Planning Your Michigan Farm
Michigan State University Extension Service
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Issued November 1963
136 pages

EXTENSION BULLETIN 379 FARM SCIENCE SERIES NOVEMBER, 1963

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DEPARTMENT OF AGRICULTURAL ECONOMICS

Cooperative Extension Service Michigan State University

Cooperative extension work in agriculture and home economics. Michigan State University and the U. S. Department of Agriculture cooperating. N. P. Ralston, Director, Cooperative Extension Service, Michigan State University, East Lansing, Printed and distributed under Acts of Congress, May 8 and June 30, 1914.

1P–11:63–5M–MO

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FOREWORD

The prime job of a farm operator is to make decisions about using the resources at his command. Principles, facts, imagination, and effort are needed for making effective decisions. The management process provides a systematic way of using these ingredients in making wise decisions.

If you are a farm operator, or for other reasons are interested in the long-range planning of Michigan farm businesses, you will find in this bulletin

(a) an explanation of the job and process of management,
(b) some suggestions on procedures for farm planning,
(c) data for use in planning, and
(d) analyses of various current problems involving management alternatives for Michigan farms.

The long-range outlook is for a continuation of very modest returns to farm operators, resulting in part from the price-depressing effects of abundant production, and in part from the ample supply of individuals who would like to enter or remain in agriculture. The large amount of capital needed for farming, however, will present a serious obstacle to many who would like to farm, and the prospective level of returns will also exert downward pressure on the number of operators who continue in farming.

Under these conditions, two important trends can be expected to continue on Michigan farms over the next decade or more. First, the total count of commercial farms will probably continue to decline slowly, with the average size of business increasing at about the same rate as the capabilities of the typical farm family, operating in an environment of constantly developing technology. Second, Michigan farms will continue to become more specialized, with the limitation that feed crop production will still be closely associated with livestock production. Developing successful, new, specialized units will commonly involve investments in the $50,000 to $100,000 range for dairy, poultry, and swine farms, and above $100,000 for beef-feeding units.

The operators of existing farm units have important opportunities for adjustments to make their businesses more successful. In many cases, greater success can be achieved with modest additional investments, or perhaps with no additional investments. The general outlook suggests that great caution must be exercised if sizable new investments are to be made and recovered from earnings within a reasonable period of time.

CONTENTS

INTRODUCTION

THIS BULLETIN has been written especially for Michigan farm operators who are trying to make their businesses more successful. It is also intended for individuals who are thinking about becoming farm operators, for those who finance Michigan farming, and for those who have a more general interest in the success of the State's agriculture. Thus, it was written for YOU if you can answer "Yes" to any of the following questions:

	Yes	No
(a) Do you own a Michigan farm?	☐	☐
(b) Would you like to farm in Michigan?	☐	☐
(c) Are you about to choose a vocation?	☐	☐
(d) Are you concerned about income prospects in Michigan Agriculture?	☐	☐
(e) Are you concerned with the wise use of farm credit?	☐	☐
(f) Do you have a specific problem in making a Michigan farm more profitable?	☐	☐

The first seven chapters will examine some of the major problems that face Michigan farm operators. The survey of these problems will point out some general directions for future farming adjustments, based on facts and analyses provided by research studies of Michigan farms and farming. The detailed analyses of specific problems will also illustrate procedures for using available facts and techniques in reaching wise decisions. Thus, these chapters will provide much of the background you will need for developing your own individual farm plans.

The last three chapters, comprising PART II of this bulletin, will provide additional guidance when you are ready to develop specific plans for YOUR farm. They are intended primarily as a reference section, with planning forms, data, and guidelines to supplement the illustrative material included in Part I. The last chapter discusses farm records and their contribution to planning.

Do not expect any of the chapters in this bulletin to tell you (a) what to do on your farm, or (b) how to solve the total farm income problem. Making the final decisions for your farm is your prime job as a manager—a point that will be discussed more fully in Chapter I. Wise planning will help you to make your farm more profitable and successful, moreover

but even the wisest planning of individual farms can be expected to provide only part of the solution to the total farm income problem.

The four main purposes of this bulletin, then, can be listed as follows:

1. To show how to use the best available facts and techniques in making decisions,

2. To provide a single source for much of the basic data needed in planning Michigan farms,

3. To analyze some major problems that face many individual farmers, and thus

4. To contribute to more successful farming in Michigan in the 1960's.

ACKNOWLEDGMENTS

Gathering the information and making the analyses needed to accomplish the above objectives would obviously be a difficult task for any one person. The final product reflects the generous assistance of many colleagues at Michigan State University and elsewhere. Specific contributions in the form of facts and analyses are suggested by the footnote references, but other kinds of assistance should also receive mention.

In particular, this study would have been impossible without the cooperation of farmers participating in the Michigan Successful Farms Project, the Michigan Test-Demonstration Project, and the Michigan Farm Account Project. Their willingness to supply detailed information about their farm business activities has provided an indispensable background for the analysis of problems.

The manuscript for this bulletin has also benefitted from careful review and helpful, specific suggestions by J. R. Brake, J. C. Doneth, and C. R. Hoglund of the Agricultural Economics Department; R. M. Clark of the College of Education; and R. W. Bell of the Cooperative Extension Service. Many other individuals have reviewed certain parts of the bulletin, or have contributed in other ways that are deeply appreciated.

CHAPTER 1.

MAKING IMPORTANT DECISIONS

If you are already farming, you may be facing such questions as the following:

Shall I build a silo?
If so, what kind shall it be, and how big?
Can I afford a new milking parlor?
Will it pay to expand?
Shall I specialize in cash crops?
How much fertilizer shall I use?
Is there a place for hogs on my farm?
How can I plan a pullet replacement program to fit seasonal variations in egg prices?
Does it pay to pack and grade fruit on the farm?
Shall I combine an off-farm job with farming?
Can I find an extra source of income?

Questions like these face every farmer who is trying to make his business more successful. Likewise, bankers and lenders need to think about how their borrowers can find sound answers to such questions.

Prospective farmers face an even wider range of questions, including the following:

Can I look forward to financial success in farming?
Where shall I farm?
Shall I buy or rent?
How much capital will I need?

The Management Job

As you seek answers to questions like those above, and as you choose among alternative lines of action, you are engaged in **planning,** or **decision-making.** To plan is to select future acts that seem likely to cause desired results. Planning and decision-making represent the central part of the job of **management.** The process of management is much the same for a farm as for a factory, a home, or even the personal affairs of a student. **In each case, information and judgment are used to provide a basis for action.**

The job of managing is a top priority one. In the heat of a busy day, the operator of a one-man Michigan farm may feel that he is mainly a laborer with a silo to fill, machinery to repair, or cows to milk. On larger

farms, the operator may become occupied with supervising hired labor, with salesmanship, or with buying supplies advantageously. Each of these jobs is important, and some decision-making or management is involved in the successful performance of any one of them. But neither a good job of milking nor a full silo will insure a successful dairy business, and salesmanship alone is insufficient to make a fruit farm profitable. Wise decisions are needed on dozens of detailed matters in the operation of any farm business, but especially on the general organization of the business as a whole.

The successful farmer of tomorrow will be much more a manager, and much less a laborer, than the farmer of yesterday. Machinery has replaced large amounts of manual labor, while decisions have multiplied in number and importance. These changes are rapidly leading Michigan farmers to accept new roles, which involve more emphasis on gathering information, sifting it, and using it in making deliberate choices for the future. As a further result, both present and prospective farm operators are sensing a need for more formal and informal training in the processes of management and decision-making.

Operating any sort of business involves making decisions and bearing the consequences, whether favorable or unfavorable. The businessman cannot really evade responsibility for the decisions he makes directly, or even for the decisions he delegates to others; hence he cannot afford to let anyone else make the major decisions for him. The probability that decisions need the careful, personal attention of the operator himself increases with the seriousness of the consequences for the success of the business as a whole.

The order of cultivating rows in a field of corn, for example, can probably be left to the judgment of the hired tractor operator without disastrous results, and a capable herdsman is often entrusted with most decisions affecting the care of the dairy herd. If the herdsman makes unwise decisions, he may suffer by losing his job, but the farm operator is also likely to suffer from **his** decision about what could safely be delegated to the herdsman.

The fact that the farm operator or manager must accept final responsibility for his decisions does not mean, of course, that he must make them in isolation. Often, he will want to seek information and counsel from qualified advisers. The adviser, however, cannot bear the full consequences of the decision unless he takes over the role of the businessman. Thus the adviser, whether he be an extension agent, a classroom

teacher, or other counselor, needs to recognize that the final decision is for the operator to make.

This is especially true in farming, where the business premises are usually the site for family living, where there is no timeclock to separate business activity from family affairs, and where both are financed from the same bank account. Under these circumstances, the criteria for choosing appropriate actions depend very greatly upon the personal attitudes, goals, and values of the farm operator and his family. If YOU are a farm operator, YOU alone are in the best possible position to make a final choice of actions that will contribute the most to attaining your particular combination of personal objectives.

Deciding vs. acting

The management process includes the steps involved in reaching decisions, plus the executive action to implement the decisions. When a farmer signs an order for a new tractor or an agreement to purchase a farm, he is acting upon the basis of a decision that may have been reached after long and careful study. In such cases, the action phase of management may seem almost too trivial for mention.

A decision not followed by immediate action, however, is ordinarily subject to reversal—thus, it must be regarded at most as a tentative decision, or perhaps not really a decision at all. The language of management is not very satisfactory in this respect, but perhaps the word "decision" is best reserved for a very specific choice made immediately in advance of the implementing action.

Plans, programs, and policies

The words "plans", "programs", and "policies" relate to earlier stages in the decision-making process, when more generalized choices on broad matters are being determined in a somewhat tentative way. They are sometimes used interchangeably, but they do have different shades of meaning.

A "plan" commonly describes a fairly comprehensive scheme of action, with emphasis on the relation of the detailed elements to the total result. A house plan, for example, can be reduced to drawings that show the relationship of the various rooms, doors, windows, and other structural features to the building as a whole. A farm plan would list crops to be grown, livestock to be kept, the use of feed crops for livestock, and various other data reflecting the use of resources in the business as a whole.

The word "program" often implies a sequence of events, such as the steps in giving full effect to a plan. A home builder, for example, would

have a program for constructing a house according to plan, and a farmer might outline a program for adopting a new operating plan for his farm business.

Many individual decisions and actions would be involved, of course, in following any program designed to give effect to a plan. In the process, the program or plan might require some modification. If the home builder could not obtain bricks of a specified color at an appropriate time, for example, he might modify the program by delaying work on the chimney, or he might modify the plan by substituting bricks of a different color, or by eliminating the use of brick entirely. Similarly, a change in price relationships might cause a farmer to postpone or modify proposed changes in his cropping plan.

A "policy" is best described as a long-standing restriction on the range of choices to be considered in making a decision, developing a plan, or scheduling a program. Policies, of course, like decisions, plans, and programs, are subject to change, but the admissibility of certain possible actions is pre-determined for the lifetime of the policy. If a farmer has a firm policy of buying only for cash, for example, he automatically eliminates consideration of any action that would require the use of credit. Once a farmer has determined that it will be his policy to specialize in dairy production, he narrows his concern to choices affecting the dairy enterprise. The builder automatically schedules excavation of the basement before construction of the floor as a matter of policy. Honesty continues to be accepted by many as the best policy in their relations with other individuals. Without an accumulation of established policies for guidance, most of us would find ourselves lost in a continual turmoil of trying to choose among countless, changing alternatives involving every aspect of our daily living.

The Elements of Management

Plans, programs, policies, decisions, and actions are all closely related products of the management process. Several elements or stages in this process can be clearly identified. Up to the point where action takes place, the process and its elements may equally well be described as planning or decision-making.

Recognizing problems

Recognition of a problem is commonly regarded as the first stage in the management process. A "problem" arises for a manager when he suspects that the existing situation is not the best possible compromise between **what could be** and **what ought to be.** This may lead him imme-

diately to establish a "goal" or "objective" representing what he conceives to be a more satisfactory compromise. In many cases, however, goals cannot be chosen rationally until a much later stage in the management process.

Observing

Before proceeding further, the manager will probably need to begin making new observations and gathering more facts. Fact gathering, of course, may have led him to detect the problem in the first place, but now his fact-gathering can be more selective and pointed. A farmer who faces the problem of too low an income will examine the resources at his command, the various technical possibilities for using them, the market situation, and the behavior of his neighbors who seem to have found a more satisfactory pattern of resource use.

Identifying alternatives

Facts, imagination, and judgment must next lead the manager to identify promising alternative patterns of action for the future. Studying farm account data for successful businesses with similar resources can be an important source of useful ideas.

One alternative usually available is to continue the action pattern of the past without change. This plan may often be taken as the benchmark against which other plans are to be compared. Other alternatives will ordinarily involve some balanced combination of several inter-related changes. A Michigan dairyman, for example, might consider the alternative of buying more land, erecting new dairy buildings, employing a full-time hired man, and increasing the size of the milking herd.

The above alternative is only vaguely and incompletely stated. A more complete statement would include a description of changes in machinery as well as in land and buildings; the specified changes might logically be accompanied by a change from two-row to four-row corn equipment, for example, and changes in harvesting equipment might also be appropriate. A completely stated alternative would specify an entire combination of inter-related changes. The alternative would be more specifically stated if numerical changes in acres, cow numbers, and other items were noted. Any precise evaluation of alternatives requires that they be identified both completely and quantitatively.

Scientists often conduct their work by developing hypotheses to be tested and ultimately accepted or rejected. The identification of alternatives in the management process may be compared to the development of hypotheses in the application of scientific method.

Evaluating alternatives

When two or more promising alternatives have been identified more or less completely and quantitatively, the next step is to evaluate them by estimating their probable effectiveness in producing desired results. The scientist would often be able to make laboratory tests to verify or disprove his hypothesis, but such tests are seldom possible for management alternatives. This is especially true because we desire to compare the effectiveness of the specified alternatives under conditions of the future instead of under conditions of the present or past. Logic and forward-looking calculations, reinforced by knowledge of past experience, are the common tools for use in evaluating management alternatives. More specifically, comparative budgeting provides a basis for estimating the income possibilities in alternatives for managing the farm business. Additional fact-gathering may be needed at this stage. Considerations such as risks, appeal to personal preferences, and strategies for dealing with other individuals are usually handled by less formal and more subjective methods.

Making a choice

The final choice among alternatives is made by reference to the values which the manager believes important. Up to this point, an outside adviser could help in identifying and evaluating alternatives. In making the final choice, however, few outsiders could expect to weight alternatives as accurately as the manager, in reference to his personal scheme of values. A hired manager, to be sure, often assumes such responsibilities for the business proprietors whom he represents, but he is then more than an outside adviser, and he assumes primary responsibility for the results of the choice.

Acting upon the choice

If the choice that has been made is of a general plan, program, or policy, the manager will probably go through the analytical phases of the management process many more times in reaching the detailed decisions involved in a course of action. If a narrow and specific choice has been made, the next step is the executive action involved in implementing the decision. For a farm operator, this executive action may consist only of instructing himself to go to the barn and milk the cows. In a large corporation, analytical, executive, and laboring functions may be assigned to different individuals, so that a need for written communication of plans and orders exists; the elements of the management process, however, are the same for both farm and factory.

Evaluating results

Evaluating results may be considered as a final stage or element in the management process after action has taken place. If the process has functioned perfectly, there will no longer be a problem; if a problem is still recognized, the manager is back to the first stage of the management process.

The Process of Change

Management might even be called the science of change. Without change in the world about us and in ourselves, there would be no need for management or decision-making. Change creates a need for management, and management provides an orderly and rational basis for selecting actions appropriate to new situations. In reacting to change by making plans or decisions, however, the manager or farm operator rarely faces a totally new situation.

In operating a farm business, each new plan or decision is conditioned by many plans and decisions that preceded it. Michigan farmers are still using buildings that were originally constructed as many as 50 to 100 years ago. The original builders probably had no expectation that milking machines or gutter cleaners would be installed in some of their structures, yet their designs have had significant effects on the decisions of present-day dairymen. Likewise, the choices which a man makes in his youth may have profound effects on subsequent decisions throughout his lifetime.

This means that one can rarely make a full evaluation of alternatives that have any major, long-run significance. A young person choosing a career today can hardly visualize many of the occupations that will exist in a decade or two. The builder of a Michigan barn 50 years ago could hardly have given any serious consideration to its adaptability for installing a mechanical gutter cleaner in the 1960's. Results after the first 10 to 20 years are rarely considered seriously in even the most careful evaluations of farm management alternatives.

Instead, most alternatives are identified and evaluated only in terms of results for the fairly immediate future. A decision to build a new barn, of course, must be considered in terms of a longer time span than a decision to increase the rate of grain feeding to the dairy herd, since the latter decision can be reversed much more easily than the former. Even when a choice involving major, long-term investments is being considered, the evaluation rarely is made in terms of conditions more than 5 or 10 years hence.

Insofar as decisions affecting future incomes are concerned, there is at least partial justification for the kind of analytical procedure that is ordinarily followed. Most of us seem to place a premium on present income as compared with future income. Stated in reverse, we discount future income as compared with present income. The sum of 31 cents invested today at 6 percent interest compounded annually will be worth $1.00 in 20 years; stated another way, on the same terms, we would only invest about 31 cents today for the promise of a dollar in 20 years. By the same reasoning, incomes differing by a dollar 20 years hence, would differ in value today by only 31 cents or so.

Thus, two alternatives may offer the prospect of generating entirely different patterns of income streams far into the future, yet results in the first 10 or 20 years will be of predominant importance in the way they would be evaluated by most individuals. On the other hand, farmers would rarely make any sizable new investments if they did not consider results beyond the first two or three years, since major investments in farming are seldom recovered that quickly.

