PRACTICAL EXPERIENCE WITH NEW LUCERNE CULTIVARS FOR HAYMAKING AND GRAZING ON IRRIGATED BEDS

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INTRODUCTION

Wooloondool is an 850 hectare property with 640 hectares laid out for furrow irrigation and an approximate 4,300 Ml irrigation licence from the Murrumbidgee River which it adjoins.

It is situated 10 km west of Hay in the Western Riverina. The climate has hot dry summers, high evaporation and low rainfall of 325 mm per year average. Soils are predominantly heavy grey, cracking clays of better than average quality for the district.

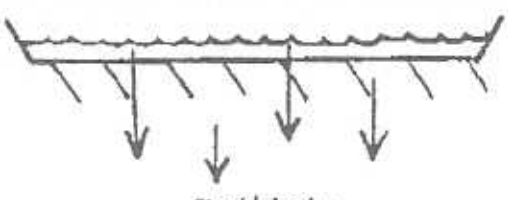
The irrigation country has been progressively developed between 1968 and 1980, land was levelled and laser planed with an average grade of approximately 1 in 2000. We have had some previous experience (3 years) growing lucerne on beds for seed production. We also grew some hay during the drought in the early 1980's. With the general downturn in grain prices in the mid 80's we looked at lucerne as a complementary enterprise to the annual rotation of maize (300 ha), oilseeds (rape 50 ha, sunflower 50 ha), winter cereals (wheat and barley 100 ha) and pulse crops (soybeans and faba beans 100 ha) which we were growing at the time. We now have 160 ha of lucerne on beds.

LAYOUT

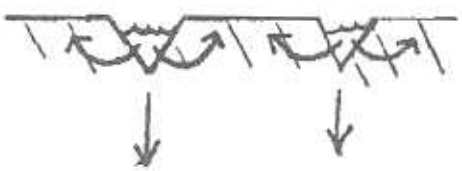
With the constraints of heavy soils, flood irrigation, flat grades (1:2000^{+}) and relatively long fields (600 m), we had to design a lucerne growing system to get water on and off quickly and at the same time bear in mind the need for access and working of haymaking machinery.

We have therefore sown all the lucerne on the normal raised bed system with a furrow every 1.8 m (6 ft) hence ensuring minimum surface ponding of the water and immediate drainage of water at the finish of the irrigation, which is essential for lucerne (see Figure 1).

Figure 1: Direction of water flow in flood and bed/furrow irrigation



Flood Irrigation



Bed/furrow Irrigation

In order to facilitate access to the fields for haymaking plant, we have not used siphons on individual furrows, our traditional system with other crops, but used 300 mm concrete pipes, through the bank, leading into a 27 m flat head bay area which then evenly distributes the water to 15 furrows. These fields are divided into 10 hectare bays with access at the head ditch end so that we can get in and out of both ends of the bays for haymaking while watering adjacent bays.

IRRIGATION

The irrigation system is very labour efficient in these bays since there is only one control stop for each 10 ha area. We can water approximately 70 ha in 24 hours with approximately three man hours of labour in two changes.

The frequency of irrigation is largely determined by the cutting regime. In mid-summer we cut at a four week interval and it is only possible to get two irrigations in between cuts since it takes a week to dry out sufficiently after a cut and a week to make the hay and get it off the field. This definitely restricts production since the plants are nearly always stressed by the time we get the water on after cutting and carting. It is always a rush to get the hay off the field and the water back on the crop. I estimate that we use approximately 1.5 Ml/ha on the first water after cutting and 1 Ml/ha on the second watering with a total water use of 12.5 Ml/ha/annum. Further improvement of the system will be to provide more drainage points on the bottom of the fields, so that we can get water back on the fields sooner without interfering with access for haymaking on adjacent fields.

FURTHER POINTS ABOUT BEDS

The drainage aspect of the bed layout is paramount and we consider that this will give a considerably longer stand life as well as extra production in our conditions.

Beds also have the advantage of providing controlled traffic lanes for machinery over the paddock. All wheeled traffic (except for the rear wheel of the self propelled mower conditioner) travels in the furrows so that damage to young shoots is minimised. Research in the United States claims 10% or 1 t/ha p.a. improvement in yield from this technique. We have no concrete research evidence on the benefits but certainly we do see serious shoot damage where traffic travels on top of the bed. In addition subsoil compaction is confined to the furrows or controlled traffic lanes.

