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DAIRY FARM AMALGAMATION AND INCREASED FARM OUTPUT*

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INTRODUCTION

Among many recommendations designed to ensure an economic and stable dairy industry in Australia the 1960 Dairy Industry Committee of Enquiry suggested that finance should be made available to expand or amalgamate small dairy farms.¹ The underlying hypothesis is that as farm acreage increases so does total output, but costs per unit of output decrease and hence net income rises. Certainly there is evidence that dairy farms with relatively high net incomes do tend to have larger acreages and levels of output.²

On the other hand large numbers of farmers are leaving dairying. For example membership in the Queensland Dairymen's Organization which is compulsory for all dairymen in Queensland fell from 21,842 in 1949 to 14,610 in 1964. It is sometimes suggested that this automatically means that the farms remaining tend to become larger by purchase of land from those moving out.³ Hence direct financial assistance through Government action is not necessary as the small size and associated small output problem is in the long run self correcting.

The purpose of this paper is to examine the effect that increasing dairy farm size has had on butterfat output on farms in Boonah Shire, Queensland. The practicability of raising income by increasing size is also discussed. The analysis proceeds as follows:

Changes in land ownership in the Shire for the calendar years 1957-61 are detailed. The extent of the increase in size of dairy farms is thus revealed. For those farms which have added land over the period and whose major source of income⁴ is dairying, butterfat production for up to five years before and after the additional land purchase is subject to statistical analysis to determine whether significant increases have taken place. The kind of changes necessary in farm acreage *ceteris paribus* to overcome low income problems are next outlined. Finally the attitudes of a random sample of farmers in the Shire towards selling out or purchasing more land are examined to determine whether radically altered land ownership patterns are feasible.

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¹ *Report of the Dairy Industry Committee of Enquiry* (Canberra: Government Printer, 1960), p. 116.

² For example: M. L. Parker and H. P. Schapper, *A Resurvey of Dairy Farming in the Far South West of Western Australia* (Perth: Institute of Agriculture, University of Western Australia, 1961), p. 75.

³ A. G. Lloyd, *Proceedings of the Conference on the Primary Industry Cost-price Squeeze* (University of Melbourne, 1962), p. 107; and N. T. Draine and H. R. Edwards, eds, *The Australian Dairy Industry* (Melbourne: Cheshire, 1960), p. 306.

⁴ Greater than 50 per cent of gross income from butterfat, pigs cull cows and bobby calves.

CHANGES IN LAND OWNERSHIP 1957-61

Over the 5-year period 1957-61 there were 370 notifications of changes in land ownership in the Shire involving a total area of 81,221 acres. This represents a land turnover per year of approximately 5.9 per cent of the total area in the Shire used for farming purposes. In Table 1, such sales have been grouped according to the major source of income of the farm sold. If the land sold was itself only part of a farm, it was grouped according to the major source of income of the farm of which the land formed a part. The farm type grouping follows that adopted by the Commonwealth Bureau of Census and Statistics in its 1959-60 survey.⁵

TABLE 1

Land Sales Boonah Shire 1957-61 According to Land Usage Before Sale

Farm Type	1957		1958		1959		1960		1961		Total 1957-61	
	No.	Acres	No.	Acres	No.	Acres	No.	Acres	No.	Acres	No.	Acres
Dairy ..	67	8,077	37	8,264	53	8,005	56	8,974	45	7,236	258	40,556
Beef ..	6	1,940	8	951	23	13,558	21	12,603	22	8,904	80	37,956
Potatoes ..	3	220	3	571	4	371	5	650	0		15	1,812
Cereal grain ..	..	..	..	..	..	..	..	..	1	30	1	30
Multi-product ..	3	327	..	..	1	160	..	..	..	..	4	487
Other ..	4	212	5	114	..	..	2	40	1	14	12	380
Total ..	83	10,776	53	9,900	81	22,094	84	22,267	69	16,184	370	81,221

Over the period, sales of dairy land accounted for 50 per cent of all land sold and sales of beef cattle land for 47 per cent. However, of total transactions dairy farms accounted for 70 per cent, and beef cattle farms for 22 per cent. According to the Bureau of Census and Statistics 1959-60 survey, 47 per cent of farms in the Shire obtained their major source of income from dairying, 29 per cent from beef cattle and 7 per cent from multi-purpose activities. Hence a somewhat higher proportion of dairy farms are changing ownership than beef cattle farms. But the turnover of dairy land is not great. For example in 1959 it represented 6.3 per cent of all land on which the major source of income was dairying.

