# PROBLEMS OF APPLYING NEW KNOWLEDGE OF PASTURE PRODUCTION IN DAIRYING IN SOUTH-EAST QUEENSLAND

D. R. LAMOND*

## ABSTRACT

*Some dairy farming experiences in South-East Queensland are discussed. Problems relating to the nutritive value of sown tropical species, supplementary feeding, fertilizer practice, stocking policy and animal health are presented. More emphasis might be given to evolving efficient pasture farming systems and less emphasis to differences in the productivity of individual pasture species.*

## INTRODUCTION

The dairy industry is facing a number of important adjustment problems. The decline in numbers which has amounted to well over 50% in Queensland in a decade, is normal and desirable. However, the Australian dairy industry has found it difficult to accept this numbers adjustment. One of the reasons for this outlook is that dairy farmers, by and large, have little confidence in their advisers and research people. The aim of this paper is to present a farmer's viewpoint in an effort to help break down the barriers of communication between farmers and scientists. Thus I want to indicate what one farmer believes to be some of the problems involved in applying new knowledge about pastures to dairy farming. I speak as one of 10,000-12,000 farmers who hope to remain in the industry in Queensland, producing as much milk as did 25,000 ten years ago. I speak also as one who believes that the economic stability of the industry centres around better nutrition. Better quality of cattle, disease control and husbandry will follow better nutrition. In the present state of development of the industry, improved pastures offer the best opportunity for closing the feed gap. Many farmers are applying the principles of high fertilization and high stocking rate to both new and old pastures and because of this it seems appropriate that a two-way flow of information would be to the advantage of both the farmer and the scientist.

## PLANT SPECIES

It is becoming clear that plant species on dairy farms must be highly digestible. Holder's (Tropical Grasslands 1 (2): 135 1967) figures on the effect of adding concentrates suggest that Kikuyu and Glycine are seriously deficient in digestibility or some other factor which limits intake of digestible nutrients. I have had experience which fully supports Holder's findings in that cows on nitrogen-fertilized Kikuyu, paspalum (*P. dilatatum*), couch, setaria and weeds mixtures increased production by about 30 per cent. after addition of 4lb of concentrate per day (1lb D.P.; 3lb S.E. approx.). An interesting and disconcerting observation was that cows in mid-lactation responded as well as fresh cows. This leads me to believe that even at high stocking rates and high fertilization, maximum economic efficiency of use of both the present pastures and the cows which graze them will be possible only with some form of supplementation.

What farmers would like to know, is whether we are right in believing that intake of digestible nutrients is low, and if so, is there anything that we can do to increase it, apart from supplementation.

In my view the growing season is next in importance. In particular, farmers are interested in the ability of the plant **either** to get away quickly in the spring under irrigation **or** to grow late into the winter, which implies frost tolerance. All irrigated species need to be early spring growers as well as high yielders and highly digestible, and they ought to be efficient users of nitrogen. The late autumn, early winter growers are required for autumn saving, in order to feed back in the winter.

* Mt. O'Reilly Road, Samford, Queensland

An important practical problem is that of pasture establishment. Modern dairy farmers should spend the major portion of their time milking cows, feeding cows and calves, tending to the irrigation plant and maintaining animal health. Fertilization, weed control, fencing, etc., should be done by contract. The farmer should have a minimum amount of field machinery. All this puts great emphasis on developing techniques for making old pasture into new. An obvious thought (apart from chemical ploughing) is a machine for planting Pangola, Kikuyu and setaria, in rows, into old pasture. Another, is to teach farmers the art of changing pastures, after superior species are introduced, by fertilizer and stock management. I emphasize the importance of this problem because modern dairy farmers cannot afford to have part of their farm lying idle while replacing one sward with another.

As an example of the problem I can quote an experience with a two-acre paddock in an irrigation area which was sown with *Setaria sphacelata* (var. Nandi) in the summer of 1965. The paddock was non-productive until it rained in July because there was no irrigation of consequence during the drought. As a result of the rain, paspalum, couch, nutgrass, and crowsfoot, especially the latter, challenged the few setaria plants. The farmer couldn't afford to plough and resow so he applied superphosphate and urea strategically (about 5cwt super and 12cwt ureau per acre were applied in 1967) and grazed heavily. Today, that paddock comprises couch, paspalum and setaria and it was estimated last year that the paddock produced about 750 gallons of milk per acre. At whole milk prices, this represented about $300 gross per acre. Fertilizer costs were about $60 including labour. When Kikuyu and Pangola are introduced into this pasture more fertilizer will be applied and it is expected that the paddock will carry more cattle more often.

