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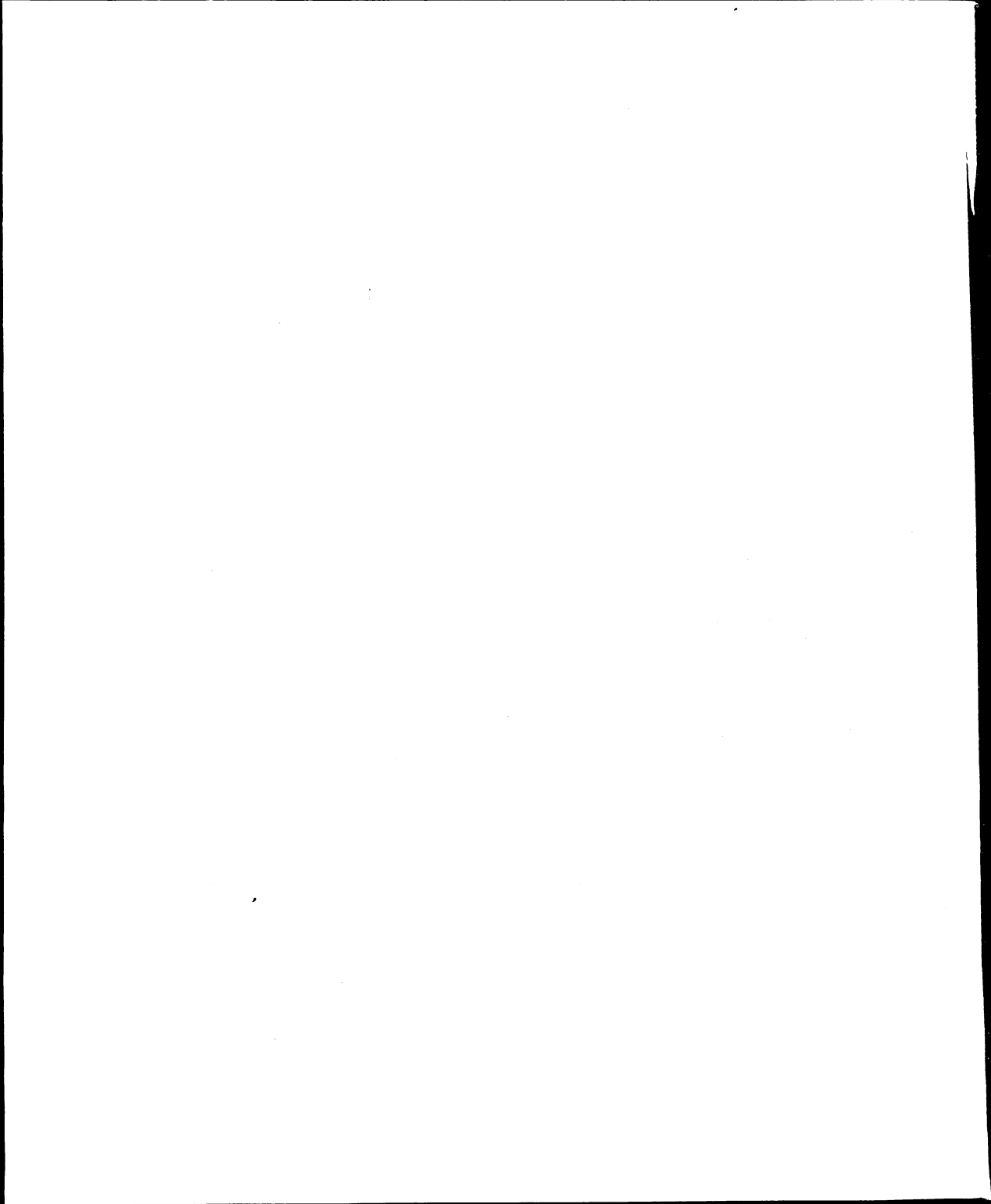
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The Place of Lucerne Production for Dehydration in Farming Systems of Mid-Canterbury

B.J.P. Ryde & W.A.N. Brown
Farm Management Papers 3





THE PLACE OF LUCERNE PRODUCTION
FOR DEHYDRATION
IN FARMING SYSTEMS OF MID-CANTERBURY

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To Fletcher Industries Limited, for their financial assistance to make this study possible.

SUMMARY

This study, conducted by the Farm Management Department, Lincoln College, investigated, solely on a financial basis, the place of irrigated lucerne production for dehydration in farming systems of Mid-Canterbury.

The results, covering a wide range of farm types in the Ashburton-Hinds area, and including properties on a variety of soil types, show that under present conditions, this type of production can be as profitable as the conventional farming system, and in some cases, more so.

If the advantages of reasonably guaranteed steady income, and lowered labour input with lucerne production for dehydration are considered at the individual farm level, this type of production may well be advantageous on many properties.

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CHAPTER I
LUCERNE PRODUCTION FOR DEHYDRATION
IN MID-CANTERBURY

1.1 The Mid-Canterbury District

(a) Area:

The Mid-Canterbury Plains of the Ashburton County lie between the Rakaia and Rangitata Rivers in the north and south respectively, and are bounded by the foothills in the west, some 35 miles from the coast.

From the coast to the foothills, there is a gradual rise across the Plains of approximately 30 ft. per mile.

(b) Climate:¹

Hot, dry summers with low humidity and cold winters characterise the climate. During the summer, temperatures often exceed 80°F, and strong north-west winds accentuate the dry conditions. From May to August there is little or no pasture growth, with frosts reaching a maximum of 19°F.

The mean annual rainfall for the Winchmore Irrigation Research Station, in the middle of the Plains area, is 31 inches per year and, while on average its distribution is quite uniform throughout the year, this can vary considerably from year to year.

