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EVALUATION OF THE FARM MANAGEMENT PHASE OF THE FARM AND HOME MANAGEMENT PROGRAM IN NEW YORK STATE. EXTENSION STUD', NUMBER 1.

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THE MAIN PURPOSE OF THIS 1956-60 LONGITUDINAL STUDY WAS TO COMPARE CHANGES IN FARM PRACTICES AND RELATED KNOWLEDGE AND IN INCOME AND RELATED BUSINESS FACTORS AMONG 87 PARTICIPANTS (DAIRYMEN) IN THE FARM MANAGEMENT PHASE OF THE NEW YORK STATE FARM AHD HOME MANAGEMENT PROGRAM, WITH THOSE OF A CONTROL GROUP OF 87 WHO DID NOT PARTICIPATE. IN 1956, THE PARTICIPANTS HAD AN AVERAGE AGE OF 43.6 YEARS, WITH GENERALLY A HIGH SCHOOL EDUCATION AND A HIGH LEVEL OF ORGANIZATIONAL PARTICIPATION. OF THE 11 VARIABLES ON WHICH BOTH GROUPS HAD ORIGINALLY BEEN MATCHED, ONLY EDUCATION, ORGANIZATIONAL PARTICIPATION, AND PERCENT SCORES ON AGRONOMY PRACTICES FOR HAY AND PASTURE DIFFERENTIATED SIGNIFICANTLY BETWEEN THEM. OF THE 25 ITEMS UNDER CHANGES IN KNOWLEDGE AND PRACTICE, THE PARTICIPANTS SIGNIFICANTLY SURPASSED THE CONTROLS ONLY ON EFFICIENT USE OF LABOR, USE OF INVENTORY INCREASE IN FIGURING LABOR INCOME, SIZE OF OPERATION, AND ACTUAL EFFICIENT USE OF LABOR AND CAPITAL. CHANGE ADVANTAGES OF PARTICIPANTS ON BUSINESS FACTORS AFFECTING LABOR INCOME RESULTED IN A AVERAGE INCOME GAIN SOMEWHAT GREATER THAN THAT OF NONPARTICIPANTS. (SEVERAL IMPLICATIONS FAVORABLE TO THE FARM MANAGEMENT PHASE OF THE PROGRAM WERE NOTED. ALSO INCLUDED ARE 13 TABLES, A GLOSSARY, APPENDIXES, AND A DESCRIPTION OF PROGRAM OBJECTIVES, SUBJECT MATTER EMPHASIS, AND METHODS.) (LY)

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EVALUATION OF THE FARM MANAGEMENT PHASE OF THE FARM AND HOME MANAGEMENT PROGRAM IN NEW YORK STATE

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PREFACE

The Evaluation Study of the Farm and Home Management Program in New York State was initiated in 1956. It was supported by a generous grant from the Kellogg Foundation, amounting to $75,000. The study was conducted in 10 counties selected from the 20 counties which were conducting programs at the time it was initiated.

The study was designed as a longitudinal one with both a participant and control group. A study of this type involves technical difficulties which can prevent final completion. In this case it has been possible to complete the study, but this has been accomplished with full recognition of imperfections. For example, both research and program limitations prevented an effective evaluation of the home management phase of the Program. For this reason this bulletin is primarily concerned with the farm management phase of the Program. It is believed, however, that the problems encountered in conducting the study have provided a constructive experience which will be especially helpful in designing and conducting similar studies in the future.

In addition to providing an evaluation of the farm management phase of the Program, the study has served well to stimulate and maintain interest in the Program on the part of the Extension staff. Furthermore, it has provided the foundation upon which has been organized an evaluation unit connected with the Office of the Director of Extension.

Many people have contributed to the study. Among these have been the farm operators and homemakers who were the subjects of the study, the Extension agents in the 10 study counties, the Extension subject-matter specialists at Cornell, the Extension state leaders, and a conscientious and faithful staff including statistical clerks and typists in the Office of Extension Studies.

Maurice C. Bond

Director of Extension

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SUMMARY OF FINDINGS

Introduction

The major purpose of this study is to compare changes in farm practices and related knowledge, and in income and related business factors, of participants in the farm management phase of the Farm and Home Management Program in New York State with those of a control group of nonparticipants. The study first describes the Farm and Home Management Program in New York State with special attention to the farm management phase of the Program. Following the description of the Program, the remainder of the study presents comparative changes in farm practices and related knowledge, and in income and related business factors, of 87 pair-matched participant and nonparticipant dairy farm operators for the purpose of determining the influence of the Program.[1]

Description of the Program With Primary Emphasis on the Farm Management Phase

Objectives of Program

1. The Farm and Home Management Program began officially in New York State in July, 1954. In August, 1954, a special committee from the Colleges of Agriculture and Home Economics issued a statement of policy for guidance of the Program. The central core of this statement was as follows:

> It [the Program] means further that agents will help farm families to:
> 1) Carefully analyze the situations confronting them and to re-examine their present and potential productive resources and the way they use these resources in relation to their goals and aspirations.
> 2) Clarify the various alternatives the family has in the use of its resources, and to help the individuals to think through these alternatives in terms of their consequences.
> 3) Make sound decisions following analysis of alternatives and consequences, and to develop plans to carry out the decisions.
> 4) Put the plan to work on the farm and in the home.[2]

[1] These 87 participants and 87 nonparticipants are the maximum number which could be matched from the residue after attrition of an original modified random sample of 250 participants and of 150 nonparticipants matched with an equal number of the 250. The study was conducted in ten selected counties of the state.

[2] *The Expansion of the Extension Service Program in New York State,* prepared by a committee concerned with Extension work in the New York Colleges of Agriculture and Home Economics, New York State College of Agriculture, Cornell University, Ithaca, New York, August 28, 1954, p. 5.

2. The Extension staff at Cornell responsible for the Program at the state level was generally agreed in 1959 that the Program objectives as originally stated had been adhered to. It should be observed, however, that while the farm management phase of the Program has followed the original objectives fairly closely, the home management phase, for several legitimate reasons, has been conducted on a rather limited basis. Moreover, the farm and home management phases of the Program were never well integrated.

3. The objectives of the farm management phase of the Program, as stated by the agricultural agents in the ten study counties, both at the time the evaluation study was initiated (1956) and two years later (1958), reflected a fair degree of adherence to the basic objectives which characterized the Program from the beginning, especially its emphasis on farm management.

Subject-matter Emphasis and Methods

1. The principal subject-matter emphasis of the farm management phase of the Program, as shown by information from both agents and participants in the ten study counties, has been analysis of farm business records. Other emphases, according to participants and agents, have been varieties of legumes seeded, production per acre of forage crops, production per cow, time of first cutting of hay, and how to keep a farm record book.

2. Farm and home visits, letters or cards reminding participants to do things, and group meetings are the general methods which have characterized the Program in the ten study counties. The only specific method used extensively has been comparing individual summary of business with averages.

3. The average number of visits per family per year as estimated in 1958 by the agricultural agents in the ten study counties was 2.9.

4. For the six-year period (1954-1959) of the Program's operation in the ten counties, the average years-of-participation of all participants ever in the Program was 2.5; for those still in the Program at the end of 1959 the average was 2.4; for the drop-outs the average was 1.9; and for graduates or those completing the Program the average was 3.3.

5. On the whole, in the ten counties the Program has had fairly unbroken leadership. In seven counties, the agent who initiated the Program was either head agent in the county at the end of 1959 and was still doing some work on the Program, or the associate or assistant agent who started the Program was continuing to have primary responsibility for it.

6. The agricultural agents in the ten counties devoted to the Program an average of .63 agent-years per year during the four-year period (1956-1959) with a range among the counties from .27 to 1.06.

7. Twenty-one training schools were held between 1954 and 1959 for agents conducting the Program. Twelve of the schools were held for two days, seven for one day, and two for three days. Seventeen of the 21 schools were attended by agricultural agents. Forty-one different topics were considered in the 21 schools. Some of the topics were repeated in several schools, resulting in a total of 77 topical exposures. Of these 77

exposures 25, or about one-third, were concerned with farm management involving in many instances a consideration of business records and analysis.

8. The farm management phase of the Program has been primarily an intensified effort in a subject-matter field which has been given considerable attention in the state in the past. The intensive nature of the Program is reflected: *a)* in the greater attention which participants, compared to nonparticipants, were receiving from the Extension staffs in the ten counties in 1959; and *b)* in the relatively small average number of Program families per full-time agent on the Program in these counties.

9. The Program has had these two features: *a)* from the beginning, major responsibility for the subject-matter of the Program was assigned to the farm and home management specialists in the Colleges of Agriculture and Home Economics; and *b)* at the beginning a College Steering Committee was organized whose major function was planning and conducting training schools for agents and others associated with the Program.

Cost-benefit Relationship

1. On the basis of the advantage in labor income in 1959 of 87 participants over 87 pair-matched nonparticipants (control group), the cost-benefit ratio for the farm management phase of the Program over 3.9 years of participation is .983. This is based on a mean per participant cost figure of $429 for the 3.9 years and a mean per participant benefit figure of $436 for one year, 1959. Thus, in this one year (1959), the average labor income advantage of 87 participants over 87 pair-matched nonparticipants more than paid for the cost of the Program. It should be mentioned, however, that the benefit figure of $436 could have occurred by chance between 1 and 1.5 times out of 10.[3]

Matching of Participants and Nonparticipants

The data on comparative change are for 87 pair-matched participants and nonparticipants. These 87 pairs were trial matched on 11 variables and were considered matched ($P > .05$) on eight of them.

Characteristics of the 87 Participants at Beginning of Program

General Characteristics

When the study began in 1956, on the average the 87 participant operators were early middle-aged and had completed high school. Their participation in formal organizations was high.

[3] While the correction in labor income for influence of benchmark difference, which is made in the section of the bulletin dealing with changes in labor income and related business factors, results in a difference ($510) more favorable to the participants than the original difference of $436 used above, it is not possible to test the corrected figure to ascertain its probability point. Moreover, the difference in favor of nonparticipants in the 1959 price received for milk which is discussed on page 41 is not very reliable for use in estimating a higher difference in labor income favorable to the participants, because, when the difference in price was tested, the probability level was nonsignificant ($P < .50$). In view of these considerations, the use of $436 in calculating the cost-benefit rates is considered sound procedure.

Farm Operation Characteristics

The 87 participants were dairy operators with very few having a secondary enterprise. Most of these owned one-half or more of the land which they operated. Only a small percentage of them were involved in partnerships. Their mean farm management knowledge and practices per cent score was 62.9, or a little less than two-thirds of a perfect score of 100. The size of their operations, as represented by mean number of cows, was a herd of 31 cows. Their mean number of work units, which is a measure of labor efficiency, was 309 work units per man. The mean per cent score on dairy feeding practices of the group was 61.2, or a little less than two-thirds of a perfect score of 100 per cent. Their mean per cent score on agronomy practices for hay and pasture was just a little over half (54.5) of a perfect score; on dairy breeding practices 76.5, or slightly over three-fourths of a perfect score; and on dairy disease control practices 62.9, or a little less than two-thirds of a perfect score. The 1955 mean labor income per operator of the 87 participants was $1938.

Changes in Knowledge and Practices Scores

1. Seven knowledge and/or practices scores were calculated from data obtained by means of seven tests[4] developed from a questionnaire and a labor income form administered to participant and nonparticipant farm operators in 1956 and 1960.

2. Of the five test scores used in the study, only in the farm management knowledge and practices per cent score did the 87 participants show a significant gain over the 87 nonparticipants in the control group between 1956 and 1960.

3. On the scores for five of the 25 internal items of the farm management knowledge and practices test, the 87 participants showed a significant gain over the 87 nonparticipants in the control group between 1956 and 1960. These five items are *a)* operator's evaluation of efficient use of labor, *b)* use of increase in inventory in figuring labor income, *c)* actual size of operation based on mean number of cows, *d)* actual efficient use of labor, and *e)* actual efficient use of capital.

4. On two internal items of the farm management knowledge and practices test—farm records used in farm business and most important use of records kept—the 87 participants and 87 nonparticipants were not matched in 1956. There is positive evidence that about half of the participants at the time of the initial survey had been in the Program long enough in advance of the survey to have been influenced on these items. On a third internal item—actual size of operation based on mean number of cows– the participants and nonparticipants were not matched in 1956. The nonparticipants had a significantly higher mean score on this item than the participants. Despite this initial advantage of the nonparticipants, the participants significantly surpassed them in gain in score between 1956 and 1960.

[4] *Tests* as used here refer to the questions which appeared in the initial and terminal survey questionnaires or labor income record forms which were combined into broad subject-matter areas for summarizing, by means of scores, the level of knowledge and practices of respondents. Five of these tests yielded the scores which are used for measuring change in knowledge and/or practices and in matching the 87 participants and nonparticipants. The five tests are a) farm management knowledge and practices test, b) dairy feeding practices test, c) agronomy practices for hay and pasture test, d) dairy breeding practices test, and e) dairy disease control practices test.

5. Participants and nonparticipants were divided into high and low groups on their 1956 or initial scores on the farm management knowledge and practices per cent score, and each of these groups was in turn divided into high and low groupings on percentage points of change between their 1956 and their 1960 or final scores. For participants as well as nonparticipants the low scoring groups on the initial score had large proportions (over two-thirds of their total numbers) who fell in the high group for change in percentage points between initial and final scores, while the opposite was true for the groups with high initial scores. Moreover, when the magnitude of change as reflected by the difference in change between the 1956 and 1960 means of the participants and nonparticipants is examined, the low group of participants on initial scores on farm management knowledge and practices are the ones who surpass, but not significantly, their pair-matched nonparticipants. Hence, the low group is that part of the participants who contributed most to the participants having significantly surpassed the nonparticipants on their gain in average score on farm management knowledge and practices.[5]

6. An effective evaluation of an educational program should test the subject-matter which has been emphasized. The primary emphasis of the farm management aspect of the Program was analysis of farm business. The farm management knowledge and practices per cent score indicated that the participants made progress in this area and significantly surpassed the nonparticipants. On five internal items contributing to the farm management knowledge and practices score, the same was true, and for two other internal items almost true. The operators particularly emphasized they had received help on how to keep a farm record book. There is partial indication from one internal item of the farm management knowledge and practices test that the participants surpassed the nonparticipants in change in this area. Although two areas of Program emphasis—production per cow and correct harvest time—were specifically tested on practices relating to these areas, the participants did not significantly surpass the nonparticipants on change in scores relating to these items.

Changes in Labor Income and Related Business Factors

1. The analysis of the differences in change in farm business factors and related income encounters the difficulty that the probability points for the tests of differences in change between participants and nonparticipants on most of the factors, as well as income, while often low, are certainly above .05—the point at which differences in the study are considered significant. For only four factors are the probability points at .05 or less. For nine factors and three income measures the probability points are between less than .10 and less than .20. For the five remaining factors and one income measure for which tests were calculated, the probability points range from less than .25 to less than .45. Because many of the

[5] High percentage points of change are changes ranging from 2 points and above for the participants and from −1 and above for the nonparticipants, and low percentage points of change are in the opposite direction. In the relationship of initial score to change the participants and nonparticipants were divided at approximately the median score for each group, but for the calculation of difference in mean change the participants were divided at approximately their median initial score and each nonparticipant was placed in the same group in which his participant match fell.

probability points for tests of differences on the business factors and income measurements are not significant yet rather low, it is difficult to arrive at clear-cut conclusions. Therefore, in most instances, only indications of change favorable to the participants are possible. Furthermore, this inability to arrive at clear-cut conclusions is complicated by correcting for influence of benchmark differences without at the same time being able to calculate tests for differences in corrected changes.

2. While the probability points for net farm income per operator and labor income per operator are relatively low, they were not considered significant. Nevertheless the participants' changes on these two important income measurements may be considered favorable to them and indicative of Program influence. This is especially true for labor income, when the correction for influence of benchmark difference and possibly the differential in 1959 price received for milk, which is favorable to the nonparticipants, are considered. In fact the correction for benchmark difference plus the difference in 1959 price indicate a possible labor income difference which, if it could be tested, might be at a probability point around .05.[6] The differences in change for a number of business factors affecting income lend some support to the preceding statement, even though for most of these factors the probability points for the tests of differences are above .05.

3. One of the most important business factors affecting labor income is size. Of particular importance is size of herd, but number of crop acres is also rather important. While the difference in change in number of cows was favorable to the participants, it was not considered significant. However, the probability point for the test of difference was relatively low. The difference in change in crop acres was significant and favorable to the participants. The participants' favorable difference in labor income in 1959 was undoubtedly influenced by the differences in change in number of crop acres and possibly in number of cows.

