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## FARM MANAGEMENT RESEARCH IN THE PROVINCE OF ONTARIO

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FORMAL research in farm management problems was begun in Ontario in 1917. Since then, 6,317 labor income records have been collected and analyzed. Three enterprise studies covering the cost of production of milk, tomatoes and beef, have been carried out, involving 174 farm businesses. One regional study of farm practices was undertaken in the Ontario Corn Belt including 653 reports, while 230 records of farm practices in a submarginal area were taken, and finally 234 farms were included in a farm labor study, making a total of 7,608 farm business records. Besides these we had four groups of twenty farmers in different areas, who cooperated in the keeping of cost records over a period of three years.

From the foregoing statement, it will be seen that the survey method of research has been used very largely. Our plan has been to choose typical areas representing important types of farming. In a few cases investigations have been carried on at the request of organized bodies of farmers.

The aim has been to secure a minimum of approximately 200 farm records since this number seems to be about the smallest which will enable a reasonable distribution of farms in the different size groups. The largest number of farms included in a single survey was 437 and the smallest was 178. These numbers include discards or unusable records.

Our plan of collecting data from farmers, though similar to that ordinarily used in the United States, differs in some respects. Our field parties consist of from four to six enumerators under the direction of a supervisor, who may or may not direct the survey through all stages until completion. We use automobiles for transportation, with two men to a car. Four to six enumerators will ordinarily keep the supervisor busy checking the reports for inaccuracies or omissions.

Statistically it is desirable that the enumerators copy their own records on the office sheet or permanent record while still in the field. However, we have found that this is not feasible, for when

enumerators have taken from two to four records per day, they are not likely to be able to do accurate work. All we require is that the records shall be gone over each day by the enumerator and the supervisor, after the data have been checked by the supervisor. The effort is to secure the statement of the farmer's business in such a clear way that there can be no possibility of misunderstanding. If one could afford to have an extra man along with the party who would copy the records, this would add another check on accuracy.

This year we have endeavored to get a representative sample of farms devoted to the different lines of production in one county. It is a combination of economic and technical data. This type of survey involves a larger sample and presents serious difficulties in the collection of the primary data, because of the large number of questions which must be asked and because of the fact that many of the questions are technical. Too many of the answers secured are based on opinion.

Our survey years approximate the close of the farmers' business year in the area under survey. Ordinarily, we do not like to spend more than two months in the collection of primary data, for the reason that it is difficult to secure accuracy, due to the fact that farmers are likely to compare conditions at the moment with those of one year ago, and thus they will confuse sales and purchases which have taken place after the close of the year with those within the business year and thus add to the difficulties of the enumerator. In the majority of cases we have secured the cooperation of creameries, milk distribution plants, cooperative companies and other agencies, in order to supplement and complete the data secured by enumerators from farmers.

Our methods of compilation of data are for the most part similar to those employed in labor income studies in the United States. The first step is to copy the data from the questionnaire on the permanent record. The forms used minimize the tenancy record, because we have very little tenancy in Ontario. When the data are copied and after the totals have been computed, the record is again checked by the supervisor. The more experienced members of the staff then begin to compute the efficiency factors. I might add here that we have used men in all this work, because we feel that rule of thumb tabulation is impossible. Judgment is involved in computing animal units, in allocating expenses, and so forth,

so that a practical knowledge of farming and farm conditions is essential; thus, we have been obliged to use male help.

#### EFFICIENCY FACTORS

In discussing efficiency factors, I shall deal only with a few of the variations from the general practices followed in computing these factors. The system of animal units varies with the area and the type of farm production. In one survey in which cattle were of relatively small importance cows were given a unit value of 1, while horses were given a unit value of 1.5. The horses obviously consumed a larger part of the feed than did the cows. We have also had to vary the units for hogs from that used in the United States, because we produce a bacon hog which cannot be fed on corn. One unit in Ontario represents five hogs weighing 175 pounds, whereas in the United States seven hogs raised to marketable size form one unit. In general, I would say that the unit system has been too rigid. In Ontario we have been obliged to revise the American units, and we believe that with changes in the emphasis on different classes of livestock further revision will be necessary. For example, 100 hens are considered one animal unit. Is this correct? Farmers feed their hens better than was the custom ten years ago, hence revision in the unit equivalent is necessary. There is some kinship between the unit and an index number; and when shifts are made, the methods and reasons should be preserved in detail so that one's followers may build on what has been done.

