

PERCEPTIONS AND ATTITUDES TOWARDS INTEGRATED WEED MANAGEMENT IN THE INTENSIVE BROADACRE CROPPING REGION OF THE DARLING DOWNS IN SOUTHERN QUEENSLAND

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Summary Herbicide resistance, a major problem in many wheat growing areas of Australia, has so far not been a problem in the double cropping areas of the Darling Downs region of southern Queensland. This may be due to wide-spread adoption of an integrated weed management approach in this region. In order to test this hypothesis, a questionnaire concerning farming practices and perceptions on information regarding integrated weed management was mailed to 150 growers in an area of the Darling Downs region of southern Queensland which is suitable to double-cropping. The return rate was 47%. Some additional questionnaires were filled in by customers of merchandize outlets. The data collected confirm the assumption that integrated weed management is the general approach to weed control in double-cropping broad acre farming. However, herbicides are rated as the most important tool for weed, together with cultivation. Therefore, problems with herbicide resistance may occur in the future, especially if the cropping systems rely more on group A and B herbicides in the future.

INTRODUCTION

Herbicide resistance has become a major problem throughout Australia's wheat-growing areas (Powles *et al.* 1996). Sulfonylurea resistance has been confirmed for a population of climbing buckwheat in the south-west of the Darling Downs region of Queensland (S. Adkins, University of Queensland, personal communication). This population has developed in an area of extensive wheat growing with limited crop rotation. However, no herbicide resistance has been reported in the intensive double cropping region of the inner Darling Downs. It can be argued that intensive double cropping excludes the use of some sulfonylurea herbicides with long residual activity in alkaline soils, and that this prevents occurrence of resistance. However, the absence of herbicide resistance is most likely due to an integrated weed management approach, based on crop rotation or crop sequences, the use of herbicides with a differing modes of action, planting timing, planting density and cultivation. This assumption, however, may not be correct, and therefore, a one page questionnaire was distributed to farmers. The questions were concerned with attitudes towards weed management, perception of information

available, importance of weed control practices and research priorities.

MATERIALS AND METHODS

Design of questionnaire A concise questionnaire was designed which would fit on a standard A4 size sheet printed on both sides in a sufficiently large font to allow easy reading.

The questions included:

- Whether the grower was double-cropping regularly.
- Questions regarding the tillage regime and the type of weed control used when planting a crop.
- Rating the importance of various weed control measures.
- Indicating agreement or disagreement with statements pertaining to integrated weed control.
- Listing of sources of weed control advice and the value of these sources.
- Rating the quantity of information available in various disciplines pertaining to weed management, and rating the importance of pertinent research.

The questionnaire also asked to list difficult to control weeds.

Distribution and returns The questionnaire was mailed to 150 growers, most of whom are living in the Pittsworth shire south-west of Toowoomba. Within three weeks, 70 sheets were returned.

The questionnaire was also given to agronomists in selected merchandize outlets; of these, 15 were returned.

RESULTS

Farming systems and tillage The vast majority of respondents confirmed that they practised double cropping (Table 1). Most use several tillage methods and fallow weed control methods, depending on needs (Table 1, personal communications and comments). Roughly 12% do practice zero tillage, while equal numbers use conventional or conservation tillage (~25%). It is noteworthy that there was an apparent reluctance to tick the 'no' box in any of these questions. This probably reflects an unwillingness to subscribe to a rigid farming regime.

Importance of weed control measures Herbicides and cultivation were both regarded as equally important tools

for weed control, and were rated as most important. Crop choice, sequence or rotation were rated next, followed by planting density. Chipping was regarded as least important. The higher numbers among the higher ratings reflect the fact that many respondents did not user ratings below 3.

Table 1. Farming systems, tillage and fallow weed control measures as numbers of answers returned.

Question	Yes	No
Do you double-crop?	68	17
Do you practice:		
Conventional tillage?	22	8
Conservation tillage?	21	4
Zero tillage?	10	3
Mixture of all?	50	8
Is fallow weed control:		
Mechanical cultivation?	26	5
Knockdown herbicides only?	22	1
Knockdown plus residual?	7	2
Combination of above?	48	5

Table 2. Importance of weed control practices as total numbers from returned questionnaires. Ratings are 1 for most important, and 6 for least important. Equally important ratings with the same number were used in many returned questionnaires.

Method	Rating					
	1	2	3	4	5	6
Herbicides	54	18	9	1	1	0
Cultivation	54	18	10	1	0	0
Crop choice	19	36	17	7	2	0
Rotation	25	29	19	3	1	1
Plant density	5	20	17	9	7	4
Chipping	8	2	20	9	11	7

Table 3. Validation of statements regarding integrated weed management.