4. There is some slight evidence that the participants made more improvement than the nonparticipants in their efficiency in the use of capital as measured by one index, i.e., years for receipts to equal capital investment. One would expect this slightly favorable position in efficient use of capital by the participants to be reflected in income change favorable to them. The participants' small advantage in change in efficient use of capital may be explained in part by the difference in change in production of milk, which came as a result of the favorable difference in change in pounds of milk produced per cow. Participants also showed a greater change in tons of hay equivalent per cow. The significantly larger increase in crop acres on participants' farms no doubt produced this larger supply of forage, which accounts in part for their higher production per cow.

5. It is difficult to determine which group did better, if change in six cost control factors is considered. In only one of the six factors, i.e., machine expense per crop acre, did the participants show a significant and favorable difference in change. Two other measurements of machine expense showed changes in which the participants surpassed the nonparticipants, but not significantly. In both instances, the probability points

[6] The probability level of the test of the difference between the participants and nonparticipants in 1959 price received for milk was fairly high, less than .50; hence, the use of the 1959 price differential is rather unreliable. It may, therefore, be questionable procedure to use the 1959 price difference for estimating a more favorable labor income difference for the participants.

for tests of differences in change were relatively low. Thus, it seems that the participants made changes in machine expense that may be attributed to the Program. In two other cost control factors—purchased feed expense as a per cent of milk receipts, and crop expense per cow—the changes in the participants and nonparticipants were equal for the first factor and favorable (less increase) for the nonparticipants for the second one. However, in this latter instance, it appears that the crop expense per cow change of the participants (more increase) may have been favorable to them since their forage production (hay equivalent change and related milk production change was better than those of the nonparticipants. The probability point of the test of difference for the sixth factor—purchased feed expense per cow—was so high ($P < .45$) that the difference, although favorable to the participants, hardly deserves attention. While on the whole the participants have some advantage over the nonparticipants with respect to desirable change on cost control factors, it seems that analysis of cost control factors not account for much of the superior position of the participants with respect to labor income change.

6. On the whole, the measures of change for labor efficiency favor the participants. Thus, on change in number of work units per man, the participants significantly surpassed the nonparticipants. They also surpassed the nonparticipants on pounds of milk sold per man. Although the probability point for the difference in change for pounds of milk sold per man was at .05 or less, the point was at a relatively low level. There was no difference in mean change between the two groups on number of cows per man. Thus, broadly, the change in labor efficiency of the participants may be attributed to the Program and should have had some effect on their superior position on labor income change.

7. In summary the participants in general surpassed the nonparticipants on size and labor efficiency. They also had a slight advantage over the nonparticipants on efficient use of capital, on machine expense in connection with cost control, on milk production, and on production of forage. The analysis of the comparative changes shows a somewhat consistent pattern of interrelationships for the factors on which the participants were superior. Taken together, the change advantages of the participants on business factors affecting labor income resulted in a per operator labor income change for the participants that was almost, possibly, significantly above that of the nonparticipants. Thus, it can be concluded that the Program had a favorable influence on the participants.

IMPLICATIONS

Implications of a study should primarily be derived directly from the findings. To some extent this is true of the implications which are set forth here. However, researchers often cannot escape important implications which are derived from observations but are not directly supported by specific findings. Some of the following implications are of this character.

1. The findings of the study are sufficiently positive to support the continuation of the farm management phase of the Program.

2. Although the intensification of Extension teaching of the participants did not show dramatic results, their comparative favorable progress over the control group of nonparticipants was sufficiently positive to warrant even greater intensification of management teaching.

3. Although the participants as a result of the Program made several important changes in their farm operation—for example, increasing their crop acres—the fact that they significantly surpassed the nonparticipants on the farm management knowledge and practices score, but failed to do so on four other practices scores, emphasizes the necessity for management teaching to be strengthened in the area of programming farm operations.

4. Although the study did not specifically examine the advantages of identifying individual farm operators as participants, the impressions gained by the researchers over the four-year period of the study strongly support the conclusion that both the agents as teachers and the operators as pupils found this conscious recognition of teacher-pupil relationship satisfying and constructive. Therefore, in the future, particularly for those educational activities of the agricultural department of Extension which extend over time, the identification of participants would seem to be highly desirable.

5. Both the formal training and the experience have given the agents who conducted the Program a broader perspective, so that transmitting isolated bits of information of subject-matter is now regarded by many of the agricultural agents as a minor function, compared to the job of teaching an over-all view of the farm business. It is believed that this new orientation of agents' thinking can provide the basis for developing county agricultural programs which will be based on farm management considerations.

6. It is strongly believed that, whatever success the agricultural phase of the Program had in New York, it was in part the result of designing and conducting a management program, rather than a development program, such as was conducted in some states which participated in the nation-wide Extension activity that has been supported by federal funds specifically appropriated for intensive educational work with farm families. Compared to development, the term management designates a field of agricultural subject-matter which is relatively well organized and hence can provide agents with specific and tested materials and tools for carrying on their educational work. In developing new educational programs, the agricultural department of Extension can profit greatly from this experience by taking stock of the subject-matter and teaching tools available before launching extensively on a new program.

7. In New York State, combining farm and home management should generally be abandoned, since such an approach does not appear to be based on family interests. Moreover, the Extension Service in the state has so developed that a combined approach between its agricultural and home demonstration departments cannot be expected to operate effectively.

EVALUATION OF THE FARM MANAGEMENT PHASE OF THE PROGRAM

Introduction

In New York State the Farm and Home Management Program was initiated primarily as a cooperative effort by the agricultural and home demonstration departments in order to work with both the farm operator

and the homemaker within the participating families.[7] For reasons which will be noted subsequently, the home management phase of the Program was conducted on a limited scale. Consequently, the measurement of the influence of the home management phase of the Program was not adequate.[8] This bulletin is primarily concerned with the farm management phase of the Program.

The major objectives of the bulletin are: 1) to describe the farm management phase of the Program including cost-benefit considerations, and 2) to compare changes in farm practices and related knowledge, and in labor income and related farm business factors, of participants in the farm management phase of the Program with those of a control group of nonparticipants.

In carrying out the second objective it is anticipated that light will be thrown on the relative effectiveness of the intensive effort represented by the Program, compared to the less intensive effort of the regular program of the agricultural department of the Extension Service. This assumes, of course, that the nonparticipants represent farm operators who had an opportunity to be exposed to the regular Extension program and for the most part have not been influenced by the Program.[9]

Sources of Data and Methodology

Relating to Description of Program

The data for the description of the Program were obtained principally from mimeographed reports already prepared in connection with the evaluation study of the Farm and Home Management Program in New York State. These include: *Study of the Operations of the Farm and Home Management Program in New York State,* Report No. 2; *The Farm and Home Management Program as Known and Viewed by Extension Administrators, Supervisors, and Specialists,* Report No. 3; *Time and Cost In-put and Cost-benefit Relationship for the Farm and Home Management Program in the Ten Study Counties of New York State,* Report No. 6; and *Evaluation of the Farm and Home Management Program by Participants and by Agents in the Ten Study Counties of New York State,* Report No. 7. Information from a preliminary survey of agents in counties which had entered the Program before or during the early part of 1956; data from the 1956 benchmark, and 1959-1960 terminal surveys of participants and nonparticipants; and information on agents' training schools from the files of members of the College Steering Committee for the Farm and Home Management Program have also been used.

[7] The 4-H club department participated to a very limited extent at the beginning of the Program, but subsequently discontinued its participation.

[8] The limited findings on the influence of the home management phase of the Program are available in James W. Longest and Frank D. Alexander, *Evaluation Study of Farm and Home Management Program in New York State—Changes in Homemaking Practices of Participants in the Home Management Phase of the Farm and Home Management Program in New York State,* Report No. 12 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, February 15, 1962.

[9] Since the nonparticipants and the participants who are included in this study were from the same counties, and since in these counties general information relating to the farm businesses of the participants was made available by the Extension Service through various mass media, it is hardly possible that the nonparticipants completely escaped from some Program influence.

Relating to Comparative Changes[10]

A modified random sample of 25 participants in the Farm and Home Management Program in each of six selected counties and all participants (25) in each of four other selected counties were chosen for study in 1956. In six of the ten counties, the 25 participants were pair-matched with 25 nonparticipants. This matching was done by the county agricultural agents on nine variables, i.e., age of operator, tenure of operator, existence of a partnership, major farm enterprise, second ranking farm enterprise, number of milk cows, full- or part-time operator, quality of soils on farm based on opinion of agricultural agents, and managerial ability of the operator as rated by the agents. Thus in the initial survey there were 150 participants and 150 pair-matched nonparticipants in six counties plus another 100 participants in four other counties.[11]

The sample of participants and the matched nonparticipants were interviewed in the late summer and fall of 1956 by trained interviewers using a farm operator's schedule, a homemaker's schedule, and *Cornell Labor Income Blank #40* for recording farm business data. In the fall of 1959, a second survey was made of the homemakers, and in the late winter and spring of 1960 a second survey of the farm operators was made. For the most part, the farm operator's and homemaker's schedules used in the terminal survey contained the same questions which were used in the initial survey. The *Cornell Labor Income Blank #40,* with some slight revisions for more effective recording of data, was also used in the final survey.

Because of attrition, the number of participants available for inclusion in the analysis of change in farm practices and related knowledge, and in labor income and related farm business factors, was 204 and the number of nonparticipants 107. Because the attrition in both groups was of sufficient magnitude to prevent utilization of the original matching, it was necessary to undertake a new match from the pool of 204 participants and the 107 nonparticipants. Since considerable quantitative data were

[10] Since most of the material relative to change reported in this bulletin comes from Report No. 8 and Report No. 11 of the evaluation series, no specific references to these two reports appear in this bulletin The two reports are: Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State--Changes in Farm Practices and Related Knowledge of Participants in the Farm Management Phase of the Farm and Home Management Program in the Ten Study Counties of New York State,* Report No. 8 (mimeographed), July 15, 1961; and Longest and Alexander, *Evaluation Study of Farm and Home Management Program in New York State—Farm Business Factors Affecting Income Change for 87 Pair-matched Participants and Nonparticipants,* Report No. 11 (mimeographed), Office of Extension Studies. State Colleges of Agriculture and Home Economics. Cornell University, Ithaca, New York, February 15, 1962.

[11] The ten study counties were Cattaraugus, Chenango, Jefferson, Madison, Oneida, Rensselaer. St. Lawrence, Schoharie, Tioga, and Wyoming. These ten counties were selected from 20 which had initiated programs by the spring of 1956 The criteria used in selecting the ten counties were: 1) at least two counties should have Farm Business Management Clubs and one an area approach; 2) each county should have at least 25 participants who had entered the Program in either 1955 or 1956; 3) as far as was possible the 25 participants per county chosen for the study should have dairying as their major enterprise; 4) Labor Income Blank No. 40 or comparable data should be available on participants in each county to provide benchmark production and economic information; 5) a maximum number of counties in which the home demonstration department had a Program or might be expected to have one was sought; and 6) a reasonable distribution of the counties over the state was sought.

available from the initial survey, it was possible to undertake pair-matching, using as many as 11 variables in the trial matching. When the final trial pair-matching, involving 87 participants and 87 nonparticipants, was tested by a t test for nonsignificance,[12] the matching was found to be valid for eight of the 11 variables (See Table 2, page 24).[13] These 87 pair-matched operators are the subjects which are used in those parts of the study which deal with comparative change in farm practices and related knowledge, and in labor income and related farm business factors, during the period of the study.

The 87 participants were tested by a t test for their relationship to the remainder (163) of the original sample of 250 in order to ascertain to what extent the 87 resembled the original sample, and hence whether the two groups (87 and 163) could be considered to represent the same universe. This testing was done for the 11 variables used in matching the 87 participants and nonparticipants. For only five of the 11 variables was the relationship considered nonsignificant ($P > .05$). Because of the rather poor resemblance of 87 participants, who were matched with 87 nonparticipants, to the original sample of participants, it should be emphasized that findings based on the 87 matched pairs are limited, and hence should be interpreted as indicative of the influence of the Program.

Description of the Farm and Home Management Program in New York State With Primary Emphasis on the Farm Management Phase

Objectives of Program

The Farm and Home Management Program in New York State began officially in July, 1954. In that year, five counties reported participants in the Program. In August, 1954, a special committee, composed of Extension administrators; farm and home management specialists; agricultural, home demonstration, and 4-H club state leaders; and the head of the Department of Agricultural Economics, issued a policy statement entitled, *The Expansion of the Extension Service Program in New York State.* The objectives of the Program, as stated in this document, were as follows:

> The objectives of the intensified farm and home management program are in line with the fundamental purposes of Extension. In general, these goals are: efficient family farm businesses, and satisfying farm family living. This specifically involves helping farm families:
>
> 1) To determine and use the combinations of farm and home practices that best fit their needs.
> 2) To organize their farm and home business to utilize effectively their resources and opportunities, and to promote attainment of the goals of the farm family.

[12] The basic formulas used for calculating t's in the study appear in Appendix A. Throughout the study the $P \leqq .05$ for t is considered significant. In determining the probability of t's in the study, both the two-tail and one-tail tests are used. The two-tail test is used for testing the closeness of matching. However, since it is hypothesized that the participants, as a result of the Program influences, will change more than the nonparticipants, the one-tail test was considered more appropriate for testing change. For a discussion of two- versus one-tail tests see Allen L. Edwards, *Statistical Methods for the Behavioral Sciences,* New York, Rinehart and Company, Inc., 1954, pp. 257-260.

[13] Trial matching on this large number of variables finds its justification in the low correlations which existed among the 11 variables.

3) To attain higher levels of living and to get more satisfaction out of farm family life.

The policy statement further indicates as immediate objectives that agents will help farm families to:

1) Carefully analyze the situations confronting them and o re-examine their present and potential productive resources and the way they use these resources in relation to their goals and aspirations.
2) Clarify the various alternatives the family has in the use of its resources, and to help the individuals to think through these alternatives in terms of their consequences.
3) Make sound decisions following analysis of alternatives and consequences, and to develop plans to carry out the decisions.
4) Put the plan to work on the farm and in the home.[14]

A study of the Farm and Home Management Program as known and perceived by Extension administrators, supervisors, and management specialists which was done in the latter half of 1959 reported that: "Among these administrators, supervisors, and specialists there is a high degree of consensus that the objectives of the Program have not changed."[15] This conclusion was based on the relatively high consensus among these Extension workers that three of the four immediate objectives above, namely. 1, 2, and 3, were still a part of Program policy.

In a general way, this high consensus that the Program objectives have remained basically unchanged can be accepted as true. However, because the New York Extension Service has three rather distinct departments, i.e., agriculture, home demonstration and 4-H club, the integration of the farm and home aspects of the Program has been limited. The high turnover of home demonstration agents assigned to the Program has resulted in numerous interruptions in conducting the home management aspect of the Program. Moreover, the participating families in most instances have entered the Program because of their contacts with the agricultural department. This prior connection has frequently meant that the families were principally interested in the farm management phase of the Program.

The Study of the Operations of the Farm and Home Management Program in New York State, Report No. 2, for which data were obtained in the spring and summer of 1958, clearly shows the limited nature of the home management phase of the Program. Of the thirty participating counties, only thirteen had a home management phase of the Program. A total of 1,639 families were reported participating in the farm management part, but only 471 of these were also participating in the home management part of the Program.[16]

[14] *The Expansion of the Extension Service Program in New York State.* prepared by a committee concerned with Extension work in the New York Colleges of Agriculture and Home Economics, New York State College of Agriculture. Cornell University, Ithaca, New York, August 28, 1954, pp. 4-5.

[15] Alexander, *Evaluation Study of Farm and Home Management Program in New York State--The Farm and Home Management Program in New York State as Known and Viewed by Extension Administrators, Supervisors, and Specialists,* Report No. 3 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, June 15, 1960, p. 23.

[16] Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State--Study of the Operations of the Farm and Home Management Program in New York State,* Report No. 2 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, January 15, 1960, p. 1.

During the four-year period (1956-1959) in the ten counties included in the evaluation study, two counties never had a home management phase of the Program. For the remaining eight counties which participated in this phase of the Program for two or more of the four years, the average per cent of the home demonstration staff time devoted to the Program was 8.4. In the agricultural departments of the ten counties for the four-year period, an average of 17.4 per cent of the total staff time was given to the Program. The average number of agent-years per year devoted to the home management phase of the Program for the five counties which participated all four years was .27, compared to .63 agent-years per year devoted to the farm phase of the Program in all ten counties.[17]

In the light of these facts, it should be recognized that the objectives of the original policy statement relating to home management have not been retained on a state-wide basis. Wherever the home management phase of the Program has been conducted, however, it may be said that the objectives have been at least partially accepted. Nevertheless, in so far as the objectives imply integration of farm and home management behavior of those taught, or of the teaching operations of the agricultural and home demonstration agents, it is doubtful whether the objectives were ever fully realized in practice.

