Key results of DWLBC Land Manager Surveys 2000 – 2008: Forum Paper Waite 26 November 2008

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1. INTRODUCTION

The Land Condition Monitoring Program was initiated in 1995 by the Department of Water, Land and Biodiversity Conservation (DWLBC) and the then Soil Conservation Council, with funding support from the Natural Heritage Trust. The land manager survey was developed as part of a suite of tools (including the field survey program for erosion risk/protection) to monitor indicators of land condition and provide insights into land managers and their practices. While some survey data of agricultural land management practices is available from other sources such as the Australian Bureau of Statistics (ABS), these do not provide the detail required for this program. The land manager survey is a repeatable telephone survey designed to monitor trends in agricultural land management practices, as well as knowledge and attitudes of land managers over time, as indicators of risk of land degradation. Data from the land manager surveys provides evidence to support trends in land condition observed in the field survey program.

The first land manager survey was conducted in February/March 2000, and was repeated in 2002, 2005 and 2008. There is now sufficient data to identify meaningful trends.

A market research company conducted the land manager telephone surveys, funded by the DWLBC Land Management and Revegetation Program. Landholders for each survey were randomly selected from a commercial database of Australian land managers. Usually, over 1000 landholders were interviewed (618 in the 2000 survey), 200 within each of the five major agro-ecological regions of South Australia's agricultural zone (Figure 1). Interviews were conducted with commercial landholders from broad-hectare agricultural cropping and/or grazing properties and dairy properties that were greater than 200 ha in size (40 ha in the Mt Lofty Ranges - Kangaroo Island region). Respondents were anonymous but a postcode was recorded for each respondent to allocate results to regions or rainfall zones.

Survey results can be calculated for natural resource management (NRM) regions, but have been initially calculated for agro-ecological regions and also rainfall zones (low <325mm, medium 325 – 600mm, high >600mm p.a.) to examine trends according to biophysical environment and major land use systems. All data presented in this paper refers to these agro-ecological regions. State (agricultural zone) data means were calculated by weighting regional data sets according to estimated regional populations of relevant agricultural establishments using ABS 2005/06 Census data.

While there have been minor variations made to the survey questionnaire over the four surveys, core questions have remained essentially unchanged. These cover property, arable and crop areas, crop types sown, general land management issues of concern, more specific details of cropping, tillage and residue management practices, feed-lotting, amelioration of soil acidification, salinity and water repellence, soil nutrition testing and perennial vegetation activities.

Survey data is managed by the land condition monitoring program in DWLBC in an MS Access® database.

Some results from the 2000 – 2005 surveys were published in "Report on the condition of agricultural land in South Australia", McCord A.K. and Payne, R.A., 2004, DWLBC.

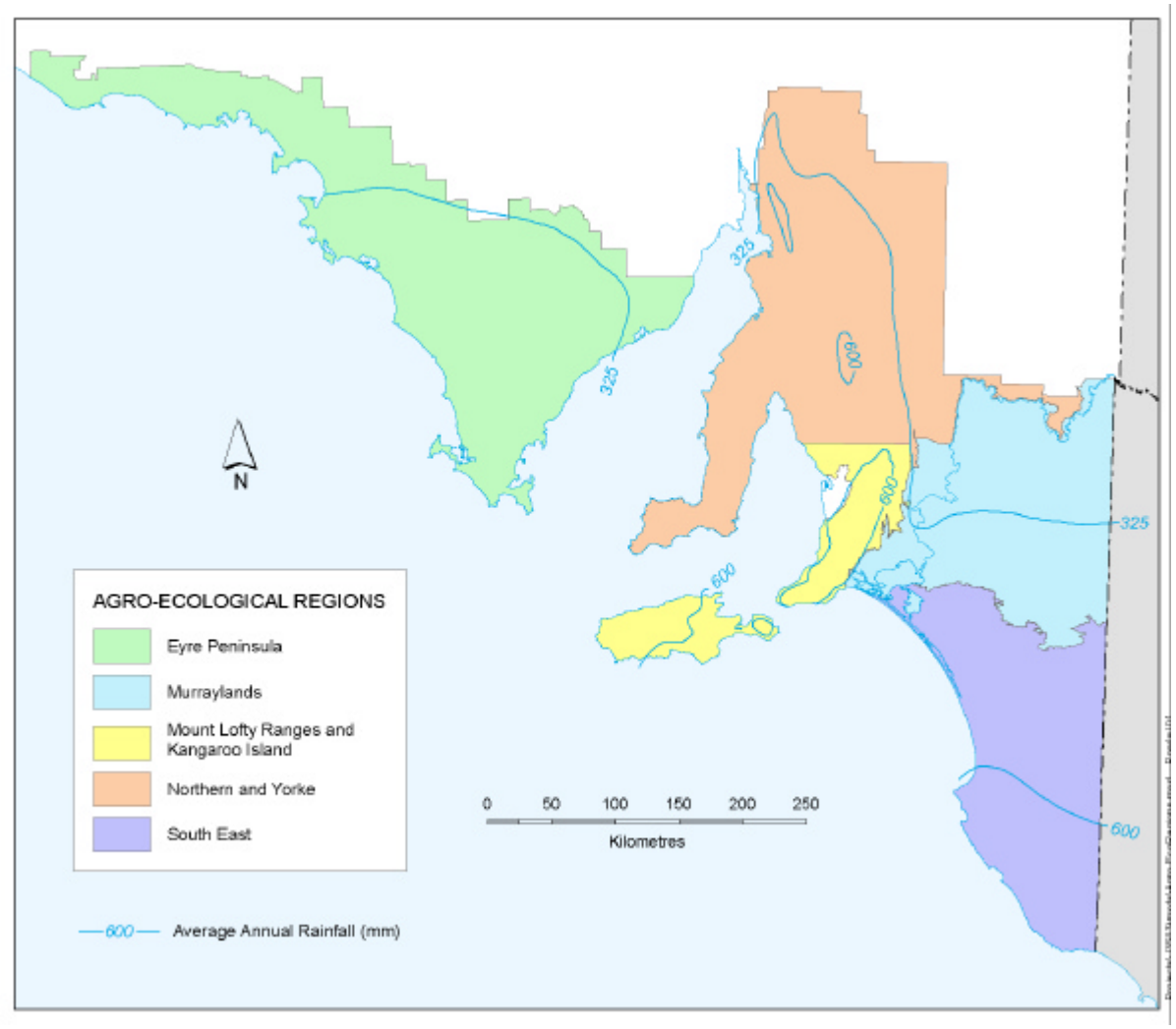

Figure 1. Agro-ecological regions and rainfall zones within the agricultural zone of SA used for analysis of the land manager survey data.

This paper summarises the main findings over the four surveys that have implications for land condition, particularly trends that have emerged over this eight year period. It is intended that a comprehensive report of survey results will be subsequently published and made available on the DWLBC website.

2. KEY RESULTS OF SURVEYS 2000 - 2008

2.1 LAND MANAGEMENT ISSUES OF CONCERN

Respondents were asked by prompting whether various land management issues were of concern to them in their district.

There was generally little change in the overall proportion of respondents citing the various land management issues of concern over the four surveys, and the 2008 results are shown in Figure 2. The exception was an increase in the proportion citing animal pests as an issue (84% in 2008 vs. 67% in 2000).

