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FACTORS AFFECTING DAIRY FARM  
INCOMES IN THE LOWER FRASER VALLEY

by

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## ABSTRACT

In order to determine the effect of organization and management on the size of income secured by dairy farmers, the business records of 208 dairy farms in the Lower Fraser Valley were analyzed. The records were secured by the survey method and covered the operations during the calendar year 1946.

Earnings secured by operators for their labour varied from minus \$1,370 to plus \$18,341. Labour earnings averaged \$1,042.

High earnings were associated with the following factors:

1. A farm business above average in size.
2. High butterfat production per cow.
3. High yields of crops per acre.
4. Efficient use of labour.
5. Efficient use of capital.

It was not enough to be above average in only one or two of the factors mentioned. To be most successful the farm business had to be better than average in all of them. Much hard work and careful planning were necessary to excel in all the factors which influenced farm returns. The results of this study, however, show that the rewards were great.

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## SUMMARY

II.

In order to determine the effect of organization and management on the size of income secured by dairy farmers, the business records of 208 dairy farms in the Lower Fraser Valley were analyzed. The records were secured by the survey method and covered the operations during the calendar year 1946.

Earnings secured by operators for their labour varied from minus \$1,370 to plus \$8,341. Labour earnings averaged \$1,042.

High earnings were associated with the following factors:

1. A farm business above average in size
2. High butterfat production per cow
3. High yields of crops per acre
4. Efficient use of labour
5. Efficient use of capital.

Large farms held an important advantage over the small ones in efficiency of operation. This advantage traced chiefly to a more effective use of man labour on the large than on the small farms. Crop yields and butterfat production per cow also tended to be greater on large farms. Another advantage of larger farms was that a large volume of output sold at a profit returned a larger total profit than a smaller volume. It should be noted, however, that when farming is unprofitable a large volume may result in a sub-

stantial loss. Operators of large farms, therefore, must III recognize the risks as well as the advantages which a large business involves. They should endeavour to increase productive efficiency so as to avoid, or at least reduce, the risks which a large volume entails when farming is unprofitable.

The production of butterfat per cow was an important factor affecting returns. As production of butterfat per cow increased, there was a consistent increase in labour earnings. High producing cows required more attention than lower producers but the larger production resulted in a much smaller labour charge per pound of butterfat produced.

Crop yields were also shown to be important, since earnings increased as higher crop yields were obtained.

Labour was used more effectively on the large-size farms, although high efficiency was also obtained on some small farms. Regardless of the size of farm greater earnings were obtained when labour efficiency was above average. Inefficient use of labour was associated with a high degree of specialization in the dairy enterprise. Supplementary enterprises, combined with the main enterprise, aided in a fuller utilization of labour throughout the day and throughout the year. Efficient use of labour was also associated with a large investment in machinery and equipment per man. Many farms were too small, however, for the economical use of labour-saving equipment.

Farmers who used large amounts of capital in relation

to the size of their business were handicapped in their IV. efforts to obtain economical production. A large proportion of capital in real estate resulted in relatively heavy expenses for depreciation, taxes, and repairs of buildings as well as burdensome charges for interest. Some farmers also had too large an investment in machinery and equipment relative to the amount of productive work available.

It was not enough to be above average in only one or two of the factors mentioned. To be most successful the farm business had to be better than average in all of them. Much hard work and careful planning were necessary to excel in all the factors which influenced farm returns. The results of this study, however, show that the rewards were great.

Prevailing weather and economic conditions also affect the size of income which can be obtained from dairy farming. Over these factors, however, the dairy farmer has little control. Previous dairy farm business studies in the Fraser Valley have shown that incomes of dairy farmers are, on the average, below those of workers of comparable ability engaged in non-farming pursuits in British Columbia. Some maintain that this is because dairy farmers receive prices for their milk which are generally below their costs of production. The steady upward trend of milk production in the Fraser Valley, however, refutes this contention, since in the long-run expansion of production will not take place unless farmers are receiving their costs of production.

The fundamental reason for the low average income of



dairy farmers -- and other agricultural producers -- is that<sup>V.</sup> they find it difficult to shift to alternative forms of employment where higher earnings can be secured. Improvement in the incomes of farmers is dependent upon providing them with a means whereby they can readily transfer themselves to other employment. When other forms of employment are readily available farmers will not continue production unless earnings and amenities are comparable to those which can be obtained in alternative employment.

# FACTORS AFFECTING DAIRY FARM INCOMES IN THE LOWER FRASER VALLEY

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## INTRODUCTION

Business studies of dairy farms in the Lower Fraser Valley have shown striking variations in the incomes secured by their operators. Some of the factors which cause these variations are clearly beyond the control of the individual producer. The most important of these are the economic conditions and the climate. In any given year, however, wide variations in incomes occur amongst farmers who operate under similar conditions of price and weather. This indicates that the success of the farm business is dependent mainly upon factors which are within the managerial control of the farm operator. In order to determine what some of these factors are, and their relative importance, a study was made of the organization and management of 208 dairy farms in the Lower Fraser Valley for 1946.

Dairy farmers in the Lower Fraser Valley receive incomes which are, on the average, below those secured by workers of comparable ability in the non-agricultural industries of British Columbia. The usual reason which is advanced as an explanation for the low incomes of dairy farmers is that they do not secure a price for their milk sufficient to cover their full cost of production. To

suppose that this is so, however, is to overlook the fundamental reason for the low average income secured by dairy farmers and other agricultural workers. A secondary purpose of this report will be to discuss the relationship between the cost of producing milk, the resultant supply, and the price received for it; and to suggest a permanent means of improving the incomes of dairy farmers in the Fraser Valley.

### GENERAL DESCRIPTION OF THE AREA

#### Location and Extent:

The Lower Fraser Valley is one of the largest blocks of arable land in British Columbia, covering approximately 545,000 acres. As described by Kelley and Spilsbury (1), it comprises that part of the delta of the Fraser River which lies in Canada. The delta begins a few miles east of Agassiz and extends westward for about 75 miles to the Strait of Georgia. It is bounded on the north by the Coast Range and on the east by the Cascades. The southern limit of the delta is in the state of Washington and so the southern boundary of the Valley in Canada is the 49th parallel.

The area is divided into 14 district municipalities. These are as follows: Richmond, Delta, Surrey, Langley, Matsqui, Sumas, Chilliwack, Kent, Nicomen, Dewdney, Mission, Maple Ridge, Pitt Meadows and Coquitlam.

#### Topography:

The elevation of nearly all of the area is less than

400 feet. For topographical description it can be divided into two regions:

(1) The uplands which have rolling to fairly level upper surfaces lying up to 400 feet or more above sea level. The uplands are composed of glacial deposits, dissected by subsequent river channels.

(2) The lowlands or recent delta region represented by the Chilliwack, Sumas, Matsqui Prairie, Pitt Meadows and Lulu Island areas, is low and flat. The lowlands are dyked against the river and the sea, and the elevation is not more than 25 feet above sea level.

#### Soils:

The soils of the entire area have been classified and mapped by Kelley and Spilsbury (1). The soils of the recent delta area are fine-textured and fertile, and the vegetative cover before settlement was comparatively light.

Much of the soil of the upland areas is well suited for agricultural purposes. The cost of clearing it of old stumps and logs and the heavy second growth, however, has greatly retarded its use for agriculture.

#### Climate:

The climate of a region is of primary importance in determining the crops which can be grown and the livestock which can be kept successfully. It is also a major factor in influencing the health and comfort of the people who make their homes in the area. The climate of the lower Fraser

Valley furnishes very favourable living conditions. The climate is less extreme both in summer and in winter than in other major agricultural areas of Canada. Comparatively uniform temperatures, characteristic of a maritime climate, are maintained throughout the year. The difference between the average temperature of the coldest month and the warmest month is small. The average for the coldest month, January, is 36°F.; and for the warmest month, July, 63°F. This gives a variation of 27°.

The characteristic feature of the Pacific Coast precipitation is heavy winter rainfall succeeded by summer dryness. Because of the relationship of different areas in the valley to mountain ranges, precipitation is not uniform for all areas. The south-western areas receive an annual precipitation of from 36 to 40 inches. This increases to as much as 70 inches in those areas immediately bounded by the Coast Range and the Cascades.

#### Agricultural Development of the Area:

The type of agriculture followed in the Fraser Valley is governed largely by the climate, qualities of the different soils, density of the vegetative cover, drainage, and the requirements of the Vancouver market.

The recent delta areas were settled first because the soils were fine-textured and fertile and the vegetative cover was comparatively light. When not covered with peat, these lowlands are well suited for dairying, mixed farming,

grain growing and the intensive production of vegetables for the Vancouver market and for canning. Within recent years large areas have been devoted to the growing of hops and to grass which is dehydrated for incorporation into commercial feed mixtures.

Development of the upland soils for farming has been retarded because of the difficulty of clearing it of old logs, stumps and heavy second growth. The farms are small, ranging from 10 to 40 acres. Poultry raising and the growing of small fruits, vegetables, and bulbs are the principal types of farming in the upland districts. Since 1942 numerous new farms have been established in the upland districts. Most of these are specializing in the production of small fruits.

The area is well served by a system of provincial and municipal roads, by the inter-urban routes of the British Columbia Electric Railway and by the main lines of the Canadian Pacific Railway and Canadian National Railway.

#### METHOD OF COLLECTING THE INFORMATION

Data were obtained from the dairy farmers by the survey method. Each farmer co-operating in the study was interviewed and every effort was made to obtain accurate information concerning receipts, expenses, inventories, crop acreages and production. This information was recorded in a field schedule designed for the purpose (see Appendix C). Many of the farmers visited kept either full or partial

records relative to expenses and income. Such records were used when available, but when not, the co-operator was asked to make careful estimates of those items required to complete the field schedule.

Figures on the quantity of milk shipped, the payment received for it, and the charges for freight were obtained from the offices of milk distributors in Vancouver.

In selecting farms to be included in the study, a very definite attempt was made to choose farms which were representative for the areas being studied. Complete information required for the study was secured for 208 farms. These, therefore, compose the sample upon which this study is based.

#### DESCRIPTION OF THE FARMS STUDIED

The 208 farms studied averaged 62 acres in size. (Table 1). The average acreage in crops was 27 acres and improved pasture 18 acres. The hay crop on almost all farms was a mixture of clovers with timothy or rye grass. Only 26 farms produced alfalfa as a hay crop. Oats were produced as a hay crop on 21 per cent of the farms, and as a grain crop on 45 per cent of the farms. Corn was the most popular silage and accounted for 58 per cent of the total amount used. Twenty-six per cent of the silage was put up from clovers and grasses.

TABLE 1. - CLASSIFICATION OF LAND UTILIZATION,  
208 DAIRY FARMS IN THE FRASER VALLEY, 1946.

Items	Average Acres per Farm	Percent of Total Acres
Acres in crops	27	44
Improved pasture	18	29
Farmstead (includes orchard)	2	3
Untillable pasture	9	14
Acres waste or not farmed	6	10
Total	62	100

The remaining 16 per cent represented pea vines, oats or vetch. Only 11 farms produced a root crop to provide a succulent feed for the dairy herd. The principal cash crops were potatoes, canning peas, canning corn, and clover seed. Strawberries and raspberries were produced for sale on several of the farms.

The average number of dairy cows kept per farm was 18. Eleven per cent of the herds were predominantly purebred and five per cent were part purebred and part grade. The remaining 84 per cent of the herds were predominantly grade. The average number of heifers per farm was 6 and the average number of calves was 4. The average number of hens in the farm flock was 58. Forty-four farms reported hogs. These were kept mainly for use on the farm. Seven farms kept sheep.



TABLE 2. - FARMS CLASSIFIED ACCORDING TO SIZE OF DAIRY HERD, 208 FRASER VALLEY DAIRY FARMS, 1946

Number of Cows per Farm	Number of Farms	Percentage Distribution of Farms
Less than 10	38	18
10 to 14	65	31
15 to 19	39	19
20 to 24	34	16
25 to 29	12	6
30 to 35	9	4
35 and over	11	6
Total	208	100

Horses were used on 75 per cent of the farms.

