INCOMES OF DAIRY FARMERS IN THE RICHMOND-TWEED REGION.*

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1. SUMMARY.

It is well known that farm incomes in the dairying industry, as in other sectors of the rural economy, vary markedly even within fairly homogeneous regions. A knowledge of the factors which result in variations in farm incomes is essential if cost reductions are to be effected.

In this article a study is made of the factors associated with variations in farm incomes on a group of dairy farms in the Richmond-Tweed Region of the Far North Coast of New South Wales. The basic data used were obtained from the 1953 Dairy Survey and relate to 113 farmers in the Region.

Financial success in dairy farming, as in other types of economic activity, is affected by a variety of factors which, unfortunately, do not always lend themselves to measurement and classification. Consequently, the analysis presented here leaves a considerable part of the variation

* The data used in this article were collected in the course of the 1953 Dairy Survey conducted by the Bureau of Agricultural Economics in collaboration with State Departments of Agriculture.

The author wishes to thank Mr. L. W. McLennan, of the Bureau of Agricultural Economics for help in the original classification of dairy farms in the Region and for a great deal of constructive criticism of an earlier draft of this report. Thanks are also due to the 113 farmers who willingly supplied the information which was obtained in the survey.

in incomes on the survey farms unexplained. Nevertheless, certain tentative conclusions which should be of value to extension workers and others associated with the industry can be drawn from the analysis. Briefly stated, these conclusions are:—

(1) Differences in Incomes Associated with Broad Land Types.

Some sections of the Richmond-Tweed Region are regarded as more suitable for dairying than others. In order to find out whether financial success was significantly related to the type of land used for dairying the farms were divided into seven sub-regional groups.

There were considerable differences in average incomes for the three-year period 1950-51 to 1952-53 between these sub-regional groups (Table III). Thus survey farmers in the Big Scrub sub-region obtained incomes which were on the average 45 per cent. higher than those earned by farmers in the Flooded Flats sub-region. However, the differences in incomes within each sub-region were very much greater than the differences in average incomes between any two sub-regions (Table IV).

In other words, factors other than the type of land used seemed responsible for most of the differences in incomes which were found to exist among the farmers surveyed.

(2) Yield Per Cow.

Traditionally it has been very widely accepted that high production per cow and economic success are closely related. In this study the relationship between net incomes and cow yields was found to be very tenuous. Among the survey farmers it seems that the relationship was obscured by two factors—the tendency of some farmers to milk a large number of cows per man at the expense of cow yields (Table VIII) and secondly, the regular feeding of concentrates. The practice of regularly feeding concentrates increases cow yields, but its effect on net income is somewhat obscure. Among the survey farmers, those who fed concentrates obtained considerably lower average incomes than the remaining farmers, but the income differentials were related to a considerable extent to other factors—such as the fact that the farmers feeding concentrates had, on the whole, considerably less land at their disposal (Table XII).

It seems likely that under some conditions dairy farming can be financially more successful by concentrating on milking the maximum number of cows, even though this entails producing less per cow. This is but a particular example of the general principle that the process which is the most efficient technically is not always the most profitable.

(3) Practices Associated with Financial Success.

The incomes of farmers carrying out certain approved practices were compared with the incomes of farmers not following these practices. To make the comparisons more meaningful, adjustments to incomes were made for differences in farm size.

It was found that farmers who followed a definite policy of rotational grazing earned considerably higher incomes than other farmers (Table IV). In the Big Scrub and Tweed-Byron sub-regions, the difference

was 27 per cent.; in Terania it was 36 per cent. and in Kyogle 11 per cent. Somewhat smaller differentials existed between farmers who harrowed, renovated and/or mowed their pastures and those who did not follow these practices. However, the farmers using these practices in the Big Scrub, Kyogle and Tweed-Byron sub-regions secured significantly higher incomes than the other farmers in these sub-regions (Table XIII). On the other hand, evidence is presented to show that on many of the non-practising farms, harrowing, renovation and mowing may not be feasible.

The few farmers who tested their herds for production obtained incomes which were on the average 22½ per cent. higher than those of the remaining farmers (Table XV). However, their capital resources and number of cows milked were also appreciably higher, so that the difference in incomes cannot be ascribed to the fact that they were herd recording.

(4) Some Comments on Low Income Producers.

The number of milking cows per man was found to be the most important single factor in determining incomes per man. It can be shown by means of fairly simple budgets that a farmer milking less than 25 cows will, on the average, tend to earn less than the basic wage after allowance is made for cash costs, depreciation and bank interest on the capital he has invested in land, plant and stock.

On 40 of the 113 survey farms less than 25 cows were milked per adult worker. The high cost problem in the dairying industry is to a considerable extent the result of the prevalence of such small-scale producers. It is obvious that there are two ways in which the number of cows milked per man on these farms can be increased. One way is to reduce the labour force per farm and the other is to increase the number of cows per farm. The scope for reducing the labour force is in most cases small, as the farm family supplies practically all the labour used on dairy farms. An increase in the number of cows run is probably the main way in which the incomes of these high-cost producers can be raised most effectively. On some farms cow numbers can be increased by more intensive development such as sub-division, pasture improvement and the growing of fodder crops. However, in other cases, farm areas are too small to enable operation at reasonable costs—or to put it differently—to enable the farm operator to obtain an adequate return for his labour.

2. INTRODUCTION.

In 1953-54 an Australia-wide cost-of-production survey of the dairying industry was conducted by the Bureau of Agricultural Economics in co-operation with State Departments of Agriculture. In the course of this survey information regarding management problems and costs was obtained from over 1,000 dairy farmers in Australia, of which 231 were in New South Wales. In the Richmond-Tweed Region 114 dairy farmers were interviewed. The purpose of this report is to present some of the cost and management information obtained from dairy farmers in this region.

The Richmond-Tweed region was selected for detailed examination as this region is the most important dairying area in New South Wales, containing approximately one-third of all dairy cattle in the State. Over 90 per cent. of the milk produced in this area is made into butter. In terms of butter production the importance of the Richmond-Tweed is even greater; the dairy factories in the region producing between 45 to 50 per cent. of all butter manufactured in New South Wales.

The average net cost of production of butter in the Richmond-Tweed for the three years 1950-51 to 1952-53 was calculated at 38d. per lb. of commercial butter, which compares with 42d. per lb. for the Commonwealth as a whole and 39d. for New South Wales. These figures confirm the impression obtained from the earlier 1947 cost of production survey that costs in the Richmond-Tweed are considerably below the Australian average. In the 1947 survey, comparable average costs of production for the Richmond-Tweed amounted to 24d. per lb., compared with 29.5d. for Australia as a whole.

3. GENERAL CHARACTERISTICS OF DAIRY FARMING IN THE REGION.

The Richmond-Tweed region has a high average annual rainfall, varying from 40 inches in the western parts of the region to 70 inches along a narrow eastern coastal strip. The greater portion of this rain falls during summer and autumn months. However, for any month the mean rainfall is greater than 2 inches in most parts of the region. The driest period is in winter and early spring.

From the point of view of dairy farming, August to March rainfall is important. The summer and early autumn months are the period of heaviest butter production. As the majority of the herd come into production during August, September and October, early spring rainfall influences the condition of the cows when they start milk production and also affects the length of the lactation period.

During the period covered by the survey (i.e., from 1st July, 1950 to 30th June, 1953) seasonal conditions in the region were probably no better than average (except for one sub-group—the farms subject to flooding—where seasonal conditions were considerably worse than can be expected in the long run). In 1950-51 and 1952-53 August to March rainfall in Murwillumbah, Byron Bay, Lismore, Casino and Kyogle was considerably higher than average. On the other hand, 1951-52 was a very poor year, which was reflected in an average 27½ per cent. reduction in butter output from 1950-51 levels. For the whole three-year period, August to March rainfall exceeded by 15 to 20 per cent. the levels which may be expected in the long run in the region.

