Chapter 8

Dairy industry: constraints and opportunities

Earlier chapters have considered many key relationships and issues that influence forage-based livestock production. To examine industry constraints and opportunities adds a further dimension of personal decision making, options and sometimes prejudices.

It is important to be aware of the constraints that the biological system, the producer, and society may place upon what is achievable or acceptable. Even more important is to use whatever knowledge is available to focus clearly on the opportunities that may be grasped for the benefit of all.

Dairy industry situation statement

A comparison by Kerr (1993) of 93 representative dairy farms surveyed in 1986-87 and again in 1990-91 gives an interesting insight into the trends in production technology used by Queensland dairy farmers. It was found that:

- inputs of nitrogen fertiliser declined by 4% per farm (9% per cow)
- phosphorus fertiliser use declined by 41% per farm (43% per cow)
- potassium fertiliser applications increased by 29% per farm (22% per cow)
- winter irrigation area increased by 6% per farm
- supplemental energy feeding (as grain equivalent) increased by 82% per farm (73% per cow).

This reordering of inputs resulted in a 27% increase in total farm milk production to 379 368 litres per farm, which was due to a 6% increase in cow numbers (mean 94 cows/farm), and a 21% increase in milk per cow (mean 4036 litres/cow). Kerr (1993) commented that the data for all four dairy regions of Queensland confirmed these production per cow and per hectare increases. The majority of this increase appears to have been obtained from increased feeding of supplementary energy.

In contrast, Kerr (1993) also reported data collected from 11 high producing farms achieving more than 750 000 litres milk per farm. Some interesting comparisons between the representative and high producing herds are presented in Table 8. 1.

The representative herd data suggests that on these farms there was a:

- 11% increase in stocking rate over the 5 year period
- 27% increase in farm milk production
- 21% increase in production per cow
- 41% increase in production per hectare.

A significant contributor to the 41% increase in production per hectare was an 82.4% increase in supplementary energy fed per farm (73.3% increase per cow).

The additional 5 cows per farm would consume approximately 33 tonnes of dry matter per year at an average intake of 18 kg DM/cow/day. This leaves 30 tonnes of additional supplementary dry matter which should yield 36 000 litres of milk (1.2 litres per kg grain), plus the 20 000 litres from the extra 5 cows, resulting in a 'net productivity' gain or return to management of 25 000 litres milk/year or 8.6% over the 5 years.

For the high producing herds, the increase in production of 383 954 litres has occurred as a result of increases in the number of cows (44 at 4863 = 213 972), and increases in the amount of feed available as hay/silage (176 800 kg wet, 106 000 kg dry, or sufficient to feed 44 cows at 20 kg per day for 120 days) and grain (262 400 kg as fed, 236 160 kg DM, or sufficient for 44 cows at 20 kg DM for 268 days).

Table 8. 1. Comparison of changes in average farm inputs for 93 representative (RH) and 11 high production (HH) herds between 1986-87 and 1990-91.

	Average 86-87		Average 90-91		Change		Percent change	
	RH	HH	RH	HH	RH	HH	RH	HH
Nitrogen fertiliser (kgN/ha/farm)	34.6	46.3	35.1	56.6	0.5	10.3	1.4	22.2
Phosphorus fertiliser (kgP/ha/farm)	4.9	7.7	3.1	3.1	-1.8	-4.6	-36.7	-59.7
Potassium fertiliser (kgK/ha/farm)	6.05	4.28	8.25	1.92	2.2	-2.36	36.4	-55.1
Winter irrigation area (ha/cow)	0.085	0.077	0.085	0.095	0	0.018	0	+23.4
Total farm area (ha/cow)	1.83	1.30	1.63	1.03	-.20	-0.27	-11	-21
Supplementary energy (grain equivalent)								
(tonnes per farm)	76.6	199.2	139.7	461.6	63.1	262.4	82.4	131.7
(tonnes per cow)	0.86	1.09	1.49	2.04	0.63	0.95	73.3	87.2
Production per hectare (litres)	2194	3436	3088	6729	894	3293	41	96
Production per cow (litres)	3342	4051	4036	4863	694	812	21	20
Total farm milk production (litres)	289362	719964	379368	1103918	81007	383954	27.1	53.3
Hay or silage fed (tonnes wet matter)								
(per farm)		199.2		376.1		176.8		88.7
(per cow)		1.09		1.66		0.56		51.0

