lesser utility.

## **Property planning**

- The most useful property planning topic was reported to be keeping up-to-date with land management techniques (Item T, mean rating 4.8). Other important topics included resource mapping (Item O, mean rating 4.0), financial planning (Item R, mean rating 4.1) and succession planning (Item S, mean rating 4.0). Identifying and protecting bushland was less important than other topics (Item Q, mean rating 3.5). Landholders stated that learning about identifying and protecting sites of significance to Aboriginal communities (Item P, mean rating 1.9) was the least useful of listed property planning topics.
- Landholders on large mixed enterprise properties (category 3) and larger grazing properties (category 2) reported that learning about succession planning (Item S) was more useful than those on small grazing properties (category 1). Landholders on larger grazing properties (category 2) also reported that learning about financial planning (Item R) was more useful than it was to people on small grazing properties (category 1).
- There was no substantial difference between landholders on different property categories with respect to the utility of learning about property resource mapping (Item O) or identifying sites of significance to Aboriginal communities (Item Q), identification of remnant bushland (Item Q) or keeping up to date with advances in land management practices (Item T)

## **11.7. Organisations or people for learning**

### **11.7.1. All landholders**

A series of interval variables relating to ‘organisations or people for learning’ were created from 6 survey items within Question 9.3 “How useful have you found the following organisations or people in learning about new land management practices?” Response scale anchors for this survey item were ‘Not Useful (0) and Very Useful (6). These items were:

- A. State Government field officers
- B. Officers from sub-catchment or catchment organisations (e.g. CHRRUP, Dawson Catchment Coordinating Association, Fitzroy River and Coastal Catchments. Fitzroy Basin Association)
- C. Private consultants
- D. Neighbours or other farmers
- E. Sellers, resellers

Landholders stated that neighbours or other farmers (Item E, mean rating 4.1) were the most useful group of people for learning about new land management practices. Landholders also reported that sellers or resellers of equipment or agricultural supplies were moderately useful (Item F, mean rating 3.2).

Other organisations and people, being State Government field officers (Item A, mean rating 2.4), Officers from catchment organisations (Item B, mean rating 2.7) and private consultants (Item D, mean rating 2.4), were reported to be less useful than other listed organisations or groups of people (Table 35, Figure 51)

**Table 35. Descriptive statistics for organisations or people for learning**

| <i>Item</i>                             | <i>Mean</i> | <i>95% CI for Mean</i> |              | <i>Median</i> | <i>Std Dev</i> | <i>'N' (applicable)</i> |
|---|-------------|------------------------|--------------|---------------|----------------|-------------------------|
|   |             | <i>Lower</i>           | <i>Upper</i> |               |                |                         |
| A State Government field officers       | 2.4         | 2.2                    | 2.7          | 2.0           | 2.0            | 325                     |
| B Officers from catchment organisations | 2.7         | 2.5                    | 2.9          | 3.0           | 2.1            | 311                     |
| C Private consultants                   | 2.4         | 2.1                    | 2.6          | 2.0           | 2.1            | 277                     |
| D Neighbours or other farmers           | 4.2         | 4.1                    | 4.4          | 5.0           | 1.6            | 354                     |
| E Sellers, resellers                    | 3.2         | 3.0                    | 3.4          | 3.0           | 1.8            | 332                     |