Thirty-six per cent used a tractor, and 18 per cent used both a tractor and horses.

Sixty-nine per cent of the farms had a car and 21 per cent a truck. Nineteen per cent had neither a car nor a truck.

Operators of 85 per cent of the farms visited owned the entire acreage which they used, and seven per cent owned part of their land and rented the rest. Eight per cent of the operators rented their farms outright.

#### TERMINOLOGY

Farm Income is the amount by which farm receipts exceed farm expenses. It represents the return both for the operator's

time and for the use of capital invested in the farm business during the year.

Capital Investment, as calculated in this study, is the sum of the value of farm real estate, livestock, feeds, supplies, machinery and equipment which is used primarily for the farm business.

Labour Income, is the return which the operator receives for his year's work and management in addition to the value of the house rent and products which he and his family obtain from the farm.

Perquisites represent the value of farm-furnished living. They include farm products used in the operator's household and the use of the dwelling for one year.

Labour Earnings is the sum of the labour income and perquisites. It is the return received by the operator and his wife from the farm for the year's work and supervision.

Productive Man Work Unit\*(abbreviated P.M.W.U.) represents the amount of any kind of income-producing work accomplished by one man in a day at usual farm tasks and under average conditions. It is used as a standard measure of the amount of work to be done on the farm and does not indicate the amount of labour actually used in getting the work done. It is one of the best measures of the size of the farm business since it includes the productive work on all the enterprises of the farm.

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\* See Appendix B for a detailed explanation of method of calculation.

Man Equivalent is the average number of persons, including the operator, working on the farm during the year, expressed in units of full-time men.

Productive Man Work Units per Man Equivalent is a measure of labour efficiency in that it indicates the amount of work actually accomplished by the labour used on the farm.

Crop Index is the rate of yield per acre expressed as a percentage of average, with the average taken as 100. For example, a crop index of 107 would mean a yield of 7 per cent more than the average for the group.

Capital Turnover is the number of years required for cash operating receipts to equal the invested capital. It is a measure of efficiency in the use of capital.

### FINANCIAL ORGANIZATION

#### Investment:

Considerable capital is necessary for the operation of a dairy farm in the Lower Fraser Valley. Operators of farms included in this study had an average investment of \$19,867 in land, buildings, livestock, machinery, equipment, feeds and supplies (Table 3).

TABLE 3. - DISTRIBUTION OF CAPITAL INVESTMENT,  
208 FRASER VALLEY DAIRY FARMS, 1946

Item	Average Value per Farm	Per cent of Total
Real estate	\$13,226	67
Livestock	3,855	19
Machinery and equipment	2,034	10
Feeds and supplies	752	4
Total Capital	\$19,867	100

Two-thirds of the capital invested was in real estate. Of this 40 per cent was in buildings and 60 per cent in land. One-fifth of the investment was in livestock, one-tenth in machinery and equipment and about one-twentieth in feeds and supplies.

The investment was less than \$10,000 on one-quarter of the farms, and less than \$20,000 on two-thirds of the farms (Table 4).

(See next page for Table 4)

TABLE 4. - VARIATION IN TOTAL CAPITAL,  
208 FRASER VALLEY DAIRY FARMS, 1946

Capital	Number of Farms	Per cent of Farms
Less than \$5,000	8	4
\$5,000 - 9,999	43	21
10,000 - 14,999	46	22
15,000 - 19,999	41	20
20,000 - 24,999	24	12
25,000 - 29,999	9	4
30,000 - 34,999	11	5
35,000 - 39,999	7	3
40,000 and over	19	9
	208	100

Farm Receipts:

Total receipts amounted to \$5,718 per farm (Table 5). The dominance of the dairy enterprise is emphasized by the fact that 76.3 per cent of the gross income, or \$4,361 per farm, came from the sale of milk and dairy livestock; while an additional 5.8 per cent, representing the net increase in livestock inventory, was derived mainly from dairy cattle. Sales of crops and income from other livestock accounted for about 14 per cent of the receipts. The \$401 inventory increase did not represent cash income since it was made up of net additions to the inventory

TABLE 5. - AMOUNT AND DISTRIBUTION OF RECEIPTS,  
208 FRASER VALLEY DAIRY FARMS, 1946

	Average per Farm	Per cent of Total
<u>Cash Receipts</u>		
Dairy enterprise <sup>(a)</sup>	\$4,361	76.3
Other livestock enter- prises <sup>(b)</sup>	270	4.7
Crop sales <sup>(c)</sup>	541	9.4
Other farm income <sup>(d)</sup>	<u>145</u>	<u>2.6</u>
Total cash farm receipts	5,317	93.0
<u>Inventory Increases</u>		
Livestock	332	5.8
Feeds and supplies	53	0.9
Machinery and equipment	<u>16</u>	<u>0.3</u>
Total inventory increases	<u>401</u>	<u>7.0</u>
TOTAL FARM RECEIPTS	\$5,718	100.0

(a) Sale of milk and dairy livestock

(b) Sale of poultry, eggs, hogs, etc.

(c) Chiefly potatoes, canning peas, canning corn,  
small fruits and peas

(d) Man labour off farm, custom work, equipment  
rentals, pasture rentals, wood, empty sacks,  
equipment, real estate sales, etc.

values of livestock, feeds and supplies, and machinery and  
equipment.

Farm Expenses:

Total expenses, other than interest, amounted to \$4,225 per farm (Table 6). Purchased feed was the largest single item accounting for one-quarter of this amount. Nearly a fifth was accounted for by charges of \$780 per farm for labour other than that of the operator. Of this \$470 was for hired labour and \$310 represented the value of labour contributed by unpaid members of the family. There was a cash outlay of \$995 per farm for capital purchases and improvements during the year. Part of this expense is offset by the inventory increase shown under farm receipts.

The cost of operating power equipment was \$204. Milk hauling and custom work hired cost \$318, most of which was for milk hauling. Other operating expenses amounted to \$713. This amount chiefly represents the cost of seed, fertilizer, lime, taxes, insurance, rents, telephone, electricity, dairy herd expenses such as C.T.A. and R.O.P. fees, artificial insemination charges, veterinary charges, and the costs of sprays, germicides, etc.

(Table 6 next page)

TABLE 6. - AMOUNT AND DISTRIBUTION OF EXPENSES,  
208 FRASER VALLEY DAIRY FARMS, 1946

	Average per Farm	Per cent of Total
<u>Cash Operating Expenses</u>		
Labour hired	\$ 470	11.1
Feed purchased	1,039	24.6
Power equip. operating costs	204	4.8
Freight on milk; Custom work	318	7.5
Repair and maintenance of buildings & equip.	126	3.0
Other expenses	<u>713</u> 2,870	<u>16.9</u> 67.9
<u>Capital Purchases and Improvements</u>		
Livestock	273	6.5
Machinery and equipment	337	8.0
Real estate	<u>385</u> <u>995</u>	<u>9.1</u> <u>23.6</u>
Total Cash Outlay	\$3,865	91.5
<u>Inventory Decreases</u>		
Real estate	50	1.2
<u>Value of unpaid labour</u>	310	7.3
TOTAL FARM EXPENSES	\$4,225	100.0



Farm Profits:

The difference between receipts and expenses averaged \$1,493 per farm (Table 7). This difference, commonly termed "farm income," represents the amount left, after all other business expenses have been deducted, as compensation for the use of capital invested in the farm and the year's labour and management of the operator. After deducting interest at five per cent on invested capital, a labour

TABLE 7. - FINANCIAL RETURNS, 208 FRASER VALLEY DAIRY FARMS, 1946

Item	Average per Farm
Farm Receipts	\$ 5,718
Farm Expenses	4,225
	<hr/>
FARM INCOME	1,493
Interest on Capital at 5%	993
	<hr/>
LABOUR INCOME	500
Perquisites	542
	<hr/>
LABOUR EARNINGS	\$ 1,042
	<hr/> <hr/>

income of \$500 remained. In addition to this monetary income the farmer also had, as part of the return for his labour, the use of a house and products such as milk, eggs, meat, fruits, vegetables, and wood which were obtained from

the farm for family use. When the value of such perquisites is added to labour income a measure known as "labour earnings" results. In this study the average labour earnings per farm was \$1,042.

When receipts from the farm, including the value of the perquisites, are not sufficient to cover both expenses and interest, a "minus" labour earnings figure results for the operator.

Labour earnings is one of the best measures for comparing the profitability of different farm businesses. Because the unpaid labour of members of the family is counted as an expense, it eliminates differences in returns between farms where members of the family or other unpaid workers are available, and farms where all help must be hired. Variations in the capital used are eliminated by deducting an interest charge. Labour earnings also recognizes the value of non-cash contributions from the farm as a part of the operator's return. For these reasons labour earnings is used as the measure of profits in this study.

While "labour earnings" serves well as a means of comparing the business efficiency of different farms, it fails to indicate the amount of money a dairyman may extract from the business for living purposes. Providing the farm is free of debt, the amount charged as interest on capital investment is available for family living. The value of the work contributed by unpaid members of the family has been

charged as an expense to the business, but it too is available for family living. Finally the charges for depreciation on buildings and equipment represent non-cash expenses. In times of emergency such depreciation allowances may be used to cover living expenses. Should such reserves be used for too long a period, however, the capital value of the investment will decline because of the failure to replace equipment and maintain buildings in good repair.

In this study the average debt per farm was slightly less than \$650. Interest on this at five per cent is \$32 - and when subtracted from the \$993 charged as interest on total farm capital, left a return of \$961 for the farm operator. This return to capital, plus labour earnings of \$1,042 and family labour returns of \$310 gave an average total of \$2,313 available for family living in 1946 on the 208 Fraser Valley dairy farms included in the study.

#### Variations in Profits:

Among the 208 farms studied, the range in farm profits -- as measured by labour earnings -- was from minus \$1,370 to plus \$8,341. Thirteen per cent of the farms had labour earnings which were negative (Table 8). Seventy-three per cent of the farms were in the range from \$0 to \$2,000, while 14 per cent had labour earnings in excess of \$2,000.

The variations in farm profits indicate that dairy-men met with varying degrees of success in their productive

TABLE 8. - DISTRIBUTION OF LABOUR EARNINGS,  
208 FRASER VALLEY DAIRY FARMS, 1946

Labour Earnings	Number of Farms	Per cent of Total
Plus		
\$4,000 or more	5	2
3,000 - 3,999	7	3
2,000 - 2,999	19	9
1,000 - 1,999	57	28
0 - 999	93	45
Minus		
\$ 0 - 999	21	10
1,000 or less	6	3
TOTAL:	208	100

efforts. The principal purpose of this study is to determine the factors of farm organization which have a significant effect on the profitability of dairy farms in the Lower Fraser Valley.

#### SIZE OF BUSINESS

The size of the farming unit may be measured in several ways. The number of cows or the number of acres are measures which are in common use. Another measure of size which is coming into more common use is the number of "productive man work units". A productive man work unit

measures the amount of any kind of income-producing work accomplished on the farm by one man in a ten hour day. For example, the feeding, milking and care of one dairy cow for a year represents 13.5 man work units, since under average conditions, about 135 hours per cow per year are required to do these chores. Because this measure of size includes the productive work on all the enterprises, animals as well as crops and miscellaneous income, it is one of the best measures to use in comparing the size of business on one farm with that on another.

Size and Profits:

As the size of the farm business increased the profits also increased (Table 9). The labour earnings

TABLE 9. - RELATION OF SIZE OF BUSINESS TO LABOUR EARNINGS, 208 FRASER VALLEY DAIRY FARMS, 1946

Total P.M.W.U. per Farm	Number of Farms	Average per Farm	
		Total P.M.W.U.	Labour Earnings
Less than 160	16	141	526
160 - 259	61	209	679
260 - 359	58	309	836
360 - 459	37	404	1,039
460 - 559	17	512	1,561
560 and over	19	882	2,812
ALL FARMS	208	353	\$1,042

averaged \$526 for the group of smallest farms as compared with \$2,812 for the largest.