Early in 1956, the agricultural agent in each of the ten study counties was asked to state his objectives. Their answers, taken in direct interview, follow:

County Code No.	*Objectives*
1.	Essentially, I am trying to help families see where they are and most importantly to see where they want to go.
2.	I subscribe to national objectives helping farm families see their own farm business and think through their adjustments in terms of their personal aspirations and un-met needs besides money.
3.	Ever since I have been in county all questions have been on production. A year ago economic climate changed to matter of income and costs. This showed we need figures and is the reason we started this. People wanted to see whole business and get answers to management questions.
4.	Under present economic conditions (price-cost squeeze) and expanding need for capital individual families have to know more about business than through memory. First year a farm management program; now can launch out into soils, economics of growing more grain, costs involved in dairy animal husbandry.
5.	It is to assist farm families in not only taking over-all look at farm business, but also family living side—over-all look at whole family living. Taking a look at farm business and making adjustments in business.
6.	To keep a decent set of records and have uniform records.
7.	Trying to assist farm families in analyzing where they are, determining goals, and ways to get there.
8.	Main objective is to get farm families to keep records and take a more critical look at their business. The people don't know what they have to work with.

[17] Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State—Time and Cost In-put and Cost-benefit Relationship for the Farm and Home Management Program in New York State,* Report No. 6 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, May 31, 1961, pp. 8-9.

9. An educational program to help farm families make wiser farm management decisions based on more facts and knowledge.
10. Trying to teach farm families how to study and analyze farm business and make decisions. Five steps: 1) learning, 2) analyzing, 3) making decisions, 4) action, 5) taking responsibility.

While a variety of ideas are to be found in these statements of objectives, about half of them can be specifically identified with getting the farm operator to know his business situation; and in all of them is to be found some concept that relates to management.

In the 1958 study of the operations of the Farm and Home Management Program, the agricultural agents were asked to state what the Program had to offer that no other Extension activity provided. The unique features mentioned by 12 agents in the ten study counties follow:[18]

Unique Features of Program	*Number of Mentions*
Analysis of each farm situation	7
Personal or individual approach	5
Planning	3
Whole farm approach	2
Intimate knowledge of participants	2
Determining goals	2
Effective guidance of agents in work with families	1
Intensive work with families	1
Record keeping	1
Continuous work with same people	1
Dealing with specific problems	1
Concentrated effort	1
New subject matter	1
Teaching people to solve own problems	1
Budgeting	1

These unique features of the Program reveal objectives, or directions, of the educational effort which are concerned with analysis, planning, goal determination, etc. A number of these can be identified with the management concept. Thus, the agricultural agents' 1956 statements of objectives, and to a lesser extent their indications of the unique features of the Program made two years later, reflect a fair degree of adherence to the basic general objectives which characterized the Program from the beginning.

Subject-matter of Program

Unquestionably what is taught provides a better indication of an educational program than statements of objectives. The 1958 agents' study relative to the operations of the Program reported the number of the ten study counties in which various subject-matter topics were being taught and the per cent of those counties in which 50 per cent or more of the participants, according to estimates of the agricultural agents, had been taught each subject-matter topic. The list of these topics, accompanied by the number of counties in which they were taught, and the

[18] These data were obtained in the survey which provides the information for Report No. 2 but were not presented in the report. (See footnote 16 for authors and title of Report No. 2.)

per cent of these counties exposing 50 per cent or more of the participants thereto follows:[19]

Subject-matter Topics	*No. of Counties in Which Taught*	*Per Cent of Counties Using Method With 50 Per Cent or More of Participants Exposed*
Analyzing farm business, machinery expenses considered	10	100
Analyzing farm records and summaries thereof to find strong and weak points of business	10	100
Analyzing cost factors, machinery costs per cow considered	10	100
Analyzing labor efficiency, number of cows per man considered	10	100
Analyzing labor efficiency, number of pounds of milk sold per man considered	10	100
Analyzing cost factors, per cent of milk check spent for feed considered	10	100
Analyzing farm business, cost of purchased feed considered	10	100
Analyzing receipts, interest on capital considered	10	90
Analyzing receipts, inventory increase considered	10	90
Analyzing receipts, labor income for farm considered	10	90
Analyzing farm business, crop expenses considered	10	90
Analyzing receipts, labor income per operator considered	10	90
Analyzing farm business, cost of hired labor considered	9	89
Analyzing receipts, proportion of farm income derived from milk sales considered	9	89
Summarizing a farm business for the year	9	89
Analyzing farm business, proportion to total investment in land and buildings, in machinery, and livestock considered	9	80
Analyzing receipts, unpaid family labor considered	10	80
Keeping a farm inventory book	10	80
Keeping a cash account book	10	80
Correct harvesting times	10	80
Soil testing	10	80

[19] Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State—Study of the Operations of the Farm and Home Management Program in New York State,* Report No. 2 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, January 15, 1960, pp. 30-32.

Principles of fertilization	10	70
Feeding of roughage	10	70
Grain feeding of milk cows	10	70
Evaluating number of heifers in herd	10	60
Interpreting soil test results	10	60
Selection of Seed	10	60
Planning future adjustments in farm-business on basis of records (budgeting for change)	10	60
Using business records for income tax purposes	10	50
Culling of herd	10	50
Planning the fertilizing of specific fields on each farm	10	50
Planning rotation	10	40
Taking a soil sample	10	40
Partnership arrangements	10	20
Preparation of farm map showing field and farmstead layout	8	12
Entering important field data on map	8	12
Breeding programs	10	10
Recommendations for disease prevention	10	—

While the very nature of the Program as known by the researchers tended to dictate the subject-matter about which agents were uniformly asked to give information, the high proportion of counties in which 50 per cent or more of the participants were exposed to various aspects of analyzing the farm business compared to other topics is apparent in the foregoing list.

Further indication of subject-matter emphasis of the farm management phase of the Program is available from Report No. 7 of the evaluation series. From a list of 19 items, the first five ranking subjects, according to degree of help from the Program which the 87 participants thought they had received, are in rank order: 1) making analysis of your business records, 2) varieties of legumes seeded, 3) production per acre of forage crops, 4) how to keep a farm record book, and 5) production per cow.

The agricultural agents who worked with the 87 participants indicated for each of them whether or not they thought they had given help on 14 subject-matter items. The first five ranking items, according to percentage of operators whom agents thought they had helped, are in rank order: 1) making analysis of your business records, 2) varieties of legumes seeded, 3) production per acre of forage crops, 4) production per cow, and 5) time of first cutting of hay.[20]

Because *making an analysis of your business records* ranks first on both of the above lists, the importance of this central core of management subject-matter in the teaching of the agents is proved. Furthermore, most of the other items in the two lists reflect a managerial orientation.

[20] Alexander and Longest, *Evaluation of Farm and Home Management Program in New York State—Evaluation of the Farm and Home Management Program by Participants and Agents in the Ten Study Counties of New York State,* Report No. 7 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, June 30, 1961, pp. 19 and 28.

Methods Used in Conducting Program

The 1958 study of the operations of the Program also sought to find what methods the agricultural agents were using in conducting the Program. The following tabulation from that study shows for the ten study counties the number using given methods and the per cent of those counties in which 50 per cent or more of the participants—according to estimates of the agents—had been exposed to those methods:[21]

Methods	*Number of Counties Using Method*	*Per Cent of Counties Using Method With 50 Per Cent or More of Participants Exposed*
General		
Farm and home visits	10	100
Seasonal letters or cards saying "this is the time to do"	10	100
Group meetings	10	80
College publications on matters relating to farm and home management	9	67
Tours	3	—
Farm walks	5	—
Specific		
College summaries of cash account and inventory books	3	100
Comparisons of individual summary with averages	10	90
Summaries by participants of o vn cash account and inventory books	6	66
Use of specialists at group meetings	8	63
Use of farm maps for analysis and planning	9	33
Use of specialists on individual farm visits	7	—
Use of panels of participants at group meetings	1	—
Use of specialists on tours	2	—

Farm and home visits, letters or cards reminding farmers when to do things, and group meetings are the general methods which have characterized the Program in these ten counties. The only specific method used extensively has been the comparison of individual summary with averages.

In this 1958 study, the agricultural agents estimated the average number of visits which they made per family per year. The 13 agents in the ten study counties made an average (median) of 2.9 visits.[22]

One of the ten study counties reported families participating since 1954, nine had participants in 1955, and all ten had them by 1956. Four hundred seventy-four families participated in the Program in these ten counties in 1956, which was the year of the initial survey of the sample of 250 participants. This number rose continuously for the next three

[21] Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State—Study of the Operations of the Farm and Home Management Program in New York State,* Report No. 2 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, January 15, 1960, p. 38.

[22] *Ibid.,* p. 44.

years to 651 in 1959. For the six-year period of the Program's operation, the average years of participation of all participants ever in the Program was 2.5; for those still in the Program at the end of 1959, the average was 2.4; for the drop-outs, the average was 1.9; and for graduates, or those completing the Program, the average was 3.3.[23]

In seven of the ten counties included in the study the Program was initially conducted by the head county agricultural agent, in one by an experienced associate agent, and in two by two new assistant agents. Subsequently, in four of the counties in which the head agent was initially in charge of the Program, the major responsibility shifted to either an associate or assistant agent. However, by 1959, in four of the counties three different agents, and in four others two different agents, were simultaneously giving time to the Program. At that date there was only one agent working on the Program in each of two of the ten counties. From one point of view, however, the Program in the ten study counties had a fairly unbroken leadership. In seven of the counties the agent who initiated the Program was either head agent in the county at the end of 1959 and was still doing some work on the Program, or the associate or assistant agent who started the Program was continuing to have primary responsibility for it.

For the four-year period 1956-1959, the per cent of the total agricultural staff time devoted to the Program in the ten counties averaged 17.4 with a range among the counties from 7.7 to 26.8 per cent.[24] The agricultural agents in the ten counties devoted an average of .63 agent-years per year during the four-year period, with a range among the counties from .27 to 1.06. The average number of agent-years rose slightly, but not continuously, from .61 in 1956 to .67 in 1959. The highest number of agent-years which any county had for the four-year period was 1.41 in 1959 and the lowest was .20 in 1958.[25]

Table 1. Number of Agent Training Schools According to Number of Days Held, by Years: 1954-1959[a]

Number of Days Held	*Number of Training Schools by Years*						
	1954	*1955*	*1956*	*1957*	*1958*	*1959*	*Total*
1	1	1	1	1	—	3[c]	7
2	1[b]	5	2	1	1	2	12
3	1	—	—	—	1	—	2
Total	3	6	3	2	2	5	21

[a] Most of the schools were held on the Cornell University campus.

[b] This two day school was held in three regions of the state.

[c] One of these schools was held in three regions of the state and another one in two regions.

[23] Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State—Time and Cost In-put and Cost-benefit Relationship for the Farm and Home Management Program in New York State*, Report No. 6 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, May 31, 1961, pp. 16-17.

[24] *Ibid.*, p. 7.

[25] *Ibid.*, p. 7-8.

In-service Training of Staff for the Program

A considerable amount of in-service training has been given the agents who were conducting the Program. Table 1 gives the number of schools by years and by number of days held from 1954 through 1959.[26] Twelve of the schools were held for two days, seven for one day, and two for three days.[27] Seventeen of the 21 schools were attended by agricultural agents.[28] Most of the schools were held on the Cornell University campus.

Forty-one different topics were considered in the 21 training schools. Some of the topics were repeated in several schools, so that there were a total of 77 topical exposures. Of these 77 exposures 25, or about one-third, were concerned with farm management involving in many instances a consideration of business records and analysis. When to these exposures are added orientation exposures and exchanges of experience, the focus of the Program on farm business management, which the study of the operations of the Program (Report No. 2) has shown to exist, is not surprising.

Intensive Character of the Program

The farm management phase of the Farm and Home Management Program considered topics that already were part of the regular programs of the agricultural departments of the ten study counties.[29] Actually, the farm management phase was primarily an intensified effort in a subject-matter area that has been given considerable attention in the past, but with less agent time devoted thereto and without the audience always

[26] No training schools were held in 1960. Several other training conferences having a bearing on the Program have been held. These included two of the annually held agricultural economic conferences for agricultural agents at which a major emphasis was on farm management, and three regional conferences for agricultural agents interested in farm planning and budgeting phases of farm management, an annual Extension conference at which Program progress was reported, one conference on the Program for specialists, and another for both specialists and administrators.

[27] The number of days devoted to training schools is not an accurate figure, especially for two and three day schools, because schools of these lengths were often held for only 1.5 or 2.5 days respectively.

[28] Sixteen of the schools involved home demonstration agents, and ten involved 4-H club agents. During the early period of the Program, the 4-H club department participated, but an effective role could not be developed. Later the 4-H club department initiated in six counties an experiment which used farm and home development funds and was directed primarily to vocational guidance of older youth with special attention to farming. Some of the 4-H club agents conducting these experimental programs attended a few of the training schools held for agricultural and home demonstration agents. In addition several special schools were held for these 4-H club agents. These special schools are not included in the list of 21 schools held for agents conducting the adult program. Attendance of agents was available for some, but not all, of the 21 schools. Consequently, no attempt is made to present attendance records.

[29] Each of the agricultural departments in the ten study counties in its 1954 plan of work, or in a plan of work for the first year preceding 1954 for which a plan was available in the files, indicated that attention was to be given farm management, farm business management, farm account project, etc., in its program during the ensuing year. No plans for years prior to 1951 were examined.

being well identified.[30]

Two indications of the intensity of the farm management phase of the Program are available. In 1959, which was the terminal year of the evaluation study of the Program, the 87 participants and 87 nonparticipants differed widely with respect to contacts with agricultural Extension agents. The tabulation below, which presents extremes for extent of contact, indicates this wide difference:

Contacts With Agricultural Agents	*Participants (N=87)*	*Nonparticipants (N=87)*
Per cent attending 5 or more meetings in which an agricultural agent participated	56	19
Per cent making 5 or more visits to agricultural agent's office	28	7
Per cent having 5 or more visits to farm by agricultural agent	30	6
Per cent attending no meeting in which an agricultural agent participated	14	38
Per cent making no visits to agricultural agent's office	25	40
Per cent having no visits to farm by an agricultural agent	6	34

From these data it is clear that the Program participants in 1959 were receiving or obtaining much more intensive treatment from the agricultural agents than were the nonparticipants. Unfortunately, comparable data for contacts with Extension were not available for participants before entering the Program. It is very probable that the frequency of contacts before entering the Program was high for many of them, since the early participants in the Program were often recruited from among the more active Extension clientele. Thus it is possible that the participants had had fairly intensive exposure to Extension teaching for a long time.

During the four years from 1956 to 1959, the average number of agricultural agent-years devoted to the Program in the ten study counties was, for each successive year, .61, .56, .68, and .67. On the basis of this agent input and of the average number of participants in the ten counties in each of these years, if the average agent-years of input had been one agent-year for each of the successive years, this one agent would have been serving on the average 77.7 participants in 1956, 107.1 participants in 1957, 91.3 participants in 1958, and 97.2 participants in 1959.[31] Again, the data emphasize the intensive nature of the farm management phase of the Program.

[30] It should be noted that, before the Farm and Home Management Program began, farm management was taught in various counties in the state through farm business account clubs in which the participants were fairly well defined. The use of the word "club" for these study groups may be misleading, since the groups were not formally organized. This club approach has continued to be used in some of the counties participating in the Farm and Home Management Program.

[31] Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State—Time and Cost In-put and Cost-benefit Relationship for the Farm and Home Management Program in New York State,* Report No. 6 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, May 31, 1961, pp. 9 and 16.

Relation of State Staff to Program

At the time the Program was initiated, the Director of Extension assigned major responsibility for its subject-matter to the farm management specialists in the Department of Agricultural Economics of the College of Agriculture, and the home management specialists in the Department of Household Economics and Management of the College of Home Economics. At first, state supervision of the Program was assigned to one of the leaders in the agricultural department of the Extension Service. Later, supervision was turned over to the state leaders of the agricultural and home demonstration departments as part of their regular supervisory functions.

At the very beginning of the Program, a College Steering Committee was established whose functions, as defined by its chairman, were: 1) planning training for agents, 2) advising the Director concerning progress in the Program, 3) evaluating the Program and 4) advising the Director concerning Program operations.[32] The membership of the Committee has consisted of: a state leader from the agricultural, one from the home demonstration, and one from the 4-H club departments; two representatives who were farm management specialists from the Department of Agricultural Economics of the College of Agriculture; one or two representatives who were home management specialists from the Department of Household Economics and Management; the home demonstration agent-at-large assigned to the Program; and the administrative specialist in Extension studies. Throughout most of the committee history, it has had the same chairman who was a state leader from the agricultural department. The 21 training schools which were held for agents and others associated with the Program were largely planned by this committee.

Cost of the Farm Management Phase of the Program[33]

In relation to participation. In the ten study counties as a whole for the four-year period (1956-1959) the mean per family-year cost for the agricultural department at the county level was $95. For the same period, the mean family-cost for the farm management phase of the Program, combining county-level agricultural department cost plus farm management specialists' cost, was $110.