Decisions in a Changing World

Change in the world about us and in ourselves creates a need for almost continual planning and decision-making, yet the prospect of continuing and only partially foreseeable change far into the future reduces the possibility of any completely rational and precise evaluation of the more far-reaching decisions which must be made. Under these conditions, successful managers probably exercise both art and science in their decision-making.

The elements of a rational management process are closely interrelated, but they may be listed in a formal sequence as follows:

(1) recognizing problems,
(2) observing or fact-gathering,
(3) identifying alternatives,
(4) evaluating alternatives,
(5) making a choice,
(6) acting upon the choice,
(7) measuring and evaluating results.

The first four items may also be considered as the planning or decision-making process, which stops short of the executive elements of management. These elements of the planning process apply in determining plans, programs, and policies, as well as for the more detailed decisions which immediately precede action. Items 5 through 7 include the executive elements of management, although item 5 is at the threshold between planning and executive action. Item 7, in turn, may be at the threshold between executive action and a second round of planning.

Comparative budgeting has a special place as a technique for evaluating the income and related effects of various farm management alternatives. This technique will be thoroughly illustrated in subsequent chapters. Other less formal and more subjective techniques will also be needed by most decision makers who face choices involving strong personal preferences, risks, and inter-personal strategies.

For this and other reasons, remember that as a farm operator, YOU alone are in the best possible position to make a final choice of the actions that will contribute to the fullest possible attainment of the values which YOU regard as important. A manager can use large amounts of information and counsel, but perhaps his most important function is to bear the consequences of his own decisions—a responsibility that he cannot really shift to anyone else as long as he is to remain the manager.

CHAPTER 2. WHAT'S AHEAD?

Sizing up the future is a key step in planning for your Michigan farm. A farmer can fail dismally if he works hard at producing a large output of something that nobody wants. In some parts of the country, specialized producers of timothy hay learned this lesson forcefully when horses disappeared from city livery stables.

Farmers can also fail by producing something that is not scarce enough to command a favorable price. Broiler growers will have no trouble in understanding this point, even though their product is a popular food which was once distinctly in the luxury class.

A farmer can succeed, in fact, only by producing something that is both desirable enough **and** scarce enough to be of value when marketed. The value of the product, moreover, must be sizable in relation to the value of the resources used in its production. This requires constant vigilance in observing and acting upon changes in supply, demand, and price prospects for farm products and farm inputs.

On some occasions, the farmer may need information about price prospects for the next few days or hours; on other occasions, he may be concerned with the outlook for years ahead. Cattle feeders need to know how cattle prices will vary from day to day and from market to market, if they are to buy and sell successfully. They also need to forecast prices for six months to a year in advance if they are to choose the most profitable class of cattle to feed. Furthermore, they may need to judge the outlook for cattle feeding over a span of 5 to 10 or even 20 years if they are to make wise decisions about major investments in new buildings and equipment. The trend to specialization has brought new importance to all these kinds of forecasts.

Not of least importance is the forecast of the future used by a young man in deciding for or against agriculture as a career. Such a decision cannot easily be reversed, especially after the passage of a decade or two. Specialized knowledge and skills are needed in almost any occupation today; this is equally true for farming, for farm-related businesses, and for other industries. Changing from one kind of work to another is thus likely to require a reinvestment of time and resources in acquiring the appropriate knowledge and skills.

Long-Range Demand Prospects

Michigan consumers buy more than half of the State's total farm output, yet the demand for Michigan farm products is far from independent of demand and supply conditions in the country and even in the world as a whole. Products such as wheat, dry beans, and apples actually move to far distant markets. Products such as beef, pork, and eggs must com-

pete on Michigan and other markets with similar products from other sections of the country. If New Yorkers decide to eat more eggs, the demand for Michigan eggs will be strengthened, and Michigan egg producers will be able to sell more eggs at a given price. If Georgia poultrymen start to produce more and cheaper eggs, the demand for Michigan eggs will be weakened and Michigan egg producers will have to take less for a given volume of eggs. Thus, any analysis of demand prospects can well begin at the national level.

Note that "demand" has both **price** and **quantity** dimensions. As used by economists, the word means an entire schedule of quantities that a person or a market would accept at various prices. Usually it seems reasonable to expect that consumers will accept more of a given product at a lower price than at a higher price, and that markets will reflect this kind of behavior. Frequently, however, the change in consumption is so small in relation to the change in price that a large quantity sells for a smaller total return than a small quantity. When this situation exists, as is frequently true for farm products at any given time, the demand is described as "inelastic".

The fact that the human stomach has a rather sharply limited capacity is reflected in the general inelasticity of U.S. demand for all farm products at any one time. If we eat more oranges, we eat fewer apples, and if we eat more beef, we eat less pork. Much may happen over time, however, to affect the demand for all farm products as a group, as well as the demand for each product.

Total demand is likely to grow, for example, with growth in the total income available to consumers for buying food, clothing, and other goods and services. The trend in expenditures for food since 1940 suggests that food demand has been increasing along with the growth in total income (Figure 2.1). During most of this period, about a quarter of total disposable income has been spent on food; in the last few years, this fraction has dropped to about a fifth.

The rise in total disposable income is the combined result of a growing population and a growing income per person (Figure 2.2).

Population growth in the U.S. has added 50 million consumers in the last 30 years, and population continues to grow at a rate of almost 2 percent annually. Current projections point to a 1970 population of 214 million and a population of more than 300 million in the year 2000.

Part of the increase in total disposable income per person must be attributed to rising price levels, of course, but the remainder reflects a continuing gain in actual purchasing power or real income. During the 1950's alone, per-capita real income rose about one fourth.

Higher per-capita real incomes have enabled American consumers to increase their consumption of animal products at the expense of cereals and potatoes (Figure 2.3). As compared with 1940, the increase in per capita consumption has been nearly a fourth for meat, and about 10 percent for eggs and for dairy products other than butter. Meanwhile, consumption is down about 15 percent for flour and cereal products and 25 percent for potatoes.

Total consumption of fats and oils has held fairly steady, but vegetable fats have been taking the place of butter and lard. Consumption of fruits and vegetables increased substantially before 1940; since then the big change has been a substitution of processed items for fresh ones. Use of wool and cotton has declined at the expense of synthetic fibers per person, during recent years (Figure 2.4).

Changes in per-capita consumption do not really measure changes in demand, but the changes mentioned above probably do reflect the effect of rising incomes on demand for certain important farm products. When households are classified according to income per person, for example, the tendency for higher income families to consume more beef has been demonstrated.

For the future, however, we have no assurance that the same general trends will continue, even if incomes continue to rise. In fact, the trends of the last 20 to 50 years show some signs of leveling off recently. The share of the food budget spent for processing and marketing services continues to increase, however, and a continued increase seems likely for some time to come (Figure 2.5).

Altogether, there seem to be few reasons for expecting major changes in domestic demand for farm products except for the gradual increase that is likely to accompany population growth.

Prospects for foreign demand are even more difficult to analyze. Millions of hungry people abroad represent potential consumers for large quantities of American food. Hungry people without money, however, have little effect on market demand. Exports have accounted for 8 to 10 percent of total farm output in recent years, including sizable quantities financed in whole or in part by government programs.

Serious efforts have been, and are being, made to expand foreign markets through regular commercial channels and government programs; the prospect is that such efforts will continue to strengthen total demand, especially for grains and certain other non-perishable farm products. Foreign demand, however, seems unlikely to become a major factor in the market for perishable commodities such as most fresh fruits and vegetables, fluid milk, and meat, which comprise so large a share of Michigan's agricultural output.

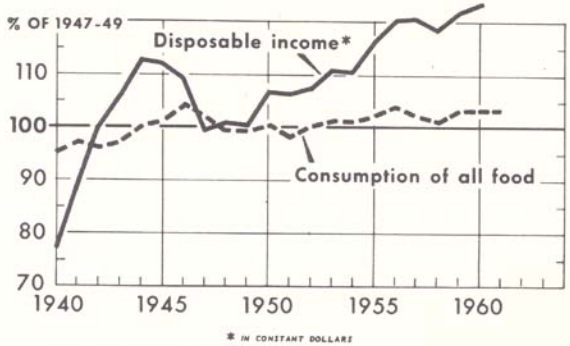

Fig. 2.1—Per capita consumption of food rises slightly as income increases.

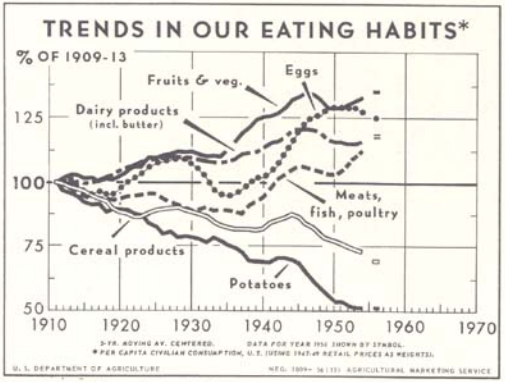

Fig. 2.3—Trends in U.S. per-capita consumption of major food groups, 1940-49.

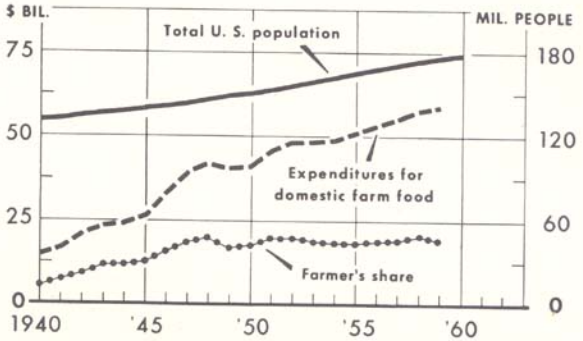

Fig. 2.2—Rising population leads to increasing expenditures for food; farmer's share declines.

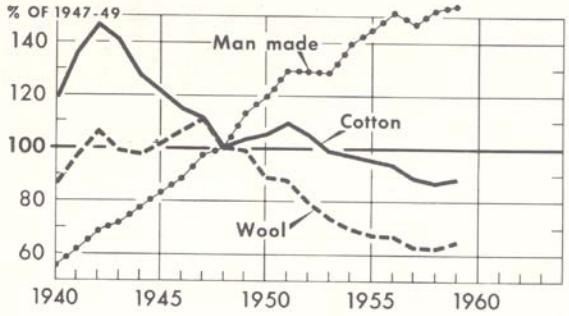

Fig. 2.4—Downtrend in use of natural fibers halts.

Long-Range Supply Prospects

On the supply side, the growth of production on U.S. farms has fully kept pace with the growth of population, decade after decade (Figure 2.6). Since 1910, the U.S. population has doubled, and the index of total farm output shows a similar change. Even so, total cropland harvested in 1960 was only 328 million acres—a figure almost identical to the 325 million acres harvested in 1910. The acreage of cropland harvested reached a peak in 1932, but most of the change in total output for the period as a whole has come from higher yields per acre and per animal (Figure 2.7).

Crop production per acre rose by 40 percent between 1940 and 1960, with a rate of gain that seemed to be increasing toward the end of the period. Livestock production per breeding unit has shown similar progress. New knowledge not yet fully applied, moreover, gives promise of higher and higher yields for the future. Land resources, in short, present no apparent obstacle to a continued growth of output at least in proportion to any probable growth of population in the next decade or more.

Output per man hour, moreover, tripled between 1940 and 1960, and continues to rise at a rate of at least 6 percent annually (Figure 2.8). Machinery, fertilizer, and other purchased inputs have substituted for land and labor in the production process (Figure 2.9). They have also permitted large increases in total production from a relatively fixed land area and a rapidly declining labor force.

The changes in output do, in large measure, reflect a true increase in supply (a schedule of quantities that would be offered at various prices). Farmers are now prepared to produce larger quantities of crops and livestock at given prices than they were 10 or 20 years ago, and the change has been especialy marked for the crops where mechanization has proceeded rapidly, including wheat and other food grains, corn and other feed grains, soybeans, and potatoes. One analysis of the future balance between production and consumption suggests that there will be an aggregate surplus productive capacity equivalent to some 15 to 25 million acres of cropland continuing into the 1960's.[1]

Long range trends or changes in the output of U.S. farms will depend upon many factors, including adjustments in the total economy and the resulting attitudes of farmers toward long range employment and investment opportunities in agriculture. A broad appraisal of economic prospects is therefore necessary in considering future trends in the supply of farm products.

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1 *Agricultural Research Service (1961). Farm production trends, prospects and programs. U.S.D.A. Agricultural Information Bulletin 239.*

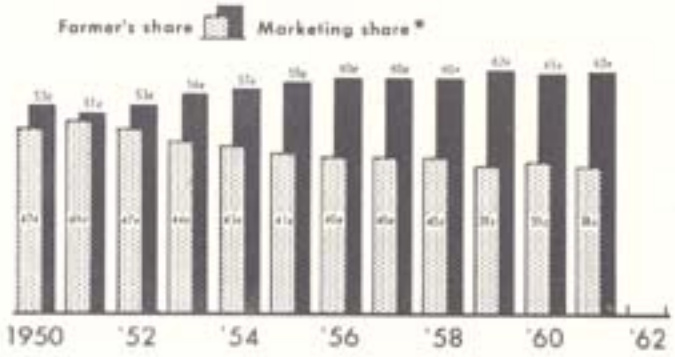


Fig. 2.5—Farmer's share of consumer's retail food dollar declines.

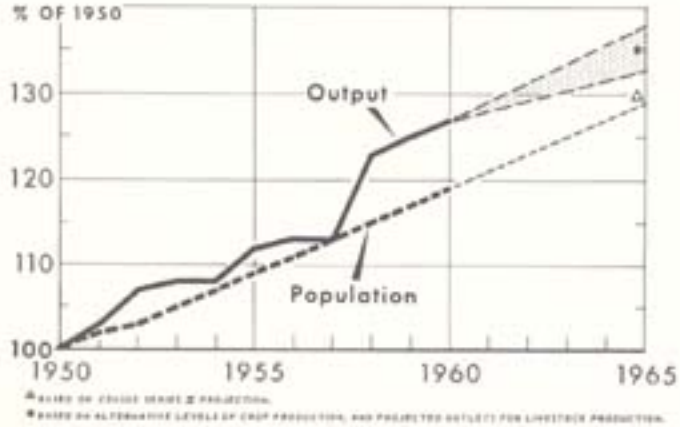
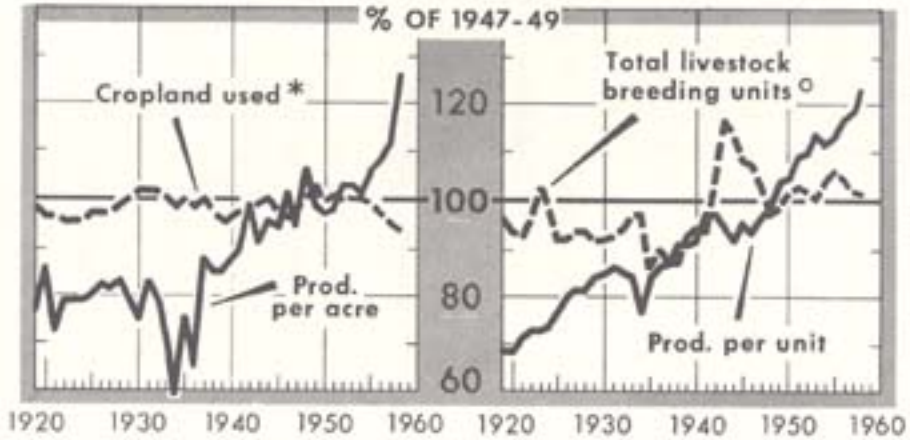


Fig. 2.6—Farm output up faster than population during 1950's.



*ESTIMATED ACREAGE FROM WHICH ONE OR MORE CROPS WERE HARVESTED PLUS ACREAGE OF CROP FAILURE AND SUMMER FALLOW

°INCLUDES ALL BREEDING LIVESTOCK EXCEPT HORSES, AND ALL LIVESTOCK PRODUCTION EXCEPT FARM-PRODUCED POWER OF HORSES AND MULES

Fig. 2.7—Production per livestock breeding unit has increased at a faster rate than crop production per acre of cropland.

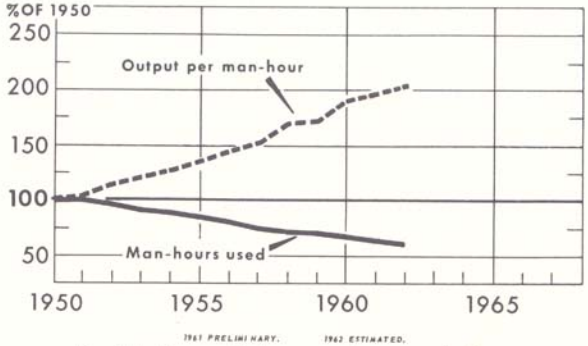


Fig. 2.8—Farm output per man-hour now twice as high as in 1950.

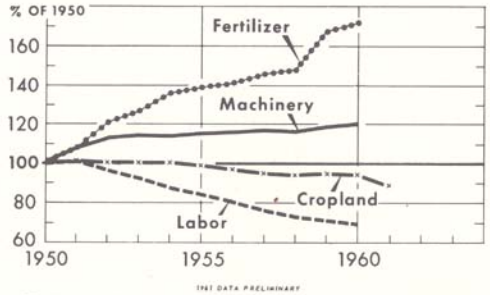


Fig. 2.9—Use of fertilizer and farm machinery increasing; labor and cropland, decreasing.

