# COST OF FORAGE COMPARED WITH COST OF GRAZED PASTURE

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**ABSTRACT**

Estimates are made of the cost of forage crops and grazed pasture as feed for cattle.

For forage this is on the basis of two crops per year, grown well to give good yields and handled by contractors who have an adequate scale and compactness of operation to give them high utilisation of men and machines. That is costs for established rather than pioneering operations.

For grazed pasture costs are for the top practitioners of a well established system. The data are from the N.Z. Dairy Board Surveys and are for those farms producing over 400lbs milk fat per acre. Such are a fraction of one percent of the total farms in that survey.

Results are on the basis of feed delivered to the animal's mouth. Costs for the crops are 2.06 cts/kg for a full forage ration, 2.59 cts/kg where the feed averages 70% whole plant forage and 30% grain, and 3.14 cts/kg for the grazed pasture.

It is suggested that if these cost advantages of forage can be accepted the industry can proceed with confidence to take advantage of the substantial off-the-farm advantages which flow from no longer having farm production tied to the seasonal cycles and irregularities of grazed pasture.

## INTRODUCTION

Cheap food has been the basis of New Zealand's traditional, and very effective, trading strategy. This is seen visibly, and externally as our ability to market animal products competitively almost anywhere in the world given reasonable trading access.

Less obviously, but very well understood, this animal production has been based in years past on very cheap feeding of the animals. The cornerstone of that has been again in years past our economical pastures providing all the year round grazing. The cheapness of that as feed for animals has been considered to over-ride all of its manifest limitations.

Chief among these limitations are low yields of utilisable product, with a probable ceiling of around 13,000-13,500 kg/ha of grazed feed into the animal's mouth. Another is variability in supply at different times of year. In this a major variation in yield between winter, spring and summer, has imposed on it large perturbations from variability of seasonal rainfall. Another limitation is quality of the product eaten. A reasonably high D.O.M. is not only the feature required of a good quality feed for best results in various ruminant animal production enterprises. Finally, a limitation often forgotten because we live so much with the grazing system, is the additional maintenance cost for feed when an animal has to graze for rations which may or may not be adequate. Recent California assessments indicate that this itself could in production terms convert a 450lb milk fat cow to a 300lb milk fat per annum cow.

In saying this the writer is aware that statments by Hutton (1971) have been widely interpreted to indicate that in new Zealand there is little additional maintenance cost for grazing for a dairy cow. The writer is equally conscious that these conclusions are not shared in other countries with very much larger numbers of dairy cows than our own, and that Hutton has not to the writer's knowledge, published his results in the form of formally presented scientific papers which allow detailed analysis by others of the results and the manner in which they were achieved.

However, despite all these reservations the cheapness of grass as a feed has been a very cogent reason for staying with it as a main source of feed for livestock. Alternative feeds, if more costly, must have special production or convenience advantages to justify their use.

If however alternative feeds can be produced and delivered to the animal's mouth at equal or lower costs than pasture they become a genuine alternative.

If, in addition, good crops of these alternative feeds can give production yields 2-3 fold those achievable in the animal's mouth from good pasture, those alternative feeds become cogent alternatives. Their use would strengthen that traditional New Zealand strategy of export production based on cheap feed to our animals. Implementation would justify major changes in farming practice, and all the innovation and sense of keen enterprise which goes with that.

Accordingly once the levels of yield which could be expected from well grown crops of summer and of cool season forages had been determined, production costs were re-examined. This was done for a 1971 report on forage production systems and testing of them, which has essentially remained a departmental document. The matter was re-assessed for a subsequent 1973 report which now has some circulation within industry and various government agencies, and to which various references have been made in public comment.

As the relative costs at the animal's mouth of feed from pasture, and from forage crops, are central to consideration of the farming alternatives the calculations, and the conclusions arrived at, are presented here. These are for consideration and debate.

The examples given here are based on well grown forage crops being handled by men who are well past the learning stage. They are compared with results achieved by the top fraction of one percent of men in the long established pasture grazing system.

These are based on work done by contractors operating on sufficient scale to keep men and machines well utilised and allow for efficient scheduling of operations. A group of closely-sited farms providing 250-400 hectares of land in continuous forage crop with present conventional paddocking removed and reasonable provision for spread maturity of crops, should provide that. Low tillage agronomy would be used on a soil in good condition for tilth and with weeds kept in control.

