FINANCIAL SEASONALITY OF DAIRY FARMING AND ITS RELATION TO RISK AND UNCERTAINTY

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FINANCIAL SEASONALITY OF DAIRY FARMING AND ITS RELATION TO RISK AND UNCERTAINTY

by

John Ronald Brake

AN ABSTRACT

Submitted to the College of Agriculture of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

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1956

Approved Warren H. Vincent

ABSTRACT

The purpose of the study was to attempt to reduce risk and uncertainty concerning the financial flow pattern of the dairy farm business by analyzing the monthly flow of cash receipts and expenses.

In keeping with this purpose the study attempted: (1) to determine the extent to which definite and reliable monthly variations in income and expense items existed on the sample farms; (2) to reduce uncertainty associated with income and expense flow by presenting a description of the flow pattern, and; (3) to make some suggestions based on the seasonality pattern of income and expenses which could be beneficial to farmers.

The prime hypothesis of the study was that many of the farm expenses were seasonal in nature. Thus, if the pattern were found to be seasonal, there would seem to be applications not only for farmers and farm planners, but also for extension men, farm credit agencies, and teachers of agriculture and farm management.

The study was made on a sample of forty Ingham and Jackson County dairy farms. These farms were in the Michigan State University Mail-In Account project in which the cooperators were chosen on a volunteer basis. Each of the forty farms had more than fifty per cent of its 1955 income from the sale of dairy products and dairy cattle.

The statistical procedure was to determine the median for specific categories although the mean figures were included. The selection of the sample made it inappropriate to set confidence limits for the mean.

Three approaches to the financial seasonality were taken. The first was to analyze each expense and income item individually to show the per cent of its total which occurred in each month. The second was to explore the changing relative importance of the various income and expense items in each month of the year. The third approach was to present the per cent of all expenses and all income which occurred in each month.

A majority of expenses were found to have a strong seasonal pattern. The expenses exhibiting this pattern were hired labor, seeds and plants, fertilizer and lime, machinery repair and maintenance, supplies, improvement repair and maintenance, machine hire, breeding fees, veterinary and medicine, fuel and oil, and taxes. Others exhibiting a mild seasonality or months of high expense percentagewise were feed purchases, insurance, interest, rent, auto upkeep, and other expenses. Telephone expense and other livestock expense had little indication of seasonality. Electricity was the most constant of all expenses.

Considering all expenses together, April and December were the two highest months while the three months following April were higher than others.

Dairy products income was very definite and constant. Dairy cattle sales and crop sales were seasonal in nature. All monthly income together was high in July and the last three months of the year.

Suggestions were made largely on the basis of the total expense-total income pattern. Indications were that in April and May, expenses were high relative to income while in July and October, expenses were low relative to income. Applications could be made not only by farmers, but also by extension workers, farm planners, and credit agencies. For example, extension workers might be more effective in urging special purchases in July or October while in April and May, credit problems may be more appropriate.

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ACKNOWLEDGMENT

To name the many people who have in one way or another made this thesis a reality would be impossible.

Specific thanks are due Dr. Warren H. Vincent under whose direction this study was accomplished. His patience and many important suggestions served to make a difficult task considerably easier.

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Thanks are due my father also. His sturdy faith and confidence in the author and his work have always been sources of strength and encouragement.

The author assumes responsibility for any errors in the thesis.

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CHAPTER I

INTRODUCTION

The Problem

Farming involves a large degree of risk and uncertainty. In such a business with lack of knowledge and many types of uncertainty, decision making becomes very important and difficult. This study is concerned with improving knowledge in the area of uncertainty of monthly income and expense flow throughout the year.

It might be well at the outset to attempt a short explanation of what is meant by risk and uncertainty. Frank Knight makes the following differentiation between risk and uncertainty:

> The practical difference between the two categories, risk and uncertainty, is that in the former the distribution of the outcome in a group of instances is known (either through calculation a priori or from statistics of past experience), while in the case of uncertainty this is not true, the reason being in general that it is impossible to form a group of instances, because the situation dealt with is in a high degree unique.[1]

A risk, then, is a situation which can be reduced to a probability. It is then possible to protect oneself from

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[1]Frank H. Knight, Risk, Uncertainty, and Profit (Boston and New York: Houghton Mifflin Company, 1921), p. 233.

a risk situation by insurance. For example, a probability distribution exists and is known for the number of barns that will burn out of a given total in a year. It is possible to protect oneself from most of the loss through fire insurance.

With uncertainty, the situations are unique, or enough so, that a probability distribution is not known. Knight says, "the fundamental uncertainties of economic life are the errors in predicting the future and in making present adjustments to fit future conditions."[2] The manager is not able to refer to enough numbers or experiences to calculate a probability. Weather, for instance, stands as an uncertainty. The farmer cannot refer to experiences or tables to predict the chance that certain weather conditions will prevail at any particular time.

There are many other areas of uncertainty in addition to weather. Uncertainty concerning institutional changes is another that is often mentioned. Changes in government policies, laws, or interpretations of policies by administrators can have a profound influence on the way farm managers react. Marketing quotas on wheat have made changes in the decisions of many farmers. The chance that the same might occur with respect to corn acreage could easily influence some farmers to overplant in order to build a larger base acreage.

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[2] Ibid., p. 259.

Farmers are faced with uncertainty concerning technological changes. New methods and equipment are constantly being introduced. Farmers realize it is "the first one in" that makes the most gain, but if it is not a good idea, he is also the one to suffer the most loss. Farmers often develop their own "strategy" for coping with such uncertainty.

Uncertainty exists in the area of human relations. Quarrels, deaths, and divorces can have much to do with manager's decisions. It is likely that a farmer might make an entirely different decision if his only son is planning to remain on the farm than he would if the son planned to leave.

Price uncertainty is probably the one most often mentioned. A major change in prices may put a farmer out of business, particularly if he is specialized and short on reserve credit. Farmers often use a "strategy" of diversification to protect themselves. If a farm is best fitted for producing one crop and the farmer diversifies to protect himself against price changes, he will have cut down his production efficiency each time that the unfavorable price change does not occur. Uncertainty nearly always results in less than maximum use of resources. Because he does not know, the farmer may use restraint even in specialized enterprises.

The preceding discussion was meant to review some of the concepts of risk and uncertainty as an orientation for the immediate study. Uncertainty is responsible for poor

use of resources or at least less than optimum use of resources. If research in the area of uncertainty situations can bring them more into the realm of risk or improve knowledge for coping with uncertainties; then that research can make a definite contribution.

Need for the Study

Farm production is usually thought of as being seasonal in nature. Empirical evidence of this is found in such phenomena as the harvesting of wheat each July, or corn each autumn, and the seasonal fluctuations in numbers of hogs marketed. Many others could be cited. However, when it comes to the question of income and expense fluctuations from month to month, little is known of the variations which may exist. If income and expenses are based on the production cycles, it could be expected that there would be a fairly definite and reliable seasonal fluctuation in the income and expense items associated with a type of farming enterprise.

To the extent that these variations in income and expense items exist, limitations on our present method of farm planning may be imposed. For it may well be that farm management people are merely balancing the budget at the end of the year and ignoring the possibility that more expenses need to be paid early in the year than there is income to cover them--in which case the farmers would need additional liquid reserves or obtainable credit. Conversely, it may

be that the farmer can expect more income early in the year than he will need for expenses, so that he could better utilize his liquid reserves or credit instead of keeping more than needed on hand.

Short run planning is of great importance in the farm business. Schickele was emphasizing this short run problem when he said,

> A farm family--any family--lives in the short run. Mouths have to be fed every day, bills have to be met every month, taxes have to be paid every year. In face of great uncertainties, the farmer's first concern is survival in the short run, of reducing the probability of risk loss so heavy as to bankrupt him.[3]

It is this short run income and expense aspect of risk and uncertainty with which this study is concerned. Probably one of the best statements that could be added at this point is one made by Williams which points up the need in this area:

> Extension agents have been left to their own devices to develop principles by which they can take account of the aspects of farm management which relate to uncertainty and the farmer's response to it.[4]

Extension workers also feel a definite need for information which would aid them in timing their releases and topics of instruction. They would like to know when farmers

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[3] Rainer Schickele, "Farmers Adaptations to Income Uncertainty," Journal of Farm Economics, Vol. 32, p.367.

[4] D. B. Williams, "Price Expectations and Reactions to Uncertainty by Farmers in Illinois," Journal of Farm Economics, Vol. 33, p. 20.

rent and buy land, when they buy machinery, and when they make other major purchases. This knowledge would enable them to be more effective in their work and perform a greater service to farmers.

The study is important with reference to farm planning. In many cases planning is done on a short run basis so that accurate, up-to-date figures are needed. For purposes of linear programming and budgeting, it is important to know if these monthly variations in income and expenses impose a restriction that should be taken into consideration. If such a limitation does exist, it is important that it be brought to light.

Research is needed in this area with reference to farm credit. Monthly variations are important to a credit agency when they set up a repayment schedule for farmers. Data on income and expense variation would aid them in setting up a more satisfactory repayment schedule.

Farmers would like any information they could get that would help them in planning and running their business. With the present agriculture problem, it is important that any work which might be done to reduce uncertainty be done as soon as possible.

Dairy is a logical enterprise with which to start this type of study in Michigan, for it is Michigan's chief source of agricultural income. In 1955, 32.5 per cent of Michigan's cash farm receipts came from dairy sources.[5]

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[5]Michigan Crop Reporting Service.

Objectives

The specific objectives of this study are as follows:

1. To determine the extent to which a definite and reliable monthly variation in certain income and expense items exists on a sample of forty central Michigan dairy farms.

2. To attempt to reduce short run risk and uncertainty associated with income flow and expense flow by presenting a description of income and expense flow.

3. To suggest ways farmers might plan their financial practices to take advantage of the seasonality of farming.

Hypothesis

In addition to the accepted belief that certain expenses such as fertilizer, are closely tied to the production cycle, it is felt by the author that several other expenses are highly seasonal in nature also. The prime hypothesis of this thesis is that these expenses have a definite pattern of monthly distribution and that this pattern may be used in more effective farm planning.

Assumptions

Conclusions drawn from this study must be tempered by the following assumptions:

First, it is assumed that planning is desirable in farming as in any business. Without planning, the farm business operations tend to be haphazard, poorly organized, and inefficient. It is obvious, too, that farmers do plan, though it may be a very informal or even mental plan. If planning is desirable, then figures which make planning easier or more accurate, serve a worthwhile purpose.

Secondly, it is assumed that averages may be useful for certain purposes if they are reliable. These averages may be used advantageously at times in farm planning. Then again, they may be useful merely as an aid in understanding the farm business more fully. The usefulness of the averages for farm planning purposes depends on the reliability of the statistic in question.

Thirdly, it is assumed that for purposes of short run planning, the time that expenses are paid is more important than the time at which expenses are incurred, since it is the actual payment which has to be planned for in the short run.

Fourthly, it is assumed that 1955 was a normal year. This assumption includes weather as well as other aspects. The accuracy and applicability of the results depend on the year under consideration. To the extent that 1955 was not normal, the results would need to be modified for use in other years.

Finally, it is assumed that the decisions made and actions taken by the cooperators in the study were rational

and that the results in most cases can serve as guides to planning.

Definition of Terms

Following is a list of terms that may need clarification. Other terms used in this thesis are as defined in Heady and Jensen's Farm Management Economics.[6]

Expense refers to the payment of a bill or debt rather than to the time a debt is incurred.

Operating expenses are those variable expenses tied in with the operation of the farm business. Included in these are hired labor, feed, crops expense, machinery maintenance expense, livestock expense, improvement maintenance expense, and others of a monthly or annual nature such as telephone, electricity, taxes, etc.

Short run is a length of time shorter than one year. In general, it shall mean from one to six months.

Dairy farms in this study are farms which received more than fifty per cent of their 1955 income from sales of dairy products and dairy cattle.

Risk and uncertainty were differentiated earlier. However, to review, risk refers to a situation in which a probability can be calculated. Uncertainty refers to a situation in which a probability cannot be calculated and which cannot be guarded against by formal insurance.

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[6]Heady and Jensen, Farm Management Economics (New York: Prentic-Hall, Inc., 1954), passim.

Review of Literature

Farm Accounts

It might be appropriate first to review literature dealing with farm accounts. The present study was based on figures supplied by the Mail-In farm account project being carried on at Michigan State University. The Mail-In project itself is a new application of the older farm accounts, and will be explained further in Chapter II. Older farm accounts were wholly inadequate to give seasonal figures.

Although there are many farm account projects carried on in the various land grant colleges and universities, there has been little literature written dealing specifically with them. Many text books make a reference to farm accounts but do not go beyond this to any extent. However, one source of information was a report by Pond in the Journal of Farm Economics. He wrote:

> On January 1, 1902, W. M. Hays and Andrew Boss started some cost accounts on Minnesota farms. This was the first organized continuing project in farm management research in the United States. It was also the first research project in the general field of agricultural economics in the country.[7]

He goes on to say that the accounts came about because it was found that experimental plots did not give

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[7]George A. Pond, "Fifty Years of Farm Records in Minnesota," Journal of Farm Economics, Vol. 35, p. 249.

adequate cost figures. It was then decided to try and get the figures from farmers themselves. Continuing, Pond states that the fifty years of records in Minnesota have "supplied a continuous flow of information on farm costs, farm returns, and factors affecting farm financial success."[8]

Income Variations

Work on income variation has come about largely within the last decade or so. Heady has several interesting tables in his Economics of Agricultural Production and Resource Use related to income variation.[9] One of these shows income distribution and variation data for Iowa livestock enterprises in which the coefficient of yearly variation ranged from fourteen per cent in dairy to thirty-nine per cent for feeder lambs.

Another approach Heady took was that of combining two enterprises to determine which combinations provide the steadiest flow of income year after year.

Later in the chapter, he stated:

> Income variability can be lessened through diversification only if the prices or yields of the products bear the proper correlations. If the correlation coefficient is -1.0, the 2 enterprises serve optimally as an uncertainty precaution. A correlation coefficient of zero is preferable to greater (+) correlation coefficients.[10]

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[8] Ibid.

[9] E. O. Heady, Economics of Agricultural Production and Resource Use (New York: Prentice Hall, Inc., 1952), p. 506.

[10] Ibid.

D. Gale Johnson summed up the problem very well when he wrote:

> A firm is confronted not only with the necessity of considering the expected value of the income stream but also with the desirability or necessity of maintaining within limits the capital value of the firm as a going concern. If expectations are certain, knowing the expected (discounted) value of the income stream specifically denotes the capital value of the firm as a going concern. If not . . . there arises the possibility that events may force the liquidation of the firm.[11]

Risk and Uncertainty

In the area of risk and uncertainty, the literature deals more with bringing to light what the problems are. However, some attempts have been made to actually reduce risk as in crop insurance, fire insurance, etc. Some other studies have been made to check farmer's reaction toward uncertainty.

One such study was made by Williams in Illinois.[12] When he asked 161 farmers to choose between a sure $5,000 a year income or a chance of $7,500 or $2,500, 111 chose the sure $5,000 income. When the question was asked as $1,000 sure or flipping a coin as to a chance of $1,500 or $500, 127 of the 161 chose the sure $1,000. Evidently farmers are typically interested in the "sure" thing.

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[11] D. G. Johnson, Forward Prices for Agriculture (Chicago: University of Chicago Press, 1947), p. 39.

[12] Williams, op. cit., p. 30.

Williams found that farmers tended to react similarly according to (1) the year they started farming, (2) education, and (3) age.

D. G. Johnson listed four ways of limiting uncertainty.[13] They are (1) diversification, (2) flexibility, (3) liquidity, and (4) risk aversion and combination of factors. These are the factors most often mentioned in other references on the subject in one combination or another. Some authors break them down more, but for present purposes, this is adequate.

A. G. Hart came closer to the problem of this study when he listed three phases of enterprise planning.[14] The first phase, he said, was planning a set of production schedules. The second phase was the marketing plan which was made up of buying schedules for productive services or goods, and of sales schedules for saleable output. The third phase he listed was the "finance plan." This is made up of outlay schedules for paying for purchases, and receipts schedules for sales proceeds. It is this third phase that is of prime concern to this study.

Most references on this subject are cited in North Dakota Experiment Station Bulletin 400, the proceedings

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[13] Johnson, op. cit., p. 50.

[14] A. G. Hart, Anticipations, Uncertainty, and Planning (Chicago: University of Chicago Press, 1948), p. 11.

issue of the Research Conference on Risk and Uncertainty in Agriculture.[15]

The conclusions of this review are several. First, research in the risk and uncertainty area has only begun. Further work is needed. In regard to the financial seasonality with which this study is particularly concerned, the author found no indications of previous research. The enterprise combination work of Heady which was mentioned above is the closest to financial seasonality in the general area of risk and uncertainty that has been undertaken.

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[15] Agricultural Experiment Station Bulletin 400, Fargo, North Dakota: North Dakota Agricultural College, August, 1953.

CHAPTER II

DESCRIPTION OF THE SAMPLE

History of the Project

The data studied were obtained from farm records kept by Michigan farmers in cooperation with Michigan State University. So, it seems appropriate to describe briefly this farm accounting project.

Since 1929, Michigan farmers have been keeping records under supervision of extension specialists in farm management at Michigan State University. The farmers have used special farm account books obtained through the University. Generally, the accounts include complete itemizing of the various expense and income items, crop and livestock production figures, and inventories on land, machinery, feed, livestock, and improvements.

At the end of the year, the extension specialist would meet with the farmer to check and close his books for that year. Later, the books were brought to the University to be used for extension and research purposes. An area report for several areas in the state was one of the more extensive uses of the data obtained in this way.

After 1949, a part of the information was put on IBM cards for ease and speed of operation. Other than this, the calculations and summarizing were done completely by

the staff and clerical help in the agricultural economics department. Since the books were often used for income tax purposes, this manual aspect placed a great seasonal burden on the extension specialist staff and its clerical help. The extra burden at one time of year also magnified the possibility of error.