In computing man work units, we have made a distinction between man units for crop production and total man work units, although the latter have not been tabulated in any data published thus far. This distinction is based upon the practice of hiring labor for a period of 8 or 10 months. When this period extends from April to November inclusive, the hired labor has been employed in the harvesting and threshing of the crop. It corresponds to a crop year which is slightly shorter than the calendar year (table 1).

In regard to unpaid family labor, the services of members of the family for farm work were valued largely at what they could have secured if they had worked for neighbors on similar sized farms of the same type. This method was adopted so as to eliminate, in so far as possible, any bias in the estimate of the value of services.

Automobile and telephone expenses were charged to the farm at a certain rate, usually one-half the value and cost of upkeep. Depreciation was determined on the basis of present value divided by the number of years future use expected. This is not entirely satisfactory because the years of future use are difficult to estimate and it is hard to value the farmer's house. I personally incline to the view that the farmer's house ought not to be considered to be a part of the business. If it is correct to exclude the business man's home from his business, it should also be correct to exclude the farmer's house.

Table 1. Hired Labor Units, Family Labor Units, and Horse Labor Units For Crop Production, as Used in Farm Management Research in the Province of Ontario, Canada

Number of months work	Hired labor units	Number of units Family labor	Horse labor units
1.....	.12	.08	.12
2.....	.25	.17	.25
3.....	.37	.25	.37
4.....	.50	.33	.50
5.....	.62	.42	.62
6.....	.75	.50	.75
7.....	.87	.58	.87
8.....	1.00	.67	1.00
9.....	1.00	.75	1.00
10.....	1.00	.83	1.00
11.....	1.00	.92	1.00
12.....	1.00	1.00	1.00

The problem of valuation is a very difficult one, particularly where buildings are concerned. The market value of farms is at certain times almost nil and "an asking price" is not a satisfactory valuation.

Of the size factor, I merely wish to correct an impression that we have used a single measure of size. We have used several. Adjusted tillable area has been the basis of many of the earlier sortings of records, but in subsequent studies other measures of size were used. The use of adjusted tillable area as a basis of size groupings is founded on the fact that woods, non-tillable pastures, lanes, roads, and so forth, do contribute to the supply of feed produced on the farm and those contributions are not inconsiderable on many farms.

In the study of tobacco farming we used the actual size of farm because most of the farms were fully cropped. In the study of fruit growing, capital as well as area was the basis of comparison. I shall refer again to the question of size of farm.

#### DIVERSITY

Various measures of diversity have been used. We first sorted our farms according to percentage revenue obtained from the most important enterprise such as the dairy herd. This classification was too indefinite and we shifted over to percentage revenue obtained from sales of dairy products. The percentage was determined by deducting the increase in feed and supplies from the gross receipts of the farm, divided into the net receipts from dairy cattle and the result multiplied by 100.

#### RESULTS

Turning now to the results of our surveys. In a study of tobacco farms, the operators of the larger farms had on the average smaller labor incomes than did the operators on the small farms (table 2). The range in size of farms and in labor incomes, found in a Kent County study, is shown in table 3. This table shows that although the average size of farm in the different groups varies from 75 acres to 232 acres, there is little variation in the labor incomes of the operators of the best farms.

The tendency towards large farms is indicated by recent census returns in all of the provinces except British Columbia, Manitoba, Nova Scotia and New Brunswick, where slight declines have taken place.

