ECONOMIC INTEGRATION OF IRRIGATION INTO DRYLAND FARMING

USING HAIFA WHITE CLOVER

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Background

In the early '60's there had been substantial irrigated pasture development in the Hay district often based on the work carried out at the CSIRO Falkiner Research Station - Deniliquin and the Department of Agriculture. The then area recommendation was 25% summer pasture and 75% winter annual pasture. In general these quite expensive developments had fallen onto disuse and were only activated in dry times. Many farmers had spent money without commensurate return.

In 1982, the Hay Water Users Association formed a research sub-committee made up of local graziers, farmers and advisory officers of the Department of Agriculture. This committee adopted as it's objective:-
To investigate the methods of maximising return per megalitre from the Merino sheep enterprise by supplementing dry country with irrigated pasture, the problem was investigated in three stages,

Stage 1.

The Sub-committee's initial programme was two-pronged:

a) To answer the questions - why had these previous irrigation developments fallen into disuse?

b) To review all relevant information (CSIRO, NSW and Victorian Departments of Agriculture).

Results of stage 1.

a) Irrigation had been developed without a feasibility study on a whole farm basis. The recommendations that were right when applied to a wholly irrigated property were incorrect when applied to a property of say 400 ha with a 1000 megalitre water right. Some of the areas developed for summer pastures (mainly paspalum) were still in regular usage mainly for the special purpose of carrying ewe weaners over summer.

The abundance of feed produced in most years in winter and spring on the large area dry country had put the ryegrass and sub.clover pastures in the category of carrying coals (and expensive coals) to Newcastle.

Moreover, the Falkiner Research work had been carried out using wethers only, whereas we are predominantly a Merino breeding district.

b) Much excellent and pertinent research work was unearthed, some of it fortunately relating to dry country.

We applied the methods of Rickards and Passmore to the data obtained and after a considerable amount of work formed the opinion that supplementing the dry country with summer growing perennial pasture might be profitable.

The result from our first attempt was that stocking rate could be increased from 1.41 dse/ha to 6.15 dse/ha on a whole farm basis provided sufficient summer irrigated pasture was provided.

Stage 2

We decided to retain the ABRI as consultants to express an opinion on our theoretical results.

They constructed a simple linear programme matrix to solve the problem and came up with the answer that dryland alone had a carrying capacity of 1.3 dse/ha. If however this hectare contained 0.13 ha of summer pasture capable of carrying 60 dry sheep/ha over summer and autumn then the supplemented system had a carrying capacity of 9 dse/ha. I should emphasise that the preliminary draft report pointed out that further investigation verifying assumptions was required. However, the situation looked hopeful.

We approached the Department of Agriculture requesting help in selecting a suitable pasture and for construction of a linear programme model for the Southern Region. Haifa white clover was suggested however they could not assist with a linear programme mode. So a few of us bit the bullet, lasered country and sowed Haifa white clover. The results were promising.

Frustrated by the inability of the Department to respond to our request for computer and other technical support, five of us formed a syndicate and approached the ABRI for a quotation to carry out work on our behalf.

Stage 3

Construction of the model commenced with the assistance of ABRI and the NSW and Victorian Departments of Agriculture. This exercise proved most instructive and after many tuning runs on the computer at the ABARI University of New England, we had a prototype model. Hawkesbury Agricultural College provided a linear programme for use on an Apple computer. We began running our model on one of the syndicates Apple 2E's at Hay. For the last twelve months we have been running various models on our Apple computers and more recently on IBM compatible PC's.

<u>Where we are now.</u>

With the model we can readily optimise profit on an individual property basis not only taking into account dryland area, water availability, the characteristics of alternative pastures, and crops, but also development and stock costs, interest rates, machinery and labour costs. It sounds complicated but its like riding a bike - at your first try it seems hopeless, but once you get the hang of it, it's a lot simpler than you thought.

Let us use the integration model to demonstrate the preceding comments.
This particular model contains four pastures.

1. **Dryland with no costs attached.**

2. **Perennial pasture, Haifa based.**

   Fertilizer and herbicide costs $68/ha. Water consumption 15ML/ha. Cost of development $750/ha.

3. **Long term annual pasture Trikkala sub.clover and rye grass.**

   First watered March 1, last watering before the Melbourne Cup. Fertilizer and herbicide cost $38/ha. Water consumption 6.25ML/ha, cost of development $650/ha.

4. **Short term annual pasture Seaton Park sub.clover and rye grass.**

First watered March 1. Not watered after June; fertilizer and herbicide cost $38/ha; water consumption 4.25 ML/ha; cost of development $500/ha.

The model is set for twelve Merino ewe enterprises. In six of these, wether lambs are kept for 7 months and sold in wool, in the other six, the wethers are kept for 12 months, not lamb shorn and sold off-shears. The gross margins of the former are $24 per ewe and of the latter $27 per ewe.

The average capital invested per additional ewe (including additional rams required) is $30 for the 7 month programme and $33 for the 12 month wether programme.