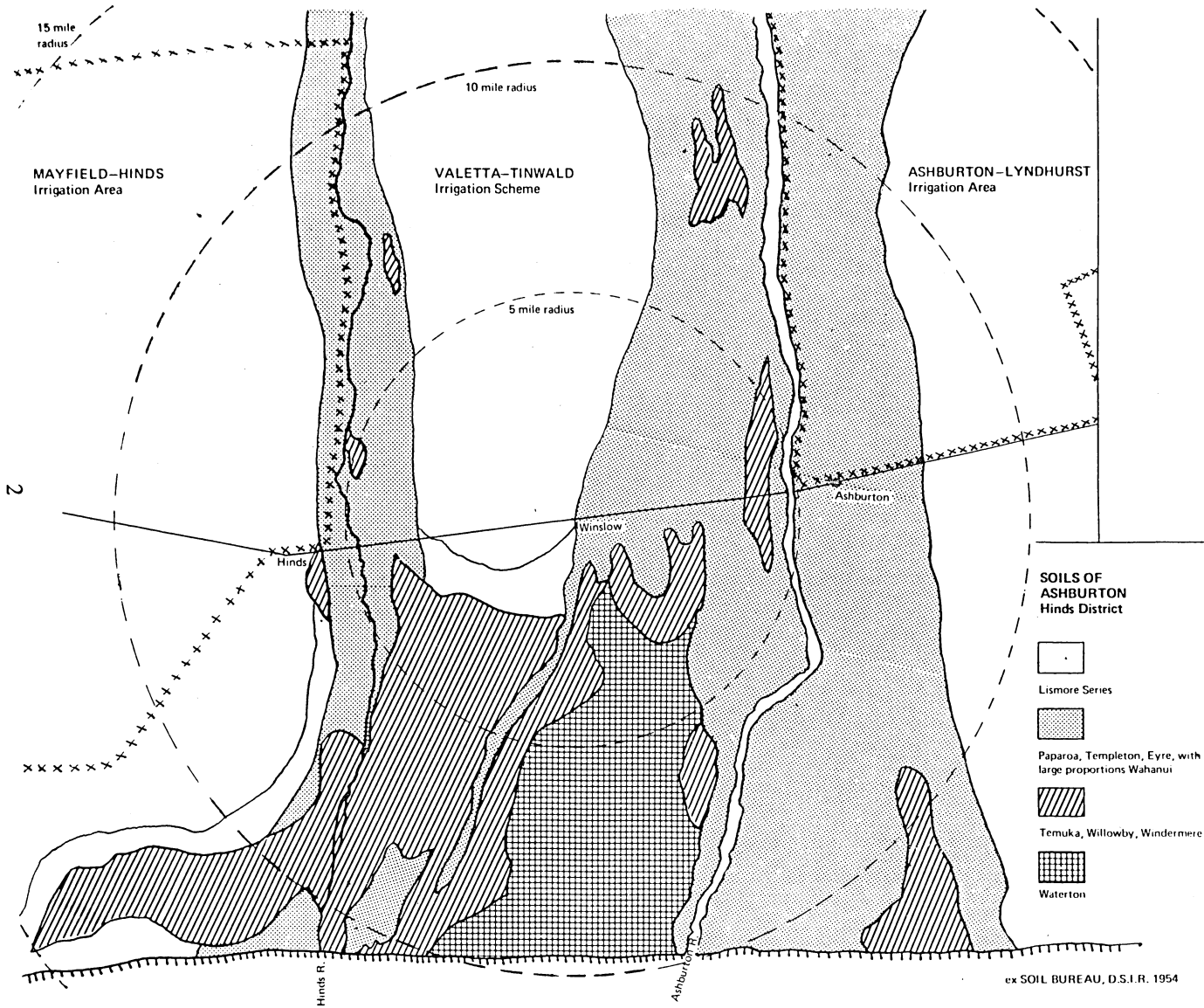
(c) Soils:

The soil types within the vicinity of the lucerne dehydration factories, at Hinds and Winslow, can be divided roughly into three types (Fig. 1.1).

The first is the light Lismore soil type with free to rapid drainage through the profile and prone to wind erosion. Cultivation accentuates the stoniness of the topsoil. Crops are likely to suffer from a seasonal moisture deficit at any time. The soils are strongly leached and have low phosphorus levels. Lismore soils are suited for irrigation, with the gentle relief and free drainage favouring border dyke irrigation.

The second slightly heavier, medium type soil lies along the banks of the Hinds and Ashburton Rivers, and comprises the Paparua, Templeton and Eyre

1. see Haslam, 1965



series, with a large proportion of the heavier Wakanui series.

Eyre, Templeton and Paparua soils are weak to moderately leached and generally suitable for a cropping programme. The Wakanui series is medium draining and friable, suited for intensive cropping and/or fat lamb farming. The well drained Waterton series can be included in this group.

The third, heavy type soils, are of the Temuka, Willowby and Windermere series. These soils are low lying and subject to seasonal flooding. Where there is sufficient fall, extensive drainage systems can realise the full cropping potential of these soils.

(d) Irrigation:

There are three major State irrigation schemes within the district, the Lyndhurst, Valetta and Mayfield-Hinds Irrigation Schemes.²

Scheme	Gross Area (acres)	Net Area (acres)	Border-Dyke Area (acres)
Mayfield-Hinds	85,000	44,000	1,360
Valetta	17,400	10,875	8,874
Lyndhurst	64,000	45,000	21,760

In addition to the area served by State schemes, there are a considerable number of areas where water is drawn from rivers, drains, or wells, in the majority for sprinkler irrigation. In particular there are over 60 plants operating in the Hinds drainage area.³

(e) Lucerne in Mid-Canterbury:

The Mid-Canterbury area is thus an ideal situation for lucerne growing. With free draining soils, adequate irrigation and careful management, high yields of lucerne should be possible.

1.2 Fletcher Industries Limited: Dehydrated Lucerne Division

Fletcher's have established a long term contract with Sumitomo Shoji Kaishua Limited, a Japanese Stock Food Importer and Manufacturing Company, for the supply of dehydrated lucerne pellets. Their target is a supply of

2. Fitzgerald, 1968

3. Lobb, 1968

30,000 tons of dry matter (D.M.) per annum which will require approximately 8,000 acres of lucerne.

The initial dehydrating plant of Fletcher's is sited at Winslow, six miles south of Ashburton, on State Highway No. 1. The lucerne is cut from the surrounding farms, dehydrated and pelleted at Winslow then railed to Timaru for export to Japan.

1.3 New Zealand Lucerne Products Limited

This company is aimed at supplying, in the main, the local market with dehydrated lucerne. The dehydrator is sited just out of Hinds, 13 miles south of Ashburton and approximately 8 miles from Fletcher's plant.

In 1970 Fletcher Industries' bought up 50% of New Zealand Lucerne Products limited shares.

1.4 Supply of Lucerne to the Factory

The grower agrees to provide access to the lucerne, and, in the case of full season contracts, to make the lucerne available for cutting between 15th October and 15th April in each season. He must keep stock off the lucerne during that period, and for one month prior to it.

