FARM PRACTICE ADOPTION AS RELATED TO EXTENSION PARTICIPATION AND IMPORTANCE OF ENTERPRISE

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By

Ruford F. Bittner

A THESIS

Submitted to the College of Agriculture
of Michigan State University of Agriculture and
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ABSTRACT

Two guiding hypotheses were followed in this thesis. One is that the more closely dairy farmers associate themselves with the Cooperative Extension Service the more of the recommended farm practices they will follow. The second one was that dairy farmers follow more of the recommended practices on their major (dairy) enterprise than they do of the recommended practices of their minor livestock enterprises such as swine and poultry.

To obtain representative dairy farmers that could be surveyed to obtain data, the author selected three areas in the state that were typical of Southern Michigan dairy farms. The areas were located in Lapeer, Ionia and Calhoun counties. A check type questionnaire with farm practice questions was developed. Each practice included the recommended practice and the alternatives to that practice so that the farmer could quickly indicate what he did. Also provided in the questionnaire was a place where the farmer could indicate the extent of his association with the Cooperative Extension Service. The questionnaire was pre-tested with fourteen farmers.

Mailing lists in the three areas were obtained through the assistance of county extension offices from the county treasurers' tax roles. This was then compared with the county office of the Agricultural Stabilization Committee to insure completeness and accuracy.

Questionnaires were mailed to farmers in the three areas. A 44 percent return was attained. The three areas were then visited to personally interview nonrespondents to obtain a random sample of 20 percent in order to study the effect of nonresponse bias. Chi square tests revealed no significant difference at the 5 percent level between respondents and nonrespondents on eight control items and 15 practice questions. A total of 180 farms fell into the category of dairy farmers and were completely usable, and were considered representative of Southern Michigan dairy farms.

After considering several types of analysis, the formation of an index was selected as the most desirable since it had the flexibility necessary to best use the data. In exploring the formation of an index, examination of practices revealed that because of the vast differences in importance between practices there were influencing factors which motivated farmers in practice adoption. Four factors were accepted as being important. They were, the investment required, costs and return, magnitude of change, and length of time practice had been recommended. With the assistance of a panel of judges numerical weights were established for the four factors, totaling 100. Each practice and its alternatives was given a total numerical value based on the four factors. A second panel made up of extension service administrators and extension workers were asked to give numerical values to nine factors of a farmer's association with his cooperative extension service. This made it possible to give each farmer an index of association with the Cooperative

Extension Service. Of the 180 dairy farmers, 37 said they had no association with the Cooperative Extension Service, 51 had little association, 41 had considerable association, and 51 had complete association within the framework of the developed index.

Indexes of practice adoption for soils and soils management, crop culture, farm management, and dairy were computed for each of the 180 dairy farms. Fifty-four indexes of swine practice adoption and 96 indexes of poultry practice adoption were obtained.

Correlation analysis was employed to analyze the relationship between farmers' association with the Cooperative Extension Service and their farm practice adoption. The indexes of farmers' association with the Cooperative Extension Service were the independent variable, denoted as X and the various indexes of practice adoption as the dependent variables denoted as Yn. Indexes of soil and soil management practice was Y1; indexes of crop culture, Y2; indexes of general farm management, Y3; indexes of dairy practice adoption, Y4; indexes of swine practice adoption, Y5 and indexes of poultry practice adoption, Y6. The X variable was correlated individually with Y1, Y2, Y3, Y4, Y5 and Y6. Coefficients of correlation, coefficients of determination were obtained. The coefficient of correlation on farm practice adoption were as follows: soils .625; crop culture .550; general farm management .496; dairy .621; swine .228 and poultry .329. All were significant at the one percent level except swine practice adoption which was significant at the five percent level.

In determining whether dairy farmers followed more of the recommended practices on their major enterprise than they did with their minor livestock enterprises, correlation analysis was also used. Here the indexes of dairy practice adoption was the independent variable and the swine and poultry indexes the dependent variable. Correlating 54 indexes of swine practice adoption with the 54 indexes of dairy practice adoption resulted in a low coefficient of correlation (.12). Correlation of 96 indexes of poultry practice adoption with 96 indexes of dairy practice adoption also resulted in a very low coefficient of correlation (.19).

Conclusions that can be drawn from the analysis support the hypotheses stated earlier. The high correlation between the indexes of dairy farmer association with the Cooperative Extension Service and the indexes of farm practice adoption indicate that the closer a dairy farmer associates himself with his Cooperative Extension Service the more of the recommended practice he will follow. Secondly, from the low coefficient of correlation existing between the indexes of dairy practice adoption and both the indexes of swine and poultry practice adoption it can be concluded that farmers follow less of the recommended practices on their minor livestock enterprises than they do on their major enterprises. About one-fifth of the farmers did not associate themselves with the Cooperative Extension Service and less than 10 percent associated themselves fully lending the thought that here is real opportunity for extension workers.

Implications that can be drawn from the analysis are that the Extension Service can be more effective in bringing about farm practice adoption. By employing their facilities and time, by using better techniques, extension workers can hasten the rate of adoption of new practices, reach people not now being directly reached, and bring about a higher total farm income.

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CHAPTER I

INTRODUCTION

Scientific agriculture as we know it today is over one hundred years old. Michigan State University was established as Michigan Agricultural College in 1855 and in 1862 became a Land Grant Institution devoted to the study of agriculture and applied science. Land Grant institutions of higher learning were established by other states in the ensuing years. Shortly following the establishment of agricultural colleges, agricultural experiment stations were established in connection with these schools, usually by state inception. In 1887 the Hatch Act was passed, which provided for the first national system of agricultural experiment stations with federal aid. One of the primary purposes has been to conduct research on methods of doing things on the farm to increase income, reduce costs and make for better rural living.

Through the years that have followed, tremendous agricultural technology and know-how has been developed and made available as the result of research work. The application of this technology by farmers has resulted in a tremendous productive ability, making it possible for 12 percent of our population to produce enough food and fiber for the remaining 88 percent. The employment of scientific production practices has been carried to such an extent that in 1955, 90 percent of all farm products were produced on 44 percent of the farms.

The Cooperative Agricultural Extension Service, established in 1914 through the Smith Lever Act, has, through its specialist and county agent system, carried the results of research from the experiment station to the farmer through many types of personal contacts and the various mass media. The service and assistance of the County Extension Service has been available to all farmers who desired to utilize it. Through the years, farmers have, in varying degrees, availed themselves of this service. Some have used it a great deal, some in moderation and still others have used it very little or not at all. Where farmers have found their initial contacts satisfactory, they have developed real confidence in their County Extension Service and consult extension personnel whenever they have decisions of importance to be made. In the years since its inception, the Extension Service has come to be regarded as an important service by farmers. Many farmers who haven't felt it necessary to have any contact with their county extension agents regard it as a service that should be maintained and thereby available to them in case of an emergency or when a situation arises making it necessary for them to obtain assistance. From his experiences as a county agricultural agent the writer's observations are that farmers in this category would benefit materially if they would maintain a closer relationship.

Statement of the Problem

A great amount of information is available to Michigan farmers on every type of farming enterprise, describing and evaluating the more

desirable methods of carrying out specific farm practices. In fact it is doubtful if there is any segment of our population that has as much information available for use as do farm people. These more desirable farm practices have been determined by research workers in the experiment station, the United States Department of Agriculture and by farmers themselves, as the best practice under most conditions, from such standpoints as more income, the reduction of costs, making work easier or more personal satisfaction. The extent to which farmers follow these desirable practices is something about which little is known. It is known, however, that some farmers follow excellent practices while others do not seem to put forth the effort necessary or take the necessary steps to put them into operation. Since information on farm practices developed and tested by the experiment station and other unbiased media is available to farmers, it would seem they would make every effort to use it.

Although there are many reasons why some farmers do not follow the more desirable farm practices, one of the important reasons is because they either do not know about the practice or because their knowledge is incomplete. In view of the fact that all farmers can obtain information on farm practices by attending meetings, demonstrations, field days or by contacting his county agricultural agent, it seems strange that this lack of knowledge should exist. Unfortunately, all farmers to not make use of their County Extension Service. It was surprising to find that 20 percent of the farmers sampled in this study said they had no direct association whatever with

the Extension Service. Another 29 percent said they had only occasional contact with the Extension Service. The remaining 51 percent associated themselves frequently in one way or another with the Extension Service.

Just as it is true that not all farmers cooperate or associate themselves with their Extension Service in any degree, it is generally understood that not all farmers follow all the recommended practices that they realize would be profitable. It is disturbing to an extension worker to know that even farmers who do associate themselves with him and are generally considered as a cooperator, do not all follow the better practices.

It should be stated here that there are numerous local sources of information in addition to the Extension Service that are available to farmers in all areas of Michigan. Farm magazines, farm pages in newspapers, radio and television are some of the mass media through which farmers get information. More personalized other sources of farm practice information available are the Soil Conservation Service, the vocational agriculture teachers, the Farmers Home Administration, farm supply store managers, salesmen and neighbors. It is therefore understandable that not every farmer would find it necessary to utilize his Extension Service in order to get information on new and better practices. Also farmers frequently get certain kinds of information from one source, other types from another.

In view of the low income situation that farmers sometime find themselves in, it would seem that they would search out and follow the

best known practices to either increase their net income, or reduce costs or both. This would be an especially logical supposition for an observer to make in view of the cost-price squeeze that farmers have been in since 1953 and the present high investment necessary in a farm operation.

Purpose of the Study

The writer, during his tenure as a County Agricultural Extension Agent, was constantly aware that some farmers failed to follow practices he had made known to them and which farmers had good reason to believe, because of the research they were based on, would either increase their farm income, reduce their costs, result in a better rural life for their family or increase their personal satisfaction. He frequently wondered why this situation existed and wondered whether it was the lack of desire on the part of farmers to gain these benefits or whether it resulted from an inability of the writer to motivate them. One purpose of this study then, is to study farm practice adoption of Southern Michigan Dairy Farms to see if there is a relationship between the desirable farm practices they follow and their use of the Cooperative Extension Service. It was believed that this study might show a possible need for changing techniques used by extension workers.

Secondly, the writer was aware of a situation that existed on many farms where a farmer would follow desirable practices on his main enterprise but gave little or no consideration to recommended practices

on his minor enterprise. For example, a dairy farmer would follow excellent practices with his dairy herd but would not follow anywhere near correspondingly desirable practices with his swine and poultry enterprises. Therefore, a further purpose of this study was to study the extent to which Southern Michigan Dairy Farmers in a selected sample follow as good practices relatively on one livestock enterprise as they do on another.

Objectives

Two definite objectives are sought in this study which can be more precisely stated by listing them as follows:

A. To determine the extent of the relationship that exists between the farm practices a dairy farmer follows and his association with the Cooperative Extension Service.

B. To determine the association that exists between the farm practices a dairy farmer follows with his dairy enterprise and practices he follows on other livestock enterprises.

Hypotheses

Two hypotheses have been selected for testing which seem pertinent in view of the stated problem and from the standpoint of the objectives of the Cooperative Agricultural Extension Service.

The first hypothesis is that the more closely dairy farmers associate themselves with the Cooperative Agricultural Extension Service the greater will be their tendency to follow desirable or recommended farm practices.

The second to be tested is the hypothesis that dairy farmers follow more of the recommended farm practices on their major (dairy) enterprise than they do of the recommended practices of their minor livestock enterprises such as swine and poultry.

Thesis Organization

The research procedure is described in Chapter II. It includes the selection of the sample, the development of the questionnaire and the gathering of the data from the selected universe.

Chapter III is devoted to a description of the method of analysis. This includes the type of analysis considered, the procedure followed in the development of acceptable indices and the arrangement of practices into logical groupings.

Chapter IV contains the analysis of relationship between farm practice adoption and the degree of farmer cooperation with the Extension Service, utilizing an index of farmer association of cooperation with the Extension Service which was developed as a part of the research. Simple correlations are used and the results are expressed statistically and graphically. Chapter IV also contains an analysis of the relationship that exists between practice adoption on the dairy enterprise and that on the swine and poultry enterprise.

Chapter V embraces the conclusions and presents the implications of the analysis.

CHAPTER II

QUESTIONNAIRE DEVELOPMENT, SAMPLING AND DATA CLASSIFICATION PROCEDURE

In order to have representative dairy farmers to whom questionnaires could be sent to obtain farm practice information it was necessary to determine what area would be suitable for the sample.