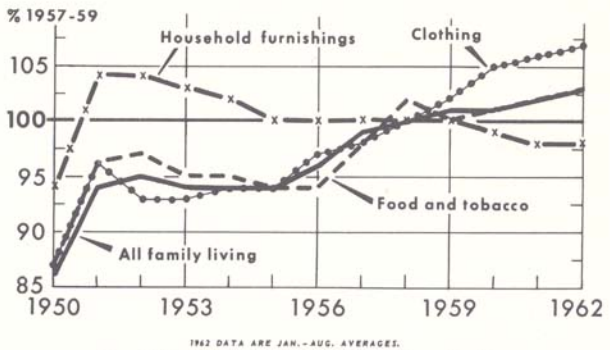


Fig. 2.10—Prices received and paid up slightly.

The General Prospect for Farm Prices, Incomes and Employment

The war periods of the 20th century have produced farm price levels regarded by farmers as generally favorable, or at least as acceptable. Most of the remaining years have brought urgent calls for public action to alleviate price and income situations regarded as unfavorable or intolerable. Abundant production, in the face of an inelastic demand, has led to prices for farm products that seemed extremely low in relation to prices paid for commodities and services used in farm production and living (Figure 2.10). The parity ratio, an index measuring this relationship, stood at 120 in 1917, 58 in 1932, 115 in 1947, and 80 in 1960 (1910-14 = 100).

Many people have interpreted the parity ratio as a direct measure of net incomes in farming. Others have expected net incomes to vary directly with the total volume of production. Still others have supposed that net incomes would vary with production efficiency. Each of the three viewpoints is incomplete, since all three factors act jointly in determining changes in net incomes.

Changes in output and efficiency have partially offset the effects of changes in the parity ratio during recent years. This can be illustrated with data that reflect changes in two dairy farming areas—one to the east and one to the west of Michigan.

Production per farm in each of the two areas in 1960 was about 50 percent above the level of the 1947-49 base period. Since total inputs did not rise as rapidly, production efficiency (the ratio of output to input) rose 15 percent in the Central Northeast and 30 percent in Eastern Wisconsin. Prices received fell while prices paid were rising. The parity ratio, therefore, fell to 79 percent of 1947-49 for the Central Northeast and to 64 percent of 1947-49 for Eastern Wisconsin.

Even so, 1960 net incomes per farm were about 5 percent above the 1947-49 level in each area—the combined result of increased production and increased efficiency. In terms of purchasing power, however, the 1960 net income fell about 11 percent during a period when the incomes of industrial workers were rising substantially.

Comparison of farm and non-farm incomes is difficult because of the difference in consumption of home-produced items, the varying costs of living at similar levels in different locations, and the varying importance of the capital gains that may arise in holding business property. Rising

values of land and other business assets added materially to farm incomes of the 1940's and 50's. These gains are not included in the data for Figure 2.11, which show that the per-capita income of farm people from farming and from non-farm sources has just about been holding its own since the mid-1940's, whereas the per-capita income of non-farm people has shown a steady rise. The data of Figure 2.11 show the dollar amounts of per-capita incomes of non-farm people to be roughly double the income of farm people throughout most of the period since 1950, but equality of dollar incomes would not necessarily have meant equality of levels of living.

Real incomes and levels of living of non-farm people may be far less than double those of farm people, as might appear from the data of Figure 2.11. Farm incomes, however, have been low enough to encourage a gradual reduction in the proportion of the total population residing on farms (Figure 2.12), and an actual movement of families out of agriculture during most of the period since World War I.

The net effect is dramatically portrayed by the trend in the number of persons supplied with farm products by the production of one farm worker (Figure 2.13). Throughout the 19th century, this number gradually increased from about 4 to 7; between 1945 and 1950 it stood at around 14 to 15, or double the 1900 level; and by 1961 it had almost doubled again.

In other words, the relatively unfavorable price and income situation during most of this century has provided strong pressure for a reduction of the labor force in agriculture, and for a transfer of labor to other sectors of the economy. Without such a transfer, the families remaining in agriculture today, as well as the rest of the American public, could hardly be enjoying as many autos, television sets, and all the other consumption goods produced by non-farm industry. Whether this is good or bad depends on personal viewpoint, but the record of what has happened is clear to see. In the absence of war or drastic government action, moreover, pressure for continuing transfer of labor, arising through continuing unfavorable terms of trade for agriculture, seems the most likely prospect for some years to come.

Although average returns to farm labor and capital have been very modest in recent years, they have varied from year to year, from area to area, and from one type of farm to another. Some of these variations are illustrated in data developed by the U.S. Department of Agriculture to show earnings on typical commercial farms in many specific situations

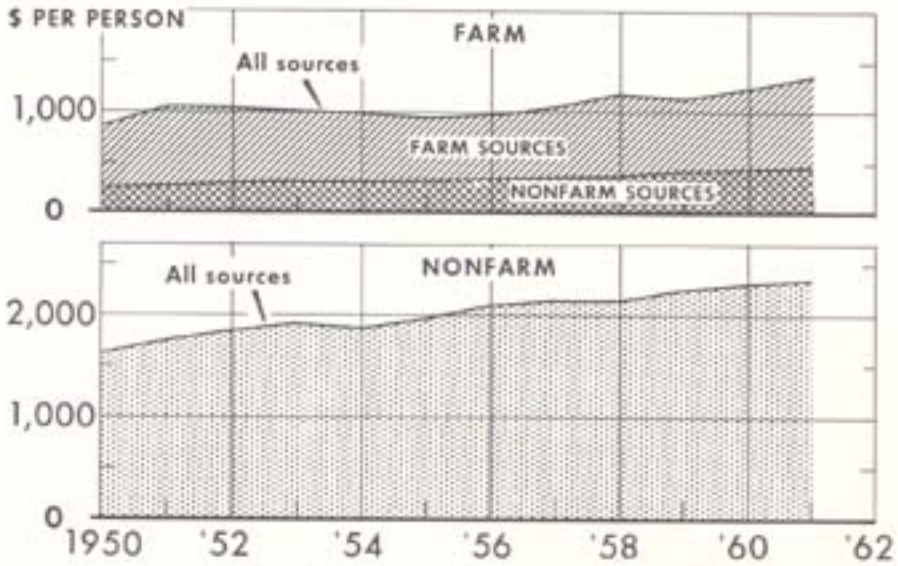


Fig. 2.11—Personal income per person.

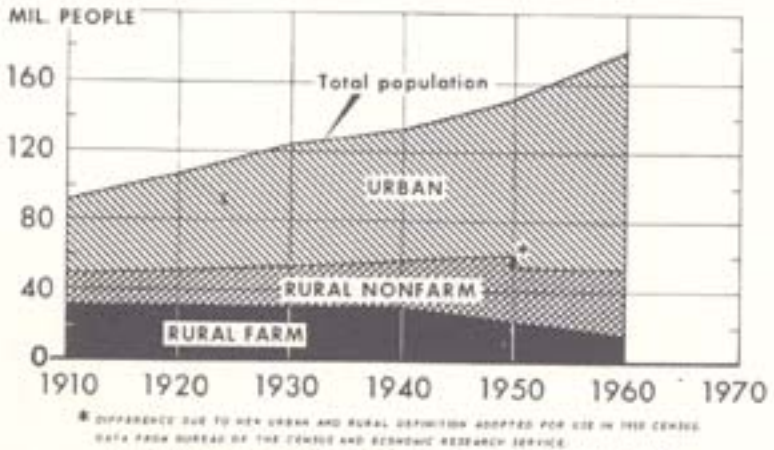


Fig. 2.12—In 1960, 1,100 nonfarm people per 100 on farms.

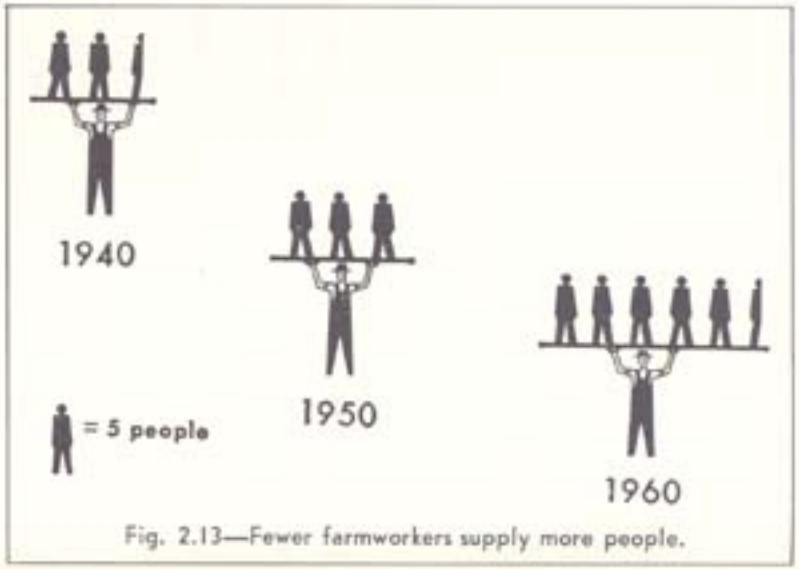


Fig. 2.13—Fewer farmworkers supply more people.

throughout the country (Table 2.1). Returns to labor appear to have been generally favorable between 1957 and 1960 on Cotton farms in the High Plains of Texas and on Winter Wheat farms in the Southern Great Plains, but generally unfavorable on Southwestern Sheep ranches and New Jersey Poultry farms. Notable are the number of cases where labor returns have been below the prevailing minimum wage level of $1.00 an hour. Notable also are the number of cases where returns on capital have amounted to less than 5 percent after allowing hired labor wages for operator and family labor.

TABLE 2.1 RETURNS TO FAMILY LABOR AND INVESTMENTS ON COMMERCIAL FARMS BY TYPE, SIZE AND LOCATION, 1947-49 AND RECENT YEARS

TYPE, LOCATION, AND SIZE OF FARM	RETURNS PER HOUR OF LABOR a/					RETURNS PER $100 invested b/				
	1947-49	1957	1958	1959	1960 c/	1947-49	1950-59	1958	1959	1960 c/
Dairy farms:										
Central Northeast	.72	.74	.63	.60	.46	9.81	5.83	5.17	3.78	2.88
Eastern Wisconsin	.45	.27	.12	.25	.10	-.35	-1.60	-2.37	-1.35	-1.58
Western Wisconsin	.48	.56	.59	.49	.40	.18	.00	1.41	-.16	-.28
Dairy-hog farms:										
Southeast Minesota	.70	.56	.52	.33	.23	3.82	2.21	2.14	.23	.62
Corn Belt farms:										
Hog-dairy	1.10	.89	1.07	.50	.31	7.90	3.97	6.07	.94	.49
Hog-beef raising	.86	.53	.80	.19	-.01	5.94	2.32	4.50	-.20	-.67
Hog-beef fattening	2.22	1.23	1.62	.63	.07	14.61	6.43	8.44	2.87	1.41
Cash grain	2.21	.73	.63	.07	.02	11.70	6.52	4.46	2.41	3.33
Poultry farms:										
New Jersey (egg)	1.04	-.07	-.13	-.88	.23	9.27	-2.40	-3.97	-10.72	-.07
Cotton farms:										
Southern Piedmont	.37	.26	.61	.29	.13	5.95	5.59	8.09	3.76	2.68
Texas Black Prairie	.87	.13	.56	.23	-.05	10.19	4.48	5.34	2.44	1.93
Texas High Plains (nonirr.)	2.59	1.88	2.60	1.82	1.99	18.60	7.27	13.74	9.21	10.99
Texas High Plains (irr.)	3.87	2.50	4.94	2.87	2.98	20.61	12.41	15.82	10.03	11.26
Peanut-cotton farms:										
Southern Coastal Plains	.60	.61	.98	.51	.72	17.73	13.10	17.01	6.99	10.96
Tobacco farms:										
No. Carolina, Tobacco-cotton	.78	.47	.78	.48	.74	10.74	8.19	7.88	3.98	7.14
Kentucky Bluegrass, tobacco dairy, intermediate area	.44	.43	.47	.43	.34	-3.62	-2.25	-.31	-1.26	-2.06
Wheat farms:										
Northern Plains, spring wheat-roughage-livestock	1.52	.91	.83	-.34	.91	11.64	2.17	4.19	-3.28	5.14
Southern Plains, winter wheat	3.28	1.38	3.15	1.29	1.84	15.97	7.93	12.60	5.80	8.39
Cattle ranches:										
Northern Plains	1.14	.28	.75	.31	.01	7.14	3.08	5.03	2.80	2.56
Southwest	.74	-.51	.59	.18	-1.08	4.43	2.12	5.38	4.17	3.34
Sheep ranches:										
Northern Plains	.98	1.77	2.07	.81	.52	6.50	6.31	10.63	4.78	4.61
Southwest	.16	-.85	.28	.18	-.93	3.17	2.22	5.02	4.38	4.00

a/ The return for labor and management provided by the operator and his family after deducting an estimated charge for capital at interest rates charged by the Federal Land Banks and Production Credit Associations.

b/ The return for capital after deducting an estimated charge for operator and family labor valued at hired labor rates.

c/ Preliminary.

The Michigan Situation

Michigan population and income trends are similar to those in the country as a whole, and much that has been said for the country would apply equally in the State. Michigan agriculture, however, is not as isolated from external competition as is U.S. agriculture, and the changing balance between local production and consumption rates represents only a part of the complex outlook. The general outlook for Michigan farmers, in other words, depends more upon their ability to compete with out-of-state producers than upon the growth of local demand for farm products.

Michigan's production-consumption balance

Factors of importance in relation to the outlook for individual products do vary with the extent of local production. Michigan supply conditions, for example, are of major importance in relation to the outlook for pea beans, because Michigan growers produce almost all of the national crop. Two thirds of all U.S. tart cherries and late celery are also grown in the State.

Many cherries and important quantities of other fruits and vegetables enter processing channels, where they compete in distant markets with the output of other areas. Large quantities of fresh fruits and vegetables are also shipped out of the State during seasonal production peaks.

On balance, however, nearly half the food consumed in Michigan is imported from other states. The various red meats represent especially important in-shipments. Eggs, poultry, meat, potatoes, and a number of vegetables are also imported in substantial quantities. Changes in Michigan production alone are unlikely to have major effects on local prices of these commodities.

Michigan dairymen sell more milk and cream for fluid use than is consumed within the State. Part of their fluid milk production goes to Chicago, Toledo, and other nearby markets, while dairymen in other states produce some of the milk used in manufacturing cheese and a variety of other dairy products sold in Michigan. Changes in local demand and supply conditions have direct effects on the blend prices paid for fluid milk sold in the federal-order markets. Furthermore, high transportation expenses would probably be involved if sales outside the State were to be expanded by shipments to distant cities.

Changes in the volume of Michigan production, then, can have major effects on local prices for fluid milk and for such crops as beans and

cherries. Changes in national production and demand are likely to be more important in affecting Michigan prices of other crops and of most livestock items. Public policies are likely to interact with these factors in determining prices for most Michigan farm products.

Trends in number and scale of farm businesses

Michigan's future agricultural production will depend to a major extent upon the number of people who choose to engage in farming; upon their willingness to invest in land, buildings, equipment, and livestock; and upon their continuing use of other inputs. With many farmers and large investments per farm, total production could be very high. If no one wanted to farm or invest in farming, output would be very low. Between these two extremes, the scale of operations and investments is likely to vary more or less inversely with the number of farms. A rapid decrease in farm numbers would probably be associated with some increase in the scale of individual farm operations.

In 1959, more than half of all Michigan farm product sales came from 18,000 farms with sales of at least $10,000 per farm. Nearly two thirds of all agricultural production, including farm products for home consumption, came from 37,000 farms with sales of $5,000 or more each. These are the units which usually come to mind when the term "farm" is used. The total 1959 Census count of Michigan farms was 3 times as large, however, even under a definition which excluded thousands of properties with minor agricultural production or with an acreage of land suitable for agriculture. Thus, any count of farms will depend a great deal upon the definition chosen. If trend data are to be meaningful, moreover, they need to be based on definitions that are comparable over time.

The problem of separating "farms" from units that are primarily residential in character is not easy at any one time, and it is more difficult when trend data are needed. The products represented by 1959 sales of $5,000 for example, would probably have sold for less than half the amount in 1939. Even $1,000 worth of sales in 1939 might have represented as much farm employment as $5,000 sales in 1959. Both the level of prices and the productivity of labor need to be considered in establishing definitions that are comparable over time.

For discussions relating to farm incomes or supply prospects, the term "farm" should probably be restricted to business units with enough agri-

cultural production to represent an important source of employment and income for the operating family. Perhaps the best dividing point in 1959 is the $5,000 sales level. Most of the 37,000 farms with this sales volume could be called "family-scale, commercial farms". The number of farm units with production representing a comparable level of employment held fairly steady during the 1930's, declined sharply during the 1940's, and declined only gradually, if at all, during the 1950's.

Units with sales of $2,500 to $4,999 in 1959 represent a borderline group. The number of units with comparable farm employment was fairly constant during the 1930's and 1940's, but declined sharply during the 1950's. Many of the 22,000 units remaining in 1959 could probably best be described as part-time farms, retirement farms, or transitional situations.

The total Census count of Michigan farms reached a peak of 207,000 in 1910; from then, it declined to 197,000 in 1930, 188,000 in 1940, 156,000 in 1950, and 112,000 in 1959. The Census definition of a "farm" has narrowed slightly over time, but it has always been inclusive enough to account for almost all agricultural production. Thus the count has always included many thousands of units which are primarily residential in character.

The Census count of units with sales of less than $2,500 totaled 53,000 in 1959. Some of these units are primarily rural residences; the remainder, like the borderline group, includes part-time farms, retirement farms, and transitional units. The number of units with a comparably restricted amount of farm employment showed little change during the 1930's and 1940's, but fell sharply during the 1950's.