For maize silage, an experienced contractor's 1973 estimate for cultivation, seed sowing, fertiliser application, fine chop harvesting and delivery to the bunker was $150 per hectare — under present farm conditions.

For cool season oatlage his equivalent figure for oversowing after maize, subsequent fertiliser application, mowing, crimping, chopping and delivery to bunker was $62.5 per hectare.

That gives a total annual cost of $212.5 per hectare under present farm conditions. That has been reduced by 20% to allow for the operating economies of scale to give the estimate used of $170 per hectare.

For maize, seed and materials costs per hectare were $15 for seed, $30 for fertiliser, $37.5 for weed control, and $10 for army worm giving a total of $92.5

For oats, the equivalent costs were $15 for seed, $30 for fertiliser and $7.5 for weed control, giving a total of $52.5.

Table 1: Forage feed costs (delivered to the animal's mouth)

For 84 hectare property on level or easy contour land with 80 ha in crop. Balance in yards etc.

| | per hectare |
|---|---|
| Costs of Growing, Harvesting and Storing Feed | $315 |
| Interest and Depreciation on Feed Handling and Storage Installation | $213 |
| Wages of Feed Delivery to animals from Storage | $28 |
| | $556 |

**Crop Yields**

**Dairy:** Maize 190 bu/acre and 25,080 kg D.M./ha
Lupins or other cool season legume 12100 kg D.M./ha (All less 10% for harvesting and storage losses)

Total utilisable yield = 33,460 kg/ha

**Beef:** Maize 180 bu/acre and 23,800 kg D.M./ha
Oats 14,300kg D.M./ha
(All less 10% for harvesting and storage losses)

Total utilisable yield = 34,300 kg/ha

**Costs per kg**

**Dairy:** Direct Cost = 1.66 cts/kg
Interest on land ($1750 ha) at 8% = 0.42 cts/kg

**Total** = 2.08 cts/kg

**Beef:** Direct Cost = 1.62 cts/kg

Interest on land = 0.41 cts/kg

**Total** = 2.03 cts/kg

The overall cost per hectare is then $315 per hectare. As an independent check Mr Roger Marshall, who is handling this two crop a year system on a comparable scale at Feilding, was asked last month for his estimate of these costs. He gave as a 1974 figure: $327.5 per hectare. The two independent estimates are thoroughly comparable.

It should also be noted that fertiliser and specifically the N component is a relatively small proportion of the total cost. It follows that substantial increases in cost for these items can occur without major perturbation of overall costs. This contrasts somewhat with the legume-pasture situation where fertiliser is a more dominant component of operating cost.

TABLE 2: Forage feed costs — dairy on 30% grain rations (Delivered to Animal's Mouth)

| For 84 hectare property on level or easy contour land with 80 ha in crop. Balance in yards etc. | **per hectare** |
|---|---|
| Costs of Growing, Harvesting and Storing Feed | $315 |
| Feed Storage and Handling Installation Interest and Depreciation | $179 |
| Wages of Feed Delivery to Animals from Storage | $35 |
| | $529 |

**Crop Yields**

Maize (190 bushels per acre and 25,080 kg/ha and lupins, 12,100 kg/ha D.M.)

(All less 10% for harvesting and storage losses).

| | |
|---|---|
| Total utilisable yield Full Forage | = 33,460 kg/ha |
| With 30% Grain Ration — all wet stored — Utilisable yield for feeding milking cows | = 25,740 kg/ha |
| **Direct Cost** (30% Grain Ration) | = 2.05 cts/kg |
| Interest on Land ($1750/ha) at 8% | = 0.54 cts |
| **TOTAL COST** | = 2.59 cts/kg |

* **Note** This is a mean figure. It in fact allows for a much higher proportion of grain at the peak of production balanced by a lesser requirement around the end of lactation.

TABLE 3: Grazed pasture costs — dairy Per kg feed eaten

**Paddock Production Costs**

| | |
|---|---|
| Per Cow* — General Expenses | $46 |
| Labour (Hired & Farmer) | $23 |
| | $69 |

* From Dairy Board Economic Survey 1966-69 and 1969-70 plus 35%

| | |
|---|---|
| Per hectare at 4.2 cows/ha (Hutton 1973) | = $290 |
| **Direct Cost** per kg of pasture (at 13,200 kg D.M. hectare eaten) | = 2.20 cts/kg |
| **Interest on Land** ($1750/hg) at 8% | = 0.94 cts |
| **TOTAL COST** | = 3.14 cts/kg |

**Note** For beef cattle managed at adequate intensity to produce carcass meat yields of 2000 kg/ha per year, it is suggested grazed pasture costs will be similar to those for dairy cows.