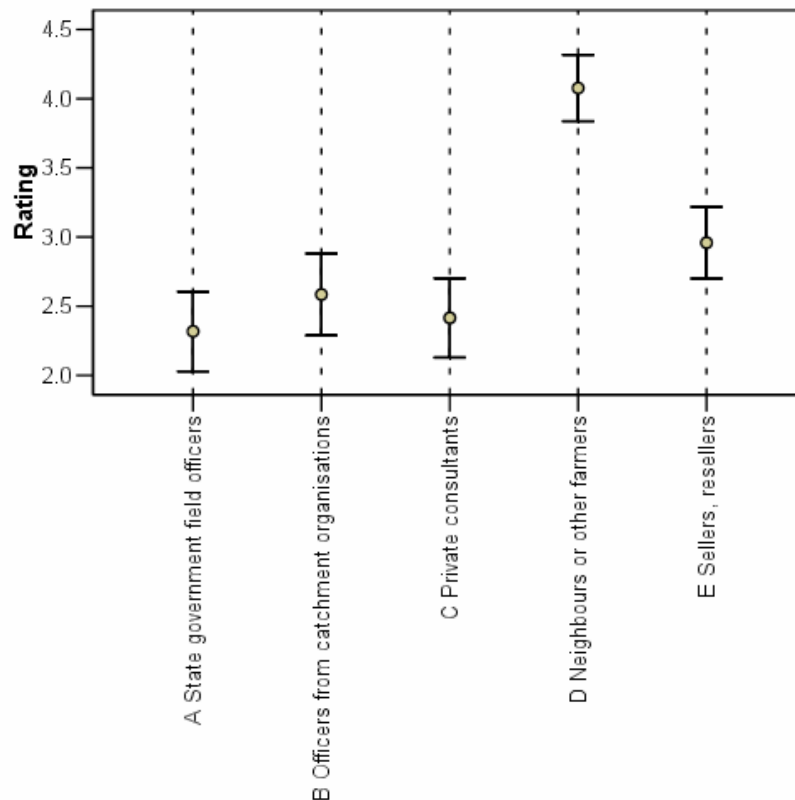


Figure 51. Confidence interval for mean rating of organisations or people for learning (Q9.3)

### 11.7.2. Property land use category

Landholders on large grazing properties (category 2) reported that the utility of learning from officers from catchment organisations (Item C) was greater than it was for landholders on small grazing properties (category 1). Landholders on large mixed enterprise properties (category 3) reported a higher level of utility in learning from neighbours or other farmers (Item D) than landholders on smaller grazing properties (category 1) (Table 36, Table 91, Table 104).

There was no substantial difference across different property categories in the utility of learning from State government officers (Item A), private consultants (Item D) or from sellers and resellers (Item F).

Table 36. Organisations of people for learning (Q9.3) by Property land use category (Q4.1)

| Item                                    | 1 Smaller grazing property | 2 Larger grazing property | 3 Larger mixed enterprise property |
|---|----------------------------|---------------------------|------------------------------------|
| A State government field officers       | 2.4                        | 2.5                       | 2.5                                |
| B Officers from catchment organisations | 2.4 <sup>(1)</sup>         | 3.1 <sup>(1)</sup>        | 2.3                                |
| C Private consultants                   | 1.9                        | 2.5                       | 2.9                                |
| D Neighbours or other farmers           | 4.4                        | 4.0 <sup>(1)</sup>        | 4.8 <sup>(1)</sup>                 |
| E Sellers, resellers                    | 3.3                        | 3.1                       | 3.7                                |

<sup>(1)</sup> <sup>(2)</sup> Differences significant at the 0.05 level (95%)

### 11.7.3. Key points

- Landholders stated that neighbours or other farmers (Item E, mean rating 4.1) were the most useful group of people for learning about new land management practices. Landholders also reported that sellers or resellers of equipment or agricultural supplies were moderately useful (Item F, mean rating 3.2).

- Other organisations and people, being State Government field officers (Item A, mean rating 2.4), Officers from catchment organisations (Item B, mean rating 2.7) and private consultants (Item D, mean rating 2.4), were reported to be less useful than other listed organisations or groups of people.
- Landholders on large grazing properties (category 2) reported that the utility of learning from officers from catchment organisations (Item C) was greater than it was for landholders on small grazing properties (category 1). Landholders on large mixed enterprise properties (category 3) reported a higher level of utility in learning from neighbours or other farmers (Item D) than landholders on smaller grazing properties (category 1).

## 11.8. Sources of information for learning

### 11.8.1. All landholders

A series of interval variables relating to ‘sources of information for learning’ was created from 12 survey items within Question 9.4 “How useful have you found the following sources for learning about new land management practices?” Response scale anchors for this survey item were Not Useful (0) and Very Useful (6). These items were:

- A. Local workshops
- B. Field days
- C. Tertiary education courses (e.g. TAFE, University)
- D. Land management advisory officers coming to your property.
- E. Telephone advice
- F. Front counter advice
- G. Radio
- H. Books or rural magazines
- I. Brochures
- J. TV
- K. Newspapers
- L. Internet / web pages

Landholders stated that the most useful sources of information about new land management practices were books and rural magazines (Item H, mean rating 4.4) and field days (Item B, mean rating 4.1). Moderately useful sources of information were local workshops (Item A, mean rating 3.7), radio (Item G, mean rating 3.5), brochures (Item I, mean rating 3.8), TV (Item J, mean rating 3.4), newspapers (Item K, mean rating 3.9) and the internet (Item L, mean rating 3.3). Sources of information of lower utility were tertiary education (Item C, mean rating 2.1), land management advisory officers coming to the property (Item D, mean rating 2.4), telephone advice (Item E, mean rating 2.8) and front counter advice (Item F, mean rating 2.7) (Table 37, Figure 52).