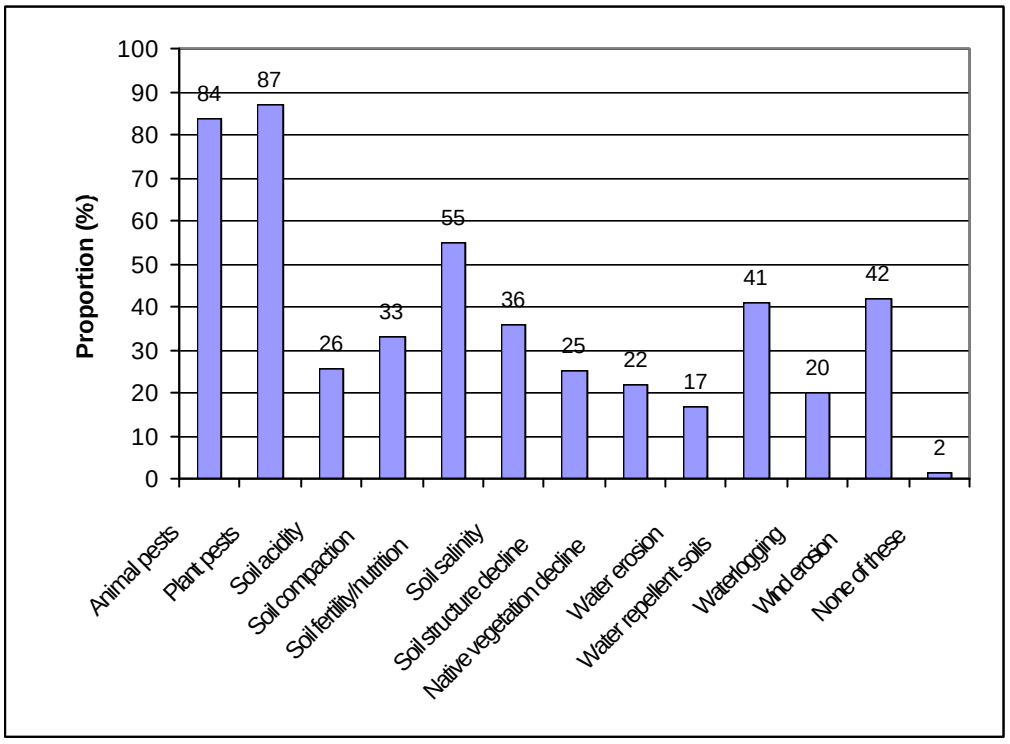

Figure 2. Proportion of respondents citing land management issues of concern in their district in SA (data: land manager survey 2008).

Among individual issues of concern, it was notable that soil acidity was cited by only 52% of respondents in the Mt Lofty Ranges – Kangaroo Island region in 2008, despite this being a more widespread issue in these areas. Apart from this, the proportion of respondents citing land management issues of concern was generally consistent with the known incidence of the issues across regions and rainfall zones.

2.2 TILLAGE, SOWING AND RESIDUE MANAGEMENT

Significant trends were observed in the use of various tillage, sowing and stubble/residue management practices over the period of the 2000 – 2008 surveys.

Cultivated long fallowing

Respondents who undertook cropping were asked if they "usually" or "occasionally" did long cultivated fallows (first cultivation before November in the previous year) in their cropping rotation.

The proportion of respondents using long fallows "usually" and "occasionally" has significantly decreased between the 2000 and 2008 surveys (Figure 3). In the 2008 survey, only 10% of cropping respondents were using long cultivated fallows at all, compared to around 20% in the 2000 and 2002 surveys. This does not equate to the actual area fallowed, as managers may only fallow some of the intended crop area.

Across the survey regions, the aggregate proportion of those "usually" and "occasionally" long fallowing (Figure 4) was highest in the Murraylands region but has similarly decreased substantially over the survey period from 36% in 2000 to 15% in 2008. The use of long cultivated fallowing was highest in the low rainfall zone (<325 mm) but has markedly decreased from 53% to 21% over the 2000 – 2008 survey period.

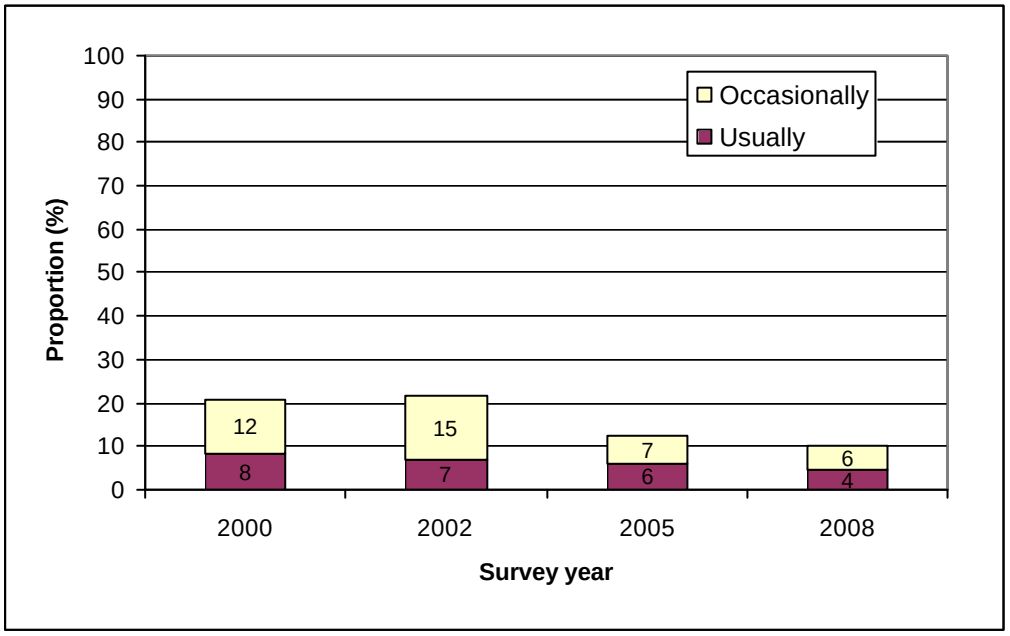

Figure 3. Proportion of cropping respondents who "usually" and "occasionally" use long cultivated fallows in SA: land manager surveys 2000, 2002, 2005 and 2008.

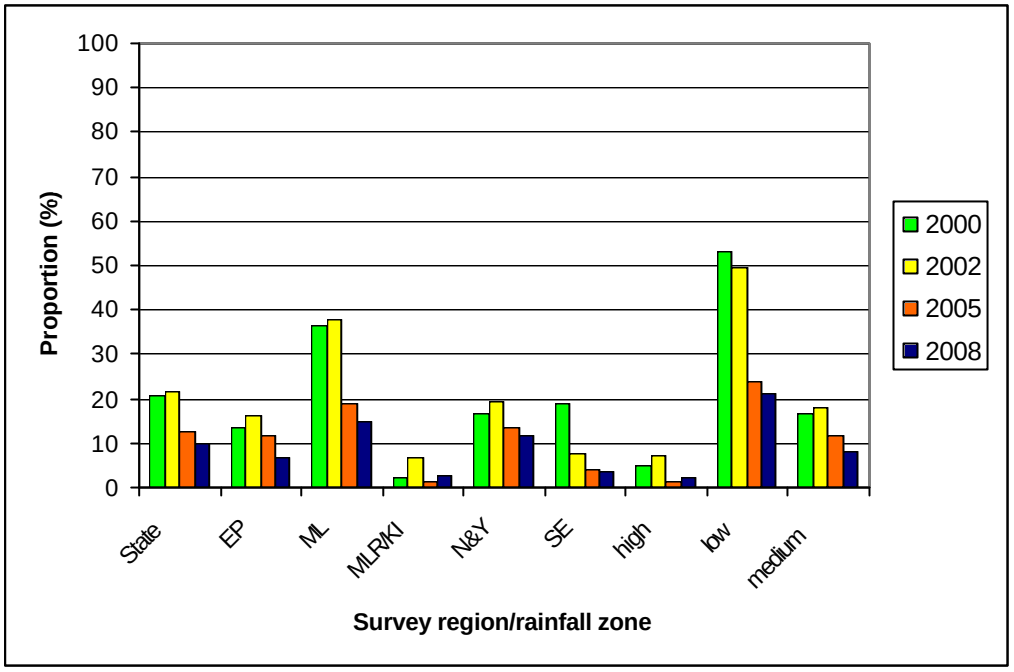

Figure 4. **Aggregate proportion of cropping respondents who "usually" or "occasionally" use long cultivated fallows in survey regions/rainfall zones: land manager surveys 2000, 2002, 2005 and 2008.**

Timing of initial tillage pass

Respondents who cropped were asked - given suitable conditions, in which month do they prefer to do the first cultivation when preparing land for crop.

Figure 5 shows that the preferred timing for the initial cultivation has tended to become closer to the time of sowing in SA since 2000. Similar trends occurred in the main cropping regions and rainfall zones. However, this does not show the actual timing of initial cultivation by land managers. This may vary depending on a number of factors such as the incidence of summer rain and weed growth, and the amount and timing of opening season rains.