Further analysis of the 258 sales of dairy land revealed that only 36 transactions involving 3,327 acres represented enlargement of existing dairy farms. The remainder of dairy land sales included transfer of ownership of self contained units and sales in which land utilization changed to only partly in dairying or completely out of dairying. (Of the 6,601 acres that went completely out of dairying 5,946 went to beef cattle production.) The possibility of increasing dairy farm size by adding land not previously used for dairying was also investigated. Over the 5-year period there were only two such sales totalling 178 acres.

Hence, of the 81,221 acres sold over the period considered, only 3,505 acres or 4.3 per cent went towards increasing existing dairy farm size.

⁵ "Classification of Rural Holdings by Size and Type of Activity 1959-60", *Bulletin No. 3—Queensland*, Commonwealth Bureau of Census and Statistics, Canberra (October, 1962).

On a yearly basis this represents an average increase of approximately 1.5 acres per dairy farm in the Shire. With this rate of increase in size, it would take 180 years to double average size. Such data emphasize the slow average rate of amalgamation and *per se* do not support the self correcting hypothesis.

Nevertheless on an individual property basis some increases in acreage are large. The 36 farms averaged 186 acres in size prior to additional land purchases and 283 acres afterwards, an increase of 97 acres or 52 per cent. Only four farms increased size by less than 25 per cent and eight farms increased by over 100 per cent. Changes in output on the 36 farms after purchase of additional land are discussed in the next section.

RELATIVE OUTPUT BEFORE AND AFTER LAND PURCHASE

For each of the 36 farms which added land over the 1957-61 period, annual total butter production was obtained for up to 5 years before and after purchase of additional land.⁶ Production for the year in which additional land was purchased was excluded.

If it were found that farms that increased acreage also increased production this does not necessarily imply a causal relationship. The increase could be due to seasonal conditions, improvements in technology, addition of resources other than land or improved management.

An attempt was made to account for these other factors by comparing production on each of the 36 farms with that of 3 adjacent or neighbouring farms. These latter farms were chosen on the basis of similarity in resource inputs and management ability of the operators. It is acknowledged that such an approach is not ideal.

For each year before and after additional land purchase, butter output was expressed as a ratio of the average production of the three control farms. There were then two sets of ratios for each farm, one before additional land purchase and one after additional land purchase. A *t* test was used to test for significant difference between group means. Table 2 includes data comparing one farm with a group of 3 similar adjacent farms.

Of the 36 farms 10 were found to have significantly increased levels of output (at the 5 per cent level) after buying additional land. A major factor appears to be the proportion of extra land bought. The 10 farms with significant *t* values increased area by 72 per cent compared with 48 per cent for the remaining 26 farms.

Analysis of variance based on the ratios discussed above, was used to test whether there was an overall significant difference in the butter output after purchase of additional land. These data are included in Table 3.

The *F* test for "Before v After" is significant at less than the one per cent level.

Table 4 summarizes the differences in butter production levels for the amalgamating and control farms.

⁶ For 36 farms over a period of 10 years this should give 360 sets of data. However, for farms purchasing additional land in 1960 and 1961 only 4 and 3 years data respectively were available. Also other single years were occasionally missing. This left 333 sets of data for analysis.

TABLE 2
Butter Production 1954-65 for 4 Similar Farms
 (lb. Commercial Butter)

Year	1954	1955	1956	1957	1958		1960	1961	1962	1963	1964
1 Farm A*	4,277	4,689	4,873	4,774	4,825		6,276	7,011	7,443	8,650	8,422
2 Farm B	4,425	5,750	5,517	5,262	4,140		5,247	4,173	5,604	8,073	5,744
3 Farm C	3,623	5,297	5,697	6,718	5,263		5,627	5,154	4,680	6,055	7,429
4 Farm D	4,314	6,093	7,654	6,655	6,896		6,416	5,974	6,695	8,856	8,880
5 Av. Farms B to D	4,121	5,713	6,289	6,212	5,433		5,763	5,100	5,660	7,661	7,351
6 Ratio: line 1 line 5	1.038	0.821	0.775	0.769	0.888		1.089	1.375	1.315	1.129	1.146

t value = 4.63 Probability level 0.5%

* Farm A was 115 acres and bought 81 acres in 1959.

TABLE 3
Analysis of Variance of Production Ratios Data

Source	d.f.	s.s.	m.s.	F
Before v After	1	5.156	5.156	42.9***
Farms	35	73.648	2.104	..
Error	296	35.555	0.120	..
Total	332	154.355	..	..