A representative of the company may enter and inspect the crop, and will decide the exact time when the lucerne should be cut.

The company is entitled to reject any crop which does not meet its requirements. This may occur where there are excessive weeds or stones.

The lucerne is cut and transported at the expense of the company concerned, and once cut, it belongs to the company. Up till then, it is at the sole risk of the grower.

The payout is based on dryweight, which is defined as zero moisture. Trucks are weighed in and out, and a stamped docket for moisture percentage goes with each load.

If a crop has to be by passed due to pressure of harvest, the company will take hay from the paddock concerned.

CHAPTER II

PROFITABILITY IN ALTERNATIVE MANAGEMENT SYSTEMS

In this study, the profitability of incorporating lucerne for dehydration in four distinct irrigated farming systems of Mid-Canterbury is explored. They are—

- (i) The small unit on Lismore soils.
- (ii) The average size unit on Lismore soils.
- (iii) The small unit on 'medium' soils.
- (iv) The intensive cropping unit on 'heavy' soils.

2.1 Small Unit on Lismore Soils

On Lismore type soils, lucerne production under border dyked irrigation competes with sheep and possible limited cropping in the renewal programme.

An analysis of the farm areas in the three main irrigation schemes on Lismore soils, shows the high number of the small marginal farms. (See Table 1)

Lyndhurst Irrigation Scheme — 58 farms, with an average farm area of 554 acres. 12% of the farms have areas less than 300 acres, and 40% less than 400 acres, with total acreage 1907 and 7793 acres respectively.

Mayfield-Hinds Irrigation Scheme — 138 farms, with an average farm area of 550 acres. 14.5% of the farms have areas less than 300 acres, 27.0% less than 400 acres, with total acreage 3900 and 10,000 acres respectively.

Valetta Irrigation Scheme — A settlement area of 8,000 acres comprising 24 units of 330 acres, with 200 acres border-dyked.

Table 1

A. Lyndhurst Irrigation Scheme

Lismore Soil

Number of farms - 58

Average farm area - 554 acres

Acreage	Number	%	%	Cumulative Acreage
50 - 200	0	-	-	-
201 - 300	7	12	12	1907
301 - 400	16	28	40	7793
401 - 500	11	19	59	-
501 - 550	3	5	64	-
551 - 600	2	3.5	67.5	-
601 - 700	6	10	77.5	-
701 - 800	2	3.5	81	-
> 800	11	19	100	-
	58			

B. Mayfield-Hinds Irrigation Scheme

Lismore Soil

Number of farms – 138

Average farm area – 550

Acreage	Number	%	%	Cumulative Acreage
< 200	12	8.7	—	—
201 – 300	9	6.5	15.2	3,900
301 – 400	17	12.3	27.5	10,027
401 – 500	33	24	51.5	—
501 – 550	16	11.5	63.0	—
551 – 600	9	6.5	69.5	—
601 – 700	14	10.2	79.7	—
701 – 800	8	5.8	85.5	—
> 800	20	14.5	100.0	—

138

The Appendix, A1, gives a detailed budget of a typical 300 acre unit in the Valetta Scheme with 200 acres border-dyked. The general management practices of the district are used, and average production yields and prices:-

(a) Physical Coefficients – A1

- (1) Effective Area: 300 acres
- (2) General Farm Policy: Romney ewe flock, selling fat lambs and 1 and 2 year ewes.
- (3) Irrigation: 200 acres border-dyked.
- (4) Stock Policy: Ewe flock, breeding own replacements, selling cull ewe hoggets, 1 and 2 year ewes, and wool. 822 ewes to Romney ram, remainder to fat lamb sire.

Ewe Numbers:	1430 m.a.
Total Stock Units:	1639
Lambing % S to S:	110
Average Wool Weight:	10.5 lb

- (5) Rotations:
- Irrigated: 200 acres: 8 year pasture life
22 acres Old Grass – Turnips – New Grass
 - Dry: 100 acres: One half in pasture, one half in lucerne.
Renewal programme through a root crop. Six year stand life.
7 acres Old Grass – Turnips – New Grass
7 acres Old Lucerne – Turnips – New Lucerne

- (6) Spring Caring Capacity:
- Irrigated Pasture: 9 e.e./acre
 - Dry Pasture: 5 e.e./acre

(b) Financial Performance – A1

(1) Total Capital Involved		\$48,180
(2) Income:		
Sheep	7,920	
Wool	4,224	
Total		12,144
(3) Expenditure:		
Wages—Manager	2,370	
Fertiliser	1,345	
Water Charge	405	
Other Farm Expenses	3,090	
Administration & Interest	2,685	
Stock Purchases	165	
Total Farm Expenditure		10,060
(4) Cash Farm Surplus		2,084
Non Farm Income		—
Total Disposable Cash		2,084

Appendix A2 considers the financial performances of the same property with the total bordered area in lucerne for dehydration, and the 'dry' area carrying a two year ewe flock:-

(a) Physical Coefficients – A2

- (1) Effective Area: 300 acres
- (2) General Farm Policy: All bordered area in lucerne for dehydration and, of the remainder, one half in grass, one half in lucerne, carrying a 2 year ewe flock. Reduced labour input necessary, leaving 20 hours/week available to the manager for a part-time job.
- (3) Irrigation: 200 acres border-dyked
- (4) Stock Policy: 2 year ewe flock to fat lamb sire, selling fat lambs, c.f.a. ewes and wool.

Ewe Numbers:	500
Total Stock Units:	508
Lambing % S to S:	110
Average Wool Weight:	10.0 lb
- (5) Rotations:

Irrigated:	200 acres: 6 year stand life
	28 acres Old Lucerne – Turnips – New Lucerne
Dry:	As for A1
- (6) Yields:

Irrigated Lucerne:	4 cuts at an average of 1¼ tons, giving
	5 tons/season.