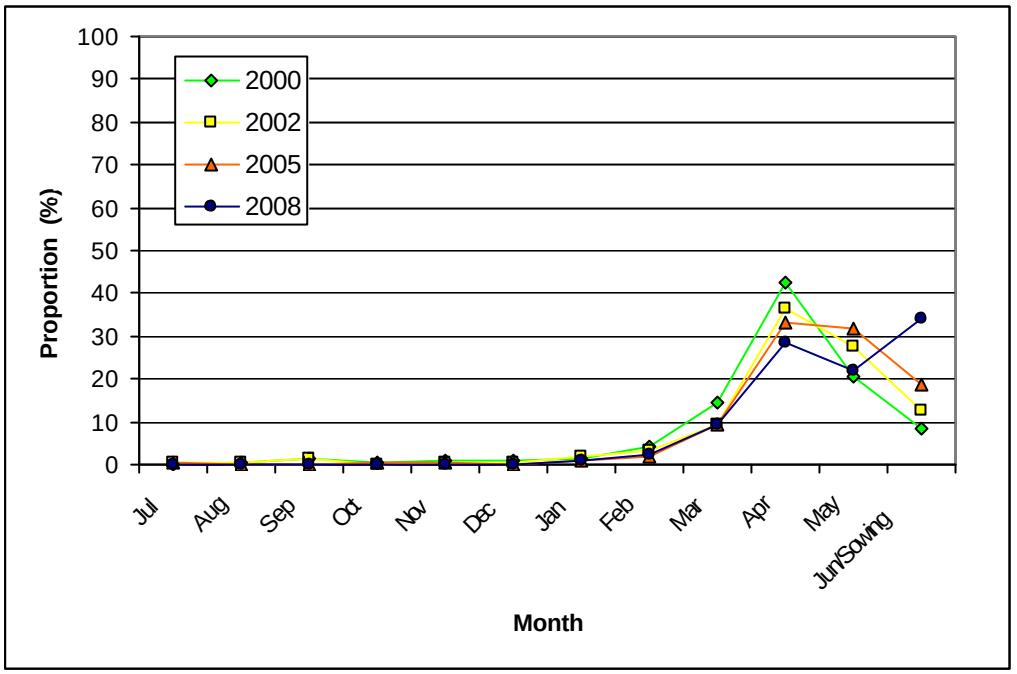

Figure 5. Preferred month for first cultivation, cropping respondents in SA; land manager surveys 2000, 2002, 2005 and 2008.

Number of tillage passes

Respondents who undertook cropping were asked - on average, how many full cultivations (including sowing[1]) they normally carried out when preparing for and sowing a cereal crop.

The proportion of respondents (after probing) who indicated they normally only do one cultivation (i.e. the sowing pass) has increased significantly from the 2002 survey (18%) to the 2008 survey (49%), with corresponding declines in the proportion doing two or more cultivations including sowing (Figure 6). Similar trends occurred in the main cropping regions and rainfall zones. The 2000 survey did not include a probing question in regard to counting the sowing pass, so results cannot be directly compared.

[1] For the purpose of this survey question the sowing operation was considered as a "full" cultivation regardless of the type of implement used.

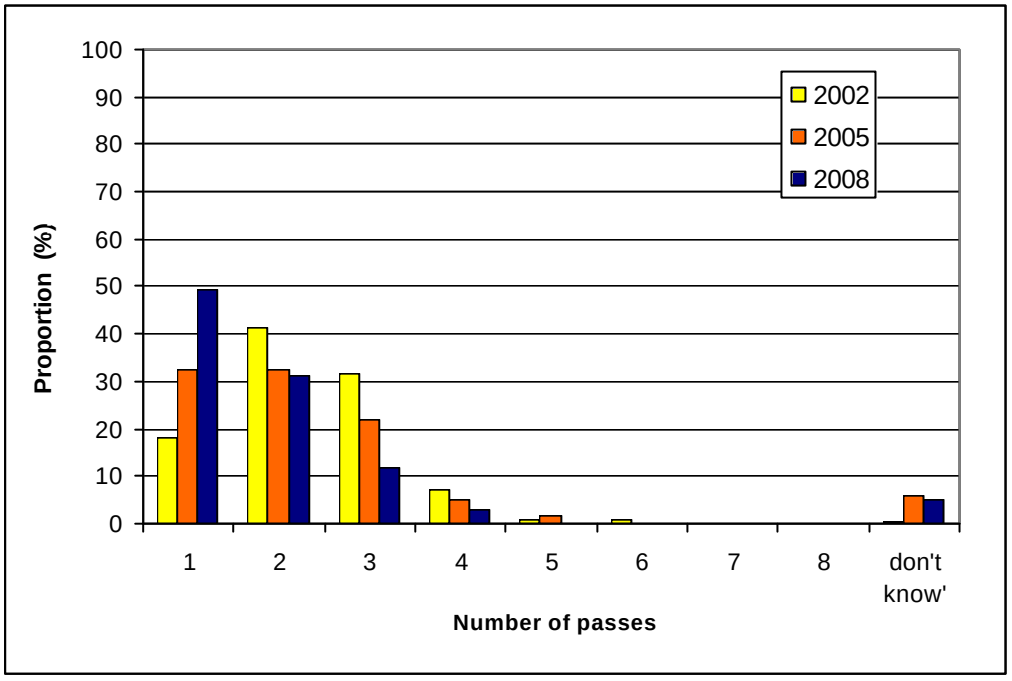

Figure 6. Average number of full cultivations (including sowing) normally carried out by cropping respondents (after probing); land manager surveys 2002, 2005 and 2008.

Direct Drill / No-Till methods

Respondents who cropped were asked on average, how much of their crop area (if any) they sowed using Direct Drilling methods, and how much using No-Till (including zero-till with disc openers).

The proportion of cropping respondents in SA using No-Till or any single pass sowing method to sow at least part of their crop area has increased significantly from the 2000 survey (55%) to the 2008 survey (77%) (Figure 7). The proportion using full-cut Direct Drill methods has decreased over this period, so the net increase in use of any single pass sowing method is due to the large increase in use of No-Till, which has more than doubled since the 2000 survey. This data supports the trends observed in the preferred timing of initial cultivation and average number of tillage passes.

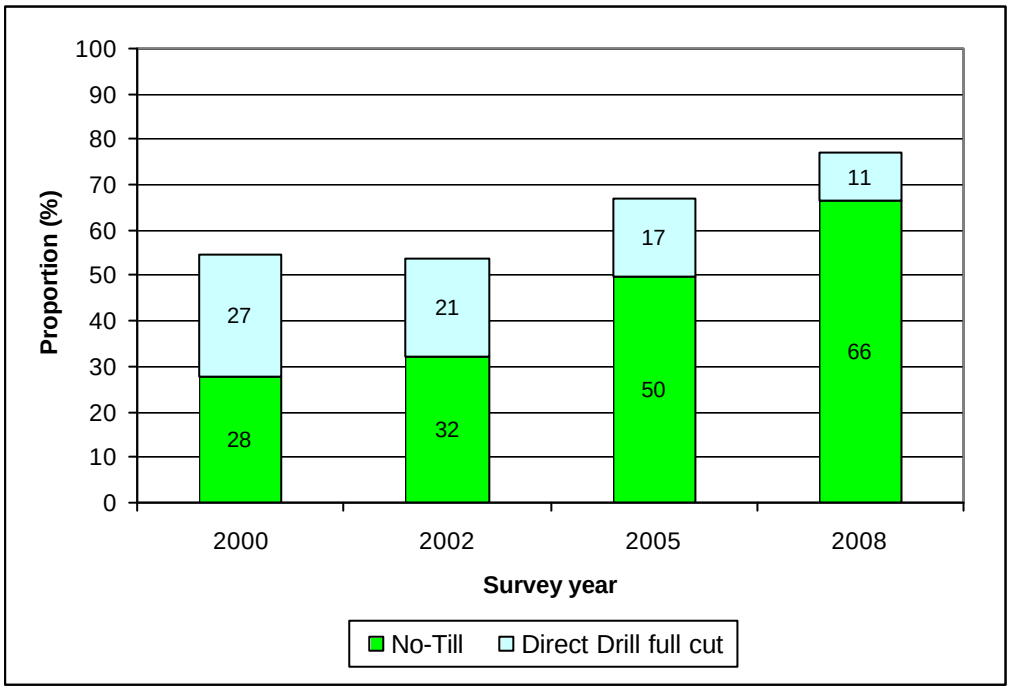

Figure 7. Proportion of cropping respondents using No-Till or full cut Direct Drill to sow at least part of their crop area in SA: land manager surveys 2000, 2002, 2005 and 2008.

The proportion of the crop area sown using No-Till indicated by cropping respondents has increased significantly in SA over the period from the 2000 (16%) to 2008 (62%) surveys (Figure 8). Significant increasing trends occurred in all survey regions and rainfall zones. According to the 2008 survey, in the Eyre Peninsula, Northern and Yorke and South East survey regions, over 60% of the crop area was sown using No-Till, with 51% in the Mt Lofty Ranges/Kangaroo Island region and 47% in the Murraylands region. The proportion of crop sown with No-Till was higher in the medium rainfall (325-600 mm) zone (73%) than the high rainfall zone (54%) or low rainfall zone (43%).