The trend in the total count of Census farms has led many people to believe that the family-size commercial farm is disappearing rapidly. Some foresee an early concentration of most farm production in a few giant firms. In 1959, however, only 1,068 Michigan farms had sales of $40,000 or more, and the number with a comparable level of farm employment has been around 1,000 or more ever since 1929.

The disappearance of Census farms over the last 20 years, then, reflects (a) a sharp drop in the number of family-scale, commercial farms during the 1940's and (b) a sharp drop in the number of units below this size during the 1950's. The total count declined only moderately during the depression decade of the 1930's, and the count of family-scale, commercial farms did not show a rapid decline in either the 1930's or the 1950's. Larger-than-family size units have shown no tendency to increase in number, and there is little evidence that farmers are relying more on

hired labor instead of family labor. Altogether, family-scale commercial farms are increasing their output in proportion to the increasing productivity of the family labor force, and these units are accounting for a constant or increasing percentage of total farm output.

The number of potential farm operators who mature on farms is an important factor in maintaining farm numbers. Farm boys naturally tend to give special consideration to farming as a possible vocation. Many of them join the large annual migration from farms only after encountering serious obstacles to establishing successful farm businesses.

In Michigan, as in most other states, the annual flow of potential farm operators is large in relation to the number of prospective retirements and deaths. Currently, about 2,000 young men trained in Vocational Agriculture are graduating from Michigan high schools annually. Thousands more are reaching maturity on commercial farms or other units with some agricultural activity. Current enrollments in high school vocational agriculture classes total about 12,000. Farming also attracts mature individuals, with or without a farm background, who have established themselves in business, industry, and professional work.

Although the average age of Michigan farm operators is close to 50 years, the group of 37,000 with annual sales of $5,000 or more includes only 7,500 who will reach 65 years of age within the next 10 years, plus 1,500 who can be expected to die before the end of the decade. An annual flow of 900 new operators would thus replace those who terminate farming for these two causes. On the same basis, only 400 replacements would be needed for operators selling $10,000 or more of farm products. Some additional operators can be expected to withdraw from farming for reasons other than death or retirement at 65. Clearly, however, the number of individuals with a potential interest in farming is large enough to exert a supporting or upward pressure on farm numbers.

Two factors will exert strong downward pressures on farm numbers. The first is the prevailing low level of earnings on Michigan farms; the second is the difficulty that young men will encounter in finding capital to establish successful businesses.

Data from the Michigan State University farm accounting project illustrate the relatively low current level of earnings and the large investments which are involved (Table 2.2). From 1953 through 1960, account cooperators worked their farms for an average labor return of less than a dollar an hour—the prevailing minimum wage level in industry.

TABLE 2.2 LABOR INCOME, INVESTMENT, AND RATE EARNED ON INVESTMENT FOR MICHIGAN FARM ACCOUNT COOPERATORS, 1949 - 1960.

YEAR	LABOR INCOME a/	INVESTMENT	RATE EARNED ON INVESTMENT b/
	(dollars)	(dollars)	(dollars)
1949	1,815	23,346	6.7
1950	2,688	25,141	9.9
51	3,782	27,963	13.4
52	2,926	32,229	9.6
3	2,447	33,385	6.2
4	1,755	37,060	4.2
5	993	37,560	2.2
6	2,646	40,460	6.5
7	2,360	49,560	5.6
8	3,426	53,060	7.6
9	2,049	69,940	4.4
60	2,339	75,850	4.8

a/ Net farm income less a 5 percent charge on investment.

b/ Computed after deducting from net farm income an estimated charge for the operator's labor.

These account cooperators are not unskilled laborers; their skills and managerial ability are presumably above the average for all commercial farmers, and most of them are better described as working owner-managers who have investments of $40,000 to $100,000 in farm businesses that gross $10,000 to $50,000 or more.

The "labor" incomes in Table 2.2 really represent a combined return for the labor and management contributed by the farm operator. They are calculated by subtracting from gross income (a) operating expenses and depreciation, (b) the value of unpaid family labor, and (c) a 5 percent interest charge on a conservative estimate of the total business investment. They do not include the value of farm products consumed in the home, and they do not include capital gains arising through increases in the value of real estate owned for use in the farm business.

Michigan land values rose about 70 percent during the 1950's. As a result, the "paper" gains in farm real estate for the decade as a whole averaged almost as large as labor income. By 1960 and 1961, however, farm land values were rising only about 2 percent per year.

TABLE 2.3 COMPARISON OF LABOR INCOMES ON FARM ACCOUNT AND CENSUS FARMS IN SELECTED AREAS, TYPES, AND SALES GROUPS, MICHIGAN, 1959.

GROUPS				
TYPE	AREA	SALES	ACCOUNT FARMS a/	CENSUS FARMS b/
Dairy				
	East Central	20,000 to 39,999	4,680	3,210
		10,000 to 19,999	2,390	1,830
		5,000 to 9,999	980	650
		2,500 to 4,999	(not available)	180
		5,000 or more	2,980	1,560
	Northern	20,000 to 39,999	4,930	
		10,000 to 19,999	2,210	
		5,000 to 9,999	710	
		5,000 or more	1,760	980
Cash grain	East and South Central	10,000 to 19,999	1,250	
General	East and South Central	20,000 to 39,999	3,480	
		10,000 to 19,999	260	

a/ Classified according to 1959 Census criteria.

b/ Estimates prepared by C. R. Hoglund of the Department of Agricultural Economics using Census data supplemented by additional information.

On "average" farms in Michigan, as elsewhere, earnings have commonly been far below the dollar-an-hour level. Only the most successful operators have been able to earn as much for their labor and management efforts as they have had to pay for moderately skilled hired workers. The data in Table 2.3 suggest that a large proportion of the Census farms with sales of $5,000 or more, and most of those with sales below the $5,000 level, have earnings well below the level of account cooperators.

Even if prospective farmers were satisfied with the income potential in agriculture, many would be eliminated by the high capital needs. Investments on the account farms in 1960 averaged more than $75,000 on the basis of conservative estimates (Table 2.2), and replacement costs would be even higher. Even a 50 percent equity in a $40,000 business amounts to $20,000—a sum too large for any young man to accumulate by savings from ordinary wages. Those who begin as tenants instead of as owners still need a sizable equity in machinery, stock, and operating capital.

Various kinds of credit from many sources are available to farmers for investment and operating capital. Farmers with large equities in

substantial assets can ordinarily find ample credit for expansion from banks, individuals, and other lenders. Prospective farmers, and farmers with limited equities in small businesses, have much less assurance of finding the capital to establish successful farms. The Farmers' Home Administration exists to serve such individuals within the limit of its annual appropriations, and parents or friends sometimes aid a promising individual. Altogether, however, the individual with few resources of his own will face real difficulty in acquiring the assets for successful farming. Many attempts have come to grief because the individual had the land but not the fertilizer, the machinery but not the livestock, or the livestock but not the feed.

Under these conditions, family transfers of farm units from one generation to the next are likely to become a principal means of becoming established in farming. A recent study shows that many farm operators past the age of 40 are making definite plans for the future transfer of their businesses to sons or other prospective replacements in the farm family.[2] Surveys in 1955-57, however, indicated that half of the operators with sales of $2,500 to $4,999, and a fifth of those with sales of $5,000 to $9,999, were 55 or older and had no prospective replacement.[3] As these operators leave farming, their farms stand a strong chance of being consolidated with other units.

In summary, then, limited numbers of commercial farms are likely to continue expanding in size, at a rate that will reflect the impacts of continuing technological progress on the capabilities of the typical farm family. Returns from these units will be favorable enough to attract an ample flow of replacements for present operators. Although many more individuals would probably like to become farmers, the total count of commercial farms will continue to decline slowly under the pressure of low returns and the difficulty of acquiring enough resources to establish a successful business. Furthermore, the general price outlook does not offer promise of quick returns from investments for expansion, especially in relation to developing units of larger than family size.

Prices for planning

Any careful appraisal of alternative plans for the future requires forward-looking estimates of prices for items to be bought and sold.

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[2] *Brake, J. R., D. E. McKee, and J. T. Bonnen (1960). The age and future plans of Michigan farm operators as related to agricultural adjustment. Michigan Agricultural Experiment Station Quarterly Bulletin, Volume 43, pp. 421-434.*

[3] *Unpublished data collected by D. E. McKee and R. G. Wheeler.*

TABLE 2.4 MICHIGAN FARM PRODUCT PRICES PROJECTED FOR THE 1960's, WITH COMPARISONS. a/

ITEM	UNIT	1948-57 AVERAGE PRICE	1958 PRICE	1960 PRICE	PROJECTED PRICE FOR THE 1960's
Crops					
Corn	bu.	$ 1.38	$ 1.08	$ 1.00	$ 1.00
Oats	bu.	.71	.58	.61	.52
Barley	bu.	1.00	.83	.71	.80
Soybeans	bu.	2.37	1.95	2.24	1.80
Wheat	bu.	2.00	1.75	1.75	1.60
Dry beans	bu.	7.28	6.50	5.50	5.50
Hay (baled)	ton	20.29	19.50	17.50	20.00
Sugar beets	ton	12.02	11.50	12.20	10.50[b]
(sugar act payment)	ton	2.38	2.35	2.19	2.35
Poultry and Dairy					
Eggs	doz.	.41	.36	.33	.30[c]
Cull birds (lt. breeds)	each				.40
Fluid milk					
(blend--f.o.b. plant)	cwt.	4.34	4.10	4.40	
(blend--at farm)	cwt.				3.80
Manufacturing milk					
(f.o.b. plant)	cwt.	3.50	3.20	3.29	
(at farm)	cwt.				3.00
Cull dairy cows					
(commercial)[d]	cwt.	17.97	19.76	16.21	15.00
Milk cows	head	196.00	209.00	223.00	200.00
Veal calves (all grades)	cwt.	25.00	26.00	26.10	
Deacon calves	head				10.-15.
Livestock					
Barrows and gilts					
(200-220 lbs.)[d]	cwt.	$ 20.32	$ 21.01	$ 16.65	$ 14.00
Sows (330-360 lbs.)[d]	cwt.	17.85	18.82	14.16	11.00
Weaning pigs					
(37-40 lbs.)	head				10.00
Slaughter cattle[d]					
Steers (choice)	cwt.	27.39[e]	27.42	26.24	22.00
Steers (good)	cwt.	24.57[e]	25.85	24.80	20.00
Slaughter lambs					
(all grades)[d]	cwt.	24.76	22.58	19.26	20.00
Slaughter sheep[d]	cwt.	8.83	7.23	5.56	7.00
Wool (exclusive of subsidy)	lbs.	.52	.34	.46	.30

a/The projections for the 1960's are from Michigan Cooperative Extension Service Fact Sheet No. 125 by James Mulvany and R. G. Wheeler (February 1960). The historical prices are based on data from the following sources:

Michigan Agricultural Statistics, Michigan Department of Agriculture, July 1959 and July 1961

Livestock and Meat Statistics, U.S.D.A. Statistical Bulletin 230, July 1958 and later supplements.

Dairy Statistics, U.S.D.A. Statistical Bulletin 218, October 1957, and supplements.

b/This price does not allow for a downward trend in sugar content.

c/Average price for all eggs of wholesale producers, assuming no expansion of per-capita U.S. production.

d/Chicago prices are quoted for these items because they provide detail by class and weights, They appear representative of Michigan prices.

e/Averages for the years 1949-56, a period which includes a complete cycle in cattle numbers from a low in 1949 to a low in 1956.

Changes from historical or current prices are ordinarily to be expected in planning for the future, especially when plans are being developed to take effect over a span of several years. Relationships among prices and the general level of prices are both important.

Over-estimating the general **level** of future prices will encourage farmers to make investments that cannot be recovered from increased earnings of the business. Low price forecasts will discourage farmers

from making profitable investments. Unrealistic **relationships** between prices to be received and prices to be paid can also lead to overinvestment or underinvestment. Furthermore, unrealistic price relationships can lead farmers to make the wrong investments—investments in swine facilities, for example, when cattle feeding might prove more profitable, or **vice versa.**

A set of guideline prices for use in planning Michigan farms during the decade of the 1960's was developed in 1959, on the basis of prospective changes from the situation in 1958 and earlier years. These prices are reproduced in Tables 2.4 and 2.5 with the addition of a column to show actual 1960 prices.

TABLE 2.5 PRICES OF MICHIGAN FARM EXPENSE ITEMS PROJECTED FOR THE 1960's WITH COMPARISONS. a/

ITEM	UNIT	1948-57 AVERAGE PRICE	1958 PRICE	1960 PRICE	PROJECTED PRICE FOR THE 1960's
Feeds					
Corn	bu.		-	-	$ 1.10
Bran	ton		$ 65.00	$ 61.80	60.00
Soybean oil meal	ton		80.00	83.80	75.00
Supplements (32%)					
-beef	ton		80.00	93.80	80.00
-hog	ton		110.00	105.00	110.00
-dairy	ton		90.00	93.60	90.00
-laying flock	ton		-	-	107.00
Complete laying ration	ton		68.00	64.40	68.00
Alfalfa hay	ton			24.83	23.00
Seeds					
Alfalfa	cwt.		48.00	49.25	52.00
Corn, hybrid	bu.		10.70	12.00	11.70
Oats	bu.		1.54	1.73	1.50
Wheat	bu.		2.84	2.75	2.75
Sudangrass	cwt.		12.00	14.40	13.00
Fertilizer					
82-0-0	ton		$200.00	$175.00	$200.00
33-0-0	ton		90.00	85.00	90.00
5-20-20	ton		75.00	74.50	75.00
0-20-20	ton		68.00	65.40	68.00
4-16-16	ton		70.00	61.50	70.00
12-12-12	ton		75.00	70.70	75.00
Livestock					
Steer calves[b]	cwt.	$ 25.70	31.68	27.88	25.00
Stockers and feeders[c]					
500-700 lb. steers	cwt.	23.33[d]	26.96	24.62	23.00
700-800 lb. steers	cwt.	22.78[d]	25.92	23.57	22.00
Feeder lambs[e]	cwt.	22.17	22.54	18.26	20.00
Milk cows (fall fresh, 10,000 lbs. capacity)	head				400.00
Pullet chicks	100				55.00

a/The projections for the 1960's are from Michigan Cooperative Extension Service Fact Sheet No. 125 by James Mulvany and R. G. Wheeler (February 1960). The historical prices are based on data from the following sources:
Agricultural Prices, U.S.D.A., 1958-61.
Livestock and Meat Statistics, U.S.D.A., Statistical Bulletin 230, July 1958 and later supplements.

b/Kansas City price for good and choice steers. Freight rates from Kansas City to Michigan approximate $1.00 per cwt.

c/Chicago prices are quoted for these items to provide detail by class and weights. They appear representative of Michigan prices.

d/Averages for the years 1949-56, including a complete cycle in cattle numbers from a low in 1949 to a low in 1956.

e/Omaha price for feeder lambs of 60 pound average weight. Freight rates will approximate $1.00 per cwt.

The guideline prices took account of the major trends in demand and supply that have been discussed earlier in this chapter. They assumed some changes in government price programs, but no drastic new controls upon farm output. They projected further adoption of labor-saving technology, especially in the production of field crops and in the feeding of cattle and swine.

Prices of some investment items at 1961 levels appear in Tables 2.6 and 2.7.

In using these planning prices, remember that any general guide intended to apply over a period of years for an entire state can provide only a point of departure in making a specific decision for your farm.

TABLE 2.6 PRICES OF INVESTMENT ITEMS USED IN MICHIGAN FARM PRODUCTION a/

ITEM	UNIT	1961 PRICE
Field Machinery		
Tractors		
20 - 29 horsepower	each	$2,540
30 - 39 "	each	3,080
40 - 49 "	each	4,060
Tandem disc harrow, 8 ft.	each	390
Corn planter, two-row	each	307
Corn picker, two-row	each	2,560
Power sprayer, mounted	each	224
Manure spreader	each	510
Forage harvesting machinery		
Hay drier (per dry ton capacity)		15-20
Baler		
small capacity	each	1,600
large, with auxiliary engine	each	2,440
Hay conditioner or crusher	each	850
Flat wagon (without rack)	each	400
Side-delivery unloading wagon	each	1,400
Forage harvester		
small	each	1,980
large	each	2,740
Forage blower		
small	each	700
large	each	1,100
Mower, 7 ft.	each	450
Side delivery rake	each	550
Bulk tanks b/		
400 gal.	each	2,950
700 gal.	each	3,900
800 gal.	each	4,300

ITEM	UNIT	1961 PRICE
Housing and related equipment		
Pole-type buildings		
material only	sq. ft.	$ .75-1.00
erected	sq. ft.	1.00-1.25
Concrete flooring	sq. ft.	.25- .35
Concrete paving	sq. ft.	.20- .30
Electrical heating cable and controls for farrowing stall or pens	each pen	10
Heated waterers for steers		~~150~~
for steers	150 gal.	150
for hogs	80 gal.	80
Feed bunk auger	linear ft.	10
Maypole electrical service and heavy amperage boxes (installed)	per farm	300-500
Silos and silo equipment		
Bunker silo with floor (per ton capacity)		6.50-7.00
Upright silo without roof		
12 x 40 ft. (110 tons cap.)	each	1,370
14 x 40 ft. (135 tons cap.)	each	1,950
18 x 40 ft. (230 tons cap.)	each	2,450
20 x 40 ft. (290 tons cap.)	each	2,600
20 x 50 ft. (390 tons cap.)	each	3,350
20 x 60 ft. (500 tons cap.)	each	4,070
24 x 60 ft. (730 tons cap.)	each	5,100
30 x 60 ft. (1,120 tons cap.)	each	6,800
Silo unloader		
14 ft.	each	1,200
18 ft.	each	1,300
20 ft.	each	1,400
30 ft.	each	2,250

a/ The historical prices are from Agricultural Prices, U.S.D.A., 1961, and unpublished reports by Michigan dealers and contractors.

b/ For other dairy equipment refer to Table 2.7.