(b) Financial Performance – A2

(1) Total Capital Involved		\$41,240
(2) Income:		
Sheep	3,488	
Wool	1,200	
Lucerne	8,600	
Total		13,300
(3) Expenditure:		
Wages—Manager	1,450	
Fertiliser	2,510	
Water	420	
Other Farm Expenses	1,940	
Administration & Interest	2,225	
Stock Purchases	1,630	
Total Farm Expenditure		10,175
(4) Cash Farm Surplus		3,125
Non Farm Income (off-farm employment)		1,000
Total Disposable Cash		4,125

Since there are only 84 acres of cultivation, 400 ewes, and the automatic borders to attend, the labour input in A2 is much reduced as compared with A1. Thus, off-farm employment is possible, at around 20 hours/week. The farm manager's income in the two budgets is:

	A1	A2
	\$	\$
On-farm work	1,880	1,040
Management	490	410
Off-farm work	—	1,000
	2,370	2,450

The actual difference in the manager's income between the two systems really depends, in practice, on the type of off-farm employment taken. However, in this situation, their total incomes are similar.

However, there is an advantage of \$830 in the Cash Farm Surplus from a swing to having lucerne for dehydration as the major farm enterprise.

An analysis of the two budgets shows that, on the income side, the reduction in income from sheep and wool sales is more than compensated by the gain from lucerne production. However, the expenditure with the two systems varies little, for in the second budget with lucerne production, the drop in labour and running expenses is balanced by a rise in fertiliser application and stock purchases.

2.2 Average size unit on Lismore Soils

Appendices A3 and A4 show detailed financial budgets of an average size – 550 acres effective – unit on Lismore soils under the normal management system, and with the bordered area converted to lucerne production for dehydration respectively.

(a) Physical Coefficients – A3

- (1) Effective Area: 550 acres
- (2) General Farm Policy: Romney ewe flock breeding own replacements, selling fat lambs and 1 and 2 year ewes. Limited cropping in pasture renewal programme.
- (3) Irrigation: 150 acres border-dyked
- (4) Stock Policy: Ewe flock, breeding own replacements, selling fat lambs, cull ewe hoggets, 1 and 2 year ewes, and wool.
900 ewes to Romney ram, remainder to fat lamb sire.
Ewe Numbers: 1800 m.a.
Total Stock Units: 2000
Lambing % S to S: 105
Average Wool Weight: 10.5 lb
- (5) Rotations:
Irrigated: 150 acres: 8 year pasture life.
15 acres Old Grass – Turnips – Wheat – New Grass
Dry: 400 acres: 6 year pasture life.
41 acres Old Grass – Turnips – Wheat – New Grass
7 acres Old Lucerne – Turnips – Wheat – New
Lucerne

(6) Spring Carrying Capacity:		
Irrigated Pasture:	9 e.e./acre	
Dry Pasture:	5 e.e./acre	
(7) Yields:	Wheat at 40 bushels/acre	
(b) Financial Performance – A3		
(1) Total Capital Involved		\$85,945
(2) Income:		
Sheep	9,380	
Wool	5,570	
Crop	3,100	
Total		18,050
(3) Expenditure:		
Wages – Manager	2,735	
– Casual	720	
Fertiliser	2,420	
Water Charge	650	
Other Farm Expenses	5,230	
Administration &		
Interest	4,495	
Stock Purchases	210	
Total Farm Expenditure		16,460
(4) Cash Farm Surplus		1,590
Non Farm Income		–
Total Disposable Cash		1,590

For a similar property, with the bordered area in lucerne for dehydration as in A4, the bordered area has been increased from 150 to 200 acres.

(a) Physical Coefficients – A4

- (1) Effective Area: 550 acres
- (2) General Farm Policy: Bordered area increased to 200 acres and in lucerne for dehydration. Last years growth (year 7) is grazed.
Ewe flock reduced to one man unit – no casual labour required.
- (3) Irrigation: 200 acres border-dyked
- (4) Stock Policy: Romney ewes, breeding own replacements, selling fat lambs, cull ewe hoggets, 1 and 2 year ewes, and wool.
Ewe Numbers: 1200 m.a.
Total Stock Units: 1373
Lambing % S to S: 105
Average Wool Weight: 10.5 lb
- (5) Rotations:
Irrigated: 200 acres: 7 year stand life.
29 acres Old Lucerne – Turnips – New Lucerne
year 1 – 6 for dehydration
year 7 grazing
Dry: 350 acres: 6 year stand life.
44 acres Old Grass – Turnips – Wheat – New Grass
- (6) Yields: Wheat at 35 bushes/acre
Lucerne: 4 cuts at 1½ tons/cut
average making 6 tons/season.

(b) Financial Performance – A4

(1) Total Capital Involved		\$82,125
(2) Income:		
Sheep	6,630	
Wool	3,680	
Lucerne	8,520	
Wheat	1,925	
Total		20,755

(3) Expenditure:		
Wages – Manager	2,695	
Fertiliser	3,200	
Water Charge	865	
Other Farm		
Expenses	4,165	
Administration &		
Interest	4,345	
Stock Purchases	140	
Total Farm Expenditure		15,410
(4) Cash Farm Surplus		5,345
Non Farm Income		—
Total Disposable Cash		5,345

For this farming system, there is a definite financial advantage in lucerne production for dehydration—in this case, a gain of \$3,755 in Cash Farm Surplus.

The income in A4 is \$2,700 greater due to a swing to lucerne, and, in addition, the saving in labour and general farm expenses exceeds the additional cost of fertiliser.

2.3 Small Cropping Unit under Spray Irrigation

Appendices A5 and A6 show the financial performance of a 180 acre cropping unit on medium-heavy soil under spray irrigation. Again, a typical present management pattern is budgeted in A5, while A6 shows the alternative with emphasis on lucerne for dehydration and cropping in the renewal programme. As before, the lucerne system has a reduced labour input, and opportunity for off-farm employment.

(a) Physical Coefficients – A5

- (1) Effective Area: 180 acres
- (2) General Farm Policy: Intensive cropping rotation with spray irrigation and complementary 2 year ewe flock to fat lamb sire.
- (3) Irrigation: All spray irrigated – hand move system.

(4) Stock Policy: 2 year ewe flock selling fat lambs, c.f.a. ewes and wool.