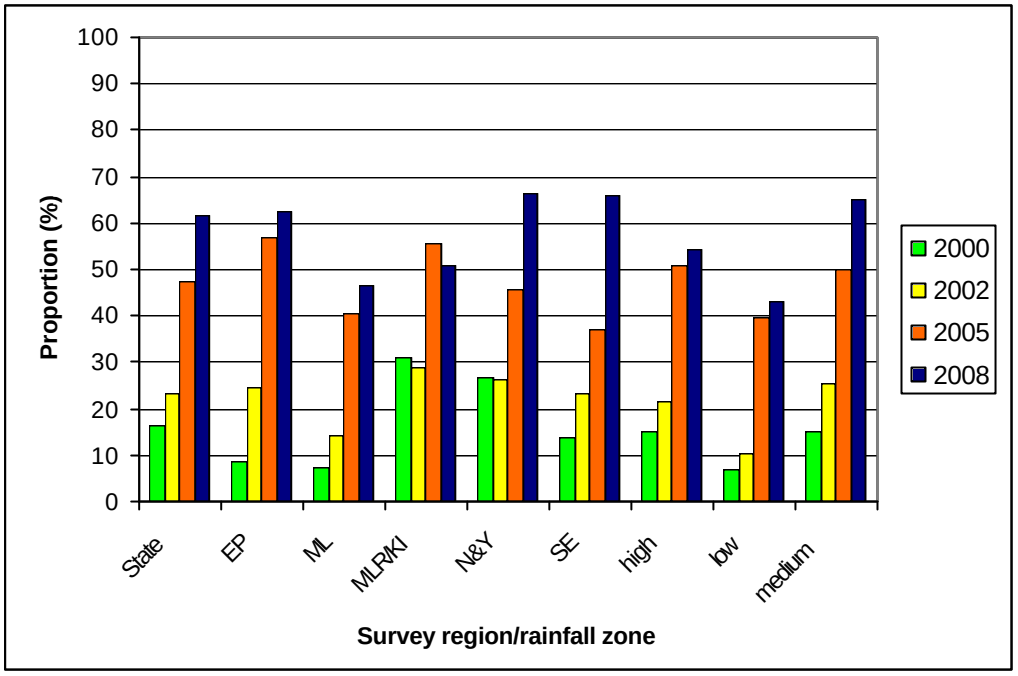

Figure 8. Proportion of crop area sown using No-Till according to cropping respondents: land manager surveys 2000, 2002, 2005, and 2008.

Stubble retention

Respondents who undertook cropping were asked how important they considered full stubble and residue retention in cropping rotations was for soil protection and health.

Most respondents indicated they considered full stubble retention "very important" (Figure 9) or "quite important", and there was a slight increase in the proportion saying it was "very important" from the 2000 to the 2008 survey.

Across the survey regions, the aggregate proportion considering it was "very" or "quite" important was highest in the Northern and Yorke Region (96% in 2008) and lowest in the Mt Lofty Ranges/Kangaroo Island region (81%) although this has significantly increased since the 2000 survey (53%).

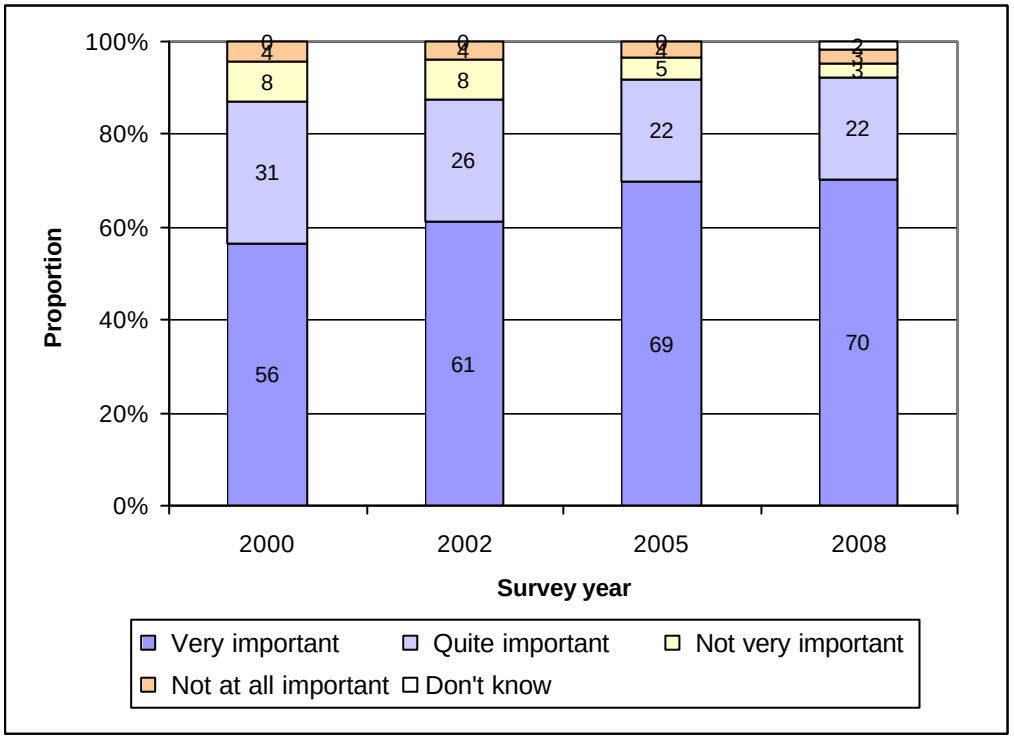

Figure 9. Importance of full stubble/residue retention for soil protection and health indicated by cropping respondents in SA: land manager surveys 2000, 2002, 2005 and 2008.

Stubble/residue burning

Respondents who did cropping were asked if they "usually" or "occasionally" burnt crop stubbles or pasture residues when preparing for cropping.

The proportion of cropping respondents in SA who "usually" burnt stubbles/residues was significantly lower in 2008 than other survey years (Figure 10). The data suggests a declining trend in the use of burning over the survey period, which was consistent across cropping regions and rainfall zones, but this cannot be confirmed. The practice of burning stubbles/residues can be influenced by the amount of stubbles or residues in paddocks prior to sowing, which can vary according to seasonal rainfall, as well as other factors. Yearly data would be needed to confirm trends.

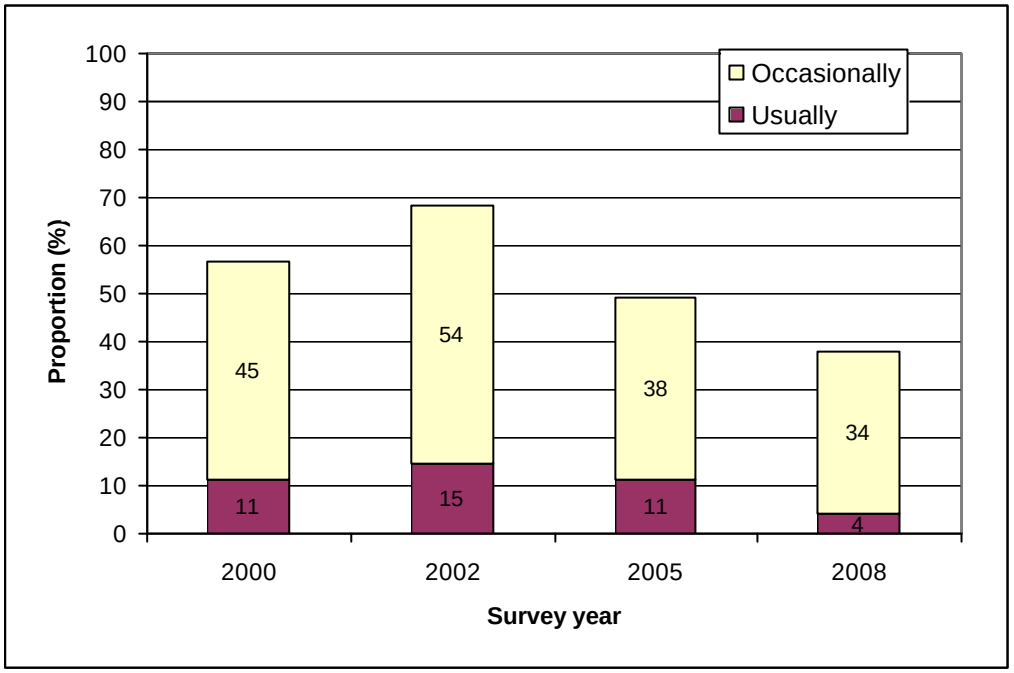

Figure 10. Proportion of cropping respondents who "usually" and "occasionally" burn crop stubbles or pasture residues in SA: land manager surveys 2000, 2002, 2005, and 2008.