Comparison of Program and regular program costs. The per participant county-level cost of the farm management phase of the Program in the ten study counties as a whole was $105 in 1956 compared to a per com-

32 Alexander, *Evaluation Study of Farm and Home Management Program in New York State—The Farm and Home Management Program in New York State as Known and Viewed by Extension Administrators, Supervisors, and Specialists*, Report No. 3 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York. June, 1960, pp. 18-19.

33 The material for this section is taken from Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State—Time and Cost In-put and Cost-benefit Relationship for the Farm and Home Management Program in New York State*, Report No. 6 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, May 31, 1961, pp. 19-27.

mercial farmer cost for the regular agricultural department Extension program of $16.[34] In 1959 the respective figures were $97 and $19. Thus the per participant county-level cost of the Program was 6.6 times that of the per commercial farmer county-level cost for the regular program in 1956 and 5.1 times in 1959.

The per participant county-level cost of the farm management phase of the Program in the ten study counties as a whole was $105 in 1956 compared to a cost of $17[35] per association member of the agricultural department for the regular agricultural department Extension program. In 1959 the respective figures were $97 and $19. Thus, the per participant county-level cost of the Program was 6.2 times that of the per association member county-level cost for the regular program in 1956 and 5.1 times in 1959.

Cost-benefit relationship. On the basis of the advantage in labor income in 1959 of 87 participants over 87 pair-matched nonparticipants, the cost-benefit ratio for the farm management phase of the Program over 3.9 years of participation is .983.[36] This is based on a mean per participant cost figure of $429 for the 3.9 years and a mean per participant benefit figure of $436 for one year, 1959. Thus, in this one year, 1959, the average labor income[37] advantage of 87 participants over 87 nonparticipants more than paid for the cost of the Program. It should be mentioned, however, that the benefit figure of $436 could have occurred by chance between 1 and 1.5 times out of 10. Moreover, in matching the 87 participants and nonparticipants, much of the representative character of the original sample was lost and, hence, the data for the 87 pairs can not be considered representative, but only indicative, of the influence of the Program on labor income for all participants who were in the Program at the time the study sample was chosen.[38]

[34] The commercial farmers used to obtain this per capita cost were those receiving $2,500 or more from the sale of farm products. This group should be considered a hypothetical clientele used to provide a basis for examining comparative costs. It is not identical with the actual clientele, those taught and serviced by the agricultural departments.

[35] These association members are not identical with the actual clientele—those taught and serviced—of the agricultural departments and should be considered a hypothetical clientele used for the purpose of examining comparative costs.

[36] The 3.9 years is the mean number of years of participation by the 87 participants. The range in years of participation was from 1.5 to 5.5. Some of the participants had more years of participation than the approximate four years covered by the study, because they entered the Program before the study was begun.

[37] See Appendix C for definition of labor income.

[38] While the correction in labor income for influence of benchmark difference which is made in the section of the bulletin dealing with changes in labor income and related business factors (see page 41) results in a difference ($510) more favorable to the participants than the original difference of $436 used above, it is not possible to test the corrected figure to ascertain its probability point. Moreover, the difference in favor of nonparticipants in the 1959 price received for milk which is discussed on page 41 is not very reliable for use in estimating a higher difference in labor income favorable to the participants, because when the difference in price was tested the probability level was nonsignificant ($P < .50$). In view of these considerations, the use of $436 in calculating the cost-benefit rates is considered sound procedure.

Characteristics of 87 Pair-matched Participants and Nonparticipants at Beginning of Program

Matching Characteristics

The principal characteristics presented here are the 11 variables on which the 87 paired participants and nonparticipants were trial matched. As previously stated the 87 pairs were considered to be matched on eight of these variables. Since the major concern of the study focuses on the Program participants, their characteristics will be emphasized, but accompanied by comparisons with the pair-matched nonparticipants.

General Characteristics

The mean age of the 87 participants in 1956 was 43.6 years (Table 2). The mean for the nonparticipants was identical.

The mean number of years of school reported completed by the participants in 1956 was 11.3. This was .6 of a year higher than the number of school years completed by the nonparticipants and the difference is significant ($P < .01$).

The mean social participation score[39] of the 87 participants in 1956 was 59.0.[40] This was 10.6 score points above the nonparticipants and the difference is significant ($P < .001$).

Farm Operation Characteristics

The mean number of cows in the herd of the 87 participants provides an index of the size of their operations. In 1956 this average was 31 cows. The control group of nonparticipants had a mean of 32 cows. The difference between the two averages was considered nonsignificant ($P < .2$).

The number of productive work units per man is an index of labor efficiency. In 1956, the 87 participants had a mean of 309 work units per man.[41] The control group of nonparticipants had a mean of 318. The difference between the two averages was considered nonsignificant ($P < .4$).

The 1956 mean per cent score of the 87 participants on farm management knowledge and practices was 62.9.[42] The mean farm management knowledge and practices per cent score of the control group of nonparticipants was 61.5.[42] The difference between the two mean scores was considered nonsignificant ($P < .2$). This farm management knowledge and practices per cent score is an important initial characteristic of the participants in relation to nonparticipants, because in the Program farm management subject-matter has been given major emphasis.

[39] This social participation score is obtained by counting each organization membership as 1, each organization attended as 2, each organization contributed to as 3, each committee membership as 4, and each office held as 5. Add the resulting values.

[40] This is high when compared with findings in other studies in New York State, i.e., James W. Longest, *Social Changes in the Marathon Community, Cortland County, New York, 1929 to 1954*, an unpublished Ph.D. thesis, Cornell University, February, 1957, p. 122; W. A. Anderson, *Social Participation of Rural Nonfarm Adults*, Bul. 928, Cornell University Experiment Station, New York College of Agriculture, Ithaca, New York, May, 1958, pp. 3, 4, and 13; and data in the files of the Rural Sociology Department, College of Agriculture, Cornell University.

[41] See Appendix C for definition of work units.

[42] 100 per cent=perfect score.

Table 2. Means in 1956 (or 1955) of Trial Matching Characteristics for 87 Pair-matched Participants and Nonparticipants With Difference of Means and Probability Levels of t's for the Differences and Interpretations Thereof.

Matching Characteristics	*1956 Mean*		*Difference of Means*	*Probability Level of t*	*Interpretation of Probability Level*[b]
	Participants	*Non-participants*			
General Characteristics					
Age (years)	43.6	43.6	0.0	1.00	NS
Education—number of school years completed	11.3	10.7	.6	.01	S
Social participation score	59.0	48.4	10.6	.001	S
Farm Operation Characteristics					
Mean number of cows[a]	31.0	32.0	−1	.20	NS
Number of work units per man[a]	309.0	318.0	−9	.40	NS
Farm management knowledge and practices per cent score	62.9	61.5	1.4	.20	NS
Dairy feeding practices per cent score	61.2	61.2	0.0	1.00	NS
Agronomy practices for hay and pasture per cent score	54.5	49.3	5.2	.02	S
Dairy breeding practices per cent score	76.5	73.7	2.8	.20	NS
Dairy disease control practices per cent score	62.9	63.9	−1.0	.70	NS
Labor income per operator—dollars[a]	1938	1774	164	.30	NS

[a] Based on data for 1955 calendar year.

[b] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

The 1956 mean per cent score on dairy feeding practices of the 87 participants was 61.2.[42] The control group of nonparticipants was very well matched with the participants, having an identical mean score.

The 1956 mean per cent score on agronomy practices for hay and pasture of the 87 participants was 54.5 For the control group of nonparticipants the mean score was 49.3.[42] In this case there was a significant difference between the two means ($P < .02$).

The 1956 mean per cent score on dairy breeding practices of 87 participants was 76.5, and that of the control group of nonparticipants was 73.7.[42] The difference between the two means was considered nonsignificant ($P < .2$).

The mean per cent score on dairy disease control practices of the 87 participants in 1956 was 62.9, and that of the control group of nonparticipants was 63.9.[42] The difference between the two means was considered nonsignificant ($P < .7$).

Labor income[43] may very well be assumed to be a function of a number, if not all, of the preceding characteristics. The 1955 mean labor income per operator of the 87 participants was $1938, and that of the control group of nonparticipants was $1774. The difference between the two means was considered nonsignificant ($P < .3$).

Other Characteristics Not Used for Matching of 87 Participants and 87 Nonparticipants

In 1955, 93 per cent of the 87 participants had dairy enterprises only, and 7 per cent had dairy enterprises with poultry as a secondary enterprise. The distribution according to enterprises of 87 nonparticipants in the control group was quite similar to that of the participants. When the association between the two distributions was tested by chi square, the probability level of the chi square was less than .7.

In 1955, 97 per cent of the 87 participants, owned from 50 to 100 per cent of the land which they operated. The remaining 3 per cent were owners, but rented more land than they owned. Ownership of land operated was not so marked among the 87 nonparticipants in the control group. The difference between the distributions of the two groups on this variable is almost significant. When the association was tested by chi square, its probability level was less than .10.

In 1955, only 9 per cent of the 87 participants were involved in partnership firms.[44] The per cent of the 87 nonparticipants in the control group having partnership arrangements was 10 per cent. When the distributions of the two groups were tested by chi square, the difference was definitely nonsignificant, with chi square having a probability level less than .9.

Changes in Knowledge and/or Practices Scores

Seven knowledge and/or practices scores were calculated using 1955 and/or 1956 data obtained from the farm operators. Similar scores

[43] See Appendix C for definition of labor income.

[44] In the case of partnerships, the data on changes in knowledge and/or practices scores in this study were obtained from that member of the firm who was considered the leader in the management of the operation.

were calculated using 1959 and/or 1960 data from the same operators. Each score is the sum of weights assigned to the items composing each of seven tests.[45] These tests were developed for broad subject-matter areas, i.e., farm management, dairy feeding, etc. The tests and the weights assigned to the items composing them were developed cooperatively with specialists from the subject-matter fields to which the tests are related. In the case of the farm management knowledge and practices score, which is the only score of the five used in this analysis for which the 87 participants show a significant gain over the 87 nonparticipants in the control

Table 3. Differences Between Participants and Nonparticipants in Mean Changes for Knowledge and/or Practices Per Cent Scores With Probability Points of t's for Differences and Interpretations Thereof: 1956-1960.

Knowledge and/or Practices Scores and Groups	*Mean* 1956	1960	*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[c]
Farm management knowledge and practices per cent score[a]						
Participants	62.9	66.3	3.4			
Nonparticipants	61.5	61.4	−.1	3.5	.025	S
	(.20)[b]					
Dairy feeding practices per cent score						
Participants	61.2	59.1	−2.1			
Nonparticipants	61.2	55.9	−5.3	3.2	.01	S
	(1.0)[b]					
Agronomy practices for hay & pasture per cent score						
Participants	54.3	58.8	4.5			
Nonparticipants	49.3	54.8	5.5	−1.0	[d]	—
	(.02)[b]					
Dairy breeding practices per cent score						
Participants	76.5	75.6	−.9			
Nonparticipants	73.7	72.8	−.9	0.0	.50	NS
	(.20)[b]					
Dairy disease control practices per cent score						
Participants	62.9	66.0	3.1			
Nonparticipants	63.9	68.3	4.4	−1.3	[d]	—
	(.70)[b]					

[a] Some of the items in the test which this score represents were based on data for the calendar years 1955 and 1959.

[b] Probability level for test of difference of 1956 means of participants and nonparticipants.

[c] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

[d] Since the one-tail test used here hypothesizes that the participants will surpass the nonparticipants on each test score because of Program influences and the opposite is true for this score, no test of difference in change was made.

[45] *Test* as used here refers to the questions which appeared in the initial and terminal survey questionnaires, including Labor Income Form No. 40, which were subsequently combined into broad subject-matter areas for summarizing by means of scores. Five of these tests yielded the scores which are used in this part of the study and in the discussion of matching variables and characteristics of the participants. The five tests are 1) farm management knowledge and practices test, 2) dairy feeding practices test, 3) agronomy practices for hay and pasture test, 4) dairy breeding practices test, and 5) dairy disease control practices test. Two of the seven tests were not used because they were applicable to only part of the total number of participants and nonparticipants.

group, all of the items of the test which contribute to the total score on the test will be examined. Each of the other four practice scores will be illustrated by one major internal item, or combination of items, of each test.

Farm Management Knowledge and Practices Per Cent Score

This score is the crucial one for the evaluation study. As pointed out in the description of the Program, the major emphasis of the agricultural phase of the Program has been farm management subject-matter.

In 1956, the 87 participants had a mean per cent score of 62.9 compared to 61.5 for the nonparticipants (Table 3). The difference between the two means in 1956 was considered nonsignificant ($P < .2$). By 1960 the mean per cent score of the participants had risen to 66.3. Thus the participants had gained 3.4 per cent points while the nonparticipants had declined by .1 of a point. The difference between this gain and loss of the two groups was 3.5. This difference is considered significant ($P < .025$). It can, therefore, be concluded that the participants' farm management knowledge and practices were changed in a favorable direction as a result of the Program.

Composition of the Farm Management Knowledge and Practices Score

Twenty-five items are included in the farm management knowledge and practices score. These items, classified broadly by knowledge and practices and accompanied by the maximum values assigned to each, and by comparison of change of participants and nonparticipants, follow:

Items	*Maximum Scores*	*Participants Significantly Surpass Nonparticipants*
Farm management knowledge		
1. Operator's evaluation of size of operation (based on mean number of cows)	8	—
2. Operator's evaluation of production per cow	6	*
3. Operator's evaluation of production per acre	1	—
4. Operator's evaluation of efficient use of machinery	4	—
5. Operator's evaluation of efficient use of labor	6	S
6. Operator's evaluation of efficient use of capital	3	—
7. Operator's evaluation of efficient use of feed	4	—
8. Least important farm record	6	—
9. Goal for purchased dairy feed (as per cent of milk receipts)	15	—
10. Three-year goal on number of cows per man in relation to labor efficiency	15	--
11. Three-year goal on number of pounds of milk sold per man in relation to labor efficiency	15	—
12. Use of increase in inventory in figuring labor income	10	S
13. Proportion of total current market value of business represented by real estate	10	—
14. Proportion of all farm cash income represented by sales of milk	15	—

15. Comparison of labor income of farmer with wage of factory worker, and wage of hired man on farm	5	—
16. Problem to solve on farm business situation	10	—
Farm management practices		
1. Actual size of operation (based on mean number of cows	3	S
2. Actual production per cow	6	—
3. Actual production per acre	4	—
4. Actual efficient use of machinery	4	*
5. Actual efficient use of labor	6	S
6. Actual efficient use of capital	3	S
7. Actual efficient use of feed	4	—
8. Farm records used in farm business	30	—
9. Most important use of records kept	10	—
Total maximum score	211	

S means considered significant with P for t of difference $\leqq .05$.
* nearly significant with P for t of difference between .05 and .10.

Of the 16 items classified as farm management knowledge, on only two did the participants significantly surpass the nonparticipants with respect to change in mean scores between 1956 and 1960. These two items are the operator's evaluation of efficient use of labor[46] and the use of increase in inventory in figuring labor income.[47] For each of the items, the change in mean score of the participants exceeded that of the nonparticipants.[48]

An additional item entering into the total score for farm management knowledge and practices, and in this instance one on which the participants and nonparticipants were especially well matched in 1956, was operator's evaluation of production per cow ($P < 1.0$). The matching of the two groups on this score was identical, and the probability point[49] ($P < .1$) of the t for difference is definitely in the direction of .05. Moreover the difference in change between the 1956 and 1960 mean

[46] The score for this item was calculated from data obtained by asking the operators to rate their farm business according to whether it was strong or weak with respect to efficient use of labor. The strong and weak ratings were then checked against actual farm business data which were related to criteria set up by farm management specialists based on farm management studies. If the operator's rating of his farm business as strong or weak was supported by his actual performance in relation to the criteria, then he was given 6 points, otherwise 0.

[47] The data on which the score for this item is based were obtained by asking operators the following question with accompanying choices: "If you were undertaking to figure your labor income or the amount you received for your labor during the year, you would add up your cash receipts and your cash expenses. Now, if you find that your inventory has increased by $2,000, for example, during the year, what would you do with this item? (Check one) 1) ..... Add to cash receipts (weight—10); 2) ..... Add to cash expense (weight—0): 3) ..... Neither (weight—0); 4) ..... Don't know (weight—0)."

[48] The participants surpassed the nonparticipants on change in scores between 1956 and 1960 on 10 of the 16 knowledge items, whereas the nonparticipants surpassed the participants on 6. The foregoing statement about change has no reference, however, to whether or not the changes were significantly different ($P \leqq .05$).

[49] In references to probabilities, *level* is used for the two-tail test and *point* for the one-tail test.

scores of the two groups is favorable to the participants. It appears, therefore, that the comparative change for this score shows that the participants were influenced to some extent by the Program.