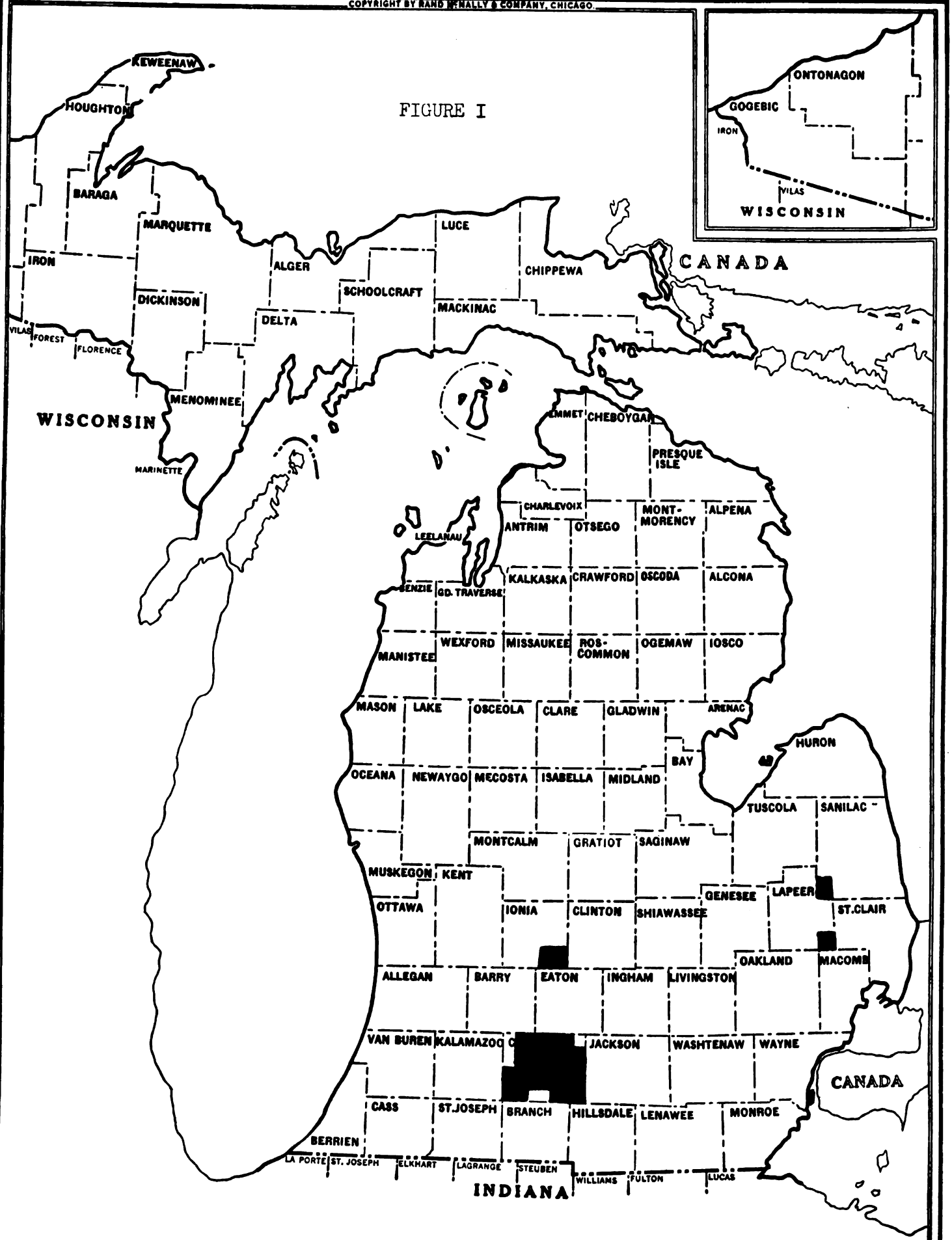
The Extension Service of Michigan State University in cooperation with the Kellogg Foundation had just embarked on an experiment that was a definite departure from anything that had been done heretofore in agricultural extension work. This was known as the township agent program whereby five successful County Agricultural Agents were to be placed in selected townships in the State to do concentrated extension work for a five year period on a township basis. The attempt here was to determine to what extent farm income could be increased through an agent working closely with people in an educational way.

In the selection of these areas the Michigan Extension Service Administration did intensive research on the various types of Michigan agriculture. At the conclusion of this investigation those responsible for the final determination selected four individual townships and one group of three townships as being typical of five of the major farm types in Michigan. The main types of farming sought were Southern Michigan Dairy, Southern Michigan Livestock, Southern Michigan General,

Southern Michigan Crop, Northern Michigan Dairy and Saginaw Valley Cash Crop. Townships selected to provide these types of farm operations were Newton in Calhoun County, Odessa in Ionia County, Almont in Lapeer County, Denmark in Tuscola County and the Tri-Township Area of Oliver, Boardman and Orange in Kalkaska County.

The three townships of Newton, Odessa and Almont are located in Southern Michigan and each had ample dairy farmers to provide an excellent universe to survey dairy farmers on farm practice adoption. Also each had adjacent to it a township with a similar agriculture providing an enlarged universe and a control area for each township extension program that could be used for additional studies. The areas selected then in which to obtain data on farm practice adoption for Southern Michigan Dairy farms were Newton township and control in Calhoun County, Odessa Township and control in Ionia County and Almont township and control in Lapeer County. These are identified in Figure 1.

After the areas were selected as representative ones in which a survey on dairy farm practice adoption could be made, it was necessary to obtain a list of farmers in the designated areas. To facilitate this the township Agricultural Extension Agent was contacted and asked to provide a complete list of farmers within the area. This he did by obtaining a list from the County Treasurer's tax role. Further this list was then compared with that of the County Extension office and the County Office of the Agricultural Stabilization Committee.



The final list was examined carefully and it was evident that some names would need to be eliminated and not used in the universe. This included absentee owners, widows who operated their farm with a hired manager and owners who had a tenant with the farm managed by a professional farm management company. Where tenants were operating the farm, their names replaced that of the owner where it could be determined.

Development of Questionnaire

Preliminary to the development of a questionnaire it was necessary to determine what farm practices should be included for use in a survey of the selected universe. The head of each production department in the College of Agriculture at Michigan State University was asked either to prepare a list of farm practices recommended by his department or delegate this responsibility to a member of his staff.

In some cases the department head made up a list of practices after consultation with his staff, but in most cases the department head assigned the task to the Extension Specialist Project Leader. Where this was done, the Extension Specialist Project Leader met with the departmental research personnel and other department Extension Specialists to make up the list. When completed, the lists of practices were given to the writer.

After receiving the lists of recommended practices from the nine departments, the writer examined them closely. Final tabulations showed there were nearly three hundred practices listed as recommended for

farmers to follow. In the lists obtained from the departments it was obvious from examination that there were four factors that would enable considerable elimination and consolidation of practices in preparing a questionnaire.

First, there was much duplication by as many as three departments on a single practice.

Secondly, some of the practices submitted were eliminated because they were not applicable to all farmers.

Thirdly, some of the practices suggested were still highly controversial and there was not complete agreement within the recommending department that the practice was a profitable one under all or even a large number of farm situations.

Fourthly, there were far too many practices to be incorporated into a check type questionnaire to be feasibly used on a mail type survey. Some of the suggested practices were of lesser importance, while others were extremely important from a profit return standpoint to the farmer. Those of lesser importance were eliminated from the list.

In view of the four criteria used, the list of nearly three hundred farm practices was reduced to a list of eighty-eight practices for all nine departments, that were considered as having the combination of being desirable, feasible or practical and having a worth-while degree of profitability to the farmer employing them.

After the elimination of practices and the consolidation of departments the eighty-eight practices were placed in a tentative questionnaire

divided into nine sections. These were Soils, Farm Crops, General Farm Management, Agricultural Engineering, Dairy, Swine, Beef, Sheep and Poultry.

The writer then went back to talk with the responsible person in each of the production departments to show him the final selected list of practices, explain what had been done and receive his approval or objections. A few minor changes such as substituting an eliminated practice for one selected by the writer or the addition of an occasional eliminated practice were suggested. The suggested changes were made in each case and the final list for each department received approval from the person or persons that submitted the original list.

The approved list of desirable farm practices was then developed into a check-type questionnaire that could be easily and quickly answered by a farmer. Each practice included the desirable recommended practice and also the often numerous alternatives to that desirable practice that farmers could and do often follow.

In selecting the alternatives the writer called upon his experience in working with farmers as a county agricultural agent. The check-type questions with alternatives were again taken to the production departments and discussed, with special emphasis placed on phraseology of the recommended practice and including all the alternatives to it.

The completed questionnaire was then discussed with various members of the Agricultural Economics staff to remove bias and to select the most appropriate phraseology. Numerous changes were suggested which

were made. The questionnaire was then presented at a seminar with six members of the Agricultural Economics staff who made additional suggestions which were incorporated also.

Since the questionnaire was to be a mailed questionnaire a further safeguard against conveying a false meaning in regard to a practice was employed. This was a pretesting procedure. The writer invited fourteen farmers in the county where he had served as a County Agricultural Extension Agent and whose farm practices he knew well, to meet with him. Each was asked to fill out the proposed questionnaire. Notes were made on practice questions on which the various pre-testers did not seem to have complete understanding. Following this pretest the practice questions which had proved confusing were reworded to give more precise meaning. The questionnaire was then reproduced in quantity for use.

Mailing Questionnaires

Questionnaires were mailed to all farmers on the mailing lists of the selected areas described heretofore, accompanied by an explanatory letter. Five days after the questionnaires were mailed a postcard was sent to the same farmers asking them to complete the questionnaire as soon as was reasonably possible and return them in the stamped addressed envelope which was provided with the original mailing.

Three weeks later the returning questionnaires reached a point where only an occasional one was being received. Upon examination of

the returned questionnaires, it was found that in spite of the precaution taken in correcting the original mailing list, thirty-nine questionnaires returned uncompleted because recipients had ceased farming, rented their farms, sold their farms or were deceased. In addition, nineteen were returned only partially complete. The total universe of 436 yielded 192 usable questionnaires which was a 44 percent return.

The author went to the three areas of the universe and made personal interviews of the nonrespondents. A 20 percent random sample was obtained with which to study the effect of non-response bias. Chi-square tests revealed no significant difference at the 5 percent level between respondents and the nonrespondents on eight control items and 15 practices.

The questionnaire used in this mail survey was used in additional research work to survey farmers adjacent to the townships in the Kellogg Township Extension program. These farmers were surveyed for the purpose of establishing a benchmark for later research to compare progress made by farmers in the experimental areas versus those in control areas. Questionnaires obtained from farmers in the adjacent areas were added to those obtained previously via the mail survey. A total of four hundred seventy-one questionnaires were then available for possible use in the research.

In preparation for analysis, the 471 available questionnaires were carefully examined in order to eliminate those that were not usable. Operators of farms with less than 30 acres were eliminated. From those

that remained, all farms which classified as dairy farms were selected for use in this study. To classify as a dairy farm, 50 percent or more of the gross income must have come from dairy products and dairy cattle.

A total of 185 farms of the 471 were classified as dairy farms in the three areas as portrayed in Table I.

TABLE I

LOCATION OF FARMS IN THE SOUTHERN MICHIGAN DAIRY FARM SAMPLE

County	Number of Farms
Calhoun	52
Ionia	85
Lapeer	48
	185

The total of 185 farms fell in the Southern Michigan Dairy Farm Category by virtue of the fact that they met all the qualifications set forth above. These were then used by the author to prepare for further analysis. Upon detailed examination, it was found that five farm questionnaires had to be eliminated because of incomplete information on dairy practice adoption. The remaining 180 were found to be completely usable in the analysis that will follow.

The dairy farms in the sample were considered representative of southern Michigan dairy farms. The average tillable land per farm was 144 acres, they had an average of 17 months of labor per farm and received 70 percent of their income from their dairy enterprise.

CHAPTER III

CONSTRUCTION OF THE INDICES OF PRACTICE ADOPTION

Because of the nature of the data, the wide variations that existed between practices that farmers followed, and the fact that not all practices were applicable to all farmers, the type of analysis to be used required the investigation and consideration of analytical procedures that might best lend itself to the nature and type of data at hand.

Exploration of the types of analyses that might be used indicated a total of three that were worthy of consideration. One was the multiple factor analysis. A second was the Guttman Technique. Both of these, after being carefully considered, in light of the data at hand, were discarded not because they were faulty or undesirable methods of analysis but rather because the data at hand did not fit the techniques that these methods utilized.

A third method of analysis considered was the development of an index that could be used to measure farm practice adoption. In view of the nature of the data available, the formation of an index appeared to be the most desirable because it had flexibility of use, made possible the measurement of varying values, made possible the comparison of unlikes in percentage terms and permitted weighting, if necessary.

The data available from the farm questionnaires were such that they needed the statistical advantages that an index made possible. The variations in relative values between one practice and another, the varying values between a desirable farm practice and its less desirable alternatives made the formation of an index necessary to make it possible to compare unlikes percentagewise.

Factors Influencing Practice Adoption

While exploring the formation of an index, close examination of the practices indicated that there were often vast differences in importance between practices which would influence adoption by farmers. This suggested that there were influencing factors which motivated farmers to adopt some practices and either to be slow in adopting others or not adopt them at all. Four factors were finally accepted as being important in influencing practice adoption by farmers. These were: (1) the amount of investment required; (2) the net return per acre or per animal; (3) the magnitude of change required, and (4) the length of time the practice had been recommended. These are discussed in more detail in the following paragraphs.

Investment Required

The amount of investment required to make the changes necessary to be able to adopt a new practice was one of the factors that may have an influence on practice adoption. For example, a sizable investment is required for a dairyman to follow the practice of selling Grade A milk

when he needs to build a milk house and equip it while the practice of feeding grain to dry cows necessitates no investment except for the current input.

The Current Cost and Returns

The current costs of adopting and following a practice weighed against the possible increased returns is accepted as an influence on the practices a farmer follows. The current costs and returns are much higher to follow the practices of artificial breeding than the costs and returns of feeding grain to cows during the dry period.