Cropping respondents were also asked what area of land they burnt the previous year.

Overall in SA, the average area burnt according to cropping respondents ranged from 112ha to 152ha (representing 7 – 10% of the mean property area) over the 2000 – 2005 surveys but was much lower at 27 ha (1.5% of mean property area) in the 2008 survey. This probably reflects the relatively poor season in 2006/07 in many cropping districts that would have resulted in lower than average stubble/residue levels in paddocks, reducing the need for managers to burn to manage excess amounts of residues prior to cropping.

Feedlotting

Respondents were asked if they feedlot stock when necessary as a means of managing erosion risk in paddocks.

Overall in SA, the proportion who feedlot livestock was significantly higher in 2008 (36%) than in 2000 (29%) or 2002 (21%), and in most regions, the data suggest an increasing trend over the survey period (Figure 11). However this data does not reflect that in very dry seasons, many managers may sell off livestock, thereby easing grazing pressure in paddocks. The economics of feedlotting (relative to selling) stock can also vary seasonally according to the cost of grain. It is therefore difficult to draw conclusions from this data.

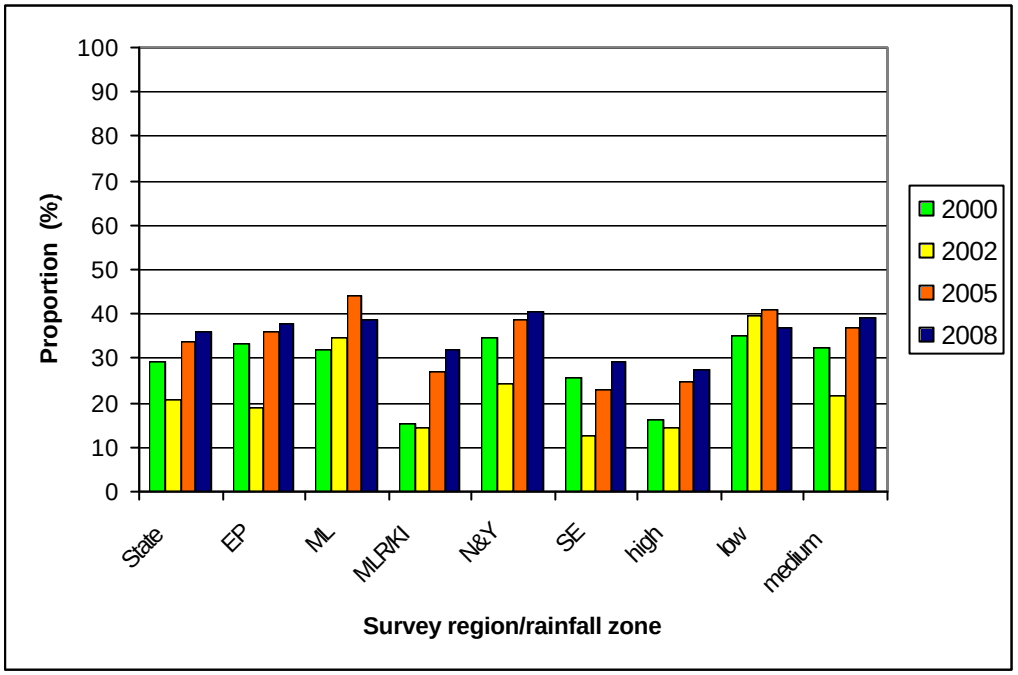

Figure 11. Proportion of respondents who feedlot stock when necessary to manage erosion risk: land manager surveys 2000, 2002, 2005, and 2008.

The trends observed in tillage/sowing practices and stubble/residue management practices in these surveys would be expected to contribute to reducing overall exposure of soil to the risk of wind and water erosion. In addition, these trends would have potential benefits for soil condition including reduced soil compaction and increased inputs of organic matter.

2.3 SOIL ACIDITY

The proportion of respondents citing soil acidity as an issue of concern in their district generally reflected the relative incidence of acid soils in most survey regions, but was somewhat lower in the Mt Lofty Ranges – Kangaroo Island region (52%) than the known incidence in these areas. For example, the DWLBC Soil and Land Information Group database indicates that 80% of agricultural land on Kangaroo Island and 67% in the Adelaide and Mt Lofty Ranges NRM region (which includes neutral to alkaline soils on the northern Adelaide Plains) has acid or highly acid surface soils.

In the 2008 survey, when asked, some 21% of respondents in SA considered they had acid soils on their property (Figure 12), and a further 7% considered they had potentially acid soils. In the Mt Lofty Ranges – Kangaroo Island region, 48% of respondents said they had acid soils and a further 15% had potentially acid soils.

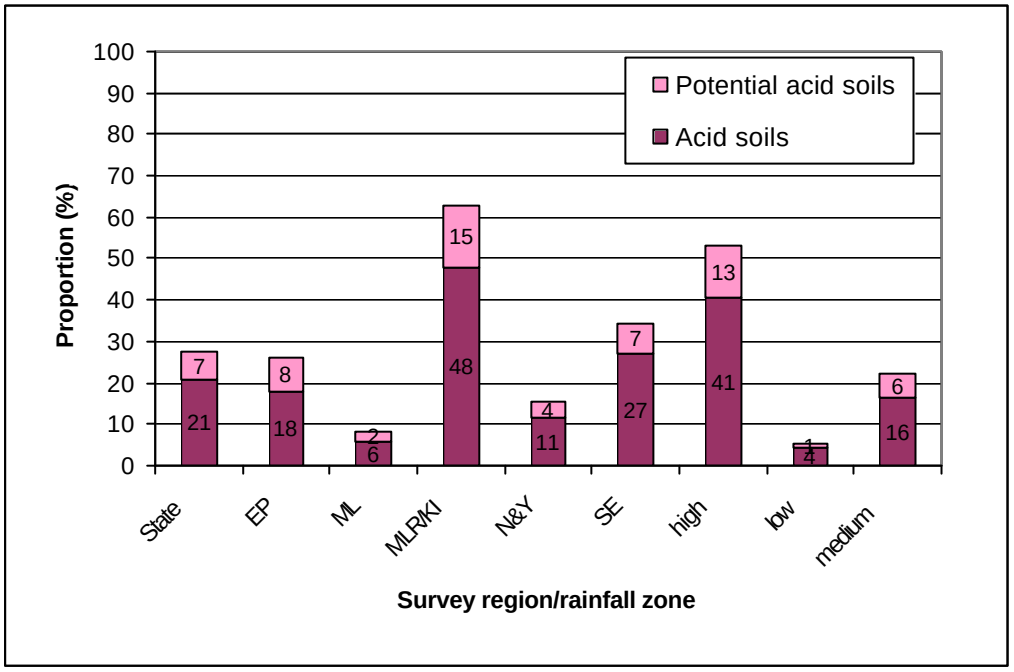

Figure 12. Proportion of respondents considering they have acid soils or potential acid soils on their property: land manager survey 2008.

Perceptions regarding soil acidity

The surveys identified there was inconsistency in landholders' understanding of the causes of, treatments for, and critical pH level for soil acidity.

Respondents who said they had acid soils or potential acid soils on their property were told the following statements about the causes and treatment of soil acidity and asked whether they thought they were true or false.

