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Information Needs of Western Australian Farmers in Relation to Precision Farming

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Abstract

(Key words: precision farming, GIS, information needs)

Precision farming has the potential to increase farm productivity, lower input costs and increase expected returns. Despite these potential benefits, the adoption of precision farming technology in Australia has been relatively slow. One of the reasons for this is the lack of information regarding the technology. This study investigated the information needs of farmers in relation to precision farming. The study was conducted in Western Australia and involved interviews with 400 farmers. The study identified current information gaps and information needs of farmers in relation to precision farming.

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Precision farming has the potential to increase farm productivity, lower input costs and increase expected returns. Despite these potential benefits, the adoption of precision farming technology in Australia has been relatively slow. One of the reasons for this is the lack of information regarding the technology. This study investigated the information needs of farmers in relation to precision farming. The study was conducted in Western Australia and involved interviews with 400 farmers. The study identified current information gaps and information needs of farmers in relation to precision farming.

1. Background

Developments in information technology have brought dramatic advancements in geographic information systems (GIS), global positioning systems (GPS), remote sensing and related technologies. These technologies have been used widely in mining, soil science, oceanography, environment, climatology and meteorology. The use of these technologies has also been extended to agriculture via precision farming. In some parts of the world, notably North America, precision farming is on the rise, with a significant number of farmers converting from the conventional mode of production to the more advanced state of the art of precision farming. With increasing world population and the associated increases in food demand, there is a need for farms to remain efficient, competitive and viable. The rise of globalisation and the world economic and financial factors also mean that farms not only have to maintain, but also improve productivity to remain competitive in the global market. Precision farming has the potential for increasing farm productivity. It has been sometimes referred to as the future of farming because it offers significant advantages over conventional farming methods. Precision farming refers to tailoring soil crop management to fit the different conditions in a particular field (Johannsen 1995). Advantages include more efficient input use, lower input costs, higher expected returns and increased productivity. Under precision farming, farms can be mapped to assess resources and can use site-specific requirements (soil nutrients, pesticides, other chemicals, etc). Consequently, a more precise response to environmental and site-specific needs can be made such as the correct amount and type of fertiliser or pesticide to apply. This can therefore lead to better management practice, increased returns and improved environmental management.

Despite these potential benefits, the adoption of precision farming technology in Australia has been relatively slow. One of the reasons for the slow uptake of precision agriculture is the lack of knowledge surrounding the use of the technology.

Considering the significant benefits that this technology offers, it is important to understand what are the information needs of farmers in relation to precision farming. This study examined the level of awareness of farmers about precision farming and related technologies, their attitude towards precision farming and their information needs in relation to precision farming.

2. The study

The study was part of a larger research that looked at the adoption of precision farming in Western Australia. The study involved a sample of 400 agricultural producers selected using stratified random sampling. Fifty respondents each for Wheatbelt East, Wheatbelt West, Midlands and Central Wheatbelt, Great Northern and Midwestern Wheatbelt, Southeast Lakes Area, Upper Great Southern, Lower Great Southern and Central Great Southern were randomly chosen for the survey. Respondents were interviewed by phone. Interviews lasted between 10 – 30 minutes.

There were two types of questionnaires used in the study – one was for farmers who were currently using precision farming technologies during the time of the study or have used it in one form or another. The other type of questionnaire was for those who have not used the technology yet. Each questionnaire was divided into four parts. Part one comprised questions on background information. Part two dealt with farm resources and practices, while part three was devoted to attitude towards precision farming. The last part comprised demographic information. Data gathered was encoded into a computer and analysed using SPSS. Results presented in this paper only deals with the information needs of farmers.

3. Findings

3.1 Respondent profile

The average years of experience in farming of respondents was 27.8 years. The average years in farming of respondents vary, with average experience in the farm in the Eastern Wheatbelt, South East Lakes Area and Upper Great Southern as 26 years while that in the Midlands and Central Wheatbelt was 31 years (Table 1).