In most of our studies we have tried to show the effect of using high quality equipments and capital goods. The returns are particularly noticeable where livestock are concerned. The relation between quality of livestock and labor income as found in a study made in Dundas County, Ontario, is shown in table 4.

Such a tabulation as the foregoing has been very useful in livestock improvement work, as have some others contained in our publications. Tables based on crop index and labor income along with cross tabulations to measure the relative effect of the crop improvement and stock improvement seem to show that livestock

Table 2. Receipts, Expenses, and Incomes on Tobacco Farms in Ontario, 1926 \*

	Group of farms						
	1	2	3	4	5	6	7
Average size (acres) . . .	22	39	51	69	96	120	218
Average tobacco sales . . .	\$5,858	5,771	2,992	4,147	4,908	4,019	7,812
Average total receipts . . .	\$6,807	6,686	4,058	6,399	6,532	6,287	10,970
Average current expenses . . . . .	\$3,172	2,853	1,767	3,434	3,678	3,152	6,273
Average depreciation buildings and machinery . . . . .	\$ 410	393	316	391	375	463	678
Average farm income . . .	\$3,183	3,411	1,923	2,520	2,358	2,503	3,879
Average labor income . . .	\$2,170	2,455	1,146	1,244	1,229	1,116	1,490

\* Above table published only in mimeographed form.

Table 3. Range in Size of Farms and in Labor Incomes, Kent County, Ontario

Group	Number of farms	Size of farm		Average labor income		Best farms		
		Average size (acres)	Per cent increase over average of preceding group	Group average	Per cent increase over average of preceding group	Labor income		
						Number of farms	Average	Per cent increase over average of preceding group
1 . . . . .	29	75	—	\$511	—	5	\$1,699	—
2 . . . . .	38	100	33.0	809	58	6	2,321	37.0
3 . . . . .	40	108	8.0	915	13	6	2,680	15.5
4 . . . . .	19	141	30.5	1,230	34	3	2,919	8.5
6 . . . . .	17	232	65.0	1,315	7	3	3,132	7.0

Table 4. Relation of Quality of Livestock and Labor Income, Dundas County, Ontario

Group of farms	Quality of live stock (per cent of average)	Number of farms	Milk yield per cow (pounds)	Percentage of farms using purebred bulls	Labor income
1 . . . . .	Less than 71	28	2,900	18	\$119
2 . . . . .	71-80	38	3,500	22	566
3 . . . . .	81-90	57	3,800	21	644
4 . . . . .	91-100	45	4,200	31	889
5 . . . . .	101-110	44	4,600	38	970
6 . . . . .	111-120	31	4,800	36	1,073
7 . . . . .	121-130	17	5,200	53	1,249
8 . . . . .	Over 130	30	6,660	53	1,841

Table 5. Cash Returns Per Dollar of Feed, Oxford and York Counties, Ontario

County	Returns per \$1 of feed	Grown feed out of each \$1	Purchased feed out of each \$1	Net to farmer for each \$1 of feed
Oxford.....	\$1.60	.77	.23	\$1.37
York.....	1.51	.58	.42	1.09

is the major factor affecting the returns of farmers engaged in that kind of business. I wish moreover to emphasize the fact that the farmer who uses inefficient equipments cannot expect to obtain a high reward. I call to mind the cases of Oxford and York County dairymen. York County farmers produce whole milk. Their herds are mostly made up of producing cows. The supply of cows is the Central Market at Toronto. These cows are not always first grade, else they would not be on the Central Market. The York County dairyman obtains 6,500 pounds of milk per cow just as the Oxford County dairyman does, but his costs are higher. In order to get this high yield, he buys concentrates to a large extent, whereas the Oxford County dairyman grows a higher percentage of the feed fed to cows. The relation of the two practices to returns is shown in table 5.

The best method of securing lower costs is demonstrated in table 6 which shows that by better breeding, costs can be lowered.