**Table 37. Descriptive statistics for sources of information for learning**

| Item                         | Mean | 95% CI for Mean |       | Median | Std Dev | 'N' (applicable) |
|------------------------------|------|-----------------|-------|--------|---------|------------------|
|                              |      | Lower           | Upper |        |         |                  |
| A Local workshops            | 3.7  | 3.5             | 3.9   | 4.0    | 1.9     | 300              |
| B Field days                 | 4.1  | 3.9             | 4.3   | 5.0    | 1.8     | 316              |
| C Tertiary education courses | 2.1  | 1.8             | 2.3   | 2.0    | 1.9     | 228              |
| D Officers to property       | 2.4  | 2.1             | 2.6   | 3.0    | 2.0     | 258              |
| E Telephone advice           | 2.8  | 2.6             | 3.0   | 3.0    | 1.9     | 287              |
| F Front counter              | 2.7  | 2.4             | 2.9   | 3.0    | 1.8     | 289              |
| G Radio                      | 3.5  | 3.3             | 3.7   | 4.0    | 1.8     | 335              |
| H Books, magazines           | 4.4  | 4.3             | 4.6   | 5.0    | 1.5     | 356              |
| I Brochures                  | 3.8  | 3.6             | 4.0   | 4.0    | 1.7     | 346              |
| J TV                         | 3.4  | 3.2             | 3.5   | 3.0    | 1.8     | 346              |
| K Newspapers                 | 3.9  | 3.7             | 4.1   | 4.0    | 1.6     | 343              |
| L Internet                   | 3.3  | 3.1             | 3.5   | 4.0    | 2.0     | 274              |

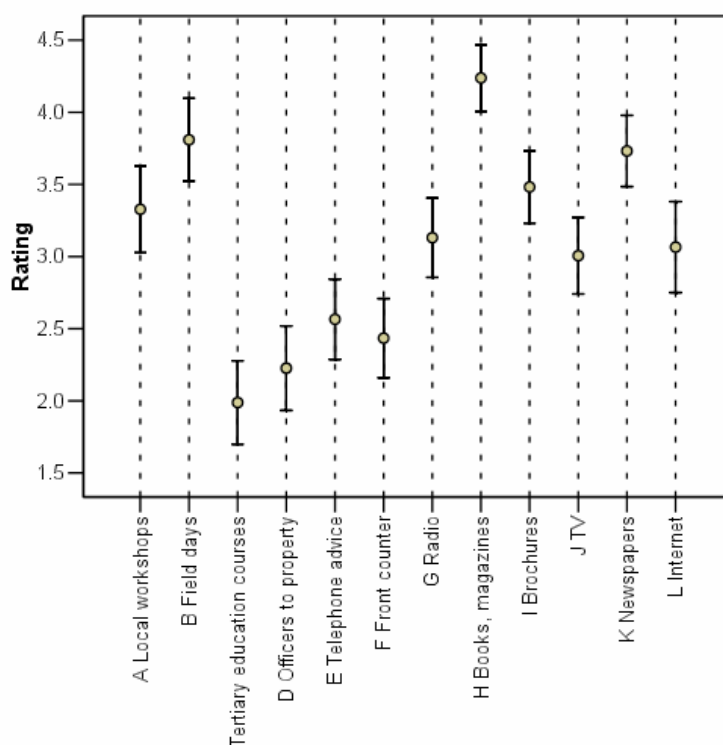


Figure 52. Confidence interval for mean rating of sources of information for learning (Q9.4)

### 11.8.2. Property land use category

Landholders on larger grazing properties (category 2) and larger mixed enterprise properties (category 3) reported that field days (Item B) had a higher utility than reported by landholders on smaller grazing properties (categories 1). Landholders on large grazing properties (category 2) also reported a higher level of utility for local workshops (Item A) and than landholders on small grazing properties (category 1). Landholders on small grazing properties (category 1) reported a higher level of utility for learning from the internet than landholders on large grazing properties (category 2).

There were no substantial differences between landholders from different property categories with respect to their assessment of the utility of tertiary institutions (Item C), officers visiting the property (Item D), telephone advice (Item E), front counter advice (Item F), radio (Item G), books and magazines (Item H), brochures (Item I), TV (Item J) and newspapers (Item K) (Table 38, Table 92, Table 105).