Size and Labour Efficiency:

There was a pronounced difference between the large and small farm businesses with respect to the efficiency in the use of labour. (Table 10). The average accomplishment per man on the 19 farms in the largest size group was more than  $2\frac{1}{2}$  times that on the 16 farms in the smallest group. This relationship does not indicate that good labour efficiency was not obtained on some small farms. It does show, however, that greater opportunity for increased efficiency was possible on the larger farms. The greater efficiency on the large farms resulted in lower labour costs in proportion to the business done, making possible a more economical operation.

One reason for the increased output per man on the large farms seems to lie in the fact that their operators used more machinery and equipment per man than did the operators of small farms. The investment per man in farm machinery and equipment ranged from \$434 on the smallest group of farms to \$1,754 on the largest group (Table 10). The average was \$1,196.

TABLE 10. - SIZE OF BUSINESS, EFFICIENCY IN THE USE OF LABOUR, AND CAPITAL INVESTED IN FARM EQUIPMENT PER MAN, 208 FRASER VALLEY DAIRY FARMS, 1946

	Number of Farms	Average per Farm		
		Total P.M.W.U.	P.M.W.U. per Man	Capital in Equip- ment per Man
Less than 160	16	141	108	\$ 434
160 - 259	61	209	161	808
260 - 359	58	309	206	1,225
360 - 459	37	404	224	1,341
460 - 559	17	512	269	1,571
560 and over	19	882	285	1,754
ALL FARMS	208	353	209	\$1,196

Certain other characteristics of large farms which can contribute to the effective use of labour may be listed briefly, though data regarding them were not specifically secured during this study.

1. Many of the daily chores on a farm do not increase in proportion to the increase in the size of business. For example, it takes as long to climb up a silo to throw down feed for 10 cows as it does for 30 cows.

2. The presence of two or more men is necessary in order to do some farm jobs most efficiently. This is well illustrated by referring to the various operations which must be performed in hay-making.

3. The average size of fields usually varies directly with that of the farm. A large field is more efficient in the use of labour and machinery since a fewer number of turns are made per acre. Large fields are also more efficient in the use of fencing than small ones.

4. The fact that there is a large amount of work to be done on a large farm may stimulate men to work harder than they otherwise would.

#### Size and Rates of Production:

In this study crop yields tended to rise as the size of the farm business increased. The crop index for the smallest-sized group of farms was 91. This increased steadily to 108 for the farms in the largest-sized group.

There was also a tendency for milk production per cow to increase as the size of farm increased. The 16 farms representing the smallest-sized group, however, provided an exception to this tendency. The average number of cows for this group was 8 and the average production of butterfat per cow was 330 pounds.

The fact that the larger businesses tended to have better rates of production raises two questions. First, as size increased, were the greater profits due to the higher rates of production? Second, what was the effect of rates of production on the profits of various-size businesses?



TABLE 11. - SIZE OF BUSINESS AND RATES OF PRODUCTION,  
208 FRASER VALLEY DAIRY FARMS, 1946

Total P.M.W.U. per Farm	Number of Farms	Average per Farm		
		Total P.M.W.U.	Crop Index	Lbs. B.F. per Cow
Less than 160	16	141	91	330
160 - 259	61	209	96	301
260 - 359	58	309	98	304
360 - 459	37	404	106	304
460 - 559	17	512	108	308
560 and over	19	882	108	328
ALL FARMS	208	353	100	302

The farms were divided into two groups according to size, then each of these groups was sub-divided into three groups according to crop yields and milk production per cow respectively (Tables 12 and 13). Increased size of business

TABLE 12. - RELATION OF SIZE OF BUSINESS AND CROP YIELDS  
TO LABOUR EARNINGS, 208 FRASER VALLEY DAIRY  
FARMS, 1946

Total P.M.W.U. per Farm	Crop Index			All Farms
	Less than 90	90 - 110	110 & more	
Less than 250	\$ 602	\$ 739	\$ 562	\$ 616
250 - 449	653	994	1,064	922
450 and over	1,294	1,635	2,889	2,133
ALL FARMS	\$ 700	\$1,076	\$1,286	\$1,042

paid regardless of the crop yields or the rates of milk production due to the greater sales turnover of the larger farms

TABLE 13. - RELATION OF SIZE OF BUSINESS AND RATES OF MILK PRODUCTION TO LABOUR EARNINGS, 208 FRASER VALLEY DAIRY FARMS, 1946

Total P.M.W.U. per Farm	Lbs. B.F. per Cow			
	Less than 250	250 - 349	350 and over	All Farms
Less than 250	\$ 346	\$ 676	\$ 703	\$ 616
250 - 449	125	1,058	1,293	922
450 and over	679	2,247	2,667	2,133
All farms	278	1,148	1,393	1,042

and to factors other than rates of production. As rates of production increased, however, the combined effect of good rates of production and size resulted in greatly increased returns. On the other hand poor returns resulted for those operators with small farms and low rates of production.

Small businesses with rates of production above average were more profitable than small businesses with rates of production below average. This is indicated by a study of Table 14. It should also be noted that small businesses with rates of production above average were slightly more profitable than large businesses with rates of production below average. This indicates the necessity of achieving good rates of production before enlarging the size

TABLE 14. - RELATION OF SIZE OF BUSINESS AND RATES  
OF PRODUCTION TO LABOUR EARNINGS,  
208 FRASER VALLEY DAIRY FARMS, 1946

Items	Number of Farms	Average per Farm		
		Lbs. B.F. per Cow	Crop Index	Labour Earnings
<u>Small Businesses:</u>				
Both Crop Index and Lbs. B.F. per cow -				
Below average	76	290	86	\$ 572
Above average	28	344	117	889
<u>Large Businesses:</u>				
Both Crop Index and Lbs. B.F. per cow -				
Below average	56	272	93	858
Above average	48	352	121	2,090

of the business. For example, it would not pay to enlarge a dairy herd by adding more poor producers. Rather, production of the present herd should be first built up and then the size increased.

A study of Table 14 shows that a large-sized business with good rates of production is necessary for high earnings.

Importance of Size of Business:

Large farm businesses have another advantage beside that of greater efficiency. When farming is profitable, the larger the volume of business, the more there is on which to make a profit, and so the greater the profit from the business as a whole, and vice versa.

In order to show the importance of size of business alone on profits, an attempt was made to eliminate the effect of other important factors. This was done by pairing a small farm business with a large farm business so that each had similar rates of crop yields, milk production per cow and labour efficiency. From the entire group it was possible to make 20 pairs in this manner. Labour earnings

TABLE 15. - RELATION OF SIZE OF BUSINESS TO LABOUR EARNINGS, 40 FRASER VALLEY DAIRY FARMS, 1946

Items	Small Businesses*	Large Businesses*
Number of farms	20	20
P.M.W.U. per man	214	213
Crop index	98	98
Lbs. B. F. per cow	303	305
P.M.W.U. per farm	254	475
Labour earnings	\$745	\$1,555

\* Small Businesses - those having less than 353 P.M.W.U. per farm.

Large Businesses - those having more than 353 P.M.W.U. per farm.

averaged \$745 for small farm businesses as compared to \$1,555 for the large farm businesses (Table 15). This difference was due mainly to the larger volume of output marketed from the larger farms. It should be noted, however, that a large volume of business may result in a substantial farm loss during periods when the prices of farm

products are low relative to costs. In order to minimize such losses the operators of large farms must be efficient in their use of capital and labour, and they must secure good yields of crops and high production from livestock.

Ways to Enlarge the Farm Business:

It has been shown that a moderately large farm business is necessary if a good return is to be secured from dairy farming in the Fraser Valley. The individual farmer, therefore, wants to know what, if anything, he can do towards enlarging his own business. As a result of the analysis of these records, some observations can be presented.

1. Before attempting to enlarge the farm business, be sure that rates of butterfat production and crop yields are good, and that labour will be used efficiently in the new setup. Otherwise greater losses may result.

2. The renting or buying of additional land was a common method of enlarging the farm business.

3. Some farmers had remodelled or extended buildings in order to make room for more dairy cows or space for poultry.

4. Provided the soil was suitable, many operators increased the amount of productive work by shifting part of their crop land from extensive crops, such as grain, to intensive crops such as peas and potatoes. This was particularly effective in the Ladner and Sumas areas. Farmers on upland soils achieved a similar result by growing straw-

berries and raspberries. Farmers contemplating small fruits, however, are advised before planting to make a careful study of varieties for which there is a good market demand.

5. Where the area of land available for crops and pasture was definitely the limiting factor, some farmers were able to increase the size of their dairy herd by devoting most of their land to hay, pasture and silage crops; and buying most of the concentrate feeds. An increase in the carrying capacity of pastures also made an increase in the size of the dairy herd possible. The carrying capacity of pastures can be raised by the use of lime and fertilizer; plus proper management practices such as mowing and grazing. One farm operator achieved considerably increased yields by the use of a sprinkler irrigation system.

6. Where the opportunity was present, some farmers increased the amount of productive work by doing custom work, trucking, or part time labour off the farm.

The best method to use in increasing the size of the farm business will vary with the circumstances and the man. The operator's ability as a manager, that is his ability to plan and operate the business as a going concern, will largely determine the success of expansion. The man who is enlarging his business, and the man who is already operating a large farm as well, must recognize the risks which a large business involves. He must organize in such a way as to take full advantage of a larger size operation

in good times and to avoid, if possible, or at least reduce the risks which a large volume entails when farming proves unprofitable.

#### PRODUCTION OF BUTTERFAT PER COW

The average rate of butterfat production per cow for the 208 farms included in the study was 302 pounds.

Production per cow was an important factor affecting farm returns. Table 16 shows the relationship between the pounds of butterfat produced per cow and labour earnings.

TABLE 16. - RELATION OF MILK PRODUCTION PER COW TO  
LABOUR EARNINGS, 208 FRASER VALLEY  
DAIRY FARMS, 1946

Pounds of Butterfat per Cow	Number of Farms	Lbs. B.F. Produced per Cow.	Labour Earnings
Less than 240	32	209	\$ 215
240 - 289	36	260	765
290 - 339	73	319	1,241
340 - 389	48	364	1,283
390 and over	19	412	1,585

Operators with herds producing an average of 412 pounds of butterfat per cow made earnings seven and one-half times as large as herds producing an average of 209 pounds per cow. Although some of this difference may have been due to other factors that had an influence on profits, the importance of good milk production from the herd was indicated.

In order to show that the production of butterfat per cow was important in itself, an attempt was made to eliminate the effect of other important efficiency factors in the same manner as was used to show the effect of the size of farm on profits. Table 17 shows the effect on profits of butterfat production per cow when other important factors are approximately equal.

TABLE 17. - RELATION OF MILK PRODUCTION PER COW TO LABOUR EARNINGS, 60 FRASER VALLEY DAIRY FARMS, 1946

	Milk Production per Cow Below Average	Milk Production per Cow Above Average
Number of farms	30	30
Total P.M.W.U.	319	319
Crop index	96	97
P.M.W.U. per man	209	205
Lbs. B.F. per cow	243	346
Labour earnings	\$333	\$1,321

Butterfat per Cow and Various Factors:

Table 18 shows some interesting relationships between the pounds of butterfat per cow and various factors. Higher rates of production per cow allowed the total volume of production to be increased without any increase in the size of the dairy herd. This in turn permitted some very decided management economies. The higher producing cows re-



quired that more time be spent per animal on dairy chores. The total hours of dairy chores per pound of butterfat, however, was almost 50 per cent less for the group of highest producing herds as compared with the group of lowest

TABLE 18. - RELATION OF POUNDS OF BUTTERFAT PER COW TO VARIOUS FACTORS, 208 FRASER VALLEY DAIRY FARMS, 1946

Lbs. of B.F.	Number of Farms	Lbs. B.F. per Cow	Total Lbs. of B. F. Pro- duced	Number of Cows	Hours of dairy chores per Cow	Hours of dairy chores per lb of BF
Less than 240	32	209	3,635	17.4	138	0.66
240 - 289	36	260	4,256	16.4	133	0.53
290 - 339	73	319	6,000	18.8	136	0.43
340 - 389	48	364	6,294	17.3	154	0.42
390 and over	19	412	6,425	15.6	146	0.35

producing herds. Because of the importance of labour as an expense in milk production, such savings can have a significant effect on the profits secured from dairy farming.