Late in 1954, Dr. Warren H. Vincent, Extension Specialist in Agricultural Economics, thought of the possibility of carrying on a Mail-In account project which would be handled entirely on IBM cards. The farmers would send in their reports every month so that the first of the year rush could be somewhat relieved. The IBM machines would speed the process and save on labor.

In December, Dr. Vincent contacted Kenneth Swanson and Kenneth Brown, the assistant county agents of Jackson and Ingham Counties, respectively, to see if they could get enough farmers interested to carry out the project in 1955. There were fifty farmers in Jackson County and thirty in Ingham County who indicated a willingness to try the new system of farm accounts. Of the eighty who started the project, seventy-five actually completed the year.

As indicated above, the reports were to be sent in at the end of every month (see Appendix A). If they were not received by a certain date the following month, one, two, or three reminders were sent to the farmer (See Appendix A). When the reports were received, they were stamped with the date received, checked, totaled, and the data was

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put on IBM cards. Next, a check sheet (see Appendix A) was sent back to the farmer indicating whether his report was all right or what additional data was needed. Along with the check sheet was sent the envelope to be returned the next month. The farmers were invited to ask questions on anything they did not understand when they sent their monthly reports in. Answers to these questions were put in a space provided on the check sheet.

The Mail-In project has several desirable features over the annual method. First, it makes information available about what farmers are doing much sooner than the annual accounts. It can be set up to give new information with a minimum of effort and cost. Besides being up to date, the Mail-In project gives monthly information on expense and income items such as is used in this study.

The project was expanded in 1956 to include about twice as many farms. The "regular" account cooperators from Jackson and Ingham Counties were absorbed into the project, and about twenty new cooperators were taken in from both Ionia and Calhoun Counties. In 1957, plans are to expand the project to absorb all the "regular" account cooperators. By 1959, it is hoped to increase the project until approximately thirty farms from each of seventy-five counties are included.

Selection and Size of the Sample

The Mail-In project was originally set up in Ingham and Jackson Counties. Both of these counties are in Michigan's Area Five which is classifed as a dairy and general farming area. It was quite likely then, that of the original cooperators in the project, a large proportion would classify as dairy farmers. An examination of the farms showed this to be the case.

In drawing a sample for this study, it became necessary to define a dairy farm. For this purpose, the census definition was used. A farm is a dairy farm when fifty per cent or more of total sales were from dairy products, or if;

1. Milk and other dairy products accounted for 30 percent or more of the total value of products, and
2. Milk cows represented 50 percent or more of all cows, and
3. Sales of dairy products, together with the sales of cattle, amounted to 50 percent or more of total sales.[16]

Each of the farms in the sample used for this study had greater than fifty per cent of their income from dairy product sales and dairy cattle sales in 1955.

There were forty-two of the farms in the Mail-In project which met this definition. TWo of these forty-two were thrown out when an examination revealed they had "sold out" during the year. This fact seemed sufficient to take

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[16] United States Bureau of the Census. 1950 United States Census of Agriculture (Washington: Government Printing Office, 1951) p. xix.

them out of the sample. The remaining forty farms were used in the present study.

Several things should be kept in mind concerning the sample selection. First of all, no attempt was made to get a random or representative sample. Any farmers who indicated a willingness to Mr. Swanson or Mr. Brown to be in the project were given the opportunity to do so. This in itself, probably indicates that the farms would tend to be better than average. Even if this were not so, a year of keeping records with the University and special help from the assistant county agents would probably tend to bias the sample. While this might be a rather serious fault in many studies, it is much less of a limitation with the statistical analysis to be used in this study since the analysis does not assume a random sample nor a representative one.

Description of the Sample Farms

The forty farms selected for the sample are in Ingham and Jackson Counties. There are fifteen in Ingham and twenty-five in Jackson. Figure 1 indicates the location of Ingham and Jackson Counties in Michigan as well as the location of the forty farms within the two counties.

In size, the per farm average was 256 acres which includes an average rented acreage of seventy-four acres per farm. An average of 170 out of the 256 acres were tillable. The mean rented acreage amounted to twenty-nine per cent. The median farm in total acres was 231; in tillable acres,

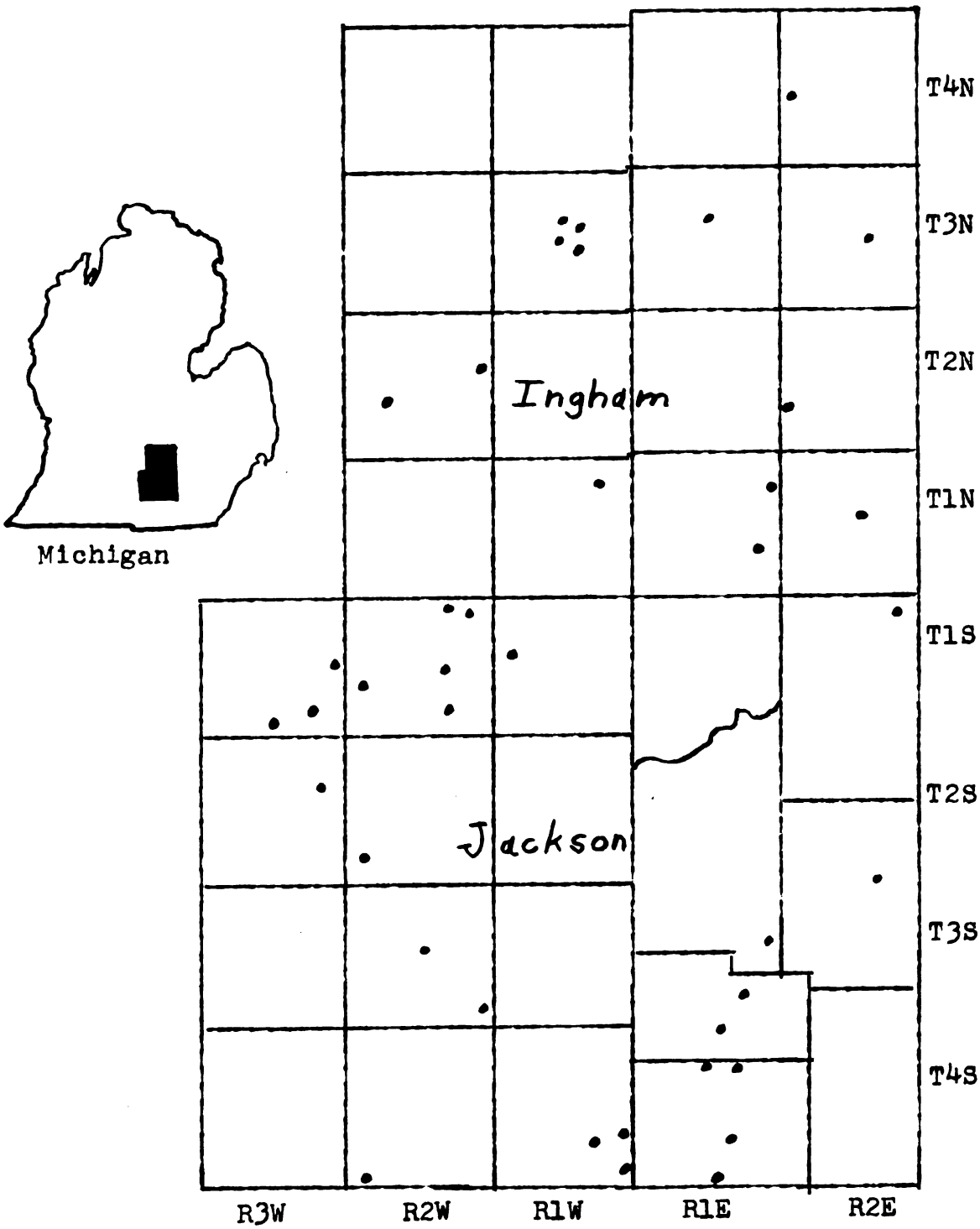

Fig. 1. Location of the 40 Farms in the Study

172; and with respect to rented land, 17%. Total acres ranged from 100 to 730, and tillable acres ranged from 62 to 298. One farmer rented all the land he worked.

The average size figures are similar to the 1954 area 5 report.[17] The 133 farms which kept records in the regular project in 1954 had an average of 254 total acres per farm with 194 tillable. The mean rented acreage was 27%.

The farms could be classified according to herd size. There were 999 cows on the forty farms to give an average of 25.0 per farm. The farms ranged from 10 cows to 53 with the median being 23. One could divide the sample into large herds and small herds. Such a division gives a mean of 17.4 cows and a median of 18 for the small division. A mean of 31.9 and a median of 30 are obtained in the large herd division.

Some figures on receipts and expenses may be worthwhile for descriptive purposes. Average cash receipts per farm for the whole sample were $11,663. Average expense per farm amounted to $5,874. Sorting the sample again into large herds and small herds, the average income for large herds was $14,668, and for small herds it was $8,342. Average expenses were $7,339 and $4,254 respectively.

The sample description with respect to source of income provides important information. Dairy product sales, as expected, were the chief income source. These sales amounted to 65.1% of the income. Crop sales were next in

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[17] "Farming Today," Area 5 Report, Michigan State University, Department of Agricultural Economics.

importance with 11.8% of income from this source. Dairy cattle sales were 8.9% so that the combination of dairy product and dairy cattle sales accounted for 75% of the income on the sample farms. Other income sources were as follows: swine, 4.7%; poultry, 2.5%; off farm labor, 2.0%; custom work, 1.5%; and other sources, 3.5%. Other sources include income from sheep sales, beef sales, machinery sales, dividends, and refunds.

The farms were ranked on soil productivity. The various soil types were given an index rating according to a chart compiled by Schneider and Engberg (see Appendix A). Soil maps of the area indicated the soil types on various parts of each farm. The index numbers were weighted and a soil production index number was assigned to each farm. The numbers assigned to sample farms ranged from thirty-four to ninety-two. The average of all farms was 58.8, and the median farm index was fifty-eight.

The cropping system is an important consideration on livestock farms. Percentagewise, the farms in the sample had an average of 48% of their tillable land in sod, 23% in small grains, and 27% in cultivated crops. The median farm in each category was 44%, 21%, and 27% in the three uses.

There was a wide range however. The per cent in sod varied from 12% to 97%. The per cent in small grains varied from 0 to 40%. The cultivated crop percentage varied from 0 to 69%.

Again, these figures fall fairly close to the area 5 report in which the 133 farms averaged 41% of their land in sod crops, 31% in small grains, and 24% in cultivated crops. The sample farms had about 2% of their tillable land idle while the area 5 farms averaged 4%.

Farm investment data may be helpful in a description. The average total investment per farm was $41,503. This figure includes an average investment of $14,992 in land, $9,143 in farm improvements, $7,469 in machinery and equipment, $3,847 in feed and crops, $5,690 in dairy cattle, $33 in beef cattle, $87 in sheep, $200 in swine, and $42 in poultry. The middle farm in each category was below the mean. The median farms in beef, swine, sheep, and poultry were zero since so few farms had investments in these categories.

It is interesting to note the range in investments. Total investment varied from $16,205 up to $82,379. The land investment ranged from $5,457 to $32,319. Farm improvements had a wide range of from $1,915 to $24,257. Machinery and equipment investments varied from $2,068 up to $15,134. The feed and crops investment had a low figure of $852 and ranged up to $10,431. The low in dairy cattle investment was $2,185 while the high farm had $16,325 invested. The investments in beef, swine, sheep, and poultry went as high as $800, $1,970, $850, and $450 respectively.

The forty farm operators averaged 40.2 years of age. The youngest operator was twenty-five and the oldest was

sixty. The middle farmer in this respect was forty-two. there were eighty-two children on the sample farms. Two operators had five children in their families while eight had no children. The median family size was two children.

CHAPTER III

MONTHLY VARIATION IN THE FLOW OF INDIVIDUAL INCOME AND EXPENSE ITEMS

Statistic Used for Analysis

When analyzing data, it is important to consider the purpose of the study and the use that is to be made of the results. With respect to the present study, the analysis should furnish figures of use to farm planners and managers in helping to reduce the uncertainty on the financial side of the business.

With this purpose in mind, it seemed that more useful figures could be obtained by using percentages rather than absolute amounts. If the flow of expenses and income is seasonal for the items, then percentage figures would be more applicable for a larger number of farms than would absolute figures. It is for this reason that the analysis is on a percentage basis.

As mentioned in Chapter II, the selection of the sample farms was voluntary rather than by chance. With a relatively small size of sample and no random or chance selection, it becomes rather difficult to assume that the sample includes a normal distribution of farms. Indeed, judgment would suggest in many cases that other than a normal distribution would be desirable. Certainly such is

the case in an analysis of cause and effect factors. However, without the normality assumption, the arithmetic mean becomes difficult to use since setting a confidence limit on the mean requires the calculation of variance which in itself assumes normality in the sample. For planning purposes, it seemed important to use some measure of central tendency. Without the necessary assumptions about the sample for the mean, the median was considered. With this statistic, no assumption of normality is needed. Since it is a non-parametric statistic useful for small samples, it was chosen as the statistic for analysis.

The median has several other desirable features. It eliminates the unusually large values which influence the mean. Thus the median may in reality be more appropriate to a larger number of farms than the mean. A further advantage is that the confidence limits on the median are both actual observations and very nearly divide the sample into thirds. Nair was referring to this statistic when he wrote:

> This is important work in view of the fact that in small samples it is not easy to test whether the assumption of normality holds good.[18]

The median will also be very close to the mean in a normal distribution. In a perfectly normal distribution it will be the same as the mean. Even without the normality assumption, the median will be fairly close to the mean and

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[18] K. R. Nair, "Table of Confidence Interval for the Median in Samples From Any Continuous Population," Sankhya, Vol. 4, 1940, p. 551.

may actually be a more usable measure of central tendency since it will have as many observations on one side as on the other.

When setting confidence limits on this statistic, the median of the universe can be expected to fall between the 14th and 27th observations 96.2% of the time when they are arranged from highest to lowest.[19] The middle thirty per cent of the observations are between the two limits.

In several cases, it was felt that more appropriate and meaningful estimates could be obtained by dividing the sample on the basis of herd size into farms with larger herds and farms with smaller herds. The dividing line was between twenty-two and twenty-three cows. This gave a large herd sample of twenty-one farms and a small herd sample of nineteen. In the sample of twenty-one, the median can be expected to fall between the 6th and 16th observations 97.3% of the time. In the nineteen farm sample, the median could be expected to fall between the 5th and 15th observations 98.1% of the time.[20]

Analytical Approach

There are several possible approaches which may give indications of financial seasonality. There are three

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[19] Ibid., pp. 551-558.

[20] Ibid.

approaches that will be taken in the present study. The one taken in this chapter is to analyze each expense and income item individually to estimate the per cent of the item that occurs each month. This would mean, for example, to take items like hired labor expense and figure the per cent of the year's labor expense that occurs each month. This analysis shows the seasonality throughout the year for each individual item.

A second approach is used in Chapter IV. That approach will analyze the relative importance of the monthly expense and income items for the various months of the year. This would mean, for example, estimating the per cent of January expenses which go for feed, taxes, hired labor, etc.

The third approach is used in Chapter V. In that chapter, an attempt is made to measure seasonality by analyzing the percentage of the year's total expenses and income which occur each month. This approach is important in comparing the total income flow by months with the total expense flow in those months.

Organization of Tables

Since the study is oriented in some degree toward planning of the farm business and especially planning as a means of reducing uncertainty, it seemed that a single estimate of the median might be more appropriate than presenting a range of estimates. This has been done in the tables by using the midpoint between the confidence limits

as the single estimate of the median. The confidence limits that were used in arriving at this estimate can be found in the Appendix in Tables B, C, D, and E.

Asterisks will be found in the tables alongside some of the percentages. This is an indication that the two confidence limits from which the estimate came were less than 4.0% apart. Estimates with narrow confidence limits could be expected to be more reliable for planning purposes than estimates with wide limits. For instance, a figure of 5% in the table with confidence limits of less than 2.0% on either side could be expected to be more nearly correct when used a number of times than a figure of 5% with confidence limits of 5% on either side.

The tables also include the arithmetic mean. Mean percentages are useful in a descriptive way as well as for items which may not have very definite or reliable median estimates. It is also interesting to compare the median estimates with the mean for disparity and similarity. In addition, the mean percentages should always total 100 per cent so that all the item is accounted for. This is not true of the median. For present purposes, it is necessary only to note that this is not true for the median since the median farm in each month will probably not be the median farm the next month, and certainly will not be the median farm in each month.

Seasonality of Expenses

Tables 1 and 2 give definite indications of seasonality in some of the expense items. Many of these, such as the planting expenses, would be expected. Others, like insurance and interest perhaps would not have been expected. Still other expenses like electricity, are fairly constant throughout the year.

Hired labor expense is one of the more important expenses that have a seasonal pattern. Both the median estimate and the mean percentages indicate the seasonal flow with the high in the spring and summer and the low in the late fall and winter months. It is interesting to note that the median estimate indicates August as the month of highest expense for the median farm while the mean per cent is largest in July. Table B in the Appendix shows that August was the month when the most farms had hired labor expense.

Feed purchases had less of a seasonal pattern than might be expected. Both the median estimate and mean indicated that feed expenses would be high in November, December, February, and March. Though this is somewhat of a seasonal pattern, it is rather surprising that the January feed expense did not remain high also. The median estimate showed fairly large figures for feed purchases in April and October while the mean per cent for June was higher than other summer months.