Table 38. Sources of information for learning (Q9.4) by Property land use category (Q4.1)

| Item                         | 1 Smaller grazing property | 2 Larger grazing property | 3 Larger mixed enterprise property |
|------------------------------|----------------------------|---------------------------|------------------------------------|
| A Local workshops            | 3.0 <sup>(1)</sup>         | 4.1 <sup>(1)</sup>        | 3.9                                |
| B Field days                 | 3.5 <sup>(1)(2)</sup>      | 4.5 <sup>(1)</sup>        | 4.3 <sup>(2)</sup>                 |
| C Tertiary education courses | 2.1                        | 1.8                       | 2.5                                |
| D Officers to property       | 2.2                        | 2.4                       | 2.8                                |
| E Telephone advice           | 2.9                        | 2.8                       | 2.9                                |
| F Front counter              | 2.8                        | 2.6                       | 2.7                                |
| G Radio                      | 3.4                        | 3.5                       | 3.6                                |
| H Books, magazines           | 4.4                        | 4.5                       | 4.3                                |
| I Brochures                  | 4.0                        | 3.7                       | 4.0                                |
| J TV                         | 3.5                        | 3.3                       | 3.2                                |
| K Newspapers                 | 3.7                        | 4.1                       | 3.8                                |
| L Internet                   | 3.9 <sup>(1)</sup>         | 2.8 <sup>(1)</sup>        | 3.6                                |

<sup>(1)(2)</sup> Differences significant at the 0.05 level (95%)

### 11.8.3. Key points

- Landholders stated that the most useful sources of information about new land management practices were books and rural magazines (Item H, mean rating 4.4) and field days (Item B, mean rating 4.1). Moderately useful sources of information were local workshops (Item A, mean rating 3.7), radio (Item G, mean rating 3.5), brochures (Item I, mean rating 3.8), TV (Item J, mean rating 3.4), newspapers (Item K, mean rating 3.9) and the internet (Item L, mean rating 3.3). Sources of information of lower utility were tertiary education (Item C, mean rating 2.1), land management advisory officers coming to the property (Item D, mean rating 2.4), telephone advice (Item E, mean rating 2.8) and front counter advice (Item F, mean rating 2.7)
- Landholders on larger grazing properties (category 2) and larger mixed enterprise properties (category 3) reported that field days (Item B) had a higher utility than reported by landholders on smaller grazing properties (categories 1). Landholders on large grazing properties (category 2) also reported a higher level of utility for local workshops (Item A) and than landholders on small grazing properties (category 1). Landholders on small grazing properties (category 1) reported a higher level of utility for learning from the internet than landholders on large grazing properties (category 2).

## 11.9. Community initiatives

### 11.9.1. All landholders

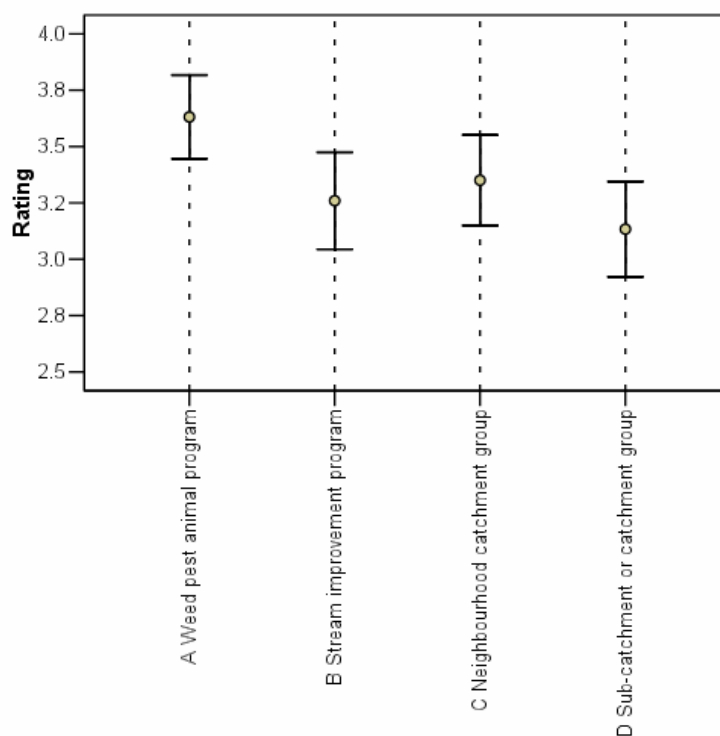
A series of interval variables relating to ‘community initiatives’ was created from fore survey items within Question 9.5 “How useful would you find it to be involved in the following initiatives or groups?” Response scale anchors for this survey item were ‘Not Useful (0) and Very Useful (6). These items were:

- Being involved in a weed or pest animal control program with other landholders and stakeholders
- Being involved in a stream improvement and management program with other landholders and stakeholders
- Being involved in a Land care group
- Being involved in catchment group or Regional NRM Body (i.e. Fitzroy Basin Association)

Landholders stated that the listed community initiatives were of moderate and approximately equivalent utility i.e. weed or pest animal control program (Item A, mean rating 3.6), stream improvement program (Item B, mean rating 3.3), neighbourhood catchment group (Item C, mean rating 3.4) and sub-catchment or catchment group (Item D, mean rating 3.1) (Table 39, Figure 53).