The Magnitude of Change Required

The third determinant involved in the adoption of a desirable practice is the amount of change required in the habits of the farmer. The complexity of making the change is involved here also. It might also be expressed simply as "just the plain bother." The amount of change or the complexity of bringing about fall freshening in a dairy herd is greater than the change required in the practice of giving the dairy cow a sufficiently long dry period.

Length of Time Practice Has Been Recommended

The final factor used as having an affect on farm practice adoption was the length of time that a practice has been recommended. Feeding grain to dairy cows according to production has been recommended as a profitable practice for fifty years while the recommended practice of so-called fast milking has been in effect for seventeen years.

The longer a practice has been recommended, certainly the more time a farmer has had to become exposed to it as a recommendation, and the longer he has to evaluate it or to overcome inertia.

Establishment of Numerical Value for Each Factor

It was recognized that in the formation of an index that would be meaningful and that would reflect differences, it was necessary to account for differences in importance between the four factors. To establish a difference, numerical values needed to be placed on each factor with which to evaluate each farm practice so that an index could be formed. To accomplish this a panel of judges made up of sociologists and extension specialists and research men in farm management from the Department of Agricultural Economics were asked to study the four factors and give a numerical weight to each, the total to be 100.

They were asked to establish a numerical relative importance of the investment factor, which was done purely on the basis the investment required. In establishing a numerical value on the net return factor they were asked to consider the subfactors of increase in yield or rate of production, reduction in labor, reduction in risk, reduction in cash cost and personal satisfaction as well as the cost side with the subfactors of increase in cash costs, increase in depreciation and interest on capital investment, increase in labor required and the increase in risk. On the magnitude of change or action factor they considered the subfactors of change in habit or custom, the inconvenience or just

plain bother and the necessity of acquiring new skills because of the complexity of the new practice. The fourth factor of length of time the practice had been recommended was considered by the group purely on the basis of the time element.

The fourteen sets of values obtained from the panel, plus that of the author were placed together for observation and study. Following are the four factors with the modal values that resulted from the fifteen sets of values:

1. Investment Required.	20
2. Net Return per Acre or per Animal.	40
3. Magnitude of Change or Action Required	30
4. Length of Time Practice Has Been Recommended . .	10
Total	100

Numerical Values Placed on Practices and Alternatives

The author, after reviewing the farm practices from each production department in light of the four factors to be utilized, asked research and extension project leaders in each department to do two things. First, they were asked to array the practices for their department from high to low in regard to importance. Secondly, they were asked to assign numerical values within the limits presented to each practice and its alternatives on the basis of Investment, Current Cost and Returns, Magnitude of Change and the Length of Time the Practice had been Recommended.

Standardization of Numerical Value

As would be expected there were wide variations in the relative values between production departments. It was felt that it was highly necessary to standardize these relative values. The published literature available from the production departments was gathered together for study. Each farm practices and its alternatives were weighed carefully from the standpoint of the published literature, the production specialists' ratings and the author's judgment. Each was considered from the standpoint of the farm factors of Investment, Current Cost and Returns, Magnitude of Change and the Time Factor. Attempts were made to set up a scale whereby numerical values could be placed on each practice and its alternatives. Each practice and its alternatives could then be given an investment rating from 0 to 20, a current cost and return value ranging from 0 to 40, a magnitude of change value from 0 to 30 and a time factor value ranging from 0 to 10. At best, after repeated efforts, only a rough scale could be devised that would serve as a guide in using good judgment. Also, rating according to a rigid scale appeared unrealistic when the author considered, for example, that the investment cost for one farmer to convert to the production of Grade A milk could be much larger or smaller than that of another farmer. The time factor however, lent itself realistically to a scale which was devised and shown in Table II.

TABLE II

LENGTH OF TIME PRACTICE RECOMMENDED

Number of Years	Numerical Value Assigned
0 - 5 years	5
6 - 10 years	3
11 - 15 years	2
16 - 20 years	1
Over 20 years	0

Each practice was studied and given a numerical value on the basis of the investment factor, one on the basis of current cost and return factor, one for the magnitude of change factor, one on the time factor. This then permitted a total numerical value for each recommended practice and for each of its alternatives. In order to determine how valid this procedure was, a further step was taken. Before permanent values were assigned to each practice for the four factors, the practices were arrayed from high to low on the basis of values assigned to investment, current costs and returns, magnitude of change, the time element and the total value. These arrays were studied carefully to see that the order appeared to be reasonable. Except for minor disparities the values established were retained as permanent.

A complete list of recommended practices and alternatives with their established values is given in the Appendix. Two practices thus treated are reproduced here, in Tables III and IV, for example purposes and to show contrast.

TABLE III

DAIRY PRACTICE NUMBER 6

How do you test the production of your dairy herd?

Investment Value	Cost Return Value	Change Value	Time Value	Total Value		
0	0	0	0	0	(a) No testing	___
0	25	20	2	47	(b) D.H.I.A.	___
0	25	20	2	47	(c) Owner Sampler	___
0	25	20	2	47	(d) Herd Improvement	___
0	25	20	2	47	(e) Registry or Advanced Registry	___
0	20	15	0	35	(f) Weigh Milk from each cow monthly	___

Here if the dairyman checked practice alternative (f) the index of practice adoption for this practice would be 35.

TABLE IV

DAIRY PRACTICE NUMBER 7

How are your cows bred?

Investment Value	Cost Return Value	Change Value	Time Value	Total Value		
0	35	30	5	70	(a) Artifically	____
20	26	25	0	71	(b) Proven Sire	____
10	18	15	0	43	(c) Purebred bull	____
5	7	5	0	17	(d) Bull from artifically bred cow	____
5	0	0	0	5	(e) Bull raised from good cow	____

As will be noted the practice of breeding cattle has two practically equal alternatives, that of artificial breeding and the use of a proven sire. The remaining three alternatives are much less desirable and were given low numerical values for each of the four factors and consequently a low total value.

Application of Factor Values to Questionnaire

With the establishment of numerical values for each of the four factors it was possible to assign a weighting to each practice studied. Each practice on the 180 questionnaires returned by dairy farmers were weighted according to the values established.

At the conclusion of weighting the practices in the questionnaires and the application of the weights, each practices had two values. One was the score reflecting the highest value that could be placed on

each practice, had the farmer employed the most desirable one and the other reflecting a score of what the farmer actually did with that practice. The two could be the same, of course, where the farmer had followed the recommended one. Applied to all his dairy practices, this resulted in a possible score and a farmer's actual score as shown in the sample presented:

Dairy Section

Practice	Possible Score	Example Farmers Score
1. Time of freshening	72	72
2. Grain to milking cows	46	30
3. Grain to dry cows	27	19
4. Herd testing	47	47
5. How cows are bred	70	43
6. Provide for forage (summer and fall)	52	38
7. Time required for milking	62	62
8. Class of milk sold	93	93
9. Length of dry period	31	31
10. Testing for Bangs	49	30
Totals	549	465

Farmers Score ÷ Possible Score = Index of dairy practice adoption = 85

It was possible to obtain an index of practice adoption of Soil Management and Fertilization, Crop Culture, General Farm Management and Dairy on all farms since the entire 180 farms had these farm practices groups. Fifty-four of the 180 had a swine enterprise and 96 a poultry enterprise.

Characteristics of Data

To describe the indices and portray them more conveniently to permit inspection, tables are presented separately that give the frequency distributions of the indices in each of the farm enterprise sections.

TABLE V

FREQUENCY DISTRIBUTION OF INDICES OF SOIL AND SOIL MANAGEMENT PRACTICES ON 180 SOUTHERN MICHIGAN DAIRY FARMS

Indices of Soils and Soil Management Practices	Number of Dairy Farmers
0 - 20	6
21 - 40	50
41 - 60	82
61 - 80	38
81 - 100	4
Total	180

TABLE VI

FREQUENCY DISTRIBUTION OF INDICES OF FARM PRACTICE ADOPTION IN CROP CULTURE ON 180 SOUTHERN MICHIGAN DAIRY FARMS

Indices of Crop Culture Practices	Number of Farmers
0 - 20	5
21 - 40	36
41 - 60	77
61 - 80	53
81 - 100	9
Total	180

TABLE VII

FREQUENCY DISTRIBUTION OF INDICES OF GENERAL FARM MANAGEMENT PRACTICE ADOPTION ON 180 SOUTHERN MICHIGAN DAIRY FARMS

Indices of General Farm Management Practice Adoption	Number of Farmers
0 - 20	7
21 - 40	27
41 - 60	56
61 - 80	67
81 - 100	23
Total	180

TABLE VIII

A FREQUENCY DISTRIBUTION OF INDICES OF DAIRY PRACTICE ADOPTION ON 180 SOUTHERN MICHIGAN DAIRY FARMS

Indices of Dairy Practice Adoption	Number of Farms
0 - 20	5
21 - 40	18
41 - 60	55
61 - 80	73
81 - 100	29
Total	180

Swine

Of the 180 farms in the sample only 54 had a swine enterprise. The distribution of the indices is shown in Table IX.

TABLE IX

A FREQUENCY DISTRIBUTION OF INDICES OF SWINE PRACTICE ADOPTION ON FIFTY-FOUR SOUTHERN MICHIGAN DAIRY FARMS

Indices of Swine Practice Adoption	Number of Farmers
0 - 20	8
21 - 40	5
41 - 60	13
61 - 80	10
81 - 100	18
Total	54

Poultry

Ninety-six of the 180 Southern Michigan dairy farmers also had poultry as one of their enterprises. Table X shows the distribution of the indices.

TABLE X

A FREQUENCY DISTRIBUTION OF POULTRY PRACTICE ADOPTION INDICES ON NINETY-SIX SOUTHERN MICHIGAN DAIRY FARMS

Indices of Poultry Practice Adoption	Number of Farms
0 - 20	5
21 - 40	14
41 - 60	42
61 - 80	29
81 - 100	6
Total	96

Examination of Indices

Data, when grouped and examined gives some indication of its reliability. To do this the author utilized three measures of central tendency and two measures of dispersion. They are included in Table XI for all six sections which permits inspection and simple comparisons.

TABLE XI

RANGE, ARITHMETIC, MEAN, MODAL CLASS, MEDIAN, AND STANDARD DEVIATION OF INDICES OF PRACTICE ADOPTION OF RECOMMENDED FARM PRACTICES ON ONE HUNDRED EIGHTY SOUTHERN MICHIGAN DAIRY FARMS

Farm Practices	Number of Indices	Measures of Central Tendency			Measures of Dispersion	
		Arithmetic Mean	Mode	Median	Range	Standard Deviation
Soils and Soil Management	180	48.1	54	47	8-92	16.31
Crop Culture	180	53.3	60	55	13-89	16.18
General Farm Management	180	58.6	68	61	2-100	19.84
Dairy	180	62.2	77	65	14-90	17.55
Swine	54	61.0	95	62	5-100	28.07
Poultry	96	53.5	54	54	5-89	16.69

As will be noted the ranges of the indices are broad, and the standard deviations indicate that there is a wide dispersion around the arithmetic means.

CHAPTER IV

ANALYSIS OF RELATIONSHIPS

In the following pages will be presented an analysis of the adoption of desirable farm practices by a selected group of Michigan Dairy Farmers. The first portion will be an analysis of the relationship that exists between the adoption of recommended farm practices by dairy farmers and their association with the Cooperative Extension Service.

Development of An Index of the Farmers Association with the Cooperative Extension Service

Along with other additional basic information obtained on the questionnaires farmers were asked to check the extent to which they associated themselves with the Cooperative Extension Service. They were asked to check the items of participation that applied to their situation.

In order to develop an index of a farmer's association with his Cooperative Extension Service it was necessary to establish numerical values for each of the indicators of association. To obtain values for each item, ten persons closely associated with Extension work were asked to give a value from zero to ten to each of the nine association factors. The ten persons consisted of four men in Extension Administration, one person in charge of the Extension Training program, three County Extension Agents and the Author.

The values given by the ten people were averaged for each association factor and totalled. This total divided into 100 provided a multiplier for the average of each of the factors. Thus the various indicators of a farmers' association with his Cooperative Extension Service had the following values.

1. Call at the office of the County Agricultural Agent two or more times a year.	19
2. Telephone the County Agricultural Agent two or more times a year.	15
3. Have the County Agricultural Agent call at my farm once a year or more.	19
4. Seldom see or contact the County Agricultural Agent.	0
5. Never contact the County Agricultural Agent.	0
6. Attend two or more meetings each year called by the County Agricultural Agent where Michigan State University Specialists speak.	15
7. Read an occasional new bulletin from the County Agricultural Agents office.	7
8. Attend Tours, Grass Days, Demonstrations, etc.	13
9. Have now or have had children in 4-H Club work.	12
Total	100

Through the use of these values it was possible to compute an index of association with the Cooperative Extension Service for each of the 180 dairy farmers.

The indices of association with the Cooperative Extension Service of the 180 dairy farmers ranged from 0 to 100 with thirty-seven farmers showing no association and sixteen showing an index of 100 or complete

cooperation according to the original standards set forth. A more complete picture is shown in the frequency distribution in Table XII.

TABLE XII

FREQUENCY DISTRIBUTION OF INDICES OF ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE OF ONE HUNDRED EIGHTY SELECTED SOUTHERN MICHIGAN DAIRY FARMS

Farmers Indices of Association	Number of Farmers	Percentage
0	37	20.6
1 - 33	51	28.3
34 - 67	41	22.8
67 - 100	51	28.3
Total	180	100.0

As will be noted 79.4 percent of the farmers surveyed for this study had some degree of association with the Cooperative Extension Service and of these 35.6 percent within the framework of study can be considered complete cooperators.