Ewe Numbers:	400
Total Stock Units:	406
Lambing % S to S:	110
Average Wool Weight:	10.0 lb

(5) Rotations:

Irrigated: 180 acres:
26 acres Old Grass – Linseed – Wheat – Peas
– New Grass – H1 – White Clover – 2 year Pasture

(6) Effective Carrying Capacity on Spring grazing: 8 s.u./acre

(7) Yields: Wheat at 55 bushels
Linseed at 25 cwt
Peas at 45 bushels
H1 at 45 bushels
White Clover at 1.5 bags

(b) Financial Performance – A5

(1) Total Capital Involved \$92,240

(2) Income:

Sheep	2,770
Wool	970
Crop	9,160

Total 12,900

(3) Expenditure:

Wages – Manager	2,795
– Casual	420
Fertiliser	850
Water & Irrigation	360
Other Farm Expenses	3,255
Administration & Interest	4,690
Stock Purchases	1,275

Total Farm Expenditure 13,645

(4) Cash Farm Deficit	\$	745
Non Farm Income		—
Total Disposable Cash	-\$	745

Appendix A6 shows the system converted to lucerne production for dehydration. A tow-a-line spray irrigation system is used on the lucerne, and since the labour input is low, all labour is charged at contract rates, leaving the manager the opportunity of alternative employment.

(a) Physical Coefficients – A6

- (1) Effective Area: 180 acres
- (2) General Farm Policy: Emphasis on lucerne production for dehydration under tow-a-line spray irrigation.
No stock.
- (3) Irrigation: All spray irrigated
- (4) Stock Policy: No stock
- (5) Rotations:
Lucerne renewal programme. Stand life of 6 years
20 acres Linseed – Wheat – Peas – Lucerne
- (6) Yields: Lucerne at 7 tons with mature lucerne
Wheat at 55 bushels
Linseed at 25 cwt
Peas at 45 bushels

(b) Financial Performance – A6

(1) Total Capital Involved		\$84,250
(2) Income:		
Lucerne	7,200	
Crop	4,555	
Total		11,755
(3) Expenditure:		
Wages—Manager	840	
—Casual	480	
Fertiliser	1,845	
Water & Irrigation	700	
Other Farm Expenses	3,515	
Administration & Interest	4,170	
Total Farm Expenditure		11,550
(4) Cash Farm Surplus		205
Non Farm Income (30 hrs/wekk)		1,500
Total Disposable Cash		1,705

Since off-farm employment is possible with a lucerne system, the managers receive –

	A5	A6
On-farm Work	1,872	–
Management	923	840
Off-farm work	–	1,500
	\$2,795	\$2,340

although, as with the small unit on Lismore soils, the actual difference depends on the type and extent of off-farm employment.

There is, between the two types, an advantage in the Cash Farm Surplus of \$950 in favour of the lucerne system. This is mainly due to the significant decrease in farm expenses with a lucerne system, together with the reduced labour input, two factors which could be of great significance in particular farm situations.

2.4 Intensive Cropping Unit

e.g. Farms on soils: Wakanui, Temuka, Willowby, Windermere series.

Due to drainage problems on heavy soil types, only a proportion of the farm could be devoted to lucerne production. These are the higher areas, not liable to seasonal flooding from a fluctuating water table.

To evaluate then, the profitability of the alternative systems of management on these areas, gross margins analysis is used.

Gross margins per acre, equal the gross revenue less the direct costs. It is therefore the amount contributed to the meeting of costs which are fixed in the short term, and to profit. They do not take account of such basic considerations as the husbandries, labour and machinery availability, personal preferences, risk and uncertainty etc.

It is essential to note, that although the labour input per annum under commercial lucerne production and a cropping programme is very similar, lucerne under spray irrigation has a high relative labour input in the summer period. It is in this period that a mixed cropping farm has its labour fully extended, and the extra requirements for labour for spray irrigated lucerne during this time must be carefully evaluated on each property.

Appendix B details a comparison of –

- (a) Lucerne production for dehydration
 - (b) Conventional cropping programme,
- and (c) Lucerne production for sale of hay –
using gross margins as a measure of profitability.

The results are summarised below.

(1) Lucerne Production for Dehydration:

	Dry	Irrigated
Production (lb D.M./acre)	12,000	18,000
Stand Life	6 year	6 year
Gross Margin/acre (\$)	39.70	61.70

(2) Conventional Cropping Programme:

Rotation:

Old Grass – Wheat – Wheat – Peas – New Grass – H1 – White
Clover – 1 year Grazing

	Dry	Irrigated
Gross Marging/acre (\$)	39.85	61.20

(3) Lucerne Production for Hay Sale:

	Dry	Irrigated
Gross Margin/annum		
at 50c/bale	35.50	62.80
at 60c/bale	52.50	87.80

In financial terms then, all three systems are equivalent, given the yields and prices used. However, large variations in income can occur from a cropping programme with changes in the market. Also, when calculating the gross margin of lucerne production for hay sale, it is assumed that all the available production can be harvested and, climatically, this is unlikely. A loss of only 20 bales/acre/annum can mean a \$10 change in gross margin, whereas, with lucerne production for dehydration, a reasonably assured and steady income is provided.

CHAPTER III

EVALUATION OF YIELD AND PRICE VARIATION EFFECTS

Tabulated below is the effect of changes in the major yields and prices used, on the cash farm surplus of the farming systems studied.

(a) Price

Item	Price	Price	Variation in Income					
	Used	Variation	A1	A2	A3	A4	A5	A6
	\$	\$						
Fat Lambs	5.25	1.00	1121	550	1417	990	440	—
2 year Ewes	4.50	1.00	250	—	318	216	—	—
Wool	0.24	0.06	1056	300	1392	920	243	—
Lucerne	10.00	1.00	—	860	—	852	—	720

(b) Yield

	Change						
Lucerne	0.1 tons/cut	—	688	—	568	—	500

These emphasise the dependence of the results given on the parameters assumed. It must be stressed that until more research work, and work at the farm level, is undertaken with growing lucerne commercially, production figures and fertiliser requirements are not truly predictable.

Also, these comparative budgets do not show properly the advantages of commercial lucerne production in terms of labour saving and risk aversion. The size of the labour input to a farm may be markedly reduced, with just a small swing to lucerne production, at no detrimental effect on profit. The knowledge of an assured and steady income, which can result from lucerne for dehydration under irrigation, can also allow long term farm planning to an extent not possible with the normal farming system and fluctuating market conditions.

CHAPTER IV

SUMMARY AND CONCLUSIONS

While these results do not show that commercial lucerne production for dehydration is more profitable than the conventional farming systems in all cases studied, they show that this crop has a definite place in farming in Mid-Canterbury.

Where fluctuating markets can mean a large annual variance in farm income; where the farmer wishes to reduce the labour requirement of his unit; and where an easily managed and comparatively profitable crop is desired; commercial lucerne production has a place.