TABLE 1

THE ESTIMATE OF MEDIAN MONTHLY CASH EXPENSES AS A PER CENT OF EACH ANNUAL TOTAL EXPENSE ON 40 CENTRAL MICHIGAN DAIRY FARMS FOR 1955

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Hired Labor	1.1*	2.2	1.0*	3.9	3.2	5.4	5.6	7.2	4.1	3.3	1.8*	0.8*
Feed Purchases	5.6*	7.4*	8.9	7.3	4.5*	6.2*	5.4*	6.3	5.8	7.6*	7.5*	8.7
Seeds and Plants	0.0	0.0	4.0	17.0	17.8	6.3	1.2*	0.0	3.8	0.0	0.0	0.0
Fertilizer and Lime	0.0	0.0	0.0	14.0	7.3	4.4	2.9	0.1*	7.7	4.0	0.0	0.0
Machinery Repair and Maintenance	1.1*	4.4	4.0*	6.8	11.6	9.8	10.3	7.8	7.4	6.4	5.8	6.1
Machine Hire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	6.7	0.0
Supplies	1.4*	1.5*	1.7*	3.0	1.2*	5.4	9.4	6.3	4.6*	0.0	2.3	2.7
Improvement Repair and Maintenance	0.0	0.0	0.3*	2.4	0.0	2.1	6.8	4.8	0.6	3.1	3.6	0.0
Breeding Fees	4.4	5.1	4.2	1.8*	2.5	2.6	1.6*	0.0	1.3*	0.9*	7.2	9.6
Veterinary and Medicine	6.0	3.9	6.7	3.9	1.9*	2.9	1.8*	4.5	5.4	3.6	7.6	7.5
Other Livestock Expense	5.0	3.3	3.8	3.8	6.7*	5.0	4.3	8.7*	4.9	3.9	4.1	4.6
Fuel and Oil Expense	2.9*	3.6	6.4	8.8	10.4	8.2	12.1	10.6*	8.5*	7.4	4.6	4.1
Taxes	31.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.9	3.9
Interest	1.1*	0.0	0.7*	0.0	0.2*	0.0	0.0	0.0	0.9*	0.0	3.3	1.7*
Electricity**	8.4	8.8	8.6	8.9	7.9	8.2	7.9	8.1	8.3	8.0	7.6	8.7
Telephone	6.5	4.1	7.0*	8.2*	6.3	3.9	7.6*	4.1	3.8	6.5	4.4	4.3
Rent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Auto Upkeep	4.4	5.5	3.6	1.8*	1.7*	2.0	2.6	3.7	4.6	0.9*	6.3	1.0*
Other Expenses	3.6	3.1	2.8	2.2	1.4*	2.7	1.8*	2.4	1.7*	3.5	3.3	7.4

*Indicates range of 96.2% confidence limits was less than 2.0% on both sides of the median estimate. All zero estimates indicate 96.2% confidence limits were zero on either side.
**Confidence limits were within one per cent on either side for all items.

TABLE 2

MEAN MONTHLY CASH EXPENSES AS A PER CENT OF ANNUAL TOTAL EXPENSES FOR EACH MONTH FOR 40 CENTRAL MICHIGAN DAIRY FARMS FOR 1955

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Hired Labor	7.1	7.8	7.6	10.1	8.7	10.4	12.1	10.1	8.7	6.9	5.2	5.4	100
Feed Purchases	6.5	9.3	10.5	8.6	5.5	8.7	7.6	6.6	7.1	7.9	10.1	11.7	100
Seeds and Plants	1.6	2.0	11.5	24.4	22.2	11.4	7.3	3.0	9.8	3.8	2.0	0.9	100
Fertilizer and Lime	5.3	0.9	4.5	20.7	16.1	11.6	8.8	4.2	11.1	9.6	2.5	4.6	100
Machinery Repair and Maintenance	3.1	6.5	5.6	7.4	11.1	11.6	11.3	9.2	8.5	9.0	8.4	8.3	100
Machine Hire	0.4	2.0	1.5	2.5	0.2	9.6	11.7	15.4	15.6	10.5	19.2	11.3	100
Supplies	3.4	7.8	3.9	5.2	5.7	18.3	15.9	10.8	12.3	2.8	4.2	9.9	100
Improvement Repair and Maintenance	1.4	2.0	6.3	8.7	5.7	5.8	25.2	12.6	8.3	8.3	12.4	3.3	100
Breeding Fees	9.8	9.1	9.5	5.7	7.3	6.0	5.0	2.5	6.1	6.6	13.5	18.9	100
Veterinary and Medicine	6.0	9.9	10.1	7.8	7.8	5.9	6.1	6.9	9.6	6.1	10.9	12.9	100
Other Livestock Expense	7.9	6.8	8.8	8.1	8.9	8.2	7.1	9.6	8.4	7.1	8.9	10.3	100
Fuel and Oil Expense	3.6	5.2	7.7	8.3	11.1	9.0	11.6	11.3	9.7	8.7	6.8	6.9	100
Taxes	39.8	17.4	0.3	4.6	2.2	0.0	0.0	0.0	0.0	0.0	7.8	27.8	100
Insurance	4.9	2.9	1.8	12.7	2.9	7.9	2.8	2.7	7.3	11.6	25.8	16.7	100
Interest	5.6	3.1	7.1	5.9	12.2	12.0	4.7	5.4	6.6	5.5	22.4	9.6	100
Electricity	8.9	8.8	8.2	9.6	7.6	8.2	7.7	8.3	7.9	8.4	7.5	8.9	100
Telephone	9.9	6.4	9.0	10.2	9.7	5.4	9.4	7.1	5.7	8.6	7.7	11.0	100
Rent	11.1	9.7	3.0	3.0	4.7	6.5	9.7	7.5	7.5	11.0	5.2	21.1	100
Auto Upkeep	7.8	9.9	8.6	6.3	7.3	7.9	9.0	11.5	7.2	4.2	14.7	5.5	100
Other Expenses	8.3	5.6	7.8	11.3	9.8	8.0	6.3	8.3	3.4	10.1	7.9	13.2	100

Seeds and plants expense exhibited the expected seasonal pattern. The mean percentage for April alone was nearly one-quarter of the year's expense. May was only slightly less, so that the two together accounted for 46.6% of the year's expenses for seeds and plants. The median estimate was larger for May than for April by .8%. In the first two and the last three months of the year, less than one-third of the farms had this expense.

Fertilizer and lime expense was very similar to seeds and plants in its seasonal pattern. The median estimate was highest in April, May, and September with April having an estimate of nearly twice the others. The mean percentages showed April, May, June, and September as the four months of the highest expenses.

Machinery repairs and maintenance expense is highly seasonal in nature. The mean per cents indicate that over one-third of the year's expense in this item was paid out in the three months from May through July. The median estimate parallels this very closely with 31.7% in the three months.

Machine hire has a definite seasonal nature according to Table 2; 93.4% of this expense occurs in the last seven months of the year. However, Table 1 would seem to indicate that few farms have the expense in most months.

Supplies expense is another that has a high degree of seasonality with the largest share of the expenses of this item occurring in June, July, August, and September.

The mean percentages give some indication that December was also a month of high supplies expense.

Improvement repairs and maintenance had much less in the way of a seasonal pattern. Table 2 shows that one-quarter of the expense occurred in July and another one-quarter occurred in August and November. Table 1 indicated a similar pattern but with an estimate of much less for the median farm. Evidently a few farms spent rather large amounts in these months for improvements as indicated by the discrepancies between the two tables percentagewise.

Breeding fees had a definite seasonal pattern and indicated when the production cycle was planned. The high per cent for breeding fees from November through March indicate that the cows on the farms were coming fresh from August to December.

Veterinary expense exhibited a seasonal pattern quite similar to breeding fees. In general the expenses were high from November through March.

Other livestock expense had little in the way of a seasonal pattern. May and August appeared to be two months with a fairly high proportion of the year's expenses. Table 2 indicated that December was a month of high expense.

Fuel and oil expense had a very seasonal pattern with May, July, and August the three months with the largest amounts of the year's expenses. The January, August, and September estimates had fairly narrow confidence limits on either side.

Taxes were much as expected. More than two-thirds of the taxes were paid in December and January according to Table 2. The median estimate was 31.6% for January and zero for all other months. However, as Table B in the Appendix indicates, this figure could be as high as 63.3% or as low as nothing for the median farm.

Insurance expense exhibited an odd pattern. According to Table 2, 42.5% of the insurance bills were paid in November and December. October and April were also months of high expense. The median estimate indicated November and December as important months for this expense although the confidence limits were again very wide in November (Table B in Appendix).

Interest expense had a seasonal pattern with two high points in the year six months apart. One high was in May and June while a second occurred in November and December according to Table 2. The median estimate indicated November and December as the months of highest expense for this item.

Electricity was the most constant of all expenses. The confidence limits were narrow (within 1% on either side of the median estimate) and the resulting median estimate was very similar to the mean per cents in Table 2. The constant nature of this expense is probably the outstanding point to be mentioned.

Telephone expense was also fairly constant from month to month. The variation in the mean figures was, in part,

due to the different payment plans used by the sample farms. Many paid on a quarterly basis while others paid every second month. The largest share paid monthly.

There were too few farms with rent payments to get a median estimate other than zero. The mean figures indicate that a large proportion of rent was paid in December.

Auto upkeep expense does not seem to have a very definite seasonal pattern. February and November are indicated as months of larger expenses for this item by both tables. In addition, the mean percentages indicate August as a month of high expenditures.

Other expenses have little in the way of a seasonality pattern. The median estimates tend toward a slight seasonal rise from October to December. The mean percentages show that December was the month of highest expenditure.

Seasonality of Income

Table 3 indicates the seasonal nature of the various sources of income similar to the way Tables 1 and 2 showed the expenses. Since the sample farms were all dairy farms, it is only natural that the two main sources of income month after month would be dairy products and dairy cattle sales. There were two other sources, however, that were important enough on the sample farms to get median estimates in some months. They were egg sales and crop sales and government payments.

TABLE 3

MONTHLY CASH INCOME FROM EACH SOURCE AS A PER CENT OF TOTAL ANNUAL INCOME FOR 40 CENTRAL MICHIGAN DAIRY FARMS FOR 1955

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Median Estimate:**													
1. Dairy Cattle***	4.6	4.3	9.2	2.1	3.1	1.7*	1.2*	3.1	8.3	4.8	5.4	3.7	
2. Dairy Products	7.7	7.6	7.3	8.4	8.1	8.9	8.2	8.0	8.2	8.7	9.5	9.5	
3. Crop Sales and Government Payments	0.0	0.0	0.0	0.0	0.0	0.0	28.5	0.0	0.0	0.0	0.0	0.0	
4. Egg Sales	0.0	1.9*	1.6*	1.9*	1.8*	0.0	0.0	0.8*	0.0	0.0	0.0	0.0	
Mean													
1. Dairy Cattle	9.5	9.5	12.9	6.6	6.4	7.6	5.8	6.2	11.8	9.6	7.2	7.0	100
2. Dairy Products	7.7	7.4	7.4	8.3	8.2	9.1	8.2	8.0	8.1	8.6	9.5	9.5	100
3. Crop Sales and Government Payments	7.6	6.2	4.0	4.6	1.5	4.4	29.2	5.9	4.2	10.2	6.5	15.7	100
4. Egg Sales	7.6	6.9	8.3	7.8	6.6	6.5	6.3	9.2	8.7	11.3	9.8	11.0	100
5. Beef Sales	--	19.4	5.3	10.0	25.6	--	--	30.7	--	--	9.0	--	100
6. Hog Sales	2.8	9.1	8.7	14.2	9.2	11.5	6.2	4.5	8.2	6.9	10.7	8.0	100
7. Sheep Sales	--	18.0	--	50.6	9.3	12.7	--	3.3	--	--	6.1	--	100
8. Poultry Meat	0.7	21.3	11.1	--	12.1	10.4	6.8	12.0	17.1	1.7	6.8	--	100
9. Dividends and Refunds	3.4	13.5	3.7	0.5	5.8	5.1	5.7	1.3	23.3	19.4	13.2	5.1	100
10. Custom Work	--	3.7	0.3	1.9	5.1	15.2	19.2	7.1	14.7	7.1	19.6	6.1	100
11. Work Off Farm	8.3	10.7	7.5	7.9	8.4	7.1	7.0	8.7	8.1	6.5	8.9	11.0	100
12. Machinery Cash Sales	--	--	--	6.3	4.6	2.0	32.6	--	16.8	8.2	29.5	--	100
13. Miscellaneous	4.2	3.3	18.2	5.7	4.0	12.2	9.3	7.8	3.6	3.3	3.6	24.8	100

* Range of 96.2% confidence limits were within 2% on either side of median estimate.
** Nine of the thirteen items had too few farms with the expense to get an estimate.
*** Confidence limits for all figures were equal to or less than .8% on either side.

Dairy cattle sales varied a great deal during the year. Two months seemed to have large percentages of the sales. In May 12.9% of this income was received, and in September, 11.8% was received. The median estimate was high in these two months although not as high as the mean.

Dairy products income was very constant with a slight seasonal rise toward the end of the year. The median estimate and the mean percentages were within 0.2% of each other every month of the year. The confidence limits also were very narrow on either side of the estimate. It would appear that dairy farming does indeed provide a constant and reliable flow of income into the business.

Crop sales and government payments provided a fairly large proportion of the cash receipts on the sample farms. The largest part of this comes into the business in July with the harvest of wheat. The median estimate for July was 28.5% which was very close to the mean per cent of 29.2%. Less than one-third of the farms sold crops in other months. However, there was a large percentage of the total crop sales which occurred in September.

Egg sales are not very important as a source of income on dairy farms. Still, enough of the sample farms had this income to give estimates for the median farm other than zero. It appears that the median farm would be most apt to have egg sales from February to May though the mean per cents indicate that most of the money from this source came in from October to December.

Other sources were relatively unimportant as sources of income. Less than one-third of the sample farms received income from any one of these sources in any one month so that no median estimates were obtained other than zero.

Differences in Seasonality of Certain Expenses Due to Herd Size

As mentioned earlier in the chapter, a division of the sample based on herd size was made in hopes of getting more usable figures. There were some differences brought out by the division.

Hired labor expense appeared to be much more constant on the larger herd farms as indicated in Table 5. This may be due to many of the larger farms having labor in several months of the year. The smaller herd farms (Table 4) fluctuate more between months with the median estimate for August nearly double that of the larger herds. The seasonal nature of the expense appears in both sub-samples, though a greater seasonality is found on smaller herd farms.

In general, there is little difference between the two sub-samples in feed purchases expense. Large herd farms appear to have a greater proportion of this expense in February and smaller herds appear to have a little more in December. There is little in the way of a definite seasonal pattern in either group for this item of expense.

There are several differences between the two groups with respect to machinery repairs and maintenance expense.

TABLE 4

MONTHLY CASH EXPENSES FROM SELECTED SOURCES AS A PER CENT OF TOTAL ANNUAL EXPENSES FOR 19 CENTRAL MICHIGAN DAIRY FARMS WITH LESS THAN 23 COW HERDS IN 1955

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Median Estimates													
1. Hired Labor	0.8*	2.0	0.0	4.1	1.2*	5.4	7.3	15.4	4.1	5.0	3.0	0.8*	
2. Feed Purchases	6.0	6.5	9.1	6.5	4.2	7.0	7.6	6.0	6.4	7.7*	6.7*	11.9	
3. Machinery Repair and Maintenance	2.7	6.8	4.4	5.9	15.9	9.3	10.0	8.4	8.6	5.8	4.8	11.4	
4. Supplies	2.1	4.2	9.3	8.2	4.2	10.7	8.4	13.5	5.4	0.0	1.7*	3.4	
5. Breeding Fees	4.0	5.4	4.9	3.4	3.8	4.6	3.0	2.5	6.4	3.1	8.2	13.8	
6. Veterinary and Medicine	7.9	3.7	4.4	6.5	4.4	3.0	11.3	5.5	5.4	2.7	9.7	9.3	
7. Fuel and Oil Expense	4.2	5.4	6.2	7.1	10.0	6.3	13.5	6.3	7.1	5.5	7.0	7.1	
Mean Per Cents													
1. Hired Labor	8.0	9.5	7.2	11.8	6.4	10.8	12.8	8.8	10.2	6.0	5.2	3.3	100
2. Feed Purchases	6.2	5.6	9.6	7.4	5.3	9.5	9.1	7.0	9.8	8.1	9.9	12.6	100
3. Machinery Repair and Maintenance	4.3	8.4	4.1	7.0	15.1	9.5	10.4	8.5	8.0	7.0	5.0	12.7	100
4. Supplies	2.3	11.6	11.0	10.1	4.1	14.8	9.5	18.4	7.1	0.8	3.4	6.9	100
5. Breeding Fees	5.8	7.7	6.6	6.5	6.8	7.2	7.3	3.6	10.0	5.8	13.7	19.2	100
6. Veterinary and Medicine	11.4	9.5	7.0	9.0	6.0	6.7	10.6	6.9	7.4	5.7	9.6	10.3	100
7. Fuel and Oil Expense	3.9	5.3	7.2	8.5	10.6	9.0	13.3	9.5	10.1	7.1	7.3	8.3	100

*98.1% confidence limits are less than 2% on either side of median estimate.