- Is it beneficial to apply lime to acidic soils before any sign of production decline
- Superphosphate is a direct contributor to soil acidity
- The major causes of soil acidity are nitrogen fertilisers and produce removal
- High levels of acidity can cause irreversible loss of soil productivity
- Gypsum can be used to treat acid soils

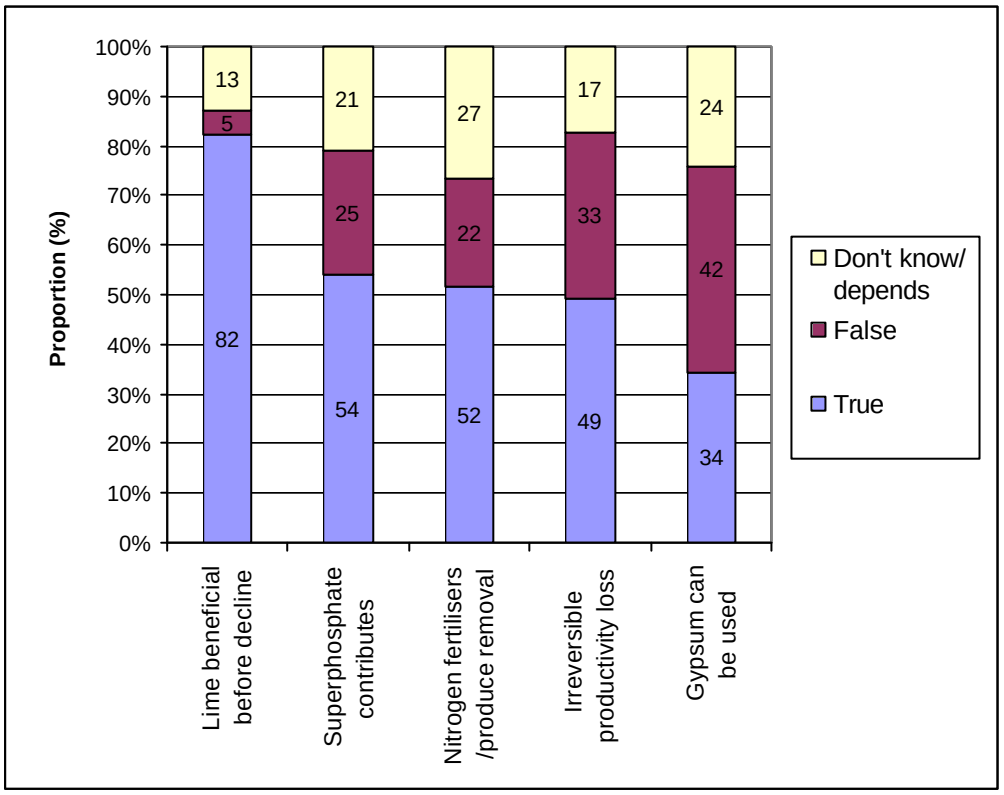

Figure 13. Perceptions of causes and treatments for acid soils by respondents on acid soil properties: land manager survey 2008.

Figure 13 shows that a high proportion (82%) of respondents in SA in 2008 correctly understood that lime application is beneficial before signs of production decline. However only 52% correctly understood that nitrogen fertilisers and produce removal were major causes of acidity. Over 50% of respondents incorrectly believed that superphosphate was a direct contributor to soil acidity, with only 25% understanding this was false. Over 50% of respondents also incorrectly believed that high levels of soil acidity[1] cause irreversible loss of soil productivity. In regard to using gypsum to treat acid soils, 42% correctly understood that

this was false while 34% incorrectly believed this was true. Generally responses were similar in earlier surveys.

[1] This statement was not intended to refer to extremely low pH levels that can cause decomposition of soil clays, which is generally unlikely to occur on agricultural soils.

Critical soil pH to indicate soil acidity

Respondents who said they had acid soils or potential acid soils on their property were asked what they considered to be the critical soil pH level for acid soil at which production is likely to be reduced, before they were asked what soil pH test method they were referring to. Those who indicated a soil pH level in the range 4.5 to 6.0 were considered "correct" for the purpose of data analysis, regardless of the test method.

Figure 14 shows that overall in 2008, 60% of respondents gave a "correct" critical soil pH level for acid soil, although this varied somewhat between regions. When asked to specify which soil pH test method their figure referred to, 39% of respondents overall cited the calcium chloride method, 20% cited distilled water and 41% weren't sure. Results were similar in previous surveys.

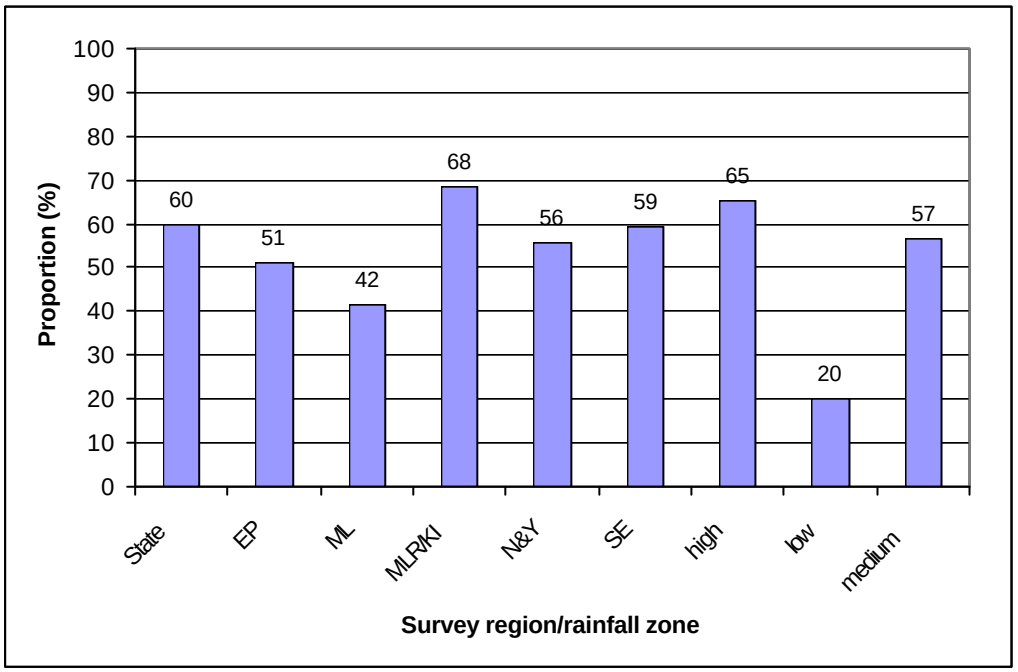

Figure 14. Proportion of respondents with acid soil properties that gave a "correct" critical soil pH level for soil acidity: land manager survey 2008.

Treatment of soil acidity

The same respondents were asked whether they had sought information on treating soil acidity. In the 2008 survey, overall 75% said they had done so, with 35% saying they got information from agronomists/farm consultants followed by 24% from DWLBC/PIRSA staff and 16% from stock agents/fertiliser companies. In the 2005 survey, significantly more (45%) got information from agronomists/farm consultants while use of other information sources were similar. This question was not asked prior to 2005.

In the 2008 survey, some 65% of respondents in SA who reported they have acid soils said they had limed at least part of this area (at any time), virtually the same as reported in 2005 (66%). The mean area treated by liming at any time (on acid soil properties) was 64 ha in the 2008 survey, compared to 73 ha in 2005. Comparable questions were not asked in earlier surveys. Data sample size is too small for meaningful analysis at a regional level.

Among respondents with acid soils, those who had not applied lime or had applied lime to only part of the affected area were asked to indicate why that was.

In the 2008 survey, the most frequent reason given overall was "couldn't afford it/too expensive" (36% of respondents) followed by "not financially worthwhile" (23%) and "acidity not severe enough" (17%). Among regions, the leading reason was given most frequently in the Mt Lofty Ranges – Kangaroo Island region (51%). Responses in 2005 were similar apart from a higher proportion saying, "couldn't afford it/too expensive" (46% in SA; 64% in MLR-KI).

The survey results regarding soil acidity suggest there are variable levels of awareness and understanding of soil acidity in affected agricultural areas, and that a significant proportion of acid soils may not be being adequately treated by liming.

2.4 WATER REPELLENT SOILS

Respondents were asked if they considered they had water repellent soils on their property. In 2008, overall 38% said they had water repellent soils, although this varied between regions (Figure 15). The proportion with water repellent soils appears to be slightly lower in 2008 than previous surveys in some regions, although possible reasons for this are not clear. The area of water repellent soil clayed over this eight year period would be insufficient to account for such a difference.