The organization of the enterprises in a farm business is a problem of first importance. The results of sorting on the basis of diversity are given in the first part of table 7.

Table 6. Breeding Versus Feeding to Increase Milk Yield Per Cow

Group of farms	All-grade breeding, or purebred sire less than 5 years	Purebred sire more than 5 years
Feeding costs below \$86 per cow:		
Number of farms.....	45	31
Production per cow (herd average—pounds).....	4,400	5,400
Cost of production per hundredweight...	\$3.08	\$2.03
Feeding costs above \$86 per cow:		
Number of farms.....	30	33
Production per cow (herd average—pounds).....	5,400	6,100
Cost of production per hundredweight...	\$3.00	\$2.28

Table 7. Relation of the Percentage of Total Farm Receipts from the Dairy Herd to Labor Income and to Various Other Factors, Western Ontario

Percentage of total farm receipts from dairy herd	Number of farms	Labor income	Milk sold per cow	Labor hired per farm	Feed bought per farm
Less than 51.....	43	\$861	\$79	\$408	\$217
51-60.....	55	1,384	99	445	269
61-70.....	65	1,485	108	465	274
71-80.....	79	1,285	117	394	276
81-90.....	47	1,335	124	442	233
91-100.....	38	986	134	409	304
Farms with highest labor incomes with over 80 per cent of total receipts from dairy herd (average of 88 per cent)*.....	20	2,596	145	606	450

\* Production per cow (herd average), 6,100 pounds; number of cows per 100 acres, 18.

It is shown that the average farmer should exercise considerable care in increasing the percentage of revenue from the dairy herd after the point has been reached where two-thirds of the revenue is being secured from that source. This does not mean that all farmers should of necessity stop at that point. This is clearly indicated in the second part of the table, but under the conditions that obtain in western Ontario this organization of farm business seems to yield the most satisfactory returns.

It has been suggested that this tabulation should be supported by several years results. In reply, I may say, that we recognize the fact that economic organization must change with changing conditions. In the same year that these data were compiled for western Ontario, we published the data given in tables 8 and 9 as applied to eastern Ontario.

Table 8. Side-Lines on Cheese Factory Farms, Eastern Ontario

Percentage of revenue from side-lines	Number of farms	Crops sold per farm	Milk sold per cow	Labor income
Less than 20.....	12	\$38	\$79	\$363
20-30.....	30	65	90	731
30-40.....	41	122	81	744
40-50.....	46	128	72	938
Over 50.....	31	260	65	848

Table 9. Side-Lines on Condenser and Market Milk Farms, Eastern Ontario

Percentage of revenue from side-lines	Number of farms	Milk sold per cow	Labor incomes
Less than 10.....	19	\$129	\$684
10-20.....	53	130	1,075
20-30.....	34	114	1,040
Over 30.....	24	96	888

These tables show that what was true for western Ontario was not true to the same extent in eastern Ontario. The high price of hogs and the stabilized price of cheese suggested greater diversity. Similarly those farmers who sold whole milk to the condenser or for consumption in Ottawa and Montreal found it profitable to specialize to the point of obtaining 81-90 per cent of the revenue from the dairy herd. These tabulations really indicate that what was most desirable was a semi-diversified type of farming. Economic information that does not take into consideration shifts in production and consumption is not worth a great deal.

#### FARM LABOR

In the surveys we have not attempted to analyze farm labor very fully. On the majority of farms, the labor force is made up mostly of family labor. My opinion is that this will be more true as time goes on. It is the same old story over again; the farmer cannot utilize improved equipments and retain every member of the family, as well as hired labor on farms of a given size. Many employers of farm labor have not attempted to so organize their business as to provide profitable employment of labor on a yearly contract.

#### COST STUDIES

Reference has already been made to cost data. We have carried on three types of cost study:

1. Studies based on a selection of farms where some one product was the major source of income, information being obtained by a general survey, as for example the milk studies made in Oxford and Dundas counties.