It would therefore appear that there is surplus grain to the extent of 20 240 kg or the equivalent of 24 300 litres of milk equivalent. The increased milk production (383 954 - (213 972 + 24 300)) or 145 700 litres has principally resulted from the additional 7.4 ha of irrigated winter feed which would account for all of the additional nitrogen fertiliser use at a rate of 300 kg N/ha. The estimated response is therefore 20 000 litres of milk from each additional hectare of irrigated winter pasture. However if we assume a productivity growth rate of 8.6% similar to the average farm, then the response from the irrigated winter pasture is 11 300 litres per hectare.

These coarse calculations indicate the importance of the farm feedbase in dairy production, and the apparent lack of increased production from this feedbase through improved management and utilisation during this 5 year review period.

It would appear that in the 1986-87 to 1990-91 period, most of the gains in production on farm have arisen from increased use of concentrate feed and conserved feeds which have, in part, allowed an effective increase in stocking rate.

The future

Concentrates and forage

The economic sustainability of a continued dependence on concentrates is open to debate. This is particularly so in the current drought situation affecting much of northern Australia.

Busby (1995) in an analysis of the production costs of 138 dairy farms in south east Queensland during 1993-94 found:

- The feed related cost (FRC) of production was 14.8 cents/litre, comprising 10.7 cents/litre in purchased feed costs, 1.5 cents/litre fertiliser cost, 1.0 cents/litre fuel and oil, 0.5 cents/litre seed and 0.7 cents/litre irrigation costs.

- The feed related costs per litre of milk produced tend to decline as production per farm increases, with farms producing between 500 000 and 750 000 litres having a FRC of 15.9 cents/litre; 750 000 - 1 000 000 litre farms with a FRC of 14.2 cents/litre; and farms >1 000 000 litres with a FRC of 13.6 cents/litre.

If we assume that the ratio of purchased feed cost (grain, mixes and minerals) to total feed cost for these herds (Busby 1995) gives an estimate of the relative contribution of grain and "forage" feeds, then in 1993-94, 54.6% of total feed costs was directed towards grain purchases, to generate 40-45% of total milk production (based on 1.2 litres milk/kg grain fed, assuming average grain prices of $200/tonne, 238 tonnes/farm, 2.1 tonnes per cow).

More detailed analysis of these data sets is needed to ensure that the production contribution from the forage component of the farm system is not undervalued, and to establish useful working relationships between inputs and outputs, actions and consequences, constraints and opportunities.

Technical and research priorities

Farm priorities were allocated by participants (80 farmers and researchers) in a national workshop. Conley (1990) reported the following four priority areas for improvement of dairying technology:

Perennial pastures

- Breed improved perennial pasture plants for the dairy industry using both conventional breeding and biotechnology techniques
- Study the ecology and management of perennial pasture systems in relation to persistence, competition and legume balance
- Increase the efficiency of fertiliser use in perennial pastures, particularly in relation to S, K, N and alternative P sources.

Grazing management

- Increase the emphasis on extension and education in relation to grazing management systems
- Integrate the existing pasture information into grazing management models for different regions for both research and extension purposes
- Investigate the dynamics of grazing systems, in particular the plant/animal interactions, cow behaviour and pasture selection.

Soils

- Study the effects of soil biological activity on pasture production, including macrofauna and microfauna and flora
- Study the production and economic benefits of drainage systems on different soil types
- Investigate the environmental effects of fertiliser applications.