On the other hand, this rainfall was very unevenly distributed, causing five major floods of the Richmond River in three years. Early spring rainfall, which is of considerable importance, was 30 to 40 per cent. below normal for the three-year period. Hence the seasonal conditions were not as advantageous as is suggested by the rainfall total for the August-March period.

Dairy farming in the Richmond-Tweed region is a relatively extensive form of land use with natural pastures supplying most of the feed of dairy cattle. *Paspalum dilatatum* makes up about 70 to 80 per cent. of the naturally occurring pasture in the region, with varying amounts of carpet grass, kangaroo grass, bladey grass, kikuyu grass and some seasonal growth of white clover on the best quality flats. With the exception of white clover and kikuyu, paspalum is the best of these pasture plants, the presence of the others mentioned only serving to lessen the overall grazing value. The productivity of the natural pastures depends, therefore, mainly on the quality of the paspalum.

Paspalum is an excellent grass for seven months of the year but remains dormant during the winter. The generally warm temperatures enable farmers to maintain cattle over the winter period with a minimum of supplementary feeding. However, if cattle are to be kept in really good condition a certain amount of supplementary feeding is necessary. This can be obtained most cheaply from small areas of improved pasture or cow cane and maize where land suitable for crops and/or pasture improvement is available. In some cases supplementary concentrate feeding is also practised.

However, pasture remains by far the most important item of feed. The proper management of pasture is therefore of very great importance. Paspalum shows a tendency to form an unpalatable sod-bound sward unless measures are taken to check this condition. Sub-division of paddocks, harrowing and renovation of pastures and spelling of paddocks to allow the grass to rot down are some of the management practices employed to counteract this tendency. The use of a new machine—the sod-seeder—also promises to be of value in this connection.

4. THE SURVEY FARMS.

Method of Selection.

The names of farmers to be interviewed in the survey were selected at random from lists of suppliers obtained from each butter and cheese factory in the region. Certain groups of farms were excluded after initial contact. Where a farm was excluded a replacement was selected at random from the remaining suppliers to the factory concerned. The following groups of farms were excluded from the sample:

(i) farms on which less than 50 per cent. of the total proceeds of sale of milk or milk products was derived from the sale of butterfat (e.g., farmers who obtained more than half their incomes from the sale of milk for local consumption);

(ii) farms on which the size of the dairy herd (milking and dry cows) was less than 15 cows;

(iii) farms on which income from the sale of butterfat and/or milk products and pigs represented less than 75 per cent. of gross income;

(iv) atypical farms, such as farms engaged in the sale of stud stock, farms operated by a paid manager for absentee landlords, etc.

In addition, certain other farmers selected had to be rejected, such as farmers who had been on the farm less than three years, those unable to answer questions due to illness and farmers who had left the district. In order to obtain satisfactory information regarding costs from a sample of 114 dairy farmers, the names of 244 farmers had to be obtained—a surprisingly large number.

Table I gives the number of farmers which had to be rejected for different reasons. It should be emphasized that some of the farmers rejected could also have been rejected for a reason other than the one listed in this table.

TABLE I.

Reason for Rejection of Farmers Drawn in the Sample but not Included in Survey.

Reason for Rejection.	Number of Farmers.
The farmer has not been engaged in dairy farming on the one farm since July, 1950	54
Costs for this farm cannot be separated from those of another farm...	17
Income from sidelines (except pigs) exceeds 25 per cent. of gross income	15
Atypical farms (e.g., studs)	8
Farmer unwilling to co-operate	7
Farmer ill—unable to assist	5
Farmer sold his property	5
Farms with less than 15 cows	4
Farmer absent	2
Rejected during processing (inadequate records)	2
Other reasons	11
Total	130

By far the largest number of rejects resulted from changes in farm occupancy during the three-year period for which information was sought in the survey. While these exclusions were necessary if cost information for three successive seasons was to be obtained, it must be stressed that this has introduced an important bias into the sample. Non-family sharefarmers, and to a lesser extent tenants, move more frequently from one farm to another than do owner-operators. Sharefarmers are therefore unlikely to be adequately represented in this sample.[1]

[1] In a survey of dairy farmers in the "Big Scrub" section of the Richmond-Tweed conducted by this Division in 1953, 13 out of 72 dairy farmers interviewed were sharefarmers not related to the landlord. In the cost of production survey only 3 out of 34 farmers interviewed in the same section were non-family sharefarmers.

Another group of rejections consisted of those farms where costs could not be separated from the costs incurred on another farm owned by the same person. As many of the most successful dairy farmers own more than one farm this introduced another source of bias. The third major group of rejections consisted of those farms where sidelines other than pigs were important. In some parts of the Richmond-Tweed region typical dairy farms have important sidelines such as tropical fruits or peanuts, and in these areas the method of selection actually ensured the inclusion of atypical farms (e.g., farms with insufficient cropping land) in the sample.

That the geographical distribution of sample farms finally used in this survey differed considerably from what would be expected from a completely random sample of dairy farms in the Richmond-Tweed region is shown in Table II.

TABLE II.

Number of Sample Farmers as a Percentage of all Dairy Farmers.

Shire.	Percentage.
	Per cent.
Tweed	1·39
Gundurimba...	1·40
Tintenbar	1·63
Kyogle	2·04
Average Richmond–Tweed Region	2·44
Terania	2·65
Tomki	2·86
Byron	4·24
Woodburn	4·64

Some variation in the percentage of farmers selected from each shire would be expected because factory lists (which overlap several shires) were used for selection. But it seems unlikely that such large variations in sampling fractions would arise purely by chance. This opinion is confirmed by an examination of the rejected farmers on a shire basis. In Tweed Shire 73 per cent. of all farmers contacted (i.e., sample farmers and rejects) had to be rejected, in Gundurimba Shire the corresponding percentage was 67 per cent., compared with 53 per cent. for the region as a whole.[2]

[2] In Tweed Shire an important reason for rejection was excess sidelines (mainly bananas and other tropical fruit) which accounted for 23 per cent. of all rejections, compared with 10 per cent. for the rest of the region. In Gundurimba, occupancy of the farm for less than 3 years was the major cause of rejection (60 per cent. of all rejections compared with 42 per cent. for the rest of the region).

The survey farms therefore cannot be regarded as an adequate random sample of all dairy farmers in the Richmond-Tweed. The major groups of farms which were either under-represented or entirely excluded are, in order of importance:

(1) Non-family sharefarmers, tenants and other farmers who have recently changed farms;

(2) Farmers owning more than one farm;

(3) Farms with a large proportion of income from sidelines. (In the Richmond-Tweed the main sidelines would be bananas, peanuts and pineapples.)

Sub-regions of the Richmond-Tweed.

There are considerable differences in topography, soils and rainfall within the region which are reflected in the farming pattern. To obtain a more accurate picture of the effect of these factors on the dairy farms included in the sample, an attempt was made to classify farms into seven sub-regional groups. Although each of these sub-regions is by no means homogeneous, there is considerably more similarity within them with regard to farm practices and problems encountered, than there is in the Richmond-Tweed region as a whole.

Most farms fell automatically into one of the sub-groups, but in some cases the classification proved considerably more difficult. It is necessary to stress that, to some extent, the classification was subjective and that it might differ from the classification which other observers might have used.

The grouping of survey farms was largely based on Map No. 4 of the Richmond-Tweed region, published by the Division of Reconstruction and Development, Premier's Department. This map was drawn from data supplied by Mr. L. W. McLennan, who was formerly the Department of Agriculture's agronomist in Lismore for many years. It shows pasture productivity in the major sub-regions of the Richmond-Tweed.