With the indices of the farmers' association with the Cooperative Extension Service computed, it was then possible to measure the relationship between this and the farmers indices of farm practice adoption.

This relationship for the various farm enterprises is shown graphically by the least squares regression line in the following scatter diagrams in Figures 2 through 7.

FIGURE 2

RELATIONSHIP BETWEEN ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND SOIL MANAGEMENT FARM PRACTICE ADOPTION ON 180 SOUTHERN MICHIGAN DAIRY FARMS

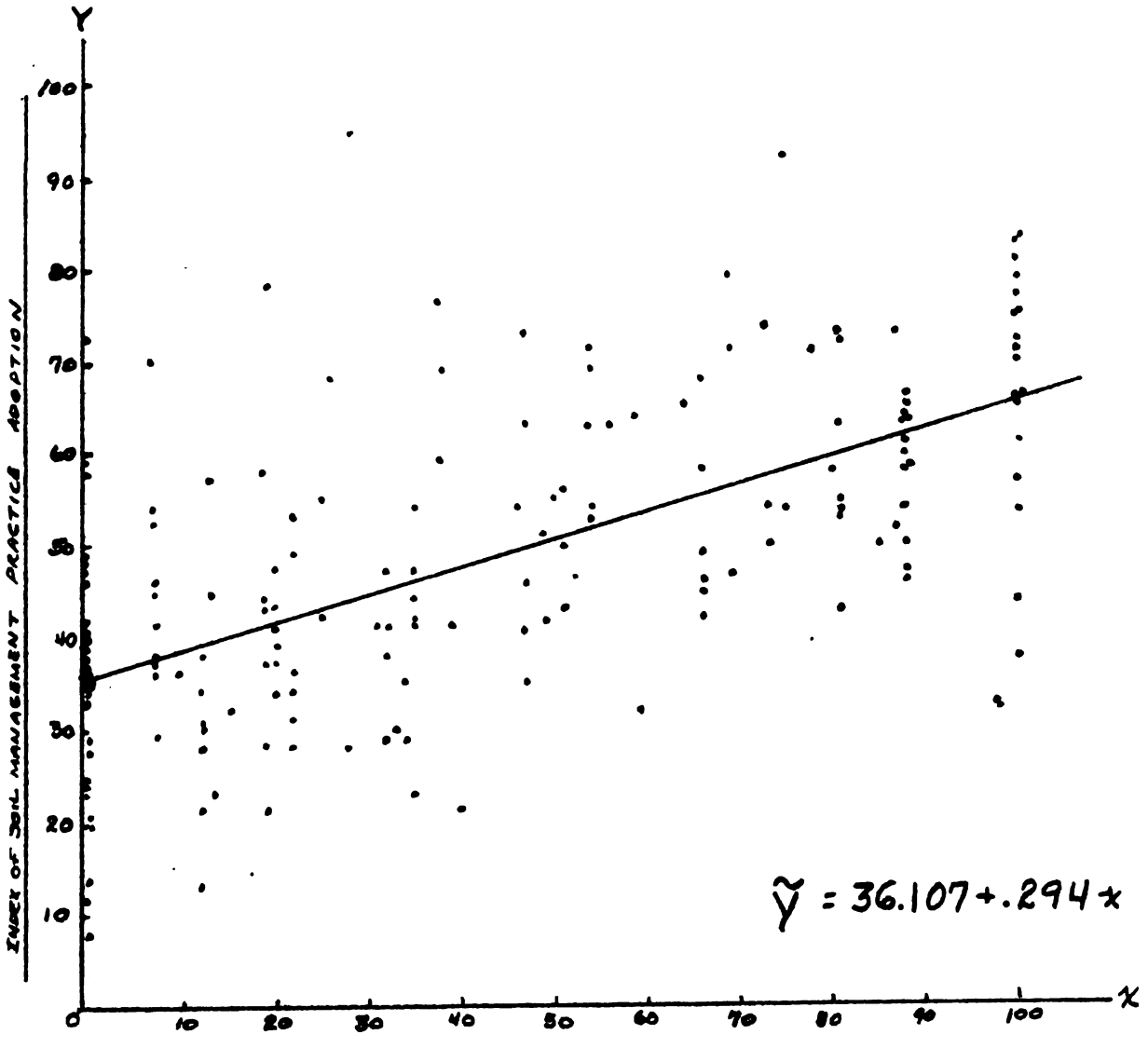


FIGURE 3

RELATIONSHIP BETWEEN ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND FARM CROPS FARM PRACTICE ON 180 SOUTHERN MICHIGAN DAIRY FARMS

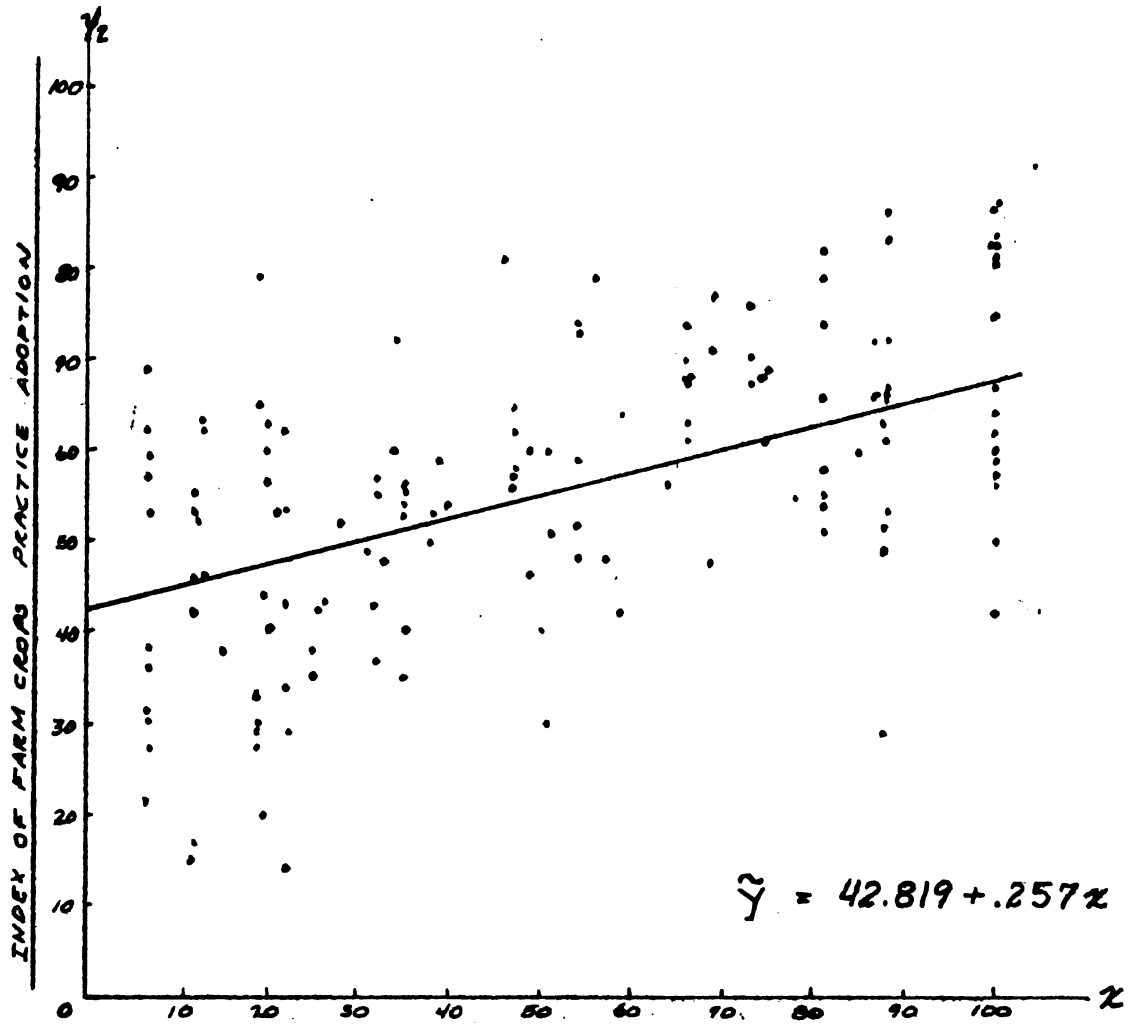


FIGURE 4

RELATIONSHIP BETWEEN ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND GENERAL FARM MANAGEMENT FARM PRACTICE ADOPTION ON 180 SOUTHERN MICHIGAN DAIRY FARMS

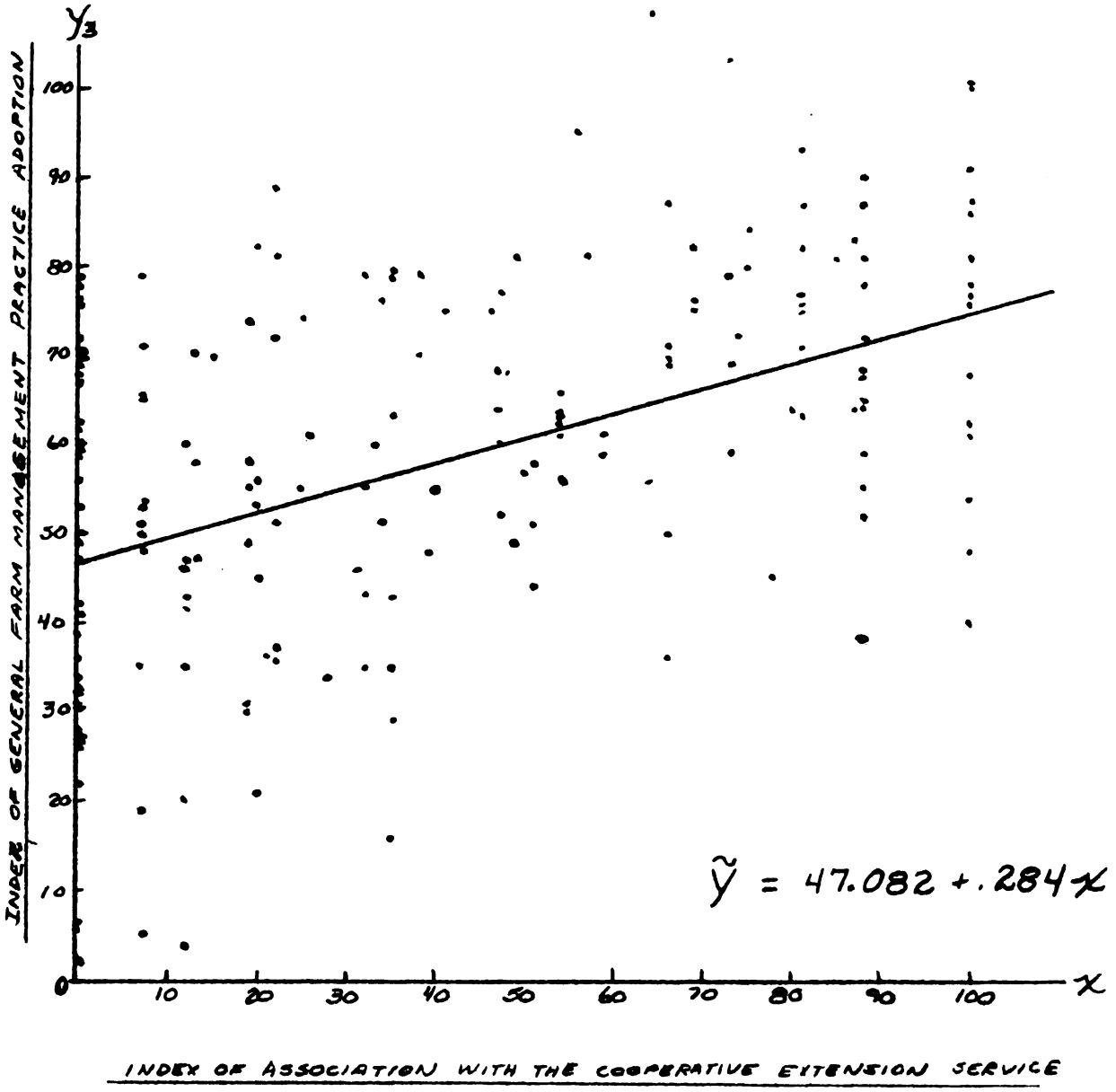


FIGURE 5

RELATIONSHIP BETWEEN ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND DAIRY FARM PRACTICE ADOPTION ON 180 SOUTHERN MICHIGAN DAIRY FARMS

