FARMERS' RISK PERSPECTIVE ON ADOPTION OF LEGUME CROPS

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Summary. Western Australian wheatbelt farmers are being introduced to chickpeas, lentils, faba beans and albus lupins. Farmers' perceptions of the riskiness of these crops are likely to affect their adoption. This paper presents some survey findings concerning Western Australian farmers' perceptions of the riskiness of grain legumes. A majority of farmers interviewed believe that the current grain legumes, for neutral to alkaline soils, are harder to grow and are less profitable than wheat. When asked specifically about chickpeas, the average response was that this crop's yield is 51% less reliable and its profits are 44% less reliable. About 70% of farmers interviewed would want to wait between one and three years, and watch others in the district grow chickpeas, before they did. This paper shows only a subset of the of the survey data currently being analysed. The survey will be repeated again in 1996 and 1997.

INTRODUCTION

In 1993, Australia produced 1,950 kilo-tonnes of grain legumes consisting mainly of lupins (60%), field peas (20%) and chickpeas (8%). Australia also produces faba beans, cowpeas, lentils, peanuts, mung beans, navy beans and albus (Kiev) lupins. Western Australia, where nearly 80% of Australia's lupins are grown, produces less than 5% of all the other legume crops (1). Crops like chickpeas, lentils, albus lupins and faba beans are new to most West Australian farmers.

Farmers' attitudes toward these new crops are one of the main constraints to increasing the size of the industry (7, 8, 9). Wood *et al.* (9) identified production risk as one factor which influences farmers' decisions to adopt crops like chickpeas. Saha *et al.* (7) showed that perception of riskiness of an innovation influenced the degree of its adoption. Farmers vary in their attitudes toward risk and in their perception of riskiness of various enterprises (2, 3, 4). Feder (3) showed that the optimal allocation of land for new crops, in other words their adoption, declines with higher degrees of risk aversion. Lindner *et al.* (5) found that the time to adoption is directly related to farmers' pessimism about relative profitability of an innovation like a grain legume, and also directly related to their conservatism or the degree of conviction with which they hold this initial expectation.

There is currently little information on farmers' perception of grain legumes and how risky they perceive the yield and profitability of these crop to be. This paper shows some survey findings on how risky grain legumes are perceived to be by farmers in Western Australia. The survey was part of a project aimed at assessing farmers' risk attitudes and perceptions, the factors which change perceptions over time, the effect of risk on adoption behaviour, and finally how grain legumes could be managed to reduce risk.

METHODS

A survey of 120 farmers in the central, eastern and northern wheatbelt of Western Australia was conducted between February and March 1995. The farmers were selected at random from a mailing list of *On the pulse* newsletter, the official journal of the Grain Legume Association of Australia. To test for selection bias in our sample, we also chose at random a group of farmers who delivered wheat to the Wheat Board. A written questionnaire was filled out in a structured interview which consisted of questions on the following general topics:

• Age, experience, family/business structure, and prospects in farming;

• Farm resources, cropping and flock history, and pasture quality;

• Attitude towards risk, use of insurance, time and discount rate preferences;

• Agronomic and marketing knowledge, and experience with grain legumes;

• Current and previous adoption history and pattern;

• Perception of the riskiness of legume crops, and subjective yield and price distributions;

• Perception of the interactions of legume crops with other enterprises, and covariance relationships;

• Factors affecting adoption of grain legumes, including use of information.

RESULTS AND DISCUSSION

Table 1 shows farmer's response to the question, *For how many years would you need to see a new legume crop grow successfully in your area before you try the crop?* The results show that 23% would be the first to grow the new crop. This group is referred to by Rogers (6) as innovators. Sixteen percent said they would only need to see a single year demonstration of a new crop before attempting to grow the crop themselves. However, slightly more than half of the farmers would rather evaluate a crop by seeing other farmers' trials for between two to three years before they grow it themselves. A small proportion of farmers (7%) would base their adoption decisions on 4-5 years of trials by their peers. A few individuals (2%) would not grow the crop unless there were eight years of local farmer trial results on which they could base their adoption decisions. These may be called the *laggards* (6).

Table 1. Years that farmers wait, and watch others grow a new legume crop, before they do.

Years of observations	0	1	2	3	4	5	6	7	8
Percent of farmers	23	16	41	11	3	4	0	0	2

Farmers were asked to compare the profitability and ease of growing of legumes to wheat. In asking this question, we were aware that interactions between wheat and legume crops make direct comparison of the two crops difficult. However, farmers have the opportunity to plant wheat or other cereal for 3-5 years before switching to a legume alternative.