There are broadly five land types which are used for dairy farming in the Richmond-Tweed. These are:—

(i) *The red-brown volcanic soil area.* This area is bounded roughly by the centres of Lismore, Mullumbimby, Tintenbar and Meerschaum Vale. It is popularly known as the "Big Scrub" because it was originally covered with a tall, dense sub-tropical softwood jungle or scrub. For many years this has been regarded as the most productive and fertile dairying district of any size (it extends over approximately 250 square miles) in New South Wales. In the last 15 to 20 years soil fertility seems to have diminished and no economic method of completely restoring the original fertility of this area has yet been discovered. However, even at the present time incomes on these farms appear to exceed those of any other group in the Richmond-Tweed region.

Thirty-four of the survey farms were situated either entirely (30 farms) or predominantly (4 farms) on these red volcanic soils. Of these 16 were in Byron Shire, 8 in Terania, 7 in Tintenbar, 2 in Gundurimba and one in Tweed Shire.

(ii) *First-class alluvial flats.* First-class alluvial flats lie along the banks of the Richmond, Tweed and Brunswick rivers and their tributaries. Some of the most productive river flats are devoted to the production of sugar cane and other cash crops. However, a considerable proportion of the river flat areas are used for the production of fodder crops for dairy herds and for dairy farming in general. Few of the survey farms consisted entirely of first-class alluvial flat land. For purposes of classification, all farms where alluvial flat land comprised one-third or more of the total farm area were included in this category.

This group differs in one important respect from the other six classifications used. The farms in the other groups are to a large extent contained within a compact, reasonably well defined geographic area. The eleven river flat farms are scattered over the entire region, though the majority are on the less extensive flats of the upper reaches of the Richmond River; most of the first-class river flats on the Lower Richmond and Tweed Rivers being utilized for sugar cane and other more intensive forms of land use.

One reason why it was thought advisable to put these farms into a separate category was the great discrepancy in farmers' estimates of their value, compared with the prices quoted for neighbouring country. (The average land value per acre of the river flat farms was more than twice as high as for other farms in the Casino and Kyogle districts.) Of the 11 farms in this category, 4 were situated in Tomki Shire and 2 each in Kyogle and Gundurimba Shires. The remaining 3 farms were in Terania, Tweed and Woodburn Shires.

(iii) *Low lying flats subject to frequent and severe flooding.* Large areas of low-lying flats on the lower reaches of the Richmond River have been subject to frequent and severe floodings in recent years. Flood waters lie on the flats for a few days—and in severe floods some areas may remain submerged for weeks and even months. These floods temporarily kill the paspalum and encourage the growth of worthless reeds, sedges, smart weed, etc. In addition, they are usually followed by caterpillars which denude whatever vegetative cover has been re-established since the floods. For the farmers in this group seasonal conditions in recent years have been extremely poor. In the three-year survey period most of these farms were flooded severely four or five times. That this is not in accordance with long-term expectation is well illustrated by citing the example of one survey farmer who had lived on the same farm since 1890. Between 1890 and 1945 his farm had been flooded only once. Between 1945 and 1953 it was flooded no less than eight times. Also, as shown in Table III, in comparison with the other groups, average land values for the flooded flat farms seem far too high in relation to average production per acre during the three-year survey period. This also suggests that the volume of production achieved in the three-year survey period was abnormally low. Of the 11 farms in this group, 6 were in Woodburn Shire, 3 in Gundurimba Shire and 2 in Terania Shire.

TABLE III.

Survey Farmers Grouped by Sub-Regions.

Sub-Regions.	Number of Sample Farms.	Average Area per Farm.*	Average Area of Dry Run.†	Average Annual Production per Farm, 1950–1951—1952–1953.	Land Value per Acre (Farmers' Valuation).	Butter Production per Acre.	Average Number of Milking Cows in Dairy Herd.	Average Production per Cow.	Average Annual Labour Income per Adult Male Labour Unit.
		Acres.	Acres.	lb. c.b.	£	lb.		lb. c.b.	£
(i) Red volcanic "Big Scrub" areas	34‡	140·3	100 (1)§	8,576	80	57·4	49	176	577
(ii) Productive River Flats not subject to flooding	11	187·8	...	9,939	79	61·8	59	165	523
(iii) Rugged mixed forests and scrub country excluding group (vi)—mainly Terania Shire...	13	219·5	n.a. (3)§	8,337	46·9	41·9	58	144	487
(iv) Undulating open forest country: Kyogle Shire	14	263·2	553 (3)§	7,946	28·7	30·1	56	142	469
(v) Undulating open forest country in the vicinity of Casino	12	241·2	123 (3)§	6,655	35·5	32·3	49	137	447
(vi) Rugged mixed forest and scrub country: Byron and Tweed Shires	18	188·1	150 (1)§	7,313	39·3	39·5	52	140	411
vii) Flats subject to severe flooding	11	192·2	430 (4)§	6,476	64·4	43·3	48	127	397

* Excluding farms with dry runs.
† Averages per farm having a dry run.
‡ This includes four farmers reclassified after the cost analysis as predominantly though not wholly "Big Scrub" farms.
§ The figures in brackets give the number of farmers in each sub-region who owned a dry run.

(iv) *Rugged Mixed Forest and Scrub Country.* North and west of the Big Scrub sub-region are large areas of rugged mixed hardwood forest and scrub country, broken by numerous watercourses running into the Tweed and Richmond Rivers. Along the creeks a broken chain of small alluvial flats provides cultivation land which largely makes dairy farming in these areas possible. The northern portion of the Shire of Byron, most of Tweed Shire and large sections of Terania Shire fall within this group. It was decided that the survey farms falling into the rugged mixed forest and scrub category could be conveniently divided into two groups (*a*) farms within the Shires of Byron and Tweed and (*b*) all other farms—which, in practice, meant mainly farms in Terania Shire. Terania and the other two shires are separated by a stretch of very rugged, mountainous country and the differences in average annual rainfall figures between the two districts suggested that such a separation was desirable. In addition, for reasons given earlier, it is believed that the farms chosen from Tweed Shire, apart from their inadequate number in the sample, may be atypical of dairying in the area, so that it seemed best to separate the northern portion of the rugged forest and scrub country. This group contains 18 farms, situated in equal numbers in Tweed and Byron Shires. The other portion of the rugged forest and scrub country group contains 13 farms, of which 10 are in Terania Shire and one each in the Shires of Kyogle, Gundurimba and Tintenbar.

(*v*) *Undulating Open Forest Country mainly in the Western Portion of the Region.*—Lightly timbered, undulating open forest country with frequent watercourses is the fifth major land type used for dairying in the Richmond-Tweed Region. Large areas of undulating forest country are to be found in Kyogle, Tomki and Woodburn Shires. It was decided to divide the farms in these areas into two groups—those in Kyogle Shire and the remainder (i.e., those in the Casino district). The open forest country in Kyogle Shire is more rugged than the corresponding areas in the more southern shires. It is also more often associated with small areas of alluvial flats which can be utilized very effectively for the growth of lucerne and sown pastures. In Tomki and Woodburn Shires the soils of the undulating open forest country are mostly heavy clay loams and clays with a strong tendency to melon-hole formation. This condition develops where the insufficiently drained clay flats expand on absorption of excessive moisture. These "puggy" soils are very difficult to cultivate unless soil moisture conditions are ideal. Some of the farms in the Casino district were very badly affected by outbreaks of bush fires in the early part of the survey period.

The Kyogle group contains 14 farms and the other group contains 12 farms of which 10 are in Tomki Shire and 2 in Woodburn.

5. CRITERION FOR ECONOMIC SUCCESS.

The criterion used for economic success in this study is the amount of labour income per adult male labour unit. The method of computation of this measure is as follows:—

A. Gross Income = Butterfat income and sideline income.

B. Farm Income = Gross income minus (cash costs and depreciation).

C. Return to Labour = Gross income minus (cash costs, depreciation and interest on capital).

D. Labour income per adult male labour unit = Return to Labour/ Number of adult male labour equivalents.

Two other measures considered were:—

E. Return to Management = Return to Labour minus labour costs at award rates.

F. Rate of return on capital = Farm income minus labour costs at award rates/capital.

Some comment is necessary regarding several items used in this calculation. Sideline income, as used for the management analysis, differs from the figure used for cost purposes. For cost purposes sideline income includes livestock gains as obtained from income tax records. In some cases (where farmers used market valuation for livestock inventories instead of uniform values) sideline income includes income from a revaluation of livestock assets over the three-year period. This is excluded in the income figures used for the management analysis and leads to some discrepancies between the two sets of figures. For the management analysis, gains and losses in livestock assets over the three-year period were valued at uniform rates which correspond approximately to the market values of the livestock concerned during the survey period.