My final point about species follows from the above experience. There seems to be a real need to study the biology of these unsophisticated, motley, non-conformist pastures (I like the term "farmed" pasture, which connotes the economic interrelations between the plants, fertilizer, soil, stock and the manager). Practical questions concerning such pastures are fairly obvious and include — how much of which fertilizer and when; optimum intervals between waterings; optimum intervals between grazing. Studies of these should indicate economic optimum combinations between fertilization, water and stock days.

## FERTILIZER

The practical problem of great importance to a whole milk farmer, is how much nitrogen, and when, should be applied to farmed pasture. It should be used strategically, that is, in relation to assumed feed requirements of the herd. This means that one should know what is available to the herd from the other paddocks, and to what extent the treated pasture will respond to the nitrogen and hence fill projected availability gaps. These are tough problems but they assume great importance in my mind. One hear much about computers these days and I assume that computerized information services will be available soon. Thus, paddocks could be checked for fertilizer requirements and responses at regular intervals and these data would be considered in making decisions on fertilizer use and response. I should like to know when this service might become available, and how much it would cost for information on nitrogen (N) requirements and responses on some paddocks on my own farm. I stress N because a good deal is known about phosphate, and I believe it it profitable to use N on a wide range of grasses on whole milk farms.

My faith in N is based on data such as the following. I have related annual cost of fertilizers to gross income on one farm (see Fig. 1) for six years, including budgets for 1968 and 1969. Since the amount of superphosphate used was fairly constant, and most other costs were also fairly constant over this period, the relationship is a reasonable representation of the effect of N fertilizer on gross income.

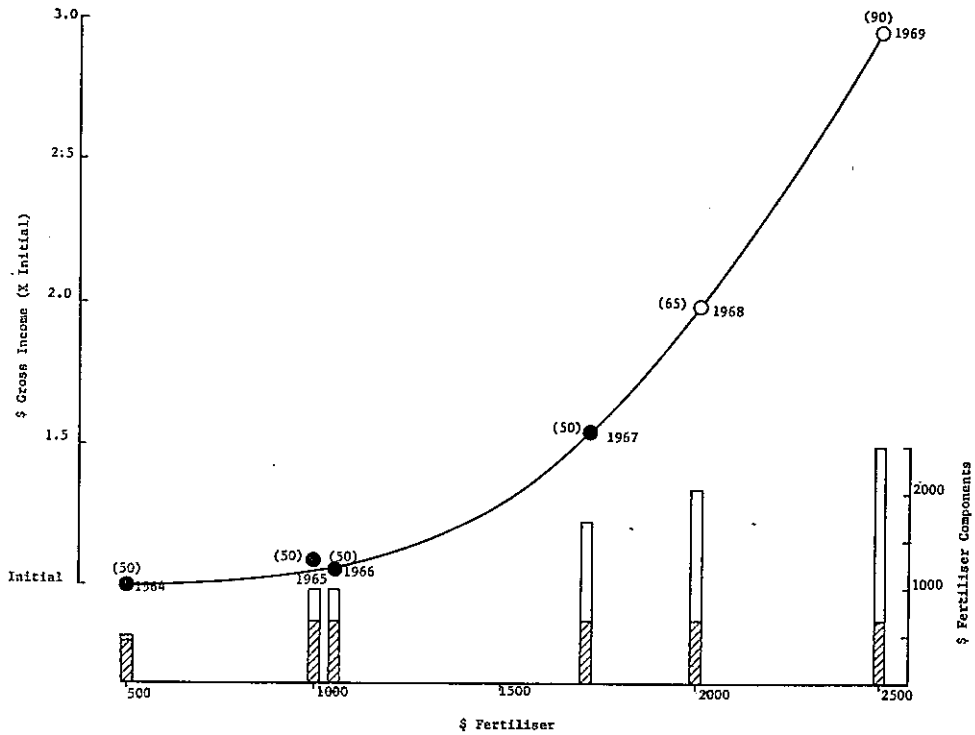


FIGURE 1

The relation between money spent on fertilizer and gross returns on a developing whole milk farm near Brisbane. The figures for 1968-1969 are budgetted and are not extrapolations of the curve. The percentage of superphosphate used is shown by the hatched area.

The figures in brackets are the actual or projected number of cows in the milking herd. The number milked at any one time is 70% - 80% of this figure.