TABLE 2.7 INVESTMENT IN HERRINGBONE AND OTHER MILKING SYSTEMS. a/

MILKING SYSTEM AND NUMBER OR STALLS	SIZE OF BUILDING	INVESTMENT		
		BUILDING b/	STALLS AND FEEDERS c/	MILKING EQUIPMENT d/
	(square feet)	(dollars)	(dollars)	(dollars)
Herringbone				
Double 4	774	3,290	900-1,100	1,850-2,700
Double 5	884	3,757	1,050-1,350	2,150-3,100
Double 6	994	4,215	1,200-1,650	2,400-3,500
Double 8	1,105	4,696	1,350-1,900	2,650-3,900
Walk-through				
Double 3	690	2,932	850- 950	1,900-2,100
Double 4	800	3,400	1,100-1,300	2,250-2,300
U parlor				
3 stall	640	2,720	650- 750	1,900-2,000
4 stall	800	3,400	850-1,000	2,100-2,200
Side opening				
Three in line	680	2,890	650- 750	1,900-2,200
Four in line	780	3,315	850-1,000	2,200-2,300
Double 2	860	3,655	850-1,000	1,900-2,200 e/
Double 3	1,014	4,310	1,250-1,550	2,200-2,600 e/
Double 4	1,170	4,972	1,650-2,050	2,600-3,000 e/

a/ Hoglund, C. R., J. S. Boyd and W. W. Snyder (1959). Herringbone and other milking systems. Mich. Agr. Expt. Sta. Quarterly Bulletin article 41-75.

b/ Includes contract price of labor and material for grading, foundation, concrete inside building, lumber, hardware, electrical installations and fixtures, water and sewage installations. Add $300 to $500 for cost of glazed interior surface. Cost of new wells or sewage systems constructed are not included.

c/ For gravity feeders. Add $300 for extra cost of auger feeders.

d/ Most of these systems include either automatic or semi-automatic line washers. Pyrex weight jars costing about $137 each, milking meters and automatic tank washers are not included in these investment figures.

e/ The double 2, 3, and 4 side opening systems include milkers for each stall.

Appropriate prices and price relationships for planning will vary from area to area and from day to day. The impact of the recreation industry, for example, has a significant influence on local prices within Michigan, and it has been estimated that tourists consume the equivalent of one fourth of the value of all food products sold from Michigan farms. Appropriate planning prices will also vary according to the personal circumstances and attitudes of the farm family. Remember that you as a farm operator will ultimately gain or lose through your judgment in making the right choices for your situation.

CHAPTER 3. HOW MUCH SPECIALIZATION?

The trend toward specialization in agriculture and in manufacturing was in progress long before the English economist Adam Smith described the advantages of specialization for an 18th century pin factory. In manufacturing, specialization has commonly taken the form of a division of labor among workers, plus the use of machines and facilities especially designed for certain operations. The industrial firm does not necessarily specialize in a single product or a small group of products. The latter is the logical pattern for specialization in farming, however, because a large share of all labor and management is supplied by the operator and members of his family.

Specialization does permit a worker to develop and exercise great manual dexterity in performing certain tasks. Much more important on the farm is the parallel opportunity for the operator to acquire and use a high level of knowledge and managerial skill in guiding business decisions. The development of specialized machinery and facilities has also placed strong pressure for product specialization upon farm families with limited capital.

Specialization and Trade

Specialization, of course, necessitates trade, since no producer could afford to specialize unless he could buy a wide variety of needed consumption items with the proceeds of selling the excess of his specialized production. Trade, in turn, implies that both parties to a transaction can "get the best of the deal". Each party must be satisfied that what he can acquire through trade will be worth more **to him** than what he relinquishes. This situation is possible because different resource situations, plus specialization of itself, result in different **relative** costs for different producers.

Farmer A, for example, might be in a position to produce 20 dozen eggs for the same cost as 100 pounds of milk, whereas Farmer B could produce only 10 dozen eggs at the cost of 100 pounds of milk. Each could gain in acquiring items needed for home consumption through a trade of 15 dozen eggs produced by Farmer A for 100 pounds of milk produced by Farmer B. This simple example of the basis for trade illustrates why farmers tend to specialize in the production of those commodities in which they have a **relative** or **comparative advantage.**

There are still many cases when it does not pay to specialize. Two main arguments for diversification in farming have related (a) to achieving fuller seasonal use of a given labor force and (b) to reducing risks.

These arguments have lost much of their strength in recent years, as machinery has been substituted for labor, as off-farm work has been combined more and more with farming, and as various factors have helped to reduce risks. Farms have continued to become more specialized, but few have yet reached the point of producing a single product to the exclusion of all others.

Specialization is thus a relative matter. When we speak of a specialized dairy farmer in Michigan, we ordinarily mean a farmer who produces grain and roughage crops, feeds them to milk cows, and raises heifer replacements. Dairy farmers could specialize to the extent of buying all their feed and all their herd replacements, but few Michigan dairy farms are this specialized at present. When we speak of a specialized cash grain farm, we mean a farm that specializes in some combination of cash crops such as corn, wheat, and beans. A specialized fruit farm may grow several fruit crops and some vegetables as well.

Types of Farms in Michigan

Michigan **agriculture** is diversified, even though its **farms** are becoming more specialized. There are many different kinds of farms in the State, and many different ways of classifying them, depending in part upon the purpose of the classification. The 1959 Census of Agriculture provides a large amount of descriptive information about Michigan farms, classified according to (a) total value of farm product sales, and (b) major sources of income.

Farms that receive one half or more of their sales income from the dairy enterprise are by far the most numerous type in Michigan and are widely distributed throughout the State (Table 3.1). DAIRY farms account for about 40 percent of all units with sales of $5,000 or more in the State as a whole, and for about two-thirds of all such units in the area designated as SRC-1 in Figure 3.1.

Fruit farms are relatively numerous along the western edge of the Lower Peninsula, in the area designated as SRC-2. Climate in this area is strongly influenced by Lake Michigan. Many well established POULTRY farms are located in Allegan and Ottawa Counties of area SRC-2, but the development of new commercial poultry units spreads throughout the State.

CASH GRAIN and OTHER FIELD CROP farms are relatively numerous in area SRC-3. Most of Michigan's pea bean crop and sizable amounts of wheat and corn are produced on the CASH GRAIN farms; sugar beets and potatoes are major crops of the OTHER FIELD CROP farms.

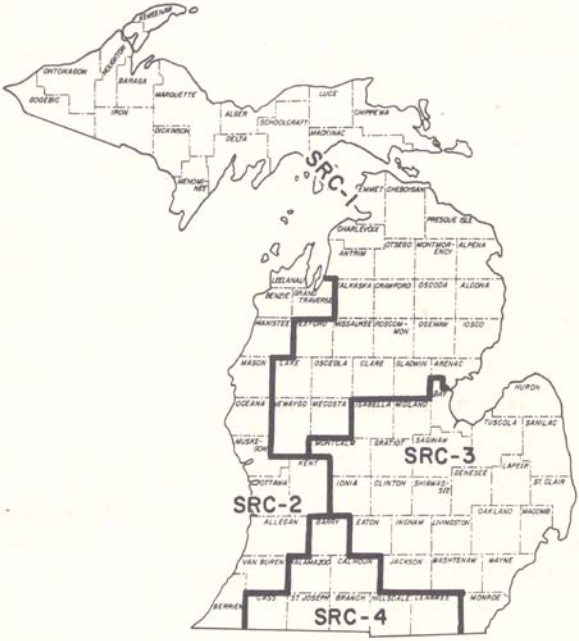

Fig. 3.1—Sub-regional components of Michigan used in classifying census farms by area.

TABLE 3.1 NUMBER AND PERCENTAGE DISTRIBUTION OF CENSUS FARMS WITH SALES OF $5,000 OR MORE BY TYPE AND AREA a/, MICHIGAN, 1959

TYPE	STATE		AREA SRC-1 (NORTH)		AREA SRC-2 (WEST)		AREA SRC-3 (EAST)		AREA SRC-4 (SOUTH)	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Cash-grain	6,550	18	26	1	138	2	5,239	25	1,147	21
Other field crop	955	3	208	5	37	1	694	3	16	--
Vegetable	729	2	80	2	234	4	344	1	71	1
Fruit & nut	2,879	8	122	3	2,369	36	183	1	105	2
Poultry	1,039	3	99	3	511	8	367	2	162	3
Dairy	15,829	43	2,439	63	2,143	32	9,216	44	2,031	37
Other livestock	464	12	536	14	493	7	2,289	11	1,327	24
General	3,556	9	286	7	465	7	2,268	11	537	10
Miscellaneous	851	2	84	2	194	3	468	2	105	2
Total	37,033	100	3,880	100	6,584	100	21,068	100	5,501	100

a/ See Figure 14.1 for an outline map of the four areas.

CASH GRAIN farms are also relatively numerous in area SRC-4, but corn and soybeans are the predominant crops for these farms. This area resembles the Corn Belt region to the south, and includes a number of OTHER LIVESTOCK farms (cattle feeding, swine, and sheep).

On the specialized types of farms mentioned above, 80 to 90 percent of all farm product sales usually originate in the specified crop or livestock enterprises. Sales of eggs and poultry meat, for example, represent well over 80 percent of all farm product sales on POULTRY farms. GENERAL farms, on the other hand, have no one of the designated product groups which accounts for half of all farm product sales. Many of these farms include some dairy and, like DAIRY farms, they are widely distributed throughout the State.

Trends in Farm Numbers, by Type

A trend toward more specialization is clearly evident in Census data by type of farm. A comparison for the last 10 years can be made conveniently for the group of farms with sales of $2,500 or more, since the total number of farms in this group remained almost constant at 60,000 from 1950 through 1959 (Table 3.2). (see page 42),

During the period, the number of GENERAL farms dropped from about 12,000 to 5,700. In 1959 there were 10 specialized farms for each GENERAL farm, whereas in 1950 there were only 4. Meanwhile, the number of CASH GRAIN farms increased by 4,300, and the OTHER LIVESTOCK groups increased by 3,200, while the count of DAIRY farms decreased by 3,700.

In total, the number of DAIRY and GENERAL farms decreased by 10,000 while the number of CASH GRAIN and OTHER LIVESTOCK farms increased by 7,500. In other words, many farmers who formerly grew feed crops for a small dairy herd are now feeding these crops to other livestock or have changed to selling crops for cash.

Highly specialized businesses are thus accounting for a larger and larger share of Michigan's farms and farm production. Probably 25,000 highly specialized farms account for more than half of all farm product sales, and 12,000 highly specialized farms with sales of $10,000 or more account for a third of all farm production. Some of these farm businesses will probably serve as models to be followed by other producers. No exact count or description of the large, highly specialized businesses is available from the Census but the important groups can be roughly identified as follows:

(a) About 6,000 highly specialized dairy farms with herds of 30 to 90 or more milk cows,

(b) About 3,000 cash field crop farms with 100 to 400 acres in some combination of wheat, pea beans, corn, and sugar beets. These farms are mostly in the eastern and southern part of the State, include real estate valued at $300 to $400 or more per acre, and have mechanized their field operations to a high degree.

(c) About 1,500 highly specialized fruit farms, mostly on the western side of the State, including an average of 70 acres or so of tree fruits, vineyards, and berries.

(d) Several hundred or more specialized cattle feeders in southern Michigan, who buy 50 to 500 or more head of cattle each year, to be fed corn silage, corn grain, and limited amounts of other feeds grown on the farms or in the vicinity.

(e) About 1,000 farms that are highly specialized in poultry, swine, or vegetable production.

Product Specialization

Another measure of the trend toward specialization is the decline in the number of producers of each product marketed. While the total number of farmers with sales of $2,500 or more declined by only 4 percent between 1949 and 1959, the number of producers for most individual products has shrunk by a third to two thirds. Wheat is the main exception among crops grown primarily for market; corn is another exception because it is grown primarily as a feed crop.

Most livestock producers have now narrowed their interests to one, or perhaps two, kinds of livestock. This trend within the group of approximately 60,000 farms having sales of $2,500 or more is illustrated below:

Item	Farms Reporting in 1949	Farms Reporting in 1959	Percent Decrease
Milk cows on hand	50,082	33,944	32
Eggs sold	32,388	18,878	42
Chickens sold	24,344	15,400	37
Hogs and pigs sold alive	27,465	16,388	40
Wheat harvested	43,377	41,739	3
Corn harvested for grain	46,121	44,023	5

Among all Census farms for the same period, there was a 76-percent decline in the number reporting potatoes harvested, a 52-percent decline in the number reporting vegetables grown for sale, a 45-percent decline in the number harvesting dry beans, and a 42-percent decline in the number harvesting sugar beets.

Farmers have discontinued secondary or minor enterprises that no longer could serve the purpose for which they were intended. Originally, many such enterprises permitted fuller use of land, labor, and other resources than would have been possible with specialization in a single product. In this way, they "supplemented" the main enterprise.

At one time, for example, a dairyman could grow a few acres of potatoes with very limited equipment, use family labor in the harvest, and sell the crop locally to good advantage. The crop provided a real addition to cash income without limiting the dairy enterprise appreciably.

With the use of more specialized equipment in each enterprise, and with changes in prices and markets, the potato enterprise has come to be more and more "competitive" with the dairy enterprise for land, labor, and capital. The dairyman cannot grow potatoes or keep cows very effectively without large investments, and he can seldom afford to invest much in equipment for a small-scale supplementary enterprise. Without such investments, however, the supplementary enterprise may not produce enough income to warrant use of the land and labor that would be needed.

In some cases, several crops are similar enough to use much the same combination of equipment and facilities. Tree fruit growers in southwestern Michigan can include apples, pears, peaches, cherries, and other fruits in their orchards without having to equip separately for each crop. Soil and climatic adaptabilities of the crops vary to some extent, and labor needs vary seasonally, especially for the harvest. Therefore, the relationship among these crops is still "supplementary" to a considerable degree, and growers still tend to produce a combination of several tree fruits.

Dropping a Supplementary Enterprise

The economy of continuing a supplementary enterprise depends upon its effect on the net income of the business as a whole. If the enterprise adds more to receipts than to expenses, there may be good reason for continuing it, especially if continuation does not compete with other ways of expanding net income.

Consider, for example, the question of whether or not a dairyman's wife should give up her flock of 300 pullets that can be expected to produce $1,500 worth of eggs over a year's time. The decision will depend upon when the change is to take place, and upon whether or not some other activity is to replace the poultry enterprise.

Over the last 10 or 20 years, thousands of farm families have decided to discontinue supplementary poultry enterprises such as the one considered here. The reasoning involved illustrates a decision-making process that will find frequent use in managing a farm. The process can be termed "partial budgeting".

In this case, suppose that the family has become concerned about the merits of the small poultry flock just after housing a flock of new pullets. Discontinuing the flock at this point would probably reduce receipts for the coming year by $1,600, yet the only prospective saving in expense would be about $900 for feed and supplies. (Receipts from fowl sales do not enter the comparison, because they would be about the same whether the birds were sold immediately or after a year of lay.) Unless the labor and other resources formerly used for poultry can be used in expanding the dairy enterprise or earning other income, sale of the pullets will obviously be an unpromising move at this point in time. The partial budget for the ensuing year would be as simple as this:

Reduction in receipts from eggs	$1,600
Reduction in expenses for feed	900
Change in net income	—$ 700

Note that this partial budget is really a comparison of results under **two** alternative plans for a specific period of time—namely, the coming year.

One plan is to continue the flock; the other is to discontinue it. In this case, continuing the flock is taken as the basis for comparison, and CHANGES from this situation are estimated for discontinuing the flock. The comparison could also have been made in the opposite direction by showing what the flock would have ADDED to receipts, expenses, and net income if continued. In this case, the partial budget would show:

Additional receipts for eggs	$1,600
Additional expenses for feed and supplies	900
Change in net income	+$ 700

Partial budgeting can be simple after one has identified two clear-cut alternatives for some specific time period. The possibilities for error are great if the two alternatives are not clearly identified. Comparing three or more plans with each other on the basis of CHANGES is not so simple, but TOTALS for all receipt and expense items subject to change can be estimated and compared.

This family might reach an entirely different decision about buying replacements to continue the poultry enterprise for a second year or thereafter. The budget for the second year might look like this:

Additional receipts from eggs	$1,600	
Additional receipts from fowl	100	
Total		$1,700
Additional expenses for feed and supplies	$ 900	
Additional expenses for replacement pullets	600	
Total		$1,500
INCREASE IN NET INCOME		$ 200

Adding in the expense for new pullets, and the receipts from their eventual sale, makes the enterprise appear less promising as a supplementary venture. If the enterprise were to be continued for a number of years, the expenses of replacing present buildings and equipment would also have to be considered at some future date. Over time, moreover, eliminating the poultry flock might enable the family to intensify efforts in dairying and increase income from that source. Often there are logical reasons for short-run continuation of an enterprise that is to be discontinued in the long run.

On other farms, the same process of analysis will be helpful, even if the answers do not prove to be the same. The method is to identify two or more possibilities for the future and then estimate the effects of each upon receipts, expenses, and net income of the business as a whole.

Feed Crop and Livestock Relationships

In many cases, two enterprises or crops are more closely related than the poultry and dairy enterprises of the above example. On sloping, light textured soils, for instance, a rotation including some sod crops tends to

protect soil productivity and add to yields of row crops, while the tillage and reseeding which accompany row-crop production may add to yields of the sod crops. Thus, the right combination of sod crops and row crops may produce more of each than continuous cropping to either. This "complementary" kind of relationship helps to account for the typical sequence of corn, oats, and legume crops which is followed, with variations, on most dairy farms in the State.