There is also some discrepancy in the depreciation rates used. For cost purposes the depreciation claimed by farmers on their income tax schedules was used. For the management analysis depreciation was calculated from the inventory of plant and structures obtained during the field interview. The rates used for depreciation were based on the approximate average working life of the asset concerned, which are set out in the Schedule of Rates of Depreciation (Income Tax Order 1217, issued by the Commissioner of Taxation, 1951). The initial 40 per cent. depreciation rate in force in 1950-51 was not used.[3] The calculated depreciation rates were on the whole considerably higher than those used by farmers for income tax purposes.

The capital valuations for interest calculations were made by valuers of the Commonwealth Bank. The level of land values used—the long-term security value—was, on the average, 57 per cent. of the farmers' estimates of the market values of their own properties.[4] The interest rate charged was 4.65 per cent. Interest actually paid on overdraft and for other debts was excluded from cash costs.

The number of adult male labour units for each of the survey farms was obtained as follows:—

Field teams secured information on the number of weeks worked on the farm by all family members and permanent hired workers. In cases where the farm wife or junior members of the family assisted on a part-time basis their labour contribution was assessed at a certain fraction of a full-time female or junior labour unit. These units were converted into adult male labour units on the basis of the Federal Dairy Industry Award rate for each class of labour.

To take one fairly common example; where the farm labour force consisted of the farmer and his wife who regularly assisted in milking, washing up and feeding the calves, her labour contribution was assessed at half of a full-time adult female. As the adult female award rate was approximately 72 per cent. of the adult male rate the number of adult male labour units (or equivalents) on the farm was calculated at 1 plus $\frac{\cdot 72}{2}$ i.e., 1.36 adult male labour units or adult male equivalents.

In order to obtain some idea of the profitability of different practices and the factors which seem to be associated with differences in farmers' incomes, it is obviously necessary to obtain some measure of financial success. The three measures which were considered for this purpose were (*a*) rate of return on capital: this is the criterion of financial return normally used for secondary industry. It was discarded here because the value of the capital employed by each farmer had to be based either on bank valuation, which could of necessity not be sufficiently detailed for each one of the many farms in the survey, or the farmers' valuations which were not likely to be sufficiently uniform for this purpose. This left two other measures, namely, (*b*) the return to

[3] cf. "A Note on Depreciation" by D. B. Williams, *Quarterly Review of Agricultural Economics*, Vol. VIII, No. 1, January, 1955, pp. 30-33.

[4] This comparison has to be modified somewhat as the bank valuation excluded the value of the farm house, whereas the farmers' estimate of walk-in-walk-out values included it.

management and (*c*) labour income per adult male labour unit. From a theoretical point of view both these measures seemed to be equally acceptable. In addition, there was little difference in the ranking order of farms between these two measures.[5] It was finally decided to use labour income per adult male labour unit on the grounds that it is probably more suitable for extension purposes.

From an extension point of view it would probably have been preferable to take farm income per adult male labour unit as the criterion instead of deducting interest on capital from farm income to obtain the return to labour. However, it seemed advisable to make allowance for the fact that two farmers with the same farm income per head may have widely different capital resources at their disposal. In such a case labour income per adult male unit provides a better criterion of financial success. As will be shown later the interest deduction actually made was probably not adequate to put farmers operating with different amounts of capital on an equal footing. However, it seemed preferable to make some allowance for this possibility than to ignore it completely.

One difficulty which arises from the use of any criterion of financial success is that no account is taken of any deterioration of soil fertility. It is well known that farm incomes can be increased for some period—certainly for longer than the three-year average used in this survey—by neglecting to carry out those long term improvements which are necessary for the maintenance of soil fertility. This does not mean that higher incomes in all, or even in a majority of cases, are the result of "mining the land", but there is little doubt that some farmers tend to have higher farm incomes because they neglect to adopt practices which, whilst raising costs (and thus lowering incomes) in the short run are essential for the maintenance of fertility.

6. FACTORS ASSOCIATED WITH FINANCIAL SUCCESS AMONG SURVEY FARMERS.

Average labour incomes over the three-year survey period ranged from minus £65 to £1,495 per annum for the whole of the Richmond-Tweed Region. The most common income range was £200 to £399 per annum per head (one-third of all farms) and 60 per cent. of the 113 survey farmers had incomes between £200 and £599 per annum. An attempt will be made in this section to discuss the factors which appear to be associated with and perhaps responsible for these very large variations in incomes.

Land Types Associated with Financial Success.

An examination of Table III shows that there are considerable differences in average labour incomes in the various sub-regional groupings which have been used. Differences in yields per cow seem to parallel differences in labour incomes with high income regions also being areas with high average yields per cow. On the whole, too, farmers using

[5] The coefficients of rank correlation for three of the sub-groups tested were: Big Scrub .990, Flooded River Flats .933, Productive River Flats .965.

more high-priced land are able to earn higher labour incomes than farmers with less valuable land, though this relationship is not as noticeable as the previous one. However, these averages conceal very substantial variations in incomes and cow yields within each sub-region. The relevant data regarding incomes are given in Table IV. Comparison of Tables III and IV shows that labour income differences within each sub-region are very much greater than differences in average labour incomes between regions. The two sub-regions with the highest and lowest average labour incomes can be used to illustrate this point. Although average labour incomes in the best area—the Big Scrub—were 45 per cent. higher than in the Flooded Flats sub-region, half the farmers in the flooded flats earned more than 13 of the 34 Big Scrub farmers.

TABLE IV.

Number of Farms in Various Income Groups—By Sub-Regions.

(Average Annual Labour Incomes per Adult Male Labour Unit.)

Income Range.	Sub-region.							Whole Region.
	(i) Big Scrub.	(ii) Productive River Flats.	(iii) Terania.	(iv) Kyogle.	(v) Casino.	(vi) Tweed-Byron.	(vii) Flooded Flats.	
Under £200 ...	1	...	1	4	1	2	1	10
£200–£399 ...	12	4	5	3	3	7	4	38
£400–£599 ...	8	3	2	1	6	6	4	30
£600–£799 ...	7	2	4	5	2	2	2	24
£800–£999 ...	1	2	1	...	...	1	...	5
£1,000–£1,199	3	...	...	1	...	...	...	4
Over £1,200 ...	2	...	...	...	...	...	...	2
Total ...	34	11	13	14	12	13	11	113

Table IV suggests that while the type of country which farmers use for dairying in the Richmond-Tweed may account for some of the differences in incomes which exist among dairy farmers in the Region, other factors have to be found to account for the major portion of these differences. It may be objected that the great variation in incomes in each sub-region as shown in Table IV tends to throw doubt on the correctness of classification used rather than demonstrating that the type of land farmed is not the major factor determining incomes. To further test the contention that the type of land used for dairying in the Richmond-Tweed is not a major factor determining incomes, farms were grouped according to the farmers' valuation of land. If land quality is a major factor one would expect to find significant differences in average incomes when farms are grouped according to the farmers' estimates of the value of land per acre. Table V shows that while farmers on high-priced land tended to have somewhat higher incomes, the relationship was not a very marked one.

TABLE V.

Number of Farms Classified by Income and Land Value Groups.

(Average Annual Labour Incomes per Adult Male Labour Unit.)

