

Perceptions of grain growers towards their soils in the high rainfall zone of Southern Australia

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Abstract

Dryland cropping in the high rainfall zone (HRZ) of southern Australia has the potential to produce high yields of cereals, canola and pulses. However, actual yields often fall well short of the estimated potential. A survey of grain growers in the HRZ was conducted to gain a greater understanding of the factors which may prevent growers from achieving potential yields. The survey was developed in consultation with growers, soil scientists and agronomists and distributed nationally through an industry magazine. The survey captured grower perceptions of soil and crop management using multiple choice questions and free comment sections. This paper documents the section of the survey pertaining to soils. In this survey, growers throughout the HRZ provided common responses regarding their use of some forms of tillage, trafficking, chemical soil amelioration techniques and physical soil engineering techniques. Different responses were evident depending upon region and farm size for issues such as the use of conventional tillage, raised beds and lime. The perceived success of various types of soil management options is also discussed. This information is valuable for those who wish to identify which regions or grower audiences should be targeted for research and extension in soil management.

Key Words

Survey, farmers, opinions, social, high rainfall zone.

Introduction

The high rainfall zone (HRZ) of southern Australia has the potential to produce high yields of grain crops including wheat, barley, canola and a range of pulses. Consistent yields, particularly in years declared drought in the traditional winter cropping areas, means the HRZ has the potential to significantly contribute to Australia's winter crop production (ABS 2004a; ABS 2004b). So far, productivity increases in the HRZ related to soil management have been attained through reduced tillage, lime and/or gypsum applications, introduction of raised beds to alleviate water logging and recently, adoption of controlled traffic to reduce compaction. These practice changes were principally driven by soil scientists, district agronomists and a select group of highly motivated grain growers. The perceptions of a broad cross-section of grain growers in the HRZ has not previously been canvassed and made available to agricultural soil scientists. A national survey of HRZ grain growers' perceptions of the issues limiting winter crop production was conducted to provide soil scientists and plant breeders with grass roots information to decide the future direction of plant breeding, crop and soil research and practice change programs. The importance of gaining the views of grain growers is obvious if the survey is viewed as a market research exercise where the results can be used to develop products or services that meet grain growers' common needs. An earlier paper focused on the cropping section of this project (Clough et al., 2008). This paper reports results from the soil management section of the survey.

Methods

The methodology used to prepared, distribute and analyse the soil section of this survey is the same as that used for the cropping section of the work which has been published in full in the earlier paper (Clough et al., 2008). However, we briefly outline the methodology for those who are unfamiliar with the earlier publication. The survey was developed using a consultative process with input from growers, agronomists and soil scientists. Pilot questionnaires were assessed by growers who were members of grower groups. The anticipated statistical analysis methodology was tested on the pilot data. Questionnaire and analyses were modified accordingly. The questionnaires were distributed throughout the HRZ to 13,831 subscribers of Ground Cover, an industry publication by Grains Research and Development Corporation (GRDC). Numerical data was analysed using SPSS Version 14.0. Growers' comments were grouped to identify key issues.

Results

Response distribution

An analysis of the survey respondents has been presented elsewhere (Clough et al, 2008). Briefly, the response rate was 3.5% with distribution across the whole target area (Figure 1). Region was the background factor which most often influenced the response of respondents. Analysis of responses is based on geographic regions of New South Wales (NSW), Western Australia (WA) and South-eastern Australia (Tasmania, Victoria and South Australia).

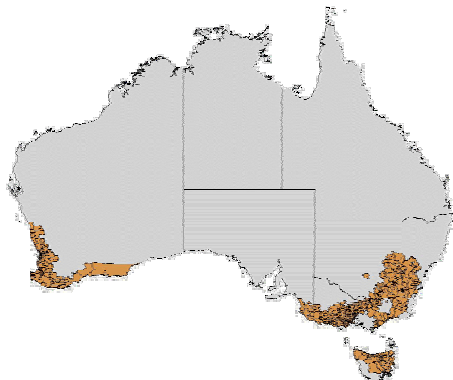


Figure 1. The spatial distribution of returned questionnaires in the high rainfall zone of southern Australia.

Tillage and soil trafficking

The categories provided in the questionnaire covered most options with the proportion of responses in the 'other' category being only 1.3% for tillage practices (respondents = 412) and 4.2% for traffic management (respondents = 398). Respondents were able to acknowledge more than one practice on a farm (i.e. practices are not mutually exclusive), so total responses relative to the number of respondents may sum to more than 100 per cent.

Zero and minimum tillage were uniformly nominated as a practice across all regions with 43% and 69% of respondents choosing those options, respectively. Conventional tillage was more likely to be a nominated practice in south-eastern Australia (32% of respondents in that region) than in NSW (19%) or WA (12%) ($P < 0.001$ by Z test). Farm size was also related to tillage practice with the tendency for zero tillage practice to increase in frequency whilst conventional tillage decreased as farm size increased ($P = 0.007$ by Z test) (Figure 2).