Statement	Yes	Neutral	No
Agronomists strongly support IWM	61	20	2
Herbicides are only part of weed control	81	2	1
I am familiar with herbicide mode of action classifications on the label	37	14	28
Most weed control is done post-emergence depending on need	38	13	30
There is no way to know which weeds can be expected in a paddock	17	2	62

The statement ‘Herbicides are only one part of weed control. Other methods are used regularly’ was almost totally endorsed (Table 3). A 73% majority agree that agronomists strongly support integrated weed management, and that recommendations are done based on paddock history and future use. The new herbicide classification, however, is not a familiar system as yet. Respondents are also fairly evenly agreeing and disagreeing with the statement that most weed control is done post-emergence depending on need. A three-quarter majority, however, reckons, that weeds can be predicted in a paddock. One quarter, however, say that there is no way to know which weeds can be expected. This was clarified in some personal interviews. It was pointed out that while most common weeds were readily predicted, there were always surprises, new weeds, and the odd unexpected weed emerging due to varying weather conditions.

Source of agronomic advice Most farmers get their advice from more than one source: Reseller staff was consulted by 55, consultants by 48, other farmers by 32, chemical company staff by 29, and government personnel by 22 respondents. As to the value of the advice, both consultants and reseller staff were very highly regarded, while other farmers, chemical company staff and government personnel were mostly seen as somewhat valuable (Table 4).

Table 5 shows the perception of information available on various aspects of farm management, which is pertinent to weed management. The answers in this section were more widely spread than with the more concise questions in the rest of the questionnaire. The majority, however, thought that there was a reasonable amount of information available on weed biology, crop biology, Planting density, the effect of the weather, cultivation, farm hygiene and profitability (Table 5). The information about long-term effects of herbicides and effects of soil type, however, was gauged as lacking.

Importance of research The fate of herbicides in plants and soils and economics of farming practices scored as most important research with 65 and 52% in the most

Table 4. Source of advice for weed management.

Source of advice	Value			
	High value	Some value	Slight value	Low value
Government	13	30	20	9
Consultants	44	15	8	2
Farmers	20	43	11	
Reseller staff	41	27	14	
Chemical Co. staff	26	31	15	1

important category, respectively (Table 6). Weed biology, Crop biology and plant breeding were regarded as of lesser importance. Again, the rating reflects the tendency by most respondents to regard most research as equally important.

DISCUSSION

Data reliability and bias The total number of grain growers in the shires of the Darling Downs with a potential for double cropping is 2600 (Australian Bureau of Statistics). However, the actual number is much smaller, since only areas with more than 700 mm average annual rainfall are suitable for intensive cropping, and the rain isohytes do not follow shire boundaries. Therefore, the mail-out was targeted at 150 growers in the Pittsworth shire and surrounds with a total grain grower population of 264 (Pittsworth shire) and probably a similar number in adjacent areas. The quantity of returned questionnaires (70, i.e. 47%) from the mail-out is satisfactory. However, this survey may be biased towards innovative growers, as most of the respondents rely on consultants and reseller agronomists for advice.

Table 5. Assessment of availability of information on various topics related to weed management.

Topic	Too much	Enough	Reason- able	Not enough	Nothing
Weed biology		23	33	24	4
Crop biology		21	40	23	
Planting density		24	40	20	1
Long term effect of herbicides		18	20	44	1
Soil		16	31	37	1
Weather		20	40	23	2
Cultivation		31	48	6	
Hygiene	1	29	33	22	
Profitability	2	25	32	24	1

Table 6. Importance of various research disciplines. Ratings in descending order. Equally important ratings with the same number were used in many returned questionnaires.

Topic	Importance				
	1	2	3	4	5
Weed biology	25	32	9	7	8
Crop biology	23	25	19	12	1
Fate of herbicides in plants and soil	47	22	10	5	
Plant breeding	22	24	19	4	9
Economics	41	14	11	6	7

Integrated Weed Management The assumption that most growers practice integrated weed management is corroborated by several sets of responses:

1. A vast majority use a combination of tillage methods and fallow weed control measures.
2. More than 96% agree that herbicides are only a part of weed control.
3. Herbicides and cultivation ranked equal as the most important weed control measures.

Nevertheless, the data should not lead to complacency, as there are some aspects which have the potential to lead to the development of herbicide resistance. Firstly, herbicides are clearly regarded as the most important tool for weed control. Currently, weed control relies on a broad variety of herbicides with different modes of action. However, as many new products belong to the 'high risk' classes A ('fops' and 'dims', inhibitors of acetyl-CoA-carboxylase) and B (inhibitors of aceto-lactate-synthase), it is of greatest importance to promote awareness regarding the mode of action grouping, and implement strategies aimed at avoiding herbicide resistance.

A major concern among the respondents was the fate of herbicides in the environment. The data suggest that this area is perceived as poorly understood and needing a greater research effort. It also demonstrates that the growers are concerned with the long-term viability of their farms.

Profitability also has a very high priority, which in no doubt reflects the need to remain a viable enterprise. The importance of this indicates an opportunity to further promote integrated weed management as a long-term, profitable farming practice.

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