With an export market assured, and the returns to the farmer guaranteed this type of production could be included in many farm programmes.

APPENDIX A1

	Unit	Price/ Unit	\$	\$	\$
Capital Involved					
Land & Buildings				34,000	
Stock				8,845	
Plant				3,450	
Working Capital				1,885	
Total Capital Involved:					48,180
Income					
Sheep:					
Old Ewes	250	4.50	1,125		
Cull hgts	130	7.00	910		
Fat lambs	1121	5.25	5,885		
				7,920	
Wool	17600lb @ 24c net			4,224	
Lucerne				—	
Wheat				—	
Linseed				—	
Peas				—	
H1				—	
White Clover				—	
Cash Farm Income					12,144
Expenditure					
Wages—Manager			1,880		
—Casual			—		
—Management			490		
				2,370	

	Unit	Price/ Unit	\$	\$	\$
Fertiliser – Lucerne					
– Other incl. Lime				1,345	
Water				405	
Animal Health			265		
Cash Cropping Expenses			–		
Cultivation			220		
Electricity			100		
Feed & Baling			500		
Seed			220		
Shearing			480		
Weed & Pest Control			470		
Repairs & Maintenance			525		
Vehicle Expenses			310		
				3,090	
Administration			155		
Insurance			30		
Rates			200		
Interest – 50% Land & Bldgs on 25 year T.M. 6½% on Stock, Plant, Wkg Cap.			2,300		
				2,685	
Stock Purchases – 5 rams				165	
Total Cash Farm Expenditure					10,060
Cash Farm Surplus					2,084
Non-Farm Income					nil
Total Disposable Cash					2,084

APPENDIX A2

	Unit	Price/ Unit	\$	\$	\$
Capital Involved					
Land & Buildings				34,000	
Stock				2,540	
Plant				3,120	
Working Capital				1,580	
Total Capital Involved					41,240
Income					
Sheep					
Old Ewes	240	2.50	600		
Cull hgts	—				
Fat lambs	550	5.25	2,888		
				3,488	
Wool	5000 lb	24c net		1,200	
Lucerne	5 tons/ac	\$10	172 acres	8,600	
Wheat				—	
Linseed				—	
Peas				—	
H1				—	
White Clover				—	
Cash Farm Income:					13,300
Expenditure					
Wages—Manager			1,040		
—Casual			—		
—Management			410		
				1,450	

	Unit	Price/ Unit	\$	\$	\$
Fertiliser – Lucerne	4.5 cwt	Luc. mix	1,220		
Other incl. Lime			1,290		
				2,510	
Water				420	
Animal Health			75		
Cash Cropping Expenses			–		
Cultivation			280		
Electricity			100		
Feed & Baling			–		
Seed			285		
Shearing			140		
Weed & Pest Control			270		
Repairs & Maintenance			500		
Vehicle Expenses			290		
				1,940	
Administration			155		
Insurance			30		
Rates			200		
Interest			1,840		
				2,225	
Stock Purchases –					
5 yr ewes	260	6	1,560		
Rams	2	35	70		
				1,630	
Total Cash Farm Expenditure:					10,175
Cash Farm Surplus					3,125
Non-Farm Income: 20 hours/week					1,000
Total Disposable Cash					4,125

APPENDIX A3

	Unit Unit	Price/ Unit	\$	\$ \$	\$
Capital Involved					
Land & Buildings				66,250	
Stock				11,115	
Plant				4,480	
Working Capital				4,100	
Total Capital Involved:					85,945
Income					
Sheep					
Old Ewes	318	4.50	1,431		
Cull hgts	73	7.00	511		
Fat lambs	1417	5.25	7,439		
					9,380
Wool	23,205 lb 24c net			5,570	
Lucerne				—	
Wheat	63 acs 40b 1.25			3,100	
Linseed				—	
Peas				—	
H1				—	
White Clover				—	
Cash Farm Income:					18,050
Expenditure					
Wages—Manager			1,873		
—Casual			720		
—Management			862		
				3,455	

	Unit	Price/ Unit	\$	\$	\$
Fertiliser – Lucerne					
Other incl. Lime			2,420		
Water				650	
Animal Health			335		
Cash Cropping Expenses			790		
Cultivation			150		
Electricity			120		
Feed & Baling			395		
Seed			560		
Shearing			620		
Weed & Pest Control			875		
Repairs & Maintenance			600		
Vehicle Expenses			785		
				5,230	
Administration			185		
Insurance			40		
Rates			400		
Interest			3,870		
				4,495	
Stock Purchases – 6 rams at \$35				210	
Total Cash Farm Expenditure					16,460
Cash Farm Surplus					1,590
Non-Farm Income					–
Total Disposable Cash					1,590

APPENDIX A4

	Unit	Price/ Unit	\$	\$	\$
Capital Involved					
Land & Buildings				66,250	
Stock				7,485	
Plant				4,480	
Working Capital				3,910	
Total Capital Involved:					82,125
Income					
Sheep:					
Old Ewes	216	4.50	972		
Cull hgts	66	7.00	462		
Fat lambs	990	5.25	5,196		
				6,630	
Wool	15,330 lb	24c net		3,680	
Lucerne	6 tons/ac	\$10		8,520	
Wheat	44 ac.	35b \$1.25		1,925	
Linseed				—	
Peas				—	
H1				—	
White Clover				—	
Cash Farm Income:					20,755
Expenditure					
Wages—Manager			1,872		
—Casual			—		
—Management			823		
				2,695	

	Unit	Price/ Unit	\$	\$	\$
Fertiliser – Lucerne	4.5 cwt	Luc. Mix	956		
Other incl. Lime			2,244		
				3,200	
Water				865	
Animal Health			220		
Cash Cropping Expenses			615		
Cultivation			290		
Electricity			120		
Feed & Baling			–		
Seed			595		
Shearing			405		
Weed & Pest Control			710		
Repairs & Maintenance			600		
Vehicle Expenses			610		
				4,165	
Administration			185		
Insurance			40		
Rates			400		
Interest			3,720		
				4,345	
Stock Purchases – Rams 4 at \$35				140	
Total Cash Farm Expenditure					15,410
Cash Farm Surplus					5,345
Non-Farm Income					–
Total Disposable Cash					5,345