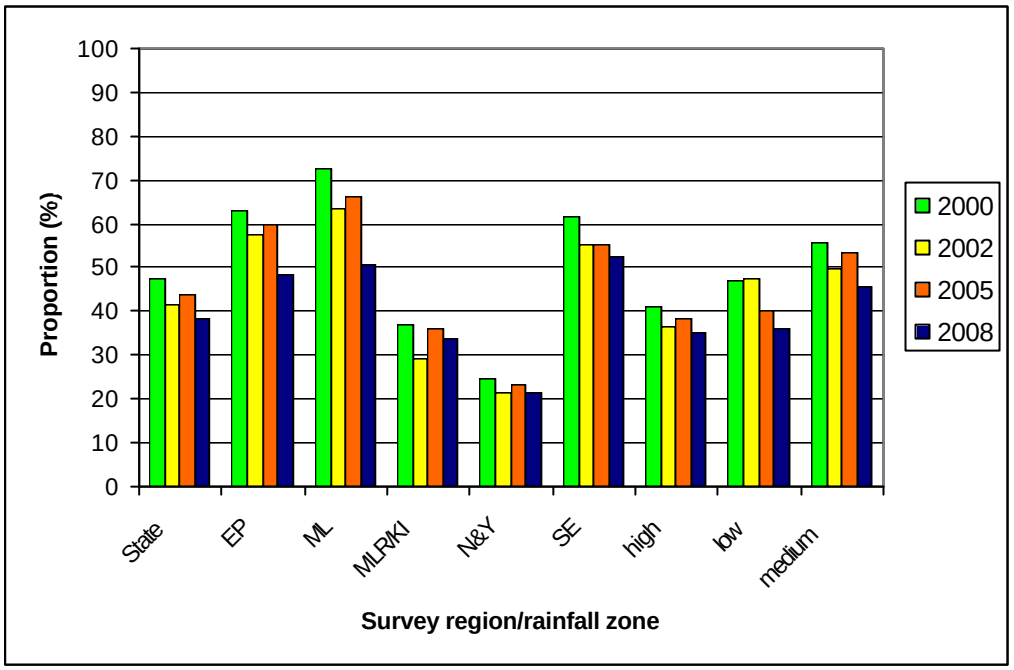

Figure 15. Proportion of respondents who consider they have water repellent soils on their property: land manager surveys 2000, 2002, 2005, and 2008.

Respondents with water repellent soils were asked if they used any of a range of techniques (prompted) to improve production on the water repellent soils.

Figure 16 shows that in the 2008 survey, 41% of these respondents used modified tillage methods (eg. press wheels, furrow sowing), while 33% used clay spreading. Use of clay spreading was highest in the South East region (42%), while clay delving was highest in the Eyre Peninsula region (37%).

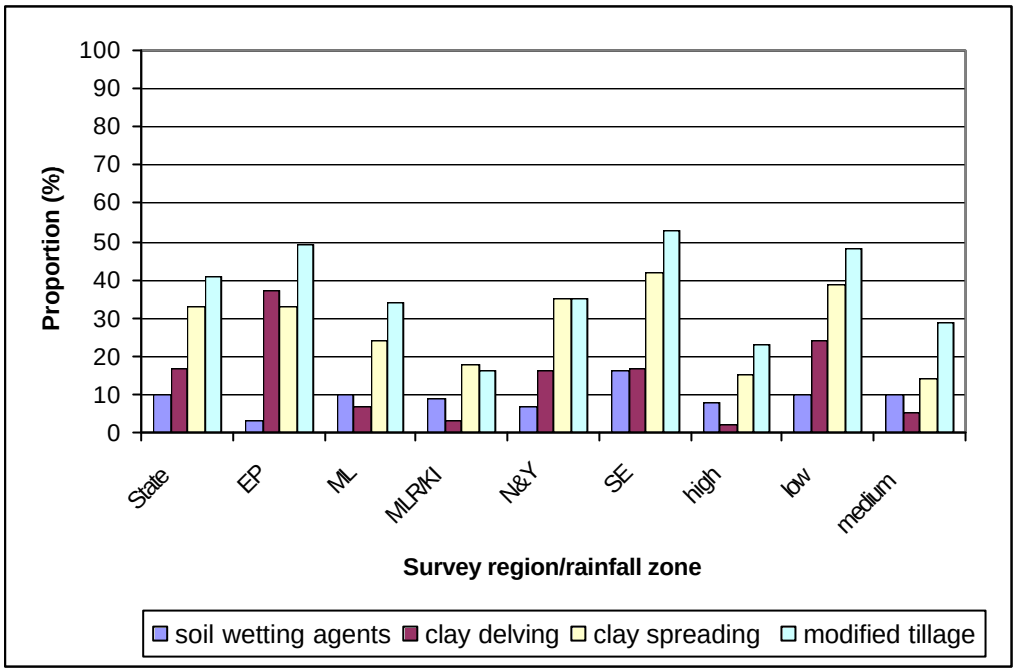

Figure 16. Proportion of respondents with water repellent soils using techniques to improve production: land manager survey 2008.

Overall, the use of these techniques (with the exception of wetting agents) by respondents with water repellent soils has increased significantly since the 2000 survey (Figure 17).

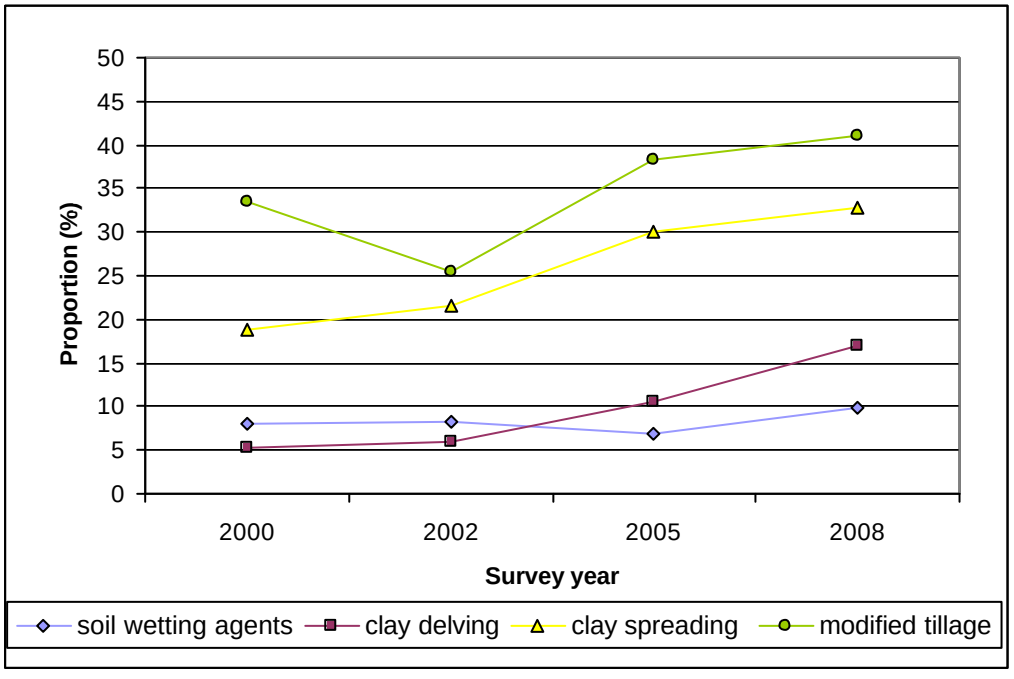

Figure 17. Change in proportion of respondents with water repellent soils using techniques to improve production in SA; land manager surveys 2000, 2002, 2005, and 2008.

2.5 SOIL NUTRITION

Respondents were asked whether they undertook regular soil testing to determine the nutrient status of their soils, and if so, on average, how many years would there be between tests in any given paddock.

Overall, 62% of respondents in 2008 said they regularly soil test (Figure 18). The overall proportion in the 2000 survey was significantly higher than subsequent surveys, and this occurred in most regions. Among regions, regular soil testing was most common in the South East and least common in the Murraylands region and low rainfall zone.

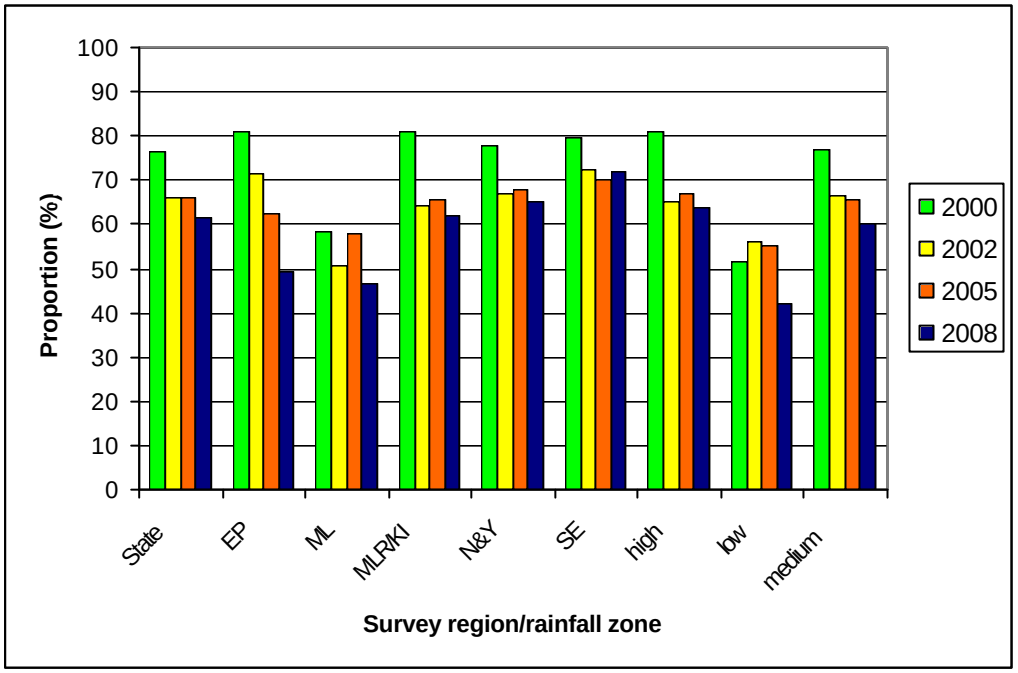

Figure 18. Proportion of respondents doing regular soil testing for soil nutrition monitoring; land manager surveys 2000, 2002, 2005, 2008.