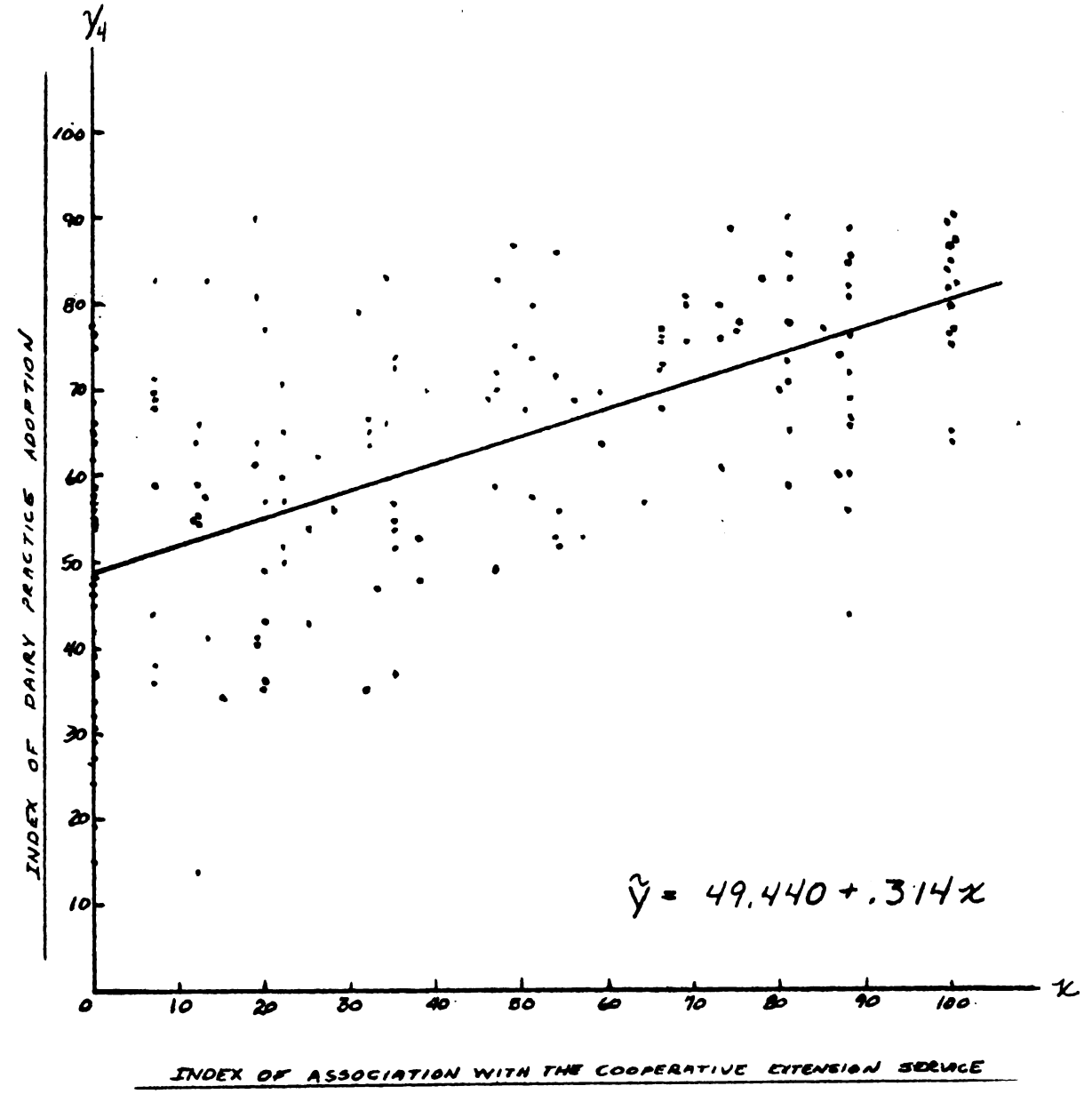


FIGURE 6

RELATIONSHIP BETWEEN ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND SWINE FARM PRACTICE ADOPTION ON 54 SOUTHERN MICHIGAN DAIRY FARMS

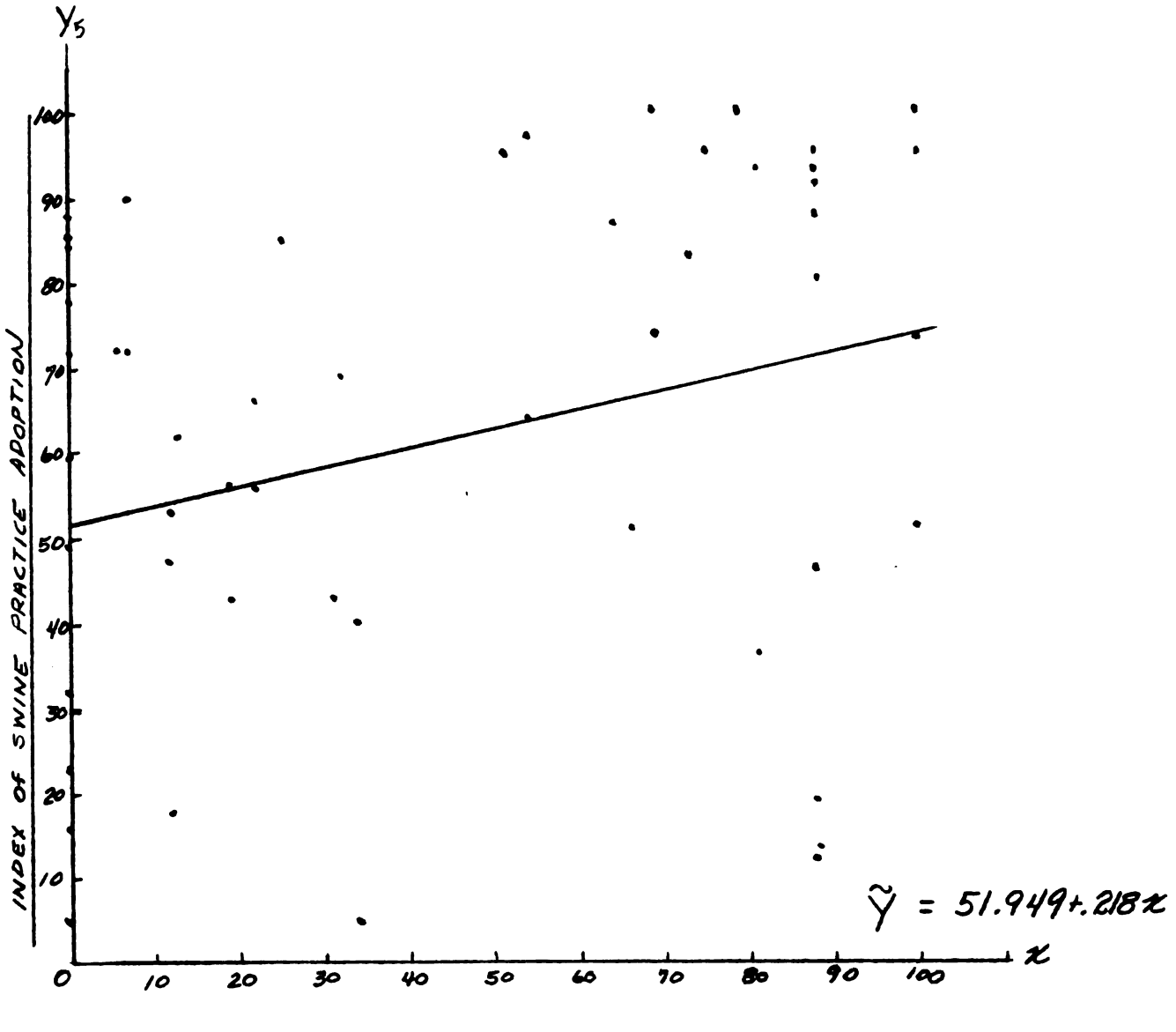
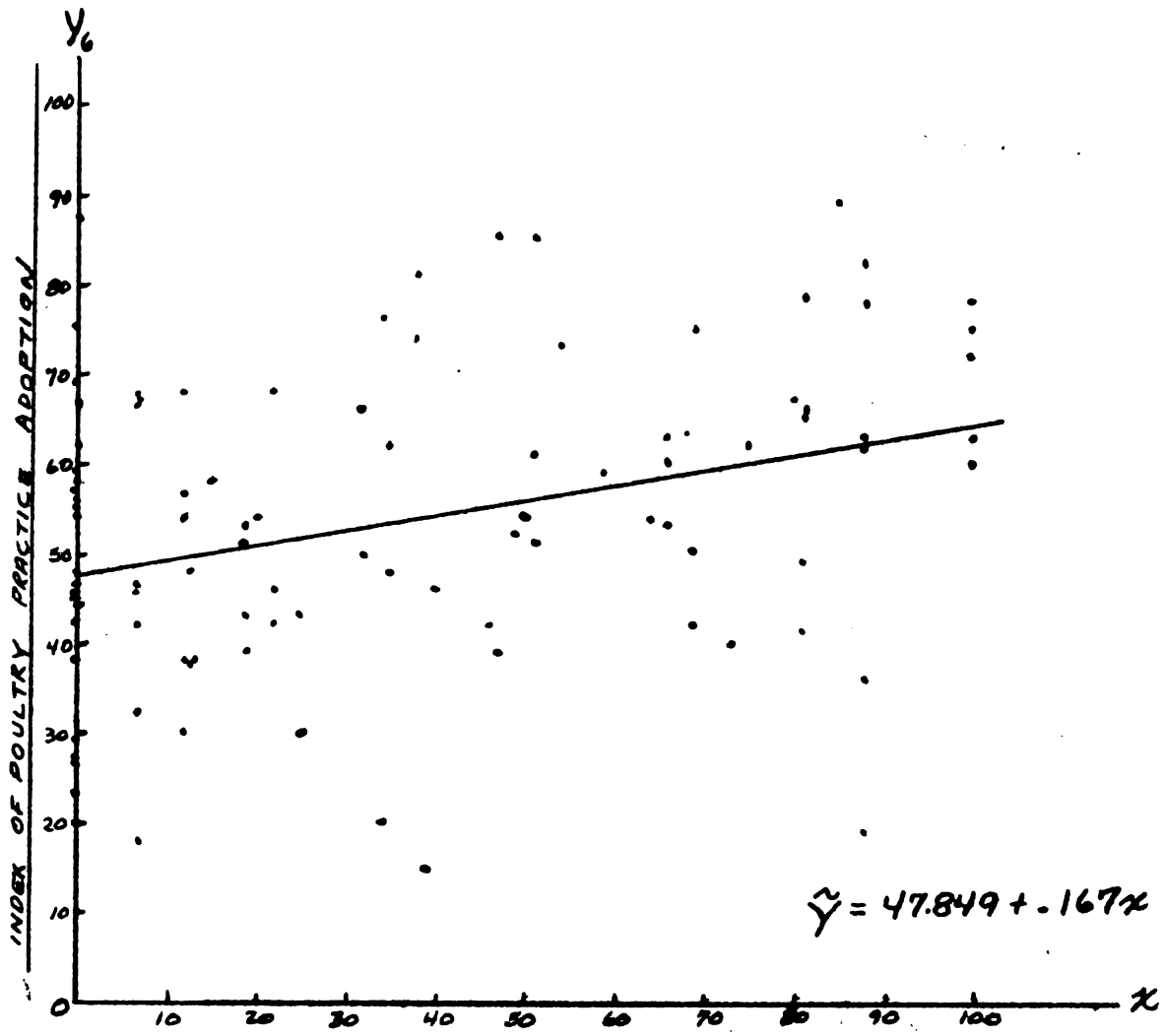


FIGURE 7

RELATIONSHIP BETWEEN ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND POULTRY FARM PRACTICE ADOPTION ON 96 SOUTHERN MICHIGAN DAIRY FARM



Correlation

Least squares regression was accepted as the more desirable technique for analyzing the relationship between farmers associations with the Cooperative Extension Service and their farm practice adoption. It is recognized and emphasized here that the existence of a positive or negative correlation, does not show "cause and effect." However, where paired indices manifest or show a concomitant variation, it does show the degree of association between two variables.

In preparation for computing correlations, an array was made of the 180 indices of farmers' association with the Cooperative Extension Service in ascending order from 0 to 100. This was done to make it possible to inspect the data and to observe any similarity in movement in the indices being correlated. Listed with each observation in this array was the corresponding index of practice adoption for soil and soil management, Farm Crops, General Farm Management, Dairy, Swine and Poultry. This permitted pairing the 180 indices of farmers' association with the Cooperative Extension Service with the 180 practice adoption indices.

The simple linear correlation coefficients and coefficients of determination were computed of the indices of the Cooperative Extension Service separately with 1) The indices of soil and soil management practice adoption, 2) Indices of farm crops practice adoption, 3) Indices of general farm management practice adoption, 4) Indices of dairy practice adoption, 5) Indices of swine practice adoption, and

6) Indices of poultry practice adoption. The following legend was used with x denoting the independent variable and the yn the dependent variables.

x - The indices of farmers association with the Cooperative Extension Service

y_1- Indices of Soils and Soil Management practice adoption

y_2- Indices of Farm Crops practice adoption

y_3- Indices of general farm management practice adoption

y_4- Indices of dairy practice adoption

y_5- Indices of swine practice adoption

y_6- Indices of poultry practice adoption.

The x variable was correlated individually with the y_1, y_2, y_3, y_4, y_5, and y_6 and a coefficient of correlation obtained. In addition a coefficient of determination, i.e. the percent of the variation that is explained by this relationship was obtained. Also the standard error of the estimate was computed for each correlation. The results of these computations are shown in Table XIII.