TABLE 5

MONTHLY CASH EXPENSES FROM SELECTED SOURCES AS A PER CENT OF TOTAL ANNUAL EXPENSES FOR 21 CENTRAL MICHIGAN DAIRY FARMS WITH MORE THAN 23 COW HERDS IN 1955

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Median Estimates													
1. Hired Labor	4.5	4.3	3.7	5.5	4.6	7.6	5.2	7.8	5.4	3.8	3.0	3.6	
2. Feed Purchases	5.3*	9.2	9.5	9.1	3.5	6.2*	4.9*	6.1	6.1	6.3	7.6	8.2	
3. Machinery Repair and Maintenance	1.4*	4.6	4.0	6.8	8.7	12.7	10.8	8.4	6.7	7.7	6.8	5.8	
4. Supplies	3.5	1.5*	1.6	3.0	2.9	8.7	10.5	4.9	9.0	1.9*	7.7	3.5	
5. Breeding Fees	9.7	7.7	6.6	0.0	3.7	0.4*	1.6*	0.0	0.0	4.9	6.3	9.6	
6. Veterinary and Medicine	6.1	6.3	10.2	6.4	2.5	6.6	1.9*	7.5	8.5	5.8	8.5	10.2	
7. Fuel and Oil	3.3	4.6	6.1	8.9	10.3	7.6	10.7	12.1	7.2	9.2	4.7	4.1	
Mean Per Cents													
1. Hired Labor	6.9	7.5	7.7	9.7	9.1	10.3	12.0	10.3	8.4	7.1	5.2	5.8	100
2. Feed Purchases	6.7	11.2	11.0	9.2	5.6	8.3	6.8	6.5	5.7	7.7	10.2	11.2	100
3. Machinery Repair and Maintenance	2.5	5.6	6.3	7.6	9.3	12.5	11.8	9.5	8.7	9.9	9.9	6.4	100
4. Supplies	3.8	6.4	1.3	3.4	6.3	19.5	18.2	8.1	14.1	3.5	4.5	10.9	100
5. Breeding fees	14.0	10.6	12.7	5.0	7.9	4.6	2.6	1.4	1.8	7.5	13.3	18.5	100
6. Veterinary and Medicine	3.6	10.1	11.4	7.3	8.5	5.5	4.2	6.9	10.6	6.3	11.5	14.1	100
7. Fuel and Oil	3.5	5.1	8.0	8.2	11.4	9.1	10.8	12.2	9.5	9.5	6.5	6.2	100

*97.3% confidence limits are less than 2% on either side of median estimate.

The smaller herds had an average of 15.1% of the year's expense in May. The median estimate was also high with a figure of 15.9%. The larger herd farms had their highest month of expense in June when the mean was 12.5% and the median estimate was 12.7%. There was a large difference in December, also, when the smaller herd operators paid 12.6% of the year's expenses as opposed to 6.4% for the larger herd farms. The median estimate for December was 11.4% for the smaller herd farms. This may be due to the small herd operators paying bills in December rather than when the bills are incurred.

There were large differences between the two groups on months of high supplies expense. The smaller herd farms had large expenditures in February, March, June and August with the latter month accounting for 18.4% of the year's expense. On the larger herd farms, the large expenditures were in June, July, September, and December with June the month of largest proportional expense. The median estimate was higher for July than June on the larger herd farms. There was no indication in the data as to why a difference existed between the two divisions.

The larger herds had a more seasonal pattern of breeding fees expense than the smaller herds. There was a definite seasonal for large herds with the high expenses in the months from November through March. November and December were high months for the smaller herds, but more cows were bred in the late spring and summer months than in the

other group. The data would tend to indicate that the large herds were more uniform in breeding for later summer or early fall freshening whereas the smaller herd operators were more varied in their production pattern.

There were some differences in veterinary and medicine expenses between the two groups. The small herd farms had a more seasonal pattern than the larger herds in that the expenses were high from November through February. July was the month of high expense in the summer. The winter months were high on the larger herds too, except that the January figure was quite low. The December and March expenses were considerably higher for larger herds than for the smaller ones.

Fuel and oil expense had a strong seasonal pattern for both groups. This was indicated more by the mean figures than the median estimate for both groups. July was the month of highest expense for the smaller herds as indicated by both the median and mean. The large herds had the highest expense in August rather than July. There is reason to doubt whether the differences in this expense item were significant. There may have been an influence from the smaller herd operators paying bills at different times than the larger operators, or the differences may be random differences.

CHAPTER IV

PERCENTAGE OF THE MONTHLY INCOME OR EXPENSE ACCOUNTED FOR BY EACH ITEM

Introduction

Chapter III described the seasonal variation of selected individual items over a twelve month period. This chapter will include an analysis month by month of the various items making up the month's expenses or income. This will also deal with seasonality by showing the changing percentage that any one item is of the total in various months.

Again as in the previous chapter, the statistic of interest will be the median and its appropriate confidence interval. Using this statistic for a sample of forty farms, one can have 96.2% confidence that the median farm will fall between the 14th and 27th observations when the observations are ranked from highest to lowest. Thus the 14th and 27th observations in each category are the upper and lower estimates respectively, between which the universe median should fall 96.2% of the time.

It is assumed, for purposes of planning, that it is usually more difficult to use a range than an individual number. For this reason, a mid-point between the 14th and 27th observations has been taken as the one most appropriate figure. This mid-point is used as an estimate of the median

farm and for each such estimate in the chapter, there can be found a table in the appendix with the appropriate confidence interval for that estimate of the median. For those who might prefer to lay plans on a range of possible outcomes, Tables F and G in the Appendix have the confidence intervals for the data presented in this chapter.

Even though the median is of chief interest, the mean will also be shown. The mean can aid in the description of the farms and in comparing with the median figures. In many cases the mean percentages indicate the same trend as the median thus tending to bear out the median estimates.

Tables 6 and 7 indicate the changing relative importance of the various items in the twelve months of the year. The median estimates in Table 6 tend to leave a large proportion of each month's expenses unaccounted for. The one exception is in April when the median estimates total 100.2%. This tendency exists largely because the same farm will probably not be the median farm for more than a few items or months and the largest percentages are ruled out by the median.

Seasonality of Expenses

Taxes and feed purchases are indicated as the two important expenses in January. The median estimate of 15.7% for feed purchases was the largest single item while taxes were estimated at 12.0%. The confidence interval for taxes was very wide, however, as shown by Table F in the Appendix.

TABLE 6

THE MEDIAN ESTIMATE OF EACH CASH EXPENSE AS A PER CENT OF THE MONTHLY CASH EXPENSES FOR 40 CENTRAL MICHIGAN DIARY FARMS IN 1955

Expense	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Hired Labor	0.7*	2.7	1.0*	4.0	2.5	4.7	5.6	5.6	2.2	1.4*	0.9*	0.6*
Feed Purchases	15.7	21.9	24.8	15.3	11.1	14.0	13.7	14.0	12.4	18.5	20.4	18.4
Seeds and Plants	0.0	0.0	1.6*	9.0	9.0	4.9	0.8*	0.0	2.9	0.0	0.0	0.0
Machine Hire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9*	0.0	0.0	1.4*	0.0
Supplies	0.3	0.4	0.4*	0.3	0.2*	1.4*	1.1*	1.0*	1.0*	0.0	0.4*	0.4*
Machinery, Repairs and Maintenance	1.9*	6.2	5.6	5.7	10.4	10.4	10.0	8.7	7.5	7.8	6.9	7.4
Improvements	0.0	0.0	0.1*	0.6*	0.0	0.8*	1.7*	1.9*	0.3*	0.9*	0.4*	0.0
Breeding Fees	1.1*	1.7*	1.1*	0.5*	0.5*	0.7*	0.2*	0.0	0.2*	0.2*	1.0*	1.9*
Fertilizers and Lime	0.0	0.0	0.0	13.0	10.9	5.4	5.4	1.0*	11.5	5.7	0.0	0.0
Veterinary and Medicine	1.8*	1.6*	1.5*	0.9*	0.5*	0.9*	0.5*	1.1*	1.4*	1.1*	1.5*	1.9*
Other Livestock Expense	2.0*	1.6*	1.0*	0.9*	1.1*	0.8*	1.0*	1.9*	1.1*	1.2*	1.3*	1.2*
Fuel and Oil	6.3	8.0	12.2	11.8	14.8	12.6	18.0	17.3	13.2	15.4	6.6	5.1
Taxes	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	1.0*
Interest	1.1*	0.0	0.0	0.0	0.3*	0.0	0.0	0.0	0.4*	0.0	1.2*	0.6*
Electricity	4.1*	5.0*	3.7*	3.4*	2.3*	3.1*	2.5*	3.3*	2.8*	3.3*	2.8*	2.6*
Telephone	0.6*	0.4*	0.7*	0.7*	0.4*	0.2*	0.6*	0.4*	0.3*	0.7*	0.3*	0.4*
Rent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Auto Upkeep	1.6*	2.3*	1.0*	0.4*	0.5*	0.9*	0.8*	1.3*	0.9*	0.5*	2.1*	0.3*
Other Expenses	1.1*	0.7*	0.5*	0.3*	0.2*	0.5*	0.2*	0.4*	0.3*	0.8*	0.5*	1.0*
Unaccounted For	49.7	47.5	44.8	**	35.3	38.7	38.2	41.2	42.0	42.5	48.4	57.2
Total	100	100	100	100	100	100	100	100	100	100	100	100

*96.2% confidence limits within 2% on either side of the median estimate.
**Indicates that total median estimates were over 100%

TABLE 7

THE MEAN FROM EACH CASH EXPENSE ITEM EXPRESSED AS A PER CENT OF THE MONTHLY CASH EXPENSES FOR 40 CENTRAL MICHIGAN DAIRY FARMS IN 1955

Expense	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr's. Avg.
Hired Labor	10.3	12.0	10.3	9.5	8.9	10.8	12.6	12.7	10.0	8.8	5.8	5.8	9.7
Feed Purchases	18.1	26.9	27.1	15.4	10.7	17.1	15.0	16.0	15.4	19.1	21.5	23.6	18.4
Seeds and Plants	1.2	1.5	7.7	11.5	11.3	5.9	3.8	1.9	5.6	2.4	1.1	0.5	4.8
Machine Hire	0.2	0.9	0.6	0.7	0.1	2.8	3.4	5.5	5.0	3.7	6.0	3.4	2.8
Supplies	0.9	2.1	0.9	0.9	1.1	3.4	3.0	2.5	2.6	0.6	0.9	1.9	1.8
Machinery Repair and Maintenance	4.2	9.2	7.1	6.5	10.6	11.2	11.0	10.8	9.1	10.7	8.8	8.2	9.0
Improvements	0.6	0.9	2.6	2.5	1.8	1.8	8.0	4.8	2.9	3.2	4.3	1.1	2.9
Breeding Fees	1.8	1.7	1.6	0.7	0.9	0.8	0.7	0.4	0.9	1.1	1.9	2.5	1.2
Fertilizers and Lime	10.0	1.8	7.9	25.0	21.2	15.5	11.8	6.9	16.4	15.8	3.6	6.4	12.5
Veterinary and Medicine	2.0	3.4	3.1	1.7	1.8	1.4	1.4	2.0	2.5	1.8	2.8	3.1	2.2
Other Livestock Expense	2.1	1.9	2.2	1.4	1.7	1.6	1.4	2.3	1.8	1.7	1.9	2.0	1.8
Fuel and Oil	7.1	10.7	14.1	10.6	15.4	12.6	16.4	19.0	15.1	15.0	10.3	9.9	13.1
Taxes	23.8	10.9	0.2	1.8	0.9	0.0	0.0	0.0	0.0	0.0	3.6	12.2	4.0
Insurance	1.4	0.9	0.5	2.4	0.6	1.6	0.6	0.7	1.7	3.0	5.8	3.5	1.9
Interest	3.8	2.2	4.4	2.6	5.7	5.7	2.3	3.1	3.5	3.2	11.6	4.7	4.5
Electricity	3.9	4.1	3.3	2.7	2.4	2.6	2.4	3.2	2.7	3.2	2.6	2.9	2.9
Telephone	1.0	0.7	0.8	0.6	0.7	0.4	0.7	0.6	0.4	0.7	0.6	0.8	0.7
ent	2.8	2.6	0.7	0.5	0.8	1.2	1.8	1.7	1.5	2.5	1.0	3.9	1.7
to Upkeep	3.2	4.3	3.3	1.7	2.1	2.3	2.7	4.1	2.3	1.5	4.7	1.7	2.7
her Expense	1.7	1.2	1.5	1.5	1.5	1.2	0.9	1.5	0.6	1.9	1.3	2.0	1.4
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

The mean per cents in Table 7 showed that for the whole sample 23.8% of the January expenses were for taxes. Feed was next with 18.1%.

There are several differences between Tables 6 and 7. Hired labor was a minor expense as shown by the median estimate. The mean percentage indicates that it was a rather important expense in January. Several farms with full time men would tend to give a disparity in the tables. The fertilizer expense was of a similar nature. Table F indicates that more than two-thirds of the farms had no fertilizer purchases, yet the mean percentage for the total sample was 10.0% for this expense in the month.

Feed expense became even more important percentage-wise in February. The median estimate was over one-fifth of the month's expense while the mean amount was actually 26.9%.

The median estimate indicated fuel and oil and machinery repairs as the next largest expenses for the month of February. The mean percentages in Table 7 tend to bear this out. Taxes and hired labor are also important when all the sample is put together to get averages.

Electricity and auto upkeep seemed to be of relatively more importance in the second month among the minor items of expense.

In March, feed purchases were the largest per cent of the month's expenses of any month in the year. The median estimate was 24.8% while the mean percentage for all sample farms was but 2.3% larger.

Fuel and oil expense continued to rise with a 12.2% median estimate for March. The mean percentage also rose. Machinery repairs decreased slightly in relative importance in March.

Table 7 indicates that some of the farms were preparing for the spring planting with early purchases of seeds, plants, and fertilizer. The mean percentages for several of the minor items of expense such as auto upkeep, and the livestock expenses were relatively important in the first three months of the year. There was little indication, however, that this relationship was necessarily true for the median farm.

Taxes, insurance, and machine hire were relatively unimportant in March.

The planting expenses became important in April. Table 7 showed that 25% of the April expenses for all sample farms was for fertilizer while 11.5% of the month's expenses went toward seeds and plants. The median estimate tended to eliminate the weight of the very large purchases to give an estimate of 13.0% for fertilizer and 9.0% for seeds. The confidence interval for the two expenses was wide apart, however.

Feed purchases while relatively less important in April than in March, were still a major item of expense. Both tables indicated slightly over 15% of the month's expense would be for feed.

Machinery repairs and fuel and oil expense remained at about the same relative importance in April. The median estimate for labor rose to 4% as some extra labor may have been needed on more farms to help with planting.

In May, the fuel and oil expense is the largest expense according to Table 6. Both tables indicate that approximately 15% of the May expense is for fuel and oil. The mean per cent for fertilizer and lime expense was larger than for fuel and oil. The median estimate for fertilizer and lime was 10.9% of the May expenditure.

Feed purchases were an important expenditure in the month with over 10% of the month's expenses. Machinery repairs were also important in the month and the two tables indicated about 10.5% of the month's expenses for this item. The machinery repair expense as well as the fuel and oil expense was the largest yet for either item in May.

Seeds and plants were still a fairly important expense with a median estimate of 9.0%. Interest expense was relatively more important than the previous month as shown by Table 7.

In June, the median estimates show feed purchases, machinery repairs and maintenance expense, and fuel and oil purchases as the three largest items of expense. Feed purchases had a median estimate of 14.0%. Machinery repairs remained at 10.4% which was the high percentage for the year. Fuel and oil expense dropped slightly percentagewise to 12.6% of the month's expenses. Table 7 also indicated

that the three above mentioned expenses were important although the per cents were different. In addition, the total sample spent 15.5% of its June expense money for fertilizer and lime.

Supplies were relatively more important in June than in previous months. The median estimate was 1.4% of the month's expenses while the average for all the sample farms was 3.4% of the month's expenses.

Hired labor was relatively more important in June than in previous months according to the median estimate. The planting expenses were still taking some of the June expense money.

Fuel and oil was the largest single item in the July expenses. The median estimate was 18.0% of the month's expenses. On the sample farms, the mean percentage was 16.4% of the expense.

Feed purchases were relatively low in July but were still an important item of expense with a median estimate of 13.7% and a mean of 15.0%.

Machinery repairs and maintenance expense was estimated at 10% for the median farm. The comparable mean per cent was 11%.

Hired labor was a more important part of the July expense than in previous months. The median estimate of 5.6% was the largest of any preceding month but was still considerably below the 12.6% average for all farms.

Table 7 indicates that a fairly large percentage of the month's expenses went for improvement repairs and maintenance on the sample farms. The 8% figure is a larger proportion of the month's expense than any other month though the median estimate indicates August as a month of high improvement expenses.

In August, fuel and oil expense was still the largest item of expense. The median estimate of 17.3% was slightly under the July estimate, but the mean per cent from the whole sample of 19% was the largest proportion that fuel and oil was of any month's expense in the year.

Feed purchases were a lesser proportion of the month's expense than in the winter months, but it was still a large item of expense with an estimate of 14% for the median farm.

Labor expense was at its seasonal high in August as shown by both tables. This was also brought out in Chapter III under the other approach. The median estimate was 5.6% of the month's expense for labor. Actually, of the expense on all forty farms, the labor was 12.7% of the months expense.

Machinery repairs dropped slightly but still remained an important item of expense as shown by the estimate of 8.7% for the median farm.

Of the minor items, machine hire expense and auto upkeep were relatively high. While this is shown slightly by the median estimate, the mean per cents in Table 7 tend to emphasize it more. Machine hire was 5.5% and auto upkeep 4.1% of the month's expense.

September shows the planting expenses rising rather sharply again. The median estimate for fertilizer and lime rose to 11.5% while seeds and plants went up to 2.9%. The mean for fertilizer and lime was 16.4% while seeds and plants were 5.6% of the month's expenses.

Fuel and oil was still an important item in September. The median estimate of 13.2% was fairly close to the actual mean of 15.1%. Machinery repairs and maintenance continued to parallel fuel and oil expense as it dropped slightly but still remained an important item of expense in the month.

Feed purchases were at the fall low in September with a median estimate of 12.4%. Even at a low, however, feed is an important part of the monthly expense on dairy farms.

Machine hire expense was 5% of the month's expenses for all farms thus indicating September as a fairly important month for machine hire expenses.

In October, the two large expenses indicated by the median estimates are feed purchases and fuel and oil. The estimates for these two were 18.5% and 15.4% respectively. The corresponding mean per cents for the two items were 19.1% and 15.0%, both very close.

Machinery repairs and maintenance expense was the third largest as shown by the median estimate of 7.8%. This estimate was below the average of 10.7 for the whole sample.