*** Significant at less than the one per cent level.

TABLE 4
Butter Production for Amalgamated and Control Farms

Farms	Mean Annual Butter Production		Increase	Per Cent Increase
	lb.	lb.	lb.	
All farms purchasing additional land	6,686 (before)	9,181 (after)	2,495	31
Farms purchasing additional land and having significant t levels ..	5,462 (before)	8,732 (after)	3,270	60
All control farms	6,190	6,438	248	4

Butter production on farms which added land increased by 31 per cent compared with a 4 per cent increase on similar adjoining farms whose acreage did not change.

The fact that only a 31 per cent increase in output was associated with a 52 per cent increase in land has several possible explanations. There could have been a lag in building up herd numbers or a lack of sufficient working capital to make best use of the additional area or a failure to replan on a whole-farm basis.

It appears then, that some significant increases in production are associated with increased acreage and that these are mostly where there is a large relative increase in acreage. However, it is not suggested that increases in output are caused primarily by increases in acreage because extra acreage normally requires consequential increases in other resources.

On the other hand in the survey area the number of dairy farmers buying additional land was very small. If the low output and low income problem is to be markedly ameliorated through increases in size of farm, a comprehensive, large scale scheme administered by a competent authority with adequate finance would be required. Certainly there are numerous overseas precedents for this, for example in the Netherlands, Ireland and the United Kingdom.⁷

DETERMINATION OF "OPTIMUM" FARM SIZE

A critical factor in any industry or Government attempt to assist amalgamation is defining a desirable farm size whether this be in terms of output, acreage or farm operators' net income. The Dairy Committee of Enquiry suggested a minimum level of output from all sources equivalent to 8,000 lb. of butterfat. In practice the average dairy farm only obtains 50-60 per cent of its gross income from butterfat alone so the 8,000 lb. figure would mean an actual butterfat production of 4,000-4,800 lb. This implies a gross income of around \$3,800. On the basis of University of Queensland Boonah Survey data the resulting net income⁸ to the farm operator would have averaged \$1,284 in 1959-61 compared with \$1,436 for the then current State adult basic wage or \$2,104 for actual average adult earnings.

An alternative method is to estimate what is considered to be a reasonable net income and then to deduce a necessary level of output and acreage.⁹ Whether such figures are realistic depends on the data on which they are based. Because of the size of the random sample (161 out of 521 eligible dairy farmers) and the fact that data represent a two-year average (1959-61) it is considered that the basis for calculations made below is sound. Briefly, it is suggested that a reasonable net income for a dairy farm operator is one which he would earn if employed elsewhere, plus allowances for his capital investment in the farm, the riskiness of farm operations and his managerial skills. Assume a basic wage of \$1,436.¹⁰ If 5 per cent of the owner's capital equity is taken as an interest reward plus $1\frac{1}{2}$ per cent for risk plus $1\frac{1}{2}$ per cent for managerial skill the required net income is \$3,232.¹¹ Assuming net income is 46 per cent

⁷ *Low Income in Agriculture—Problems & Policies* (Paris: Organization for Economic Co-operation and Development, 1964).

⁸ Gross income less running expenses and overheads but no deduction of an interest allowance on invested capital.

⁹ The data used to estimate net income and associated output was derived from unpublished University of Queensland data; D. R. J. Densley, *Survey of Dairy Farming in Boonah Shire* 1961, Collection and Classification of Data. Unpublished Honours Report, University of Queensland, 1961; E. O. Burns *et al.*, *Economic Investigations of Dairying Practices on the Eastern Darling Downs*, Queensland Department of Primary Industries, September, 1964.

¹⁰ To coincide with the period of Boonah Survey.

¹¹ The present comparable actual average adult figure for Queensland is \$2,640.

of gross income, the gross income necessary is \$7,020. Finally if 51 per cent of gross income is from butterfat sales, the required butter production is 8,950 lb. (say 9,000 lb.). This is almost double the Dairy Committee of Enquiry figure. It is conceded that the derivation and use of such a single average figure suffers from the usual limitations inherent in averages. This consideration should be kept in mind in assessing the discussion which follows.

Having established such a figure the extent of the low output problem and the changes necessary to raise output become apparent. If such changes are to be implemented the attitudes of farmers to land purchase or sale must be allowed for. These aspects are discussed below.