Income Range.	Value of Land per Acre.						Total.
	£10–19.	£20–39.	£40–59.	£60–79.	£80–99.	£100 and over.	
	Number of Farms.						
Under £200	2	4	...	2	1	1	10
£200–£399	3	9	9	6	6	5	38
£400–£599	3	4	12	4	2	5	30
£600–£799	3	4	6	5	3	2	23
£800–£999	...	1	...	1	2	1	5
£1,000 and over ...	1	...	1	...	3	1	6
Total Number of Farms	12	22	28	18	17	15	112*
Average Incomes	£450	£381	£499	£462	£611	£519	...

* For one farm the farmer's valuation of land was not recorded.

If the small farms—those which might be roughly described as smaller than a home maintenance area—are classified separately, similar conclusions seem to emerge. For the purpose of this classification it was assumed that farms with a market value of less than £8,000 were too small to constitute a home maintenance area. In terms of the average labour force on the Richmond-Tweed dairy farms this corresponded to capital resources per adult male labour unit of £6,000 or less. Table VI gives the average labour income for those survey farms which had a market value of £6,000 or more per adult male labour unit. It will be seen that there is little relationship between land values and average labour incomes.

TABLE VI.

Average Labour Incomes of Survey Farmers Grouped According to Land Values.

(Excluding small farms with a capital value less than £6,000 per adult male labour unit.)

Value of Land per Acre.	Number of Farmers.	Average Labour Incomes.	Average Capital Resources per Labour Unit.
		£	£
£100 or more ...	12	567·5	11,231
£80–£99	15	623·2	11,019
£60–£79	15	501·3	9,146
£40–£59	20	536·8	8,590
£20–£39	8	484·1	7,217
£10–£19	4	626·8	6,522

Gross Production Per Man.

An attempt was made to determine what proportion of the difference in labour incomes among the 113 survey farmers could be explained by variations in butter and pigmeat production per farmer. It might be regarded as obvious that high incomes are the result of large production and vice versa. On the other hand it could be that some farmers were more successful financially than others, not because they achieved a higher production but because they managed to keep their expenses—either per pound of butter produced or for the farm as a whole—lower than their less successful neighbours.

A measure of the strength of the relationship between incomes on the one hand and butter production, pig sales and cow yields on the other, for each of the seven sub-regions of the Richmond-Tweed was obtained by correlation analysis. The results of this analysis are given in Table VII which shows the extent to which incomes are related to differences in butter production and pig sales per man and in cow yields. In more precise language, Table VII gives the percentage of the variation in labour incomes which can be attributed to the abovementioned factors. In six of the seven sub-regions a large proportion of the difference was clearly attributable to variations in the production of butter and pigmeats per man.

TABLE VII.

*Percentage of the Variation in Labour Incomes which can be Attributed to Different Factors—By Sub-Regions.**

Factor.	Region.						
	(i) Big Scrub.	(ii) River Flats.	(iii) Terania.	(iv) Kyogle.	(v) Casino.	(vi) Tweed–Byron.	(vii) Flooded Flats.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Butter production and pig sales	77	64	62	60	48	85	20
Butter production only	73	33	62	60	40	73	7
Yields per cow ...	12	13	Nil.	9	Nil.	10	Nil.

* Linear multiple correlation analyses were used to relate differences in income to productivity and pig sales. The figures given in Table VII represent the square of the adjusted coefficients of multiple and simple correlations.

That the relationship between gross productivity and incomes is not always the decisive one is shown by the very low figure obtained for one sub-group—farms situated on low-lying flats which are subject to flooding. As was mentioned earlier the farmers in this group had to cope with five major floods during the survey period. On many of the farms in this group heavy expenditure had to be incurred merely to keep cattle alive. Over 75 per cent. of the total area of the home farms (i.e., excluding dry runs) was subject to inundation. There was a

significant relation between the proportion of land subject to flooding and farm income, but no measure of the severity of flooding experienced was available. On some farms inundations lasted only a few days; in other cases the land remained under water for many weeks. In view of the overriding importance of the extent and severity of flooding in this area, this group of farms was omitted from much of the subsequent analysis. It is possible that the comparatively low figure in Table VII for the Casino district is also connected with seasonal vagaries, in this case being attributable to the bush fire damage which was mentioned earlier.

Pig sales per man are related to butter-production per man, as skim milk is the main pigfeed used and high butter production involves a large production of skim milk. To determine whether any additional accuracy in the prediction of farm labour incomes was achieved by taking pig sales into account, pig sales per man was used as an additional variable in the analysis. In most of the regions the contribution made by taking pig sales into account was minor. The River Flats group was an exception which may be partly the result of stud pig sales from two of the farms in this group.

Differences in butter production per man are obviously the result of many factors which need to be examined in greater detail. Butter production per man can be sub-divided into two components—production per cow and number of cows milked per farmer. This distinction was used in analysing differences in labour incomes because different factors are likely to influence these two components of production per man. Broadly speaking, it may be expected that superior practices and methods of management would be reflected in differences in yields per cow, whereas the number of cows each man can look after would be affected by other factors such as the age of the farmer concerned, the suitability of the layout of his farm and the land resources available to him.

(*a*) *Yields Per Cow.*—As shown in Table VII, differences in cow yields account for only a small proportion of the differences which exist in labour incomes in four of the sub-regions and for none of the differences in the remaining three areas. This is a surprising finding, partly because traditionally it has been very widely accepted that high production per cow and economic success are closely related, and also because the comparison of the different groups of farms in the Richmond-Tweed seemed to indicate that there was a strong association between high incomes and high yields per cow. There are three factors which may explain why there seems to be little relation between yields per cow and incomes for the different sub-regions. These are:—

(i) In all sub-regions the farmers who normally feed purchased concentrates achieved relatively higher cow yields, even though their average incomes were, in most cases, markedly lower. It does not necessarily follow that concentrate feeding does not pay the farmers who are practising it. This point will be dealt with in greater detail in a later section. However, the fact that farmers feeding purchased concentrates regularly tend to have higher cow yields and at the same time lower average incomes is no doubt partly responsible for the lack of a stronger relation between yields per cow and incomes.

(ii) Another contributing factor was the tendency noticeable among survey farmers to achieve high yields to some extent at the expense of the number of cows looked after per man. This tendency existed in each of the seven sub-regions. Table VIII gives the overall figures for the whole of the Richmond-Tweed Region.

TABLE VIII.

Relation of Cows per Man and Cow Yields.

Number of Cows per Man.	Number of Survey Farmers.	Average Yield per Cow.
		lb. commercial butter.
Below 20	13	163
21–30	42	158
31–40	33	151
Over 40	25	142

As the variations in the number of cows per man is considerably greater than the variations in the production per cow, and the relationship tended to be a negative one, differences in cow yields between survey farmers within one region tended to be obscured and overshadowed by differences in the number of cows per man.

(iii) There is some evidence to suggest that the older, less active farmers tend to achieve higher cow yields. This is to be expected, as these farmers would, on the average, have been able to build up a more productive herd over a longer period. Table XI gives some evidence to support this conclusion.

(*b*) *Number of Cows Milked Per Man.*—Differences in the number of cows looked after per farmer seemed to be the most important single factor in accounting for the wide variation in labour incomes which was found among survey farmers. The relevant percentages are given in Table IX.

TABLE IX.

Percentage of the Variation in Labour Incomes which can be Attributed to Different Factors—By Sub-Regions.

Factors.	Region.						
	(i) Big Scrub.	(ii) River Flats.	(iii) Terania.	(iv) Kyogle.	(v) Casino.	(vi) Tweed–Byron.	(vii) Flooded Flats.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Cows per man	57	3	59	51	27	64	7
Capital resources per man	23	1	33	23	45	32	2
Cows and capital resources	59	...	59	54	52	69	...

[7] Pearson's coefficient of variation for cows per man was 32.43 per cent. and for production per cow 21.06 per cent.