Table 7 indicated that fertilizer expense accounted for a large share of the month's expenses on the forty farms.

November's one large item of expense was feed. The item amounted to over one-fifth of the month's expense for all farms and the estimate for median farms was just about one-fifth of the month's expense.

Machinery repairs and fuel and oil expense dropped considerably from the previous month. The estimates for the median farm were 6.9% and 6.6% respectively. In both cases the mean per cents were higher.

Interest expense became more important in November. While the median estimate of 1.2% was relatively unimportant, the mean per cent of 11.6% made it a major item of expense when considering all farms.

Several of the smaller items of expense might be noted. Machine hire expense was at its highest for the year as shown by both tables. Insurance payments were a larger portion of this month's expense than any month in the year. Auto upkeep was more important relatively in November than in any other month.

Machinery repairs and fuel and oil expense were the two next largest items with a median estimate of 7.4% and 5.1% respectively.

The mean per cents indicated that while less than one-third of the farmers paid taxes in December, those who did, paid 12.2% of the total month's expenses for that item.

Insurance, rent, and the livestock expenses were proportionally more important in December than in other months as shown by Table 7.

Seasonality of Income

Table 8 gives the median estimates for four sources of income and the mean percentages from all sources. Only the four sources were included in the table with median estimates since the estimates for all other sources were zero.

The estimate for median farm indicates that dairy cattle sales income would likely be an important part of the monthly income in January, March, and September. In July, the income from this source is a very small part of the month's income. The mean for all farms tends to bear out the relationship above with one exception. In February, the median estimate was 4.1% while the sample mean showed 11.2% of the month's income from this source. Evidently a few farms made large sales which did not affect the median estimate.

Dairy product sales were the important source of income throughout the year. With the approach used in this chapter, the results are a much less constant proportion of the month's income than in the Chapter III approach where the item was very steady month after month. The confidence interval was quite wide also for the per cents in Table 8 as shown by Table G in the Appendix.

April was indicated as the month when dairy products were the largest proportion of the month's income, and July was indicated as the month when this source was smallest

TABLE 8

THE IMPORTANCE OF THE VARIOUS INCOME ITEMS IN EACH MONTH EXPRESSES AS A PER CENT OF THE MONTHLY INCOME FOR 40 CENTRAL MICHIGAN DAIRY FARMS IN 1955

Source	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr's. Avg.
Median Estimate													
Dairy Cattle Sales	8.3	4.1	11.4	1.9	2.3	1.8*	1.2*	3.5	8.2	4.3	5.7	4.8	
Dairy Product Sales	75.9	78.8	63.1	84.7	77.8	75.1	57.7	68.6	68.6	69.7	74.9	73.1	
Egg Sales	0.0	0.0	0.0	0.4*	0.2*	0.0	0.0	0.4*	0.0	0.0	0.0	0.0	
Crop Sales	0.0	0.0	0.0	0.0	0.0	0.0	19.5	0.0	0.0	0.0	0.0	0.0	
Mean Percentages													
Dairy Cattle Sales	11.6	11.2	15.3	7.3	7.9	8.0	4.9	7.4	13.0	9.8	7.1	6.2	8.9
Dairy Product Sales	68.4	62.9	63.7	68.0	74.0	69.6	51.5	69.7	64.7	64.0	67.8	61.9	65.1
Egg Sales	2.4	2.1	2.5	2.3	2.1	1.8	1.4	2.9	2.5	3.0	2.5	2.5	2.3
Crop Sales	12.2	9.5	6.3	6.8	2.5	6.1	32.9	9.4	6.1	13.8	8.4	18.5	11.8
Beef Sales	--	0.9	0.3	0.5	1.3	--	--	1.6	--	--	0.4	--	0.4
Hog Sales	1.8	5.6	5.5	8.5	6.0	6.4	2.8	2.9	4.8	3.7	5.6	3.8	4.7
Sheep Sales	--	1.2	--	3.2	0.7	0.8	--	0.2	--	--	0.3	--	0.5
Poultry Meat	--	0.7	0.4	--	0.4	0.3	0.2	0.4	0.5	0.1	0.2	--	0.2
Dividends and Refunds	0.5	1.7	0.5	0.1	0.8	0.6	0.5	0.2	2.8	2.2	1.4	0.5	1.0
Machine Work	--	0.7	0.1	0.3	1.0	2.6	2.7	1.4	2.7	1.2	3.2	0.9	1.5
Work Off Farm	2.3	2.9	2.0	2.0	2.4	1.7	1.4	2.4	2.0	1.5	2.0	2.2	2.0
Machinery-- Cash Sales	--	--	--	0.1	0.1	0.1	0.5	--	0.3	0.2	0.5	--	0.2
Miscellaneous	0.8	0.6	3.4	1.0	0.8	2.0	1.2	1.5	0.6	0.5	0.6	3.5	1.4
Total Mean	100	100	100	100	100	100	100	100	100	100	100	100	100

*96.2% confidence limits within 2% on either side of median estimate.

percentagewise. The average of all farms indicated that May, not April had the largest proportion of income from this source. In general the median estimate was higher than the mean percentage since it tends to disregard the several farmers who had income from other sources.

Crop sales and government payments were the second largest source of income for the sample farms on the average. It was 11.8% of the year's income. The only month with a median estimate was July. Table G, in the Appendix, shows that the confidence limit went as high as 39.1% so that the 19.5% estimate may be rather inaccurate. Less than one-third of the farms had income from this source in other months. The mean percentages indicate that of the forty farms, there were some farms with income from this source in each month.

Although egg sales income is relatively unimportant percentagewise, there were enough of the farms with this income to get median estimates greater than zero. There were more than one-third of the farms with income from this source in April, May, and August.

While other sources were not important enough to get median estimates of more than zero, the mean percentages in the lower portion of Table 8 serve to give some indication of the relative importance of certain sources in the various months. When one considers that less than two-thirds of the farms had these sources of income, it is very possible that some of these sources may have been much more important on individual farms.

In concluding this chapter, there are one or two things that may need to be said. First, the approach used in this chapter was in the author's opinion less useful than the Chapter III or Chapter V approach largely due to the wide confidence intervals and the small proportion of each month's expenses or income accounted for by the median estimate. While this approach is of some importance in showing the major items of expense for a month, it is open to a large degree of error.

Secondly, it is difficult to see the applications of the chapter when such a large proportion of the month's expenses are unaccounted for. It may be difficult to see how the median estimate is worthwhile in such cases. It should be noted first that the median estimate will always disregard the extremely high or extremely low percentages. Next, it should be noted that the median estimate was presented as the <u>one</u> most applicable figure for planning. The 96.2% confidence interval was in many cases double the median estimate so that one would need to consider the confidence intervals in the appendix also when planning. Thirdly, in trying to plan a farm that might approach the median farm, one needs to realize that the farm may not be in the confidence interval for <u>all</u> items. Thus a knowledge of the farm is important in using any percentages found in this study.

CHAPTER V

MONTHLY VARIATION OF TOTAL EXPENSES AND INCOME

Introduction

There remains one important approach. That is to analyze the variation in the total expenses and income each month. This approach will be followed in this chapter.

The two previous chapters have supplied information first on monthly variation of individual items and secondly on the changing relative importance of the various items in each month. The approach of the present chapter in analyzing the total month's expense and income is important to farm planners and managers in balancing the flow of expense--primarily of the farm but also perhaps of living expenses--against the flow of income in each month.

The same statistical analysis will be used in this chapter as in Chapters III and IV. To review a moment, the statistic is the median with confidence limits for it. When the items from a sample of forty are arranged from highest to lowest, the median of the population can be expected to fall between the 14th and 27th observations from the top 96.2% of the time. For descriptive purposes these two observations divide the sample into thirds.

When dividing the sample into large herds and small herds, the median farm of large herds could be expected to fall between the 6th and 16th observations from the top 97.3% of the time. With the small herd sample, the median farm could be expected to fall between the 5th and 15th observations from the top 98.1% of the time.

The tables are arranged similar to those in previous chapters. The median estimate is the sum of the two confidence limits divided by two. It is intended as the starting point for purposes of application. Mean percentages are included also for description and comparison.

Seasonality of Total Monthly Expenses and Income

Table 9 indicates that there is a definite seasonal nature to the flow of total expenses. Income, however, has a more constant pattern with the exception of July and the last few months of the year. If one keeps in mind that there would be 8.3% of the expenses and income in each month if there were no monthly fluctuations, it appears that in the first three months of the year expenses are at a relatively low figure. From April through July, the mean expenses run at a seasonal high with April being the month of highest expenses in the year. From August through October, expenses are average or just below, and then in the last month the expenses are again on the high side.

Income had slightly less seasonality than expenses. In the first five months of the year, mean income was below

TABLE 9

THE FLOW OF ALL INCOME AND ALL EXPENSES IN EACH MONTH SHOWN AS A PER CENT OF TOTAL ANNUAL INCOME AND EXPENSES FOR 40 CENTRAL MICHIGAN DAIRY FARMS IN 1955

Sample		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Expenses													
All Farms	Median Estimate	6.5	5.9	6.4	10.0	8.1	8.5	8.1	8.0	7.9	7.5	7.9	9.5
	Mean	6.7	6.3	7.2	10.3	9.5	9.3	9.3	7.7	8.4	7.6	8.6	9.1
19 Small Herds	Median Estimate	6.7	5.7	6.2	10.1	8.5	8.7	9.0	8.2	8.6	7.7	7.8	9.7
	Mean	7.6	5.5	5.9	9.6	9.0	9.3	10.3	7.6	9.0	7.4	9.2	9.6
21 Large Herds	Median Estimate	6.1	6.1	7.3	10.0	8.5	8.1	8.1	7.5	7.7	6.8	8.5	7.9
	Mean	6.2	6.8	7.8	10.7	9.7	9.4	8.7	7.7	8.1	7.7	8.3	8.9
Income													
All Farms	Median Estimate	7.0	6.3	7.3	6.6	6.9	8.2	9.4	7.2	7.9	8.2	8.6	9.0
	Mean	7.3	7.6	7.5	8.0	7.2	8.5	10.4	7.4	8.1	8.7	9.1	10.0
19 Small Herds	Median Estimate	6.9	6.2	7.6	6.8	7.1	8.3	10.0	7.6	9.7	8.7	8.7	9.4
	Mean	6.9	6.3	8.0	7.3	7.0	8.1	11.5	7.7	9.8	8.6	8.7	10.1
21 Large Herds	Median Estimate	7.0	6.8	7.8	7.0	6.9	8.6	10.1	7.3	7.2	8.6	8.8	8.6
	Mean	7.6	8.3	7.3	8.3	7.4	8.7	9.9	7.3	7.2	8.8	9.3	9.9

average. June and July were months of higher income proportionately, with July the month of highest income for the year. Crop sales probably account in large part for the high income in the month. The last five months exhibit a constant seasonal rise from 7.4% in August to 10% in December. One could assume from information in Chapter III that this late seasonal rise results from the seasonal nature of dairy products income at this time of year.

The estimate of the median bears out the mean relationship except that in general it tends to even out the differences. The figures indicate that in the months of April, May, and June, the median farm could expect to have a higher proportion of the year's expenses occurring than the proportion of the year's income coming into the business. The median estimate indicates that December is also a month when expenses are high relative to income. The mean percentages did not indicate that this was so.

The sample was again divided into large herds and small herds to see if there were differences between them. In general, there was little difference between the large and small herds. The confidence limits were slightly wider in most cases as would be expected. Table 9 also shows the results of the herd size divisions.

The median estimates indicated that the smaller herds tended to be more variable percentagewise both with respect to income and expenses. The confidence limits are wider apart in many months as shown by Table H in the Appendix.

The upper limits tend to be higher and the lower limits lower for the small herds than for large herds. One-third of the small herds had 13.6% or more of the year's expense in April. The corresponding figure for large herds was 12.2%. They did agree, however, in that April was the month of greatest expense for both divisions.

The median estimate is quite similar for the two divisions and for all farms. The notable exception with respect to expenses is the December percentage of total expense for large herds. The 7.9% figure is considerably below either the small herd division or the all farm percentage. The median estimate for income exhibited little of a seasonal pattern except in July when both divisions showed an estimate of about ten per cent.

The mean figures show more of a seasonal pattern than the median estimate. On the expense side, both tables indicate a seasonal nature with the high in the late spring and early summer months. September and December are also months of high expenses.

Income appeared to be more constant on the large herd farms than on the smaller herd farms. The small herds had a smaller proportion of the year's income in the early months of the year and a larger proportion in July, September, and December than the large herds. The upper confidence limit on the median (Table H in Appendix) brought this out especially well as shown by the 14.5, 12.4, and 13.7 percentage figures for the three months respectively.

Per Cent of Each Month's Income Needed for Expenses

For purposes of application the preceding information was developed into three graphs to show the proportion of each month's income flow needed to pay the expenses for that month. This again shows a seasonal nature and indicates several months in which large proportions of the income are needed for expenses, and other months when relatively small proportions of the income are needed for expenses.

The percentage figures were obtained by multiplying the monthly expense percentages by the annual total expense to get an absolute amount. Then the income percentages for each month were multiplied by the total annual income to get another absolute amount. Each month's income figure was then divided into the expense for the corresponding month to get the percentage of each month's income needed for expenses in that month.

The mean figures indicate that close to two-thirds of the April and May income went to pay expenses in the two months. In June, slightly over 55% of the month's income went towards expenses. February, July, and October were months in which less than forty-five per cent of the income was used to cover expenses. The median estimate percentages generally follow the mean. The most notable exception was in April when the median estimate indicated that 76.2% of the month's income would be needed for the month's

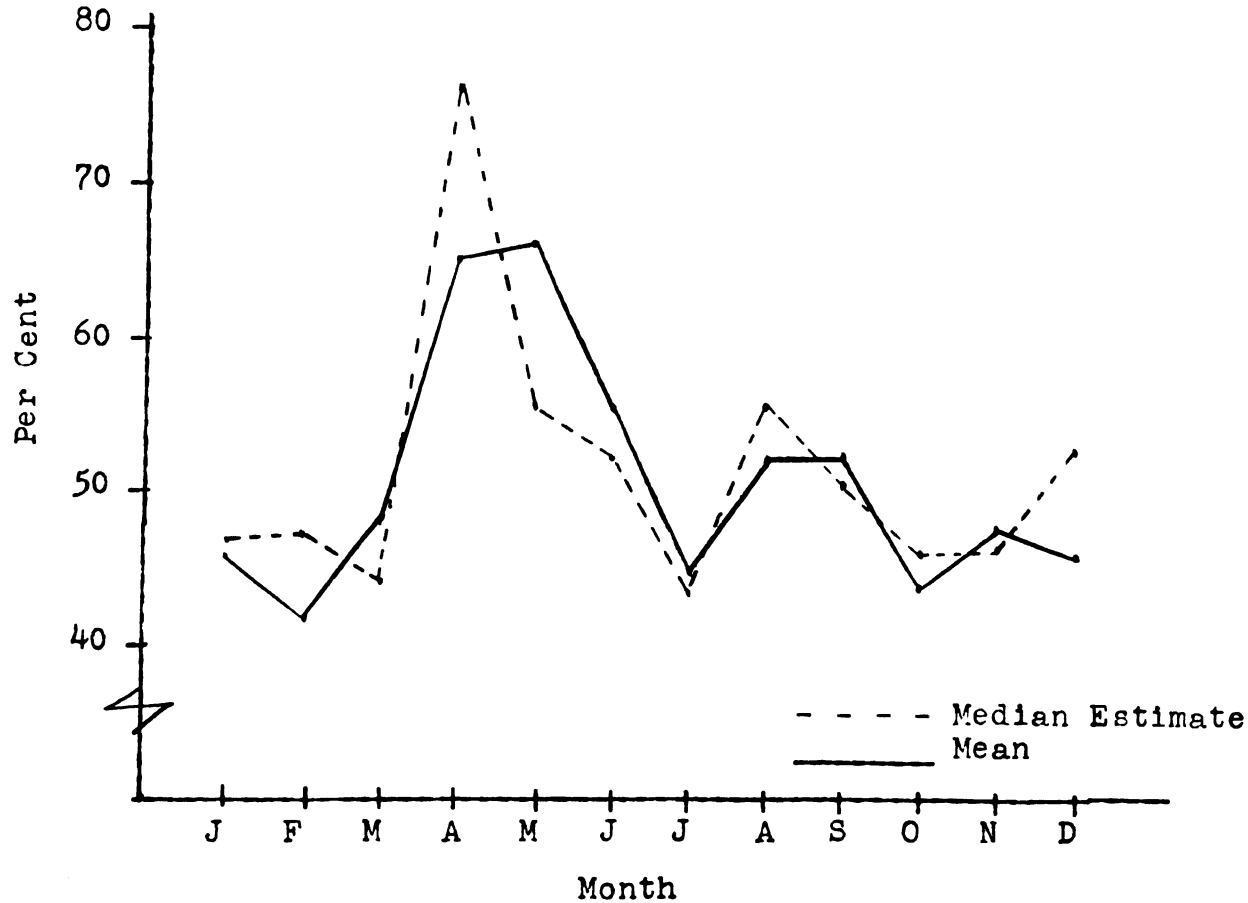

Fig. 2. The Proportion of Each Month's Income Needed for that Month's Expenses Expressed as a Percentage for 40 Central Michigan Dairy Farms for 1955