The number of P.M.W.U. accomplished per man is another method by which efficiency in the use of labour can be measured. Table 19 shows the relation of butterfat production per cow and labour efficiency to farm profits. An increase in either production per cow or labour efficiency resulted in an increase in profits. When both of these factors were increased together, however, the profits were --

greatly enhanced. Farms with poor production per cow and low labour efficiency had an average labour earnings of \$157, whereas farms with good production per cow and high labour efficiency made an average labour earnings of \$2,354.

TABLE 19. - RELATION OF MILK PRODUCTION PER COW AND LABOUR EFFICIENCY (P.M.W.U. PER MAN) TO LABOUR EARNINGS, 208 FRASER VALLEY DAIRY FARMS, 1946

Lbs. B.F. Per Cow	P.M.W.U. per Man			
	Less than 160	160-240	240 & over	All Farms
Less than \$ 250	\$ 157	\$ 250	\$ 440	\$ 278
250-350	441	1,033	1,958	1,148
350 & over	740	1,194	2,354	1,393
All farms	\$,485	\$ 894	\$1,800	\$1,042

Factors Contributing To High Milk Production Per Cow:

The importance of high rates of milk production has thus been strikingly demonstrated. Basically high rates of milk production are dependent on the inherent ability of cows to produce, since care in feeding and management will not in itself insure economical milk production if the cows are inefficient and low in capacity. Farmers with herds which produced economically kept records of the production of each cow. This made possible more accurate culling of uneconomical producers. Membership in a local cow-testing association facilitated such record-keeping. The use of pure-bred sires

or artificial insemination aid in increasing the inherent productivity of the dairy herd.

Economical milk production per cow is also dependent on proper feeding. The ration of the dairy cow must be well-balanced in nutrients supplied, and it should be fed at a rate which yields the maximum profit. It must be kept in mind, however, that production at the lowest unit cost does not necessarily result in the highest total profit. The value of the extra pound of butterfat produced may exceed the higher costs incurred and hence still be profitable.

Good milking practice must also be used if the greatest possible production per cow is to be achieved. Cows must not receive rough treatment, and loud disturbing noises in the barn during milking must be avoided. Proper stimulation of the cow's udder not more than a minute before milking will aid in securing a fast and complete milk flow.

#### CROP YIELDS

For each farm the yields of the important crops were expressed as a percentage of the average for the area. This is called a crop index. As crop yields increased profits also increased (Table 20). There was a difference in labour earnings of \$1,058 between the group of farms with the highest crop index and the group with the lowest.

The important relationship between crop yields and farm profits is further emphasized in Table 21. A group of 23 farms having above-average crop yields was compared with a

TABLE 20. - RELATION OF CROP INDEX TO LABOUR EARNINGS  
208 FRASER VALLEY DAIRY FARMS, 1946

Crop Index	Number of Farms	Crop Index (Average)	Labour Earnings
Less than 70	19	61	\$ 628
70 - 89	42	80	769
90 - 109	66	98	1,036
110 - 129	54	115	1,086
130 and over	27	143	1,686

group of 23 farms having below-average crop yields. Farms in these groups were so matched that the effects of size of the farm, labour efficiency and the rate of milk production were practically eliminated. The average labour earnings was \$ 515 for the group of farms with yields below average as compared with \$1,402 for the group of farms with

TABLE 21. - RELATION OF CROP INDEX TO LABOUR EARNINGS,  
46 FRASER VALLEY DAIRY FARMS, 1946

	Crop Index Below Average	Crop Index above Average
Number of farms	23	23
Total P.M.W.U.	325	326
Lbs. B.F. per cow	302	302
P.M.W.U. per man	198	199
Crop index	86	118
Labour earnings	\$515	\$1,402

yields above average. The crop indexes were 86 and 118 for the two groups respectively.

The farms with high crop yields had somewhat larger businesses and higher labour efficiency than the farms with low crop yields (Table 22). The importance of the crop enterprises -- as measured by the per cent of total P.M.W.U. on crops -- as a part of the entire farming operations, had little influence on the crop yields obtained.

TABLE 22. - RELATION OF CROP INDEX TO VARIOUS FACTORS,  
208 FRASER VALLEY DAIRY FARMS, 1946

Crop Index	Number of Farms	Crop Index	Acres of Crop Land	Total P.M.W.U.	Per cent P.M.W.U. on Crops	P.M.W.U. per Man
Less than 70	19	61	37	258	19	184
70 - 89	42	80	39	304	19	190
90 - 109	66	98	54	384	19	213
110 - 129	54	115	46	355	24	209
130 & over	27	143	54	413	20	243

Table 23 shows the effect of both crop yields and labour efficiency on earnings. An increase in either crop yields or labour efficiency resulted in higher earnings. When both of these factors were increased together, however, earnings were substantially increased.

37.

TABLE 23. - RELATION OF CROP INDEX AND LABOUR EFFICIENCY  
TO LABOUR EARNINGS, 208 FRASER VALLEY  
DAIRY FARMS, 1946

Crop Index	P.M.W.U. per man			All Farms
	Less than 160	160- 240	240 & over	
Less than 90	\$ 468	\$ 644	\$1,143	\$ 700
90 - 110	697	878	1,770	1,076
110 and over	383	1,084	2,214	1,286
All farms	\$ 485	\$ 894	\$1,800	\$1,042

Factors Affecting Crop Yields:

The importance of good crop yields has been shown. The problem of the individual farm operator is how to obtain them in economical ways. This is a study which requires the co-operation of the agricultural economist and the agronomist.

Farmers interviewed during the course of the study made frequent enquiries relative to soil analysis, drainage, crop varieties, fertilizer applications and cultural methods. This indicates the definite interest on the part of dairy farmers in getting information which will aid them in securing larger and more economical crop yields.

Detailed data relating to factors which influence crop yields were not collected in this study. Established dairy farmers can do little to change the inherent capacity of their soil to produce. Increased crop yields, however, can be obtained by proper draining, fertilizing and liming. Crop varieties best adapted to the particular area, insect

and disease control, and good cultural practices are also important in obtaining satisfactory yields.

### LABOUR EFFICIENCY

Efficiency in the use of labour has been measured by the number of productive man work units accomplished per man. This is one of the best measures of labour efficiency on farms which have more than one enterprise as it shows the amount of productive work accomplished per worker, whether it be on crops, livestock, or other farm work.

TABLE 24. - RELATIONSHIP OF LABOUR EFFICIENCY (P.M.W.U. per Man) TO LABOUR EARNINGS, 208 FRASER VALLEY DAIRY FARMS, 1946

P.M.W.U. per Man	Number of Farms	Average P.M.W.U. per Man	Labour Earnings
Less than 100	8	83	\$ 265
100 - 149	32	128	420
150 - 199	59	170	853
200 - 249	59	222	918
250 - 299	28	274	1,508
300 - 349	15	326	2,064
350 and over	7	398	3,350

There was a close relationship between labour efficiency and farm profits (Table 24). The group of farms with the lowest labour efficiency had labour earnings averaging \$265 as compared with \$3,350 for the group of farms with the highest labour efficiency. Part of this difference must be

attributed to other advantages that went with the pronounced increase in the size of farm which accompanied the rise in the number of P.M.W.U. per man. The effect of other important factors was practically eliminated, however, by comparing two groups of farms which varied only in labour efficiency (Table 25). Labour earnings amounted to \$320 on a group of farms which averaged 182 P.M.W.U. per man as compared with \$1,405 on a group of farms which averaged 242 P.M.W.U. per man. This difference of \$1,085 can be attributed mainly to labour efficiency.

TABLE 25. - RELATION OF LABOUR EFFICIENCY (P.M.W.U. PER MAN) TO LABOUR EARNINGS, 32 FRASER VALLEY DAIRY FARMS, 1946

	Below Average Labour Efficiency	Above Average Labour Efficiency
Number of farms	16	16
Lbs. B.F. per cow	297	297
Total P.M.W.U.	393	394
Crop index	101	99
Capital turnover	4.6	4.4
P.M.W.U. per man	182	242
Labour earnings	\$ 320	\$ 1,405

Labour Efficiency and Various Factors:

Large farms were more efficient in the use of labour than small farms (Table 26). This was also pointed out under the discussion of size of business. Part of the



TABLE 26. - RELATION OF LABOUR EFFICIENCY (P.M.W.U. PER MAN) TO  
VARIOUS FACTORS, 208 FRASER VALLEY DAIRY FARMS, 1946

P.M.W.U. per Man	Number of Farms	AVERAGE			PER FARM			
		P.M.W.U. per Man	Total P.M.W.U.	Lbs. B.F. per Cow	Crop Index	% P.M.W.U. on Dairy Herd	Hours of Dairy Chores per Cow	Per cent of Farms with Milker
Less than 100	8	83	158	340	98	76	235	38
100 - 149	32	128	205	303	96	77	190	50
150 - 199	59	170	272	307	93	73	159	76
200 - 249	59	222	377	311	103	75	133	83
250 - 299	28	274	466	311	103	74	129	89
300 - 349	15	326	555	327	115	71	117	100
350 and over	7	398	837	309	106	61	107	100

greater earnings attributed to labour efficiency was due to this factor. <sup>41.</sup>

The production of butterfat per cow was not related to labour efficiency (Table 26). Pounds of butterfat per cow varied regardless of labour efficiency. As was indicated under the discussion of production of butterfat per cow, however, a combination of good milk production per cow and high labour efficiency resulted in larger average earnings.

There was also no consistent relationship between crop yields and labour efficiency, (Table 26). Although crop yields were not closely related to labour efficiency, it was pointed out in Table 23 that higher earnings were obtained when good crop yields were combined with high labour efficiency.

The per cent of P.M.W.U. represented by the dairy herd is a measure of the extent of the specialization on dairy farms. As specialization in dairying increased, labour efficiency decreased (Table 26). This close relationship indicated that supplementary enterprises were required in order to insure the best possible use of the labour force employed.

The number of P.M.W.U. per man is a general measure of labour efficiency for the entire farm. Efficiency in the use of labour on the dairy herd has been measured by the number of hours of dairy chores per cow. Table 26 shows that inefficiency in the use of labour on the farms included in this study resulted in part from the inefficient use of

labour on the dairy herd. As the number of hours of dairy chores per cow increased, the over-all labour efficiency of the farm decreased. The use of milking machines aided in reducing the hours of labour required for the dairy chores.

Efficiency in the use of labour was largely dependent upon the use of labour-saving machinery and equipment. Table 27 shows the marked relationship between the capital invested per man in machinery and equipment and labour efficiency. Farms with less than \$500 invested in machinery and equipment per man averaged only 148 P.M.W.U. per man. On the other hand, farms with over \$2,000 per man averaged 282 P.M.W.U. per man. As a consequence of increased labour efficiency, earnings also increased.