Water cost per megalitre is set at $6; interest rate is set at 18%; cost of pump installed and supply ditch construction is $40,000; lambing percentage is 76%.

This particular model has provision for buying hay and/or grain. For these runs this facility has been blanked off. The matrix size is 50 variables x 37 constraints. Each run on an IBM compatible with 8087 co-processor takes approximately 4 minutes

(Table 1).

We start with a 4000 ha property with an unused water allocation of 1000 ML. The operator lambs in May and sells the wether lambs before Christmas.

Run 1

We set the model to emulate the property as is. The answer is 2070 ewes giving a gross margin of $49,700.

Now Bill, the operator, has a son Fred, who has been pushing Dad to increase the carrying capacity by using the water allocation. Bill isn't too keen but Fred is getting married and Mum says it's about time Dad gave Fred a go. Under this combined onslaught Bill gives in but he makes some conditions.

1. Maximum capital expenditdure $100,000. 2. No summer irrigation (his mates say it's a hassle). 3. No mucking about with the sheep programme.

Fred momentarily freed from Dad's iron hand rushes in.

Run 2.

Capital used $100,000. $40,000 on pump etc. and $60,000 on additional sheep and pasture development. Solution given is 3044 ewes lambing May keeping wethers for 7 months as required by Bill. 62 ha. Trikkala sub.clover based pasture giving total gross margin of $50,400.

So we have increased sheep numbers by 47% for a mere $700 extra in gross margin and that is before making repayments of debt. I shall leave you to imagine what the atmosphere is like at the homestead.

Run 3.

Same money, same sheep programme but the model is freed to select pasture.

Sheep numbers are up 63% and gross margin up to $9,100.

Run 4

Same money but model freed to select pasture and sheep enterprise.

Sheep numbers are up 54% and gross margin up $13,600. The model has selected a sheep programme keeping the wethers for 12 months. Part of the reason for this is that the gross margin and feed requirements per ewe is greater so less ewes need to be purchased. This is a capital efficient way of expanding production.

Runs 5, 6 and 7 parallel runs 2, 3 and 4 except that the capital restriction is removed. The ultimate the model can achieve under its constraints is seen in run 7. Here capital used was $117,900, gross margin, $35,600 after paying interest.

The total return of extra funds invested is 38%.

Compared with Run 2 (on the surface a not unreasonable programme) it gives a return of 18.7%.

I hope I have demonstrated how this modelling technique can help avoid the situation that developed in the 1960's. (run 2) On our property we have a programme of developing 20 ha a year. Each ha developed enables approximately 40 more ewes to be carried. To minimise stock capital costs and to avoid disturbing our breeding programme we tooth clip our ewes at 4.5 years, this enables us to keep them to 7.5 years. Also this year we retained our wethers to 12 months.

Our wool production in 1983/84 was 25,800 kg in 1984/85 it was 34,100 kg and last year 41,200 kg.

Over 40 years ago Humphrey Kempe at Lindsay Point on the Murray River followed a similar path. I recommend his book "The Astonished Earth" published by Heinemann in 1958 to anyone interested in the subject of this talk.

What has happened in our district.

In the last four years, annual winter pasture sown has gone from 5,769ha to 11,018ha. Summer perennial pastures sown has gone from 1,200ha (mainly paspalum) to 5,154ha (mainly Haifa based).

As a research group, we are deeply concerned that too much of this development is "copy cat" without a proper deep understanding. We have set in motion a programme to rectify this situation, if possible.

Future developments.

We are attemtping to obtain data on production versus different fertilizer and watering programmes. This will enable us to optimise the management of our pastures.

We are developing a model that in effect designs the property and overcomes the artificiality of the existing assumption that at a point in time all feed is available to any stock and that they will use this optimally. Solutions from this new model will, amongst other things, minimise stock movement.

The model can be used to evaluate the value to any individual system of new cultivars once grazing trials have been carried out. This should lead to greater cost efficiency in research.

The existing models are used to optimise mixed stock and cropping enterprises and we see this being further developed with particular interest in rotations.

We gave used the model to calculate the value of purchasing or selling properties. These results have been quite fascinating as they clearly demonstrate that a particular property offered for sale has a different value for each prospective purchaser.

If we can raise the funds we would like to link the model to a spread sheet and gross margin data file to produce cash budgets automatically.

Some lessons we have learned

Having used the model to arrive at a programme:

1. Check where model is putting stock each season.
2. Check and correct for marketing constraints.
3. If possible start with a small area and fine tune.
4. Always check the model's answers, this is not difficult.
5. Finally, prepare a cash flow budget before proceeding.
6. The technique works in pure dryland situations too.

I would like to pay tribute to my fellow syndicate members, Bruce Beattie, Max Lugsdin, Bernie Redfern and Roger Schiller.