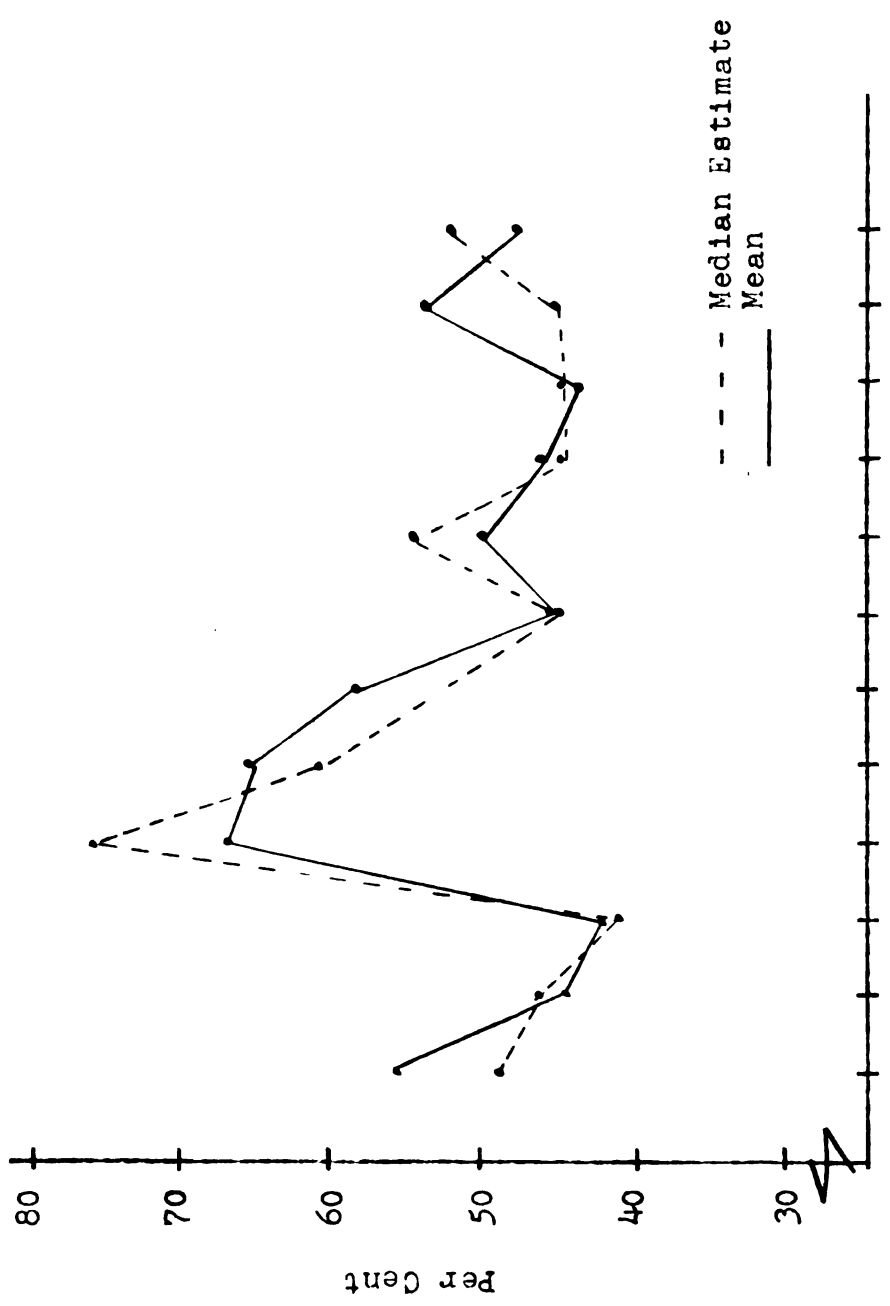

Fig. 3. The Proportion of Each Month's Income Needed for that Month's Expenses Expressed as a Percentage for 19 Central Michigan Dairy Farms with Herds of Less than 23 Cows in 1955

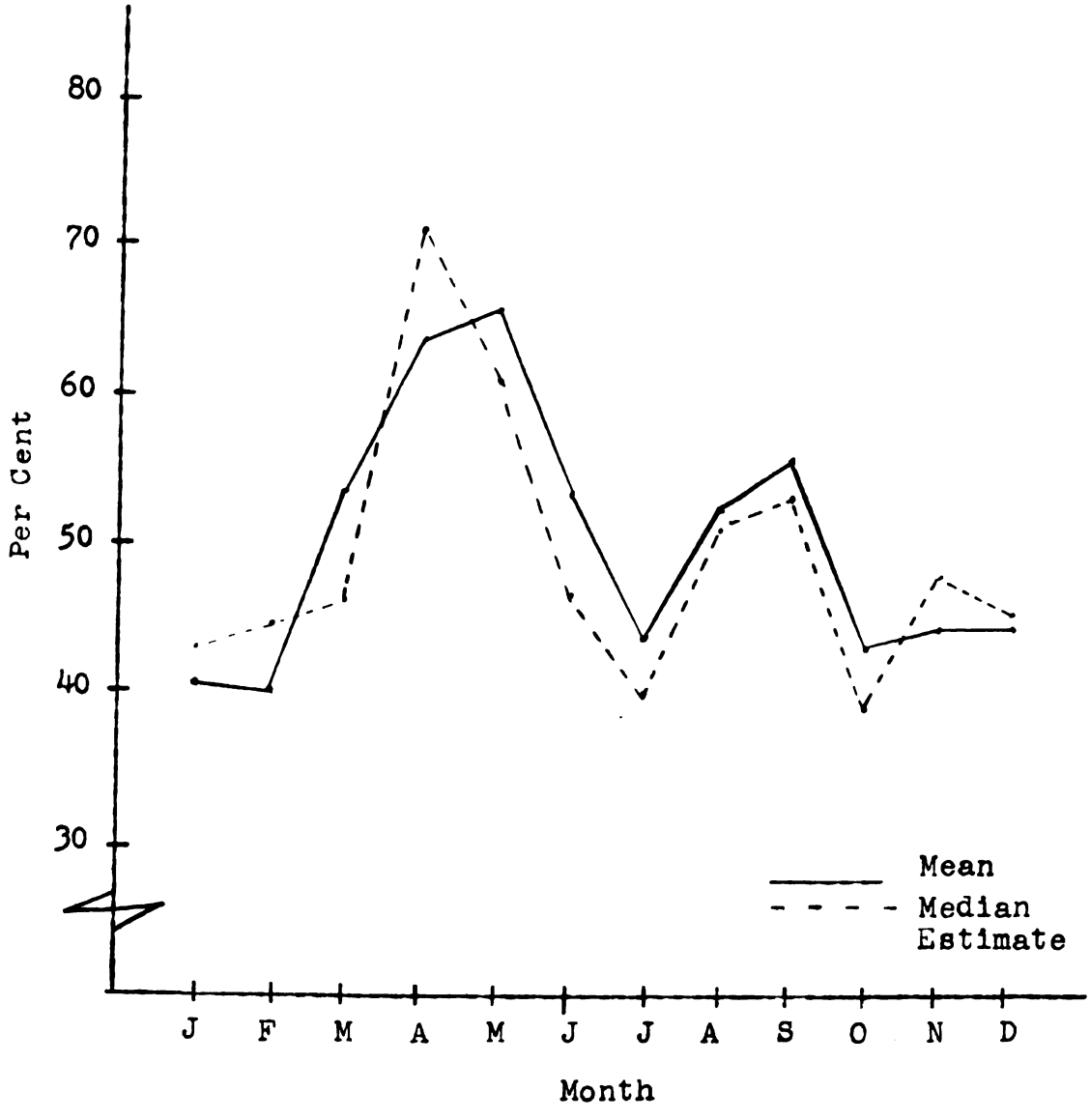

Fig. 4. The Proportion of Each Month's Income Needed for that Month's Expenses Expressed as a Percentage for 21 Central Michigan Dairy Farms with Herds of 23 or More Cows in 1955

expenses. In May, the median estimate dropped to 55% while the mean figures indicated 66%.

Dividing the sample into larger herds and smaller herds, some interesting differences come to light. The smaller herd farms used a considerably larger proportion of the January income for expenses than the larger herd farms. In September, the reverse was true; the larger herd farms had almost ten per cent more of the month's income going to pay expenses than did the farms with the smaller herds.

The median estimate closely approximates the mean in most months. In general, this estimate tends to rule out the unusually large or small percentages that influence the mean. It may be significant to note that this estimate is considerably higher than the mean in April thus indicating in both larger and smaller herd farms that the proportion of April income needed for expenses may be closer to three-fourths than two-thirds. Likewise, when the unusually large May expenditures are ruled out by this statistic, it would seem to indicate that three-fifths is a more accurate estimate of the May income needed for expenses than the two-thirds indicated by the mean.

Assume that a farmer plans to have a constant flow of cash income for his farm expenses and living costs in each month. In this respect, the foregoing figures are especially significant. For they indicate that in April, May, and perhaps June, there might need to be additional income from savings or other sources. February, March and

the late months of the year have low proportions of the income needed for expenses, so that savings might be made in these months.

From the credit standpoint or extension standpoint, the graphs indicate that smaller herd operators will be most apt to have additional funds for purchases or repayment of loans in the months of February, March, July, September, or October. March, July, and October appear particularly appropriate since they are months of near average or above average income in addition to having a smaller proportion of the income needed for expenses.

With large herd operators, it appears that the five months from October through February and the month of July are the time of low expense in proportion to income. July, October, November, and December would seem to be the most likely months for additional purchases or repayment of loans since more than the average income is received in each of those months.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Purpose and Approach of the Study

The study concerned itself with the problem of risk and uncertainty in the farm business. More specifically, it was concerned with the monthly flow of income and expenses into and out of the business. By analyzing the monthly flow pattern of income and expenses, it was hoped that uncertainty concerning the financial aspect of the dairy farm business could be reduced.

A differentiation was made between risk and uncertainty. Risk was defined as a situation which could be reduced to a probability status. Uncertainty cannot be reduced to a probability status since either there are not enough numbers available, or the interested person does not have enough experience with the situation to calculate a probability.

Such was believed to be the case with the financial flow pattern of the farm business. While many farmers do understand the financial seasonality of their business, others may not. However, many other people who deal with farmers were enough unaware of the exact nature of the

financial seasonality, that there was a need for work which would indicate if a definite pattern existed, and if so, what that pattern was. Among those other than farmers for whom more information was needed were extension workers, farm credit people, farm planners, and teachers of farm management.

With this need in mind, the three main objectives of the study were:

1. To determine the extent to which a definite and reliable monthly variation in certain income and expense items exists on a sample of forty central Michigan dairy farms.

2. To attempt to reduce short run risk and uncertainty associated with income flow and expense flow by presenting a description of income and expense flow.

3. To suggest ways farmers might plan their financial practices to take advantage of the seasonality of farming.

The prime hypothesis of the study was that many of the farm expenses were seasonal in nature. If the seasonality pattern were rather definite, it could be used advantageously in more effective farm planning.

A review of literature indicated that little--if any--previous work of this type had been undertaken. Practically all previous work in farm accounts were on an annual basis. Some work had been done on income variation, but this had taken the form of enterprise combination rather

than seasonality analysis. In regard to the area of risk and uncertainty, work has only begun.

The sample was selected from the farms in the Mail-In accounting project originally started at Michigan State University in January, 1955. There were forty farms that met the dairy farm definition with more than fifty per cent of their income from the sale of dairy products and dairy cattle. All of the farms are in Ingham and Jackson Counties. A comparison of the sample farms with the farms in the "regular" Michigan State University account project in the same area showed the two samples to be similar in most respects.

The main statistic used in the analysis was the median. This statistic was chosen for several reasons. For results that might be useful in planning, it seemed that some measure of central tendency was needed. The selection of the sample was voluntary rather than by chance. Thus an assumption of a normal distribution of farms was difficult to justify. As confidence limits for the mean need an assumption of a normal distribution, the median statistic was considered. This statistic required no assumption of normality. Since it is a non-parametric statistic useful for small samples, it was chosen as the statistic for analysis.

In setting confidence limits, the median of the universe can be expected to fall between the 14th and 27th observations 96.2% of the time when forty observations are ranked from highest to lowest. In several cases the farms were divided into large herds and small herds to see if

there were differences. This division usually resulted in a wider confidence interval.

The median is difficult to use and understand in some respects. In setting the confidence limits for this statistic, two actual observations are used as mentioned previously. These two, the 14th and 27th, very nearly divide the sample into thirds. In using the result, one needs to be rather cautious. Take, for example, the January median estimate for taxes in Chapter III. The estimate was 31.6%. If the estimate were accurate, this would mean that 31.6% of the median farm's taxes would be paid in January. However, for all other months, the median estimate was zero. This, it would seem, is impossible.

To make use of the results, it is important to understand more fully how this could come about. The 14th farm from the top in January paid 63.3% of the year's taxes in that one month. Thirteen of the farms paid more than 63.3% of the taxes in January. Some may have paid 100% of their taxes in January. The 27th farm from the top in the month paid no taxes. Thus the range of only the middle third of the sample was from 0 to 63.3% of the year's taxes in that one month. In all other months less than fourteen farms paid taxes so that both confidence limits were zero.

One can begin to see at this point how the confidence interval for the median works. January is obviously the month in which the most farms paid taxes. In other months, there may have been several farms which paid large amounts

of taxes, but because less than one-third paid taxes, one can see that the median farm did in fact pay no taxes. For items which occur only a few times a year, it is not only possible, but probable, that the median farm will not have the expense in any one month. Yet any one farm will have the expense at some time during the year. This is probably not a strong argument against the median since the expenses that are of this nature such as taxes, insurance, and interest are items that can be fairly reliabily anticipated on the individual farm. However, in using any of the median figures, it is important to realize that approximately one-third of the sample had percentages larger than the upper confidence limits and approximately one-third had percentages less than the lower confidence limits. With this realization, one may then use the results cautiously--and, in the author's opinion--advantageously.

In all cases, the mean per cents were presented also, even though confidence limits could not be calculated. This was done to aid in description and for purposes of comparison with the median.

There were three approaches used in an attempt to bring out the seasonality aspect. In Chapter III, each of the expense and income items were taken individually and arranged to show the per cent of the annual expense or income of that item which occurred in each month. In Chapter IV, each month's expenses and income were explored to bring out the changing relative importance of various expense and

income items in each month of the year. Chapter V approached seasonality by lumping all the expenses and income items together for each month to see what per cent of the total income and expense came in each month. On the basis of these figures, several graphs were presented in Chapter V indicating the per cent of each month's income that was needed to pay that month's expenses.

Results of the Study

The results may be more meaningful if they are mentioned in light of some of the applications and of the above mentioned purposes and objectives of the study. Therefore the following portion of the summary is intended to be more than just a condensation of the previous three chapters.

The hypothesis that many of the expenses of dairy farms are seasonal in nature seemed to be borne out by the study. There were eleven of the twenty expenses that were shown to have a strong seasonal pattern by the median statistic. These were generally substantiated by the mean. The eleven were hired labor, seeds and plants, fertilizer and lime, machinery repair and maintenance, supplies, improvement repair and maintenance, machine hire, breeding fees, veterinary and medicine expense, fuel and oil expense, and taxes. Six others exhibited a mild seasonal influence or else had several months when the expense was quite high. These six were feed purchases, insurance, interest, rent, auto upkeep, and other expenses. Telephone expense and other

livestock expenses had no strong indications of seasonality, and electrcity was the most constant of all the expenses with no seasonal influence noticeable. Each of these items will be mentioned later under conclusions of the study along with the indicated seasonal pattern.

The first objective was met in Chapter III. That chapter indicated that definite monthly variations in certain expenses did exist on the forty farms in the sample. Some of the items were less definite than others, as would be expected. Those with a seasonal nature were mentioned above. Tables are included in the appendix which give indications of how definite and reliable the monthly variations were. The one income item which proved to be most definite and reliable was the dairy product sales income. The middle one-third of the sample was within a range of 1.7% in every month of the year for this source of income.

The second objective was met in Chapters III, IV, and V as each of these chapters presented information on the income and expense flow on the sample farms. In many cases this information was definite enough to be worthwhile in reducing some of the uncertainty of the financial pattern on dairy farms. This was especially true of Chapter V which indicated that April and May were months of high expenses relative to income. There was also indication that February, July, and October were months of low expenses relative to income.

A consideration of the third objective is in order. The study indicates that farmers, as well as others, might plan to take advantage of the seasonality of farming. Such things as bulk purchases of feed or purchases of planting supplies in months when expenses are normally low relative to income would seem to be one of the more obvious applications. Chapter V indicated that perhaps February and March would be months in which purchases of fertilizer and seeds could be made to even out the high seasonal expenses normally occurring in April. If the study is representative of the population, it appears quite likely also that increased savings would result from such planning since other farmers do not make many purchases before the actual planting time.

Chapter V indicates further that July or October might be months when bulk purchases of feed would be appropriate since the proportion of income needed to pay expenses in those months is low relative to other months.

These same months of low expenses relative to income may be important in planning purchases of equipment for the farm or home. For a farmer taking on additional insurance of some sort, the months of proportionally low expenses might well be considered as the most convenient times for premiums to come due.

April and May, on the other hand, are indicated as months in which additional income might be most welcome. Perhaps there are sources of income that might be improved in these months. Storage and sale of commodities may be an

answer if a loss is not incurred due to a seasonal price drop. Minor enterprises such as pork or poultry may serve to supplement the income. In fact, there was some indication in Chapter III that pork was being used in this way on some of the farms.

Extension workers can make use of the results from the study. For there are indications of times when some subjects of instruction might be more fruitful than others. Insurance and interest expenses exhibited a pattern that was rather surprising. If they were representative of the central Michigan area, late fall would be an ideal time for information on these subjects to be presented. Though less than one-third of the farms paid rent in any one month, on the average almost one-third of the year's rent was paid in December and January.

Chapter V indicated that in July, October, November, and December, extension people might do well to call farmers' attention to important purchases that could be made. Indications were that these four months would be most apt to be the months when farmers would have the largest proportion of "extra"cash on hand. Thus if a situation arose when protein supplement or concentrate was a particularly good buy in the fall; extension men, with the seasonality pattern in mind, might make their efforts more effective.