A test for independence between x and yi, i = 1 to 6 was made. The test rejected the null hypothesis which implies that the two variables x and yi are independent of each other. As will be noted in Table XIII, y_1, y_2, y_3, y_4 with 180 observations are significant at the 1 percent level. At this probability level there is only one chance out of one hundred that an r value this high could have resulted from sampling error or from pure chance. In swine practice adoption (y_5)

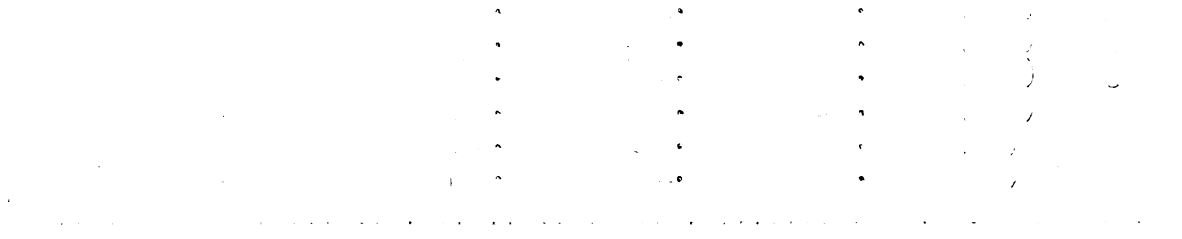
TABLE XIII

CORRELATION BETWEEN FARMERS' ASSOCIATION WITH THE COOPERATIVE EXTENSION SERVICE AND HIS FARM PRACTICES IN SOIL MANAGEMENT, FARM CROPS, GENERAL MANAGEMENT, DAIRY, SWINE AND POULTRY ON ONE HUNDRED EIGHTY SOUTHERN MICHIGAN DAIRY FARMS

Variable	(n)	ryx	r^2	r	Level of Significance (Percentage)
y_1	(180)	.625	.391	.058	1
y_2	(180)	.550	.302	.063	1
y_3	(180)	.496	.246	.065	1
y_4	(180)	.621	.385	.059	1
y_5	(54)	.288	.083	.133	5
y_6	(96)	.329	.108	.097	1

with 54 observations there is significance at the 5 percent level. Poultry practice adoption, with 96 observations was also significant at the 1 percent level.

Coefficients of determination, i.e. the amount of variance that is explained were obtained as will be noted as r^2 in Table XIII. For example the coefficient of determination for soil practice adoption is 39.1 percent. This says that 39.1 percent of the variation in the dependent variable (soil practice adoption) is associated with changes in the independent variable (Cooperative Extension Service). Corresponding figures for remaining dependent variable are, Farm Crops practice adoption 30.2 percent; General Farm Management practice adoption 24.6 percent; Dairy practice adoption 38.5 percent; Swine



practice adoption 8.3 percent; and Poultry practice adoption 10.8 percent. Soils, Farm Crops, General Farm Management and Dairy show an acceptably high influence that can be attributed to the independent variable. Swine and poultry are low which is somewhat difficult to explain. In the case of swine a possible explanation is that since the farmers in the sample had dairy cattle as their major source of income, their interest in their swine enterprise was less and therefore had less interest in attending Extension Meetings on swine, or contacting their County Agent on swine problems. The low percentage of influence that can be attributed to the Extension Service on poultry practice adoption may be explained by the fact that it is usually the farm wife who attends Extension Service events on poultry and looks after the farm poultry enterprise, whereas the husband filled out the questionnaire.

In view of the levels of significance and the coefficient of determination the correlation between the farmers' association with the Cooperative Extension Service and farm practice adoption can be considered high at least within this sample and within the framework of the developed indices.

Analysis of the Relationship Between the Adoption of Desirable Dairy Practices and Other Livestock Enterprises on Selected Southern Michigan Dairy Farms

Dairy farmers often do not confine their farm enterprise to just dairy cattle. Frequently they have other livestock on their farms to

spread their risk, further utilize their time, existing buildings and increase income.

The author during his tenure as a County Agricultural Agent believed, either correctly or incorrectly, that farmers tended to follow more of the recommended practices with their major livestock enterprise than they did on their less important livestock enterprise. This portion of the analysis is designed to test the second hypothesis of this thesis, namely, that dairy farmers do follow more of the recommended practices on their major (dairy) enterprise than they do of the recommended practices on their minor livestock enterprises, in this case swine and poultry.

In this sample of 180 dairy farmers, none had beef or sheep enterprises but some had swine and/or poultry as supplemental income producing livestock. Table XIV presents the combinations of livestock on the farms.

TABLE XIV

NUMBER OF DAIRY FARMERS HAVING SWINE AND/OR POULTRY ENTERPRISES ON ONE HUNDRED EIGHTY SOUTHERN MICHIGAN DAIRY FARMS

Number of Farmers	Number With Swine	Number With Poultry	Number With Swine and Poultry
180	24	66	30

To present graphically the relationship between the indices of dairy practice adoption and the indices of swine practice adoption, a scatter diagram is presented in Figure 8. Similarly presented is Figure 9 which shows the association between the indices of dairy practice adoption and the indices of poultry practice adoption. In both cases the indices of dairy practice adoption is the independent variable where the indices of swine practice adoption and poultry practice adoption are the dependent variables.

Inspection of the charts show a very wide scatter exists, indicating only minor relationship between the dependent and independent variables.

Correlation Analysis

Simple linear correlation analysis was employed to determine the relationship existing between the major enterprise and the minor enterprise(s). The independent variable here was the indices of dairy practice adoption while the dependent variable(s) were the indices of swine practice adoption and the indices of poultry practice adoption. Table XV shows the result of this correlation analysis.

As will be noted the correlation of the 54 indices of swine practice adoption with the 54 indices of dairy practice adoption resulted in an extremely low coefficient of correlation of .12. Likewise the correlation coefficient resulting from correlating 96

FIGURE 8

RELATIONSHIP BETWEEN INDEX OF DAIRY PRACTICE ADOPTION AND INDEX OF FARM SWINE PRACTICE ADOPTION ON 54 SOUTHERN MICHIGAN DAIRY FARMS

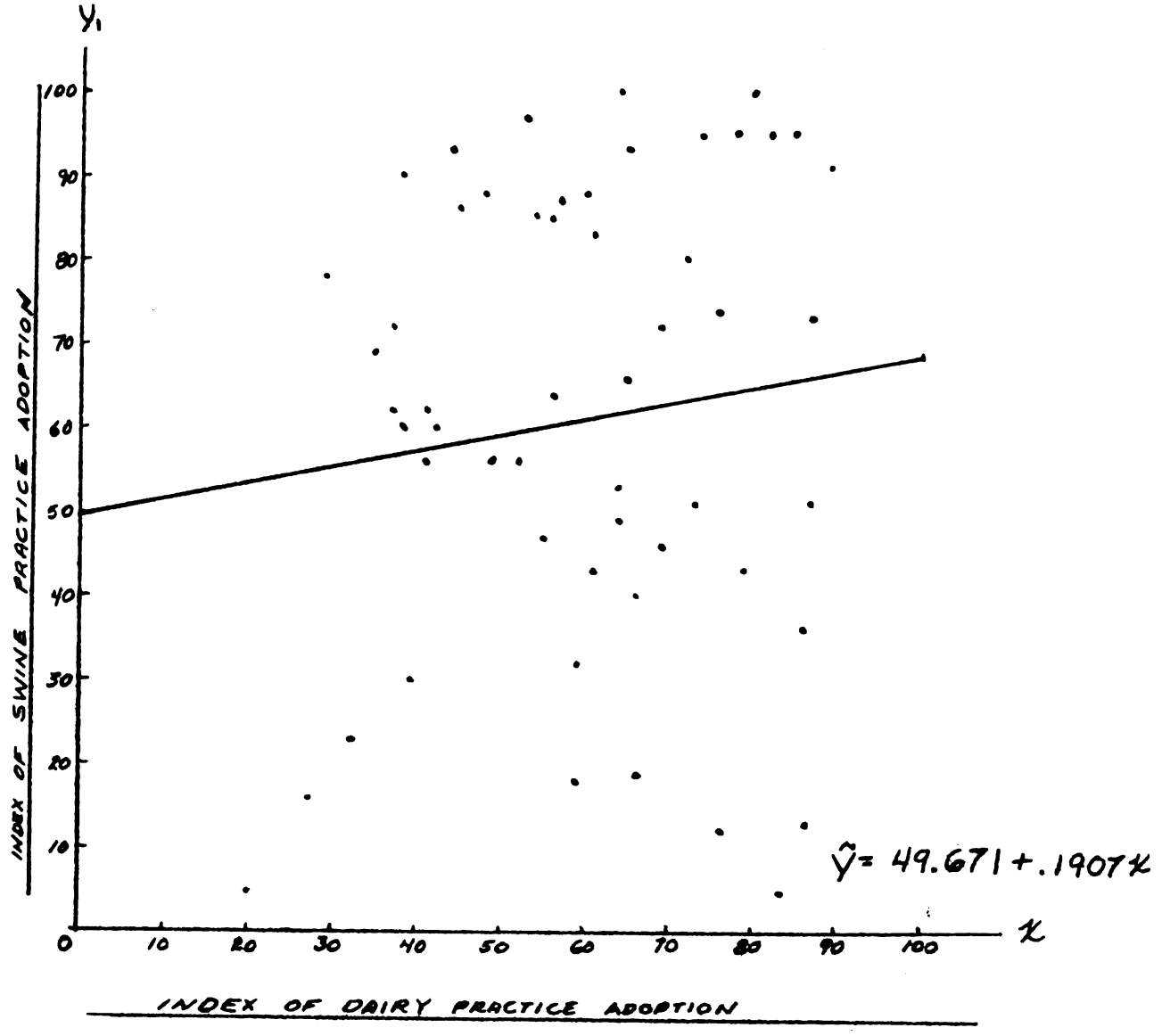


FIGURE 9

RELATIONSHIP BETWEEN INDEX OF DAIRY PRACTICE ADOPTION AND INDEX OF FARM POULTRY PRACTICE ADOPTION ON 96 SOUTHERN MICHIGAN DAIRY FARMS

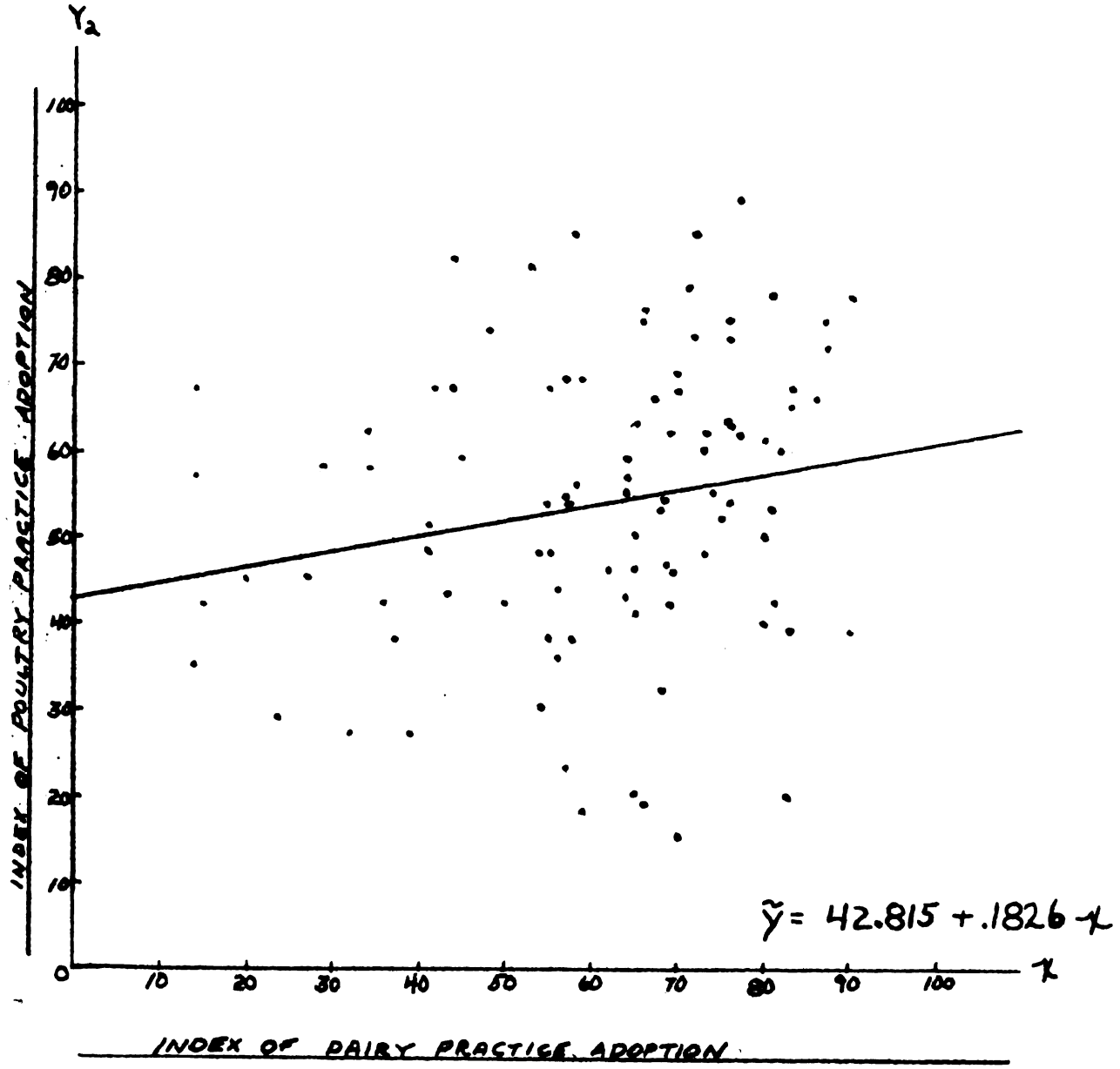


TABLE XV

CORRELATION BETWEEN INDICES OF DAIRY PRACTICE ADOPTION AND CORRESPONDING INDICES OF SWINE AND POULTRY PRACTICE ADOPTION RESPECTIVELY ON FIFTY-FOUR AND NINETY-SIX SOUTHERN MICHIGAN DAIRY FARMS

Variable (n)	ryxi	r^2	Level of Significance
y_1 (54)	.12	.0144	*
y_2 (96)	.19	.0361	*

*Not significant at the 5 percent level.

indices of poultry practice adoption with the corresponding 96 indices of dairy practice of adoption was .19, also extremely low.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

It has been previously stated that influences other than the Cooperative Extension Service have affected the practices which farmers follow. The author recognizes these many influences and their importance, however, it is not considered necessary to enumerate them at this time.

