ECONOMIC ASPECTS OF FALLOW HERBICIDE USE ON THE DARLING DOWNS

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Summary. Four wheat, one barley and two sorghum crops were grown on the Darling Downs during 1983 and 1984 using zero tillage, reduced tillage and mechanical tillage farming practices. Zero tillage had a higher fallow operating cost than reduced tillage at all sites. Gross margins for zero and reduced tillage crops were similar to those grown using mechanical tillage practices at some sites but were slightly lower at others. Labour and ownership costs were then subtracted from the gross margin to give a value termed total margin. Total margins for the three farming practices were similar at all sites. Reduced tillage practices are more likely to be adopted than zero tillage practices initially because of their lower fallow operating cost. Given the current trends for fuel, labour, machinery and herbicide prices, reduced and zero tillage practices are becoming more attractive options.

INTRODUCTION

Economic aspects of herbicide use in fallows in Queensland have received little attention from researchers so far. This paper examines the fallow operating costs, total costs, gross margins and total margins of four wheat, one barley and two sorghum crops grown during 1983 and 1984 at various locations on the Darling Downs using zero, reduced and mechanical tillage farming practices.

MATERIALS AND METHOD

Sites were selected to represent major cropping districts, soil types and typical weed populations. All sites were on slopes less than 2%. Plot size varied from 0.5 to 5.0 ha with 3 replicates at all sites except Dulacca which was unreplicated. The co-operating farmers used their own equipment and resources to manage plots. Advice on the use of herbicides was supplied by Monsanto Australia Limited. All management decisions were made by the farmers.

Prices for seed, chemicals, fertilizer and grain are current cash prices for 1984 supplied by local merchants. Machinery operating, ownership and labour costs are current and were supplied by Bloomfield (personal communication, 1984). Calculation of fallow operating costs, gross margins, total operating costs and total margins were made, using Apple's Multiplan programme.

RESULTS

Zero and reduced tillage practices resulted in the same number of fallow operations as mechanical tillage practices in all cases apart from zero till wheat Macalister, reduced till barley Dalby and zero till sorghum Dalby, where one less operation occurred (Table 1). The total amount of glyphosate used ranged from

0.45 to 0.76 kg ha^{-1} for a zero tillage summer fallow and 0.27 kg ha^{-1} to 0.45 kg ha^{-1} for a reduced tillage summer fallow. Yields of crops grown, using zero and reduced tillage practices were similar to those grown using mechanical tillage practices at all sites with the exception of Macalister (wheat) where they were slightly lower.

Fallow operating costs were highest for zero tillage practices followed by reduced tillage practices in all cases (Table 2). Fallow operating costs for mechanical tillage practices were considerably lower than for zero and reduced tillage practices at all sites. The difference between the mechanical tillage fallow operating cost and reduced tillage fallow operating cost at each site ranged from \$10.23 ha^{-1} to \$32.05 ha^{-1}.

Total fallow costs (operating, ownership and labour) for zero and minimum tillage practices were similar at each site. Total fallow cost for mechanical tillage practices were similar to those for zero and reduced tillage practices at some sites but lower at others. The differences between reduced tillage total fallow costs and mechanical tillage total fallow costs at each site ranged from \$4.66 ha^{-1} to \$18.54 ha^{-1}.

Gross margins (Return - total operating, chemical, fertilizer, seed costs) for zero and reduced tillage practices were slightly lower than those for full mechanical tillage practices at some sites, however total margins (Return - total operating, labour, ownership, chemical, fertilizer, seed costs) for the three systems were similar at all sites.

DISCUSSION

Lower than average rainfall occurred at all sites from early spring 1982 to late autumn 1983. Above average rainfall occurred from early winter 1983 to late summer 1984. These conditions resulted in what were considered a below average number of summer fallow operations and an above number of winter fallow operations. The similarity between yields of crops grown using zero, reduced and full mechanical practices was ascribed to the above average rainfall from early winter 1983 to late summer 1984. Ward (personal communication, 1984) reports that over a five year period, winter and summer crops grown in Southern Queensland using zero and reduced tillage practices have yielded higher than those grown using mechanical tillage practices.

Weed population density, species and herbicidal susceptibility varied considerably between sites. This affected fallow operating costs and to a lesser extent, total fallow cost. Variation in gross and total margins at each site depended to a large extent upon yield differences.

The majority of farms on the Darling Downs currently perceive mechanical tillage to be the most profitable crop production method. This perception is based primarily on a short term view which costs machinery on an operating basis and does not include an ownership cost for machinery or a labour cost. This study has shown them to be partly correct, however when a longer term view is taken which includes an ownership cost for machinery and a labour cost, zero and reduced tillage practices become more attractive. Farmers are more likely to adopt reduced tillage practices rather than zero tillage practices in the short term because of their lower fallow operating cost. They have the additional advantages of being a less radical change from existing practices and require less management expertise.

The cost of machinery has risen 250%, fuel 500%, labour 260% and chemicals 135% over the past 10 years (Carland, 1982). The future outlook is for stable chemical prices. Zero and reduced tillage practices will be advantaged over time if these trends continue. Changes in technology such as more efficient tillage or application methods will alter this situation.