**Forage Feed Storage and Handling Costs**

For beef on an 84 ha. property these were taken as bunkers for storage of feed $70,000, mixer forage wagon $10,000, two second-hand tractors $3,000, feeding-out installation — bunks, covers, concrete etc. $24,000, yards $12,000. Maintenance and depreciation was at standard rates for each item (Philpot pers. comm.) and interest on capital involved at 8%.

Silage bunkers were allowed for at $1.60 per ton of storage with provision for a proportion of dual filling during the year.

For dairying with the high grain rations adjustments were made for the reduced storage requirements and somewhat different feed handling systems.

**Grazed Pasture Costs**

These are based on N.Z. Dairy Board Survey of Economic Structure of Factory Supply Dairy Farms in New Zealand 1968-69 and 1969-70, plus 35% to give a 1973 figure. Those years were the two latest sets of figures then available. Data are for farms producing over 400lbs milk fat per acre in those years (Table 18 - 1968-69 and Table 19 - 1969-70). That is the top practitioners of the long established pasture grazing system.

In the general expenses the following proportions of the various items listed are charged to grazed pasture — administrative 67%, contractors 100%, feed 100%, fertiliser and seed 100%, freight 85%, weeds and pests 100%, general 100% development 75%, repairs and maintenance 50%, insurance 67%, and rates 92%. It is worth noting that bought-in feed is a sizeable item in these costs, i.e. that efficient practitioners of the dairy grazing system regard this as a needed input to achieve top levels of output from their pastures.

Labour costs were arrived at by allocating half the total to the grazed pasture. They come from allowing for the farmer at $3,900 per annum. His labour cash costs are reported in the tables mentioned above at $1,550 over the two years 1968-69 and 1969-70. This was raised by 35% bringing it to a 1973 level, and the whole then divided by 130 as the average hard size to arrive at the $23 per cow.

It could be noted that in calculations of overall profitability of dairy or beef forage enterprises wages were allowed for in them at considerably higher rate than is accepted for grazed pasture dairying. In addition provision was made for working a 40 hour five day week with some reasonable shift work.

I judging your conclusions to take from these data could two matters be kept in mind.

The first is that they have been worked up essentially as an occasional time operation by a person with his major committment to other duties. From that various sets of calculations prepared over a considerable number of years inevitably lack final polish and ultimate internal consistency of detail. Equally it is known there are a number of unders and overs in both types of feed production which have not been allowed for in detail. Overall these are judged to be largely self-balancing and do not substantially alter the major conclusions.

The reason for assembling the data has not been to demonstrate a final conclusion. It has been to make it apparent that there is a case for the situation being examined by a much enhanced grouping of skills and computation facilities. Such would also allow sophisticated estimates of the interactions of various levels of production efficiences and product return on the overall finances of the various systems and variants from them.

The second major aspect that must be kept in mind is the contrast in level of reliability for the estimates of factors of production efficiency, which inevitably exists in comparisons between an established and a potential system.

For the established system its production efficiencies and costs, as they really do operate, can be relatively unequivocally determined. That is irrespective of the joy or chagrin the answers give to those receiving them.

For a new untried system, it must always be kept in mind that irrespective of how elegantly the computations are carried out they are always based on a series of assumptions for the many production factors involved. Answers for that often fine margin from which comes overall profitability can be substantially influenced by the individuals conservatism or optimism in choosing the numbers to put on those basic production factor assumptions. It follows that, the only real test of overall economic viability remains the integrated production operation as a whole, run on adequate scale by able men keen to make it go well.

The overall conclusion suggested is that intensively produced forage crops do have potential for producing feed of equal or better quality than pasture at equal or very probably lower costs. Once that can be accepted Industry can then proceed confidently to take advantage of the immense off-farm benefits which flow from no longer having farm productin tied to the seasonal cycles and irregularities of grazed pasture.

## REFERENCES


Hutton, J.B., 1971. Nutrient requirements of New Zealand Dairy Cattle. Proceedings of N.Z. Society of Animal Production, **21**: 211-223.

Hutton, J.B., 1973. Developments in nutrition and management and their relation to the future of the New Zealand Dairy Industry. Ruakura Conference, 220-232.

Bath, D.L., 1972. "Nutrient Requirement Tables for Dairy Cattle". Agricultural Extension, University of California.