What factors affect the number of cows looked after by each farmer? Cow numbers may be limited either by the carrying capacity of the land at the farmer's disposal or by his willingness and ability to work hard enough to use this land to capacity. The carrying capacity of any farm is, of course, not fixed but will depend partly on the farmer's own operations. However, to a large extent the area of the farm and the inherent fertility and quality of the land determine the number of cows which can be grazed on it. The amount and quality of the land were measured in terms of the farmer's valuation of his farm. As might be expected it was found that the higher this valuation the larger the number of cows milked. Table IX shows that for five of the seven sub-regions there was a significant relation between incomes and capital resources per man.[8] However, in four out of five sub-regions the additions of capital resources to cow numbers added little to the accuracy with which labour incomes could be predicted.

Differences in the capital resources available to the survey farmers influenced incomes mainly by affecting the number of cows they could look after. In other words the survey farmers' ability to work hard—as measured by the number of cows they minded—depended to a large extent on the capital resources available in each case. Table X shows the relationship between capital resources available per man and the number of cows per man.

TABLE X.

Relation of Capital Resources per Man and Number of Cows Milked (Per Man).

Capital Resources per Man.	Number of Farms.	Average Number of Cows.
Under £4,000	10	24·5
£4,000–£5,999	27	27·0
£6,000–£7,999	37	31·4
£8,000–£9,999	11	35·7
£10,000–£11,999	12	36·9
£12,000 and over	15	45·0

As mentioned earlier, the efficiency of the layout of the farm and the willingness and ability of the farmer to work hard are some of the other factors which might be expected to affect cow numbers per man. In the survey, no attempt was made to assess the efficiency of the farm layout; nor was it possible in an interview lasting approximately three

[8] i.e., the farmers valuation of the farm on a walk-in-walk-out basis divided by the number of adult male labour units on the farm. Of this capital valuation approximately 75 per cent. would be accounted for by land and improvements.

to four hours to obtain an adequate indication of a farmer's ability to work hard. However, information regarding one factor which influences the ability to work hard, namely age, was obtained.

(*c*) *The Effect of Age on Farm Incomes.*—Where farms are operated by more than one person it is difficult to discern the effect of age on income as the differing ages of all persons working on the farm may be expected to influence the contribution they can make. To overcome this difficulty it was decided to compare age and incomes for only one, comparatively common, group of farms, namely, those where the farmer is the only full-time worker, and obtains assistance at milking time from his wife. There were 33 farms in the sample operated by a man-wife team without junior help. Table XI gives the average incomes, production per cow and herd size for these farms grouped according to the age of the farmer. It will be seen that the older farmers were milking much smaller herds and this is reflected in a gradual decline of incomes as the age of the operator increased.

TABLE XI.

Farm Income and Other Measures by Age Groups.

Age. (Years).	Number of Farmers.	Average Number of Cows per Labour Unit.	Average Herd Size (Cows Only).	Average Yield per Cow.	Average Labour Incomes per Labour Unit.
				Lb.-c.b.	£
20–29... ...	3	44	59	153	639
30–39... ...	14	39	53	160	596
40–49... ...	8	39	53	157	553
50–59... ...	6	31	43	164	484
60 and over ...	2	21	34	178	310

Practices Associated with Financial Success.

In this section the incomes of farmers adopting certain practices will be compared with the incomes of those farmers who have not adopted these practices. However, great care needs to be exercised in drawing conclusions from such cross-sectional studies.[9] Account must be taken of any other factors which may have led to income differences. If a group of farmers (say Group A) use a certain practice—such as, for instance, renovation—and obtain higher incomes than another group of farmers not using the practice (Group B), it does not follow that the majority of farmers in Group B would increase their incomes by adopting this practice. The farmers in Group B may be situated on more hilly country, where renovation is either not feasible or too time-consuming to be profitable. Again it may be that the farmers in Group

[9] cf. Earl O. Heady, "Economics of Agricultural Production and Resource Use" (Prentice-Hall Inc.), New York, 1952, pp. 309-312.

A achieve higher incomes because they tend also to follow some other practice, such as, for instance, using proven sires to a greater extent than the other group of farmers.

To take a concrete example, it is shown below that the survey farmers who regularly feed purchased concentrates had, on the average, considerably lower net farm incomes than the farmers who did not resort to regular concentrate feeding. However, a more detailed examination of the two groups of farmers shows that the farmers feeding concentrates had considerably smaller capital resources than the remaining farmers. As the bulk of the capital resources involved are land, the farmers feeding concentrates tended to have poorer quality land and/or less land than the farmers not feeding concentrates. This factor alone would result in lower farm incomes. In fact it seems likely that regular concentrate feeding constitutes one method used to compensate for inadequate land resources—though it appears that concentrate feeding cannot provide a substitute for more or better land. But it would be misleading to suggest, on the basis of the comparison of the incomes of these two groups of farmers, that concentrate feeding is definitely unprofitable.

While the comparison of incomes between any two groups of farms must be used with care, it does not follow that such comparisons have no value. In many cases there are no other discernible differences than that one practice is followed by one group of farmers and not by the other group. Average land values, farm size, type of country, etc., seem often to be very similar for the two groups of farmers. In these cases it seems reasonable to suggest that the differences in incomes —or at least a large proportion of them—are the result of the adoption of the practice in question.

In addition, even where differences in farm size or other factors rob a simple comparison of value, it is often possible to obtain some indication of what incomes on the two groups of farms would have been if conditions had been more equal. For instance, it is possible to establish by means of correlation analysis that on the average in the Big Scrub sub-region, net incomes rose by £7 2s. for every increase of £100 in the market value of the farms. When incomes of two groups of farmers in the Big Scrub are compared, and the farmers in one group have considerably less valuable farms at their disposal than the other group, some indication of the effect of this discrepancy in capital resources can be obtained by using correction factors obtained from correlation analysis.

(*a*) *The Feeding of Concentrates.*—The survey farmers were asked whether they fed purchased concentrates as a regular practice for some months of the year, whether they fed purchased concentrates in periods of feed shortage only or whether they relied entirely on home-grown feed. Of the 113 survey farmers 34 fed concentrates regularly. Their average labour income per man was £384. Thirty-five survey farmers fed concentrates in periods of feed shortage (average income £494); 44 survey farmers fed no concentrates whatever, which may or may not imply that they experienced no feed shortages (average income £569).[10]

[10] Some of the farmers in this group mentioned that they deliberately understocked.

TABLE XII.

Differences in Labour Incomes and Associated Factors Between Farmers Normally Feeding Purchased Concentrates and those not Relying on Concentrates—By Sub-Regions.

Sub-Region.	Measures to be Compared.	Average for Farmers Normally Feeding Concentrates.	Average for Other Farmers.
(i) Big Scrub ...	Number of farmers	10	24
	Average Labour Incomes ...	£460	£626
	Average capital resources per man	£8,159	£9,338
	Average yield per cow (lb. commercial butter)	187 lb.	171 lb.
	Average Labour Incomes adjusted for differences in capital resources per man	£516	£626
(ii) Alluvial River Flats.	Number of farmers	3	8
	Average Labour Incomes	£374	£578
	Average Capital resources per man	£6,944	£10,514
	Average yield per cow (lb. commercial butter)	167 lb.	164 lb.
	Average Labour Incomes adjusted for differences in capital resources per man	£399	£578
(iii) Terania	Number of farmers	6	7
	Average Labour Incomes	£36	£596
	Average Capital resources per man	£6,239	£8,271
	Average yield per cow (lb. commercial butter)	163 lb.	130 lb.
	Average Labour Incomes adjusted for differences in capital resources per man	£420	£596
(iv) Kyogle	Number of farmers	4	10
	Average Labour Incomes	£410	£492
	Average Capital resources per man	£6,389	£6,232
	Average yield per cow (lb. commercial butter)	142 lb.	142 lb.
	Average Labour Incomes adjusted for differences in capital resources per man	£410	£501
(v) Casino	Number of farmers	2	10
	Average Labour Incomes	£434	£450
	Average Capital resources per man	£5,305	£7,959
	Average yield per cow (lb. commercial butter)	139 lb.	135 lb.
	Average Labour Incomes adjusted for differences in capital resources per man	£534	£450
(vi) Tweed–Byron ...	Number of farmers	5	13
	Average Labour Incomes	£455	£394
	Average Capital resources per man	£5,883	£6,062
	Average yield per cow (lb. commercial butter)	149 lb.	136 lb.
	Average Labour incomes adjusted for differences in capital resources per man	£465	£394

TALBE XII.—*continued.*

Differences in Labour Incomes and Associated Factors Between Farmers Normally Feeding Purchased Concentrates and those not Relying on Concentrates—By Sub-Regions.—continued.