It is not expected that much more than $2,500 worth of fertilizer per annum (including about 20 tons of urea) will be used because of farm and herd size. Further increases in gross income will come about through greater use of concentrates, better quality cows, and a high proportion of fresh cows. There is a question as to whether this experience can be related to other farms, but even if the slope is reduced it would appear that there is a good deal of freedom for use of additional fertilizer. It will be realised that amount of fertilizer used cannot be separated from years and management. However, this does not reduce the value of the curve because it is typical of what happens on farms. What varies most between farms is the amount of finance available at the beginning of a fertilization programme.

## STOCKING RATE

I want to suggest that one should be wary of the concept of stocking rate per farm. The farmer thinks about stocking rate per paddock, or sward area. For example, we have five on the farm, each of which represents different sward types ranging from limited potential native and introduced grasses to high potential grass and grass legume pastures, and hence differs so far as stocking rate is concerned.

(i) Twenty acres (8 paddocks mainly couch, paspalum, Kikuyu with some setaria plants) which can be irrigated, and receive about 10cwt of urea and 5cwt of

super per acre, but we hope to significantly increase the use of N as the herd becomes larger. This area provides most of the annual dry matter intake of about 30 cows and so far as I can determine will do this for about 50 higher-producing cows in due course.

(ii) Thirty-five acres (4 paddocks of Kikuyu, paspalum, Rhodes grass, couch and white clover) now receive about 3cwt of urea per acre and about 3cwt of super but we propose to apply up to 300lb of N and 4cwt of super in the current year. These will be used as night paddocks and occasional day grazing paddocks and should carry the equivalent of one cow per acre per annum.

(iii) Thirty acres of legume-grass mixture autumn-saved for winter grazing. The species comprise Siratro, leucaena, white clover, green panic, paspalum, couch and Rhodes. The area carries the equivalent of about 0.6 cows per acre. After heavy grazing during the winter and spring, the paddocks are used for intermittent grazing up to mid-summer. The area receives about 3cwt of super per acre per annum but will get 4cwt next year.

(iv) Ten acres of mixed pastures (Kikuyu, couch, paspalum and white clover) for bulls, calves, horses, and in laneways. These get about 4cwt of super per acre per annum and occasional N and are grazed continuously.

(v) Eighty-five acres of cleared and partly cleared hill country, should carry 0.6-0.7 heifers and dry cows per acre. We aim to put 2-3cwt of super per annum on this area in due course.

Each of these regions requires separate management and poses separate problems to the farmer and should, I believe, pose separate problems to the research worker.

## SUPPLEMENTS

My experience indicates that even on highly fertilized and highly stocked swards in this environment cows do not produce as efficiently as they would on temperate pastures or if they were hand-fed. Thus, they produce 2 gallons or so per day but this can be increased substantially by addition of a few pounds of concentrate, costing 3.5 cents per lb., even in the summer. I have concluded that not only is some form of supplementation with highly digestible foodstuffs necessary but also that it is profitable, at least on whole milk farms.

The problems connected with supplementary feeding are: what should be the protein, carbohydrate and fibre content of the supplement for the different pasture condition, and how much should be fed on a per gallon or per cow basis and which of these is the better? I stress fibre because above all else I believe the supplements must be highly digestible. It is most likely that the ideal supplement at one time of the year would be unsuitable at other times.

There are some points worth making about the source of supplements. While the traditional forms of concentrates should be considered initially because of their easy formulation and high digestibility, the possibility of using pelletted lucerne should be considered on the basis of cost. Pelletted lucerne of 17% crude protein and 23% fibre has been quoted at $37 per ton at the plant or less than 2 cents per lb. by the time it is fed to the cow. We would consider it profitable to use lucerne pellets as the sole supplement provided they cost no more than $40-$42 per ton. The increased digestibility and reduced wastage make the pellets attractive even though we would not expect as high production as if concentrates were used.

Another possibility is that the highly proteinaceous tropical legume *Leucaena leucocephala* could be considered either for pelletting or strip-grazing. It would be easy to handle with an electric fence, is high yielding, persists even under heavy grazing and is not bothered by dry spells as much as other legumes. It would be necessary to learn more about its toxic effects, if any, when fed as a supplement, though if strip-grazed the off-flavour that is said to occur in the milk is the only

practical problem we can see. Drying and pelletting would probably eliminate this. Should *Leucaena leucocephala* be used widely it might be necessary to carry out research on how to treat animals that gain access accidentally. From the agronomic point of view I feel there is a need to understand the relation between density, height of grazing or cutting, and yield, though possibly this is already known.