A fourth item on which the two groups were fairly well matched in 1956 is the proportion of total current market value of business represented by real estate ($P < .7$). The gain in score points between 1956 and 1960 of the participants exceeded that of the nonparticipants, but the difference was not significant, although the probability point for t was fairly low, less than .15.

On 15 of the 16 knowledge items, the 87 participants and 87 nonparticipants were reasonably well matched in 1956 with probability levels for t's as follows:

Probability Level of t	*No. of Items*
$P < 1.0$	2
$P < .9$	1
$P < .8$	2
$P < .7$	3
$P < .6$	3
$P < .5$	1
$P < .3$	3
Total	15

The item on which the two groups were not matched in 1956 is least important farm record.[50] The difference in change in mean scores for this item is favorable to the nonparticipants. No test of the significance of the difference was made, because the comparative nature of the change was not that required by the hypothesis, which calls for the application of the one-tail test.[51] It is very likely, however, that the participants would have shown a favorable as well as significant mean change over the nonparticipants on this item, if it had been possible to have tested them with the benchmark questionnaire before so many of them had been exposed to Program influences. The superior position of the 87 participants over the 87 nonparticipants of 12.7 percentage points in 1956 strongly supports the view that the participants had already been considerably influenced by the Program.[52]

50 The operators were asked, "If you were keeping the following farm records, which would be the *least important* to you? (Check one) 1) ..... Farm inventory (weight—3); 2) ..... Farm cash account record with business summary (weight—0); 3) ..... Check books and check stubs (weight—6); and 4) ..... An individual record such as one on milk production per cow, or one on heifer enterprise, or one on eggs per hen, or one on corn production (weight—6)." It should be noted that the weights assigned here refer to knowledge as to which records are *least important* and that the highest scores go to answers (3) and (4).

51 This hypothesis is that, in view of the Program influence, the participants will surpass the nonparticipants on change in test scores relating to Program subject-matter.

52 Of the 87 participants, 44 entered the Program in 1956, which was the year in which the benchmark survey was conducted. The remaining 43 entered the Program before 1956. The P for the test of difference between the 1956 means for least important farm record per cent score of the 44 participants and of the 44 nonparticipants who were pair-matched with them was less then .2. Since in this study .05 has been accepted as the level for considering differences significant, this level .2 may be considered as meaning that the 44 participants and nonparticipants are matched. This supports the view that a goodly number of the 43 participants who entered the Program before 1956 had by 1956 already learned what was the least important record. This is particularly emphasized when it is recalled that the P for the test of difference between the 1956 means of the total number (87) of participants and of the 87 nonparticipants was less than .01.

Of the nine items classified as farm management practices, on only three did the participants significantly surpass the nonparticipants with respect to difference in change in mean scores between 1956 and 1960.[53] These three items are actual efficient use of labor,[54] actual efficient use of capital,[55] and actual size of operation (based on mean number of cows.)[56]

For the item, actual size of operation (based on mean number of cows), the mean scores of the two groups in the benchmark year of 1956 were significantly different ($P < .05$); therefore, they can hardly be accepted as matched. The fact that the participants had the lower mean score in 1956 and yet gained sufficient score points by 1959 to equal the 1959 mean of the nonparticipants makes it possible to conclude that they surpassed the nonparticipants in improvement on this item. The difference in change, when tested, had a probability point that was significant ($P < .05$).

On six of the nine practice items the 87 participants and nonparticipants were reasonably well matched. The probability levels of the t's for the 1956 mean differences of the six items are:

Probability Level for t	*No. of Items*
$P < .8$	1
$P < .7$	2
$P < .5$	1
$P < .3$	1
$P < .2$	1
Total	6

[53] The participants surpassed the nonparticipants on change in scores between 1956 and 1960 on five of the nine practice items, whereas the nonparticipants surpassed the participants on four. The foregoing statement about change has no reference, however, to whether or not the change was significantly different ($P \leqq .05$).

[54] The actual efficient use of labor was scored by using averages for three factors found in the preliminary data of a report by C. A. Bratton, entitled, *New York Dairy Farm Business Summaries for 1956,* (mimeographed), Dept. of Agricultural Economics, Cornell University, Ithaca, New York, July, 1957. Six points were given to an operation for which at least two of the three factors were above the average for these factors as reported in the preliminary data, and 0 for an operation for which at least two of the three factors were below the average for these factors as reported in these data. The three factors are work units per man, number of cows per man, and pounds of milk sold per man.

[55] The actual efficient use of capital was scored by using averages for three factors found in the preliminary data of the study referred to in footnote 54 above. The three factors are 1) total capital invested per cow, 2) years for total receipts to equal capital invested, and 3) per cent of total capital invested in all livestock and poultry. If the operator's values for criteria 1 and 2 were the same as, or below, the averages given in the preliminary data, the operator was rated strong on each on which he is so qualified. If the operator's percentage for criteria 3 was the same or above the average given, he was rated strong on criteria 3. If the operator was rated strong on two or more of the three criteria, he was scored 3 on use of capital; otherwise he was scored 0.

[56] The actual size of operation (based on mean number of cows) was scored by using the following criteria: 1) if operator's number of cows was the same as, or above, the average found in preliminary data of the study referred to in footnote 54, a score of 8 was given; 2) if operator had less than one-half the average number of cows reported in the preliminary data, a score of 0 was given; and 3) if the operator's number of cows was between number of criteria 1) and 2), a score of 0 was given unless total work units exceeded 500, in which case a score of 8 was given.

The three items on which the two groups were not matched in 1956 are: 1) actual size of operation (based on mean number of cows) ($P < .05$), 2) farm records used in farm business ($P < .001$), and 3) most important use of records kept ($P < .01$). As has been previously noted, the difference in change in mean scores for the first of these items is significantly favorable to the participants. For the latter two, the difference is favorable to the nonparticipants. No test of difference was made for these items, because the comparative nature of the change was opposite to that which was hypothesized.

For the last two of these three items, there can be little doubt but that the magnitude of change for the participants between 1956 and 1960 would have been greater, if a number of them had not been exposed to the Program before the benchmark questionnaires were administered. For those in the Program for a year or more before the benchmark survey, there is every reason to believe that many of them would have known and practiced the correct answers to the questions on which the scores for these items are based. Thus, the question about farm records used in farm business was: "Which of the following methods do you use for keeping up with your farm business? (Check as many as you use.)" The possible choice of answers and the weights for each were:

Choice	*Weight*
1. Keep bills in a drawer, envelope, or some convenient place	4
2. Keep check stubs	5
3. Keep a ledger (book) which I have developed on my own	16*
4. Keep a farm cash account book (printed form)	16*
5. Keep a farm inventory	5
6. Keep in mind my expenses and receipts and add them up at the end of year	0

* Credit given for either 3 or 4, but not for both.

Because the early emphasis in the Program in most counties called for record keeping by participants, it can be seen that they could be expected to have started some useful sort of records as a result of the Program, whereas the nonparticipants would not have been stimulated to do so.[57]

[57] Of the 87 participants, 44 entered the Program in 1956, the year in which the benchmark survey was conducted. The remaining 43 entered the Program before 1956. The mean difference between the 1956 means for farm records used in farm business per cent scores of the 44 participants and of the 44 nonparticipants who were pair-matched had a t at a probability level less than .01. The 1956 mean per cent score for farm records used in farm business of the 44 participants was 86.6, and of the 44 nonparticipants 75.9. It should also be noted that the difference between the 1956 mean per cent score of all 87 participants and of all 87 nonp. icipants had a t at less than the .001 probability level. This would indicate that the total group of participants, which includes in addition to the 44 entering the Program in 1956, 43 who entered before 1956, differed even more from the total group of nonparticipants on this score than did the 44 participants and their pair-matched nonparticipants. The 1956 mean per cent score of the 87 participants was 90.1 and of the 87 nonparticipants 77.1. Thus, it would appear that the 44 participants who entered the Program as late as 1956 had evidently been sufficiently influenced, so that even they differed significantly from the 44 nonparticipants. It should be observed at this point that it is very likely that some participants who were already keeping some kind of farm business records were encouraged to enter the Program.

The question about most important use of records kept was: "What is the most important use you have made of whatever records you have kept during the past year? (Check one.)" The possible choice of answers with their weights were:

Choice	*Weight*
Preparing income tax form	0
Basis for obtaining credit	0
Finding weak points in your business	10
Other	0

Again it can be readily seen that the participants who had been in the Program for a year or more could have been expected to have learned the right answer and also to have applied it, so that at the beginning the participant group, because of Program influence, would have been, as the data indicate, somewhat ahead of the nonparticipants.[58]

The actual size of the operation (based on mean number of cows) was scored on the basis of the operator's mean number of cows for the calendar years 1955 and 1959 as these related to criteria set up by farm management specialists using a mean sized herd and number of work units based on farm management research. In this case the 1956 mean score of the 87 nonparticipants was significantly greater than that of the 87 participants ($P < .05$). This favorable benchmark score difference for the control group of nonparticipants may partially reflect the actual difference between the two groups in mean number of cows in their herds in the calendar year 1955. The mean number of cows in the herds of the 87 participants in 1955 was 31.0 and in the herds of the 87 nonparticipants it was 32.0. However, the difference between these two means is small and was not considered significant ($P < .2$). The two groups were considered to be matched on this variable, which was one of the 11 variables used in the trial matching (see page 23).

Summary Relating to Internal Items of Farm Management Score

Of the 25 internal items whose score values yielded the total score for the farm management knowledge and practices test, there were only five which showed a significant difference in change favorable to the participants. The combined maximum score points of these five items amount to 33 out of a possible total of 211 points for the farm management knowledge and practices test. The five items are: 1) operator's evaluation of efficient use of labor, 2) use of increase in inventory in figuring labor income, 3) actual size of operation based on mean number of cows, 4) actual efficient use of labor, and 5) actual efficient

[58] Of the 87 participants, 44 entered the Program in 1956 which was the year in which the benchmark survey was conducted. The remaining 43 entered the Program before 1956. The mean difference of the 1956 means for most important use of records kept of the 44 participants and of the 44 nonparticipants who were pair-matched with them had a t at a probability level less than .2. Since in this study .05 has generally been accepted as the level for considering differences to be significant, this level of less than .2 may be considered to mean that the 44 participants and 44 nonparticipants are matched. This supports the view that a fairly large number of the 43 participants who entered the Program before 1956 had already learned the correct answer to the question asked of them in 1956 regarding most important use of records. This is made clear when it is recalled that the total number (87) of participants is considered significantly different (using the .05 level) from the 87 nonparticipants (probability level of t less than .01).

use of capital. It would be difficult to make any claim that these are the most important items in the total farm management knowledge and practices test.

There is considerable evidence, however, that the participants are penalized on at least three rather important internal items of the total farm management knowledge and practices test. These are 1) farm records used in farm business, 2) most important use of records kept, and 3) least important record. The total value of these three items amounts to 46 score points out of a total of 211 for the entire test. The evidence is fairly clear that, because a number of the 87 participants had been exposed to the Program for some time previous to being tested on these items, their scores on the items were already high and hence the magnitude of change in their score points during the period of study was limited. If the participants and nonparticipants had been matched on these three items before exposure to the Program, the difference in change in farm management knowledge and practices per cent score would undoubtedly have been more favorable to the participants than it actually was.[59]

Relationship of 1956 Farm Management Knowledge and Practices Score to Change in the Score: 1956-1960

Participants and nonparticipants were divided into high and low groups on their initial (1956) scores on the farm management knowledge and practices per cent score. Each of these groups was in turn divided into high and low groupings on percentage points of change between their 1956 and their 1960 scores. On the initial test, over two-thirds of the low scorers, both participants and nonparticipants, fell in the high group for change in percentage points between initial and final scores, while the opposite was true for the groups with high initial scores (Table 4). Moreover, when the magnitude of change, as reflected by the difference in change between the 1956 and 1960 means of the participants and nonparticipants, is examined, the group of participants low on initial scores on farm management knowledge and practices are the ones who surpass, but not significantly, their pair-matched nonparticipants, and hence are that part of the participants who contributed most to the participants' having significantly surpassed the nonparticipants on their gain in average score on farm management knowledge and practices (Table 5).[60]

[59] It should be noted that for use in the study the 87 participants and nonparticipants were matched on their 1956 farm management knowledge and practices per cent score, but no attempt was made to match them on internal items whose values entered into the total score.

[60] High percentage points of change are changes ranging from 2 points and above for the participants and from −1 and above for the nonparticipants, and low percentage points of change are in the opposite direction. In the relationship of initial score to change the participants and nonparticipants were divided at approximately the median score for each group, but for the calculation of difference in mean change the participants were divided at approximately their median initial score and each nonparticipant was placed in the same group in which his participant match fell.

Table 4. Number and Percentage Distribution of Participants and Nonparticipants According to High and Low Grouping on 1956 Farm Management Knowledge and Practices Per Cent Score by High and Low Groupings on Percentage Points of Change in the Same Score Between 1956-1960.

Percentage Points Change: 1956-1960	*Farm Management Knowledge and Practices Per Cent Score: 1956*							
	Participants				*Nonparticipants*			
	Low (63 and Below)[a]		*High (64 and Above)*[a]		*Low (61 and Below)*[a]		*High (62 and Above)*[a]	
	No.	*Per Cent*	*No.*	*Per Cent*	*No.*	*Per Cent*	*No.*	*Per Cent*
Low[b]	14	31	31	74	11	26	32	73
High[b]	31	69	11	26	32	74	12	27
Total	45	100	42	100	43	100	44	100

[a] Breaking points are at approximately the median positions.

[b] Breaking points are at approximately the median positions; for participants—*low: 1 and below* and *high: 2 and above* and for nonparticipants—*low: −2 and below* and *high: −1 and above.*

Participants: $X^2 = 15.86$ 1 d.f. $P < .001$

Nonparticipants: $X^2 = 19.34$ 1 d.f. $P < .001$

Table 5. Differences Between Mean Changes in Farm Management Knowledge and Practices Per Cent Scores for High and Low Scoring Participants and Their Pair-Matched Nonparticipants With Probability Points of t's for Differences and Interpretations Thereof: 1956-1960[a]

Class of Operators	*Mean*		*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[c]
	1956	*1960*				
High scoring group in 1956						
Participants (N = 42)	70.8	67.7	−3.1			
Nonparticipants (N = 42)	67.8 (.05)[b]	61.2	−6.6	3.2	.10	NS
Low scoring group in 1956						
Participants (N = 45)	55.5	65.1	9.6			
Nonparticipants (N = 45)	55.6 (1.0)[b]	61.6	6.0	3.6	.15	NS

[a] Participants were divided into high low score groups on their 1956 farm management knowledge and practices per cent score at approximately the median score. The nonparticipants were divided into similar groups by putting each nonparticipant in the same group (high or low) into which the participant with whom he was matched fell.

[b] Probability level for test of difference of 1956 means of participants and nonparticipants.

[c] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

Dairy Feeding Practices Per Cent Score

This score is composed of 17 major items and tests an area that might be expected to reflect improvements in management knowledge and practices, though not necessarily to any large degree in the short length of time covered by this study.[61] In 1956, the mean per cent score

[61] See Appendix B for list of major items for this and subsequent practices scores.

of the 87 participants was 61.2 and that of the nonparticipants was exactly the same (Table 3). However, in 1959, the mean per cent score of the 87 participants had declined by 2.1 to 59.1 and that of the nonparticipants by 5.3 to 55.9. Thus the nonparticipants declined more than the participants which resulted in the latter having a change advantage of 3.2 percentage points. Certainly no claim can be made for Program influence on participants for dairy feeding practices taken as a whole, unless it can be said that it prevented them from retrogressing in this area as much as the nonparticipants.

Because an important emphasis of the agents conducting the Program in the ten counties has been forage harvesting practices as related to the quality of the forage (with special attention to time of harvesting),[62] items composing this segment of the score of dairy feeding practices will be considered in detail. Moreover, of the 103 score points possible on feeding practices, harvesting practices contributed 36 points. No other item, or group of items, contributed nearly so many points to the total number of score points. These forage harvesting practices are:[63]

Normal date of harvesting first cutting of hay
Maturity of hay at time of cutting
Kind of hay
Date of harvesting hay silage
Maturity at time of cutting hay silage
Corn silage stage of maturity at time of cutting

In 1956, the 87 participants and 87 nonparticipants were considered matched on this score ($P < .2$) (Table 6). The change in the mean harvesting practices per cent scores of the 87 nonparticipants was greater than that of the 87 participants. In fact, the means of the two groups were slightly closer in 1960 than in 1956. However, no test of the difference in this change was made, because the comparative nature of the change was opposite to that which was hypothesized.

Agronomy Practices for Hay and Pasture Per Cent Score

This is another area on which the business analysis approach of the Program might have been expected to exert indirect, if not direct, influence for change, though not necessarily in a significant manner over a short period of time. The agricultural agents conducting the Program, as well as the participants, indicated considerable emphasis on topics associated with this area.