2. Enterprise studies, as for example, tobacco and tomatoes, as well as beef and milk.

### 3. Cost accounts by the Cornell University or "book method."

The first two methods have been the basis of the bulk of the published material. Because of the short time available, I shall not discuss in detail the results of our cost studies.

#### THE USE OF FARM MANAGEMENT DATA

Before concluding the discussion of farm surveys in the Province of Ontario, I should like to mention the uses to which these data have been put. In the first place, as soon as it was feasible, the cooperator was sent a report showing averages for farms similar in size to his own, and for the best farms of the same size as his own, and comparable data for his own farm business. The report used is slightly different from the one which was copied in a recent publication of the Empire Marketing Board—The Survey Method of Research—written by J. P. Maxton. The difference lies in that we included averages from the best farms, which I think was an effort to overcome a weakness in the survey, in that data represented the average, but gave only slight indication of the upper limits.

The surveys have stimulated an interest in farm accounting and the keeping of a closer check on farmers' expenditures and receipts. They have aided individual farmers to reorganize their business. They have given a reasonably clear analysis of farm receipts and expenditures. They have provided college men with basic material on which to build farm management courses.

Farm management surveys provided farmers with the first accurate data used in price bargaining for the sale of milk and other dairy products. Results of these surveys have been useful in providing material which would indicate the general financial position of the farmer, and these data have been used in hearings before committees on agricultural improvement, tariff, freight and taxation adjustments and may also form a basis of extension programs.

In the case of the tobacco study, a definite plan of extension followed the survey in which the difficulties resulting from over-expansion of the business among inexperienced growers were forecasted with a considerable degree of accuracy.

The relation of size of tillable area to labor incomes on dairy farms in western Ontario is shown in table 10. This table shows that labor incomes do not increase in regular progression as the size (area) of the farms increase. The group of 49 farmers with an

Table 10. Relation of Size of Tillable Area to Labor Income, 336 Dairy Farms in Western Ontario\*

	Number of tillable acres								
	21-45	46-60	61-75	76-90	91-110	111-135	136-160	161-185	Over 185
Number of farms in group . . . . .	21	38	49	77	72	36	23	10	10
Average number of crop acres . . . . .	32	41	52	62	68	88	98	102	143
Total capital . . . . .	\$7,576	9,463	12,538	14,338	15,568	19,203	21,241	24,265	36,186
Per cent capital in buildings . . . . .	36	30	27	27	26	24	23	23	24
Per cent capital in machinery . . . . .	7.5	6.9	6.8	7.0	6.3	6.3	5.5	5.3	5.4
Per cent capital in livestock . . . . .	20	22	22	22	22	22	22	23	22
Crop acres per man . . . . .	28	30	28	33	36	36	40	44	44
Crop acres per horse . . . . .	13	15	14	14	15	18	17	18	18
Livestock index . . . . .	108	108	93	100	101	99	91	95	92
Crop index . . . . .	100	102	96	101	101	96	100	96	107
Gross receipts . . . . .	\$1,835	2,362	2,784	3,397	3,662	4,424	4,970	5,755	7,486
Labor hired . . . . .	\$84	184	352	415	400	670	666	607	1,094
Labor income . . . . .	\$735	936	868	1,158	1,327	1,440	1,881	2,159	2,449
Labor income of best farmers . . . . .	\$1,236	1,804	1,975	2,695	2,772	2,695	2,769	3,192	3,691
Number of farms included in group of "best farmers" . . . . .	10	10	10	10	10	10	8	5	5

\* Leitch, A. and Neale, J. C. The Dairy Farming Business in Western Ontario, Ontario Department of Agriculture, Bul. 275, January, 1920, table 1, page 7.

average of 52 crop acres, shows smaller labor incomes than those in the preceding group, and in a somewhat similar manner the group of 36 farms having 88 acres of crops, shows only a small increase in labor income over the preceding group. This suggests that the units of organization—one, two, and three man farms—may be more significant than tillable area. Certain it is that size as indicated by capital, or crop areas alone, cannot bring about an increase in income, but that maximum income is secured only by a proper combination of the land, labor, capital and management in a farm business.