APPENDIX A5

	Unit	Price/ Unit	\$	\$	\$
Capital Involved					
Land & Buildings				75,000	
Stock				2,000	
Plant				10,845	
Working Capital				4,395	
Total Capital Involved					92,240
Income					
Sheep:					
Old ewes	185	2.50	463		
Cull hgts	—				
Fat lambs	440	5.25	2,310		
				2,770	
Wool		4050 lb 24c net		970	
Lucerne					
Wheat	1414b.	1.45	2,049		
Linseed	32.1	68.00	2,183		
Peas	1157b.	1.40	1,618		
H1	1157b.	1.80	2,081		
White Clover	38.6	\$32.00	1,232		
				9,160	
Cash Farm Income					12,900
Expenditure					
Wages—Manager			1,872		
—Casual			420		
—Management			923		
				3,215	

	Unit	Price/ Unit	\$	\$	\$
Fertiliser – Lucerne					
Other incl. Lime				850	
Water & Irrigation				360	
Animal Health			60		
Cash Cropping Expenses			1,025		
Cultivation					
Electricity			120		
Feed & Baling			180		
Seed			435		
Shearing			115		
Weed & Pest Control			–		
Repairs & Maintenance			720		
Vehicle Expenses			600		
				3,255	
Administration			200		
Insurance			35		
Rates			400		
Interest			4,055		
				4,690	
Stock Purchases –					
5 yr ewes	205	6	1,230		
Rams			45		
				1,275	
Total Cash Farm Expenditure					13,645
Cash Farm Surplus				Deficit	745
Non-Farm Income					–
Total Disposable Cash				Deficit	745

APPENDIX A6

	Unit	Price/ Unit	\$	\$	\$
Capital Involved					
Land & Buildings				75,000	
Stock				—	
Plant				6,000	
Working Capital				3,250	
Total Capital Involved					84,250
Income					
Sheep:					
Old Ewes					
Cull hgts					
Fat lambs				—	
Wool					
Lucerne	720t.	\$10		7,200	
Wheat	1100b.	1.45	1,595		
Linseed	25t.	68.00	1,700		
Peas	900b.	1.40	1,260		
H1					
White Clover					
				4,555	
Cash Farm Income					11,755
Expenditure					
Wages—Manager			—		
—Casual			480		
—Management			840		
				1,320	

	Unit	Price/ Unit	\$	\$	\$
Fertiliser – Lucerne 6 cwt Luc. Mix			1,243		
Other incl. Lime			602		
				1,845	
Water & Irrigation				700	
Animal Health			–		
Cash Cropping Expenses			960		
Cultivation			800		
Electricity			120		
Feed & Baling			–		
Seed			475		
Shearing			–		
Weed & Pest Control			–		
Repairs & Maintenance			775		
Vehicle Expenses			385		
				3,515	
Administration			200		
Insurance			35		
Rates			400		
Interest			3,535		
				4,170	
Stock Purchases				–	
Total Cash Farm Expenditure					11,550
Cash Farm Surplus					205
Non-Farm Income	30 hours/week				1,500
Total Disposable Cash					1,705

APPENDIX B

GROSS MARGINS ANALYSIS OF INTENSIVE CROPPING FARM AND OF LUCERNE PRODUCTION FOR DEHYDRATION AND HAY SALE

Intensive Cropping Rotation

Old Grass – Wheat – Wheat – Peas – New Grass – H1 – White Clover –
1 year Grazing

Costs and Returns from Lucerne Production

1. Lucerne Establishment:

Cultivation – 5 hours at 50c	2.50	
Seed – 15 lb at 55c	8.25	
Inoculant	0.60	
Lime – 2 tons at \$5.00	10.00	
Fertiliser – 2 cwt Reverted	2.75	
		\$24.10

2. Annual Maintenance – no stocking:

Fertiliser – 6 cwt Lucerne mix applied	13.40	
Lime – 1 ton/3 yr	1.87	
Weed Control/3 yr	1.00	
		\$16.27

3. Sprinkler Irrigation Cost:

Cost, on a comparative basis, including running costs and repairs and maintenance (excluding labour and depreciation) of 40 cents/acre inch applied.

For 3" effective and 5 waterings, require 20 acre inches costing \$8/annum.

4. Total Costs per annum:

	Non-irrigated	Irrigated
Annual	16.27	16.27
Establishment over 6 yr life	4.02	4.02
Water	—	8.00
	\$20.30	\$28.30

5. Revenue per annum:
based on \$10/ton D.M.

	Non-irrigated				Irrigated			
Production (lb DM)	10,000	12,000	14,000	14,000	16,000	18,000	20,000	
Costs (\$)	20.30	20.30	20.30	28.30	28.30	28.30	28.30	
G.M. (\$)	29.70	39.70	49.70	41.70	51.70	61.70	71.70	

Conventional Cropping Programme

With a rotation of —

Old Grass — Wheat — Wheat — Peas — New Grass — H1 — White
Clover — 1 yr Grazing

To compare the profitability of this rotation with commercial lucerne production, the average gross margin of all the crops in the rotation must be compared. Two yields are taken for each crop constituting the expected differences in an average year, under irrigation and non-irrigation.

1. Wheat

	Non-irrigated		Irrigated	
	50b	40b	70b	60b
Gross Revenue at \$1.45/lb	72.50	58.00	101.50	87.00
Direct Costs:				
Cultivation — 4 hrs at 50c		2.00		
Seed — 1½ at \$2.20		3.30		
Fertiliser 1½ Super		2.22		
Spray		3.00		
		\$10.52		
Harvesting	6.75	5.40	9.45	8.10
Sacks	1.70	1.35	2.40	2.05
Cartage	3.08	2.49	4.30	3.69
Levy	0.69	0.55	0.96	0.83
Irrigation			1.60	1.60
Total Direct Costs —	22.74	20.31	29.23	26.79
G.M. (\$)	49.76	37.69	72.27	60.21

2. Peas:

	Non-irrigated	Irrigated
	35b	50b
Gross Revenue at \$1.40	49.00	70.00
Direct Costs:		
Cultivation – 4 hours at 50c	2.00	
Seed – 4 at \$2.40	9.60	
Fertiliser 2 cwi Super	2.96	
Spray	3.00	
Harvesting – 17.5c/b	6.20	8.85
Mowing	0.30	
Sacks	1.20	1.70
Cartage	2.16	3.06
Tedding	0.20	
Irrigation		1.60
Total Direct Costs –	27.62	33.27
G.M. (\$)	21.38	36.73