People in the area of farm credit could make use of the results of this study. Being acquainted with the nature of the financial seasonality pattern, they can better

understand a farmer's need for credit in the late spring months. At the same time, it is possible for them to set up a more appropriate repayment plan for the farmer which will more nearly fit his circumstances. There were several differences in the farms associated with herd size that might be important considerations also. July and October would appear to be good months for repayment of loans for most dairy farmers. The statistics indicated that March might be a good time for small herd farms to make payments while the larger herd farms would seem to be in better financial position late in the year.

Farm planners should be interested to note that in the first five months of the year about three per cent more of the year's expenses occurred than of the percentage of the year's income. Since the income is based on a much larger amount, this probably does not impose as great a restriction on annual budget methods as might have been the case. However, the figures are close enough to indicate that a farm planner needs to exercise care in proposing a plan for individual farmers.

As a specific example, consider a farm with a $6,000 net farm income. The study would indicate that an investment of say $2,000 for a tractor in the spring would be an impossibility without drawing heavily on credit even though the farm plan shows the $6,000 net farm income for the whole year. Thus, the seasonal pattern of farming is an important consideration in farm planning or budgeting.

There are some applications of the study for teachers of farm management. Students taking courses in farm management are quite apt to be unaware of the nature of the financial seasonality of farming. Though dairy farming is generally considered as the type of farming with the most constant income and verified by this study, the seasonal nature of the majority of expenses can still serve to put great variation in the flow of cash income that is available for other than farm operating expenses. If dairying, the most steady type of farm business, fluctuates this much, students could soon come to recognize that farming does indeed have its financial seasonality.

Conclusions

The study indicated that a majority of the expense items did have a seasonal nature. The items with a short explanation of the seasonal pattern follow. The explanation is both in terms of the time of year when the major portion of that expense occurs and the relative importance of the expense in various months.

1. Hired labor expense was high in the summer months and low in the winter with a fairly regular rise and fall between the two. It was an important part of the monthly expenses in each month, but more so in the summer months.

2. Feed purchases expense exhibited a mild seasonality with a high proportion of its expense in the late fall

and late winter months. The item was generally the largest expense in each month but was even more important in the months fromOctober through March.

3. Seeds and plants expense had a definite seasonal pattern with the high in April and May and another slight rise in September. It was an important expense in each of these months.

4. Machine hire expense was at a seasonal high in the last six months of the year with August and November the two months of highest expense. It was of less importance in the monthly expenses at that time of year than several other expenses, however.

5. Supplies expense had a strong seasonal pattern with the high in the three summer months. As an item of monthly expense, it was relatively unimportant percentagewise.

6. Machinery repairs and maintenance expense was at its seasonal high in the late spring and summer months with a rather slow drop in the fall. This was a rather important part of the monthly expense, particularly in the late spring and summer.

7. Improvement repairs and maintenance expense had a seasonal rise with the high in July. After the decline, there was another rise of less magnitude in October and November. The expense was relatively unimportant as an item of monthly expense except perhaps in the month of its seasonal high.

8. Breeding fees expense was of a seasonal nature with the high occurring in November and December and a slow deline through the late winter months. It was relatively small as a proportion of the monthly expenses.

9. Fertilizer and lime expense exhibited a seasonal pattern very similar to seeds and plants with the largest proportion of the expense in the spring and a secondary rise in September. The item was a major portion of the monthly expenses when at its seasonal high.

10. Veterinary and medicine expense had a seasonal pattern with a high in November and December, and then a fairly constant, but lesser proportion in the next three months. For the median or mean farm, the item was of rather slight importance as a part of the monthly expense.

11. Other livestock expense was fairly constant throughout the year with little indication of a seasonal pattern. The item was relatively unimportant percentagewise as a part of the monthly expense bill.

12. Fuel and oil expense exhibited a seasonal pattern much as would be expected with the high in the summer months preceded by a rise in the spring and followed by a decline in the fall to the low in the winter months. The item is an important expense in nearly all months but proportionately more important in the late spring and summer months.

13. Taxes expense has a seasonal nature with the high in January. December was also high as shown by the mean percentages though not as high as January. The item

is important as a part of monthly expenses in the winter months.

14. Insurance expense exhibited somewhat of a seasonal pattern with November the month of highest expense and December slightly lower but still high. The data did not indicate why this migh be so. This expense was of about average importance in these two months and relatively unimportant in other months.

15. Interest expense did not have a very definite seasonal pattern. There was some indication--mostly by the mean per cents--that there were two seasonal highs, one in May and June, and the other in November and December. The mean figures in Chapter IV indicated also that this was a fairly important part of the monthly expense bill in those four months.

16. Electricity expense was the most constant of all expenses with no seasonality indicated. The expense was not large percentagewise as a part of the monthly expense bills.

17. Telephone expense exhibited no noticeable seasonality pattern. What might appear as a slight seasonality influence was due largely to different payment plans on the farms. The item was relatively insignificant as a proportion of monthly expenses.

18. Rent expense had a seasonal nature according to the mean percentages with the high in December and January. Too few farms had the expense to get median figures. As an

average, the expense was relatively unimportant in relation to other monthly expenses.

19. Auto upkeep expense had a slight seasonality pattern. There were three times when the item had seasonal rises. They were mid-winder, late summer, and late fall. The item averaged between four and five per cent of the monthly expenses at those times.

20. Other expense was slightly seasonal with the high point in the late fall and winter months. It was relatively unimportant as a percentage of the monthly expenses.

21. Dairy cattle sales income was high in the two months of March and September with the winter months somewhat higher than summer months. The item was an important source of income in these months as well as in several fall and winter months between these two.

22. Dairy product sales income was remarkably definite and constant with a slight rise occurring in June and the last four months of the year. In general this source of income was two-thirds to three-quarters of the monthly income.

23. Crop sales and government payments income had a seasonal pattern with the high in July. The item was second only to dairy product sales as a source of income in July. It was an important source of monthly income yet in October and the winter months.

24. Egg sales income exhibited a slight seasonal pattern with more receipts in the late winter and spring

months. The item was relatively unimportant as a source of monthly income.

There were not enough farms with the other sources of income to show the seasonality with the main statistic of analysis used in the study.

When all expenses and income items were put together, there was a slight seasonality. Expenses were high in the late spring and early summer and then again in December. Income had its high in July and then in the last three months of the year. The combination of all the individual items resulted in a loss of some of the seasonality shown by the individual items.

When the monthly expenses are put against the monthly income, there is a great deal of difference between the proportion of each month's income needed to cover expenses. The median statistic indicated that in March and July less than forty-five per cent of the month's income would be needed to pay expenses. In the months of April, May, and August, more than fifty-five per cent of the income would be needed to pay the monthly expenses. The mean indicated February, July, and October as the three months of low expense relative to income while April, May, and June were the months of high expense relative to income.

Several tentative conclusions can be drawn. Many of the individual items of expense and income are seasonal in nature. Only a few seem to have no seasonality influence. However, when the items are combined, the various seasonal

patterns tend somewhat to offset each other. Thus when considering all expenses and income, a less marked seasonality is observed than with some of the individual items.

The study has application in several areas of need. It can be useful to farmers, farm planners, extension men, farm credit people, teachers of farm management, and students interested in farming.

Shortcomings of the Study

The results of the study would have been improved had it not been for several shortcomings which were for one reason or another unavoidable. Keeping these shortcomings in mind, one can make more appropriate use of the results.

In order to undertake the study, it was necessary to assume things about the sample which either were not true or might not be true. For example, it was necessary to assume that the time at which expenses were paid would be more important than the time they were incurred. This may be a faulty assumption since, for one thing, the creditors of the farmers in this sample may be altogether different from other areas. Further, the seasonality results may be somewhat different or even less definite than might have been found if this assumption would not have been made. However, the assumption was necessary since the data did not specify whether entries were made at the time the debt was incurred or when it was paid. To attempt to get the necessary additional information at the time this study was

made would have been prohibitive financially as well as being open to a large degree of human error.

A second shortcoming has to do with the sample selection. The original project from which the sample came was set up on a voluntary basis. Had the sample been random or representative, more thorough--and quite likely, more useful--statistical analyses could have been performed on the data. If, for instance, a chance selection had been used, an assumption of a normal distribution would have been in order and confidence limits for the mean could have been calculated. This alone might have made the study more useful.

Thirdly, little information was known on the efficiency of the farms in the sample. For most effective farm planning, one would expect (other things being equal) that figures taken from more efficient farms would be more appropriate to use than figures from farms which might be relatively inefficient. At any rate, knowing something more of the efficiency of the sample farms would have increased the usefulness of the results.

A further shortcoming was that the sample was selected before the study was set up. The purpose of the project was primarily of an extension character rather than research. Had it been possible to plan the study first and then select a sample with specific purposes in mind, the results probably would have been more useful. Certainly some of the shortcomings could have been eliminated. However, it often happens that this is not possible; so that

one needs to make the best use of the data as it is rather than incur great additional cost for the sake of some unknown increase in usefulness or accuracy.

Suggestions for Future Work

There are several suggestions that might be made for future work in this area. There is a question of how the money from the income items was used. Many of the farms had minor enterprises in addition to the dairy enterprise. There was no indication in the data used in this study as to whether the income from crop sales or poultry, for instance, was used for special purposes.

There is also the question of when investments are made. Do farmers plan their investments when they have a large income relative to expenses or do they buy when the "fancy" strikes them? Perhaps the equipment dealers have more influence on when farmers buy than the season of the year. At any rate, this is a fertile field for further work.

Another question arises as to whether farmers may already be using practices that this study suggests. There was indication earlier that some dairy farmers raise pork along with their dairy operation and time the pork production cycle so that they are marketed in the spring when the relatively high expenses occur. It would be interesting to know if farmers do plan to make major investments with the money from crop sales or whether outside purchases are planned for months when the expenses are low relative to income.

Work is needed on other types of farming operations. Crop farming, livestock farming, or general farming are all important enough in some areas of Michigan to merit this type of work, and it would be surprising if they did not exhibit a greater seasonality pattern of expenses and income than that on dairy farms.

There is a question raised as to what the equity position of the farmer may have to do with the way he operates his business. Does the ability to get more credit have a major influence on the seasonal pattern of the farm or is there no essential difference? One might expect that this would have some influence on the farm operation, but the data obtained in this study did not give indications of the equity influence.

There was no indication either as to whether payments were made in cash or by credit. If made by credit, information on the time of payment of the credit bill would be worthwhile in helping to understand more about the farm business.

This study covered only a period of one year. Further work should be carried out which would cover a longer time period. Such work would provide more reliable and definite information about the nature of the financial seasonality on dairy farms.

The central tendency is an important consideration and probably the one type of information most often used in planning. However, in working with data, one often notices

that certain farms are almost consistently on either one side or the other of the middle. Work needs to be done to find out why certain farms or farmers have this tendency. Information along this line would aid not only in understanding the farm operations but also in helping to make farm planning and extension work more useful and more adequate for the individual farmer.

BIBLIOGRAPHY

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APPENDICES

Name _____ County _____ Farm No. _____

FARM EXPENSES

For the month of _____ 19____

HIRED LABOR

Description	Days	Rate	Amount
Labor by Day or Hour		$	$
Hired Man by Month			
Cash Cost of Board			
Insurance on Labor			
MONTHLY LABOR COSTS			$

CROPS EXPENSES

Seeds and Plants Purchased and Seed Treatment

Date	Description	Amount	Price	Cost
			$	$
Fertilizer and Lime				
			$	$
Machine Hire and Custom Work				
			$	$
Crops Supplies				
			$	$
MONTHLY CROPS EXPENSES				$

MACHINERY EXPENSES

Gasoline, Other Fuel and Lubrication

Date	Item	Auto	Truck	Tractor	General
		$	$	$	$

Machinery Repair and Maintenance

		$	$	$	$
TOTAL		$	$	$	$

Tools and Small Equipment not to be inventoried

Date	Description	Cost
		$
	TOTAL	$

FEED PURCHASED

Day	Kind	Livestock Being Fed	Amount	Cost
				$
	MONTHLY FEED EXPENSE			$

LIVESTOCK EXPENSES

Kind of Livestock Expense	Cost
Breeding Fees:	$
D. H. I. A.	
Veterinary Fees and Medicine	
Livestock Insecticides	
Registrations	
Supplies: Strainer Pads, Soap, Etc.	
Other:	
MONTHLY LIVESTOCK EXPENSES	$

IMPROVEMENT EXPENSES

Fire Insurance	$
Wind Insurance	$
Fencing Repairs:	$
Building Repairs:	$

OTHER EXPENSES

Farm Share of Telephone	$
Farm Share of Electricity	
Taxes	
Cash Farm Rent	
Farm Organization Dues	
Principal Payments on Farm Debts	
Interest on Farm Debts	
Advertising	
Farm Papers and Office Supplies	
Other:	

FARM INCOME

For the month of _____ 19___ Farm No.____

LIVESTOCK PRODUCTS

Milk or Cream: Average No. of Cows_____

Date	Pounds	Test	Price	Gross	Hauling	Net
			$	$	$	$

EGG SALES Average No. of Hens _____

Date	Doz.	Price	Receipt	Date	Doz.	Price	Receipt
			$				$
	MONTHLY EGG SALES TOTAL						$

LIVESTOCK SALES

Date	Description	No.	Wt.	Price	Hauling	Receipt
				$	$	$

LIVESTOCK CHECK TABLE

Kind	Beg.	Additions		Total A	End	Losses			Total B
		Bo't	Born			Sold	Died	Ate	
Dairy									
Beef									
Hogs									
Sheep									
Other									

CROPS

Date	Description	Am't	Price	Income
			$	$
	Government Payments			$
	TOTAL CROPS RECEIPTS			$

MISCELLANEOUS INCOME

Machinery Sold (not traded)				
				$
Custom Work:				
Description	Acres	Days	Rate	
				$
Work off the farm: Days _____				$
Patronage Dividends				
Woodland Products: Days _____				
Insurance Claims for Building Losses				
Feed Bags Returned				
Gas Tax Refund				
Breeding Fees				
Other:				
TOTAL MISCELLANEOUS INCOME				$

TOTAL CASH INCOME $ _____

TOTAL CASH EXPENSES $ _____

FARM INVESTMENTS

(If the items below are still on hand at the end of the year, then add them to inventory)

LIVESTOCK AND POULTRY PURCHASED

Date	Kind	No.	Wt.	Price	Hauling	Net Cost

NEW MACHINERY

Date	Item Bought	Trade-in	Allowance	Difference
			$	$

FARM IMPROVEMENTS

Kind of Improvement	Labor ($)	Material
Fencing:	$	$
Drainage:	$	$
Building:	$	$

APPENDIX A

COOPERATIVE EXTENSION WORK
In Agriculture and Home Economics
State of Michigan

Michigan State University
U.S. Department of Agriculture
Cooperating

Cooperative Extension
Service
Agriculture Economics

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This is a gentle reminder to have you fill our your farm expense and farm income sheets and mail them to us in the self addressed envelope.

Ten minutes now may save an hour or so later. As we work through this experiment together this first year I am always eager to hear your suggestions and ideas.

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This is a form letter that you may expect each month and the space below will be used to discuss any details that may come up. If you have questions at any time don't be afraid to ask them.

YOUR CASH RECEIPTS FOR THE MONTH: $_____ CASH EXPENSES: $_____ .

Find also a self addressed envelope (with extension enclosure slip) for use in mailing next month's report.

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APPENDICES

Name _____ County _____ Farm No. _____

FARM EXPENSES

For the month of _____ 19____

HIRED LABOR

Description	Days	Rate	Amount
Labor by Day or Hour		$	$
Hired Man by Month			
Cash Cost of Board			
Insurance on Labor			
MONTHLY LABOR COSTS			$

CROPS EXPENSES

Seeds and Plants Purchased and Seed Treatment

Date	Description	Amount	Price	Cost
			$	$
Fertilizer and Lime				
			$	$
Machine Hire and Custom Work				
			$	$
Crops Supplies				
			$	$
MONTHLY CROPS EXPENSES				$

MACHINERY EXPENSES

Gasoline, Other Fuel and Lubrication

Date	Item	Auto	Truck	Tractor	General
		$	$	$	$

Machinery Repair and Maintenance

		$	$	$	$
TOTAL		$	$	$	$

Tools and Small Equipment not to be inventoried

Date	Description	Cost
		$
	TOTAL	$

FEED PURCHASED

Day	Kind	Livestock Being Fed	Amount	Cost
				$
	MONTHLY FEED EXPENSE			$

LIVESTOCK EXPENSES

Kind of Livestock Expense	Cost
Breeding Fees:	$
D. H. I. A.	
Veterinary Fees and Medicine	
Livestock Insecticides	
Registrations	
Supplies: Strainer Pads, Soap, Etc.	
Other:	
MONTHLY LIVESTOCK EXPENSES	$

IMPROVEMENT EXPENSES

Fire Insurance	$
Wind Insurance	$
Fencing Repairs:	$
Building Repairs:	$

OTHER EXPENSES

Farm Share of Telephone	$
Farm Share of Electricity	
Taxes	
Cash Farm Rent	
Farm Organization Dues	
Principal Payments on Farm Debts	
Interest on Farm Debts	
Advertising	
Farm Papers and Office Supplies	
Other:	

FARM INCOME

For the month of _____ 19___ Farm No._____

LIVESTOCK PRODUCTS

Milk or Cream: Average No. of Cows_____

Date	Pounds	Test	Price	Gross	Hauling	Net
			$	$	$	$

EGG SALES Average No. of Hens _____

Date	Doz.	Price	Receipt	Date	Doz.	Price	Receipt
			$				$
	MONTHLY EGG SALES TOTAL		$				

LIVESTOCK SALES

Date	Description	No.	Wt.	Price	Hauling	Receipt
				$	$	$

LIVESTOCK CHECK TABLE

Kind	Beg.	Additions		Total A	End	Losses			Total B
		Bo't	Born			Sold	Died	Ate	
Dairy									
Beef									
Hogs									
Sheep									
Other									

CROPS

Date	Description	Am't	Price	Income
			$	$
	Government Payments			$
	TOTAL CROPS RECEIPTS			$