#### DISCUSSION OF QUESTIONS RELATING TO FARM MANAGEMENT RESEARCH

Professor Case—In farm management research work there is a disadvantage in that no year is a strictly normal year. In a study recently made by our department two years' data were abnormal in certain respects. It is fortunate that the project was carried through the third year as it proved to be more strictly normal in respect to cropping conditions. In the detailed cost study we have thought it advisable to conduct the study at least three years in a given area and with the same farmers as nearly as possible.

In the farm financial record work, however, an annual report is prepared in order to get the material to the farmers without delay. There is no question but that the cooperation of farmers on the farm financial record work has been due largely to the promptness with which their results were returned to them. In regard to the financial records it should be recognized that they are being kept every year by a large number of farmers and that normal conditions are pretty well known before preparing the annual reports based on the current year's records. As farm management research progress grows, accumulated data should help to interpret data secured over a one year period.

Professor Pond—We are much interested in the proposition as to whether farmers change their practices materially from year to year as the result of changes in weather, production, and prices. In general there does not seem to be much difference in the labor used per acre or per head of livestock. There does seem to be rather marked changes in feeding practices. Less economy is practiced in years of large production and low prices. Hogs are fed out to heavier weights when corn is cheap. Since heavier hogs make less efficient use of feed than do lighter ones the amount of grain used to produce 100 pounds of hogs is greater under these conditions. Our usual practice is to continue our studies in one locality for a three-year period. Until we make more careful comparisons between different years in which we check weather, price, production, and other data affecting the farmers' plans, we cannot draw definite conclusions as to the time necessary to secure a fair picture of the agriculture of the area.

Professor Ashby—It is desirable and necessary in some cases to make statements from one year's records. It is always necessary to get data back to farmers. There is risk, of course, in the use of data where there are violent fluctuations in yields and prices. It is sometimes necessary, however, to choose between expediency and scientific principle.

Sir Thomas Middleton—While it is difficult and unsafe to draw conclusions from one year's records, farmers know how to use such figures with discretion. They are well aware of the differences made by seasons. I have, for example, a set of accounts extending over 58 years, and the most striking feature is the fluctuations which occur from year to year.

Dr. King—It may be useful, even on one year's records to compare two or more farms operated under similar conditions. We have, for example, found data in this country with regards to pigs in which we were able to compare two sets of figures for batches which were treated similarly except that in one case a longer feeding period was allowed. It is possible to make valid deductions respecting the comparative returns for short periods during which weather and price conditions are the same for the several farms compared.

Dr. Warren—No year is normal in every respect, and the economic world is constantly changing. It is desirable, therefore, to have data for many years. Data for a single year even if it is an exceptional one are, however, of value. Usually, quantities such as yields per acre, production per cow, work accomplished per man, and so forth are more important than the single figure representing profits. These quantities may be normal even though profits are abnormal. For example, one may wish to know the egg production with three as compared to four square feet of floor space per hen. He may wish to know the egg production of pullets as compared with hens. He may wish to know the quantity of labor involved in various operations, crop yields on different soil types, and so forth. One must always be careful in drawing conclusions. Some of the things to be considered are: deviation from the average year, secular trends, and cycles, such as the cattle and hog cycles.