The Cooperative Extension Service, historically has been recognized as having an important influence on the practices a farmer follows. Also it has been regarded by farm people as an unbiased source of information. Michigan State University through its Cooperative Extension Service has virtually deluged farmers with farm practice information through the various media and techniques. This has, through the years, been available free upon simple request.

The employment of recommended practices by farmers has been regarded as resulting in increased production and/or a reduction in unit costs of production or better family life and increased satisfaction. In view of the availability of farm practice information, and in view of the usual desirable results it is often difficult for non-farmers to understand why all farmers do not quickly adopt practices that have been thoroughly tested and then recommended for use.

The adoption of new or better practices by a farmer, however, necessitates a number of actions on his part. Usually these include

one or more of such efforts as thought, overcoming inertia, investigation, planning, budgeting through economic considerations, taking the necessary action and the expenditure of additional money. Many farmers are quick to become aware of a new practice, quick to recognize possible benefits, quick to decide, and quick to put into operation a new farm practice. Others are somewhat slower, others still slower, while still others either never adopt recommended practice or adopt it so late that they have lost the possible financial benefits when they finally do become adopters. This loss of potential profit is due to the fact that so many farmers have already adopted the practice that total production has increased to a point where market price reflects the reduced cost of per unit production.

The author does not wish to categorize farmers as adopters and non-adopters but rather to acknowledge that there are farmers in various stages of adoption of a specific new practice for a number of years after it is introduced.

Limitations of Analysis

This thesis effort to determine the relationship that exists between dairy farmers' association with the Cooperative Extension Service and the recommended farm practices they follow, has been made through the use of original data. Data were obtained through direct mail questionnaires and by personal interview of farmers in a selected sample. There are limitations to the study that should be presented herewith.

Data Limitations

The data obtained and used in this thesis are believed reliable and authentic, since they were supplied by the dairymen themselves. In spite of efforts to remove bias, there undoubtably were elements of suggestions in the questionnaire, due to the fact that alternatives to each of the recommended practices were necessarily listed. For this reason there is question as to whether all farmers were actually following the practices they said they were following. There is no reason to suspect deception but the possibility does exist that some of the dairymen in the sample may have inadvertently reported following a practice they knew to be recommended, while actually following a less desirable alternative.

Statistical Limitations

Data obtained from the 180 farmers out of a total sample of 471 falling into category of dairy farmers were constructed into indices. Although the employment of an index as a method of analyzing the data was felt to be a desirable one for this thesis, other methods could have been used. A limitation is that the indices formed and used were the result of numerical values developed from value judgments. These value judgments, however, were made by a number of people who were the most capable people available in their field. Therefore, within the ability of human judgments, the indices as developed and used are believed to be a useful system of quantifying farmers practice adoption patterns for the purpose of studying relationships.

Conclusion

Certain conclusions can be made as a result of the analysis of data in this thesis. Two conclusions reflect on the two original hypotheses. The first hypothesis, "The more closely dairy farmers associate themselves with the Cooperative Agricultural Extension Service the greater will be their tendency to follow more desirable or recommended farm practices" was tested through the use of correlation analysis.

The high correlation between the indices of farm practice adoption and the indices of dairymen's association with the Cooperative Extension Service, suggest that this hypothesis can be accepted as true.

The second hypothesis, "Dairy farmers follow a greater number of recommended farm practices on their dairy enterprise than they do on their minor livestock enterprises" was also tested by correlation analysis. The indices of the dairy farmers who had swine and poultry in addition to dairy were correlated with their indices of swine and poultry practice adoption. Very low coefficients of correlation were obtained. In the case of swine practice adoption, the coefficient of correlation was .12, while in the case of poultry it was .19. A second conclusion can be drawn from these results; namely, that within the framework of this analysis the second hypothesis is true. This says in effect that dairymen do not follow as many of the recommended practices on their minor livestock enterprises as they do on their dairy enterprise.

The third conclusion that can be drawn is that a rather large segment of farmers make no direct use whatever of their Cooperative Extension Service. In the sample of 180 dairymen, 20.5 percent had no direct association with this Service. They may be influenced indirectly, however, by the Extension Service as a result of their observation of farmers who do associate themselves.

Fourth, many dairy farmers who do use the Cooperative Extension Service to some extent would probably benefit materially if they utilized it more. Only 8.8 percent of the dairymen in the sample, associated themselves completely, within the framework of the index, with the Extension Service.

Rate of practice adoption did not specifically enter into this analysis. However, a fifth conclusion pertaining to rate of practice adoption appears valid from the data. It is that the majority of dairy farmers are extremely slow in adopting a new practice. This has been known for a long time but it is pointedly evident in this analysis. It is understandable that a farmer would want to observe and weigh a new recommended practice on the basis of cost and return for a year or possibly two. However, when a practice has been recommended and widely publicized for four years such as in the case of minimum tillage, and only 2 percent of the dairymen adopt during that period, it must be realized that the adoption rate of a new practice is extremely slow.

Implications of Analysis

In reviewing the analysis and the conclusions drawn there are numerous implications that in the opinion of the author are important to the Cooperative Extension Service and to farmers.

It is significant that farmers who associate themselves with the Cooperative Extension Service follow significantly more of the recommended practices. This probably justifies public monies expended for this work. However, the results of this study do have some implications to both the Cooperative Extension Service and to farmers themselves.

1. Since there is a rather high coefficient of correlation between a farmers' association with the Cooperative Extension Service and the practices the farmer follows, it indicates that the Extension Service has the know how and techniques to increase the adoption of recommended practices.

2. The Extension Service is in a position to increase the rate of adoption of new practices.

By being more active in getting practice information to farmers through the use of mass media and by supplying others who influence farm people such as radio and newspaper farm editors with practice information, much could be accomplished in this process. Extension concentration on method demonstration followed with a corresponding result demonstration would materially hasten the adoption of a newly

recommended practice. Just because farm people historically have been slow to adopt new practices does not mean it must be necessarily so.

3. Assuming that the employment of recommended practices increases production and/or reduces cost, increases satisfaction and improves family living, a third implication is that the Extension Service needs to direct more effort in the direction of the minor enterprises on farms so that these enterprises would make a larger contribution to farm income.

Perhaps the Extension Service has allowed itself to become too much of a question and answer Service rather than a total farm operation aid. Certainly the total farm analysis approach, conducted recently by Extension workers, could do much more to improve practice adoption on minor enterprise.

4. From this analysis there is a strong implication that there is too large a segment of farmers that the Extension Service is not reaching. To be sure the Service is available to them but for some reason they are not utilizing it. It would seem that Extension Service even here could well afford to concentrate on reaching these people. This can be done through the use of various techniques to attract people to meetings, demonstrations and Extension functions.

5. There is the implication that the Extension Service needs to explore the area of motivation of farmers in practice adoption. Possibly greater use of such techniques as success stories in local newspapers, supplying farmers with a list of recommended practices by

enterprises or giving greater emphasis to the economics of practice adoption might be effective. Pride and making money motivate people. Emphasizing practices from the standpoint of "this is what it will cost to make the change, but this is what your increase in production will be or this is what you will save" might help in motivation.

6. The strong implication is evident that the Cooperative Extension Service, effective as it has been in practice adoption with those farmers who associate themselves with it, has reason to dwell on introspection and self analysis. Land grant colleges and their experiment stations will be constantly developing new and improved practices, new techniques which will need to be disseminated. The Cooperative Extension Service has an opportunity and an obligation to develop its teaching methods so as to first increase the rate at which farmers adopt a new practice and second to increase the total number of recommended practices a farmer follows with all his farm enterprises. Because of chronic financial limitations on most farms it is important that some changes have priority over others. Farmers need to evaluate new practices and adopt those first which bring in the highest return on the added investment. Teaching farmers to properly allocate resources is and always will be important in farm practice adoption. The Cooperative Extension Service has a challenge here.

APPENDIX

NUMERICAL VALUES OF FACTORS OF FARM PRACTICE ADOPTION

NUMERICAL VALUES OF FACTORS INFLUENCING FARM PRACTICE ADOPTION

Soil Management and Fertilization

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
1. How often have you had soil tested for lime and fertilizer from fields on your farm?					
0	5	15	2	22	(a) Every 3 to 4 years
0	4	10	0	14	(b) Every 5 to 6 years
0	3	5	0	8	(c) Every 7 to 8 years
0	2	5	0	7	(d) Every 9 to 10 years
0	0	0	0	0	(e) Never have tested all the fields
0	0	0	0	0	(f) Never have had any tested
0	5	15	2	22	(g) Every 2 years
0	5	15	0	20	(h) Test 2 to 3 fields per year
2. How have you decided whether or not to apply lime on a field?					
0	0	0	0	0	(a) Apply lime when you feel it is needed
0	40	10	1	51	(b) By having soil tested
0	0	0	0	0	(c) By the appearance of the crop
-	-	-	-	-	(d) Other methods of deciding (please state)
3. In general, how often do you plow down a green manure crop?					
0	15	10	3	28	(a) Oftener than every 4 years
0	15	5	0	20	(b) Every 4 years
0	13	0	0	13	(c) Every 5 years
0	10	0	0	10	(d) Every 6 years

Soil Management and Fertilization

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	0	0	0	0	(e) Every 7 or more years
0	0	0	0	0	(f) As it fits my rotation

4. In general, how many spreader loads of manure do you apply per acre?

0	11	0	0	11	(a) 0 to 3 loads
0	15	5	5	25	(b) 4 to 6 loads
0	14	5	0	19	(c) 7 to 9 loads
0	8	0	0	8	(d) 10 to 12 loads
0	0	0	0	0	(e) 13 or more

5. When you seed forage crops (alfalfa, clover, grass) with small grains (oats, wheat, barley, etc.) how much fertilizer do you use?

0	0	0	0	0	(a) None
0	18	5	0	23	(b) 100# - 200# per acre
0	26	10	0	36	(c) 200# - 300# per acre
0	32	15	0	47	(d) 300# - 400# per acre
0	35	20	10	65	(e) 400# - 500# per acre
0	28	20	0	48	(f) 500# - 600# per acre
0	25	20	0	45	(g) Over 600# per acre

6. What, if any fertilizer top dressing was done on legume hay and/or pasture?

0	27	15	0	42	(a) Top dress first year following planting
0	27	30	0	57	(b) Top dress each year (after 1st hay or pasture year)

Soil Management and Fertilization

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	30	30	6	66	(c) Top dress only when I keep alfalfa for 3 or more years
0	0	0	0	0	(d) Don't feel I need to top dress hay or pasture

7. If no barnyard manure was used and no legume sod was plowed down for corn last year, did you?

0	18	10	0	28	(a) Use a starter fertilizer only
5	35	20	9	69	(b) Use starter fertilizer and side dressed with nitrogen
5	18	10	0	33	(c) Just side dressed with nitrogen
0	0	0	0	0	(d) Used no fertilizer on corn

8. When you last planted spring grains (oats and barley) alone, and hay and pasture seeds were not added, how much fertilizer did you use?

0	0	0	0	0	(a) None
0	18	5	0	23	(b) 150# or less per acre
0	24	10	0	34	(c) 150# - 250# per acre
0	27	15	0	42	(d) 250# - 300# per acre
0	30	20	10	60	(e) 300# or more per acre

9. When you last planted wheat where hay and pasture seeds were not being added and were not to be added the next spring, how much fertilizer was used?