There are some problems with beds:-

1. Weeds tend to get away in the furrows where the competition from lucerne is not as strong.
2. Some hay may be lost in the furrows after raking. This is not as much of a problem as we expected - in fact many observers have commented favourably on how cleanly we rake.
3. Sheep may get 'cast' in the furrows. Last year we had old ewes in full wool lambing in the lucerne and did lose three from casting. However, it is not a problem with young or shorn dry sheep.
4. Furrows can make it rough for carting hay and make it almost impossible to load trucks straight from the paddock. I prefer to use a bale waggon which also keeps to the controlled traffic lanes with access from each end of the fields only.

YIELDS

With half our lucerne in its first year and half in its second year, we have now averaged about $5^1/_2$ cuts this season. Total production has been approximately 100,000 bales which have averaged about 45 to the tonne giving an average yield of approximately 14 t/ha. About half the area was shut up in mid September and half the area was grazed until mid October. A similar area was shut up for grazing in mid April while the last cut on the balance was at the end of April. Production for hay dropped off considerably in March, production trends being approximately:-

Month	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
t/ha/cut	2.5	2.5	3.25	4.0	2.5	1.25

WEED CONTROL

In the first year we sowed in April following the application of the pre-emergent herbicide Trifluralin and then used 2,4-D.B for broad leaf weeds in spring followed by some summer grass control with Fusilade(R). In the second year we used a late winter application of Sprayseed (R) and Diuron mixture followed again by some summer grass control with Fusilade (R). Major weed problems are dock, milk thistle and barley grass in the spring and barnyard grass, cupgrass (Eriochloa crebra) and wireweed in the summer.

FERTILIZER

We have used high rates of phosphate fertilizers. We aim to use 500 kg single super/ha in the spring and a further 350 kg in autumn. Preliminary trials with approximately 5 t/ha gypsum have indicated a strong response particularly in early regrowth. I intend testing gypsum on a larger scale this year. Apart from the plant response there appears to be a marked reduction in soil cracking which is serious in untreated areas causing machine trafficability problems through roughness. It is also hoped that gypsum application will reduce the period of moisture stress during haymaking.

CULTIVARS

The main cultivar we have used is Baron, sown at 10 kg/ha. This cultivar is unfortunately no longer available. We think that it has slightly better production than Aurora and Trifecta in the mid season although Aurora may be superior in autumn. The NSW Department of Agriculture have a variety trial on the beds and results are included in Table 1 together with results of longer term research trials conducted at Yanco Agricultural Research Institute.

The main things we are looking for in cultivars, apart from maximum yields and hay quality, is root rot resistance and aphid resistance. I prefer a cultivar that is not too highly winter active as I think that it gives more flexibility with the weed control programme during winter. Leaf diseases are also important.

Table 1: The top 10 ranking of regionally recommended lucerne cultivars, in order of decreasing yield, from three separate field experiments.[1,2]

	Leeton Field Station Sown Spring '83 Grey Soil on Flat	Leeton Field Station Sown Autumn '84 Grey Soil on Flat	Wooloondool Farm, Hay Sown Autumn '87 Grey Soil on Beds
1.	Trifecta	Maxidor II	Diamond
2.	Pioneer 5929	Aurora	WL 605
3.	Baron	Pioneer 5929	DK 187
4.	Springfield	CUF 101	Maxidor II
5.	Validor	Pioneer 581	CUF 101
6.	CUF 101	Sequel	Baron
7.	WL 515	Trifecta	WL 516
8.	NOVA	Diamond	Pioneer 5929
9.	Maxidor II	Baron	Sequel
10.	Siriver	WL 515	Aurora

[1] Some of these cultivars have consistently yielded average cuts of over 2.7 t/ha throughout this region.

[2] These NSW Department of Agriculture experimental results were conducted and compiled by Maryanne Lattimore, Research Agronomist, Yanco, Katrina Donnelly, Technical Officer, Yanco, Janet Dunbabin, Research Agronomist, Deniliquin and David Murray, Technical Officer, Deniliquin.

INSECTS

We have had few problems with insects. We treat the seed, at sowing, with Rogor(R) against red legged earth mites. Otherwise we have sprayed only twenty five per cent of the crop twice for spotted alfalfa aphids. We do see occasional buildups of heliothis also, but these have been quickly followed by huge numbers of birds, particularly starlings which seem to keep the populations in reasonable control.