TABLE 27. RELATION OF THE INVESTMENT IN MACHINERY AND EQUIPMENT PER MAN TO LABOUR EFFICIENCY AND LABOUR EARNINGS, 208 FRASER VALLEY DAIRY FARMS, 1946

Investment in Machinery and Equipment per man	Number of Farms	Average per Farm		
		Investment in machinery and equip. per man	P.M.W.U. per man	Labour Earnings
Less than \$500	33	\$ 313	148	\$ 708
\$ 500 - 999	70	769	186	877
1,000 - 1,499	47	1,224	215	966
1,500 - 1,999	34	1,806	248	1,325
2,000 and over	24	2,437	282	1,731

Although large farms were more efficient in the use of labour than small or medium-sized farms, it paid to be efficient in the use of labour regardless of the size of farm. The sample was arrayed according to size and on this basis was split into three groups - small, medium and large - with approximately the same number of farms in each group. The average labour efficiency of each group was determined. Each group was then subdivided into groups below average and above average in labour efficiency. Table 28 shows that for each size group, earnings were greater for those farms which were above average in labour efficiency for their group.

TABLE 28. - EFFECT ON LABOUR EARNINGS OF BEING BELOW AVERAGE AND ABOVE AVERAGE IN LABOUR EFFICIENCY ON SMALL, MEDIUM AND LARGE FARMS, 208 FRASER VALLEY DAIRY FARMS, 1946

	Number of Farms	Average per Farm	
		P.M.W.U. per Man	Labour Earnings
<u>Small Farms</u>			
Labour Efficiency----			
Below average	28	107	\$ 389
Above average	41	183	772
<u>Medium Farms</u>			
Labour Efficiency----			
Below average	46	171	646
Above average	55	247	1,154
<u>Large Farms</u>			
Labour Efficiency----			
Below average	19	219	1,426
Above average	19	336	2,840

### Ways to Increase Labour Efficiency

1. Have a moderately large-size business. The advantages of larger farms in using labour efficiently have already been discussed on page 22.

2. Provide a good labour distribution. Minor enterprises which are supplementary to the dairy enterprise, help to distribute the work throughout the day and throughout the year. Cash crops, poultry and part-time work off the farm helped many dairy farmers in this study to achieve greater labour efficiency.

3. Use labour-saving machinery. Economical labour-saving equipment and machinery such as milking machines, tractors, manure spreaders, and hay loaders were common on farms which used labour to the best advantage. However, over-capitalization in equipment must be avoided since too little work for equipment makes it a costly means of saving labour.

4. Have a good field layout and building arrangement. If the fields are large and rectangular the work can be done in less time. Similarly high labour efficiency is found where buildings are conveniently arranged. A recent American study (2) of dairy barn chores shows that substantial savings in labour can be made by improvements in barn arrangement, in equipment, in work routines, and in the positioning of equipment and supplies.

Have a farm work programme. Best results are obtained from labour if the work is planned and done on time. Keeping

a list of jobs to be done on a rainy day is a good way to avoid having to do these jobs during good weather. Likewise it pays to make machinery and equipment repairs during the winter.

### CAPITAL EFFICIENCY

Efficiency in the use of capital was measured by the years required for cash receipts to equal the capital investment. This is known as the capital turnover. The more rapid the rate of the turnover of capital, the more efficiently it is used. Because it measures the over-all use of capital in the farm business, it provides the means for a farmer to check the results of his operations at the end of the year.

TABLE 29. - RELATION OF CAPITAL TURNOVER TO LABOUR EARNINGS, 190 OWNER-OPERATED FRASER VALLEY DAIRY FARMS, 1946

Capital Turnover	Number of Farms	Average per Farm	
		Capital Turnover	Labour Earnings
Less than 2.5	14	2.1	\$ 2,239
2.5 - 3.4	49	2.9	1,412
3.5 - 4.4	53	4.0	894
4.5 - 5.4	44	4.9	658
5.5 - 6.4	19	5.9	362
6.5 and over	11	7.3	76

Because of the difficulty of securing complete information regarding the investments of tenant-operated farms,

the capital turnover was calculated only for owner-operated farms.

The effect of capital efficiency -- as measured by capital turnover -- on labour earnings is shown in Table 29. It will be noted that there was a marked relation between capital turnover and labour earnings secured from the farm operation. There was a difference of \$2,163 in labour earnings between the groups of farms with the highest and lowest capital turnover.

Capital Efficiency and Various Factors:

TABLE 30. - RELATION OF CAPITAL EFFICIENCY TO VARIOUS FACTORS, 190 OWNER-OPERATED FRASER VALLEY DAIRY FARMS, 1946

Capital Turnover	Number of Farms	Average per Farm				
		Capital Turnover	Lbs.B.F. per Cow	Crop Index	Total P.M.W.U.	P.M.W.U. per Man
Less than 2.5	14	2.1	341	102	461	230
2.5 - 3.4	49	2.9	332	100	328	193
3.5 - 4.4	53	4.0	313	99	327	204
4.5 - 5.4	44	4.9	315	108	383	213
5.5 - 6.4	19	5.9	268	95	316	211
6.5 and over	11	7.3	262	98	319	188

Efficiency in the use of capital is dependent upon a large volume of business in relation to the capital invested. On a dairy farm the volume of business can be increased by good rates of milk production and high crop yields.

Yearly production of butterfat per cow increased from 262 pounds on the group of farms with the lowest capital turnover to 341 pounds on the group of farms with the highest capital turnover. Crop yields as measured by the crop index did not show such a consistent relation to capital efficiency. It is evident from Table 30, however, that a rapid capital turnover was associated with a crop index which was above average. On the other hand, farms with a slow capital turnover had crop indices which were below average.

The lesser effect of crop yields on capital efficiency as compared to the rate of butterfat production per cow may be explained by the fact that on dairy farms, crops are marketed mainly through the dairy herd. The efficiency of the operator as a feeder, that is in using the dairy herd in order to market crops, largely determines the effect of crop yields on the volume of butterfat production.

The size of farm and labour efficiency were not important factors in influencing capital efficiency. Table 30 shows, however, that the most rapid capital turnover was associated with a large-sized enterprise and high labour efficiency. These factors alone, however, did not assure a rapid capital turnover. A capital turnover in the range 2.5 to 3.4 can be considered very satisfactory, yet there was no significant difference in the size of farm and labour efficiency between this group and the group which had the very unsatisfactory turnovers of 6.5 and over.



Capital Efficiency and Financial Organization:

Inefficient use of capital was associated with an excessive proportion of it in real estate (Table 31). Such over-capitalization of the farm meant that the productive

TABLE 31. - RELATION OF CAPITAL TURNOVER TO FINANCIAL ORGANIZATION, 190 OWNER-OPERATED FRASER VALLEY DAIRY FARMS, 1946

Capital Turnover	Number of Farms	Average per Farm			
		Capital Turnover	Total Capital	Per cent Capital in Real Estate	Capital per P.M.W.U.
Less than 2.5	14	2.1	\$15,153	64	\$ 33
2.5 -- 3.4	49	2.9	15,644	63	48
3.5 -- 4.4	53	4.0	19,212	68	59
4.5 -- 5.4	44	4.9	28,453	71	74
5.5 -- 6.4	19	5.9	22,794	72	72
6.5 and over	11	7.3	29,589	73	93

operations had to bear high costs for interest, depreciation and taxes. The burden of these heavier expenses accounted, in large part, for the low incomes of the operators who had large capital investments relative to the volume of business they did. This relationship is shown in Table 31 by the capital investment per P.M.W.U.

SPECIALIZATION IN DAIRYING

Records were taken only from farmers whose primary source of income was the dairy enterprise. Nevertheless, among the farms that were included there were wide differences in the extent of specialization in the dairy enterprise. One

measure of this is the percentage of income producing work (P.M.W.U.) represented by the dairy herd.

TABLE 32.- RELATION OF PERCENTAGE OF P.M.W.U. ON DAIRY HERD TO VARIOUS FACTORS, 208 FRASER VALLEY DAIRY FARMS, 1946

Per cent of P.M.W.U. on Dairy Herd	Number of Farms	Average per Farm				
		Per cent of P.M.W.U. on Dairy Herd	Labour Earnings	Number of Cows	Total P.M.W.U.	P.M.W.U. per Man
Less than 58	20	45	\$1,605	13.6	440	232
58 - 67	32	63	1,260	17.5	414	218
68 - 77	43	72	1,233	17.4	353	221
78 - 87	87	82	823	18.3	327	204
88 and over	26	91	756	18.4	294	196

Specialization in the dairy enterprise was associated with relatively low earnings. Farms with less than 58 per cent of P.M.W.U. in the dairy herd made earnings which were more than double those secured by farms with 88 per cent and over of their P.M.W.U. in the dairy herd (Table 32). Farms which were highly specialized in the dairy enterprise had slightly larger herds but they were smaller when measured in terms of income-producing work, that is P.M.W.U. As pointed out previously the number of P.M.W.U. is a better measure of size when there are different types of enterprises on the farm.

The more diversified farms were more efficient in the use of labour. This resulted from the inclusion in the farm

business of enterprises which were supplementary to the dairy herd in the use of labour. The enterprises most frequently combined with the dairy enterprise were cash crops, small fruits, and poultry. The additions of these enterprises resulted in larger-sized businesses, making possible more efficient use of labour and larger farm profits.

#### COMBINED EFFECT OF IMPORTANT FACTORS

It has been shown that there are five important factors which affect the earnings of dairy farmers in the Lower Fraser Valley. These factors are size of farm, rate of milk production, crop yield, labour efficiency, and capital turnover. It was also shown that a moderate diversification of enterprises was desirable, since supplementary enterprises aided in a fuller utilization of the labour employed on dairy farms.

TABLE 33. - RELATION OF THE NUMBER OF IMPORTANT FACTORS ABOVE AVERAGE TO LABOUR EARNINGS, 208 FRASER VALLEY DAIRY FARMS

	Above Average in Following Number of Factors						All Farms
	0	1	2	3	4	5	
Number of farms	12	46	53	46	34	17	208
Labour earnings	\$130	\$402	\$803	\$849	\$1650	\$3468	\$1042
<u>Factors</u>							
Total P.M.W.U.	230	246	269	374	476	684	353
Lbs. B.F. per cow	243	277	310	290	346	348	302
Crop index	80	92	96	105	116	120	100
P.M.W.U. per man	144	164	180	220	238	311	209
Capital turnover	5.7	4.6	3.7	4.0	3.7	2.6	3.8

In order to secure high earnings a farm operator must be above average in more than one of these factors. From Table 33 it will be seen that the number of factors in which a farm operator excels has a very strong relationship to labour earnings. Only eight per cent of the farms studied were above average in all five factors. The hard work and careful planning required to obtain such production efficiency, however, paid off very handsomely in financial returns. Labour earnings for this group of operators averaged \$3,468. On the other hand, the 12 operators who failed to excel in any factor had labour earnings which averaged only \$130.

### CONCLUSIONS

The factors that affect the size of income from dairy farming may be divided into two groups, those within the operator's control and those not within his control. The weather and economic conditions are the principal factors beyond the control of the farm operator. In any one area during a given year when all farmers are experiencing similar weather and economic conditions, however, there is considerable farm-to-farm variation in incomes. Such differences in incomes are due mainly to the factors of farm organization and management discussed in this thesis. The most important of these are:

1. Size of farm
2. Production of butterfat per cow
3. Crop yields
4. Efficiency in the use of labour
5. Efficiency in the use of capital.

High incomes are obtained only by farmers who are above average in all of these factors. Furthermore the greatest improvement in income comes about by improving the weakest factor rather than further improving a factor which is already high. Increasing the size of the farm business acts as a "multiplier" of the other factors. Thus when a business is operated efficiently a large volume will give a higher net income than a small volume. On the other hand, large losses are likely to occur through the inefficient production of a large volume.

The study showed that the average labour earnings secured by operators of dairy farms in the Fraser Valley during 1946 was \$1,042. This seems to be low and tends to raise the question as to whether or not dairy farmers in the Fraser Valley are receiving a price for their milk which covers their cost of production. On many occasions, in fact, producers have made the complaint that the price being received for their milk is below the cost of production. They ask that cost of production studies be made, and demand that a price be fixed which shall equal "the cost of production plus a reasonable profit."

Two separate studies have been made in an effort to calculate the cost of producing butterfat in the Fraser Valley. Professor H. R. Hare (3) of the Department of Animal Husbandry of The University of British Columbia carried out annual surveys of production costs between the years 1920 and 1930. In 1946 the Department of Agricultural Economics of The University of British Columbia (4) carried out a survey of production costs for the year 1945.