Here again, however, the advantages of specialization are increasing, and new soil fertility practices have made it feasible to grow corn continuously on land where a rotation was formerly considered desirable. Heavy fertilizer applications add not only to harvested yields, but also to the amount of residual organic matter returned to the soil; erosion control structures and winter cover crops have a place on some fields; and herbicides provide a new approach to weed control.

Livestock manures are still of significant value in crop production, and livestock enterprises provide a means of converting large tonnages of feed crops to products that can be marketed more advantageously. Most of Michigan's grain and roughage production is fed to livestock on farms where the crops are grown, and most of the livestock manure is then used in producing feed crops on the same farms. Any general shifting away from this pattern would be likely to involve moving large tonnages of feedstuffs over long distances, and finding new ways of disposing of animal manures advantageously.

The poultry industry has demonstrated that such problems can be overcome. "Dry-lot" dairying also has long been practiced in the vicinity of Los Angeles and other large cities. Elsewhere, individual feedlots fatten 30,000 or more head of cattle annually, using feeds that are largely or entirely purchased. The fact that these kinds of specialized feeding units exist in other states, however, provides no assurance that they will prove economical for Michigan.

A recent study shows the circumstances under which dry-lot dairying might be expected to compete with the conventional pattern in Michigan.[1] In this study, Professor Hoglund developed budgets for herd sizes ranging from 65 to 225 cows, with average milk sales of 10,000, 11,000 and 12,000 pounds per cow, under the following degrees of specialization:

(1) raise feed and raise replacements

(2) raise feed and buy replacements

(3) buy feed and buy replacements.

[1] *Hoglund, C. R., (1961). Economics of dry-lot dairying in Michigan and California. Michigan Agricultural Experiment Station Quarterly Bulletin Article 44-17.*

TABLE 3.2 NUMBER OF CENSUS FARMS WITH SALES OF $2,500 OR MORE, BY TYPE AND AREA, MICHIGAN, 1950 AND 1959.

TYPE	STATE		SRC-1 (NORTH)		SRC-2 (WEST)		SRC-3 (EAST)		SRC-4 (SOUTH)	
	1950	1959	1950	1959	1950	1959	1950	1959	1950	1959
Cash-grain	8,157	12,460	151	86	247	428	6,630	9,539	1,129	2,407
Other field crop	1,357	1,185	471	288	91	57	750	824	45	16
Vegetable	1,465	1,139	141	110	484	354	733	569	107	106
Fruit and nut	2,886	3,879	111	177	2,408	3,289	261	268	106	145
Poultry	2,276	1,774	181	189	838	756	941	562	316	267
Dairy	26,399	22,652	4,817	4,972	4,304	3,183	13,796	11,801	3,482	2,696
Other livestock	5,528	8,768	726	1,289	502	1,063	2,726	4,094	1,574	2,322
General	11,952	5,675	1,310	619	1,704	921	6,366	3,288	2,572	847
Miscellaneous	922	1,148	141	131	246	269	437	588	98	160
Total	60,942	58,680	8,049	7,861	10,824	10,320	32,640	31,533	9,429	8,966

The plan for raising both feed and replacements for a herd of 65 cows producing at the 10,000 pound level will serve here as a convenient benchmark. The estimated labor income for this plan with a milk price of $4.00 (net at the farm) would be approximately $3,800. Rather optimistic assumptions must be accepted in order to show comparable incomes under the more specialized plans. If replacements alone are to be purchased, for example, the 110-cow plan with sales of 10,000 pounds per cow or the 65-cow plan with sales of 11,000 pounds per cow would produce comparable incomes (Table 3.3). If both feed and replacements are to be purchased, the nearest plan to produce a comparable income would involve 225 cows and milk sales at the 12,000-pound level.

With milk netting $4.25 per hundredweight, the labor income for the benchmark plan would be about $5,500. At this milk price, buying both feed and replacements would become attractive with a herd of 110 cows and milk sales of 12,000 pounds per cow, or with a herd of 225 cows and sales of 11,000 pounds per cow. In general, the analysis does not show much income advantage for the more specialized plans unless one assumes (a) a relatively high milk price, (b) a sizable jump in the rate of production per cow, or (c) a sizable increase in herd size.

The Pattern for the 1960's

Altogether, the available evidence suggests that Michigan farms will continue to become more specialized during the 1960's, with the limitation

that feed crop production will still be closely associated with livestock production. In some cases, livestock producers will depend entirely upon market purchases of feed, and in some cases they may be able to work out contractual arrangements for obtaining feed supplies from their immediate neighbors. These cases will probably be exceptional instead of typical for some time to come. Cattle feeders already depend primarily upon purchased animals for stocking their feedlots; poultrymen will come to depend somewhat more on purchased replacements, and dairymen may move somewhat more gradually in the same direction.

TABLE 3.3 COMPARISON OF ESTIMATED LABOR INCOMES UNDER THREE DEGREES OF SPECIALIZATION ON A MICHIGAN DAIRY FARM. a/

SITUATION		GROW FEED AND REPLACEMENTS	GROW FEED AND BUY REPLACEMENTS		BUY FEED AND REPLACEMENTS	
MILK PRICE	MILK SALES PER COW	65 COWS (BENCHMARK PLAN)	65 COWS	110 COWS	110 COWS	225 COWS
$4.00	10,000 lbs.	$3,830	$2,200	$ 3,940	$-1,600	$ -270
	11,000 lbs.		4,100	7,230	300	2,570
	12,000 lbs.		5,880	10,400	2,690	4,980
$4.25	10,000 lbs.	$5,460	$3,800	$ 6,690	$ 1,150	$ 1,750*
	11,000 lbs.		5,880	10,250	3,330	8,750
	12,000 lbs.		7,760	13,400	5,990	11,700

a/ Data from calculations by C. R. Hoglund. The boxes indicate assumed conditions that will produce incomes equal to or larger than the benchmark situations.

CHAPTER 4. HOW MUCH INVESTMENT?

At the time when Michigan became a State, 40 acres of public land could be acquired for as little as $50, and a small additional sum was sufficient to establish a farm business large enough to employ a young man and his family. Today, productive Michigan farm land often sells for as much as $300 to $500 an acre, and investments of $40,000 to $100,000 or more are commonly involved in family-sized farm businesses. Rising land values, larger farm units, and the gradual substitution of capital for human labor are jointly responsible for the rising investments in typical farms.

The total value of production assets used in United States agriculture in 1960 was 4 times as large as in 1940.[1] Rising prices accounted for a large share of the increase, which would have been only 30 percent if prices had remained constant. Even at constant prices, however, the value of assets **per farm worker** doubled in the 20-year period, and the value of machinery per worker increased to almost 4 times the 1940 level. Similar changes have been taking place on Michigan farms.

The growth of investments per farm has been far from uniform. Small farms with a minimum investment in modern equipment and facilities exist side-by-side with large, highly capitalized units. One family may be fully employed in intensive vegetable production using 20 acres of moderately priced land and a minimum amount of equipment, while a second family may use 200 acres of land and expensive facilities for a 40-cow dairy business. A third family may have a total investment of several hundred thousand dollars in a highly mechanized cattle feeding operation employing two or three hired workers. Still another family may be employed in producing and retailing eggs from a medium-sized poultry flock housed in a converted barn on a few acres of land, and using a minimum of other facilities and equipment.

Certain enterprises commonly use more capital per worker than others Cattle feeding, for example, commonly uses more capital per worker than does specialized egg production.

Wide variations, however, are possible on successfully organized farms of any one type. In many cases, high investment patterns of organization will produce only about enough additional income to cover the added costs, as compared with low investment patterns of organization.

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[1] *Garlock, F. L., et. al. (1961). The balance sheet of agriculture, 1961. Agriculture Information Bulletin no. 247, U. S. Department of Agriculture.*

This might be true over the long run, for example, of the choice between an expensive gas-tight silo and an inexpensive bunker silo for storing corn silage. It is often true in substituting capital for labor, as well as in expanding a business by employing additional hired labor.

Investments to Establish New Units

Although capital investments in any one type of farm can vary widely, some comparative estimates for five different types of farms with livestock or poultry will be presented below. In each case. the business is designed to provide employment under modern technology for a full-time operator with a few months of part-time help from his family. High labor accomplishments, favorable crop yields, and superior livestock productivity are assumed for each farm business. These characteristics of the five plans are summarized in Table 4.1.

In each of the first four plans, the entire tillable acreage is assumed to be highly productive land capable of producing 80 bushels of corn, 16 tons of corn silage, or 3 tons of hay per acre under liberal fertilization and improved cultural practices. At these yields, the tillable acreage is large enough to produce all livestock feed except small amounts of protein supplement and other concentrates. Under the fifth plan, all feed is to be purchased. In each case, land is valued at $300 per acre, including drains but excluding buildings.

Buildings under the first plan include loose housing for the 35-cow milking herd and the young stock replacements. The cows will be milked in a pipe-line parlor, and are expected to produce 10,000 pounds of milk per cow. This level of milk production is 25 percent above the 1960 average for all cows in Michigan, but it is about average for herds of dairy cooperators in the Michigan State University farm account project.

The dairy herd is to be fed liberally on a ration including 2 tons of concentrates, 6 tons of corn silage, and 4 tons of hay equivalent in the form of hay grass silage, green chop, or pasture. Consequently, the investment for field equipment includes a forage harvester and blower, a hay conditioner, and a self-unloading wagon, in addition to two tractors, and other usual items. A silo unloader and silage feeder are included in the livestock equipment, along with a bulk tank and equipment for the milking parlor.

More silo space for storing silage and high moisture corn is included in the beef feeding plan, and field equipment includes a picker-sheller,

TABLE 4.1 CHARACTERISTICS OF FIVE LIVESTOCK ENTERPRISE ALTERNATIVES FOR FULL-TIME EMPLOYMENT OF A MICHIGAN FARM FAMILY IN THE 1960'S.

ENTERPRISE CHARACTERISTICS	KIND OF LIVESTOCK				
	MILK COWS	BEEF FEEDERS	BROOD SOWS	LAYERS (FEED GROWN)	LAYERS (FEED BOUGHT)
Number of head	35	200	56	5,000a/	10,000a/
Output per head yearly	10,000 lbs. of milk	980 lbs. liveweight	3,000 lbs. liveweight	18 doz. eggs	18 doz. eggs
Feed per head yearly					
Hay (tons)	4	0.5	--	--	
Corn silage (tons)	6	4	--	--	
Grain corn (bu.)	50	40	180	1.2	1.2
Other concentrates (lbs.)	500	450	2,500	28	28
Total feed used yearly					
Hay (tons)	190b/	100	--	--	--
Corn silage (tons)	240b/	800	--	--	--
Grain corn (bu.)	1,900b/	8,000	10,080	6,000	12,000
Other concentrates (tons)	10b/	45	70	70	140
Land use:					
Hay (acres)	63	33	--	--	--
Corn silage "	15	50	--	--	--
Grain corn "	24	100	126	75	--
Feedlots and buildings "	10	10	10	10	10
Total "	112	193	136	85	10
Investments c/					
Land	$33,600	$57,900	$40,800	$25,500	$ 3,000
Buildings	14,000	18,000	17,000	15,000	22,000
Livestock equipment	9,000	4,500	5,200	8,000	16,000
Field equipment	10,500	13,000	8,500	7,000	1,500
Livestock	14,000	20,000	3,000	8,500	17,000
Feed and supplies d/	1,500	19,000	6,000	1,000	2,000
Total	$82,600	$132,400	$80,500	$65,000	$61,500

a/ Pullets housed at 15 weeks of age.

b/ Includes feed for 10 replacement heifers raised yearly.

c/ Investments at new cost (undepreciated) except for field equipment, which is at 70 percent of new cost, representing the purchase of second-hand items.

d/ Includes a supply of feed to last until receipts from product sales begin.

as well as a forage harvester. The feed supply is calculated for feeding 200 calves from a weight of 400 pounds at purchase to a weight of 1,000 pounds at market, with a deduction of 2 percent for loss through mortality.

The swine enterprise involves keeping 56 brood sows producing two litters annually. Sales per sow are figured on the basis of 15 pigs weighing 200 pounds each, although a few gilts would be saved for replacements each year, and a few sows would be marketed instead of the gilts. Facilities would include a picker-sheller and storage facilities for high-moisture corn, or its equivalent in dry corn.

The fourth plan is for a poultry flock of 5,000 layers fed home-grown corn; the fifth is for a flock of 10,000 layers fed entirely on purchased feed. Replacements are assumed to be purchased under both plans, although results would not be greatly different if replacements were raised.

Total investments vary from $132,400 for the beef-feeding plan to $61,500 for the flock of 10,000 layers. In these figures, the investment in buildings and livestock equipment is figured at new cost, the investment in field equipment is figured at 70 percent of new cost on the assumption that many of these items will be acquired at second-hand prices, and the investment in feed varies with the length of time before income is realized. Thus, the totals are intended to show the sums needed to establish a new unit of each type; they do not reflect average investments after partial depreciation of buildings and equipment. They assume liberal application of costly new technology, but they represent conservative values for the cost of adopting this technology, and could easily be exceeded in the absence of cautious buying.

The estimated financial results of the five plans are summarized in Table 4.2, calculated on the basis of the planning prices presented earlier in Tables 2.4 and 2.5 (pp. 29-30). At first glance, it may appear a remarkable coincidence that the return for labor and management is estimated at $2,800 for each of the five plans. In fact, however, successful dairy, beef, swine, and poultry enterprises **do** exist side by side in Michigan; there is reason to believe that all have a place in the future for Michigan agriculture; and it would be surprising if capable operators could not expect roughly equivalent returns in any of these lines of production.

One individual, of course, may be better prepared to succeed in dairying and another in poultry or swine production, depending upon personal knowledge, experience, interests, and capital resources. The estimates in Table 3.2 suggest that an individual with limited capital would encounter more difficulty in establishing a successful beef feeding unit than in es-

TABLE 4.2 ESTIMATED FINANCIAL RESULTS OF FIVE LIVESTOCK ENTERPRISE ALTERNATIVES FOR FULL-TIME EMPLOYMENT OF A MICHIGAN FARM FAMILY IN THE 1960's.

ITEM	Kind of Livestock				
	MILK COWS	BEEF FEEDERS	BROOD SOWS	LAYERS (FEED GROWN)	LAYERS (FEED BOUGHT)
RECEIPTS					
Milk	$13,300				
Cattle	1,600	$43,100			
Hogs			$23,500		
Eggs				$27,000	$54,000
Fowl				1,600	3,200
Totals	$14,900	$43,100	$23,500	$28,600	$57,200
EXPENSES					
Feed	$ 900	$ 3,600	$ 7,700	$ 7,500	$28,200
Crop expense	1,200	2,600	1,900	1,100	------
Livestock bought	-----	20,000	-----	8,500	17,000
Other livestock expense	1,000	1,000	1,400	200	400
Gas and oil	600	1,000	700	500	100
Other machinary charges	2,500	3,200	2,500	2,500	2,500
Building charges	1,000	1,300	1,200	1,100	1,600
Taxes	400	600	500	400	300
Utilities & other	400	400	800	800	1,200
Totals	$8,000	$33,700	$16,700	$22,600	$51,300
NET INCOME	$6,900	$9,400	$6,800	$6,000	$5,900
Interest at 5 percent of investment	4,100	6,600	4,000	3,200	3,100
RETURN FOR FAMILY LABOR AND MANAGEMENT	$2,800	$2,800	$2,800	$2,800	$2,800
Return with 10 percent higher receipts	$4,300	$7,100	$5,100	$5,700	$8,500
Return with 10 percent lower receipts	$1,300	-$1,500	$ 500	-$ 100	-$2,900

tablishing some other type of farm business. Earnings for the beef feeding unit would also be especially affected by interest rates above the 5 percent level. Any of the common farm enterprises in Michigan, however, can offer promise for individuals suited for them by personal circumstances.

The last two lines of Table 4.2 show the variation in returns with receipts increased or decreased by 10 percent. Such variations would result if prices were above or below the planning levels, if livestock production rates were more or less favorable than assumed, or with some combination of these two types of possibilities. Note that returns from the 10,000 bird laying flock and the beef feeding enterprise are the most sensitive to a given percentage variation in receipts, and that returns from the dairy enterprise are the least sensitive to such a change.

Investments to Increase Returns on Existing Units

Only a small proportion of existing Michigan farms have total investments as large as those shown in Table 4.1. In part, this is because many assets now in use were acquired when prices were lower, and have since experienced some depreciation. It is also true that low investment plans sometimes have very little detrimental effect on earnings. Additional investments, however, would probably contribute to increased earnings on thousands of existing Michigan farms. This is especially likely to be true for businesses with annual farm product sales of less than $10,000.

Present investment levels

Average investments in land and buildings on various types of Michigan Census farms in four value-of-sales classes appear in Table 4.3.

TABLE 4.3 AVERAGE INVESTMENT IN LAND AND BUILDINGS BY TYPE OF FARM AND VALUE OF SALES, MICHIGAN, 1959.a/

TYPE OF FARM	ANNUAL FARM PRODUCT SALES			
	$2,500 TO 4,999	$5,000 TO 9,999	$10,000 TO 19,999	$20,000 TO 39,999
Cash grain	$26,627	$40,484	$70,684	$111,763
Other field crop	21,752	26,076	41,213	66,349
Vegetable	22,360	29,987	42,685	93,273
Fruit and nut	20,235	23,973	33,459	50,133
Poultry	15,597	22,455	27,700	31,196
Dairy	17,069	27,449	45,316	82,310
Other livestock	20,379	31,604	47,966	65,223
General	20,767	34,732	50,794	87,524
All types	20,957	31,068	48,514	73,239

a/ 1959 Census of Agriculture.