Table 1: Number of years in farming by respondents

	No. of respondents	Years in farming	
		Mean	Std Deviation
Wheatbelt East	50	26	14.38
Wheatbelt West	50	29	14.13
Midlands and Central Wheatbelt	50	31	15.45
Great Northern and Midwestern Wheatbelt	50	28	15.43
South East Lakes Area	50	26	10.91
Upper Great Southern	50	26	15.59
Lower Great Southern	50	29	12.02
Central Great Southern	50	29	15.98
Total	400		

Of the total respondents interviewed, the majority (86%) produced wheat (Table 2). Other major crops grown included barley (54%), lupins (45%) and canola (37%). Other respondents also raised livestock. Around 16% of farmers interviewed raised sheep, 18% had beef cattle and 3% had pigs. The average area under production was 2599 ha (sd = 2334 ha).

Table 2: Types of enterprise

	No.	%
Crops		
Wheat	343	85.8%
Oats	78	19.5%
Oats hay	40	10.0%
Barley	215	53.8%
Lupins	181	45.3%
Canola	149	37.3%
Field chick peas	44	11.0%
Livestock		
Sheep	343	85.8%
Beef cattle	74	18.5%
Pigs	11	2.8%
Others	21	5.3%

3.2 Awareness of precision farming

General awareness of precision farming was relatively high among respondents. As shown in Table 3, of the 400 farmers interviewed, 341 (or 85% of the respondents) had heard about precision farming. Only 15% were not aware of it.

Table 3: Have heard about precision farming

	Frequency	Percent
No	59	14.8
Yes	341	85.3
Total	400	100.0

Farmers had a variety of sources of information in regards to precision farming (Table 4). The most common sources of information were the Rural Press (64%), other farmers (23%) radios (19%), general magazines or newspapers (19%). Field days and Expositions were also sources of information for farmers. Only a few of the respondents learned about precision farming from universities or TAFE. However, while general awareness was high, understanding of precision farming was not.

Asking respondents to rate their understanding of precision farming using a 5-point dikert scale, almost half of the respondents (46%) rated their understanding as little to none (Table 5). About 42 percent said they had medium understanding. Only 12 percent had high to very high understanding of precision farming.

Table 4: Source of information of precision farming

	No.	%
Rural Press	219	64.22
Other farmers	78	22.87
Radio	66	19.35
General magazines / newspapers	66	19.35
Field Days/ Expos	63	18.48
Television	38	11.14
AgWA	32	9.38
Growers / farmers group	30	8.80
Farm Advisors / consultants	14	4.11
Dealers/ manufacturers	14	4.11
Internet	13	3.81
Seminars / conferences/ workshops	13	3.81
University/ TAFE	6	1.76
Others	4	1.17
Family and friends	4	1.17
Agronomists	3	0.88
Service providers/ contractors	3	0.88
Books	3	0.88
Industry bodies (e.g., CSBP)	2	0.59
Precision Farming Australia	2	0.59

Table 5: How would you rate your understanding of precision farming

	Frequency	Percent	Cumulative Percent
None at all	15	4.5	4.5
Very little	138	41.3	45.8
Medium	141	42.2	88.0
High	34	10.2	98.2
very high	6	1.8	100.0
Total	334	100.0	

3.3 Uptake of Precision Farming

The study found that use of precision farming was low. Of the 400 respondents, only 16 percent were currently using or had used precision farming technology in one form or another (Table 6). Of those who were aware of the technology, only 20 percent had taken it up.

Table 6: Use of precision farming technology

	All Farms		Those aware	
	Number	%	Number	%
No	335	83.8	265	80.3
Yes	65	16.2	65	19.7
Total	400	100	330	100.0
			400	

Reasons for not adopting the technology/farming method included costs, unsuitability to farms, the lack of skills/knowledge, the perception that the technology was too complicated and difficult to understand and apply. Others were not confident enough, while others were still waiting for the technology to develop more. Of these reasons, cost appeared to be the main impediment to adoption with about 70 percent of the respondents citing that the technologies for precision farming were too expensive (Table 7).