HARVESTING

We have chosen commercial haymaking equipment which fits our 1.8m beds. The hay is all made and carted, on a contract basis, using a 3.6m cut, self-propelled mower conditioner, a roller bar rake and conventional baler with a 10-12 New Holland non self-propelled Bale Wagon. With occasional assistance from a second baler in the middle of the season this equipment handles the 160 ha adequately. Peak production is approximately 1,750 bales per day.

When baling for the export market, it is critical to bale at under 14% moisture. This seems almost impossible in October and April but in mid-summer we can bale most of the hay at under 13% with the major problem being to get enough dew to bale satisfactorily without severe leaf loss. To manage this we use a moisture meter mounted on the baler which reads direct to the cabin of the tractor. We have also successfully used the preservative, 'Haymaker 2000' in late season cuts to protect the hay baled at 25% moisture.

MARKETING

Export - Approximately half our hay has been double-dumped and exported to Japan. We find that it is a difficult market with very high, and yet inconsistent, quality standards. The hay must be dry (below 12%), weed free and have good colour and leaf attachment. The price is not high, approximately $100/t, for the quality of product required but the demand is consistent, budgetable and we need it for cash-flow.

Local - We supply a local dairy, and some large dryland sheep stations take most of our first cut and downgraded hay. We also have good contacts in Gippsland and a lot of hay has gone out of the district to the Monaro and the South Coast. However, all these markets are highly variable and we need the export market to provide some stability and cash flow in good seasons when demand and price is low. A gross margin summary for the lucerne enterprise is included as Appendix 1.

GRAZING

We have only grazed the lucerne on Wooloondool in the winter seasons. Last year we carried approximately 1,000 sheep (large wethers, 1.3 DSE) from April to October on 80ha divided using electric fencing into 4 X 20ha fields. This year we expect to carry 2,000 wethers on 160ha but will rotate the grazing rather more quickly having subdivided the area into 9 fields. We expect to graze at approximately 15 wethers/ha with one week on and 8 weeks off. Our greatest problem with grazing, is that we have little provision for dry run-off area apart from available stubbles, and in wet weather both the sheep and the soil could get into trouble.

CONCLUSION

Furrow irrigation of lucerne on flat, heavy, clay soils grown on 1.8 m beds has proved a new profitable alternative to grain crops in the south west Riverina. Stand life and production are improved by use of this technique on country which was once considered non-lucerne growing country. Production potential of the lucerne is still restricted by moisture during the 12 day haymaking process. Other aspects of lucerne management are similar to those in more traditional areas, but the availability of abundant water and the efficiency of the irrigation system mean that we can be very competitive. We need the consistency of the export market, in spite of its stringent quality requirements and moderate price, to balance the variable local market with its broader range of quality requirements, price and demand. Where soil waterlogging and drainage problems exist, furrow irrigation or 'bed farming' is one method of substantially increasing crop and pasture production.

APPENDIX 1

GROSS MARGIN BUDGETS

1. ESTABLISHMENT (FIRST YEAR)

Cost Item	Rate/	Price $	Total $
Seed	10 kg/ha	6/kg	60
Gypsum	3 t/ha	20/t	60
Fertiliser.P.	200 kg/ha	.33/unit P	66
Trifluralin	3 l/ha	6.00/l	18
Water	1 Ml/ha	6.00/Ml	6
Land Preparation		100/ha	100
Total Establishment Variable Costs/ha			310

Written off over three years this equals $103 p.a.

2. ANNUAL VARIABLE COSTS

Fertiliser P	400 kg/ha	.33/unit P	132
Sprayseed(R)	1.5 l/ha	8.00/l	12
Diuron	3.0 l/ha	5.00/l	15
Fusilade(R)	1.0 l/ha	30/l	30
Water	12 Ml/ha	6/Ml	72
Harvest & Carting	16 $/t	45/t	720
Total Annual Variable Cost			981
Total Annual Costs (add one third of establishment costs i.e. $103 p.a.)			1084

3. PRODUCTION

Gross Income Hay	16 t/ha	$ 100/t	1600
Grazing	12 DSE/ha	$ 5/DSE/winter	60
TOTAL INCOME/ha			1660
GROSS MARGIN/ha			$576