LITERATURE CITED

Carland, D.J. (1982) National Agricultural Outlook Conf., Canberra 1982.

Table 1. A comparison of yield and fallow inputs for four wheat (w), one barley (b) and two sorghum (s) crops grown using zero (Z) reduced (R) and mechanical (M) tillage farming practices.

Location	Tara			Condamine			Dulacca			Macalister		
Rotation	w - w			w - w			w - w			w - w		
Tillage practice	Z	R	M	Z	R	M	Z	R	M	Z	R	M
Yield (t ha^{-1})	2.90	2.68	2.69	2.63	2.40	2.26	2.73	2.94	2.74	0.89	0.86	0.95
Fallow inputs												
Equipment use:												
(no. of operations)												
Heavy tillage [1]	-	-	1	-	1	1	-	-	1	-	1	1
Medium tillage [1]	-	2	1	-	1	1	-	-	-	-	1	2
Light tillage [1]	-	-	1	-	1	2	-	1	2	-	1	1
slashing	-	-	-	-	-	-	-	-	-	-	-	-
Boomspraying	3	1	-	4	1	-	3	2	-	3	1	-
Herbicide use:												
(total amount L ha^{-1})												
Glyphosate ($16.10 L^{-1}) [2]	1.25	1.25	-	1.6	0.75	-	2.1	1.35	-	2.0	0.75	-
Dicamba ($9.05 L^{-1})	1.0	-	-	-	-	-	-	-	-	1.0	0.5	-
2,4-D Amine ($2.80 L^{-1})	2.0	0	0	2.5	-	-	-	-	-	-	-	-
Picloram + 2,4-D [3]	-	-	-	-	-	-	-	-	-	-	-	-

Location	Dalby			Jimbour			Dalby		
Rotation	w - b			s - s			s - s		
Tillage practice	Z	R	M	Z	R	M	Z	R	M
Yield (t ha^{-1})	-	2.81	2.69	-	5.18	5.18	4.53	4.65	4.41
Fallow inputs									
Equipment use:									
(no. of operations)									
Heavy tillage	-	-	1	-	-	1	-	-	2
Medium tillage	-	-	2	-	-	1	-	1	1
Light tillage	-	1	1	-	3	2	-	1	2
Slashing	-	-	-	-	-	1	1	1	1
Boomspraying	-	2	-	-	2	-	3	2	-
Herbicide use:									
(total amount L ha^{-1})									
Glyphosate ($16.10 L^{-1}) [2]	-	1.0		-	2.5	-	2.0	2.0	-
Dicamba ($9.05 L^{-1})	-	-	-	-	-	-	0.9	0.5	-
2,4-D Amine ($2.80 L^{-1})	-	2.0	-	-	-	-	0.47	-	-
Picloram + 2,4-D [3]	-	-	-	-	-	-	0.47	-	-

1 Operating, labour and ownership costs ($ ha^{-1}) for heavy tillage were 5.50, 2.20, 4.90, for medium tillage were 4.00, 2.00, 4.90, for light tillage were 3.50, 1.00, 4.90, for slashing were 5.50, 2.50, 8.00 and for boomspraying were 1.65, 1.10, 1.40. [2] as Roundup (360 g L^{-1} glyphosate), [3] as Tordon 50-D

Table 2. A comparison or returns, fallow operating costs, gross margins, total fallow costs and total margins for four wheat, one barley and two sorghum crops grown using zero, reduced and mechanical tillage farming practices (ha^{-1}).

Location	Tara			Condamine			Dulacca			Macalister		
Rotation	w - w			w - w			w - w			w - w		
Tillage practice	Z	R	M	Z	R	M	Z	R	M	Z	R	M
Return	333	308	310	302	276	259	313	335	315	103	99	109
Fallow operating cost [1]	41.98	29.77	13.00	39.36	26.73	16.50	38.76	28.54	12.50	49.00	31.25	17.00
Gross margin [2]	240	229	247	218	206	200	231	262	259	-4	10	34
Total fallow cost [3]	46.28	46.87	32.80	46.86	46.53	39.60	46.26	39.34	31.20	56.50	53.55	43.70
Total margin	199	166	181	164	140	131	178	205	194	-57	-58	-38

Location	Dalby			Jimbour			Dalby		
Rotation	w - b			s - s			s - s		
Tillage practice	Z	R	M	Z	R	M	Z	R	M
Return	-	295	283	-	543	543	476	488	463
Fallow operating cost	-	30.16	17.00	-	54.05	22.00	58.33	53.03	27.50
Gross margin	-	176	179	-	395	427	340	357	359
Total fallow cost	-	48.36	43.70	-	71.95	55.50	71.73	78.53	53.00
Total margin	-	112	106	-	313	330	262	268	270

[1] Fallow operating cost — Cost of fuel, oil, repairs, maintenance and herbicides (see Table 1).
[2] Gross margin — Return - Total operating costs (i.e. Crop costs + Fallow costs).
Crop costs — Cost of fuel, oil, repairs, maintenance, herbicides, fertilizer and seed.
[3] Total fallow cost — Fallow operating cost plus labour and ownership costs.
Total margin — Return - (Total operating costs + total labour and ownership costs).