**Table 39. Descriptive statistics for community Initiatives**

| <i>Initiative</i>                  | <i>Mean</i> | <i>95% CI for Mean</i> |              | <i>Median</i> | <i>Std Dev</i> | <i>'N' (applicable)</i> |
|------------------------------------|-------------|------------------------|--------------|---------------|----------------|-------------------------|
|                                    |             | <i>Lower</i>           | <i>Upper</i> |               |                |                         |
| A Weed pest animal program         | 3.6         | 3.4                    | 3.8          | 4.0           | 1.8            | 350                     |
| B Stream improvement program       | 3.3         | 3.0                    | 3.5          | 3.0           | 1.9            | 312                     |
| C Neighbourhood catchment group    | 3.4         | 3.1                    | 3.6          | 3.0           | 1.8            | 328                     |
| D Sub0catchment or catchment group | 3.1         | 2.9                    | 3.3          | 3.0           | 1.9            | 322                     |



**Figure 53. Confidence interval for mean rating of community initiatives (Q9.5)**

### 11.9.2. Property land use category

There was no substantial difference across property categories with respect to landholders reported level of utility of a weed or pest animal control program (Item A), being involved in a stream improvement program (Item B), participation in a land care group (Item C) or a catchment group (Item D) (Table 40, Table 93, Table 106).

**Table 40. Mean rating of community initiatives (Q9.5) by Property land use category (Q4.1)**

| <i>Item</i>                        | <i>1 Smaller grazing property</i> | <i>2 Larger grazing property</i> | <i>3 Larger mixed enterprise property</i> |
|------------------------------------|-----------------------------------|----------------------------------|---|
| A Weed pest animal program         | 3.5                               | 3.8                              | 3.7                                       |
| B Stream improvement program       | 3.0                               | 3.4                              | 3.6                                       |
| C Neighbourhood catchment group    | 3.3                               | 3.4                              | 3.7                                       |
| D Sub-catchment or catchment group | 3.0                               | 3.2                              | 3.4                                       |

<sup>(1) (2)</sup> Differences significant at the 0.05 level (95%)

### 11.9.3. Key points

Landholders stated that the listed community initiatives were of moderate and approximately equivalent utility i.e. weed or pest animal control program (Item A, mean rating 3.6), stream improvement program (Item B, mean rating 3.3), neighbourhood catchment group (Item C, mean rating 3.4) and sub-catchment or catchment group (Item D, mean rating 3.1)

## 12. Relationship between objectives, values and constraints

### 12.1. Approach

An analysis of the relationship between land management objectives (Q7.1), rural and property values (Q2.1) and constraints to the adoption of new practices was undertaken to indicate some of the key factors which are likely to influence landholders update of new practices and to demonstrate methods which can be used for detailed analysis of the survey data.

A series of models were developed using stepwise linear regression<sup>2</sup> which describe landholders priorities for land management objectives (Question 7.1) from the property and land use values (Question 2.1) and constraints to the adoption of land management practices (Question 8.1). This modelling approach identifies those factors which were statistically significant descriptors of landholder priorities for each land management objective. Landholder objectives are termed 'dependent variables' and property and land use values (Question 2.1) and constraints to the adoption of land management practices are termed 'independent variables' (Table 41).

**Table 41. Variables tested for inclusion in models**

| <i>Land management objective (Q7.1)</i><br><i>(Dependent variable)</i> | <i>Rural and property values (Q2.1)</i><br><i>(Independent variable)</i> | <i>Constraints to adoption of new practices (Q8.1)</i><br><i>(Independent variable)</i> |
|--|--|---|
| <i>Cropping systems</i>  | <i>Social</i>  | <i>Land resources</i>   |
| A Farming on-contour   | A Satisfaction in working  | A Climate variability   |
| B Water use efficiency   | B Enjoy peace  | B Surface water storage   |
| C Minimum till   | C Part community   | C Area of land - viable size  |
| D Maintaining ground cover   | D Access services  | D Available ground water  |
| E Varying crop rotations   | E Preserve heritage  | E Need to reorganise layout   |
| F Weed control   | F Raise family   | <i>Social and lifestyle</i>   |
| <i>Grazing systems</i>   | <i>Bushland</i>  | F Practices fit lifestyle   |
| G Monitoring & managing stock  | G Bushland habitat   | G Support from family or partner  |
| H Weed control   | H Bushland contribution  | H Your stage of life  |
| I Fencing soil types   | <i>Financial</i>   | <i>Financial</i>  |
| J Managing stock riparian  | I Household income   | I Cash flow   |
| Other  | J Agricultural business  | J Price of land - limits expansion  |
| K Intensive animal effluent  | K Sound investment   | K Cost of inputs and services   |
| L Retain riparian vegetation   |  | L Cost of machinery / equipment   |
| <i>Bushland</i>  |  | M Delayed returns from new practices  |
| M Control spread plants  |  | N Investment additional funds   |
| N Exclude stock  |  | O Availability of labour  |
| <i>Property planning</i>   |  | <i>Information</i>  |
| O Resource mapping   |  | P Access to reliable information  |
| P Identifying cultural sites   |  | Q Time & effort to acquire knowledge  |
| Q Identifying bushland   |  | R Uncertainty about new practices   |
| R Financial planning   |  |   |
| S Succession planning  |  |   |
| T Keeping up to date   |  |   |