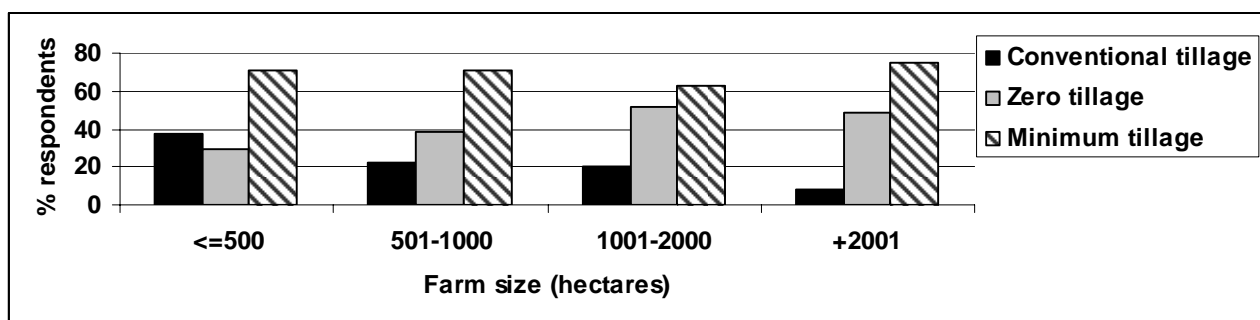


Figure 2. The percentage of respondents to a survey conducted in southern Australia nominating three of the tillage methods relative to four farm size categories. Respondents could nominate more than one tillage method thus the percentages add to more than 100%.

Five trafficking techniques were provided as options. Uncontrolled trafficking was the most common technique nominated (66% of respondents) and there was no difference between regions. Regional differences were found for raised beds which were nominated more frequently in southeast Australia (23% of respondents in that region) than in NSW (1%) or WA (0) ($P < 0.001$). Nomination of controlled traffic also varied between regions with 17% of respondents in south-eastern Australia nominating the technique compared to only 11% in NSW and 6% in WA. ($P = 0.018$).

Soil improvement and soil management

The physical and chemical soil management techniques presented to respondents covered most options with

only 10% and 17% of respondents nominating ‘other ’ for techniques they had tried (respondents = 405) or would consider trying (respondents = 266), respectively. The proportion of respondents who stated that they had applied gypsum or lime, or had installed raised beds differed between regions ($P < 0.018$) (Figure 3). Regional differences also presented for interest in trying the options of liming, or installing mole or surface drainage ($P < 0.026$) (Figure 4).

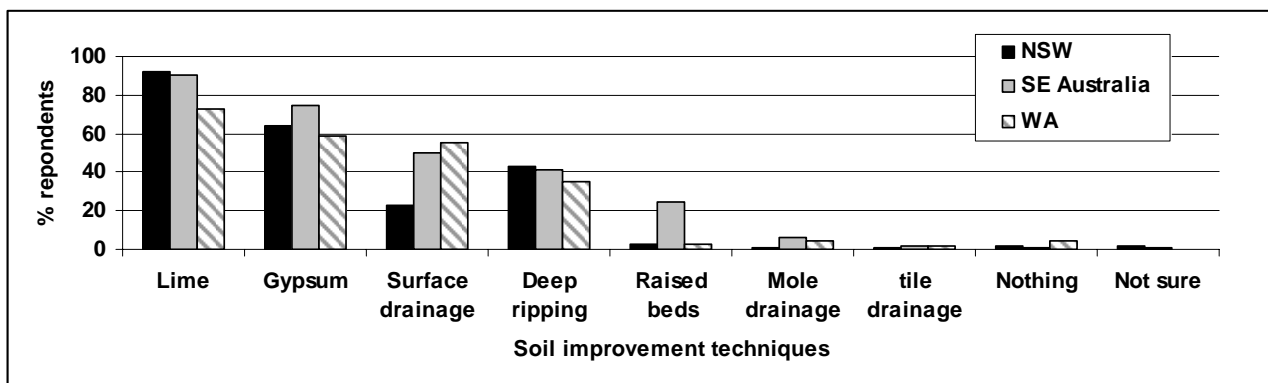


Figure 3. The percentage of respondents in each region of southern Australia nominating the soil management options they have tried as presented in the survey. Respondents could nominate more than one tillage method thus the percentages add to more than 100%.