The average interval between soil tests in any given paddock mostly ranged between one and five years overall in the 2008 survey (Figure 19). Results from previous surveys were similar. There were no marked differences in the distribution of average interval between soil tests across the various regions and rainfall zones.

These results suggest that a significant proportion of agricultural producers may not be actively monitoring soil nutrition levels.

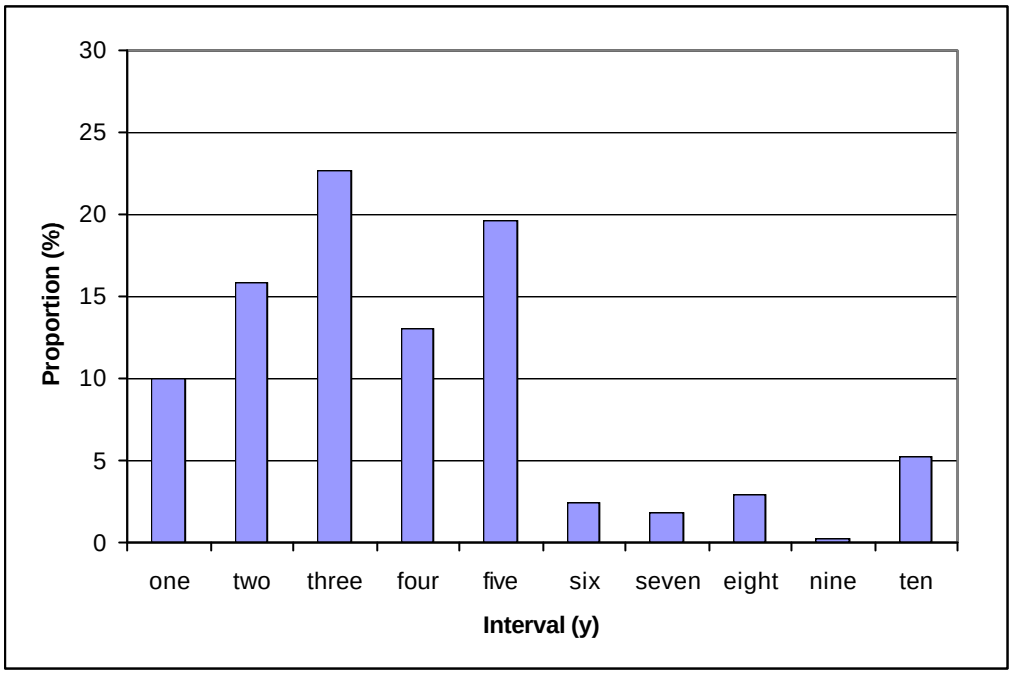

Figure 19. Distribution of the average interval between soil testing by respondents who regularly soil test: land manager survey 2008.

Respondents were asked in deciding their fertiliser use strategies, whether they mainly:

- use advice from fertiliser companies and agents
- use advice from agronomic specialists and consultants
- rely on their existing knowledge.

Generally, in the 2008 survey most respondents either used advice from agronomic specialists/consultants or their own knowledge, with a relatively small proportion using advice from fertiliser companies and agents. The overall proportion using advice from fertiliser companies/agents has significantly decreased over the surveys from 45% in 2000 to 21% in 2008, but the proportion using the other sources has not changed significantly. There was considerable variation among regions and rainfall zones in the relative proportion of respondents who used these sources of information in deciding their fertiliser use strategies (Figure 20). The use of agronomic specialists/consultants was highest in the South East region and lowest in the low rainfall zone. The reverse tended to apply for those relying on their existing knowledge.

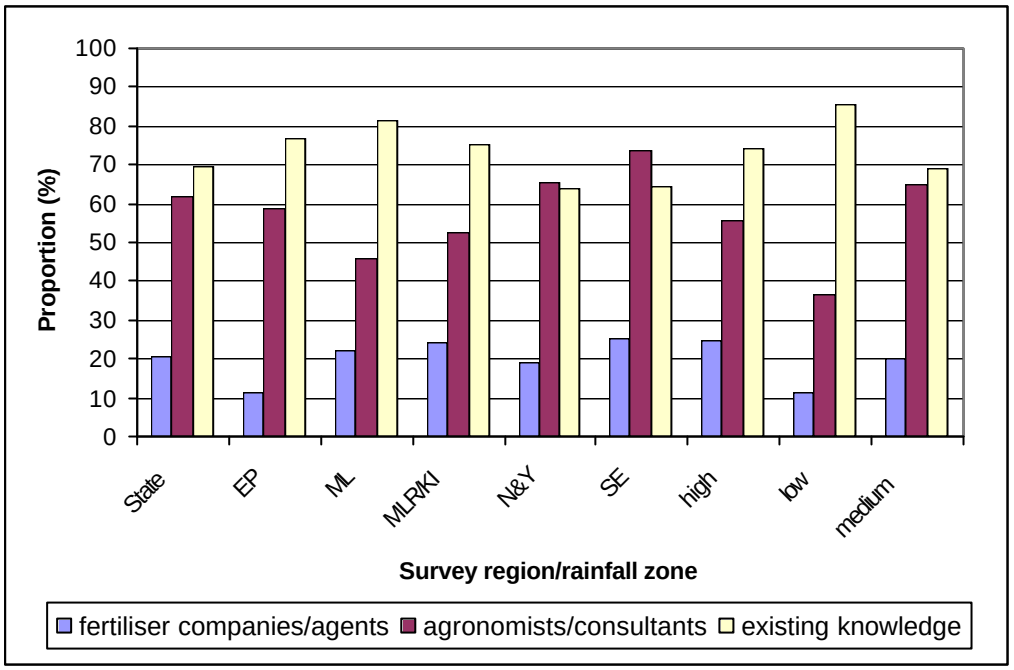

Figure 20. Proportion of respondents who use different sources of advice/information in deciding their fertiliser use strategies: land manager survey 2008.

2.6 SALINITY

Respondents were asked if they had any saline soil on their property, and whether they anticipated the current extent of salinity would change over the next 10 years. In 2008, overall 33% of respondents said they had saline soil on their property, ranging from 45% on the Eyre Peninsula to 28% in the Murraylands and South East regions. Overall, most respondents (77%) said they didn't expect any change in the extent of salinity in the next 10 years, while 6% anticipated an increase, and 11% a decrease in the extent of salinity. There were no significant differences from previous surveys. Among the regions in the 2008 survey, anticipation of an increase in salinity was highest in the Murraylands (8%), while anticipation of a decrease in salinity was highest in the Eyre Peninsula (16%).

Respondents with saline land were asked to describe the practices they were using on the affected land. In 2008, overall 84% said they were taking some sort of action on-site, although this was lowest in the low rainfall zone (54%). The most frequent activities cited were tree planting (30%), fencing off (28%), planting salt tolerant pasture (20%), planting saltbush/shrubs (16%) and planting perennial grass pasture (12%). Results from previous surveys were similar to this. Among regions, fencing was most frequently cited in the Mt Lofty Ranges – Kangaroo Island region (38%), while salt tolerant pasture (29%), installing drains (21%) and planting lucerne (21%) were most frequently cited in the South East region.

In addition, all respondents (regardless of whether they had saline land) were asked to describe any practices they were doing elsewhere on their properties to manage salinity. Overall, in the 2008 survey, 19% of respondents reported they were taking some form of action, while 23% said they were not doing anything (remaining 58% did not have saline land). The most frequent actions cited were revegetation of the surrounding area (6%), planting trees (5%) and planting lucerne (4%). Among regions and rainfall zones, the highest level of action was reported in the South East region (24%) with the lowest in the low rainfall zone (10%).