In 1956, the mean per cent score on agronomy practices for hay and pasture for the 87 participants was 54.3 and for the nonparticipants 49.3 (Table 3). The two groups were not matched on this score in 1956. The difference in their 1956 mean scores was considered significant ($P < .02$).

62 The agents in 80 per cent of the ten study counties reported exposing 50 per cent or more of their participants to *correct harvesting times.* (See page 15 of this report.)

63 A total score of 36 points for harvesting practices was obtainable if an operator made hay, hay silage, and corn silage, or if he made two or only one of the three kinds of forage. However, the details of the system used in weighting and scoring these internal items was quite complex; consequently, no attempt is made here to describe it. Information on the system is available in the working files for the study in the Office of Extension Studies, 261 Roberts Hall, Cornell University, Ithaca, N. Y.

The difference is at a probability level which actually invalidates a comparison of change. Nevertheless, the change of the two groups will be examined. By 1960, the mean per cent score of the participants had risen by 4.5 points to 58.8 and that of the nonparticipants by 5.5 to 54.8. Thus the gain of the participants was 1.0 below that of the nonparticipants. No test of the difference in the gain of the two groups was made, because the comparative nature of the change was opposite to that which was hypothesized.

The agronomy practices for hay and pasture per cent score is calculated from seven major items composing the test in this subject-matter area. Of the two internal items with the highest scores (26 score points each) proportion of acres seeded with a recommended variety of legumes (alfalfa, birdsfoot trefoil, red clover) was considered the more important. This particular item of the total score is examined here. In 1956, the participants and nonparticipants were sufficiently alike to have mean per cent scores that were considered not significantly different ($P < .2$) (Table 6). The mean per cent scores of both groups increased consider-

Table 6. Differences in Mean Changes Between Participants and Nonparticipants for Major Item, or Combinations of Items, Constituting the Dairy Feeding Practices Per Cent Score, the Dairy Breeding Practices Per Cent Score, the Agronomy Practices for Hay and Pasture Per Cent Score, and the Dairy Disease Control Practices Per Cent Score With Probability Points for t's for Differences and Interpretations Thereof: 1956-1960.

Practices Scores and Groups	*Mean* 1956	1960	*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[b]
Forage harvesting practices relating to quality of forage per cent score						
Participants	61.4	65.6	4.2			
Nonparticipants	59.2 (.20)[a]	63.9	4.7	−.5	[c]	—
Proportion of acres seeded with a recommended variety of legumes practices per cent score						
Participants	62.9	76.1	13.2			
Nonparticipants	57.1 (.10)[a]	66.3	9.2	4.0	.40	NS
Proportion of cows bred artificially, to pedigree sires, and to registered sires practices per cent score						
Participants	77.5	76.9	−.6			
Nonparticipants	70.1 (.05)[a]	71.1	1.0	−1.6	[c]	—
Proportion of herd treated during year for mastitis per cent score						
Participants	63.2	58.0	−5.2			
Nonparticipants	70.1 (.10)[a]	72.1	2.0	−7.2	[c]	—

[a] Probability level for test of difference of 1956 means of participants and nonparticipants.

[b] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

[c] Since the one-tail test used here hypothesizes the participants will surpass the nonparticipants on each test score because of Program influence, and the opposite is true for this score, no test of difference in change was made.

ably between 1956 and 1960. While the difference between the increase of both groups was favorable to the participants, it was considered nonsignificant ($P < .4$).

Dairy Breeding Practices Per Cent Score

From the agents' 1958 report on subject-matter items to which 50 per cent or more of the participants in the Program were exposed, this area received very little conscious attention.[64] Furthermore, there is no indication either that the participants thought they had received or that agents thought they had given any great amount of help in this area.[65] Therefore, any influence of the Program on change in this score would tend to be only indirect.

The 1956 per cent score on dairy breeding practices of the 87 participants was 76.5 and that of the 87 nonparticipants was 73.7 (Table 3). The difference between the two means was considered nonsignificant ($P < .2$). The score for both groups declined slightly, but by the same amount, .9 score points, resulting in a nonsignificant difference in comparative amount of change ($P < .5$).[66] Obviously the Program had no influence on the dairy breeding practices of the participants.

The total per cent score for dairy breeding practices consists of eight major items. The internal item having the highest value in score points (48) is based on proportion of cows bred artificially, to pedigree sires, and to registered sires. In 1956, the participants and nonparticipants were not matched on this item (Table 6). The difference of the two means was considered significant ($P < .05$). The 1960 mean per cent score of the participants was slightly lower than their 1956 mean per cent score, whereas the 1960 mean of the nonparticipants was slightly higher than their 1956 mean. The difference in change was, therefore, favorable to the nonparticipants. No test of the difference in change was made, because the comparative nature of the change was opposite to that which was hypothesized.

Dairy Disease Control Practices Per Cent Score

According to the agents' 1958 report on subject-matter items to which 50 per cent or more of their participants had been exposed, dairy disease did not receive much attention. Thus, in none of the counties did the agents report 50 per cent or more of their participants exposed to recommendations for disease prevention.[67]

[64] See page 16 of this report.

[65] Alexander and Longest, *Evaluation of Farm and Home Management Program in New York State—Evaluation of the Farm and Home Management Program by Participants and Agents in the Ten Study Counties of New York State*, Report No. 7 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, June 30, 1961, pp. 19 and 28.

[66] Since both groups had the same amount of change for this item, application of the one-tail test is questionable.

[67] See page 16 of this report and page 28 of Alexander and Longest, *Evaluation Study of Farm and Home Management Program in New York State Study of the Operations of the Farm and Home Management Program in New York State*, Report No. 2 (mimeographed), Office of Extension Studies, State Colleges of Agriculture and Home Economics, Cornell University, Ithaca, New York, January 15, 1960.

The 1956 mean dairy disease control practices per cent score was 62.9 for the 87 participants and 63.9 for the 87 nonparticipants (Table 3). The difference between the two means was considered nonsignificant ($P < .7$). Thus the two groups were well matched on this score By 1959, the participants' mean score had risen by 3.1 to 66.0 and the nonparticipants' by 4.4 to 68.3. The nonparticipants, therefore, had made a slightly greater gain in mean per cent score. No test of the difference in gain of the two groups was made because the comparative nature of the change was opposite to that which was hypothesized.

Of the six items composing the dairy disease control practices per cent score, the percentage of the herd treated for mastitis during the year was assigned the maximum value attainable (8 points for lowest per cent of herd treated). While the participants and nonparticipants are indicated as having 1956 mean per cent scores for this item whose differences is considered nonsignificant, the actual probability level for the t is only slightly higher than .05 (Table 6). Between 1956 and 1960, the participants' mean score declined by 5.2 percentage points while that of the nonparticipants rose by 2.0 percentage points. Thus, the difference between the changes in the means of the two groups between 1956 and 1960 was favorable to the nonparticipants. In view of this, no test of the difference was made.

Changes in Labor Income and Related Business Factors[68]

Frame-of-reference for Analysis

Price-cost trends. Analysis of farm business factors affecting income requires at the outset a consideration of trends in farm prices and costs. For dairy farms the major product for sale is milk. A secondary source of income is the sale of cattle. From 1955 to 1959, the average price received by farmers for milk increased 12 per cent, for dairy cows 63 per cent, and for beef cattle 58 per cent.[69]

The prices paid by farmers for all commodities purchased also increased during the period. Some of the major commodities purchased by farmers are labor, farm machinery, feed, and fertilizer. The prices paid for labor and farm machinery increased sharply in this period. In contrast, the price paid for feed increased only slightly, and the price paid for fertilizer decreased slightly.[70] Therefore, in analyzing change for participants and nonparticipants, we can expect that the expenses and gross income of both groups will have increased irrespective of any increases in size and inputs. Fortunately, in this study, cost-price trends do not seriously complicate the analysis, since the emphasis in the study is on comparative change between participants in the Farm and Home Management Program and a matched group of nonparticipants. There-

[68] For definition of terms used in this section of the study, see Appendix C.

[69] Based on data from G. L. Casler and C. A. Bratton, *Relation of Farm Business Factors to Dairy Farm Labor Incomes,* Agricultural Economics Research 54 (mimeographed), Department of Agricultural Economics, Cornell University Agricultural Experiment Station, New York State College of Agriculture, Cornell University, Ithaca, New York, December, 1960, pp. 2-3.

[70] Based on tabulations in the files of the Department of Agricultural Economics, Cornell University.

fore, it can probably be assumed that cost-price changes have affected each group approximately the same.

Difference in benchmark positions. As the successive reports whose findings are incorporated in this bulletin were prepared, it became increasingly clear that benchmark differences between the 87 pair-matched participants and nonparticipants for various variables, even though considered nonsignificant ($P > .05$), had an influence on differences in change. Since the findings on labor income and related business factors tended at times to yield almost significant differences between the two groups, it was thought that some attempt to correct for benchmark differences might result in more distinct differences. For this reason the changes for several variables considered in this section have been corrected. The method for making these corrections will now be described.[71]

Because the participants' change was influenced by benchmark level and presumably by the management Program, it was impossible to isolate benchmark influence for participants for use in correcting difference in change. Consequently, all corrections for the influence of benchmark difference between the two groups are confined to nonparticipants. The effect of the correction is to change the benchmark mean of the nonparticipants so that they are perfectly matched with the participants. The actual calculations are for correction of nonparticipants' mean change for the influence of the benchmark difference between them and the participants. This yields a corrected mean change of nonparticipants which is an estimate of the change which would have occurred if they had been exactly matched with participants initially. The subtraction of the nonparticipants' corrected mean change from the mean change of the participants yields the difference, if any, caused by influence of the Program. After correction for benchmark difference, its influence is eliminated in the calculation of change.

It was decided that all variables whose difference between the two groups on benchmark means, when tested, had a probability level of .30 or less would be considered for possible correction for influence of benchmark difference on change. This decision was based on the assumption that benchmark variables whose mean differences, when tested, had probability levels as low as .30 or less were instances in which the two groups might not be well matched and, therefore, required closer matching in order to have a resulting change that was not influenced so much by benchmark difference.

Before any adjustment of difference in change for the influence of a benchmark difference was made, it was necessary to establish that benchmark level actually had an influence upon change. That is, as the benchmark level is raised, the amount of change corresponding to each level is either successively increased or decreased. If difference in benchmark level caused differences in change which progress successively, either

[71] The mimeographed report dealing with change in labor income and related factors was one of the last prepared in a series of 12 reports. No attempt has been made in this bulletin to correct for changes in farm knowledge and/or practices scores because of the influence of benchmark difference. Since the data for these scores are somewhat less objective than those relating to farm business, despite recognized inaccuracies in the latter, it was felt that further manipulation of the former could not be justified. This is especially true, since the method used in making corrections in changes in the business data is not well established or refined.

inversely or positively, as benchmark level is increased, then a correction was made.

The benchmark mean and mean change for each quartile were calculated. Although, as already pointed out, corrections were made for nonparticipants only, for each variable for which a possible correction was considered, the participants were also divided into quartiles and benchmark mean, as well as mean change, calculated for each quartile. These calculations for participants were made to determine whether or not, despite Program influence, they followed the same successive inverse or positive relationship. The purpose of this determination was, if possible, to provide assurance that corrections using nonparticipant data only were based on the same tendency among the participants.[72] In fact, as a conservative measure, with only three exceptions, no corrections have been made where the participants differed from the nonparticipants with respect to successive inverse or positive relationship between mean benchmark levels of quartiles and mean changes of the same quartiles. The three exceptions are instances in which one group had one quartile whose mean change failed to fall into the pattern of successive steps of decrease.

To make corrections in the changes of the nonparticipants when their benchmark means are raised or lowered to match exactly those of the participants, it was assumed that, for each unit of difference between the means of the benchmark data, there would be a corresponding amount of increase or decrease in mean changes. For any given variable this unit of change per unit of benchmark difference was obtained by dividing the difference between the means of the lower and upper halves of the benchmark data into the difference between the mean changes of the same lower and upper halves. While the test for making a correction in change for variables was successive decreases or increases in mean changes of quartiles, the means of lower and upper halves of benchmark data and the mean changes of lower and upper halves of the same data were used for calculating unit of change per unit of benchmark difference. This use of the means for the lower and upper halves, rather than the means of the quartiles, in calculating the unit of change is justified, because they are considered more stable averages in view of the small number of cases constituting the quartiles.[73]

[72] Since the inverse or positive relationships between successive quartile benchmark means and corresponding changes for the variables examined in this study were in general in the same direction for both participants and nonparticipants, it was concluded that this similarity of direction should be required before a correction was made. It should be recognized, however, that this similarity of direction may be peculiar to the findings of this study. Whether or not adult participants in educational programs might generally follow this similarity of direction, when compared to matched nonparticipants, has not been established in so far as the authors are aware.

[73] The corrections for certain variables for influence on change of benchmark difference used in this study may introduce incongruities when the corrected changes for these variables are related to changes for other variables which were not considered for correction, because the probability level for the test of the difference between the participants and nonparticipants was greater than .30. It is important to remember that these uncorrected variables are often functions of the corrected variables before correction, or vice versa.

Changes in Price Received for Milk

The two groups were closely matched on benchmark price received for milk.[74] The difference in change for price received for milk (3.7 butterfat content) was not significant. However, the difference in change that did occur was in the direction of a higher price received by the nonparticipants. Since the difference in change in price received for milk favored nonparticipants, the differential may have had some slight effect toward increasing income of nonparticipants more than that of the participants regardless of efficiencies of either group. The difference of 6 cents per hundredweight in 1959, if deducted from nonparticipants' milk receipts, would have decreased their milk receipts about $200. However, it should be emphasized that the probability level of the test of the difference in the 1959 prices received by the two groups was fairly high, less than .50.

Changes in Per Cent of Receipts from Milk

There was essentially no difference in benchmark values of milk receipts as a per cent of total receipts (Table 7). There was also essentially no difference in change from 1955 to 1959 in milk receipts as a per cent of total receipts between the participants and nonparticipants. In fact, the change for both groups was only a slight decline in per cent. Thus, participants and nonparticipants began at nearly the same percentage, and both decreased that percentage only slightly. Since almost 75 per cent of total receipts in 1955 and 1959 were from milk, it is obvious that both participants and nonparticipants were primarily dairy farmers at both dates.

Changes in Income

Total receipts, net farm income per operator, milk receipts, and labor income per operator increased more for the 87 participants than for the matched nonparticipant operators (Table 7). While none of the probability points for the tests of differences for these variables are considered significant ($P \leqq .05$), the points for net farm income per operator and labor income per operator are fairly low. Since milk receipts, total receipts, and net farm income per operator were almost identical in 1955, these differences in change with probability points from less than .30 to less than .15 may be accepted without any question concerning the influence of benchmark differences.

Since the probability level for the test of difference between the 1955 labor incomes of the two groups was less than .30, and since there was an inverse relationship between successive quartile benchmark means and corresponding changes, this variable qualified for correction. The mean difference in change, corrected for influence of benchmark difference, is increased to $510 from the $436 that was tested. Thus, the amount of difference in change in labor income per operator, as corrected, may be considered a difference which would have a probability point for the test of difference that is below .15, but whether significant ($P \leqq .05$) is unknown.

[74] Of the farm business variables considered in this section of the study, only three, i.e., mean number of cows, number of work units per man, and labor income —were used in the pair-matching of the 87 participants and nonparticipants (see Table 2, p. 24).

Table 7. Differences Between Participants and Nonparticipants in Mean Changes in Five Kinds of Income Measures With Probability Points or Level of t's and Interpretations Thereof: 1955-1959.

Kinds of Income Measures	*Mean* 1955	1959	*Mean Change*	*Difference Between Mean Changes*	*Probability Point or Level of t*	*Interpretation of Probability Point or Level*[d]
Total receipts						
Participants	$15,315	$21,907	$6,592			
Nonparticipants	$15,731 (.70)[a]	$21.537	$5,806	$786	.30	NS
Net farm income per operator						
Participants	$ 3,580	$ 5,864	$2.284			
Nonparticipants	$ 3,564 (1.0)[a]	$ 5,592	$2,028	$256	.15	NS
Labor income per operator						
Participants	$ 1,938	$ 3,783	$1,845			
Nonparticipants	$ 1,774 (.30)[a]	$ 3,183	$1,409	$436	.15	NS
Nonparticipants (corrected for benchmark dif.)	$ 1,938	$ 3,273	$1,335	$510	[b]	—
Milk receipts						
Participants	$11,062	$15,440	$4,378			
Nonparticipants	$11,311 (.70)[a]	$15,147	$3,836	$542	20	NS
Milk receipts as per cent of total receipts						
Participants	74	72	−2			
Nonparticipants	73 (.80)[a]	72	−1	−1	.80[c]	NS

[a] Probability level for test of difference of 1955 means of participants and nonparticipants.

[b] Method of calculation did not permit testing of difference.

