

PROFITABLE UTILISATION BY PASTURE BUDGETING
IN AN INTENSIVE GRAZING SYSTEM

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This paper describes an on-farm evolution of pasture management in response to pressures imposed by the market place, the physical environment and the economic climate in which the farm is operated.

To appreciate the pasture evolution which has occurred on 'Grevillea', some basic information is provided on the farm operation.

Resources involved in production

Land: 267ha of undulating country with small areas of alluvium. The soil type is mainly free draining granite, - 300mm deep with an approximate pH of 5.6. 'Grevillea' has a long history of pasture improvement.

Climate: Average annual rainfall is 1280mm but ranging from 600 to 3000mm with no regular seasonal pattern and a rain shadow area. Long dry spells in summer regularly extend into winter without an autumn break.

Temperatures are generally cool with a few very hot periods. May to August inclusive - mean daily temperature is 10°C on average. Strong westerly winds with very low relative humidity is a problem in any season (High evaporation rates).

Water: Unlimited water is available for irrigation from the Bega River.

Stock: Grade herd consists 240-250 cows, milking all year round. 16% of herd in dry paddock. Mostly Friesian/Jersey cross upgraded with about 18% pure Jersey. (A.I. bred since 1970). The herd has been tested since 1960's, but currently discontinued. 180 replacement young stock.

Equipment:

A. 40 unit turnstile dairy with covered yard. Automatic using a Dec. Rainbow and M. Mac computers.

B. Irrigation equipment to cover 100 ha.

C. Farm plant - 3 tractors and usual grassland plant including silage equipment.

Personnel

Moirra (wife), general overseeing, bookkeeping with the computer, calf rearing, secretarial duties associated with enterprise.

Michael (son), irrigation and paddock work. 2 days milking.

Wayne employee, (40hr. week) - helps manage dairy operation and maintenance.

David employee, milks (40hrs), livestock management.

Casual - 2 days milking.

The basis of the farm operation - the pasture.

Since the late 1950's the farm has been involved in intensive management of irrigated pastures for all year-round milk production. The main problem faced was the winter feed trough when, for a period which in some years extends over four months, low temperatures severely restricting pasture growth.

In the early 1960's we sodseeded with oats and nitrogen each March to provide a bulk of winter feed. Wet winters, when large areas lodged and rotted coupled with metabolic problems and poor per cow productions, saw a change to Hl. and Italian ryegrasses still established in early March.

The problem was that the change from hot, dry summer conditions to winter often occurred over a few days and as the herd and the area of winter pasture expanded, - despite bigger machinery - it was virtually impossible to get enough pasture treated before the onset of cold weather.

The introduction of the newer tetraploid ryegrasses, such as Tetila eased this problem. They can be sown later and still produce substantial amounts of feed. The change from cereals to grasses made the wet winter easier to manage. Low production per cow ceased to be a problem during winter using ryegrass.

The problem of renovating 100 ha of pasture during March each year was still a burden, both in a physical and financial sense. The use of prairie grass helped to overcome this problem.

Current pastures

We have 42 irrigated paddocks and 25 dry land areas available to the milking herd. (the remainder of the 267 ha is a dry run).

The pastures consist of prairie grass, a mixture of Matua and a local strain - a shotgun mixture of surviving ryegrass strains, Haifa white clover, Ladino white clover, and on dryland, trefoil and Bacchus Marsh sub. clover.

The following are the details of the management regime for these permanent perennial pastures.

Area available for each grazing - 1.2ha, one morning, one evening (all electric fences).

Stocking intensity - 250 cows/1.2ha.

Rotation time - summer 28 days, mid-winter - between 42 and 60 days.

Occupation time 9 hours average.

Stocking rate on milking area - 250 cows/154ha = 1.63 cows/ha.

More precision in management needed - the future.

For the practising farmer in the past, pasture - herd management has been on the basis of observation (not measurement), gut feelings, personal bias, the dictates of the weather and the farm work load. In comparison with the intensive livestock industries, our ability to optimise the management of the controllable variables has been minimal.