Table 2 shows that 72% of those interviewed said that legume crops were less profitable than wheat. As many as 51% said they were much less profitable, 20% said they were just as profitable and 8% said they were more profitable. When we asked the farmers to compare the technicalities of growing wheat to grain legumes a majority (75%) said that they found grain legumes harder to grow. Only 2% of the farmers said they found the legume crops easier to grow.

Table 2. Perception of profitability and ease of growing legume crops compared to wheat. (% of farmers in each category)

	Much less	Slightly less	Just as	Slightly more	Much more
Profitability	51	21	20	3	5
Ease of growing	27	48	23	1	1

We asked the farmers about their expectation of long-term average yields of legume crops. Table 3 shows their pooled responses and the coefficient of variation (c.v.). The yield is the mean of subjective estimate of yields of all the farmers. The coefficient of variation shows the standard deviation as a percentage of the mean, and hence the spread of variation in farmers' subjective yield estimates. For instance, the mean yield of faba beans from pooled survey data is 0.92 t/ha. This shows that in general farmers believe that faba beans will outyield the other legumes. However, a 42% c.v. for faba beans shows that there is also a wide range of responses about the yield of this crop. A handful of farmers think that the expected long-term average yield of faba beans is as low as 0.1 t/ha and some think that they can yield as high as 2 t/ha. On the other hand, the mean subjective yield for field peas is 0.87 t/ha, but the spread of subjective yields amongst farmers is 9% less than for faba beans. This could reflect the fact that, since field peas have been around longer, more farmers are likely to have either grown or seen others grow field peas. Conversely, farmers may have had little or no experience with a crop and their subjective yield estimates may be based solely on information from identical sources such as the media. In that case, the coefficient of variation of yields is also likely to be small.

Table 3. Expected long term average yield of legume crops.

Legume crop	Field pea	Chick pea	Faba bean	Lentil	Albus lupins
Expected yield (t/ha)	0.87	0.76	0.92	0.56	0.87
c.v.	33%	31%	42%	38%	32%

We also asked more specific information about a single legume crop in a particular part of the farm. Each farmer was asked to identify and describe the soil type, history and the area of a paddock which would be suitable for chickpeas but which had not had this crop grown on it previously. We requested actual or subjective estimates of the yields of various enterprises on this paddock. The farmer was then asked to rate the relative riskiness of chickpeas as compared to wheat on that paddock.

The mean of the responses shown in Table 4 indicate that farmers perceive chickpeas to be 51% more risky in yield, and 44% more risky in profit, compared to wheat. This was in response to the question; *If the risks associated with growing a wheat crop on this paddock can be shown by the length of a line drawn on the page, could you draw a line the length of which represents how risky you think chick peas are?*. There was a 31% spread around the mean for yield as indicated by the coefficient of variation in Table 4. However, the spread around the mean is much larger for farmers' responses to profit risk associated with chickpeas, as indicated by a coefficient of variation of 77%. This indicates the uncertainty and variation between farmers about the profitability associated with a *new* crop such as chickpeas.

Table 4. Subjective estimates of riskiness of yield and profit of chickpeas compared to wheat (%).

	Riskiness of yield	Riskiness of profit
Mean response	+51	+44
c.v. (%)	31	77

To obtain a more complete estimate of relative riskiness of chickpeas, we first determined each farmer's subjective estimates of the lowest yield, the long-term average yield, and the highest yield for chickpeas and wheat on a specified paddock. The farmer was given 20 counters (5 cent coins) with which to represent 20 seasons. The farmer was asked to distribute the counters on a scale of seven season types ranging from *Very good* to *Very poor* (Table 5). The number of counters placed on each season type represented their subjective probability distribution for the performance of wheat and chickpeas on that paddock.

A comparison of wheat and chickpea in Table 5 shows that farmers believed that the chance of getting below average seasons for chickpeas is likely to be higher than for wheat. In fact, the pooled mean of the sample suggests that farmers believe that in 14 years out of 20 their wheat yields will be average to above-average. It is interesting that the reverse is true for chickpeas. Differences in opinions between farmers is larger for chickpeas than for wheat. This is probably due to the fact that all farmers had a long history of growing wheat or seeing it grow in their area, but most had little or no experience with chickpeas.

Table 5. Subjective yield distributions for the performance of wheat and chick peas. (number of years out of 20)

	Very poor	Poor	Below average	Average	Above average	Good	Very good	Total
Wheat	1	2	3	5	4	3	2	20
c.v. (%)	56	37	29	28	23	30	52	
Chickpeas	2	3	4	5	3	2	1	20
c.v. (%)	62	34	28	34	37	44	52	

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