Without their support, both financial and otherwise we could not have succeedded; to Stan Dawe and Murray Martin, without whose enthusiastic help our model would be a hollow shell; to Sean o'Sullivan and the ABRI for their technical excellence, modest charges, prompt delivery of work and continued support and interest. To Doug Kohloff for enabling us to bring our model home.

And last but not least, to John Muir our District Agronomist for his unflagging enthusiasm and support.

References

Rickards, P.A., Passmore, A.L. (1971) Planning for profit in livestock grazing systems. Professional farm management guidebook No. 7 ABRI University of New England.

Figure 1 Block demonstration at Hay

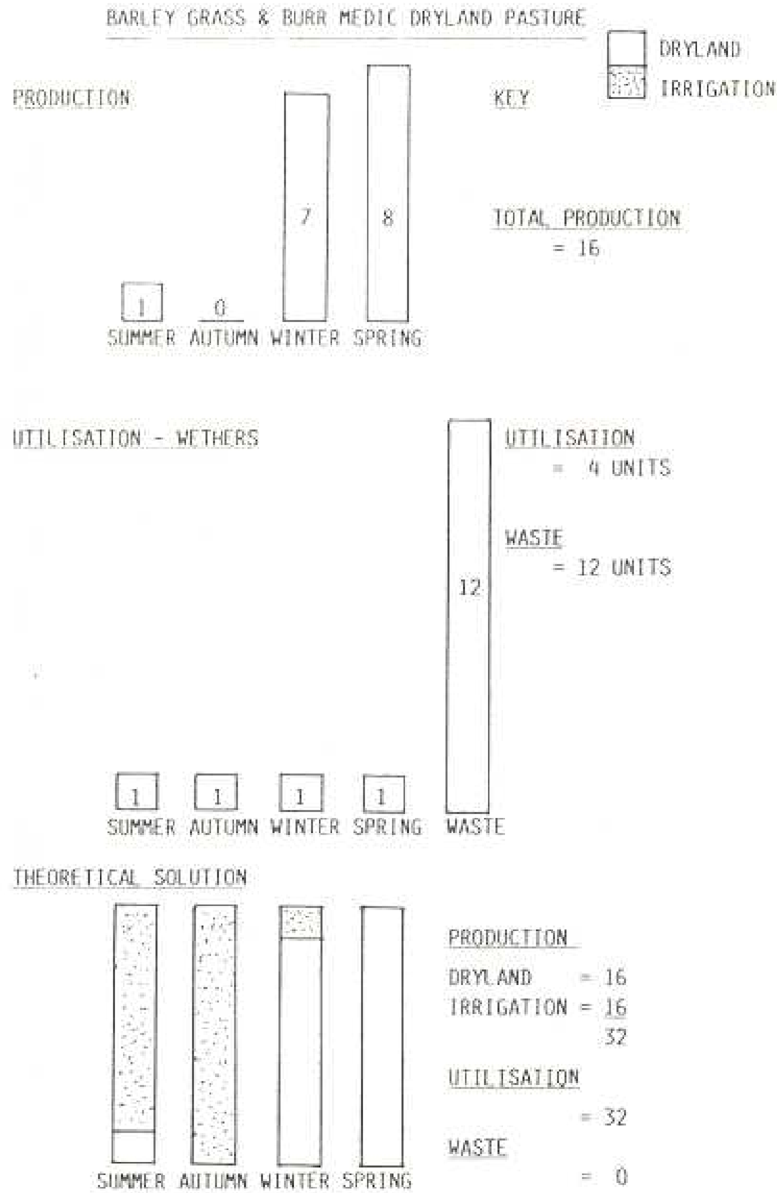

Table 1 Computer run on alternative strategies

RUN NO.	MODEL SETTINGS	WATER MEGL	AD CAPITAL $	EWE NO & PROGRAMME	PERREN.PAST HA	ANN.PAST HA	GM $	CASH SURPLUS AFTER INTEREST	% RTN ON ADDIT. CAPITAL BEFORE INTEREST
1	DRYLAND ONLY LAMB MAY WETHERS 7 MTHS	0	0	MAY 7 2070	0	0	49,700	NA	NA
2	AD CAP 100,000, MAY 7 LONG ANNUAL PAST.	385	100,000	MAY 7 3044	0	62	50,400	700	18.7%
3	AD CAP 100,000 MAY 7 MODEL SELECT PAST.	413	100,000	MAY 7 3381	28	0	58,800	9,100	27.1%
4	AD CAP 100,000 MODEL - SELECT SHEEP & PAST.	461	100,000	JULY 12 3190	31	0	63,300	13,600	31.6%
5	LONG ANN PAST. MODEL - SELECT AD CAP SHEEP MAY 7	1000	196,000	MAY 7 4604	0	160	63,100	13,400	24.8%
6	SHEEP MAY 7 MODEL - SELECT PAST. & AD CAP	1000	185,000	MAY 7 5243	67	0	82,000	32,300	35.5%
7	MODEL SELECT PAST. & AD CAP	1000	177,900	JULY 12 4735	67	0	85,000	35,600	38.%