Sub-Region.	Measures to be Compared.	Average for Farmers Normally Feeding Concentrates.	Average for Other Farmers.
(vii) Flooded Flats ...	Number of farmers	4	7
	Average Labour Incomes	£292	£458
	Average Capital resources per man	£5,959	£7,643
	Average yield per cow (lb. commercial butter)	134 lb.	125 lb.
	Average Labour Incomes adjusted for differences in capital resources per man	£306	£458

Table XII compares, by sub-regions, average labour incomes per man, capital resources and cow yields for those farmers who normally feed concentrates, and the remaining farmers. (The threefold division given above cannot be repeated for sub-regions as the numbers in each group would become too small.) As might be expected the farmers feeding concentrates obtained higher yields per cow. In 6 of the 7 sub-regions, farmers feeding concentrates had lower incomes than the farmers who did not regularly feed purchased concentrates. To some extent this was the result of lower capital resources by the farmers feeding concentrates, but even when allowance is made for this, the income differential remains substantial in 5 of the 7 sub-regions.

A comparison of land types and land values for the groups of farms does not suggest that concentrate feeding is more widely practised by farmers on poorer quality land (except in one sub-group, "Productive River Flats"). The amount of land available seems a more important factor. In other words, there is no evidence to suggest that some farmers resort to regular concentrate feeding to compensate for poorer land; the position seems to be that farmers on smaller acreages attempt to use their labour more fully by concentrate feeding when farm size is inadequate to milk as large a number of cows as on the larger farms. However, the adjusted labour incomes in Table XII seem to indicate that the attempt to boost incomes by means of concentrate feeding is often unsuccessful. While there is some evidence that regular concentrate feeding may be financially successful, Table XII suggests that there are many more cases where concentrate feeding is carried beyond the point of profitability.

(*b*) *Harrowing, Renovation and Mowing.*—These are three practices which are recommended by departmental officers for efficient dairy farming in many areas. Chain harrowing soon after the cattle have been shifted from a paddock breaks up the dung. If the latter is left undisturbed on a pasture, rank unpalatable growth around the dung will take place. Harrowing also distributes plant nutrients evenly to the pasture.

TABLE XIII.

Differences in Labour Incomes and Associated Factors Between Farmers who Harrow, Renovate and/or Mow Their Pastures and Other Farmers—By Sub-Regions.

Sub-region*	Measures to be Compared.	Average for Farmers Who Harrow, etc.	Average for Other Farmers.
(i) Big Scrub ...	Number of farmers	11	23
	Average Labour Incomes	£667	£535
	Average cows per man	32·3	31·2
	Average yield per cow (lb. commercial butter)	172 lb.	178 lb.
	Average Land Value per acre ...	£79	£81
	Average Labour Incomes adjusted for differences in cow numbers per man	£667	£561
(ii) Alluvial River Flats.	Number of farmers	8	3
	Average Labour Incomes	£528	£508
	Average cows per man	32·9	31·7
	Average yield per cow (lb. commercial butter)	174 lb.	142 lb.
	Average Land Value per acre ...	£72	£100
	Average Labour Incomes adjusted for differences in cow numbers per man	£528	£513
(iv) Kyogle	Number of farmers	11	3
	Average Labour Incomes	£434	£596
	Average cows per man	29·4	38·8
	Average yield per cow (lb. commercial butter)	150 lb.	113 lb.
	Average Land Value per acre ...	£34	£15
	Average Labour Incomes adjusted for differences in cow numbers per man	£434	£388
(vi) Tweed–Byron ...	Number of farmers	8	10
	Average Labour Incomes	£514	£331
	Average cows per man	36·7	28·8
	Average yield per cow (lb. commercial butter)	152 lb.	129 lb.
	Average Land Value per acre ...	£49	£32
	Average Labour Incomes adjusted for differences in cow numbers per man	£514	£443
(vii) Flooded Flats ...	Number of farmers	6	5
	Average Labour Incomes	£394	£401
	Average cows per man	33·1	28·5
	Average yield per cow (lb. commercial butter)	133 lb.	120 lb.
	Average Land Value per acre ...	£72	£25
	Average Labour Incomes adjusted for differences in cow numbers per man	£394	£422

*Sub-regions (iii) Terania, and (v) Casino were omitted as only one survey farmer in each region followed the practices mentioned.

Renovation counters the tendency of paspalum pasture to grow so thickly that the plants choke one another and choke out the clovers. It partially rips up the sward, preventing this choking and increasing the yield of grazing.

On some paspalum pastures growth may at times be so rapid that pastures become rank before they are due to be grazed. Mowing can be used to control such rapid growth.

As the number of survey farms in each sub-region was so small it was necessary to group the farmers using any or all these three practices together for purposes of comparison.

Table XIII gives the differences in incomes and other associated factors between farmers who harrow, renovate and/or mow their pastures, and farmers who follow none of these practices. Allowance was made for differences in farm size as expressed by differences in the number of cows milked per man. After these adjustments were made considerable income differentials between the two groups of farmers emerged in three of the sub-regions—the Big Scrub, Kyogle and the Tweed-Byron. However, it will be seen from Table XIII that the group of farmers in the Kyogle and Tweed-Byron sub-regions who practised harrowing, renovation and/or mowing had more highly priced land at their disposal. It seems likely that some of the non-practising farmers in these two sub-regions had land which was either too poor or too hilly to allow them to use these practices to advantage. Of the ten farmers not using these practices in the Tweed-Byron sub-region six considered that their land was too hilly or too stony. One farmer mentioned that he intended to harrow in the future. In the Kyogle sub-region one of the three non-practising farmers regarded his land as too hilly whereas the other two mentioned insufficient time or labour as the reason for non-adoption.

It will be seen that in the Big Scrub sub-region there is little difference in land quality between the two groups as measured by the average of the farmers' valuations per acre. Of the 23 farmers who did not practise harrowing, renovation or mowing, 13 mentioned shortages of time or labour as the main reason, five said that they needed tractors or other implements which they did not possess to carry out the practices. Of the remaining five one intended to adopt harrowing and the other four regarded their land as unsuitable. It seems reasonable to conclude that some of the survey farmers in the Big Scrub could profitably adopt one or more of the three practices.

(*c*) *Controlled Rotational Grazing.*—The aim of controlled rotational grazing is to provide, as far as climatically possible, a continuous supply of short, leafy, protein-rich pasture feed. If all cattle are run in a few large paddocks it is impossible to manage pastures so as to ensure this. By having a large number of small paddocks the cattle can be concentrated on the leafy short growth and paddocks can be "spelled" for an adequate period to ensure that a leafy regrowth is available when the cows are again put in the paddocks grazed earlier.

The survey farmers were asked whether they followed a definite policy of rotational grazing. Unfortunately this question was not as precise as would be desirable. However, most farmers seemed to have a clear idea of what was meant by this rather vague question and it

TABLE XIV.

Differences in Labour Incomes and Associated Factors Between Farmers Who Follow a Definite Policy of Rotational Grazing and Other Farmers—By Sub-Regions.