Fodder crops

- Investigate the profitability and integration of fodder crops into milk production systems
- Increase the nutritive value of fodder crops
- Breed, select and evaluate fodder crops for specific dairy environments.

This national perspective is matched by similar local reviews (Ashwood *et al.* 1993)

Consumerism

The dairy industry in tropical Australia is generally associated with areas of urban population development. These population centres are a focus for a large non-rural, and increasingly "environmentally aware" population. Many of the urban young people are taught at school about the detrimental effects of agriculture on the environment. Often poorly based information is taught and accepted by the students without serious challenge. This needs addressing to ensure the next generation has a factual and balanced viewpoint.

Some examples of those practices used by the dairy industry and perceived as harming the environment include:

- fertilisers (particularly those containing N and P) and their detrimental effect on stream and domestic storage water quality and on aquatic recreational activities of the urban population
- the management of dairy effluent, particularly the inputs of N and P from dairy effluent
- the management of nutrient effluent from fodder conservation activities (i.e. silage pits and feed pads)
- the access of grazing animals to waterways
- spraying of pasture for weed control
- animal treatment for parasite control.

Some opportunities exist for the industry to be proactive by demonstrating that:

- tropical dairying in relation to the soil-pasture-rainfall environment is conducted in a substantially different way to the more intensive dairying in other countries
- with responsible use of nitrogen and phosphorus environmental pollution is not a valid concern

- responsible effluent management practices being adopted limit pollution and recycle this valuable resource in a managed and safe way;
- effluent from carefully sited silage pits is controlled or captured for disposal;
- animals on feed pads are usually fed by-product (brewers grain, processing waste, etc) which would otherwise be a pollution problem requiring expensive and direct cost recovery, treatment processes;
- a *Quality Assurance Scheme* (QAS) is in place for the dairy industry which will allow dairy produce to be promoted and competitively marketed.

The success of the QAS will depend on:

- pasture management and establishment practices which are developed with a view to minimising and monitoring chemical inputs.
- animal treatments being managed to minimise chemical interventions which may be perceived as promoting residues, and to redirect necessary chemical interventions to non-lactating animals where feasible.

Production systems

In the tropics, the dairy industry has developed a philosophy of year round continuity of milk for domestic consumption, and also of raw materials for manufactured products. This requires a production system capable of supplying high quality forage, and for better forage species and their management.

Reason and Lowe (1994) highlighted the possible areas for the development and management of dairy forages for the future.

Forage species

- forages for subtropical and tropical dairying regions in the future will not include many new species, but the ones now being using will improve considerably;
- tropical and temperate species will continue as complementary components of the forage system;
- temperate pastures will be more persistent and will produce high quality forage all year round, but this will still only be on land which can be irrigated;
- legumes will fill a much greater role in pasture systems resulting in a dramatic reduction in the amount of inorganic nitrogen applied to pastures, mainly because nodulation efficiency of legumes should improve to contribute over 200 kg of nitrogen per hectare each year;
- summer legumes are likely to be mainly based on the *Arachis* or *Aeschynomene* genera.
- temperate legumes will remain predominantly as white clover and lucerne, with white clover cultivars being more tolerant of summer temperatures and moisture stress and lucerne cultivars being able to better tolerate heavy grazing;
- genetic engineering will be a major factor in changing many of the plant species - tropical grass foliage will be of higher quality as a result of introducing the brown mid-rib gene, and lucerne and white clover cultivars will be non-bloating;
- these improved species will ultimately be combined into intensive pasture systems, with perennial temperate species providing 24 000 kg DM/ha/year evenly distributed throughout the year and tropicals providing 20 000 kg/ha/year with about 20% of this in the cool season. Management will ensure that legume content of the diet of cows will be in the order of 70% and farmers will be capable of changing this in the short term by grazing strategies.