Professor Larsen—We in Denmark have been working with cost accounts for about twelve years. Our accounts come in each year, and the results are published. About 80 local cost keeping societies are dealing with 4,000 accounts, about 700 of which are analysed by the Bureau of Farm Management and Agricultural Economics. The results of each year's records are compared with the results of the previous year. We have to deal with farms of very different sizes, the smallest containing less than 10 hectares, the largest over 100 hectares. We endeavour to show how these different groups compare. Small farms have been the most successful. Recently, labour costs have gone down and other prices are falling, so that for last year we should have had a normal return, that is, 6 per cent on capital. For the years 1927-1928 the return on capital was only 1.8 per cent. We keep accounts for various crops—corn, roots, sugar beets, potatoes, and so forth—and every year we issue a short descriptive report of accounts for different types of farming. It is perhaps not necessary to publish the results of this investigation each year. It

probably would be better to use more money in making longer investigations, and make reports covering three, four or five years. Our work is limited by our finances and in as small a country as Denmark we cannot do as much as is done in England or in some parts of the United States.

#### DISCUSSION OF ENTERPRISE ACCOUNTS AND FINANCIAL ACCOUNTS AS A BASIS FOR ADVICE TO FARMERS

Professor Ashby—In the use of enterprise accounts it is necessary to distinguish carefully between two cases. It is quite safe to run cost records for a single enterprise which represents two-thirds of total cash receipts. In that case a weakness in another department could not do much harm. For any enterprise which represents 10 per cent of cash receipts, it is also perfectly safe to run a single enterprise cost record. As regards putting financial accounts first I have some doubts as to methods used. Some "units" are very weak. Take the question of animal units. "Animal units per man" are stated, but the units are feed requirements and not labor requirement units. As far as our own work is concerned we have tried to put side by side results of two or more methods—cost and financial records, and results of labor records, and so forth. In one particular case in which an enterprise study was made for milk and a quantity study of labor requirements was made for all departments, the labor requirement figures came out quite close together. The method used is partly a matter of expediency. If I had to give advice I would recommend the use of the enterprise cost method. I would not try to interpret financial accounts alone, but would require other figures to use as a check and to use in interpretation.

Professor Case—The balanced farm is an exception. For example, one year when seven hundred records were summarized, only one farm was found where the operator was above the average of the men in his community in all of the measures of farm efficiency used. For this reason it is thought desirable to have the financial record of the entire farm business even where the enterprise cost studies were conducted. For example, in dairying, two-thirds of the income might come from that source and while the enterprise might appear profitable, the farm as a whole might be unsuccessful due to some lack of economy in operation such as in the controlling of expenses or in the cropping system.

Professor Ashby—Great trouble is taken to check figures. One must keep in mind, however, certain conditions or particulars which cannot be changed. We have taken the trouble to get at the cost of hay making and pasture where hay was a home grown product. If we say to the farmer, "your hay is costing too much," he cannot alter it. When we say, "you are feeding too much hay according to your evidence," then we are on fairly certain ground.

Sir Thomas Middleton—Where two-thirds of receipts are from a single enterprise, it seems desirable to take the whole record of the farm. Farmers would certainly prefer to see the whole record.

Professor Ashby—There are certain farms where the main enterprise,

beside cows, is poultry. The egg money goes to the wife, and it is impossible in such cases to get true statements. The proportion of receipts is often the cause of disagreements between the farmer and his wife. As another difficulty, I might mention the case of a perfectly honest man who wished to exclude approximately 500 pounds of butter supplied to friends and relatives.

Professor Larsen—It is very difficult to get good results from poultry or milk investigations without financial records.

Dr. Borgedal—We have had some experience in single enterprise cost account work. At one of the agricultural schools the director has for many years sent the school boys to private farms in the summertime as apprentices. There they have had to keep accounts under supervision of one of the school officers with one crop, as for example, rye. These accounts are afterwards worked up at the school office, and they have given very useful material.

All of our experience, however, has not been so good. In the milk testing association the assistants have for many years worked out the costs of milking production under the supervision of the State Adviser. I might say that the greater part of our agricultural income is derived from the sale of milk. During the war milk prices rose from 200 to 300 per cent. However, during that time, when the income from the sale of milk was greater than our farmers had ever dared to expect, the cost accounts indicated that the cost of production was higher than the price received for milk, and that the loss per cow amounted to 55 shillings a year. It is obvious, therefore, that one must be careful in the use of single enterprise cost accounts.