Both of these studies reported costs of butterfat production above the price being received at the time the studies were made. In summarizing the cost results for the five year period 1921 - 1925 H. R. Hare (3) reported as follows: "A weighted average cost of production for the five years was determined and amounted to 74.4 cents. The average price received for butterfat was 50.5 cents. A loss of 23.9 cents per pound was thus registered." In the study done by

the Department of Agricultural Economics for the year 1945 the weighted average cost was 78.22 cents while the price actually received by producers was 73.24 cents.

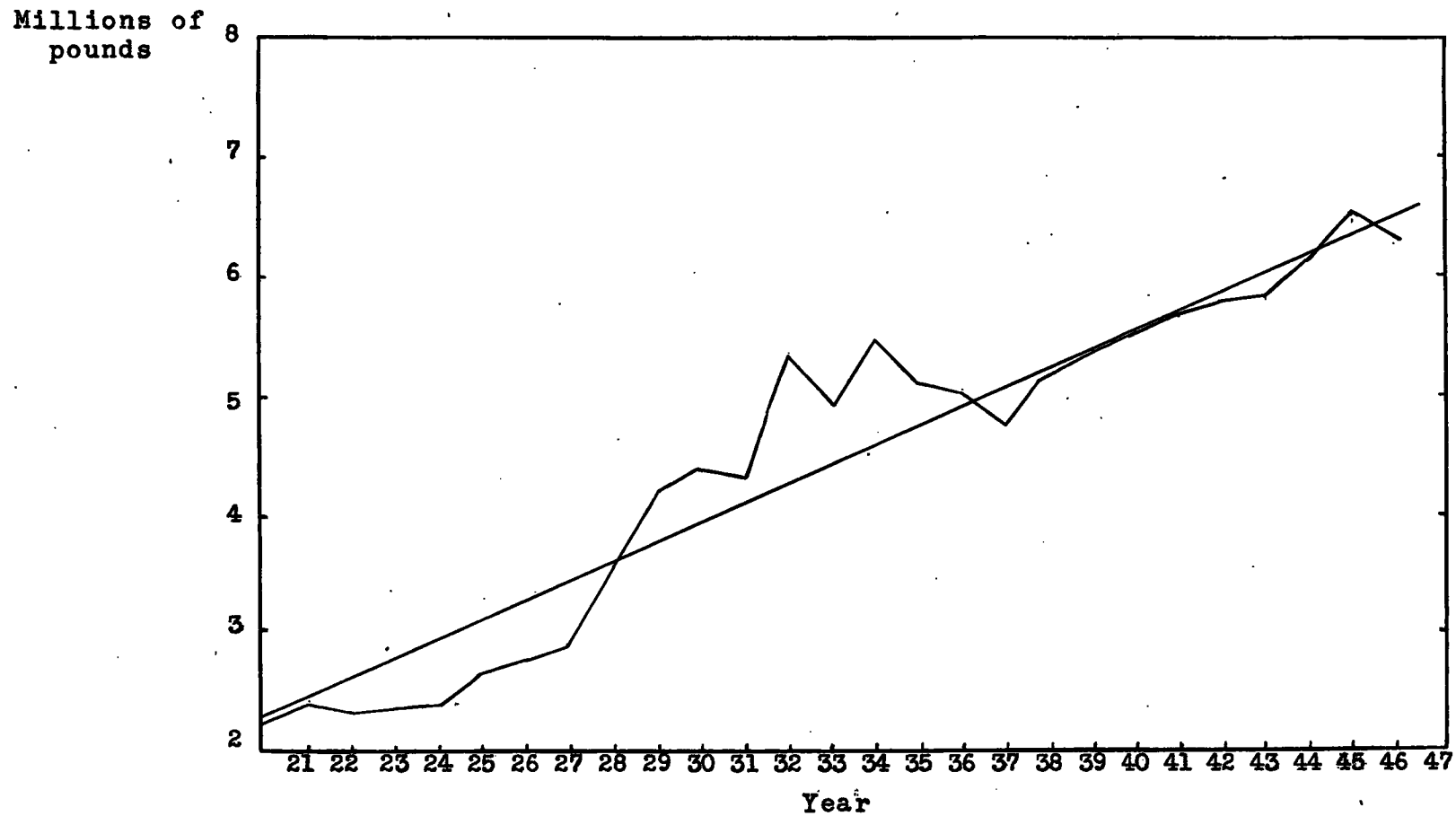
During most of the period under study, that is from 1920 to the present time, there has been a steady increase in milk production. Figure 1 shows the trend in production for the entire province of British Columbia. This chart is based on figures compiled by the Agricultural Branch of the Dominion Bureau of Statistics. Separate production figures for the Fraser Valley are not available, but as over 70 per cent (5) of the total number of milk cows in British Columbia are located in the Lower Fraser Valley it is safe to conclude that the trend is representative of production in that area.

In view of the fact that dairymen continue to produce milk in increasing amounts one may well ask how the complaint arises that the price being received by producers is below cost. The studies of dairy farms in the Fraser Valley have shown that these farms are characterized by low earnings for the labour of their operators. Are these low labour earnings the result of prices below the cost of production? Or are they a surface manifestation of a more fundamental dislocation?

#### Ambiguity of the Word "Cost"

The expression "cost of production" is extremely ambiguous. According to Boulding (6) there is no such thing as "the" cost of production of a commodity. There are as many different costs of production as there are producers, and as many different costs of production for any given

FIGURE 1. - MILK PRODUCTION IN BRITISH COLUMBIA,  
1920 - 1946 (MILLIONS OF POUNDS).



Source: Agricultural Branch, Dominion Bureau of Statistics.



producer as there are different quantities of output.

### The Economists' Definition of Cost

To the economist the total cost of producing a given quantity of output is the value of the inputs used plus the normal profit which must be secured by the owners of a business in order to encourage continued production. Thus the total cost of producing a definite quantity of milk in a given time is the least sum which will keep all the necessary factors of production -- land, capital, labour and management -- in the business of producing milk. This sum depends on the profitability of readily available alternative occupations. Thus conditions in one industry affect the total costs of other industries. If the growing of small fruits in the Fraser Valley becomes unusually profitable, the total cost of production of milk will be increased. This happens not only because the increased profitability of small fruit growing raised rents and wages, but also because milk producers will not be content with a low rate of return on their own labour and capital if they can get a higher return by growing small fruits.

### Cost of Production and Supply:

As has already been pointed out, not all producers have the same cost of production. Producers whose cost of production is equal to the price being received for the product are known as marginal producers; those with costs of production less than the price are known as intra-marginal producers; and those with costs of production above the price

being received are known as sub-marginal producers.

When the total production of milk in a given area is decreasing, some producers -- the sub-marginal ones -- are not making normal profits and are leaving the industry. Producers will continue to leave the industry until the least profitable producer is making normal profits. If, on the other hand, the least profitable producer is making profits above normal, new producers coming into the industry could probably also make profits above normal. There will thus be a tendency for new producers to enter the industry with the result that total production in the area will increase.

These, however, are long-run tendencies and it should not be thought that adjustments to cost-price relationships take place easily. When the cost-price relationship in milk production suddenly becomes unfavourable, some producers do not secure normal profits. In the short-run many such producers will continue production with the hope that the unfavourable relationship is temporary. Ultimately, however, sub-marginal producers will leave the industry.

#### Cost of Production and the Supply of Milk in the Fraser Valley

In view of the fact that there has been a long-run tendency for milk production to increase in the Fraser Valley it would appear that the opportunities of securing normal profits in the industry have been good. One can conclude then, that milk producers, on the average, in the Fraser Valley, have received their costs of production. In no other way can one account for the consistent expansion of the

industry.

Because of the close relationship between the cost of production and the resultant supply, it appears advisable that accurate figures should be compiled on the production of milk in the Fraser Valley area. Supply responses as a result of changes in the prices of important inputs of milk production such as feed and labour, as well as the response to changes in the price received for milk should be noted carefully. Once an adequate body of statistical information on production trends and responses has been built up, more reliable forecasts of supply will be possible. Such statistics are already in use in several parts of the United States (7, 8, 9, 10, 11).

An Appraisal of Cost of Production Calculations:

The results of the cost of butterfat production studies which have been carried out have been consistent in demonstrating an average cost of production above the price being received for the product. Thus there is a conflict between the conclusions arrived at by these studies and the upward trend of production which could not have taken place if producers were not receiving their costs of production.

Many difficulties arise in the attempt to calculate the cost of production of a given supply of milk during a given time. In spite of these difficulties it appears that reasonable approximations have been made of many of the costs entering into the production of milk. An almost impossible task arises, however, from the attempt to determine

normal profit, i.e. the return required to induce a producer to continue the use of his labour in the production of milk. This is because the return is not entirely monetary in its nature. To the extent that it is non-monetary it is impossible to measure. Yet until the entire return can be measured it is impossible to calculate an accurate cost of production.

In his studies from 1920-1930 Hare (3) allowed a return of \$960 per year for the operator's labour while the study for 1945 allowed \$1,200. This is in addition to any non-monetary advantages which may induce him to continue production. Although these allowances appear modest when compared with the monetary returns of workers of comparative ability in non-farming pursuits, they were evidently more than was required to induce a farmer to continue in the production of milk. After continuing his studies for a number of years, Hare also came to a similar conclusion. In reporting on his results, which consistently showed the average cost of production to be greater than the price received, he wrote as follows: "From the fact that dairymen continue to produce butterfat in increasing amounts, it would appear that items included in costs as here calculated amounted to more than was necessary to encourage production."

The error made in the cost of butterfat studies has been to assume that low earnings secured by milk producers for their labour result from a failure for them to receive their costs of production. In calculating the cost then,

the operator has been allowed a return larger than that which in fact he was actually willing to accept and continue production. As a consequence the calculated cost of production has been greater than the price received for the product, an impossible situation when the output is expanding.

The problem, then, is more fundamental. It is a question of why farmers as a group accept these low earnings and still continue producing. The answer is that farmers find it difficult to shift to alternative forms of employment where higher earnings can be secured. The adjustment which is required in order to raise farm living standards will necessitate provision of a means whereby farmers can readily transfer themselves to other employment. When alternative forms of employment are readily available farmers will not continue production unless earnings and amenities are comparable to those which can be obtained in alternative employment.

APPENDIX A

AVERAGE VALUES FOR IMPORTANT BUSINESS ANALYSIS FACTORS;  
CLASSIFIED FOR ALL FARMS, LOW EARNING FARMS, AND HIGH  
EARNING FARMS<sup>1</sup>

Items	All Farms	Low Earning Farms	High Earning Farms
Number of farms	208	52	52
<u>Investment:</u>			
Real estate	\$13,226	\$14,818	\$16,622
Livestock	3,855	3,288	5,934
Machinery and equipment	2,034	2,187	2,908
Feeds and supplies	<u>752</u>	<u>681</u>	<u>1,113</u>
Total investment	\$19,867	\$20,974	\$26,577
<u>Financial Returns:</u>			
Farm receipts	\$ 5,718	\$ 4,508	\$ 9,897
Farm expenses	<u>4,225</u>	<u>4,240</u>	<u>6,555</u>
Farm income	\$ 1,493	\$ 268	\$ 3,342
Interest on capital at 5%	<u>993</u>	<u>1,049</u>	<u>1,329</u>
Labour income	\$ 500	- \$ 781	\$ 2,013
Value of perquisites	<u>542</u>	<u>568</u>	<u>644</u>
Labour earnings	\$ 1,042	- \$ 213	\$ 2,657
Family labour earnings	\$ 1,352	344	2,943
Percentage return on capital	4.0%	- 2.0%	10.5%

CONTINUED

<sup>1</sup> Farms were arrayed according to labour earnings.  
The quartile with the highest earnings was classified  
as the high earning group, and the quartile with the  
lowest earnings as the low earning group.