Sub-region.*	Measures to be Compared.	Average for Farmers Practicing Controlled Rotational Grazing.	Average for Other Farmers.
(i) Big Scrub ...	Number of farmers	21	13
	Average yield per cow (lb. commercial butter)	181 lb.	169 lb.
	Average number of cows per man...	29·9	32·7
	Average Labour Incomes	£569	£515
	Average Labour Incomes adjusted for differences in cow numbers per man	£569	£448
(ii) Alluvial River Flats.	Number of farmers	8	3
	Average yield per cow (lb. commercial butter)	168 lb.	156 lb.
	Average number of cows per man...	29·5	43·4
	Average Labour Incomes	£542	£471
	Average Labour Incomes adjusted for differences in cow numbers per man	£542	£410
(iii) Terania	Number of farmers	6	7
	Average yield per cow (lb. commercial butter)	164 lb.	127 lb.
	Average number of cows per man...	36·7	32·6
	Average Labour Incomes	£584	£404
	Average Labour Incomes adjusted for differences in cow numbers per man	£584	£446
(iv) Kyogle	Number of farmers	9	5
	Average yield per cow (lb. commercial butter)	153 lb.	123 lb.
	Average number of cows per man...	2·95	34·8
	Average Labour Incomes	£443	£551
	Average Labour Incomes adjusted for differences in cow numbers per man	£443	£398
(vi) Tweed–Byron ...	Number of farmers	11	7
	Average yield per cow (lb. commercial butter)	147 lb.	129 lb.
	Average number of cows per man...	31·6	33·3
	Average Labour Incomes	£442	£362
	Average Labour Incomes adjusted for differences in cow numbers per man	£442	£348
(vii) Flooded Flats ...	Number of farmers	6	5
	Average yield per cow (lb. commercial butter)	139 lb.	113 lb.
	Average number of cows per man...	32·6	29·0
	Average Labour Incomes	£466	£325
	Average Labour Incomes adjusted for differences in cow numbers per man	£466	£342

* Sub-region (v) Casino was omitted owing to the inadequate number of farmers in that sub-region who practiced controlled rotational grazing.

was possible to divide the survey farmers into two groups, those who claimed to follow a definite policy of rotational grazing and those who did not. Twenty-five of the 50 farmers who said they did not follow such a policy gave as the main reason the lack of sufficient sub-division, which seems to confirm that the question was interpreted in the way it was meant to be. (Only four farmers considered that their farms were unsuitable for the adoption of this practice.)

Table XIV gives the average labour incomes (and adjusted labour incomes for differences in cow numbers) and associated factors by sub-regions for the two groups of survey farmers. In all the sub-regions shown in this table farmers who claimed to follow a policy of rotational grazing obtained higher yields per cow than the remaining farmers. The "practising" farmers also obtained considerably higher incomes after allowance was made for differences in cow numbers per man.

The use of controlled rotational grazing seems to be one of the most important ways in which dairy farmers in the Richmond-Tweed region can improve their incomes. It is encouraging to note that the survey farmers seemed very conscious of the need for increased sub-division—which is essential on many farms for the efficient employment of this technique.

The survey farmers were asked whether they had considered making any major management changes on their farms recently. More than one-third of the farmers (41) mentioned that they were considering sub-dividing existing paddocks further. Twenty-one of these 41 survey farmers were actually in the process of sub-dividing their paddocks at the date of the field interview.

(*d*) *Herd Testing.*—Only 10 of the 113 survey farmers had kept systematic records of the production of their cows for a period of 3 years or longer. Most of the farmers concerned used the Departmental herd recording service, but some farmers tested privately. In view of the small number of survey farmers throughout the region who were testing for production it was not possible to compare incomes by sub-regions. Table XV compares the average incomes of the farmers who have tested for three years or more with all other farmers in the Richmond-Tweed. The incomes of the ten farmers testing were, on the average, 22½ per cent. higher than the remaining farms. However, their capital resources and number of cows minded per man were also appreciably higher.

TABLE XV.

Labour Incomes and Associated Factors for Farmers Herd Recording Systematically for Three Years or Longer and Other Farmers.

Measure to be Compared.	Average for Farmers who have Tested for a minimum of 3 years.	Average of Other Farmers.
Number of farmers ...	10	103
Capital resources per man...	£9,027	£7,589
Cows per man	40·7	31·5
Yield per cow (lb. commercial butter)	175 lb.	150 lb.
Labour income	£590	£481

7. CONCLUSION.

On the whole the above analysis leaves a considerable part of the variation in incomes on the survey farms unexplained. Financial success in dairy farming—as in other types of economic activity—is affected by a large variety of factors which do not always lend themselves to measurement and classification. Owing to the amount of information which had to be obtained for different purposes the questionnaire was deficient in two respects for an analysis of the kind attempted here. Firstly no adequate measure of the inherent quality or fertility of the land used was available. Secondly, insufficient information was available regarding individual farm practices which may influence incomes. In most cases no information was obtained on the extent to which a certain practice was used but only whether or not it was used.

In spite of these shortcomings it is felt that there are three tentative conclusions which can be reached on the basis of the above analysis. These are:—

(1) It has been very widely accepted that high butterfat yields per cow are a rough, though fairly good, measure of the economic efficiency of a dairy farm. Evidence presented above suggests, that while the more successful farmers tend to have higher yields per cow, this relation is a rather tenuous and loose one which can be very misleading in appraising the success of individual farmers. In many cases low production per cow is offset by larger herds and higher total production. In fact, it seems likely that under some conditions dairy farming can be financially more successful by concentrating on milking the maximum number of cows even though this entails producing say only 125-130 lb. commercial butter per cow. This is but a particular example of the general principle that the process which is the most efficient technically is not always the most profitable (i.e., the most efficient process economically).

(2) Of the few practices examined above controlled rotational grazing seemed to be the one giving the largest increase in net incomes. It also seemed more applicable on the farms not at present practising it than some of the other techniques examined (such as renovation) which do not lend themselves to universal adoption due to the rugged and stony nature of the land on many survey farms.

Differences in incomes between those farmers practising controlled rotational grazing and those not doing so ranged from 11 per cent. to 36 per cent. in the different sub-groups—with four of the six groups falling between 27 and 32 per cent. The survey farmers seemed to regard controlled rotational grazing as an important way to increase incomes. This is suggested by the fact that over one-third of the survey farmers mentioned that they were either planning to or actually were in the process of sub-dividing their farms into a larger number of paddocks. Adequate sub-division of paddocks is a pre-requisite for efficient control of rotational grazing.

(3) Lastly some comment regarding high cost or low income producers should be made. As mentioned earlier, the number of milking cows per man was the most important single factor in determining net incomes per man. On 40 of the 113 survey farms less than 25 cows were milked per man. It can be shown by means of fairly simple budgets that a farmer milking less than 25 cows[11] will, on the average, tend to earn less than the basic wage, after allowance is made for cash costs, depreciation and bank interest on the capital he has invested in the land, plant and stock.

The high cost problem in the dairying industry is to a considerable extent the result of the prevalence of such small-scale producers. It is beyond the scope of this report to discuss the types of action necessary to reduce the number of high cost producers in the industry. However, it is obvious that there are two ways in which the number of cows milked per man on these farms can be increased. One way is to reduce the labour force per farm and the other is to increase the number of cows per farm.[12] The scope for reducing the labour force is in most cases small as the farm family supplies practically all the labour used on dairy farms. An increase in the number of cows is probably the main way in which the incomes of these high-cost producers can be raised most effectively. On some farms cow numbers can be increased by more intensive development such as sub-division, pasture improvement and the growing of fodder crops. However, in other cases farm areas are definitely too small to enable operation at reasonable costs—or to put it differently to enable the farm operator to obtain an adequate return for his labour.

[11] On a farm family basis this would be a 34 cow herd for a farm operated by the farmer with the assistance of his wife, or a 50 cow herd for a farmer with an adult son and no further help from other members of the family.

[12] Another possibility would be the expansion of sidelines. However, it is doubtful whether this is advisable on the majority of the farms concerned, though it may provide a solution in some cases.