<sup>2</sup> Stepwise linear regression has been performed using the SPSS (2003) Linear Regression procedure. Linear regression is used to model the value of a dependent scale variable based on its linear relationship to one or more predictors. The linear regression model assumes that there is a linear, or "straight line," relationship between the dependent variable and each predictor.

Model coefficients from this stepwise regression analysis (Table 42) can be used as a mathematical function to estimate land management objectives. For example, an equation to estimate landholder priority for land management objective for ‘farming on-contour’ could be expressed as shown in Equation 1. Further details of models are provided in Table 107 to Table 126.

**Equation 1. Example of function to predict landholders’ priority for land management objectives**

|  |     |                                    |                             |
|--|-----|------------------------------------|-----------------------------|
| Priority for farming on contour<br>(0-6) = |     | 0.6 x Satisfaction in<br>working + | 0.2 x Access to information |
| Y=   | a + | b x X <sub>1</sub> +               | c x X <sub>2</sub>          |

## 12.2. Results

### *Cropping systems*

Priorities for the adoption of farming on-contour (Item A) can be predicted from three variables: enjoy peace and quiet (property and rural value B, coefficient = -0.54), preserve family heritage (property and rural value E, coefficient = 0.24) and time and effort to acquire knowledge (constraint Q, coefficient 0.27).

Priorities for the adoption of water use efficiency techniques (Item B) can be predicted from one variable: ‘time and effort to acquire knowledge’ (constraint Q, coefficient = 0.34).

Priorities for the adoption of minimum / zero till (Item C) can be predicted from three variables: ‘provides me with the opportunity to build and agricultural business’ (property and rural value J, coefficient = 0.28), ‘extent that practices fit lifestyle’ (constraint F, coefficient = -0.29), and ‘time and effort to acquire knowledge’ (constraint Q, coefficient = 0.43).

Priorities for the adoption of practices to maintain ground cover (Item D) can be predicted from two variables: ‘climate variability’ (constraint A, coefficient = 0.40) and ‘time and effort to acquire knowledge’ (constraint Q, coefficient = 0.20).

Priorities for the adoption of practices to vary crop rotations based on soil tests (Item E) can be predicted from three variables: ‘climate variability’ (constraint A, coefficient = 0.43), ‘extent that practices fit lifestyle’ (constraint F, coefficient = -0.26) and ‘the price of land that limits property expansion’ (constraint J, coefficient = 0.43).

Priorities for the adoption of weed control practices (Item F) can be predicted from three variables: ‘a sound long term investment (constraint K, coefficient = 0.26), ‘surface water storage capacity’ (constraint B, coefficient = 0.20) and ‘time and effort to acquire knowledge’ (constraint Q, coefficient = 0.16).

### *Grazing systems*

Priorities for the adoption of practices to monitor and manage stock numbers (Item G) can be predicted from three variables: ‘satisfaction in working’ (property and rural values A, coefficient = 0.14), ‘climate variability’ (constraint A, coefficient = 0.25) and ‘access to reliable information’ (constraint P, coefficient = 0.11).

Priorities for the adoption of weed control practices (Item H) can be predicted from two variables: ‘surface water storage capacity’ (constraint B, coefficient = 0.16) and ‘time and effort to acquire knowledge’ (constraint Q, coefficient = 0.10).

Priorities for the adoption of practices to fence different land and soil types (Item I) can be predicted from three variables: ‘access to services’ (property and rural value D, coefficient = 0.18), ‘climate variability’ (constraint A, coefficient = 0.26) and ‘need to reorganise layout’ (constraint E, coefficient = 0.24).