0	0	0	0	0	(a) None
0	14	5	0	19	(b) 150# or less per acre
0	23	10	0	33	(c) 150# to 250# per acre
0	28	15	0	43	(d) 250# to 350# per acre
0	32	10	0	42	(e) 350# to 400# per acre

Soil Management and Fertilization					
Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	35	20	10	65	(f) Over 400# per acre
10. How do you spring top dress fall sown grains?					
0	0	0	0	0	(a) No spring top dressing
0	27	10	0	37	(b) Barnyard manure
0	30	20	5	55	(c) Ammonia nitrate
0	0	5	0	5	(d) Mixed fertilizer
11. Of your soil that needs drainage, do you?					
20	40	25	2	87	(a) Have all the drainage done
5	14	8	0	27	(b) Have about one-third done
10	20	12	0	42	(c) Have about half done
15	26	16	0	57	(d) Have about two-thirds done
0	0	0	0	0	(e) None

Crop Culture

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
1. The last time you bought alfalfa seed, what did you buy?					
0	11	5	0	16	(a) Any northern grown seed
0	15	5	7	27	(b) Ranger variety
0	0	0	0	0	(c) Common
0	0	0	0	0	(d) Whatever dealer had
0	11	5	0	16	(e) Canadian seed
0	11	5	0	16	(f) Others (please state)
2. What is your legume innoculation practice?					
0	0	0	0	0	(a) Don't feel innoculation necessary on my farm
0	10	10	1	21	(b) Always innoculate legume seed
0	5	5	0	10	(c) Sometimes innoculate legume seed
3. When alfalfa or clover was seeded at the same time small grain was planted, did you?					
5	30	20	9	64	(a) Use band seeding
0	0	0	0	0	(b) Drilled seed into ground with grain and fertilizer
0	15	10	0	25	(c) Scattered legume seed by drill on surface while drilling grain
0	15	10	0	25	(d) Others (please state)
5	15	10	0	30	(e) Power seeder
4. What is your fall alfalfa management program?					
0	0	0	0	0	(a) Pasture or cut in September
0	20	20	3	43	(b) Never pasture or cut in September

Crop Culture

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	16	5	0	21	(c) Pasture or cut in September only when I'm very short of hay and pasture
0	20	10	3	33	(d) Pasture or cut in September only when I plan to plow it down next spring
0	20	15	3	38	(e) Don't pasture or cut in September but pasture in October and November
5. If you planted more than 10 acres of corn, did you -					
0	15	10	6	31	(a) Plant more than one hybrid or strain
0	0	0	0	0	(b) Plant all acreage to the same hybrid or strain
0	15	10	6	31	(c) Plant all acreage to the same hybrid but different strain
0	3	0	0	3	(d) Plant different hybrids, but pay no attention to strain
6. How do you decide when to cut your alfalfa hay?					
0	0	0	0	0	(a) In early July when the weather is right
0	5	0	0	5	(b) Pre-bloom
0	15	10	3	28	(c) One-tenth bloom
0	14	10	0	24	(d) One-fourth bloom
0	8	5	0	13	(e) One-half bloom
0	0	0	0	0	(f) Full bloom
7. What has been your source of seed grains (oats, wheat, etc.)					
0	0	0	0	0	(a) Never buy certified seed
0	0	0	0	0	(b) Just buy good seed from my neighbor

Crop Culture					
Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	15	10	1	26	(c) Get certified seed about every three years
0	9	5	0	14	(d) Get certified seed every 4 to 6 years
0	12	10	0	22	(e) Certified seed every year
8. In preparing your fields for oats and corn last year, what method of tillage did you follow?					
5	10	25	10	50	(a) Plow with attached clod buster, then plant (once over tillage)
0	7	10	0	17	(b) Plow, then drag and plant
0	7	10	0	17	(c) Plow disc then plant
0	4	0	0	4	(d) Plow, disc, drag then plant
0	0	0	0	0	(e) Plow, disc twice, drag, then plant
0	4	10	0	14	(f) Others, (please state) hook, plow, drag and plant

General Management

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
1. When do you check machinery for needed repairs?					
0	19	15	0	34	(a) The last time its used
0	25	15	1	41	(b) When it's put away for the winter
0	25	15	1	41	(c) During January or February
0	6	5	0	11	(d) When I get ready to use it in the spring
0	0	0	0	0	(e) Never check it until something breaks
2. When combining grain, how often do you adjust machine cylinder speed and air?					
0	8	2	0	10	(a) Once when I start in the morning
0	16	5	0	21	(b) Twice a day
0	20	10	3	33	(c) Three times a day
0	0	0	0	0	(d) At the start of the combining season
0	4	0	0	4	(e) As needed
3. When you buy fertilizer do you buy it?					
0	0	0	0	0	(a) When you need it
0	10	15	4	29	(b) Buy in the fall for spring use
0	10	15	4	29	(c) Buy in the summer for fall use
0	0	0	0	0	(d) Don't have storage so get it just before planting
0	10	15	4	29	(e) When I get the biggest discount
4. What use have you made of short term credit?					
Does not apply					(a) Haven't needed credit
0	0	0	0	0	(b) Don't use credit because I prefer not to be in debt

General Management

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	40	30	1	71	(c) Used credit for machinery
0	40	30	1	71	(d) Used credit for livestock
0	40	30	1	71	(e) Used credit for fertilizer or lime
0	40	30	1	71	(f) Used credit for purchased feed
—	—	—	—	—	(g) Others (please state) combination

5. What use do you make of Government Support Price Program?

0	0	0	0	0	(a) Never put grain under loan
0	15	15	3	33	(b) Put under loan when cash market is too low
0	15	15	3	33	(c) Always make use of government loan program

6. In keeping track of expense and income, do you keep

0	30	20	2	52	(a) A Michigan State College book
0	23	15	0	38	(b) A machinery company or other commercial book
0	15	15	0	30	(c) A record book I've set up myself
0	6	10	0	16	(d) Use the calendar
0	6	0	0	6	(e) Save receipts and bills
—	—	—	—	—	(f) Others (please state)
0	0	0	0	0	(g) None

7. Within the limits set by income tax regulation, do you buy and sell so as to shift your tax payments from one year to another?

Does not apply					(a) Don't need to since my tax doesn't amount to much
0	15	25	4	44	(b) Yes

General Management					
Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	0	0	0	0	(c) No
0	14	20	0	34	(d) Do, but just on big items
8. In your feed supplement buying program					
0	0	0	0	0	(a) Always buy a commercial supplement
0	9	10	0	19	(b) Always buy the kind that is best adapted to the kind of livestock I'm feeding such as soybean oil meal, tankage, etc.
0	10	15	7	32	(c) Buy whichever is the cheapest per pound of protein
0	0	0	0	0	(d) Never buy feed supplements

Dairy

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
1. How many of your cows freshen in the different months of the year?					
—	—	—	—	—	(a) January
—	—	—	—	—	(b) February
—	—	—	—	—	(c) March
—	—	—	—	—	(d) April
—	—	—	—	—	(e) May
—	—	—	—	—	(f) June
—	—	—	—	—	(g) July
—	—	—	—	—	(h) August
—	—	—	—	—	(i) September
—	—	—	—	—	(j) October
—	—	—	—	—	(k) November
—	—	—	—	—	(l) December
2. How have you decided how much grain to feed your milking cows?					
0	10	5	0	15	(a) According to appearance of cow
0	25	20	1	46	(b) According to milk production
0	0	0	0	0	(c) All cows the same
0	15	15	0	30	(d) According to the kind of roughage being fed
—	—	—	—	—	(e) Others (please state)
3. How have you fed your cows during dry period?					
0	0	0	0	0	(a) No grain to dry cows

Dairy

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	14	5	0	19	(b) Same amount to all dry cows
0	15	10	2	27	(c) According to appearance of cow
4. With your dairy herd do you					
0	0	0	0	0	(a) No testing
0	25	20	2	47	(b) D.H.I.A. testing
0	25	20	2	47	(c) Owner sampler testing
0	25	20	2	47	(d) Herd improvement registry
0	25	20	2	47	(e) Advanced registry testing
0	20	15	0	35	(f) Weigh milk from each cow once a month
5. How are your cows bred?					
0	35	30	5	70	(a) Artificially
20	26	25	0	71	(b) Proven sire
10	18	15	0	43	(c) Purebred bull
5	7	5	0	17	(d) Bull from artificially bred cow
5	0	0	0	5	(e) Bull raised from a good cow
6. How do you provide for sufficient forage during late summer and fall?					
0	25	20	7	52	(a) Feed grass silage
0	18	20	0	38	(b) Sudan grass
0	23	15	0	38	(c) Feed hay
0	0	0	0	0	(d) Regular pasture

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	10	5	0	15	(e) Balbo Rye
0	0	0	0	0	(f) Corn stalks
					7. Since you may have some dry cows now, how many cows are you milking this week? _____ How long does it take you to milk them per milking? _____
10	0	25	0	35	(a) Over 25 (zero)
10	0	30	7	47	(b) 20 to 25 (100) (4 points per cow milked)
5	0	20	0	25	(c) 15 to 19 (per hour as a method of)
0	0	5	0	5	(d) 10 to 14 (computation of profitability)
0	0	0	0	0	(e) Under 10 (zero) (cost and return figure is 15)
					8. What class of milk do you sell?
20	40	30	3	93	(a) Grade A milk
0	10	5	0	15	(b) Grade B milk (includes condensory milk)
0	0	0	0	0	(c) Cream
					9. What is the usual dry period for your cow?
0	0	0	0	0	(a) 4 weeks
0	10	0	0	10	(b) 5 weeks
0	20	10	1	31	(c) 6 weeks
0	20	10	1	31	(d) 7 weeks
0	20	10	1	31	(e) 8 weeks
0	20	5	0	25	(f) Longer than 8 weeks

Dairy

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
10. How often do you test your herd for bangs disease?					
0	0	0	0	0	(a) Never test
0	35	10	4	49	(b) Every 6 months
0	35	10	4	49	(c) Once a year
0	25	5	0	30	(d) Once every 2 years
0	0	0	0	0	(e) When something looks suspicious
0	11	0	0	11	(f) Every 3 years
0	0	0	0	0	(g) State test

Hogs

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
1. What is your annual pig worming practice?					
0	0	0	0	0	(a) Don't feel I need to worm my pigs
0	5	2	0	7	(b) Worm them when they look as though they need it
0	20	5	2	27	(c) Always worm them when they are 8 to 12 weeks of age
2. What is your feeding practice on unweaned pigs?					
0	0	0	0	0	(a) Let the sow feed them
5	15	10	4	34	(b) Start creep feeding at 2 weeks of age
5	11	8	0	24	(c) Start creep feeding at 4 weeks of age
5	4	5	0	14	(d) Start creep feeding at 6 weeks of age
3. What is your feeding program (after weaning)?					
0	0	0	0	0	(a) Corn and oats
0	18	2	0	20	(b) Corn, oats and supplement
0	20	5	3	28	(c) Corn, oats, supplement and anti-biotics
0	18	2	0	20	(d) Others (please state)
4. Where do your hogs run during the summer season?					
0	0	0	0	0	(a) Use dry lot entirely
0	0	0	0	0	(b) Grass in dry lot
0	0	0	0	0	(c) Woods
5	20	10	3	38	(d) Alfalfa-ladino clover

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
5	18	10	0	33	(e) June or Mammoth clover
5	0	5	0	10	(f) Balbo Rye
5	12	10	0	27	(g) Sudan grass
5	15	10	0	30	(h) Oats and rape
5. In the winter do your bred sows and gilts get					
0	0	0	0	0	(a) No alfalfa
0	15	2	2	19	(b) Throw in some alfalfa hay
0	15	5	2	22	(c) 200# to 300# alfalfa meal with grain to make 1000 lbs. of feed

Poultry

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
1. When did you get your baby chicks?					
0	25	15	0	40	November
0	35	20	7	62	December
0	35	20	7	62	January
0	35	20	7	62	February
0	25	5	0	30	March
0	11	0	0	11	April
0	0	0	0	0	May
2. When you buy chicks do you buy					
0	0	15	0	15	(a) Straight run chicks
0	15	15	4	34	(b) Sexed chicks
0	11	10	0	21	(c) Both
3. When you buy chicks do you buy					
0	20	5	3	28	(a) Pullorum clean chick
0	18	3	0	21	(b) Pullorum passed chicks
0	0	0	0	0	(c) Just buy chicks
4. How do you feed your laying flock?					
0	18	10	0	28	(a) Feed mash and limited grain
0	20	10	3	33	(b) Feed mash and free choice grain

Poultry

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
0	15	10	0	25	(c) Feed all mash
0	0	0	0	0	(d) All grain
					5. How often are eggs gathered on your farm?
0	0	0	0	0	(a) Once a day
0	11	5	0	16	(b) Twice a day
0	15	10	4	29	(c) Three times a day
0	15	10	4	29	(d) Four times a day
—	—	—	—	—	(e) Other
					6. How do you store eggs after gathering?
0	0	0	0	0	(a) Put in basement
10	14	10	0	34	(b) Cool below 65°
10	15	10	5	40	(c) Cool below 60°
0	0	0	0	0	(d) Just room temperature
0	15	5	5	25	(e) Other - Refrigerator
					7. Most everyone gets some soiled eggs. How do you clean them?
0	0	0	0	0	(a) Don't clean them
0	11	5	0	16	(b) Wash them
0	15	10	3	28	(c) Dry clean them (sand paper or steel wool)
0	11	10	0	21	(d) Wash and dry clean

Poultry

Investment	Magnitude of Change	Cost and Return	Time	Total Value	
8. With your laying flock, do you					
0	0	0	0	0	(a) Never cull
0	9	10	0	19	(b) Cull when egg prices drop
0	15	20	2	37	(c) Cull continuously
0	4	5	0	9	(d) Cull once a year
9. With your laying flock, do you					
0	14	15	0	29	(a) Use all night lights
0	15	15	2	32	(b) Use a time clock on lights
0	14	15	0	29	(c) Turn lights off and on by hand
0	0	0	0	0	(d) Make no use of lights