The future holds promise of greater precision in management. We must have numerical data as a basis, but for the first time it seems feasible to be able to manipulate these variables to achieve pre-defined aims:

Stocking rate.

Stocking intensity.

Pasture species.

Pasture rest period.

Fertilizer application.

Concentrate usage.

Calving pattern.

Irrigation interval.

Irrigation application.

Moisture deficit at commencement of irrigation.

Pasture budgeting

For some six years now, a dissected bookkeeping programme has provided accurate data used as a basis for cash-flow budgeting. Over the last three years a multiplan spreadsheet in a Dec Rainbow P.C. has been used to do this.

Currently, attempts are being made to develop a similar spreadsheet in Megajoules (MJ) to budget the feed requirements of the milking herd. One such sample sheet is attached. Whilst the table is self explanatory, an enlargement of the basic algorithm might assist.

$$\frac{\text{Maintenance}}{\text{MJ}} + \frac{\text{production}}{\text{MJ}} = \frac{\text{total}}{\text{MJ}} = \frac{\text{concentrate}}{\text{MJ}} + \frac{\text{pasture}}{\text{MJ}}$$

Maintenance (Mm) is estimated by
 $Mm = 8.3 + 0.091 W \text{ MJ}$ ----- (1)
 (where W is liveweight in kgs)

Production (Mi) by
 $Mi = 1.694 (0.386 \text{ BF} + 0.205 \text{ SNF} - 0.236)$ ----- (2)

Concentrate (Mc) by
 $Mc = M \times V$ ----- (3)
 where M is mass in tonnes and
 V is MJ/tonne

Pasture = (1) + (2) - (3) ----- (4)
 (actual)

Additional columns attempt to provide a yardstick. The pasture (objective) figures represent a conversion of actual measurements of irrigated and improved dryland pasture growth rates over a period of fifteen years in Bega by Harry Kemp our district agronomist. They do not represent potential as published in species growth curves.

Pasture Objective = Dry matter in kg/ha x 12.5 x 0.8 ----- (5)
 MJ/ha

Assuming 12.5 MJ/kg dry matter in pasture and 20% losses from trampling during grazing.

Pasture Objective = (5) x area grazed by milkers ----- (6)
 MJ

"WHAT IF" GAMES

Just as one can play "What If" games in a cash flow budget, it is possible to instantly see the effect on MJ requirements and the break up between drought feed and pasture units. The consequences of, say, higher stocking rate, or higher production/cow or whatever, can be quickly considered.

Sophistication

The spreadsheet (Table 1) is skeletal. The following are included in the one currently in use:

1. Body weight changes.

Obviously, gain or loss in body weight undermines the logic of this basic sheet. The sheet is currently being done on a daily basis, one sheet per month. In this, the average liveweight over the past seven days of load cell weighing is compared with

the last seven days of the month, and a plus or minus adjustment made to total MJ.

1 kg liveweight = 28 MJ

2. Pregnancy

Over the milking period of 309 days, the cow produces calf tissue weighing say 30kg. This must be allowed for by the formula. $P = 1.13e^{0.01t}$

where e = base of natural log

t = number of days pregnant.

3. Temperature

Help needed! Experience shows that maintenance requirements increases at low temperatures. The only numbers available so far, suggest only a 3% increase. Experience suggests that this is too low a figure. The collection of data over a few seasons will answer this. Currently we are allowing 5% more for maintenance in our budgeting.

4. Silage and hay

The current sheet includes a column for mass and MJ/kg and total MJ. In our case we precision chop and wilt silage ("What If" games are interesting with these figures).

Part of an integrated system

We are part of the way along the road to developing an integrated management system in the Rainbow computer using Microsoft Multiplan.