Clearly, the land and building resources on most farms in the two smaller groups are very limited for employing a family effectively on a full-time basis. Probably many families with farm product sales of $2,500 to $4,999 are no longer seeking full-time employment and a corresponding income from farming, but a large share of the families with sales of $5,000 to $9,999 still depend upon farming as their primary source of employment and income, and will continue to do so. Thus, it is not surprising that case studies throughout the State show many situations where additional investments of $4,000 to $20,000 or more can contribute substantially to improved financial success.

Results of investing in farm development

Studies of 12 Mecosta County farms in 1956, for example, showed that annual net incomes could be increased by an average of $2,000 per farm under revised management plans that required additional investments averaging $5,000 per farm.[2] Even so, several of the 12 families appeared likely to continue or expand their part-time employment in off-farm work.

By 1961, the number of families depending upon income from off-farm employment had risen from 4 to 7, and 3 of the 7 had terminated most of their farming activities. On the other hand, 5 of the 12 families made substantial farming adjustments in the direction of their revised plans, invested an average of around $6,000 per farm, and added about $1,600 per farm to their annual net incomes.

These results suggest the substantial gains that are possible when modest additional investments are used to implement carefully planned adjustments on farms with limited resources and low current incomes. Most of the 12 Mecosta County families had 1955 farm product sales of less than $10,000, and none of them had as large net incomes as the operators could have reasonably expected to earn in off-farm employment. Similar families in other counties of the State have made corresponding gains through making additional investments under revised management plans, and their experience has been paralleled in other areas of the country.[3] Thus, many families with limited resources and unsatisfactory incomes can expect to achieve improved results through carefully planned investments.

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[2] *Lord, E. F., and R. G. Wheeler (1956). Opportunities for higher incomes on Mecosta County farms. Michigan Agr. Expt. Sta. Quarterly Bulletin, article 39-15.*

[3] *Wheeler, R. G., and J. D. Black (1955). Planning for successful dairying in New England. Chapter IX. Harvard University Press.*

The probable results of three alternative levels of additional investment were estimated for 8 of the 12 Mecosta County farms (Table 4.4). All of the 8 farms showed remunerative opportunities at each level of investment. The farm operators could expect an average of $1,840, $2,540, and $3,700 added net income from investments of $5,000 per man, $7,500 per man, and $12,500 per man, respectively. The range in net income prospects can be partially explained by two factors. One is that the case farms were chosen to represent a diversity of farm situations. A second factor is that eyen within a group of farms similar in many characteristics, a wide difference can occur in the type of resources at hand and the capacity of the farm operator.

TABLE 4.4 ADDED NET INCOME PER OPERATOR FROM THREE LEVELS OF ADDITIONAL INVESTMENT ON 8 MECOSTA COUNTY FARMS. a/

FARMS	LEVEL OF ADDED INVESTMENT PER MAN		
	LOW ($2,500)	MEDIUM ($7,500)	HIGH ($12,500)
One-man farms:			
B	2,280	2,330	4,200
D	1,200	1,600	3,080
E	1,800	3,100	3,700
F	2,160	2,620	3,720
G	1,400	2,260	3,260
Two-man farms:			
A	2,260	3,180	3,980
C	2,040	2,610	4,500
H	1,600	2,600	3,200

a/ Lord, Edgar F., (1958). Investment opportunities on Mecosta County farms. p. 33. An unpublished thesis in the library of Michigan State University.

Under-investment and over-investment

Plans can often be developed for using modest additional investments in raising unsatisfactory incomes to more favorable levels on individual farms. Unfortunately, the families with the greatest need for additional investments are seldom the ones with ready access to the needed credit on favorable terms. Often, they have borrowed extensively to acquire the limited resources already in use, and additional borrowing would be risky if not impossible under the conventional credit arrangements of bankers and other lenders. The same families, moreover, often lack the information and experience for developing promising plans.

As a result, investments remain low on farms with too limited resources for producing satisfactory incomes, even while over-investment is taking place on farms with more adequate resources. Under the current situation, the risk of making investments which cannot be recovered

from additional earnings over a reasonable period of time is equally real on many farms.

Recovering added investments

If you were to invest $5,000 to $50,000 in buildings and equipment for expanding a dairy business, you would almost certainly be hoping to recover your investment, with interest, before the equipment wore out and before the buildings became obsolete. Thus, it is reasonable to ask how soon such investments can be expected to pay for themselves.

Dairy expansion, of course, also involves added investments in cows, feed, and perhaps in land. Prudent investments in land purchases can ordinarily be recovered simply by re-selling the land—it does not depreciate or become obsolete in the same manner as the buildings and equipment. Long range plans involving dairy expansion, moreover, usually provide for maintaining the expanded inventory of livestock and feed. These investments, like the land investment, can usually be liquidated and recovered on short notice. Investments in specialized buildings and equipment can also be recovered by re-sale if there is a prospect that the buyer can use them productively. If the original investor cannot expect to recover his investment in new facilities by using them, however, perhaps no one else will take them off his hands. Thus the prospects for recovering added investments in buildings and equipment warrant special study.

There are at least two ways of looking at the problem of recovering such investments. Both involve estimating changes in receipts and expenses.

A conventional approach is to include the estimated increases in depreciation and interest charges with other expenses in computing the change in net income. If a $2,000 silo with a prospective life of 20 years will add $450 to receipts, $50 to cash expenses, and $160 to interest and depreciation charges, it will add about $240 to annual net income. The gain computed in this way can be regarded as a continuous one, provided the additional assets can be used productively over the entire useful lifetime chosen for computing the depreciation charges.

The second approach is probably somewhat more realistic, especially in times of rapid change. All added net cash income of the early years is allocated to amortizing the added investment, leaving any true benefits of the investment to be realized after amortization is completed, yet before the end of the useful life. On this basis, the annual difference

between added receipts and added expenses is $400, not $240. Accordingly, the cost of the $2,000 silo could be repaid with 6 percent interest during the first 6 years of its life, and a $400 gain could be realized annually thereafter for 14 years.

Many dairymen would probably be willing to invest in a silo if they could expect to amortize its cost from the added earnings of the first 6 years. Even this might not seem a very favorable investment for individuals with limited capital or an uncertain future in dairying. If the amortization period were much longer, the merits of the investment would be even more uncertain, especially in view of the current rapid development of new techniques in the production, handling, storage, and use of dairy feeds.

Investments for major expansion programs will not always be easy to recover on farms where output has already been reasonably adjusted to the available supply of family labor and other resources. This will be illustrated below for a 20-cow dairy farm in Allegan County. Alternative plans involving expansion to 30, 50, 80, and 120 cows will be considered.

The Allegan farm includes 90 tillable acres located on moderately productive loamy soils, representative of land used for dairying in much of southern Michigan. The rotation includes corn, oats, and a three-year stand of alfalfa-brome mixtures (Table 4.5). Average yields of both grain corn and oats are 50 bushels; corn silage yields 10 tons per acre, and the

TABLE 4.5 HERD SIZE, CROPLAND USE, AND FEED SUPPLIES UNDER ALTERNATIVE PLANS ON THE ALLEGAN FARM.

ITEM	BENCHMARK PLAN	PLAN II	PLAN III	PLAN IV	PLAN V-A	PLAN V-B
Cows in milking herd	20	30	50	80	120	120
Heifers raised yearly	5	8	12	20	30	-
Cropland use						
Corn for grain	14 A.	14 A.	32 A.	21 A.	75 A.	-
Corn for silage	4 A.	4 A.	4 A.	87 A.	105 A.	30 A.
Oats	18 A.	18 A.	36 A.	54 A.	90 A.	15 A.
Alfalfa-brome	54 A.	54 A.	108 A.	108 A.	180 A.	45 A.
Total cropland	90 A.	90 A.	180 A.	270 A.	450 A.	90 A.
Feed produced						
Grain (corn equiv.)	1135 bu.	1275 bu.	2630 bu.	2400 bu.	6070 bu.	-
Forage (hay equiv.)	153 T.	183 T.	322 T.	623 T.	867 T.	290 T.
Feed purchased						
Grain (corn equiv.)	-	385 bu.	110 bu.	2400 bu.	1130 bu.	6600 bu.
Hay	-	45 T.	75 T.	-	65 T.	460 T.
Supplement	5 T.	7½T.	12½T.	20 T.	30 T.	24 T.

alfalfa stands produce 2.5 tons of hay equivalent per acre. These yields are much closer to State-average levels than the ones used in the budgets of Table 4.1. No crops are sold, the entire production being used to feed the milking herd and enough heifers to provide normal herd replacements.

All dairy animals are housed in a 40 x 60 ft. stanchion barn. A small upright silo provides limited storage space for corn silage. The operator is a capable dairyman who has been able to maintain average milk production of 10,000 pounds per cow. He hires no labor, but has about three months of help from a member of his family. The farm is free of debt.

Thirty cows could be housed in the dairy barn if a shed were erected for growing heifers. Corn and hay yields could be increased about 20 percent by heavier fertilization and other improved practices. A higher percentage of corn in the rotation would also increase total feed production.

Expansion to 50 or more cows would require major new structures, such as a milking parlor and a loafing barn. The investment estimates for the plans with 50 to 120 cows include a "double-four" herringbone milking parlor and a pipeline milking system for conveying milk into a bulk tank in a room adjoining the parlor (Table 4.6). They also include construction of loose housing for the three sizes of milking herds.

TABLE 4.6 ADDITIONAL INVESTMENTS FOR EXPANDING FROM THE 20-COW BENCHMARK PLAN ON THE ALLEGAN FARM.

ITEM	PLAN II	PLAN III	PLAN IV	PLAN V-A	PLAN V-B
Dairy housing	$1,700	$ 4,000	$ 6,000	$ 9,500	$ 8,500
Milkroom & parlor	1,000	4,000	4,000	4,000	4,000
Silos	-	-	8,000	12,000	3,500
Hay storage	-	500	-	6,000	-
Paving	-	2,000	3,000	4,000	3,500
Subtotal	2,700	10,500	21,000	35,500	19,500
Parlor equipment	-	3,000	3,000	3,000	3,000
Bulk tank	2,000	3,000	4,000	5,000	5,000
Silo unloader & feeder	-	-	3,500	4,000	4,000
Forage harv. equip.	-	800	4,000	4,000	3,000
Tillage equip.	-	2,000	4,000	6,000	-
Subtotal	2,000	8,800	18,500	22,000	15,000
Total dairy structures and equipment	$ 4,700	$19,300	$39,500	$57,500	$34,500
Livestock	$ 2,600	$ 7,400	$15,000	$25,000	$19,000
Land	-	18,000	36,000	72,000	-
Tenant house	-	6,000	6,000	12,000	6,000
Subtotal	2,600	31,400	57,000	109,000	25,000
Total added investment	$7,300	$50,700	$96,500	$166,500	$59,500

Plan III (the 50-cow plan) assumes purchase of a second 120-acre tract that would double the present cropland acreage. Feed production would be more than double the present level, but not twice as great as under the 30-cow plan, because the immediate yield potential of the purchased acres would probably be slightly less than for the original farm. Buying a hay conditioner and relying mainly on hay for forage appears more economical than expanding silo capacity for this plan.

Cropland is expanded to 270 acres for the 80-cow plan, and corn silage becomes an important part of the total roughage supply. This involves sizable investments in silos and silage handling equipment. The same pattern is continued in Plan V-A. As an alternative program for a 120-cow milking herd, Plan V-B assumes no expansion of cropland from the benchmark level, purchase of most of the feed supply, and contract rearing of replacement heifers at a cost of $240 each. The feed allowance is increased by 5 bushels of grain per cow under each of the last three plans, where careful individual feeding seems less feasible.

Estimated net incomes for the 30-, 80-, and 120-cow plans are higher than under the Benchmark Plan, as shown in Table 4.7. The actual level of milk prices, of course, will have a considerable effect on the size of the gains; an increase of merely 20 cents per hundredweight roughly doubles the amount of the gain for 3 of the plans.

Dairy expansion is seldom accomplished overnight; therefore, a transition period of at least one to three years must be anticipated before the full gains of any of the expansion plans can be realized. During the transition period, when the herd is being expanded, average herd production may fall below the level of the Benchmark Plan. The budgets in Table 4.7, however, reflect the results to be expected **after** the transition period, assuming that a herd average of 10,000 pounds per cow can be regained.

Even after the transition period, the substantial added investments in dairy structures and equipment will not be easy to recover from the income gains (Table 4.8). The amount recovered each year under any one of the plans is equal to the gain in net income over the Benchmark Plan, plus the charges made for depreciation and interest on the added dairy investments, as shown in the second sub-totals of Table 4.7. (The same answer would be reached more directly by subtracting the additional expense included in the first line of expense sub-totals in Table 4.7 from the added receipts.) The amount recovered annually is meaningful only in relation to the added investment; therefore, Table 4.8 includes a line to show the amount recovered per $1,000 of added investment in dairy

TABLE 4.7 COMPARATIVE FINANCIAL SUMMARY FOR ALTERNATIVE PLANS ON THE ALLEGAN FARM

ITEM	BENCHMARK PLAN	PLAN II	PLAN III	PLAN IV	PLAN V-A	PLAN V-B
Number of cows	20	30	50	80	120	120
Cropland acres	90	90	180	270	450	90
RECEIPTS						
Milk (@ $3.80 per cwt)	$7,370	$11,130	$18,620	$29,910	$44,920	$45,410
Cattle & calves	600	900	1,500	2,550	3,750	3,750
Total receipts	7,970	12,030	20,120	32,460	48,670	49,160
EXPENSES						
Labor-regular	-	-	2,400	3,000	5,400	3,000
-seasonal	-	600	-	1,200	1,200	600
Feed	450	2,130	2,970	4,440	5,440	20,000
Fertilizer & lime	700	1,210	2,500	3,710	6,130	380
Seed & crop supplies	220	260	500	750	1,080	240
Bedding	-	130	480	840	1,080	2,160
Misc. dairy	250	380	620	1,000	1,500	1,200
Heifers raised on contract	-	-	-	-	-	7,200
Electricity & telephone	230	270	350	470	700	630
Machine hire	50	50	-	-	-	-
Gas & oil	450	450	900	1,350	2,250	550
Repairs & upkeep	480	550	1,020	1,660	2,530	1,000
Depreciation of original buildings and machinery	1,200	1,200	1,200	1,200	1,200	1,200
Taxes and insurance	310	350	710	1,070	1,720	660
Interest on added investment in land and livestock	-	130	1,570	2,850	1,250	5,450
Subtotal	4,340	7,710	15,270	23,540	35,670	40,070
Charges for added dairy structures and equipment:						
Depreciation of structures	-	130	520	1,050	1,770	970
Depreciation of machinery	-	200	880	1,850	2,200	1,500
Interest on av. investment	-	140	580	1,180	1,730	1,030
Subtotal	-	470	1,980	4,080	5,700	3,500
Total expenses	4,340	8,180	17,250	27,620	41,380	43,570
NET INCOME (with milk at $3.80 per cwt)	3,630	3,850	2,870	4,840	7,290	5,590
Increase over benchmark plan	-	+ 220	- 760	+1,210	+3,660	+1,960
Additional milk receipts at a price of $4.00/cwt.	390	590	980	1,570	2,360	2,390
Net income with milk at $4.00/per cwt.	4,020	4,440	3,850	6,410	9,650	7,980
Increase over benchmark plan	-	+ 420	- 170	+2,390	+5,630	+3,960

structures and equipment. This figure can be used in determining from standard amortization tables the number of years required for complete recovery of the investment with interest (see Table 9.21, p.120).

With milk at $3.80 per hundredweight (net at the farm), the shortest amortization period is 8 years, even assuming the full gain in income that is to be realized after the transition period. By the end of the amortization period, some of the equipment would almost surely need to be replaced, moreover. A dairyman would wait a long time before benefiting from expansion unless he could do better, in one or more respects, than has been assumed in this analysis. With a $4.00 milk price, the amortization period would be shortened by two years or so, and with a $4.20 milk price, other things being equal, the prospect for expansion would be mildly encouraging. The prospect would also be more encouraging if the operator could anticipate average herd production at a higher level, or improve upon any of the assumptions which have been accepted as realistic for this analysis.

Note that the amortization period is approximately the same for Plans V-A and V-B if milk sells for $3.80, but that a $4.00 milk price results in a shorter amortization period for Plan V-B, where most of the feed supply is purchased and where heifers are raised on contract. If hay could be purchased for $20 a ton instead of $23, Plan V-B would also appear more favorably.

TABLE 4.8 RATE OF RECOVERING ADDITIONAL INVESTMENTS IN DAIRY STRUCTURES AND EQUIPMENT UNDER ALTERNATIVE PLANS ON THE ALLEGAN FARM

ITEM	BENCHMARK PLAN	PLAN II	PLAN III	PLAN IV	PLAN V-A	PLAN V-B
Additional investment in dairy structures & equipment	-	$4,700	$19,300	$39,500	$57,500	$34,500
Investment recovered annually after transition, with milk at $3.80 per cwt.:						
(a) Gain in net income	-	220	-760	1,210	3,660	1,960
(b) Depreciation and interest charges	-	470	1,980	4,080	5,700	3,500
Total	-	690	1,220	5,290	9,360	5,460
Amount recovered annually per $1,000 of added investment in dairy structures and equipment	-	147	63	134	162	158
Total time to recover added investment in dairy structures and equipment, with 6 percent interest and with milk at $3.80 per cwt.	-	9 yrs.	a/	10 yrs.	8 yrs.	8 yrs.
Total time to recover added investment in dairy structures and equipment, with 6 percent interest and with milk at $4.00 per cwt.	-	7½yrs.	a/	8 yrs	6½yrs.	5½yrs.

a/ More than 10 years, the expected lifetime of the added equipment.