Priorities for the adoption of practices to manage stock access to riparian areas (Item J) can be predicted from four variables: ‘bushland contribution to nature conservation values’ (property and rural value H, coefficient = 0.41), ‘need to reorganise layout’ (constraint E, coefficient = 0.18), ‘the price of land that limits property expansion’ (constraint J, coefficient = 0.13) and ‘time and effort to acquire knowledge’ (constraint Q, coefficient = 0.25).

## **Other**

Priorities for the development of intensive animal effluent plans (Item K) can be predicted from three variables: 'household income' (property and rural value I, coefficient = 0.19), 'the price of land that limits property expansion' (constraint J, coefficient = 0.24) and 'time and effort to acquire knowledge' (constraint Q, coefficient = 0.33).

Priorities for the adoption of practices to retain vegetation in riparian, wetland and erosion-prone areas (Item L) can be predicted from three variables: 'bushland contribution to nature conservation values' (property and rural value H, coefficient = 0.33), 'need to reorganise layout' (constraint E, coefficient = 0.17) and 'access to reliable information' (constraint P, coefficient = 0.29).

## **Bushland**

Priorities for the adoption of practices to control the spread of introduced plants (Item M) can be predicted from three variables: 'a sound long term investment' (constraint K, coefficient = 0.20), 'surface water storage capacity' (constraint B, coefficient = 0.25), and 'time and effort to acquire knowledge' (constraint Q, coefficient = 0.22).

Priorities for the adoption of practices to exclude stock from remnant bushland (Item N) can be predicted from four variables: 'access to services' (property and rural value D, coefficient = 0.16), 'remnant bushland provides a habitat for native wildlife' (property and rural value G, coefficient = 0.32), 'support from partner or family' (constraint G, coefficient = 0.17) and 'time and effort to acquire knowledge' (constraint Q, coefficient = 0.14).

## **Property planning**

Priorities for the adoption of resource mapping practices (Item O) can be predicted from five variables: 'enjoy peace and quiet' (property and rural value B, coefficient = -0.25), 'remnant bushland provides a habitat for native wildlife' (property and rural value G, coefficient = 0.27), 'household income' (property and rural value I, coefficient = 0.16), 'need to reorganise layout' (constraint E, coefficient = 0.14) and 'time and effort to acquire knowledge' (constraint Q, coefficient = 0.34).

Priorities for the adoption of practices to identify cultural sites of significance to Aboriginal communities (Item P) can be predicted from four variables: 'bushland contribution to nature conservation values' (property and rural value H, coefficient = 0.34), 'stage of life' (constraint H, coefficient = -0.20), 'the availability of labour' (constraint O, coefficient = 0.19) and 'time and effort to acquire knowledge' (constraint Q, coefficient = 0.20).

Priorities for the adoption of practices to identify and protect remnant bushland (Item Q) can be predicted from two variables: 'remnant bushland provides a habitat for native wildlife' (property and rural value G, coefficient = 0.60) and 'access to reliable information' (constraint P, coefficient = 0.30).

Priorities for the adoption of financial planning practices (Item R) can be predicted from three variables: 'provides me with the opportunity to build and agricultural business' (property and rural value J, coefficient = 0.24), 'need to reorganise layout' (constraint E, coefficient = 0.17) and 'access to reliable information' (constraint P, coefficient = 0.32).

Priorities for the adoption of 'succession planning' (Item S) can be predicted from three variables: 'preserve family heritage' (property and rural value E, coefficient = 0.23), 'provides me with the opportunity to build and agricultural business' (property and rural value J, coefficient = 0.23) and 'access to reliable information' (constraint P, coefficient = 0.32).

Priorities for the adoption of practices to keep up-to-date with advances in land management techniques (Item T) can be predicted from four variables: 'provides me with the opportunity to build and agricultural business' (property and rural value J, coefficient = 0.13), 'a sound long term investment' (constraint K, coefficient = 0.17), 'climate variability' (constraint A, coefficient = 0.14) and 'time and effort to acquire knowledge' (constraint Q, coefficient = 0.41).



### 12.3. Summary

The above analysis demonstrates that a range of values and constraints affect landholders reported priorities for future land management.

While landholders' priorities for each land management objective were predicted from a particular combination of values and constraints, several variables and groups of variables appear more frequently in models than other.

Information constraints, land resource constraints, financial values and social values are common factors which explain landholder priorities for the adoption of new land management practices (Table 43). Frequently used variables are: time an effort required to acquire knowledge (Information constraint Q – significant in 11 models), access to reliable information (Information Constraint P – 7 models), climate variability (land resources constraint A – significant in 5 models) and the need to reorganise the layout of the property (land resources constraint E – significant in 5 models).