The essential feature of Multiplan which makes this possible is its ability to lift elements of data from existing spreadsheets and incorporate them in a new sheet. All data, financial, feed management, grain masses, herd masses, pasture measurements, herd production and herd data are stored on Multiplan files. As a result, most data in the Pasture Report is not entered as input, but is read from files created by other programmes. For example, the mass of feed comes from a file which sums load cell readings on the feed bin. The pasture area is a sum of the areas of pasture actually grazed and is lifted from the pasture file automatically.

Early days

These developments are the beginning, no more. Remember it is a commercial dairy farm - not stud cattle. Being in the country remote from city resources, makes involvement in "high tech" development difficult. To really get the whole concept working so that management of this pasture/cow system can approach the precision achieved in intensive livestock industries we must overcome a series of problems:

1. Electronic identification of dairy cows
(We are certain bar codes are the way to go).
2. A commercial practical way to measure pasture availability.
3. Experience over a number of seasons to develop a data base so that our budgets are more than wishful thinking.

References

- Energy allowances and feeding systems for ruminants, UK Ministry of Agriculture, Food & Fisheries. Technical Bulletin No. 3.

Table 1 Monthly pasture management analysis

	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL	AVERAGE
MO OF Cows	239.00	238.00	239.00	248.00	251.00	250.00	235.00	236.00	240.00	240.00	235.00	238.00	2889.00	240.75
MASS IN KG	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00	4800.00	400.00
PRODUCTION IN L	85715	85660	90768	86760	93731	90000	102036	104288	97655	111606	102631	102889	1157938	96495
PRODUCTION/COM/DAY IN L.	11.76	12.35	12.45	11.47	12.24	11.80	14.24	14.49	13.34	15.25	14.75	14.17	157.91	13.16
% FAT	4.30	4.25	4.30	4.27	4.44	4.48	4.20	4.05	4.20	4.08	4.25	4.25	50.99	4.25
% S.N.F.	8.66	8.66	8.57	8.57	8.72	8.70	8.78	8.73	8.63	8.78	8.96	8.72	104.58	8.70
CONCENTRATE TONNES	20.00	24.00	24.00	33.00	33.00	33.00	33.00	33.00	24.00	15.00	15.00	20.00	307.00	25.58
CONCENTRATE MJ/TONE	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00	126000.00	10500.00
AREA IRRIGATED PASTURE	68.00	68.00	68.00	68.00	69.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	816.00	68.00
PRODUCTION OBJECTIVE MJ/HA	12500.00	10800.00	10500.00	9600.00	9000.00	4500.00	3900.00	3600.00	6900.00	13500.00	22500.00	25000.00	132300.00	11025.00
AREA IMPROVED PASTURE	0.00												0.00	0.00
PRODUCTION OBJECTIVE MJ/HA	464513	482961	489960	465763	518488	494870	550541	550652	521816	593420	561050	556358	6249492	520791
PRODUCTION IN MJ	325841	324477	325841	338111	342201	340938	320387	321751	327204	327204	320387	324477	3938719	328227
MAINTENANCE IN MJ	790354	807438	814901	603874	860588	835707	870929	872403	849820	920624	881437	880836	10188210	849018
TOTAL MJ	210000	252000	252000	246500	346500	346500	346500	346500	252000	157500	157500	210000	3223500	268625
CONCENTRATE MJ	580254	554438	562901	457374	514188	489207	524429	525903	597020	763124	723937	670836	6964710	580593
PASTURE ACTUAL IN MJ	850000	734400	714000	652800	612000	386000	265200	244800	469200	918000	1530000	1700000	8996400	749700
PASTURE OBJECTIVE IN MJ														
PASTURE AS % OF TOTAL MJ	73.43	68.79	69.09	56.90	59.74	58.54	60.21	60.28	70.32	82.89	92.13	76.16	818.47	68.21
ACTUAL	107.55	90.95	87.62	81.21	71.11	36.62	30.45	28.06	55.26	99.72	173.58	199.00	1055.12	87.93
OBJECTIVE	68.23	75.63	78.84	70.06	84.02	159.87*	197.75*	214.83*	127.24*	83.13	47.32	39.46	1246.43	103.87
ACTUAL/OBJECTIVE AS %														