[c] A two-tail test was used, because no hypothesis concerning change for the participants as a result of the Program was appropriate.

[d] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

Changes in Size

Since participants had fewer cows per herd in 1955 than nonparticipants, they needed to gain more just to catch up in size of herd by 1959 (Table 8). The extra increase by participants was precisely the amount needed to make their 1959 average number of cows the same as that of the nonparticipants. While the difference in change in number of cows was favorable to the participants, it was not considered significant. Nevertheless, the actual probability point of the test for difference was relatively low, less than .20. Since the probability level for the test of difference of benchmark means was less than .30, this size variable was considered for possible correction in change. However, the test for inverse or positive relationship between successive quartile benchmark means and corresponding changes ruled out making any correction.

Participants increased crop acres enough more than the nonparticipants to yield a significant difference ($P < .0005$) in change (Table 8). Participants had more crop acres in both 1955 and 1959. To the 1955 difference with probability level of less than .20 was added much more

Table 8. Differences Between Participants and Nonparticipants in Mean Changes for Size Indexes With Probability Points or Levels of t's for Differences and Interpretations Thereof: 1955-1959.

Size Indexes	*Mean* 1955	1959	*Mean Change*	*Difference Between Mean Changes*	*Probability Point or Level of t*	*Interpretation of Probability Point or Level*[b]
Number of cows						
Participants	31	36	5			
Nonparticipants	32	36	4	1	.20	NS
	(.20)[a]					
Crop acres						
Participants	96	107	11			
Nonparticipants	89	91	2	9	.0005	S
	(.20)[a]					
Nonparticipants (corrected for benchmark dif.)	96	96	0	11	[c]	—
Total work units						
Participants	533	623	90			
Nonparticipants	559	609	50	40	.05	S
	(.20)[a]					
Average farm inventory						
Participants	$35,621	$45,977	$10,356			
Nonparticipants	$39,207	$48,391	$ 9,184	$1,172	.25	NS
	(.10)[a]					
Man equivalent						
Participants	1.8	1.9	.1			
Nonparticipants	1.8	2.0	.2	−.1	.70[d]	NS
	(.80)[a]					

[a] Probability level for test of difference of 1955 means of participants and nonparticipants.

[b] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

[c] Method of calculating correction does not permit testing of difference.

[d] A two-tail test was used since no hypothesis concerning change for the participants as a result of the Program was appropriate.

change by participants than by nonparticipants, thus causing the 1959 difference to be about twice that existing in 1955. Since the probability level of the test of difference of benchmark means for this variable was less than .20, and since it met the test for inverse or positive relationship between successive quartile benchmark means and corresponding changes, correction for influence of benchmark difference was calculated. The correction resulted in a still more favorable change for the participants. The Program definitely influenced the participants to increase crop acres. Thus, by 1959 the participants had more crop acres on which to raise feed than the nonparticipants had, while each group was feeding the same number of cows. It would be expected that the participants' greater number of crop acres would have yielded more home grown feed. The increase in milk production per cow of participants (see Table 11, page 47) might be interpreted as related to the quality, as well as the greater quantity, of home grown feed, but there is no information on quality of home grown feed or extent of substituting home grown for purchased feed. Moreover, the increase in milk production per cow could be a reflection of better cows in the participants' herds, but whether this was the case is also not known. The increase in crop acres may also represent preparation

for additional increase in herd size. If this is the case, then the full effects of the Program on size of herd would not have occurred by 1959 and are, therefore, not measured by this study.[75]

The larger increase in cows and crop acres by participants led to a much higher increase in work units for the participants, and hence a significant difference ($P < .05$) in change in work units (Table 8). Although this variable qualified for correction for benchmark influence on the basis of probability level (less than .20), it failed to do so on inverse or positive relationship between quartile benchmark means and corresponding changes. The directions of the two groups were opposite for this relationship.

Average farm inventory or capital investment is another index of size of operation. Participants had lower inventories in both 1955 and 1959, but their larger increase reduced the difference between them and the nonparticipants in 1959 (Table 8). The difference in change is not considered significant; nevertheless, the probability point of the test for the difference is relatively low, (less than .25). Although the probability level (less than .10) for the test of benchmark difference qualified this variable for consideration of correction for influence of benchmark difference, the test for inverse or positive relationship between successive quartile means and corresponding changes failed to support making a correction. The participants had a positive relationship on the test and the nonparticipants an inverse one.

The meaning of man equivalent as a size index is definitely a relative matter. In this study it was impossible to hypothesize that the Program should have either increased or decreased the index.

On four measures of size, excluding man equivalent, the participants increased over the nonparticipants between 1955 and 1959, and for two of these four measures, they increased at a significant level ($P \leqq .05$). In general, the changes give the participants a size advantage in 1959. Therefore, in respect to size of operations, the Program can be considered to have influenced the participants.

Changes in Efficient Use of Capital

The two measures of efficient use of capital which are used in this study are dollars invested per cow and years for receipts to equal capital investment. Both measures qualify for correction for benchmark difference, because the probability levels for the tests of their benchmark differences are at .30 or less, and the test of inverse or positive relationship for successive quartile benchmark means and corresponding changes was satisfactory in each instance.

Since, in general, the desirable direction of change for dollars invested per cow is a decrease in per cow investment, the participants moved in a direction contrary to that which was hypothesized (Table 9). However, when corrected for benchmark influence, the nonparticipants made a slightly larger increase than the participants. It is impossible to test the corrected difference between the two groups, but the amount is relatively small. Even so, the nonparticipants, whether the uncorrected or corrected means for 1959 are considered, had a larger dollar investment per cow. However, it is difficult to conclude that one group is

[75] Total acres increased more for participants. However, total acres are not considered a reliable measure for size of New York dairy farms, because the amount of waste and timber lands varies greatly from farm to farm.

Table 9. Differences Between Participants and Nonparticipants in Mean Changes of Two Indexes of Efficiency in Use of Capital With Probability Points of t's and Interpretations Thereof: 1955-1959.

Efficiency Indexes	*Mean* 1955	1959	*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[d]
Dollars invested per cow						
Participants	$1,157	$1,315	$158			
Nonparticipants	$1,225 (.30)[a]	$1,363	$138	$20	[b]	—
Nonparticipants (corrected for benchmark dif.)	$1,157	$1,321	$164	−$6	[c]	—
Years for receipts to equal capital investment						
Participants	2.4	2.1	−.3			
Nonparticipants	2.6 (.10)[a]	2.4	−.2	−.1	.35	NS
Nonparticipants (corrected for benchmark dif.)	2.4	2.3	−.1	−.2	[c]	—

[a] Probability level for test of difference of 1955 means of participants and nonparticipants.

[b] No test is made when the change is in favor of nonparticipants. Such a change is contrary to the hypothesis of the study that participants would as a result of the Program surpass the nonparticipants.

[c] Method of calculation does not permit testing of difference.

[d] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

doing better than the other on the basis of the difference in this particular index for efficient use of capital.

In general, the fewer years it takes receipts to replace capital the better. This cannot be made an absolute, because it is possible to be under-capitalized as well as over-capitalized. Because there is a minimum of buildings, machinery and equipment needed to operate any farm, small farms tend toward over-capitalization—relative under-utilization of resources—so that costs of production are high relative to receipts. Large and medium sized farms may be either under- or over-capitalized, but probably it is more common to be over-capitalized rather than under-capitalized.

In the benchmark year, the participants required fewer years for receipts to replace capital (Table 9). Between 1955 and 1959, there was a decrease in number of years for receipts to replace capital for both the participants and nonparticipants. The difference in decrease was in the direction of a greater decrease for participants. The probability point for the test of the difference in change was less than .35; hence, the difference was not considered significant. However, under the criteria for correcting for influence for benchmark difference, this variable qualifies for correction. The correction doubled the difference in change. Therefore, the corrected difference in change in years for receipts to replace capital would be likely to yield a fairly low probability point.

It appears, therefore, that on the number of years for receipts to replace capital, the participants had some advantage in change. It is difficult to see that either group had a much better improvement than the other for dollars invested per cow. Perhaps a slight claim for Program influence on efficient use of capital can be made.

Changes in Total Production

The total number of pounds of milk sold increased somewhat more for the participants (Table 10). The difference, although not at the .05 point level of significance, is at a relatively low point ($P < .15$). Since the benchmark difference in pounds of milk sold was nonsignificant with the test for the difference having a probability level of less than 1.0, there is no need to correct change for influence of benchmark difference. The differential change in milk production in favor of the participants may very well be attributed to Program influence, because the change is a result of a favorable, but not significant, difference in change in number of cows and production per cow which were factors emphasized by the Program (Table 11).

The total tons of hay equivalent increased somewhat more for the participants (Table 10). While the test of the difference between the two groups was not significant, the probability point was low (less than .20). Since the benchmark difference between the two groups was not significant—the test for the difference having a probability level of less than .90—, there is no need to correct for influence of benchmark difference. The differential change in total tons of hay equivalent in favor of participants is in part the result of a favorable as well as significant increase in their crop acres. Since both increase in home grown forage and increase in crop acres were emphasized in the Program, there can be no doubt about attributing them to its influence.

Table 10. Differences Between Participants and Nonparticipants in Mean Changes in Pounds of Milk Sold and Tons of Hay Equivalent Produced With Probability Points of t's for Differences and Interpretations Thereof: 1955-1959.

Kinds of Production	*Mean* 1955	1959	*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[b]
Pounds of milk sold						
Participants	271,379	335,575	64,196			
Nonparticipants	271,034 (1.0)[a]	322,184	51,150	13,046	.15	NS
Tons hay equivalent produced						
Participants	168	205	37			
Nonparticipants	167 (.90)[a]	193	26	11	.20	NS

[a] Probability level for test of difference of 1955 means of participants and nonparticipants.

[b] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

Changes in Rates of Production

The first three rates of production which are considered here relate a final product to the producing units. These rates are pounds of milk sold per cow, tons of hay produced per acre, and tons of corn silage produced per acre. The fourth rate, tons of hay equivalent produced per cow, relates an input product (tons of hay equivalent) to producers (cows) of a final product (pounds of milk).

Rate of producing milk—pounds of milk sold per cow—is by far the most important rate of production on dairy farms. The participants had a greater change in production of milk per cow. The difference between their change and that of the nonparticipants was at a fairly low probability point ($P < .20$) (Table 11). The benchmark difference was

highly nonsignificant, so that the difference in change favorable to the participants can probably be attributed to Program influence.

The tons of hay produced per acre increased more, but not significantly, ($P < .30$) for the participants (Table 11). The two groups were well matched ($P < .40$); hence, there was no need to make any correction for benchmark difference.

Under the criteria set up for deciding whether or not a variable should be corrected, benchmark difference for tons of corn silage produced per acre qualified for making such a correction. Before correction, there was no difference in mean change between the two groups (Table 11). After correction, the slight difference favored the nonparticipants. Since only 56 pairs of participants and nonparticipants had corn silage, no particular importance can be attached to the statistics for this variable.

Table 11. Differences Between Participants and Nonparticipants in Mean Changes in Rates of Milk and Rates of Forage Production With Probability Points of t's and Interpretations Thereof: 1955-1959.

Rates of Production	*Mean* 1955	1959	*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[f]
Pounds milk sold per cow						
Participants	8500	9266	766			
Nonparticipants	8393	8932	539	227	.20	NS
	(.70)[c]					
Tons hay per acre[a]						
Participants	2 1	2 4	.3			
Nonparticipants	2.2	2 4	.2	.1	.30	NS
	(.40)[c]					
Tons corn silage per acre[b]						
Participants	10	11	1			
Nonparticipants	11	12	1	0	.40	NS
	(.20)[c]					
Nonparticipants (corrected for benchmark dif.)	10	12	2	−1	[e]	—
Tons hay equivalent produced per cow[d]						
Participants	5 4	5 9	.5			
Nonparticipants	5.2	5 4	.2	.3	.20	NS
	(.50)[c]					

[a] N=85 pairs.

[b] N=56 pairs.

[c] Probability level for test of difference of 1955 means of participants and nonparticipants.

[d] N=86 pairs.

[e] Method of calculation does not permit testing of difference.

[f] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

While the differences between participants and nonparticipants on the above two rates of production, for which the data were adequate, were not considered significant, for the most important rate, i.e., pounds of milk sold per cow, the test of the difference in change had a relatively low probability point, and for tons of hay produced per acre the absolute difference was favorable to the participants. It appears, therefore, that the data point toward a difference in change which is favorable to the participants and attributable to Program influence.

The tons of hay equivalent produced per cow increased more for participants (Table 11). The test of the difference in change between the two groups had a low probability point ($P < .20$), but was not considered significant. This variable did not qualify under the criteria for making a correction for the influence of benchmark difference. The benchmark difference between the two groups was relatively small; hence, the difference in change in favor of the participants with its low probability point for the test of difference can very well be attributed to Program influence. The favorable, but not significant, difference in milk production per cow of the participants probably results at least in part from their better production of hay equivalent.

Changes in Cost Control Factors

Purchased feed expense as per cent of milk receipts. Both participants and nonparticipants declined in their purchased feed expense as a per cent of milk receipts, although the latter had a slightly larger decline (Table 12). Since the difference in the decreases was favorable to the nonparticipants, contrary to the Program hypothesis, no test of significance was made. However, under the criteria set up for the purpose of deciding whether or not a correction should be made, this variable qualified for correction for influence of benchmark difference. After correction the two groups had no difference in their decreases.

Purchased feed expense per cow. Purchased feed expense per cow increased for both groups with the change for the nonparticipants being larger, but not significantly so (Table 12). In fact, the probability point for the test of difference is fairly high, less than .45, and would make unreliable any interpretation of difference.

Crop expense per cow. This cost control factor qualified for correction for influence of benchmark difference under the criteria set up for making this determination. The participants increased their crop expense per cow more than the nonparticipants, both before and after correcting for benchmark difference (Table 12). Before correction for the influence of the benchmark difference, the nonparticipants made no change in this cost; but after corrected, they showed a slight decline. No test of the difference in change on this cost variable before correction was made, since the change was favorable to the nonparticipants—or contrary to hypothesis—and, of course, the same would apply to the corrected difference if it were possible to make a test. The participants' greater increase in crop expenses per cow undoubtedly results in part from the greater increase in their crop acres. It is a fairly safe assumption that their increase in crop acres had some influence on the increase which occurred in their total crop expense.[76] Both participants and nonparticipants increased their cows by about the same number from almost equal benchmark numbers to equal in 1959. Since the participants and nonparticipants had about equal numbers of cows in the benchmark year and equal numbers in 1959, the larger increase in total crop expense of the participants would result in a larger increase in crop expense per cow.

[76] The total crop expense of the participants increased by $269 and that of the nonparticipants by $129. The probability level for the test of the difference between these two figures was less than .10.

Table 12. Differences Between Participants and Nonparticipants in Mean Changes for Six Cost Control Factors With Probability Points of t's and Interpretations Thereof: 1955-1959.

Cost Control Factors	*Mean* 1955	1959	*Mean Change*[b]	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[e]
Purchased feed expense as per cent of milk receipts						
Participants	26	24	-2			
Nonparticipants	29	26	-3	1	[c]	—
	(.10)[a]					
Nonparticipants (corrected for benchmark dif.)	26	24	-2	0	[d]	—
Purchased feed expense per cow						
Participants	$91	$100	$ 9			
Nonparticipants	$95	$106	$ 11	-$ 2	.45	NS
	(.60)[a]					
Crop expense per cow						
Participants	$31	$35	$ 4			
Nonparticipants	$28	$28	$ 0	$ 4	[c]	—
	(.30)[a]					
Nonparticipants (corrected for (benchmark dif.)	$31	$29	-$2	$ 6	[d]	—
Machine expense per cow						
Participants	$102	$111	$ 9			
Nonparticipants	$97	$114	$ 17	-$ 8	.10	NS
	(.30)[a]					
Nonparticipants (corrected for benchmark dif.)	$102	$116	$ 14	-$ 5	[d]	—
Machine expense per man						
Participants	$1,833	$2,065	$232			
Nonparticipants	$1,747	$2,142	$395	-$163	.15	NS
	(.30)[a]					
Nonparticipants (corrected for benchmark dif.)	$1,833	$2,179	$346	-$114	[d]	—
Machine expense per crop acre						
Participants	$36	$39	$ 3			
Nonparticipants	$36	$45	$ 9	-$ 6	.025	S
	(.90)[a]					

[a] Probability level for test of difference of 1955 means of participants and nonparticipants.

[b] The smaller increase or larger decrease is considered the desirable one.

[c] No test is made when the change is in favor of nonparticipants. This is contrary to the hypothesis of the study that participants as a result of the Program would surpass the nonparticipants.

[d] Method of calculation does not permit testing of difference.

[e] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

While it was hypothesized that the participants should have had a greater decline in crop expense per cow, the indication is that the average participant may have been moving in the right direction by increasing his crop expense per cow. This increase in crop expense undoubtedly helped to produce the almost significant favorable change which the average participant made in production of hay equivalent per cow, which in turn may have resulted in his favorable change in production of milk per cow.