3. Pasture:

(a) Establishment Cost:

Cultivation ex peas 5 hrs at 50c	2.50
1 bus. H1	3.00
4 lb Huia at 55c	2.20
Fertiliser – 1½ cwt Super	2.22
Lime – 1 ton	5.00

\$14.92

(b) Maintenance Cost per year

Fertiliser – 1½ cwt Super	2.22
Application	0.50

\$ 2.72

4. Ryegrass Seed:

	Non-irrigated 35b	Irrigated 50b
Gross Revenue at \$2.00 M.D. (80% F.D.)	50.00	80.00
Direct Costs:		
2 cwt N.	5.06	5.06
Cartage	0.24	0.24
Mowing	0.15	0.15
Harvesting	5.50	7.33
Sacks	0.87	1.25
Cartage	1.25	1.80
Dressing & Certification	5.60	8.00
Irrigation		1.60
Total Direct Costs –	18.67	25.43
G.M. (\$)	37.33	54.57

5. White Clover:

	Non-irrigated	Irrigated
	160 lb	240 lb
Gross Revenue at 40c	64.00	96.00
Direct Costs:		
Mowing	0.20	0.20
Baling	0.30	0.30
Sacks	0.22	0.33
Harvesting	6.00	6.00
Cartage	0.36	0.54
Dressing 4.4c/lb	7.05	10.50
Irrigation		1.60
Total Direct Costs —	14.13	19.47
G.M. (\$) —	49.87	76.53

6. Grazing:

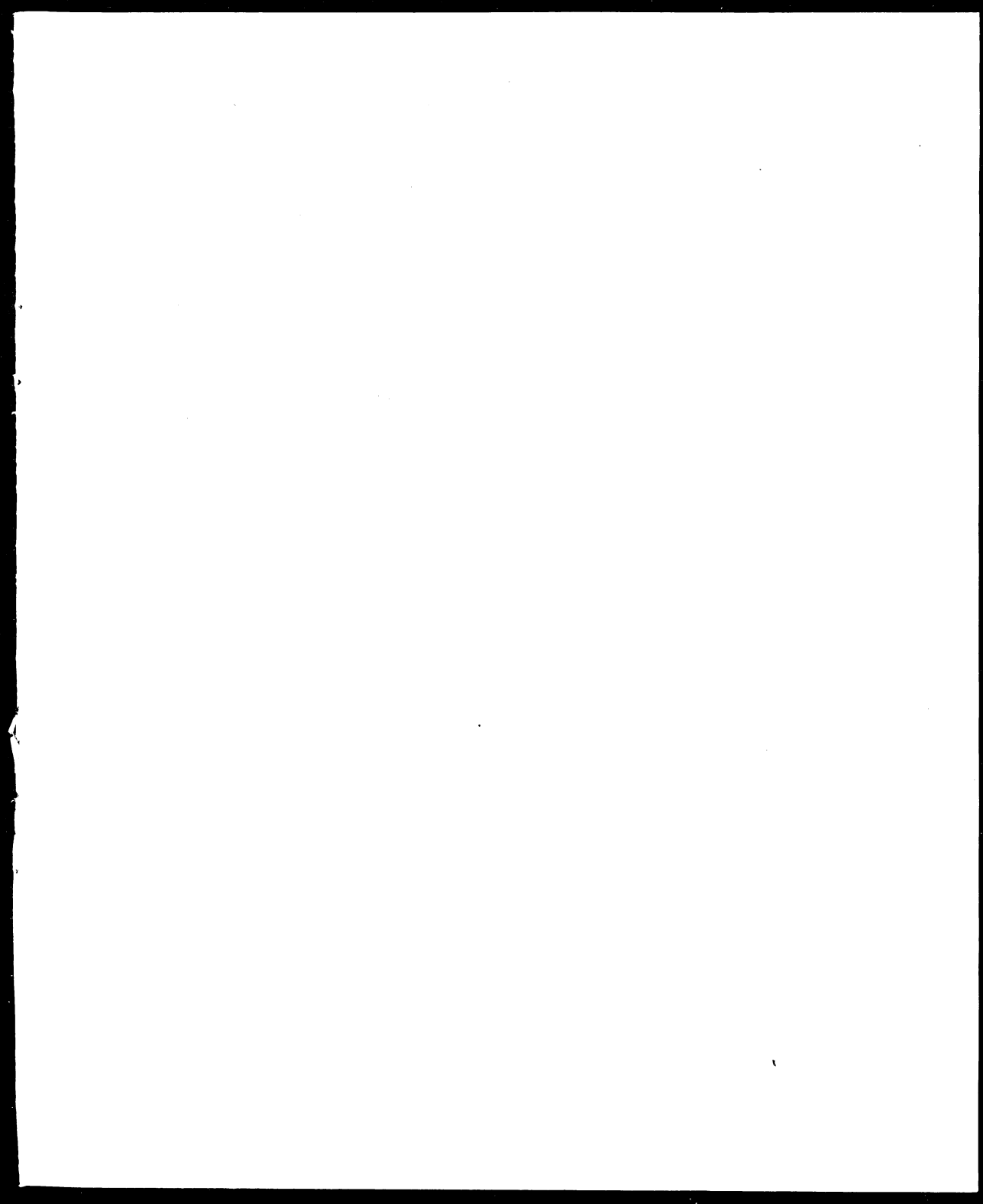
One years grazing at 8 e.e. on available grass on irrigated pasture
(8 x \$6 = \$48) and 6 e.e. on dry pasture (6 x \$6 = \$36).

Summary

	Dry		Irrigated	
	Costs	Returns	Costs	Returns
Wheat		49.76		72.27
Wheat		37.69		60.21
Peas		21.38		36.73
Pasture est.	14.92		14.92	
Maintenance	8.16		8.16	
Ryegrass		37.33		54.57
Grazing (2 at \$6)		12.00	(3 at \$6)	18.00
White Clover		49.87		76.53
Grazing (3 at \$6)		18.00	(4 at \$6)	24.00
1-year Grass		36.00		48.00
	<u>23.08</u>	<u>262.03</u>	<u>23.08</u>	<u>390.31</u>
G.M./annum		\$ 39.85		\$ 61.20
G.M./annum lucerne (12,000 lb)		\$ 39.70	(18,000 lb)	\$ 61.70
Difference in G.M.'s		\$ 0.15		\$- 0.50



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