Professor Ashby—My department has discussed on many occasions the question of policy in regard to farm management. The attitude taken is that it is not our business to tell a man how to run his farm. That is his job. If we can give him information to assist him in checking up on his policy or actions, our functions cease. We should supply a basis for intelligent examination and criticism. When we have done that, we have done our work.

#### DISCUSSION OF THE DESIRABILITY OF DIVERSIFIED PRODUCTION

Professor Case—Under our conditions we have reached the point where the soil needs to be considered. In order to improve the soil most economically, a suitable crop rotation is necessary. It does not seem advisable to shift the cropping system greatly after it is once established. Part of the farmer's income is derived from the sale of crops and part from the sale of livestock and livestock products. Under such circumstances the opportunity of shifting production in response to market conditions comes about largely through the possibility of feeding a larger or smaller proportion of the crops produced. The yield of crops cannot be forecasted, and therefore the market price cannot be determined in advance of planting the crops. This probably applies more in a grain surplus

production area than in an area where feeds must be purchased in large quantities.

Professor Jutila—Is not the most important thing to get farmers and economists to think in terms of economics? Is not the emphasis on diversity of enterprise an inheritance from the previous generation of agricultural specialists?

Professor Case—The concept of diversity of production would seem to be modern rather than a hold-over of the past. A great deal has been said about diversity of income but there is a distinct difference between diversity of income and diversity of production. Many farms that are specialized from the standpoint of income are diversified from the standpoint of production. For example, many of the highly successful dairy farms sell a single product, but in applying this reasoning to conditions in Illinois we find that there are few dairy farms that are highly successful unless they have a well diversified cropping system that provides for distribution of labor and power, the maintenance or improvement of the soil, the production of feeds required in feeding the dairy herd, and other points which are a part of good farm management. There are, of course, some highly specialized farms such as poultry farms, but in general under Illinois conditions they have not been altogether successful. At least a great many of them have been failures. There are times when it is desirable to change the cropping system. A highly specialized farm is always subject to considerable risk. For example, a change in the cost of production, or disease or insect pests, may change the relative profit of one crop compared with another. In general, profitable rotations are those that include three types of crops, a cultivated crop, a small grain crop, and a grass or legume crop. Most of the farming in the Corn Belt is based upon feeding a considerable part of the crops produced upon the farm. Under these conditions, we have found it highly desirable to group the crops under each of the three classes referred to above, according to their relative profit, using the more profitable crop in each group in building up a rotation. Since, however, the relative profitableness of these crops may change from time to time due to various conditions such as those already mentioned, it becomes necessary to continue investigations from year to year. It seems that no sudden change in the relative profitableness of the crop takes place under conditions which continue year after year. Oats, of course, are now looked upon as an unprofitable crop by many farmers, but this has been rather a gradual, long time change, coming about with the reduction in the total number of horses. Also, it would seem that fairly stable crop rotations are desirable since it is impossible to forecast yield and therefore impossible to forecast total production. Under Corn Belt conditions, however, some adjustment may be had by selling a greater or a smaller portion of the crops produced as livestock or livestock products, or as grain products. Even under these conditions many farms with little diversity of income are successful, but they still show considerable diversity of production.

Professor Ashby—Is there not danger of leaving out or neglecting the demand side of the market?

Professor Case—Is not the profit realized from the different crops over a period of years a good indication of the demand for products, if one recognizes the long-time trend?

Professor Ashby—The whole situation is mixed up with local patriotism, but there is too much emphasis on the individual and too little on the agricultural group. Various conditions may determine the high profitability of a given crop in a given area. It may be that better natural facilities exist in one area than in another, whilst again in another there are better transport facilities. When you come to more general conditions and consider the rate of profit on any specific crop, then you have to consider what determines the rate of profit. If it is only a temporary situation arising out of demand, then, of course, you destroy the result you have been accustomed to get by stimulating production.