Machine expense per cow. This cost control factor increased less for the participants than for the nonparticipants (Table 12). While the difference in change was not significant, the test of the difference was at a relatively low probability point ($P < .10$). This cost control factor qualified for correction for benchmark difference. When the correction was made, the difference in change was decreased from −$8 to −$5. Since the participants and nonparticipants had almost equal numbers of cows in the benchmark year and equal numbers in the terminal year, the effect of the difference between the two groups in numbers of cows on per cow machine expense may be considered relatively unimportant. With this relative equality in numbers of cows noted, it should next be observed that, since the participants' crop acres increased considerably more than did those of the nonparticipants, their machine expense per cow would have been expected to increase more than that of the nonparticipants. However, the actual per cow expense of the participants increased less. When this relationship of per cow machine expense to increase in crop acres is considered, the favorable change in per cow machine expense of the participants has added importance. Hence, it can be claimed that the Program influenced the participants in controlling machine expense as measured by the rate per cow.

Machine expense per man. This cost control factor increased more for nonparticipants (Table 12). While the difference in change between the two groups was not significant, the probability point for the test of the difference was relatively low ($P < .15$). This cost control factor qualified for correction for benchmark difference. When the correction was made, the larger change of the nonparticipants was reduced a little. Program influence on the participants, which led them to hold down machine expense per man, is indicated, but very weakly.

Machine expense per crop acre. This cost control factor increased much more for nonparticipants (Table 12). The difference in change was considered significant ($P < .025$). Under the criteria set up to determine whether or not to correct for influence of benchmark difference, this variable did not qualify for correction.

Since the machine expense of the participants was spread over a somewhat greater number of crop acres in 1959, their lower machine expense per crop acre is to be expected.[77] Therefore, the greater increase in crop acres by the participants provides in part the base for their more efficient cost control on machine expenses. The significantly smaller increase in machine expense per crop acre for more crop acres on the part of participants was accompanied by a nearly significant increase in tons of hay equivalent per cow which was favorable to the participants.

[77] The difference between the participants and nonparticipants in total machine expense in both 1955 and 1959 was relatively small.

Table 13. Differences Between Participants and Nonparticipants in Mean Changes of Three Labor Efficiency Indexes With Probability Points of t's and Interpretations Thereof: 1955-1959.

Labor Efficiency Indexes	*Mean* 1955	1959	*Mean Change*	*Difference Between Mean Changes*	*Probability Point of t*	*Interpretation of Probability Point*[b]
Pounds of milk sold per man						
Participants	152.816	178,920	26,104			
Nonparticipants	153,333	169,230	15,897	10,207	.10	NS
	(1.0)[a]					
Cows per man						
Participants	18	19	1			
Nonparticipants	18	19	1	0[c]	.20	NS
	(1.0)[a]					
Work units per man						
Participants	309	334	25			
Nonparticipants	318	316	−2	27	.025	S
	(.40)[a]					

[a] Probability level for test of difference of 1955 means of participants and nonparticipants.

[b] $P \leqq .05$ considered significant (S), $P > .05$ nonsignificant (NS).

[c] A one-tail test was made for this difference in change, because the actual sum of the variances showed an increase in favor of the participants.

Changes in Labor Efficiency

Pounds of milk sold per man. Since the two groups were very well matched in 1955 on number of pounds of milk sold per man, there was no reason to correct for influence of benchmark difference (Table 13). The number of pounds of milk sold per man increased more for the participants. Although the difference in change was not significant, the probability point for the test of the difference was relatively low ($P < .10$). This came about because participants increased pounds of milk sold more than did the nonparticipants without increasing their labor force as much.

Cows per man. The two groups were well matched on cows per man in 1955 (Table 13). Consequently, there was no need for correcting for influence of benchmark difference. This labor efficiency measure increased an equal amount for both groups. There was enough variance in change between pairs, however, to result in a low probability point (less than .20) for the test of the difference in change, even though the mean difference was zero.[78]

Work units per man. The two groups were fairly well matched ($P < .40$) on work units per man in 1955; accordingly, there was no need for correcting for influence of benchmark difference (Table 13). The number of work units per man increased much more for participants, and the test of difference was significant. The favorable difference for participants in change in work units per man was the net result of their larger increase in crop acres and cows, and lower increase in labor force.

[78] Averages for 1955 and 1959 in all tables were calculated by averaging all figures for each of the years. Mean changes given in the tables are the differences between these averages. On the other hand, the t test was made on the mean difference in change which was calculated by averaging the differences between each participant and nonparticipant matched pair. The mean difference in change is often slightly different when calculated by the latter rather than the former method. This to a small degree also explains why the probability point may indicate more difference than would be indicated by the difference in mean changes shown in the tables.

APPENDIX A—FORMULAS

1. Formula used for testing differences in benchmark matching and in change.

$$t = \frac{M_d}{\sqrt{\frac{\Sigma x_d^2}{N(N-1)}}}$$

(t for difference between correlated pairs of means)

where

M_d = mean of the N differences of paired observations
x_d = deviation of a difference from the mean of the differences.
For ease of calculation Σx_d^2 may be obtained by

$$\text{corrected } \Sigma x^2 = \Sigma x^2 - \frac{(\Sigma x)^2}{N}$$

where x = difference of paired observations.[1]

2. Formulas used in testing representativeness of the 87 matched participants.

After the 87 participants and 87 nonparticipants were accepted as matched for use in analyzing change, the 87 participants were tested to ascertain whether or not they represented the original modified sample of 250 participants. The hypothesis for this testing was: The 87 matched participants and the remaining 163 participants of the original sample of 250 participants were drawn from the same hypothetical universe. To test this hypothesis a t test was used.

The t test which was used required a test which utilizes N's of different sizes. Furthermore, because the amount of variance is crucial to whether or not the t test indicates a difference which is significant, one formula was used if the variances were almost identical and a different one was used if they were significantly different. Therefore, the variances were first tested by the Bartlett test for homogeneity of variances.[2] If the variances were enough alike to permit the acceptance of the hypothesis that $\sigma_1^2 = \sigma_2^2$, a common variance was estimated by:[3]

$$s^2 = \frac{(N_1-1)\ s_1^2 + (N_2-1)\ s_2^2}{N_1 + N_2 - 2}$$

[1] J. P. Guilford, *Fundamental Statistics in Psychology and Education* (3rd ed.; New York: McGraw-Hill, 1956), formula 10.6, p. 220.

[2] Explanation of this test and its calculation routine is given by Helen M. Walker and J. Lev, in *Statistical Inference* (New York: Holt, Rinehart and Winston, 1953), pp. 193-195.

[3] *Ibid.*, Formula 7.21, p. 156.

This common variance was then used in the following formula[4] for the t test:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{s^2 \frac{N_1 + N_2}{N_1 \quad N_2}}}$$

with $N_1 + N_2 - 2$ degrees of freedom.

If the variances were different enough to permit the rejection of the hypothesis that $\sigma_1^2 = \sigma_2^2$, the 2 variances were utilized in the following formula[5]:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

with n degrees of freedom[6] where

$$n = \frac{\left(\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}\right)^2}{\left(\frac{s_1^2}{N_1}\right)^2 \frac{1}{N_1 + 1} + \left(\frac{s_2^2}{N_2}\right)^2 \frac{1}{N_2 + 1}} - 2$$

[4] *Ibid.*, Formula 7.23, p. 156.

[5] *Ibid.*, adaption of Formula 7.25, p. 157. Since the hypothesis being tested by the t test in this case was that $\mu_1 = \mu_2$ it was dropped from the formula.

[6] For an equivalent formula and a discussion which is more applicable to the present use made of the t test see W. J. Dixon and F. J. Massey, *Introduction to Statistical Analysis* (1st ed.; New York: McGraw-Hill, 1951).

APPENDIX B

SCORES FOR FIVE KNOWLEDGE AND PRACTICES TESTS INCLUDED IN THE OPERATOR'S QUESTIONNAIRE USED IN INITIAL AND TERMINAL SURVEYS

A. Items Constituting Farm Management Knowledge and Practices Score of Operator

Farm Management Knowledge

	Score Points
1. Operator's evaluation of size of operation (based on mean number of cows)	8
2. Operator's evaluation of production per cow	6
3. Operator's evaluation of production per acre	4
4. Operator's evaluation of efficient use of machinery	4
5. Operator's evaluation of efficient use of labor	6
6. Operator's evaluation of efficient use of capital	3
7. Operator's evaluation of efficient use of feed	4
8. Least important farm record	6
9. Goal for purchased dairy feed (as per cent of milk receipts)	15
10. Three-year goal on number of cows per man in relation to labor efficiency	15
11. Three-year goal on number of pounds of milk sold per man in relation to labor efficiency	15
12. Use of increase in inventory in figuring labor income	10
13. Proportion of total current market value of business represented by real estate	10
14. Proportion of all farm cash income represented by sales of milk	15
15. Comparison of labor income of farmer with wage of factory worker and with wage of hired man on farm	5
16. Problem to solve on farm business situation: what is most serious weakness	10

Farm Management Practices

1. Actual size of operation (based on mean number of cows)	8
2. Actual production per cow	6
3. Actual production per acre	4
4. Actual efficient use of machinery	4
5. Actual efficient use of labor	6
6. Actual efficient use of capital	3
7. Actual efficient use of feed	4
8. Farm records used in farm business	30
9. Most important use of records kept	10
Total score	211

B. Items Constituting Dairy Feeding Practices Score

	Score Points
1. Forage harvesting practices relating to quality of forage ...	36
a. Normal date of harvesting first cutting of hay	
b. Maturity of hay at time of cutting	
c. Kind of hay	
d. Date of harvesting hay silage	
e. Maturity at time of cutting hay silage	
f. Corn silage stage of maturity at time of cutting	
2. Hay equivalent fed	8
3. Pasture management	2
4. Clipping of pastures	3
5. Supplemental roughage feeding of cows on pasture	2
6. Supplemental pasture for cows when other pastures are short	2
7. Minerals cows receive in addition to those in grain mixture	2
8. Grain feeding for milking cows	2
9. Feeding calves	2
10. Grain feeding of heifers:	
a. Less than one year of age when not on pasture	4
b. Less than one year of age when on pasture	4
c. Over one year of age when not on pasture	3
d. Over one year of age when on pasture	3
11. Supplemental roughage for heifers:	
a. Less than one year of age when not on pasture	3
b. Less than one year of age when on pasture	4
c. Over one year of age when not on pasture	2
d. Over one year of age when on pasture	2
12. Age when fall heifers are allowed to go on pasture completely	2
13. Age when spring heifers are allowed to go on pasture completely	2
14. Average tape weight of heifers at breeding	4
15. Average tape weight of heifers at first freshening	4
16. Average age of heifers at breeding	3
17. Average age of heifers at first freshening	4
Total score	103

C. Items Constituting Agronomy Practices for Hay and Pasture Score of Operators

	Score Points
1. Proportion of acres seeded with a recommended variety of legumes (alfalfa, birdsfoot trefoil, red clover)	26
2. New seedings	6
3. Average loads of manure per acre	26[7]
4. Average tons of lime per acre	
5. Average pounds of nutrient per acre:	
a. Nitrogen	
b. Phosphorus	
c. Potash	

[7] While items 3, 4, and 5 are listed as separate items, the system for scoring them involved a combination score.

	Score Points
6. Average number of years a particular mixture of legumes is left down (alfalfa alone, alfalfa and birdsfoot trefoil, red clover or other legumes, birdsfoot alone)	16
7. Percentage of acres of seeding as recommended for type of soil drainage	26
Total score	100

D. Items Constituting Dairy Breeding Practices Score of Operators

	Score Points
1. Proportion of cows bred artificially, to pedigree sires, and to registered sires	48
2. Percentage of cows bred last year which required only one service	8
3. Breeding and treatment records kept	12
4. Average calving interval	10
5. Cows turned out daily during winter for exercise	3
6. Cows turned out daily during winter to check for heat	5
7. Length of time cows usually remain dry	8
8. Length of time allowed between calving and first service following calving	6
Total	100

E. Items Constituting Dairy Disease Control Practices Score of Operators

	Score Points
1. Proportion of the herd treated during the year for mastitis	8
2. Size of stalls adequate for prevention of mastitis	3
3. Ample bedding used for prevention of mastitis	2
4. Strip cup used daily	2
5. Teat ends dipped in disinfectant after milking	2
6. Length of time milking machine is on most cows	4
Total score	21

APPENDIX C

DEFINITION OF TERMS

Total expenses include all cash expenses, a charge for unpaid family labor, and any decrease in inventory for the year. The total cost of any purchase in the year for which the business data were obtained is charged to cash expenses for that year irrespective of whether or not all or part of the cost is paid in that year. No interest nor payments on debts are included in total expenses as used in this study.

Total receipts include all cash receipts from crop, livestock, livestock products, and certain miscellaneous items, among which are off-farm work by operator (or operators), machine hire, etc., and any increase in inventory for the year.

Labor income is the difference obtained by subtracting total expenses plus interest on capital (average of beginning and end of year inventories) from total receipts.

Labor income per operator is labor income divided by number of operators of the farm firm.

Net farm income is the difference between total receipts and total expenses.

Average inventory (total capital) includes all investments in the farm business among which are the values of land and buildings (including dwelling), livestock, farm machinery, farm share of automobile, feed, and supplies. It is obtained by dividing the inventory at the beginning of the year plus that at the year's end by two.

Man equivalent is generally the sum of the months of labor devoted to the farm business by the operator (or operators), by hired persons, and by unpaid family labor divided by 12. In those instances where the operator (or operators) devotes part-time to nonfarm work a full 12 months of labor is assigned to labor devoted to the farm business (see definitions of labor income and work units).

Work units are the average number of 10-hour days it requires to do the directly productive work connected with the livestock kept and acreage of crops grown on the farm (off-farm work by the operator or operators is also included). For example, average units required to care for one dairy cow for a year is 12 (12 days of 10-hours each).

Purchased feed expense includes the cost of all feed for livestock, salt, minerals, hay, silage, grinding and mixing of feed, and stock pasturage.

Machine expense includes the following: machine repairs, gas and oil, auto expense (farm share), milk hauling, machinery hired, interest on average machine inventory, and depreciation.

Crop expense includes the following: machinery hired (connected with crop culture or harvest), seed and fertilizer costs, insect and weed control costs, and miscellaneous cost connected with crop production.

Per man factors are calculated by dividing the quantity of income, expense, or production by man equivalent.

Tons of hay equivalent is obtained by adding the tons of hay produced to one-third of the tons of corn and grass silage produced.

APPENDIX D

LIST OF MIMEOGRAPHED REPORTS IN EVALUATION SERIES[8]

James W. Longest and Frank D. Alexander, *Evaluation Study of the Farm and Home Management Program in New York State—Adequacy of Sample and Control Group,* Report No. 1, May 15, 1958, pp. 67.

Frank D. Alexander and James W. Longest, *Evaluation Study of Farm and Home Management Program in New York State—Study of the Operations of the Farm and Home Management Program in New York State,* Report No. 2, January 15, 1959, pp. 102.

Frank D. Alexander, *Evaluation Study of Farm and Home Management Program in New York State--The Farm and Home Management Program in New York State as Known and Viewed by Extension Administrators, Supervisors, and Specialists,* Report No. 3, June 15, 1960, pp. 48.

Frank D. Alexander, *Evaluation Study of Farm and Home Management Program in New York State--A Case Study of the Educational Exposure of a Sample of 25 Families Participating in the Farm and Home Management Program in a County in New York State,* Report No. 4, June 15, 1960, pp. 27.

James W. Longest, Frank D. Alexander, and Jean Harshaw, *Evaluation Study of Farm and Home Management Program in New York State —A Case Study of the Function of the Neighborhood in the Farm and Home Management Program,* Report No. 5, June 15, 1960, pp. 16.

Frank D. Alexander and James W. Longest, *Evaluation Study of Farm and Home Management Program in New York State—Time and Cost In-put and Cost-benefit Relationship for the Farm and Home Management Program in the 10 Study Counties of New York State,* Report No. 6, May 31, 1961, pp. 27.

Frank D. Alexander and James W. Longest, *Evaluation Study of Farm and Home Management Program in New York State--Evaluation of the Farm and Home Management Program by Participants and by Agents in the 10 Study Counties of New York State,* Report No. 7, June 30, 1961, pp. 46.

[8] These reports are available at the Office of Extension Studies, Roberts Hall, Cornell University, Ithaca, New York.

Frank D. Alexander and James W. Longest, *Evaluation Study of Farm and Home Management Program in New York State Changes in Farm Practices and Related Knowledge of Participants in the Farm Management Phase of the Farm and Home Management Program in the 10 Study Counties of New York State,* Report No. 8, July 15, 1961, pp. 98.

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