Table 7: Reasons for not adopting precision farming

	Count	%
Too costly	185	69.81%
Not suitable to farm	46	17.36%
Lack of skills / knowledge	42	15.85%
Technology too complicated	24	9.06%
Not economically viable / cost benefit	19	7.17%
Not confident enough	18	6.79%
Difficult to understand technology	17	6.42%
No reason	15	5.66%
Difficult to apply technology	15	5.66%

Still new / wait for it to develop more / improve	14	5.28%
Too old / retiring / for next generation	11	4.15%
Lack of technical support	8	3.02%
In the process of applying the technology	8	3.02%
Returns / benefits are marginal considering time and money for implementation	3	1.13%
Can't see the benefit	3	1.13%
Trials have proven yields higher with conventional farm	1	0.38%
Others	6	2.26%

In general, use of precision farming in Western Australia is relatively recent. The average years adopters had used precision farming was 3.8 years (median = 4; mode = 2). The number of years of experience in the use of precision farming mostly ranged between 1 and 10, although there was one respondent who used precision farming technology in one form or another for 21 years.

The types of precision farming technologies used include GPS (65%), yield mapping (46%), variable rate technologies (VRTs) (26%), GIS (26%), ground based sensors (18%) and remote sensing (25%) (Table 8). Most of those using precision farming technologies were fairly confident (Figure 1).

Table 8: Types of precision farming technology

	No.	%
Global positioning system (GPS)	42	64.60
Yield mapping systems	30	46.20
Variable rate technology (VRT)	17	26.20
Geographic information system (GIS)	17	26.20
Ground based sensors	12	18.50
Remote sensing	4	6.20
Others	4	25.00

Users of the technology also indicated some problems or constraints in using precision farming (Table 9). Foremost was the costliness of the technologies (58%). Also of concern were the difficulty of understanding and/or applying the technology (32%) and lack of support (technical and extension). Lack of information was also cited as a constraint.

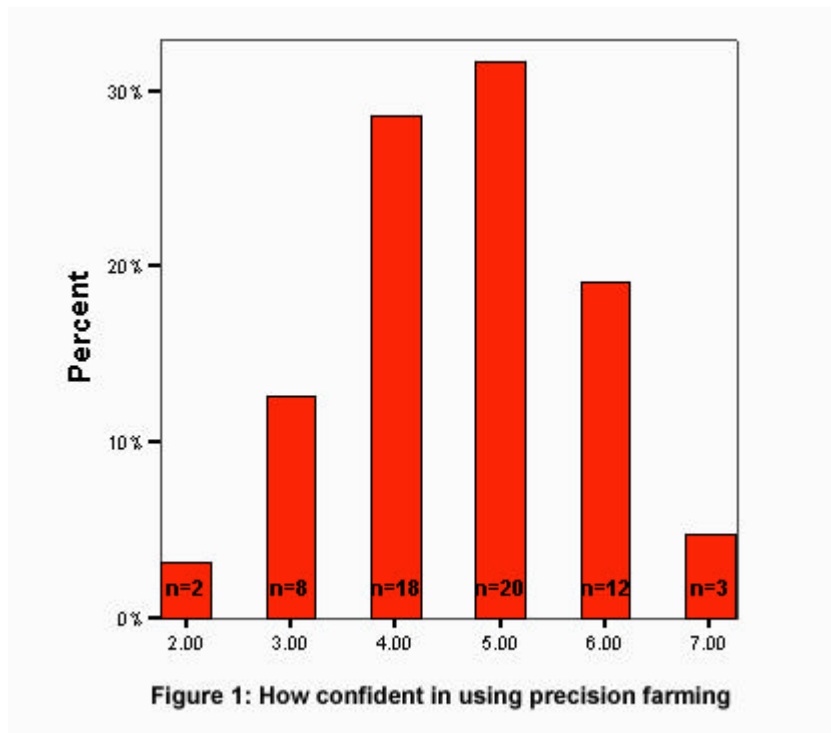


Table 9: Problems with the use of precision farming

	No.	%
Lack of information	15	23.08
Technologies too costly	38	58.46
Lack of extension support	16	24.62
Lack of technological support	19	29.23
Difficulty of understanding / applying technology	21	32.31
Technical (Problems with signal from GPS - need instant reports)	1	1.54
Have not encountered any problems	8	12.31
Others	3	4.62