MISCELLANEOUS INCOME

Machinery Sold (not traded)				
				$
Custom Work:				
Description	Acres	Days	Rate	
				$
Work off the farm: Days _____				$
Patronage Dividends				
Woodland Products: Days _____				
Insurance Claims for Building Losses				
Feed Bags Returned				
Gas Tax Refund				
Breeding Fees				
Other:				
TOTAL MISCELLANEOUS INCOME				$

TOTAL CASH INCOME $_____

TOTAL CASH EXPENSES $_____

FARM INVESTMENTS

(If the items below are still on hand at the end of the year, then add them to inventory)

LIVESTOCK AND POULTRY PURCHASED

Date	Kind	No.	Wt.	Price	Hauling	Net Cost

NEW MACHINERY

Date	Item Bought	Trade-in	Allowance	Difference
			$	$

FARM IMPROVEMENTS

Kind of Improvement	Labor ($)	Material
Fencing:	$	$
Drainage:	$	$
Building:	$	$

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APPENDIX A

PRODUCTIVITY RATINGS FOR INDIVIDUAL MICHIGAN SOIL TYPES*

Index Rating			
10.0 to 22.5	27.3 to 50.0	52.5 to 75.0	82.5 to 100.0
Soil Type			
10.0 Plainfield Loamy Sand	27.5 Oshtemo Loamy Sand	52.5 Bronson Sandy Loam	82.5 Morley Slit Loam
12.5 Coloma Loamy Sand	30.0 Berrien Loamy Sand	52.5 Ogemaw Sandy Loam	82.5 Blount Slit Loam
15.0 Newton Loamy Sand	32.5 Oshtemo Sandy Loam	52.5 Metea Sandy Loam	82.5 Celina Loam
17.5 Ottawa Loamy Sand	32.5 Oshtemo Loamy Sand	(I.D.)	87.5 Macomb Loam
20.0 Ottawa Sandy Loam	(I.D.)	57.5 Gilford Sandy Loam	(Humic Gley)
(I.D.)	37.5 Oshtemo Sandy Loam	57.5 Brady Sandy Loam	87.5 Macomb Loam
22.5 Spinks Loamy Sand	(Humic Gley)	62.5 Hillsdale Fine	87.5 Guelph Loam
	45.0 Hodunk Sandy Loam	Sandy Loam	87.5 Miami Loam
	50.0 Bellefontaine Sandy	62.5 Warsaw Loam	90.0 Kawkawlin Fine
	Loam	62.5 Fox Loam	Sandy Loam
	50.0 Griffin Slit Loam	62.5 Bellfontaine Loam	92.5 Brookston Clay
			Loam
	50.0 Fox Sandy Loam	67.5 Gilford Loam	97.5 Conover Loam
	50.0 Warsaw Sandy Loam	67.5 Locke Sandy Loam	97.5 Conover Slit Loam
	50.0 Hillsdale Sandy	70.0 Kibbie Slit Loam	100.0 Brookston Loam
	Loam	75.0 Hillsdale Loam	100.0 Brookston Silt
			Loam

*Compiled by Ivan Schneider and Clarence Engberg, Department of Soil Science, Michigan State College.

APPENDIX B

TABLE B: 96.2% CONFIDENCE LIMITS ON THE MEDIAN PER CENT OF TOTAL ANNUAL EXPENSES IN EACH MONTH FOR 40 DAIRY FARMS IN 1955

Item	Conf.* Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	2.2	4.4	2.0	7.9	6.4	10.8	11.3	12.9	8.2	6.6	3.6	1.6
Hired Labor	L	0.0	0.0	0.0	0.0	0 0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
	U	6.9	8.9	11.1	9.5	6.0	7.8	6.8	9.5	8.3	9.1	8.6	11.7
Feed Purchases	L	4.3	6.0	6.7	5.2	3.0	4.6	4.1	3.2	3.4	6.1	6.5	6.7
	U	0.0	0.0	8.0	29.4	25.4	12.6	2.4	0.0	6.1	0.0	0.0	0.0
Seeds and Plants	L	0.0	0.0	0.0	4.6	10.3	0.0	0.0	0.0	1.5	0.0	0.0	0.0
	U	0.0	0.0	0.0	28.0	14.7	8.8	5.9	0.1	15.5	8.0	0.0	0.0
Fertilizer and Lime	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machinery Repair	U	2.1	6.9	5.0	9.8	15.0	13.1	13.9	11.4	10.1	9.2	8.8	8.6
and Maintenance	L	0.2	1.9	3.0	3.9	8.2	6.6	6.7	4.3	4.8	3.7	2.8	3.7
	U	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	13.5	0.0
Machine Hire	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	2.9	3.1	3.5	6.0	2.4	10.9	15.9	12.7	9.3	0.0	4.6	5.5
Supplies	L	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0
Improvement Repair	U	0.0	0.0	0.6	4.8	0.0	4.3	13.7	9.6	1.2	6.2	7.2	0.0
and Maintenance	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	8.8	10.3	8.5	3.6	5.0	5.3	3.2	0.0	2.6	1.9	14.4	19.3
Breeding Fees	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Veterinary and	U	11.4	7.9	11.5	7.9	3.8	5.9	3.7	9.1	10.9	7.2	13.4	12.9
Medicine	L	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	2.2
Other Livestock	U	8.2	6.7	7.7	7.6	8.3	10.0	8.6	10.4	9.8	7.8	8.2	9.3
Expense	L	1.8	0.0	0.0	0.0	5.1	0.0	0.0	7.0	0.0	0.0	0.0	0.0
Fuel and Oil	U	4.7	6.2	9.3	11.6	13.5	11.1	15.1	12.6	10.3	9.5	8.5	8.2
Expense	L	1.1	1.1	3.6	6.0	7.4	5.3	9.1	8.7	6.8	5.4	0.8	0.0
Taxes	U	63.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insurance	U	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9	7.8
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*U--Upper; L--Lower; this will be used to designate confidence in the following tables.

APPENDIX B--Continued

Item	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	2.3	0.0	1.5	0.0	0.5	0.0	0.0	0.0	1.9	0.0	6.6	3.4
Interest	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	9.3	9.6	9.3	9.9	8.6	8.6	8.5	8.8	9.1	8.9	8.2	9.3
Electricity	L	7.5	8.0	7.9	7.9	7.3	7.8	7.4	7.5	7.6	7.2	7.1	8.2
	U	8.7	8.3	8.3	9.8	8.3	7.8	8.9	8.3	7.7	8.9	8.8	8.7
Telephone	L	4.3	0.0	5.8	6.7	4.3	0.0	6.4	0.0	0.0	4.2	0.0	0.0
	U	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rent	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	8.9	9.4	7.2	3.6	3.4	4.1	5.2	7.5	9.2	1.9	11.6	2.0
Auto Upkeep	L	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
	U	7.2	6.3	5.6	4.5	2.9	5.5	3.6	4.9	3.5	7.1	6.6	14.9
Other Expenses	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX C

TABLE C: 96.2% CONFIDENCE LIMITS ON THE MEDIAN FOR THE PER CENT OF TOTAL ANNUAL INCOME FROM EACH ITEM OF INCOME IN EACH MONTH FOR 40 DAIRY FARMS IN 1955

Item	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	9.2	8.7	18.4	4.2	6.2	3.4	2.5	7.0	16.6	7.9	10.5	6.7
Dairy Cattle	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	1.8	0.3	0.8
	U	8.3	8.3	7.8	9.0	8.6	9.4	8.7	8.3	8.7	9.2	10.1	10.3
Dairy Products	L	7.2	7.0	6.9	7.8	7.7	8.4	7.8	7.8	7.8	8.2	8.9	8.7
	U	0.0	0.0	0.0	0.0	0.0	0.0	57.1	0.0	0.0	0.0	0.0	0.0
Crop Sales	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	0.9	3.9	3.3	3.9	3.7	0.0	0.0	1.6	0.0	0.0	0.0	0.0
Egg Sales	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX D

TABLE D: 98.1% CONFIDENCE LIMITS ON THE MEDIAN FOR SELECTED EXPENSES AS A PER CENT OF ANNUAL EXPENSE IN EACH MONTH FOR 19 FARMS WITH LESS THAN 23 COW HERDS IN 1955

Item	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	1.6	4.0	0.0	8.2	2.5	10.8	14.7	30.8	8.2	10.1	6.1	1.6
Hired Labor	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	9.6	9.1	13.7	9.8	6.8	11.3	11.4	11.5	8.7	9.1	8.5	16.0
Feed Purchased	L	2.5	4.0	4.6	3.2	1.6	2.7	3.8	0.6	4.1	6.4	5.0	7.9
Machinery Repair	U	5.4	13.1	7.9	11.9	22.5	14.0	17.9	13.5	14.6	10.1	8.8	20.2
and Maintenance	L	0.0	0.5	1.0	0.0	9.3	4.6	2.2	3.4	2.6	1.5	0.8	2.7
	U	4.3	8.4	18.7	16.4	8.4	21.5	16.9	27.0	10.9	0.0	3.4	6.8
Supplies	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	8.1	10.8	9.9	6.8	7.7	9.3	6.1	5.0	12.8	6.2	16.5	27.7
Breeding Fees	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Veterinary and	U	15.2	7.4	8.9	13.0	8.9	6.1	22.7	11.1	10.9	5.4	19.5	18.6
Medicine	L	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel and Oil	U	8.5	10.9	14.1	13.2	13.6	11.9	18.0	12.6	14.2	10.4	13.3	14.2
Expense	L	0.0	0.0	1.7	1.0	6.5	0.8	9.1	0.0	0.0	0.7	0.8	0.0

APPENDIX E

TABLE E: 97.3% CONFIDENCE LIMITS ON THE MEDIAN FOR SELECTED EXPENSES AS A PER CENT OF ANNUAL EXPENSES IN EACH MONTH FOR 21 FARMS WITH 23 OR LARGER COW HERDS IN 1955

Item	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	9.0	8.6	7.5	11.0	9.3	15.2	14.8	18.5	10.9	7.7	6.0	7.3
Hired Labor	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	7.1	12.1	11.8	14.2	6.6	7.9	6.5	9.7	9.0	9.7	10.8	10.4
Feed Purchases	L	3.6	6.4	7.3	4.0	0.5	4.5	3.3	2.5	3.2	2.9	4.5	6.1
Machinery Repair	U	2.7	7.9	6.1	9.8	14.3	19.9	17.6	13.6	10.1	11.7	10.8	8.3
and Maintenance	L	0.2	1.3	2.0	3.9	3.1	5.5	4.1	3.3	3.4	3.7	2.8	3.3
	U	7.1	3.1	3.3	6.0	5.8	17.4	22.2	9.8	18.1	3.9	15.4	7.0
Supplies	L	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
	U	19.4	15.4	13.2	0.0	7.5	0.9	3.2	0.0	0.0	9.8	12.7	19.3
Breeding Fees	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Veterinary and	U	12.2	12.6	20.5	12.9	5.1	13.2	3.8	15.0	17.1	11.7	17.1	20.5
Medicine	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel and Oil	U	5.6	8.4	9.0	13.0	15.1	12.6	15.1	15.8	10.3	14.1	9.5	8.5
Expenses	L	1.0	0.8	3.3	4.8	5.6	2.6	6.4	8.5	4.1	4.4	0.0	0.0

APPENDIX F

TABLE F: 96.2% CONFIDENCE LIMITS FOR MEDIAN PER CENT THAT EACH ITEM OF EXPENSE WAS OF THE MONTH'S EXPENSES FOR 40 MICHIGAN DAIRY FARMS IN 1955

Expense	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	1.4	5.5	2.0	8.0	5.0	9.4	11.2	9.5	4.5	2.9	1.9	1.3
Hired Labor	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0
	U	23.6	29.0	31.7	20.1	15.2	17.6	19.8	19.9	16.8	23.8	27.3	24.0
Feed Purchases	L	7.8	15.1	17.9	10.5	7.1	10.4	7.7	8.2	8.1	13.3	11.6	12.8
	U	0.0	0.0	3.2	15.7	12.5	9.8	1.6	0.0	5.3	0.0	0.0	0.0
Seeds and Plants	L	0.0	0.0	0.0	2.4	5.6	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	U	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	2.9	0.0
Machine Hire	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	0.6	0.9	0.8	0.6	0.5	2.9	2.0	2.0	2.1	0.0	0.9	0.9
Supplies	L	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Machinery Repair	U	3.5	9.3	8.5	8.5	13.3	14.2	15.0	11.7	11.2	11.3	10.9	10.1
and Maintenance	L	0.3	3.2	2.8	3.0	7.5	6.7	5.1	5.7	3.9	4.4	2.9	4.7
	U	0.0	0.0	0.2	1.2	0.0	1.7	3.5	3.9	0.7	1.9	0.9	0.0
Improvements	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	2.2	3.5	2.2	1.0	1.0	1.4	0.4	0.0	0.5	0.4	2.1	3.9
Breeding Fees	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	0.0	0.0	0.0	26.1	21.8	10.8	10.8	2.0	23.0	11.4	0.0	0.0
Fertilizer and Lime	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Veterinary and	U	2.9	3.2	3.0	1.9	1.0	1.8	1.0	2.3	2.8	2.2	2.7	3.6
Medicine	L	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
Other Livestock	U	3.7	3.3	2.1	1.9	1.7	1.6	2.0	3.0	2.3	2.4	2.7	2.4
Expense	L	0.3	0.0	0.0	0.0	0.6	0.0	0.0	0.8	0.0	0.0	0.0	0.0
	U	10.3	12.0	17.6	16.3	21.2	18.6	24.3	23.2	17.8	20.7	12.7	10.3
Fuel and Oil	L	2.3	4.0	6.9	7.4	8.5	6.6	11.7	11.5	8.6	10.1	1.5	0.0
	U	24.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX F--Continued

Expense	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8	2.1
Insurance	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	2.2	0.0	0.1	0.0	0.7	0.0	0.0	0.0	0.9	0.0	2.4	1.2
Interest	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	5.9	6.1	5.0	4.6	3.2	4.2	3.7	4.3	3.8	4.7	3.8	3.3
Electricity	L	2.3	4.0	2.4	2.3	1.5	2.0	1.4	2.4	1.9	2.2	1.8	2.0
	U	1.0	0.9	1.2	1.0	0.7	0.5	0.9	0.8	0.6	1.2	0.7	0.8
Telephone	L	0.3	0.0	0.3	0.4	0.2	0.0	0.3	0.0	0.0	0.3	0.0	0.0
	U	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rent	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	3.3	4.2	2.0	0.8	1.1	1.8	1.7	2.6	1.8	1.0	4.0	0.7
Auto Upkeep	L	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
	U	2.2	1.5	1.1	0.6	0.5	1.0	0.5	0.9	0.6	1.7	1.0	2.0
Other Expenses	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX G

TABLE G: 96.2% CONFIDENCE LIMITS ON THE MEDIAN FOR THE PER CENT OF TOTAL MONTHLY INCOME FROM EACH OF FOUR SOURCES FOR 40 MICHIGAN DAIRY FARMS IN 1955*

Source	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	U	16.7	8.3	22.8	3.8	4.7	3.7	2.5	6.5	16.5	7.1	10.9	9.1
Dairy Cattle	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	1.5	0.6	0.6
	U	84.7	88.2	73.4	95.0	86.4	91.0	70.9	84.2	86.0	85.3	88.0	88.4
Dairy Products	L	67.2	69.5	52.8	74.5	69.3	59.2	44.6	53.1	51.2	54.2	61.9	57.8
	U	0.0	0.0	0.0	0.9	0.4	0.0	0.0	0.9	0.0	0.0	0.0	0.0
Egg Sales	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	U	0.0	0.0	0.0	0.0	0.0	0.0	39.1	0.0	0.0	0.0	0.0	0.0
Crop Sales	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*All other sources had 0% for both upper and lower confidence limits.

APPENDIX H

TABLE H: CONFIDENCE LIMITS FOR THE PER CENT OF TOTAL INCOME AND EXPENSES IN EACH MONTH FOR 40 CENTRAL MICHIGAN DAIRY FARMS FOR 1955*

Sample	Conf. Limit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Expenses													
	U	8.1	7.3	7.6	11.6	10.0	10.1	9.2	9.1	8.8	9.0	9.7	11.5
All Farms	L	4.9	4.5	5.2	8.5	6.2	7.0	7.0	6.9	7.0	6.1	6.2	7.5
	U	8.6	8.0	8.2	13.6	11.5	13.0	12.7	10.2	11.4	10.2	11.2	12.5
19 Small Herds	L	4.9	3.4	4.2	6.7	5.6	4.4	5.3	6.2	5.9	5.3	4.5	6.9
	U	8,7	8.3	9.2	12.2	10.9	10.1	9.6	9.8	8.8	8.2	10.8	10.4
21 Large Herds	L	3.6	4.0	5.4	7.8	6.2	6.2	6.6	5.3	6.7	5.4	6.2	5.5
Income													
	U	8.2	7.0	8.2	7.7	7.9	9.3	10.8	8.1	8.7	9.3	9.3	10.6
All Farms	L	5.8	5.7	6.4	5.6	6.0	7.2	8.0	6.3	7.2	7.2	7.9	7.4
	U	8.7	7.1	9.2	8.5	8.5	10.1	14.5	9.3	12.4	10.4	10.6	13.7
19 Small Herds	L	5.2	5.3	6.0	5.1	5.7	6.5	5.5	5.9	7.0	7.1	6.8	5.2
	U	8.5	8.8	9.2	8.5	8.1	9.8	12.6	8.7	8.3	10.4	9.7	10.7
21 Large Herds	L	5.6	4.8	6.4	5.6	5.8	7.4	7.6	6.0	6.2	6.8	7.9	6.5

*Confidence limits for all farm sample are 96.27% sure; confidence limits for 19 small herds are 98.1% sure; confidence limits for 21 large herds are 97.3% sure.

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