Forage management

The management of forage production will be supported by a greatly increased amount of technical information in the years ahead. This information will assist in minimising disruptions to the production of quality forage.

The opportunity already exists to make better use of existing resources, be they water, nutrients, or cultivars. Better management of these resources could increase yields of temperate pastures on farms and have a greater impact on pasture and animal productivity than a new cultivar.

Forage management strategies will be linked with projections of the amount of paddock feed required by the pasture fed herd, and will be based on exploiting an improved knowledge of two key factors influencing the production of paddock feed, namely:

- the growth processes and functions of the plant, and their response to grazing/harvesting
- an improved understanding of the likely response of each pasture to given inputs of fertiliser at that time.

A better understanding of plant growth, and its response to defoliation, will enable us to make decisions as to how hard or leniently to graze a particular paddock to provide the necessary feed for the herd today, and the likely impact of that decision on the future growth of the pasture. Such information will enable us to plan paddock feed supplies in advance.

An improved understanding of how fertiliser inputs influence the growth response of pasture under different rainfall/irrigation and temperature conditions, combined with pasture plant analysis at key times should facilitate fertiliser inputs to those paddocks which will respond most.

In the case of raingrown pastures, knowledge of the soil moisture reserves, and the probability of rainfall in the immediate future will assist in planning fertiliser applications. Better weather predictions are possible through continuing improvements in weather forecasting.

With nitrogen fertiliser inputs, immediate rainfall conditions will be important in the processes involved in transforming urea into plant available nitrogen forms, while soil moisture reserves will largely determine the response to applied nitrogen.

Farmers and their consultants/advisers may use rainfall data from their farm to calculate simple soil water balances for significant pasture areas so that soil moisture reserves and irrigation efficiency can be improved. These water balances will also be of great value in assisting farmers to plan irrigation schedules, to maximise water use efficiency (based on plant available capacity of the soil, the estimated rooting depth and rainfall).

The use of base fertilisers such as phosphorus, potassium, calcium, magnesium and sulphur will change in line with a better understanding of the roles of soil fungi and other soil microbes in promoting the availability of these nutrients under permanent pasture conditions, as well as under annually cultivated and sown pastures.

Other opportunities

The role of existing forages and developing management strategies in the reduction of agri-veterinary chemical use in production systems has not been exploited. Opportunities may include:

- the additional assessment of forages based on their anthelmintic properties in a livestock production system which depends on minimal use of chemicals e.g. Waghorn *et al* (1995);
- the additional assessment of the impact of forage components on the function of the animal's immune system and its effects on production and reproduction of the grazing dairy cow.
- the opportunities for specialised forage production systems based on providing high quality forage for 250 days a year, and maintenance levels of nutrients for the remainder of the year. This could support a change to seasonal calving, and seasonal production in specific locations.

References

Ashwood, A., Kerr, D., Chataway, R. and Cowan, R.T. (1993) "Northern Dairy Feedbase 2001. Integrated dairy farming systems for northern Australia". *Tropical Grasslands* 27(3):212-228

Busby, G. J. (1995) "Dairy farm Production Costs and Trends for south east Queensland." Department of Primary Industries Information Series QI95006.

Conoley, D. (1990) in Feedbase 2000. eds Bartsch, B. and Mason, W. Published by CSIRO Publications, East Melbourne.

Kerr, D.V. (1993) "Queensland Dairy Farm Study 1990-91." Queensland Department of Primary Industries Information Series QI93015.

Reason, G.K. and Lowe, K.F. (1994) "Pasture Systems and Efficient fertiliser useage" in *DAIRYPRAC: A Convention on Modern Dairying Practices* pp80-82.

Waghorn, G.C., Charleston, W.A.G., Niezen, J.H. and Robertson, H. (1995) "Effects of Condensed Tannins on Parasitism in lambs" in Proceedings of the International Conference on Novel Approaches to the Control of helminth parasites of Livestock, Armidale. ed. H.S. Gill. In press.