**Table 43. Number of occurrences of value / constraint variables in models used to predict landholder land management priorities**

| <i>Value / Constraint</i>      | <i>Variable</i>   |
|--------------------------------|---|
| <i>Constraints</i>             |   |
| Information constraints (18)   | Q Time effort acquire knowledge (11)<br>P Access to reliable information (7)<br>R Uncertainty new practices (0)   |
| Land resource constraints (13) | A Climate variability (5)<br>E Need to reorganise layout (5)<br>B Surface water storage (3)<br>C Area of land - viable size (0)<br>D Available ground water (0)   |
| Financial constraints (5)      | J Price of land - limits expansion (3)<br>L Cost of machinery / equipment (1)<br>O Availability of labour (1)<br>I Cash flow (0)<br>K Cost of inputs and services (0)<br>N Investment additional funds (0)<br>M Delayed returns new practices (0) |
| Social constraints (4)         | F Practices fit lifestyle (2)<br>H Stage of life (1) (negative)<br>G Support from family or partner (1)   |
| <i>Values</i>                  |   |
| Financial values (9)           | J Agricultural business (4)<br>I Household income (3)<br>K Sound investment (2)   |
| Social values (7)              | B Enjoy peace and quiet (2) (negative)<br>D Access to services (2)<br>E Preserve family heritage (2)<br>A Satisfaction in working (1)<br>C Part of community (0)<br>F Raise family (0)  |
| Natural values (6)             | H Bushland contribution (3)<br>G Bushland habitat (3)   |

## 13. Further investigations

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While this report provides detailed findings on the social, natural resource and economic dimensions of rural land management, the data collected by this survey are also amenable to further analyses and investigation.

Some opportunities for further analysis and confirmation of survey results and findings include:

- Correlation or regression analysis of the relationships between different survey constructs and operational variables (e.g. between landholder future priorities and financial assistance options, community initiatives, long term plans and social and economic variables)
- Correlation or regression analysis of the relationship between survey constructs (esp. landholder future priorities) and other operational variables by landholder category
- Investigation of sample distributions and possible transformation of variables or application of non-parametric tests to confirm critical statistical differences
- Confirmation of key findings on selected variables using small but diverse groups of landholders (e.g. sub-catchment surveys)
- Workshops or focus groups of landholders and natural resources professionals to verify key findings

## 14. Conclusions

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This survey has provided a breadth of information on landholder practices, attitudes, constraints and opportunities in the Fitzroy Basin Region which can be used to inform the development and implementation of strategies to improve opportunities for increased adoption of key land management practices.

The analysis of relationships between landholder future priorities for adoption of key land management practices, landholder rural and property values and constraints to the adoption of practices has shown that, of the array of possible social, financial, land resource and information factors, four groups of factors consistently influence the landholders' priorities for the future adoption of key practices. These are:

- information constraints,
- land resource constraints,
- financial values and
- social values

In particular four variables were found to frequently predict landholder priorities for the adoption of new practices. These are:

- the constraint of time and effort required to acquire knowledge of new practices
- the constraint of access to reliable information and advice about new practices
- the constraint of needing to reorganise the layout of the property.
- the constraint of climate variability.

While all of the above factors and variables were of approximately equal relevance to landholders future priorities, recognising landholders constraints in time and effort for acquiring knowledge of new practices and improving landholders access to reliable information and advice are probably more feasible to address than other values and constraints.

Any future programs designed to increase landholders' efficient access to reliable information and advice should take into account findings that the two most useful organisations or groups of people for learning about new land management practices are:

- neighbours or other farmers and
- sellers or resellers of equipment or agricultural supplies.

These programs should also consider findings that landholders reported that the most useful sources of information about new land management practices were:

- books and rural magazines and
- field days.

Programs to increase the uptake of key management practices should take into account landholder priorities, constraints and values which are particular to each practice.

## **15. Acknowledgements**

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Dr Joseph Reser provided extensive advice in the design of this survey, interpretation of data and editing of the report.

Mandy Moreton and staff of Sunstate Research recruited participants of focus groups at Emerald and Rockhampton.

Printing, mail out and data entry of the survey was ably undertaken by staff of Hermes Precisa (HPA) at Murarrie including David McCracken, Andrea McKay, Tim Bailey and Rebecca Linton. Beth Gordon assisted with data validation.

Staff of the Fitzroy Basin Association and the Central Highlands Regional Resources Use Planning and Co-operative (CHRRUP) provided critical advice, feedback and assistance with the development of this survey.

Beth Clouston and John Mackenzie of the Community Partnerships Unit of the Department of Natural Resources and Water assisted with suggestions on design and implementation of the survey.

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