Items	All Farms	Low Earning Farms	High Earning Farms
-------	--------------	-------------------------	--------------------------

Size of Business:

Number of P.M.W.U.	353	326	513
Number of cows	18	17	24
Acres of improved land operated	47	47	70
Total acres operated	62	65	91
Man-equivalent	1.7	1.8	2.0
Total capital	\$19,867	\$20,974	\$26,577

Rates of Production:

Lbs. butterfat per cow	302	276	332
Average test of milk, percentage	4.5	4.4	4.5
Lbs. 4% milk per cow	6,711	6,323	7,378
Value of milk sold per cow \$	221	\$ 195	\$ 246
Percentage milk sold Oct. - Mar.	41	42	43
Percentage of farms on C.T.A. or R.O.P.	34	27	50
Crop yield index	100	94	109

Labour Efficiency:

P.M.W.U. per man	209	181	256
Hours of dairy chores per cow	138	145	126
Hours dairy chores per lb. butterfat	0.46	0.53	0.38
Cash receipts per man	\$ 3,128	\$2,521	\$ 4,342

CONTINUED

Items	All Farms	Low Earning Farms	High Earning Farms
Percentage of farms using milking machines	77	81	92
Capital invested in machinery and equipment per man	\$1,196	\$1,215	\$1,454
Labour returns per man equivalent	\$1,072	\$ 373	\$1,972
<u>Capital Efficiency:</u>			
Capital turnover	3.8	4.9	3.1
Percentage of capital in:			
Real estate	67	71	63
Livestock	19	16	22
Machinery and equipment	10	10	11
Miscellaneous	4	3	4
Capital investment per P.M.W.U.	56	64	51
<u>Diversity of Business:</u>			
Percentage of P.M.W.U. on dairy livestock	73	77	69
Percentage of P.M.W.U. on crops	20	19	26
<u>Miscellaneous:</u>			
Age of operator	50	52	47
Percentage of farms owned by operator	92	98	81
Percentage of farms with mortgage	25	21	25

CONTINUED



Items	All Farms	Low Earning Farms	High Earning Farms
Percentage of farms with:			
Horses	75	79	79
Tractor	36	38	52
Horses and tractor	18	23	31
Car	69	79	65
Truck	21	19	27
Neither car nor truck	19	12	21

AVERAGE YIELDS OF CROPS,  
LOWER FRASER VALLEY, 1946

Crop	Yield (tons)	Crop	Yield (tons)
Mixed hay	2.6	Carrots	27.0
Alfalfa or clover hay	3.8	Mangels and carrots	21.3
Oat hay	2.4	Peas (canning)	1.1
Oat grain	1.3	Fibre flax	2.3
Barley	1.1	Corn (cobs, canning)	4.3
Vetch	1.0	Beans (canning)	3.2
Potatoes	8.1	Clover seed	0.1
Mangels	16.6	Strawberries	2.1
Turnips	24.0	Raspberries	3.2

APPENDIX BMETHODS USED IN COMPUTING DATAValuation of Unpaid Labour:

By tabulation from the reports in the sample it was found that the cash wage paid to hired help which was boarded by the family was \$73.22, and the average value of board as reported by the operators was \$25.00 per month. On this basis -- the cost of hiring alternative labour -- the value of unpaid adult labour was set at \$100.00 per month.

In calculating the value of unpaid labour of children, it was assumed that a child of 15 years of age and under was equivalent in work accomplished to one-half an adult. Labour of children 15 years and under was therefore valued at \$50.00 per month when employed full time.

On the basis of a 26 day month, 10 hours a day, a wage of \$100.00 per month represents an hourly labour valuation of 38 cents. This rate was used to value the total number of hours of adult unpaid labour devoted to farm chores during the year. A rate of 19 cents per hour was used to value the total number of hours of unpaid chores done by children 15 years and under during the year.

If the farm was a partnership, one partner was considered the operator and the labour of the other was valued at what it would have cost to replace it -- i.e. \$100.00 per month.

No value was placed on the chores done by an operator's wife since the return calculated for the farm was considered as the result of the joint efforts of both husband and wife.

### Calculation of Depreciation:

For depreciating assets the values recorded in the survey form were the depreciated values for the year under study. These values were assumed to be half-way values, i.e. one-half of the original purchase value. Adjustments were made for purchases and sales during the year. Since the assets were recorded at depreciated values, beginning values were obtained by applying a depreciation and repair rate, deducting the value of repairs and adding the resultant amount which represented actual depreciation.

The following depreciation and repair rates were used:

General machinery and equipment	15%
Special equipment (power)	24%
Buildings	10%

The form on the following page was used to calculate the beginning values of depreciating assets, the net change in inventories, and the average value of inventories.

### Calculation of Productive Man Work Units:

The accompanying schedule was used to calculate the total number of productive man work units. Each head of livestock was multiplied by the specified livestock standard and each acre of crops by the specified crop standard. One day of labour on work off the farm was considered as one productive man work unit.

### Calculation of Total Man Equivalents:

A man equivalent is one man working full time on a

SUMMARY OF MACHINERY, EQUIPMENT AND REAL ESTATE VALUES

Ending Value of Equip.	_____	Ending Value of Spec. Equip.	_____
Deduct Purchases	_____	Deduct Purchases	_____
Add Sales	_____	Add Sales	_____
Deprec. at 15% (Add)	_____	Deprec. at 24% (Add)	_____
Deduct Repairs	_____	Deduct Repairs	_____
Beginning Value	=====	Beginning Value	=====

Total Beginning Value of Equip.	_____	Change in Inv'ty.	_____
Total Ending Value of Equip.	_____	Average Inv'ty.	_____

-----oOo-----

Ending Value of Bldgs.	_____	Ending Value of Land	_____
Deduct Value of Cap. Imp.	_____	Deduct Improvements	_____
Add Value of Bldgs. sold	_____	Add Value of Land Sold	_____
Depreciation at 10% (Add)	_____	Deduct Value Land Bought	_____
Deduct Repairs	_____	Beginning Value of Land	=====
Beginning Value of Bldgs.	=====		

Total Beg. Value Land & Bldgs.	_____	Change in Inv'ty.	_____
Total End. Value Land & Bldgs.	_____	Average Inv'ty.	_____

-----oOo-----

farm for a year. Full-time work is considered as 10 hours per day for 312 days during the year.

A farm operator devoting full time to the farm work was considered as one man equivalent. The number of full months of labour divided by 12 gave the number of man equivalents employed as monthly labour; the total number of days of labour divided by 312 gave the man equivalents employed as day labour; and the total number of hours spent on chores divided by 3120 gave the number of man equivalents employed on chores. Children 15 years and under were regarded as one-half a man equivalent.

#### Calculation of Crop Index:

The accompanying schedule was used to calculate the crop index. For each farm the total production of each crop was divided by the average yield per acre for all farms included in the study (see Appendix "A" for average yields of crops). The quotients so obtained were added, and their sum divided by the total acreage of these crops on the farm. The quotient, multiplied by 100, is the crop index for the farm.

Name: \_\_\_\_\_

Farm No.: \_\_\_\_\_

C A L C U L A T I O N   O F   P . M . W . U .

Cows ----- x 13.5 -----  
 Heifers ----- x 1.3 -----  
 Calves ----- x 2.3 -----  
 Bulls ----- x 5.0 -----

P.M.W.U. Dairy L/S

Colts ----- x 2.0 -----  
 Sheep ----- x 0.5 -----  
 Brood Sows ----- x 2.5 -----  
 Pigs Raised ----- x 0.5 -----  
 Laying Hens ----- x 0.25 -----  
 Pullets Raised ----- x 0.03 -----  
 Roosters Raised ----- x 0.03 -----  
 Turkeys ----- x 0.15 -----  
 Bees per hive ----- x 0.50 -----  
 Other L/S ----- x -----  
 ----- x -----  
 ----- x -----

TOTAL P.M.W.U. FOR L/S: \_\_\_\_\_

P.M.W.U. OF WORK OFF FARM: \_\_\_\_\_

Mixed hay ----- x 1.2 -----  
 Alfalfa hay ----- x 2.1 -----  
 Grain hay ----- x 1.3 -----  
 Oats grain ----- x 1.8 -----  
 Potatoes ----- x 6.0 -----  
 Mangels ----- x 4.0 -----  
 Corn Cannery ----- x 7.5 -----  
 Corn stalk silage ----- x 0.5 -----  
 Corn silage ----- x 3.5 -----  
 Corn soilage crop ----- x 3.0 -----  
 Hay silage ----- x 3.0 -----  
 Peas canning ----- x 4.0 -----  
 Pea vine silage ----- x 0.5 -----  
 Small fruits ----- x 100.0 -----  
 Clover seed ----- x 0.9 -----  
 Other crops ----- x -----  
 ----- x -----  
 ----- x -----

TOTAL P.M.W.U. FOR CROPS: \_\_\_\_\_

TOTAL P.M.W.U. \_\_\_\_\_

C A L C U L A T I O N   O F   M A N   E Q U I V A L E N T S

Operator -----  
 Monthly Labour ----- mos. ÷ 12 -----  
 Day Labour ----- days ÷ 312 -----  
 Hourly Labour ----- hrs. ÷ 3120 -----

TOTAL MAN EQUIVALENTS: \_\_\_\_\_

TABLE FOR CALCULATION OF CROP INDEX				
CROP	ACRES	TOTAL PROD.	÷	QUOTIENT
Mixed Hay			2.5	
Alfalfa Hay			3.8	
Oat Hay			2.2	
Oat Grain			1.2	
Potatoes			8.1	
Corn (Cannery)			4.4	
Other Crops				
-----				
-----				
-----				
-----				

CROP INDEX \_\_\_\_\_

F I N A N C I A L S U M M A R Y

Name: \_\_\_\_\_

Farm No.: \_\_\_\_\_

Address: \_\_\_\_\_

CASH RECEIPTS

Dairy (milk & dairy  
livestock sales) \_\_\_\_\_  
Other livestock \_\_\_\_\_  
Crop sales \_\_\_\_\_  
Other farm income \_\_\_\_\_

Equipment sales \_\_\_\_\_  
Real estate sales \_\_\_\_\_  
Total Cash Farm Receipts \_\_\_\_\_

INVENTORY INCREASES

Livestock \_\_\_\_\_  
Feeds & supplies \_\_\_\_\_  
Real Estate \_\_\_\_\_  
Machinery & equip. \_\_\_\_\_

Total Inventory Increase \_\_\_\_\_

TOTAL FARM RECEIPTS \_\_\_\_\_

F I N A N C I A L A N A L Y S I S

Total Farm Receipts \_\_\_\_\_

Total Farm Expense \_\_\_\_\_

FARM INCOME \_\_\_\_\_

Interest on Investment \_\_\_\_\_

LABOUR INCOME \_\_\_\_\_

Perquisites \_\_\_\_\_  
Farm products used in  
Operator's hours \_\_\_\_\_

Rental Value of House \_\_\_\_\_

LABOUR EARNINGS \_\_\_\_\_

CURRENT EXPENSES

Labour hired \_\_\_\_\_

Feed purchased \_\_\_\_\_  
Cost of operating car,  
truck, tractor, gas  
engines, etc. \_\_\_\_\_

Custom work hired \_\_\_\_\_  
(includes freight on  
milk) \_\_\_\_\_

Repair & Maintenance  
of bldgs. & equip. \_\_\_\_\_

Other expenses (Dairy  
herd expenses, fer-  
tilizer, lime, taxes,  
insurance, seed, rents,  
telephone, elec. etc.) \_\_\_\_\_

Total Cash Expenses \_\_\_\_\_

CAPITAL PURCHASES OR IMPROVEMENTS

Livestock \_\_\_\_\_  
Machinery & Equip. \_\_\_\_\_  
Real Estate \_\_\_\_\_

Total Cash Outlay \_\_\_\_\_

INVENTORY DECREASES

Livestock \_\_\_\_\_  
Feeds & supplies \_\_\_\_\_  
Real Estate \_\_\_\_\_  
Machinery & equip. \_\_\_\_\_

Total Inventory Decrease \_\_\_\_\_

Value of Family Labour \_\_\_\_\_

TOTAL FARM EXPENSES \_\_\_\_\_

AVERAGE INVESTMENT

Livestock \_\_\_\_\_  
Feeds and supplies \_\_\_\_\_  
Real Estate \_\_\_\_\_  
Machinery & equip. \_\_\_\_\_

Total Average Investment \_\_\_\_\_

Interest on Average  
Investment at 5% = \_\_\_\_\_

APPENDIX C

Survey form used for collecting the  
information used in this study.