3.4 Information needs

All respondents were asked whether they would consider using precision farming in the future. Most respondents (72%) indicated that they would indeed consider

precision farming technologies in the future (Table 10). About 19 percent said they would not, while a few (9%) were unsure.

Table 10: Would consider using precision farming in the future

	Frequency	Percent
Yes	288	72.0
No	77	19.3
Total	365	91.3
Not sure	35	8.8
Total	400	100.0

There was a significant interest in finding out more information about precision farming, with 55 percent indicating they want to know more (Table 11). The types of information needed are listed in Table 12.

Table 11: Interest in more information about precision farming

	Frequency	Percent
No	180	45.0
Yes	220	55.0
Total	400	100.0

Table 12: Types of information needed

	No.	%
General knowledge	189	85.91
Costs and financial aspects	187	85.00
Information on how to use/apply technology	186	84.55
Demonstration sites showing precision farming application	172	78.18
Benefits of using the technology	163	74.09
Training on using the technology	158	71.82
Where the technology is available and how to access it	151	68.64
Where to obtain all relevant information	143	65.00
Experiments run	1	0.45
Others	2	0.91

As shown in the table, of utmost interest was general information on precision farming (86%). This was followed by costs and financial aspects (85%) and information on how to use or apply the technology (85%). Producers were also interested on

demonstration sites showing applications of precision farming. Other types of information needed include benefits of using the technology, training on the use of the technology, where it is available and how to access it.

In general, the producers preferred the rural press, AgWA, grower farmer groups and general magazines/newspapers as the sources of information (Table 13). The Internet and other farmers were also among the other preferred sources of information by farmers.

Table 13: Preferred source of information

	No.	%
Rural press	111	50.45
AgWA	88	40.00
Grower/ farmer groups	64	29.09
General magazines / Newspapers	56	25.45
Internet	41	18.64
Other farmers	41	18.64
Radio	39	17.73
Television	30	13.64
Field day/ demonstrations	24	10.91
University	17	7.73
Farm Advisors / consultants	15	6.82
Dealers/ industry reps	11	5.00
Seminars / conferences	8	3.64
Mail pamphlets	8	3.64
Industry bodies (e.g. AWB, CSBP)	3	1.36
Books	3	1.36
Other experts	3	1.36
Crop journals	2	0.91
Others	1	0.45

4. Conclusions and Implications

In general, farmer awareness about precision farming is high. However, understanding of the technology is low. The uptake of the technology is also relatively low. Costs seem to be the main impediment in the adoption of precision farming. The difficulties of understanding and applying the technology are also issues of concern to producers. Questions on the marginal benefit of adopting the technology also affect their decision to take up precision farming.

The challenge for industry is how to respond to these concerns. For the service sector, the challenge is to find ways on how to make it profitable for them and for the farmers. For researchers and scientists, there is a need for more and better information on

technical aspects of the use of precision farming. For instance, what are the appropriate crops and field/farm types for which precision farming will be suitable, viable and profitable. Here, experiments as well as field or on-farm trials under different agro-ecological conditions are needed. The accuracy of the technology is also an important issue. We also need to know the logistics of adopting. Studies on logistics and on-farm trials would be critical. Of equal concern is the economics of use and adoption. In this regard, benefit-cost analysis and other forms of economic analysis are needed. So are environmental impact studies.

Finally, concerns of farmers on lack of advice and technical support need to be addressed. This is an area where agricultural extensions can play a role.

Acknowledgments

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