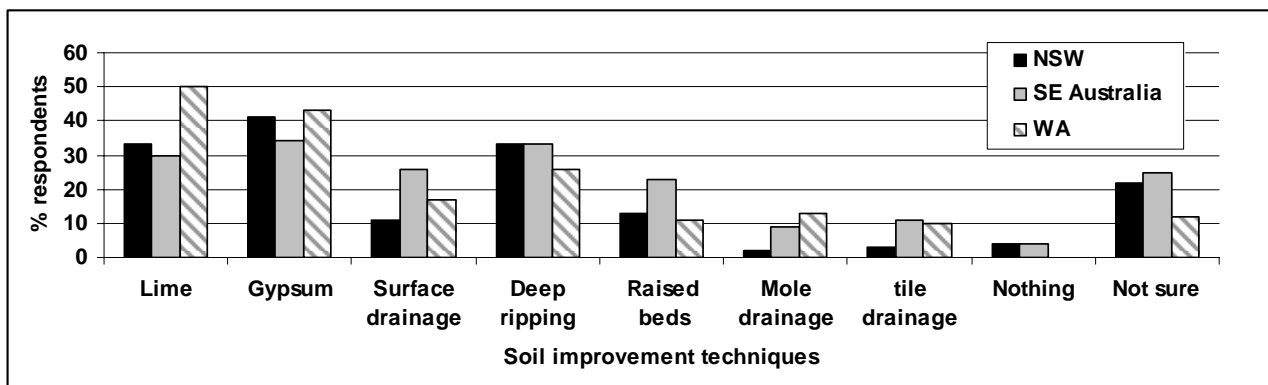


Figure 4. The percentage of respondents in each region of southern Australia nominating the soil management options they would try as presented in the survey. Respondents could nominate more than one tillage method thus the percentages add to more than 100%.

Successful soil management

Table 1. The most frequent responses to the question “What is the best thing you have ever done to your soils to get higher yielding crops?”.

Comment category	Number of comments
Lime and gypsum applied	169
Other fertilisers applied (other than animal manures)	91
Using and expanding crop rotations	90
Reducing tillage	88
Implementing soil engineering including raised beds and drainage	26
Deep cultivation	26
Improving knowledge or accessing information	15
Retaining stubble	15
Total number of comments	603

Respondents utilised the option of stating what they thought was the best action they had ever taken to improve their soils with 603 comments received. Most comments were unique as there was no set format and comments have been grouped for ease of interpretation (Table 1).

Conclusion

The response rate to the survey was low. Potential reasons and implications for this have previously been discussed (Clough et al, 2008). The summary of data and interpretations were presented back to growers at

regional meetings and to soil scientists through a fact sheet (DPI, 2006). Both groups agreed that the data and interpretations were logical and within expectations. The information from this survey assists agricultural scientists to discriminate between soil management and soil type as factors limiting crop productivity.

Several target groups for extension and research have been identified as a result of this survey. Reduced tillage has been widely adopted however smaller farms have maintained conventional tillage to a greater extent than larger farms. The survey does not reveal why this is the case and further research may be required to find out whether there is a social or technical impediment to further reductions in conventional tillage on smaller farms. The dominance of uncontrolled trafficking was a notable result of the survey. This was discussed at the SIP08 meeting, Perth, April 2006 where soil scientists pointed out that it is perfectly suitable to drive on dried soil without risking compaction. This reaction serves to indicate a weakness in the original question in which we were trying to ascertain the use of controlled traffic for cropping operations.

The survey highlighted that there has been low adoption of raised beds and low interest in trying raised beds particularly in Western Australia despite the common occurrence of soils prone to water logging. However, about 50% of WA respondents had tried surface soil drainage which may have been a suitable alternative option. The relatively high uptake of raised beds in south-eastern Australia compared to other regions may be related to the raised beds being heavily promoted over the last 12 years in Victoria by farmer groups and the State Department of Primary Industries. A limitation of this survey is that it cannot be used to identify whether respondents elect not to try a soil improvement option, such as liming, because their soil problems have been resolved by previous actions, or no benefit has been seen from previous actions or if there are other financial, social or technical constraints. A clear conclusion of this survey is that respondents are looking to improve their soils but about 20% are not sure how to achieve this objective.

Free commentary can provide insights into respondents views that cannot be encompassed in a structured questionnaire. Although there is a tendency for respondents to favour quick chemical solutions, comments indicate that respondents have a good understanding of how they can improve soils through changing the management of their soils, even in ways that may not have an instant and obvious positive impact.

Acknowledgements

This research was supported by funding from the Grains Research and Development Corporation (DAV00061 and DAV0056) and the Victorian Department of Primary Industries. The authors are grateful to Catriona King (DPI Victoria) for statistical support, Col Hacking (formally of Southern Farming Systems (SFS), the Committee Members of SFS and Narelle Hill (Department of Agriculture and Food Western Australia) for assisting with the development of the questionnaire.

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