Report No. \_\_\_\_\_

Year \_\_\_\_\_

## THE UNIVERSITY OF BRITISH COLUMBIA

## FARM BUSINESS RECORD

THIS REPORT IS ABSOLUTELY CONFIDENTIAL

Name \_\_\_\_\_ Location \_\_\_\_\_

Mailing Address \_\_\_\_\_ Ship to \_\_\_\_\_ Shipping No. \_\_\_\_\_

## DAIRY STOCK INVENTORY

		Beginning Year		Purchases		Births	Sales		Deaths	Used on Farm		End of Year	
		No.	Value	No.	Value	No.	No.	Value	No.	No.	Value	No.	Value
Cows	Gr.												
	P.B.												
Heifers	Gr.												
	P.B.												
Calves	Gr.												
	P.B.												
Veal Calves													
Bulls	Gr.												
	P.B.												

Age of Cows

Breed \_\_\_\_\_

Age			1	2	3	4	5	6	7	8	9	10	11	12	13	14
No. of Cows																

Notes as to dates of purchase and sales of cows:

	Beginning Year		Purchases		Births	Sales		Deaths	Used on Farm		End of Year	
	No.	Value	No.	Value	No.	No.	Value	No.	No.	Value	No.	Value
Horses												
Colts												
Sheep												
Brood Sows												
Boars												
Pigs												
Hens												
Ducks												
Geese												
Turkeys												
Bees												
Others												
Total												
Total Page 1												
Total Page 1 & 2												

Average Inventory \$ \_\_\_\_\_ Change in Inventory \$ \_\_\_\_\_

## Animal Units

	Average No.	A.U's		Average No.	A.U's		Average No.	A.U's
Cows			Bulls			Hogs		
Heifers			Horses			Poultry		
Calves			Sheep					

## C R O P   A N D   F E E D   R E C O R D

Kind & Variety	Beginning Inventory		Acres In	Total Yield	Acre Yield	Value	Purchases				Sales		Farm Used		Ending Inventory	
	Amt.	Value					Amt.	Value	Amt.	Value	Amt.	Value	Seed	Feed	Amt.	Value
Hay 1. mixed																
2. alfalfa																
3. clover																
Oats																
Straw																
Other Grain																
Roots																
Potatoes																
Peas																
Corn																
Silage																
Garden Crops																
Other Crops																
Small Fruits																
Orchard Crops																
Seed Purchased																
Concentrates																
Dairy																
Poultry																
Others																

Average Inventory\$ \_\_\_\_\_

Change in Inventory\$ \_\_\_\_\_

Dairy Ration Purchased? \_\_\_\_\_

(obtain tag or name of supplier) \_\_\_\_\_

If constituted on farm outline formula below:

Normal Value of Farm (land & buildings) \$ \_\_\_\_\_

Building	Deprec. Value End of Year
House	
Other House	
Dairy Barn	
Other Barns	
Silo	
Milk House	
Granary	
Chicken House	
Pig Pens	
Impl. Shed	
Tool Shed	
Garage	
Others	
Ending Value	
Cost of new buildings or capital imp'ments	
Beginning Value	

LAND VALUE

Total Acres Owned \_\_\_\_\_

Improved land \_\_\_\_\_

\_\_\_\_\_ acres @ \_\_\_\_\_

Unimproved land \_\_\_\_\_

\_\_\_\_\_ acres @ \_\_\_\_\_

Total Land Value \_\_\_\_\_

Value of new clearing

new drains, etc. \_\_\_\_\_

Value of land

bought or sold

during year \_\_\_\_\_

Beginning Value \_\_\_\_\_

TOTAL REAL ESTATE

Beginning Value \_\_\_\_\_

Ending Value \_\_\_\_\_

Average Inventory \_\_\_\_\_

Change \_\_\_\_\_

LAND UTILIZATION

Cropped area \_\_\_\_\_

Improved pasture \_\_\_\_\_

Farmstead \_\_\_\_\_ a

Total Imp. Area \_\_\_\_\_

Untillable pasture \_\_\_\_\_

Waste land or other

land not farmed \_\_\_\_\_

Total Unimp. Area \_\_\_\_\_

Total Acreage Farmed \_\_\_\_\_

NOTES ON CROP ROTATION

Pasture Management Notes

Pasture period \_\_\_\_\_ mos. Date cows turned out \_\_\_\_\_ Average hours grazing per day \_\_\_\_\_

No. animals grazed \_\_\_\_\_ Hayland grazed \_\_\_\_\_ Type of pasture drains \_\_\_\_\_

Is rotational grazing used \_\_\_\_\_ Average size of pasture fields \_\_\_\_\_

Fertilized pasture \_\_\_\_\_ Irrigated pasture \_\_\_\_\_ Subirrigated \_\_\_\_\_

Condition of pasture \_\_\_\_\_ Soil types and % of each type \_\_\_\_\_

How often new pasture seeded \_\_\_\_\_ No. years pasture is used \_\_\_\_\_

How is summer pasture deficiency met \_\_\_\_\_

Control measures for pests and diseases \_\_\_\_\_

## INVENTORY OF MACHINERY AND EQUIPMENT

No.	Kind	Value	No.	Kind	Value
	Horse Mower			Discs	
	Power Mower			Spring Tooth Harrow	
	Hay Rake			Drag Harrow	
	Side Delivery Rake			Roller	
	Hay Tedder			Cultivator	
	Hay Loader			Manure Spreader	
	Hay Bailer			Fertilizer Spreader	
	Grain Drill			Ensilage Cutter	
	Grain Binder			Fanning Mill	
	Corn Binder			Potato Planter	
	Thresher			Potato Digger	
	Wagons			Spraying or Dusting Equip.	
	Trailer			Power Saw	
	Walking Plow			Platform Scales	
	Tractor Plow			Feed Carts	
	Others			Milking Machine	
				Cans	
				Water Heater	
				Cooler	
				Other Milkhouse Equip.	
Purchases During Year				Harness	
				Farm Tools & Carpentry	
				Equip.	
				Pumping Equip.	
				Honey Equip.	
				Poultry Equip.	
				Total	
				Add Power Equipment Value End of Year	
Sales or Trades				Deduct Purchases	
				Add Sales & Trades	
				Total	
				Beginning Value	

Average Inventory \$ \_\_\_\_\_ Change in Inventory \$ \_\_\_\_\_

## RECORD OF POWER EQUIPMENT

Kind	Make Year	Purchase Price	Present Deprec. Value	Operating Expense 194						Totals	% to Farm	Total to Farm
				Gas	Oil	Grease	Repairs	License	Ins.			
Tractor												
Auto												
Truck												

## RECORD OF LABOUR

Item	J	F	M	A	M	J	J	A	S	O	N	D	Total Work	Rate	Value of Labour	Value of Board	Total
Paid Labour																	
Month																	
Day																	
Total Paid																	
Unpaid Labour																	
Total Unpaid																	
Operator																	
Total Labour																	

Labour Notes:

% labour to main enterprise \_\_\_\_\_  
 Hours dairy chores \_\_\_\_\_  
 \_\_\_\_\_ winter months average \_\_\_\_\_ hours.  
 \_\_\_\_\_ summer months average \_\_\_\_\_ hours.



# FARM RECEIPTS

Milk Receipts		
Lbs. milk		
Lbs. B.F.		
Average Test		
Sales of Dairy Livestock		
Total Dairy Receipts		
Other Livestock Receipts (p.2)		
Crop Sales (p.3)		
Breeding Fees		
Labour off Farm -- days		
Custom Work -- days		
Trucking -- days		
Eggs -- doz.		
Honey		
Fruit		
Vegetables		
Wood		
Land, Pasture or Equip. Rentals		
Empty Sacks		
Others		
Total Misc. Receipts		
Total Receipts		

Age of operator \_\_\_\_\_ years on farm \_\_\_\_\_  
 Amount of mortgage if any \_\_\_\_\_  
 Accounts kept \_\_\_\_\_

# FARM PERQUISITES

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	Amt.	Value	
Milk			
Cream			
Butter			
Eggs			
Honey			
Meat			
Poultry			
Fuel			
Potatoes			
Fruits			
Vegetables			
Wood			
Others			
Total			

Milk fed to calves  
 No. of head raised \_\_\_\_\_  
 No. of lbs. per day \_\_\_\_\_  
 No. of days fed \_\_\_\_\_  
 Total lbs. \_\_\_\_\_  
 Other livestock feeding \_\_\_\_\_  
 Total milk fed to livestock \_\_\_\_\_  
 Type of cult. on S.F. Power \_\_\_\_\_ Horse \_\_\_\_\_  
 Hand \_\_\_\_\_  
 No. cultivations per yr. \_\_\_\_\_ Hrs. per yr. \_\_\_\_\_  
 Years growing small fruits \_\_\_\_\_  
 Future plans for expansion \_\_\_\_\_

Reasons for expansion or non-expansion \_\_\_\_\_



BIBLIOGRAPHY

1. Kelley, C. C., and Spilsbury, R. H., Soil Survey of the Lower Fraser Valley, Dom. Dept. Agric. Tech. Bul. 20, 1939.
2. Carter, R. M., Labour Saving Through Farm Job Analysis, I. Dairy Barn Chores. Vt. Agric. Expt. Sta. Bul. 503, 1946.
3. Hare, H. R., Dairy-Farming in British Columbia, A Five Year Summary, B. C. Dept. Agric. Bul. 103, 1928.
4. Grahame, R. W., Dairy Farm Incomes and the Cost of Producing Butterfat in Coastal British Columbia, Dept. Agric. Econ. U.B.C., 1947.
5. Wasson, F. C., Personal Correspondence, 1946.
6. Boulding, K. E., Economic Analysis, Harper and Brothers, 1941.
7. Ross, H. A., The Supply Side of the New York Milk Market, N. Y. (Cornell) Sta. Bul. 527, 1931.
8. Ezekiel, M., Rauchenstein, E., and Wells, O. V., Farmers' Response to Price in the Production of Market Milk, U. S. Dept. Agric. Bureau Agric. Econ. Mimeo. Pub. 1932.
9. Parsons, M. S., Effect of Changes in Milk and Feed Prices and in Other Factors Upon Milk Production in New York, N. Y. (Cornell) Sta. Bul. 688, 1938.
10. Christensen, R. P., and Mighell, R. L., Supply Responses in Milk Production in Dodge and Barron Counties, Wis. U. S. Dept. Agric. Tech. Bul. 750, 1941.
11. Johnson, S. M., Elasticity of Supply from Vermont Plants. III. Forecasting the Milk Supply, Vermont Agric. Expt. Sta. Bul. 480, 1942.
12. Patterson, H. L., The Alberta Dairy Farm Business, Alta. Dept. Agric. Bul. 73, 1945.

13. Barr, W. L., Organizing Dairy Farms for Efficient Production, Penn. Agric. Expt. Sta. Bul. 478, 1946.
14. Williams, S. W., Studies in Vermont Dairy Farming. XII. Dairy Farm Management in the Champlain Valley and its Relation to the Price Level, Vermont Agric. Expt. Sta. Bul. 499, 1941.
15. Bierly, I. R., Factors that Affect Cost and Returns in Producing Milk, N. Y. Agric. Expt. Sta. Bul. 804, 1944.