THE EXTENT OF THE LOW OUTPUT PROBLEM

On average over the period 1957-61 only 12 per cent of Boonah Shire farmers supplying butter to factories exceeded the 9,000-lb level. The percentage varied from 6.8 in 1957 to 20.2 in 1959. According to the 1959 Census and Statistics Survey¹² 80 per cent of suppliers in the Shire depend on dairying as their major source of income. If it is assumed that none of the remaining 20 per cent reach the 9,000-lb. level, then 85 per cent of farmers in the Shire whose major source of income is dairying have a low output problem. University of Queensland data confirm this figure. Of 161 dairy farms¹³ selected at random, 79 per cent had an average annual butter output of less than 9,000 lb. in the 1959-61 period. Even taking the unrealistically low Dairy Committee of Enquiry figure of 8,000 lb. of butterfat equivalent as a minimum¹⁴ 34 per cent of survey farmers did not reach this level.

Consider the 127 survey farmers below the 9,000-lb. level and the 55 below the 4,820-lb. level. The average butter production of the former was 5,393 lb and of the latter 3,775 lb. The survey average butter per acre figure was 25 lb. and production per cow 155 lb. On the basis of the latter production levels, the 127 farms would each need to add on average 144 acres and 23 cows to reach the 9,000-lb. level of production. Each of the 55 farms would need an additional 42 acres and 7 cows to reach the 4,820-lb. level. As the average survey farm was 260 acres in size, approximately one farm in three (for the 127 group) or one farm in seven (for the 55 group) would have to be sold and subdivided to enable the remainder to reach the suggested levels of output. In the former case 18,300 acres would be involved and in the latter case 2,300 acres. Some idea of the upheaval required is indicated by the fact that survey farms represented only one third of dairy farms in the Shire and also that over the 1957-61 period an average of 31 self-contained dairy farms totalling 5,263 acres were sold in the Shire each year.

¹² Classification of Rural Holdings by Size and Type of Activity. 1959-60, *Bullet. No. 3—Qld*, C'wlth Bureau of Census & Statistics, Canberra (October, 1962).

¹³ Greater than 50 per cent of gross income from butterfat cull cows, bobby calves and pigs.

¹⁴ The consequent butter requirements is 4,820 lb.

FARMER ATTITUDES TO PRESENT SIZE AND LAND PURCHASE OR SALE

The data of the previous section indicate that if low output and low income problems are to be solved by increasing farm acreage a large scale scheme will be required. If such a scheme is to be implemented, minimum disturbance would be caused if sufficient numbers of farmers would sell voluntarily. On the other hand some farmers may consider present size adequate and hence not consider further land purchase necessary. Some information on these aspects was collected in the survey. Of the 161 farms, 103 considered their present farm size was satisfactory, 56 said their farms were too small and two said they were too large. The 103 farms averaged 277 acres producing 7,324 lb. of butter and the 56 farms averaged 164 acres producing 5,472 lb. of butter.

Consider the 56 "too small" farms. On average they thought an additional 83 acres were needed. All but four farmers were prepared to borrow finance to purchase extra land. They were willing to pay up to \$90 an acre which is a realistic figure for the district. However, such purchases would still leave the average farmer with only 7,550 lb. of butter. Of the 50 farmers (out of the 56) below the 9,000-lb. level, 27 were prepared to sell out. It appears that for the "56 group" adjustments to the suggested size would be possible without undue disturbance.

The 103 "satisfactory size" farms present a different type of problem. Twenty-seven had production greater than 9,000 lb. of butter leaving 76 on which size should be increased. The difficulty is that these latter farmers do not visualize additional land purchase as being necessary although they are problem farms in the sense that they do not reach the 9,000-lb. level considered desirable. One possible approach here is to link additional land purchases with whatever goals the farmers have in mind. Thus 53 per cent of the 76 farmers were not satisfied with their present level of production and 59 per cent had plans for increasing production. Purchase of more land could be suggested as a method of increasing production.

SUMMARY

Enlargement of dairy farms is sometimes advanced as one method of increasing output and raising chronically low incomes of dairy farmers.

This study examined the rate at which dairy farm size was increasing in Boonah Shire over the period 1957-61 and the changes in butter production of such farms. It was found that compared with similar farms in the district about one third of the farms adding land had increased production significantly. However the number of farms concerned was small. Hence, if increasing size is regarded as a practicable method of raising output a large scale scheme backed by adequate finance will be required. It is suggested that the minimum level of output which farms should be designed for is 9,000 lb. of butter. This, together with income from pigs, cull cows and bobby calves will provide the operator with a reasonable net income. If such a level is accepted one farm in every three would need to be absorbed by surrounding farms. In the survey area the number of farmers willing to sell out or buy additional land is such that this rate of amalgamation appears possible.