## FARMING SYSTEMS

There seem to me to be four basic farming systems that can be built around pastures in this environment.

(i) *Whole milk, zero grazing* — About fifty acres of Pangola, Kikuyu, setaria, paspalum, and couch, and plenty of fertilizer could provide enough digestible dry matter to obtain 300 gallons of milk per day all year round from a herd of about 130 cows. The grass would be forage-harvested, dried and stored and fed into troughs. Harvest stores could be considered, or the grass might even be pelletted after drying for ease of storage, and to reduce waste and increase intake. My calculations indicate that this system would be profitable provided that the land is well drained and labour is properly used. Irrigation is not essential, but would reduce the acreage needed.

(ii) *Whole milk, intensive with concentrates* — This is the system we are trying to develop. It is based on minimum use of labour away from the shed, and requires high stocking pressures with good cows, and high levels of fertilizer, particularly N. In this system there is no conservation on the farm except autumn-saving of tropical legume-grass pastures. It is essential to have an area of irrigation. Some lucerne hay is purchased for August and September.

(iii) *Manufactured milk, intensive* — The weakness in the present amalgamation proposals for the dairy industry seem to be that increased profits need not automatically follow from increased farm size. On the contrary, factory supply farms may find it necessary to intensify, but to do so in such a way that they make maximum use of the yield potential of summer-growing grasses and legumes. One man can handle 100 cows in a modern shed for 9 months of the year. By use of high fertilizer and high stocking rates it should be possible to get 25,000-30,000lbs butterfat or its equivalent in dried milk. This would provide a gross income of $11,000-$13,000. With seeds, or cash crops or beef side lines this would be a profitable concern. Furthermore, a farm capable of producing 30,000lb fat could easily use $2,000 of fertilizer, mainly nitrogen, to increase yield and quality of feed in the summer.

(iv) *Manufactured milk, and beef* — The major problems are what proportion of the herd and land should go into beef production, and labour requirements relative to farm size. I doubt whether it would pay one man to milk less than 80 cows (for 9 months), hence one can envisage a herd of about 140 cows of which 60 rear two calves each. This could increase income to $16,000-$18,000 but would require more land, more capital and probably more labour than at present available on many farms. Unfortunately, there are very little useful husbandry or economic data on this kind of farm enterprise.

## ANIMAL HEALTH

### *Rearing calves*

We have learned that it can be disastrous to wean calves on to grass too early in this environment. We now keep them on milk substitutes until 4 months of age, and then they receive lucerne hay until 8-10 months. Undoubtedly parasites are part of the problem, but I believe that the calves don't get enough digestible nutrients from the pasture. It is well known that the effect of the parasite burden is inversely related to the intake of digestible nutrients. Thus, on pasture of moderate quality intestinal parasites have serious effects. It seems that there is a need for a study of

intake of calves on the new pastures, how best they should be supplemented, and to what extent the worm burden influences the value of the pasture for calf production.

*Infertility syndromes*

Nutritional infertility may occur in cows which lose weight rapidly after calving. Little quantitative information is available on the body weight loss problem in dairy cows but it seems that milking cows will show infertility on irrigated spring pastures as well as poor quality pastures and both seem to be related to nutrition. One is believed to be an energy deficit and the other undernutrition. We have cows and heifers which have had anoestrus in the summer due to loss of body weight. Also, I have been disconcerted by a number of cows aborting late in pregnancy or having dead calves. These cows are not experiencing infectious abortion, so far as we can determine. One wonders if toxic substances can occur on occasions in heavily fertilized grasses and legumes or if the 5-6% abortion we observe is due to environmental factors.

*Mineral balances*

With the intensive grass systems I envisage, one can expect greater mineral imbalance problems in cattle in this environment compared with the temperate regions, because of the effects of high summer rainfall and temperatures on soil nutrients. I don't know whether much is known about this but perhaps a computerized fertilizer service could be extended to include monitoring the major elements in the cow as well as in the soil and the plants.

## CONCLUSION

I believe that dairy farmers in this region can have confidence in intensive use of pasture for dairy cows. Many problems remain to be solved, especially the optimum levels of fertilizer and the correct amounts and kinds of supplements to be used. From the farmers' point of view building up confidence in pasture farming is the key factor at this stage. For what it is worth, I would like to suggest that more scientific effort could be applied to tackling the problem of optimum use of the pastures we already have, before becoming too deeply involved with new species.