This analysis, like many others, suggests that farmers should proceed with extreme caution in starting expansion programs that may eventually require large additional investments and extended repayment periods. Where output has already been reasonably well adjusted to the available supply of family labor, land, and other resources, there may be little to gain. If some of the available resources are not fully utilized, of course, the prospect for recovering modest investments in a short time may be much more favorable. Both the individual and the industry, however, are likely to suffer from unwise investments in expansion, since excess productive capacity is likely to burden the entire industry for many years. There is an urgent need for giving priority of attention to adjustments that do not tend to expand total investments and total inputs.

Acquiring Control of Resources

The problem of finding capital for investments in farming has largely been ignored so far in this chapter. This is entirely appropriate, because promising investment opportunities need to be identified before efforts are devoted to finding investment capital. Finding capital for new investments, moreover, is almost inseparable from the larger problem of acquiring resources for the entire farm business and also for family living. Only a very brief summary of some key points involved in farm finance will be discussed below.[4]

The need for using credit to acquire resources

Farming is a business of producing marketable products from resources such as land, labor, livestock, feed, fertilizer, and electricity. We've heard that it's hard to make bricks without straw; similarly it's hard to farm without resources. Credit is one means of providing an adequate supply of resources for doing a successful job of farming; other possibilities are to have the resources to begin with, to steal them, to "marry" them, or to join with others in providing them through a corporate or partnership form of business organization.

Will it pay to borrow?

Probably most farmers would be reluctant to borrow money for acquiring farming resources unless they expected to increase their return by more than the costs of borrowing the money. Changes in costs and returns for any specific investment plan can be estimated by the budgeting technique that has been already illustrated. Satisfactions and costs of a non-monetary character may also need to be considered among the

[4] *For a more extensive discussion, see John Brake et. al. (1961). Farm and Personal Finance, Michigan State University Press.*

favorable or unfavorable features of the plan. Largely, however, the answer to the question "Will it pay to borrow?" is simply, "Figure it out!"

In doing this kind of figuring, conservative estimates about the physical performance of crops, livestock, and people are highly desirable. Future crop yields cannot be estimated on the basis of the success of a single, memorable year; livestock performance rates must allow for the bad years along with the good, and for the occasional misfortunes occasioned by outbreaks of disease; and labor accomplishments must be planned on a realistic level, remembering that a hired worker does not always perform exactly like an owner-operator. The importance of a 10 percent variation in output per animal was illustrated in the last two lines of Table 4.2.

Meeting a repayment schedule

Whereas returns in farming tend to be highly variable from month to month and from year to year, the terms of a schedule for repaying borrowed money are often fairly rigid. Before committing yourself to meeting such a schedule, consider these three questions:

(1) How does your combined schedule of repayments due at various times compare with your prospects for (a) meeting current farm and family expenses and (b) having enough left over for debt payments?

(2) Can the repayment schedule be made more flexible to permit advancing or delaying payments in accord with variable farm results?

(3) Can the repayment schedule itself be geared to farm output or net income?

Providing security for the lender

Credit is commonly classified into several major types, according to the type of security to be provided.

(1) Real-estate mortgage loans—loans secured by a mortgage on real estate. These are commonly obtained when sizable investments are to be made in buying or improving land, constructing buildings, etc. Such investments are likely to be productive over a long period of time, and the repayment schedule is likely to run for as much as 10 to 40 years.

(2) Chattel mortgage loans—loans secured by a lien or mortgage on property such as livestock, machinery, crops, or household assets. Most of these loans are made for periods of 5 years or less, including many on a yearly basis, sometimes with renewal privileges.

(3) Other secured loans—loans for varying periods of time, secured by deposit of negotiable securities, life insurance policies, or other intangibles.

(4) Conditional sales contracts—often used in acquiring automobiles, farm equipment, and household appliances, with the seller retaining title to the property until payment is completed.

(5) Unsecured loans—loans made on the basis of one or more signatures, without encumbering any specific assets.

Shopping for a lender

Shopping for credit is much like shopping for commodities—you are the buyer, and you will be paying for your purchase. You have an interest in the prospective lender's honesty and fairness, his experience with farming and farm lending, his lending policies, his charges, and his permanency and dependability. Common sources of farm credit include commercial banks, life insurance companies, federal land bank and production credit associations, the Farmers Home Administration, merchants, small loan companies, and individuals.

Comparing loan costs

There are many different ways of quoting the rate to be charged for the use of money. In particular, a finance charge added to an installment loan is very different from simple interest on the unpaid balance, expressed in percentage terms. Also, a given rate of discount does not represent the same charge as a rate of interest. Incidental charges other than interest must also be considered, along with any credit charges that are included in the price of the item to be purchased. Some loans may involve paying for more credit than is needed—another extra cost to be considered.

Coordinating credit from various sources

The use of credit from a variety of sources at one time may have drawbacks for both the borrower and the lender. Success or failure of

the borrower's farm business may depend upon the availability of an entire credit package. A new poultry house, for example, would be of dubious value if there were no financing for birds and feed.

Even if the total plan can be put in operation with credit from several different sources, the repayment schedules may not fit together very well. If the repayment schedules cannot be met, some lender will come out short, and no one lender will be in a good position to take full responsibility for adjusting the rate of repayment. If two or more lenders are to participate in financing a farm business, there are advantages to be gained by some coordination between them.

Business control exercised by the lender

Traditionally, the institutional lenders have seldom attempted to exercise much control over the management of farm businesses. Sometimes their experience may not even have equipped them to provide useful guidance. In the poultry business today, however, some sources of credit involve a transfer of many management functions to the lending agency. In accepting credit for housing, birds, and feed, for example, an egg producer may find that he has also given up some degree of control over where he will sell his eggs, where he will buy his feed, when he will replace his flock, how he will attempt to prevent or control disease, and how he will manage other aspects of his business. Whether this is good or bad is a matter of personal viewpoint, but it should be **considered** in examining sources of credit for poultry and egg production. Parallel statements would apply for other farm enterprises.

Risk or uncertainty in using credit

Almost any use of credit involves risk or uncertainty. For some people, the alternative of using no credit involves no risk—it guarantees starvation! Farmers naturally try to balance the possible gains from using credit against the risks involved.

Small loans to farmers with large equities usually involve very little risk for either the borrower or the lender. As the need for credit increases, the risks usually increase also.

When possible losses are large, strategies for overcoming or reducing risk become important. The possible losses from a farm fire would be large for most of us, so we carry fire insurance on our homes and farm

buildings. In farming, diversification was formerly regarded as an effective strategy for avoiding certain risks.

Production contracts have recently come into the picture as a means of reducing risks in farm production. There are many possible variations, with greater or lesser effectiveness for the producer and other interested parties. Egg production contracts provide a typical illustration. In most versions, the contract applies for a period of one year, or for the life of a single flock, whereas the producer becomes committed to paying for a poultry house and equipment over a period of at least 5 or 10 years. A contract extending over 5 or 10 years, with a rental payment provided for an empty house, would be far more significant in reducing risks for the producer.

CHAPTER 5. HOW MUCH MACHINERY AND EQUIPMENT

Perhaps no decisions have received more attention from Michigan farmers in recent years than those involved in choosing appropriate combinations of machinery and equipment. Strong pressure for increased mechanization and automation has resulted from the relative shortage of labor which has continued over the last 20 years. Sometimes, in fact, the question of whether or not to purchase elaborate new machinery has seemed superfluous, and one new technique after another has been adopted almost automatically.

Although machines have replaced large amounts of labor on Michigan farms, the implications of mechanization cannot be measured entirely in these terms. In some cases, improved machines have permitted a larger output from essentially unchanged inputs of labor and machinery. The development of speedier tractors might be used to illustrate this kind of change. In other cases, improved machinery has permitted a saving in other inputs. A more accurate drill, for example, could represent a substitution of machinery for seed or fertilizer. In still other situations, large, complex machines are substituted for simpler ones without having much effect on proportional relationships among inputs and outputs.

Adjustments in machine use sometimes involve the substitution of capital investment in machinery for operating inputs. Many farmers have recently been considering the possible savings in gasoline expense that could be realized by the added investment needed to buy a diesel tractor. This choice suggests that there are several different ways of measuring the amount of machinery in use.

The question "How much machinery?" can be answered in terms of (a) total machinery investment, (b) total annual machinery expense, (c) the extent of machinery inputs relative to labor inputs, (d) the extent of machinery inputs relative to all other inputs, or (e) in various other ways. Some choices relating to total machinery investments have already been mentioned in the discussion of the Allegan Farm (see page 55), where the sizable investments needed for a heavy silage feeding program appeared economical for the 80-cow plan but not for the 50-cow plan.

In similar fashion, many other decisions about machinery purchases must be answered by comparing alternatives for a specific farm situa-

tion. A machine that would prove economical for one situation where it could be used close to capacity might prove extremely costly for another situation where its use would be sharply limited. Owning a combine, for example, may be economical for the farmer with 150 acres of grain to harvest, but custom combining would probably be cheaper for the man with only 20 acres.

Even if the purchase of a given machine were to offer the same prospective savings to two individuals, their decisions might be different. One might have superior uses for his extremely limited supply of capital, while the other might be glad to accept a modest return on additional machinery investment. Different attitudes toward long-term commitments might also be involved.

Each new machine or technique poses two kinds of questions for the farm operator. First, he needs to decide whether he can take immediate advantage of the new development without making other major changes in his business activities; second, he needs to consider whether the new development would be more advantageous if adopted in combination with other adjustments. In many cases, the full benefits of a new technique can be realized only after major adjustments in the organization of the entire business.

Mechanizing the Fruit Harvest

These points are well illustrated by the choices which now face Michigan fruit growers with the rapid development of mechanical harvesting and handling techniques. New mechanical aids can now be employed in two distinct phases of harvest-season operations. Tree shakers and catching devices are capable of separating fruit from the tree and depositing it in containers for transportation from the orchard; bulk boxes and fork-lift trucks are available for handling harvested fruit. These two kinds of mechanization have specific but limited applicability to various kinds of fruit.

Recent experiments indicate that the new mechanical harvesting equipment can be used in harvesting plums, cling peaches, and possibly sweet cherries to be sold for canning, as well as for the tart cherry crop for which they are especially well adopted.[1] Apples and pears can be handled in bulk boxes with the prospect of less bruising than when conventional field crates are used. Fork-lift trucks have a variety of possible applications in harvesting and handling tree fruits.

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[1] *Gaston, H. P., J. H. Levin, and S. L. Hedden (1959). Mechanical harvesting of cherries, plums and blueberries in 1959. Eighty-ninth Annual Report of the Michigan State Horticultural Society.*

A study based on preliminary performance estimates shows that mechanical harvesting of tart cherries can be expected to increase net farm incomes when moderate acreages and fairly high yields are involved.[2] With performance at the rate of 12 trees per hour, growers could expect a gain from mechanical harvesting of as few as 14 acres yielding 4 tons per acre (Table 5.1). With improved performance, mechanical harvesting of even 7 acres appears worthwhile. The prospective gains are much larger for growers with larger acreages, however, especially when yields are well above the State average level.

The same study also examined the possibilities in using fork-lift equipment and bulk boxes for mechanical handling of tree fruits on 7 case-study farms. Again, the possible gains varied widely, according to the specific situation on the individual farm (Table 5.2). The net income changes varied from a decrease of $20 on Farm B to a gain of over $3,000 on Farm K. Farms with a large volume of apples and pears to handle are likely to gain the most from mechanical handling, whereas a large

TABLE 5.1 COMPARISON OF FINANCIAL RESULTS FROM MECHANICAL HARVESTING AND HAND HARVESTING ON VARIOUS ACREAGES WITH THREE DIFFERENT YIELD LEVELS. a/

			MECHANICAL HARVEST, STANDARD PERFORMANCE			MECHANICAL HARVEST, IMPROVED PERFORMANCE	
ACREAGE	YIELD PER ACRE	TOTAL HAND HARVEST COSTS	TOTAL COSTS	REDUCED RECEIPTS	NET ADVANTAGE	TOTAL COSTS	NET ADVANTAGE
7 acres	6T.	$ 2,400	$1,560	$ 230	$ 610	$1,450	$ 950
	4T.	1,660	1,510	160	-10	1,410	250
	2T.	880	1,460	80	-660	1,370	-490
14 acres	6T.	4,910	2,160	460	2,290	1,930	2,980
	4T.	3,280	2,060	310	910	1,850	1,430
	2T.	1,790	1,970	150	-330	1,800	-10
22 acres	6T.	7,450	2,850	730	3,870	2,470	4,980
	4T.	5,500	2,680	480	2,340	2,370	3,130
	2T.	3,000	2,550	240	210	2,280	720
28 acres	6T.	9,830	4,210	920	5,620	3,740	6,090
	4T.	7,030	4,010	620	2,400	3,610	3,420
	2T.	3,320	3,840	310	-830	3,490	-170
40 acres	6T.	13,970	5,220	1,320	7,430	4,750	9,220
	4T.	10,130	4,920	880	4,330	4,540	5,990
	2T.	5,770	4,680	440	650	4,350	1,420
65 acres	6T.	23,330	8,450	2,140	12,740	7,340	15,990
	4T.	16,050	7,970	1,430	6,650	7,020	9,030
	2T.	9,290	7,550	710	1,030	6,740	2,550

a/ Ricks, D. J. and R. G. Wheeler (1961). Farm management aspects of mechanical harvesting and handling of tree fruits in Michigan. Michigan Agricultural Experiment Station Quarterly Bulletin article 43-66.

[2] *Ricks, D. J., and R. G. Wheeler (1961). Farm management aspects of mechanical harvesting and handling of tree fruits in Michigan. Michigan Agricultural Experiment Station Quarterly Bulletin, article 43-66.*

acreage of high yielding tart cherries is likely to produce the large gains from mechanical harvesting.

These conclusions led to a further examination of gains that would be possible with long-range adjustments in the acreage combinations of the various tree fruits on the selected case-study farms. The procedure of discounting future incomes to the year 1960 at a rate of 5 percent a year was followed to permit a simplified comparison of net income flows over time.

TABLE 5.2 SUMMARY OF EXPECTED CHANGES IN ANNUAL COSTS AND RETURNS FROM SUBSTITUTING MECHANICAL HANDLING EQUIPMENT FOR HAND LABOR ON SEVEN FRUIT FARMS. a/

FARM AND MAIN CROPS	ACRES	PRODUCTION	CONTAINER SAVINGS	TOTAL LABOR SAVINGS	ADDED RECEIPTS	TOTAL CREDITS	EQUIPMENT COSTS	GAIN FROM MECHANICAL HANDLING
Farm A								
Apples	40	14,000 bu.	$280	$ 530	$140	$ 950		
Pears	37	12,000 bu.	100	460	---	560		
Cherries	14	65 T	---	460	---	60		
Total			380	1,050	140	1,570	260	1,310
Farm B								
Apples	19	5,000 bu.	---	200	50	250		
Peaches	9	1,600 bu.	---	30	---	30		
Cherries	7	25 T	---	20	---	20		
Total			---	250	50	300	320	-20
Farm D								
Apples	7	2,800 bu.	50	100	30	180		
Peaches	28	9,000 bu.	---	120	---	120		
Total			50	220	30	300	210	90
Farm E								
Apples	43	10,000 bu.	---	410	100	520		
Peaches	13	1,300 bu.	---	20	---	20		
Plums	16	1,600 bu.	---	60	---	60		
Cherries	24	80 T	---	60	---	60		
Total			---	550	100	650	320	330
Farm F								
Apples	49	13,000 bu.	120	530	130	780		
Peaches	36	5,000 bu.	---	70	---	70		
Cherries	29	80 T	---	60	---	60		
Total			120	660	130	910	260	650
Farm K								
Apples	110	36,000 bu.	930	2,050	360	3,340		
Pears	23	5,000 bu.	---	220	---	220		
Plums	4	1,200 bu.	---	40	---	40		
Peaches	18	3,500 bu.	---	70	---	70		
Cherries	45	160 T	---	150	---	150		
Total			930	2,530	360	3,820	870	3,050

a/ Ricks, D. J. and R. G. Wheeler (1961). Farm management aspects of mechanical harvesting and handling of tree fruits in Michigan. Michigan Agricultural Experiment Station Quarterly Bulletin article 43-66.

Estimates for Farm A showed that a 70-percent increase in tree-fruit acreage would add $1,000 per year to the average discounted net income for the 20-year period from 1960 to 1980. At maturity of the new plantings, mechanical harvesting of the cherry crop would increase net income by $800 per year, whereas purchase of equipment for harvesting the 1960 acreage would reduce net income. Furthermore, adoption of mechanical handling equipment for the 1960 acreage would have added only $700 to average annual net income, whereas using the same equipment on the expanded fruit acreage will add about $1,300 per year after mature production is attained.

Similarly, the operator of Farm D could gain by adopting both mechanical harvesting and mechanical handling after acreage expansion, but he would have little to gain from either mechanical harvesting or handling until after making acreage adjustments. This is typical of the problem in achieving the full benefits of almost any major new technological development.

Mechanization in the Laying House

Ventilating fans, pit cleaners, and automatic feeders are among the items that contribute to an appearance of high investment and high mechanization in the modern poultry house. The appearance is partially misleading, because the modern house contains nearly 3 times as many birds per unit of floor space as the house of a few years ago. Investments in equipment have substituted in part for investments in the actual house structure, and some savings in labor have resulted incidentally from the higher concentration of birds. In addition, machinery has been substituted directly for labor with the introduction of automatic feeders, waterers, and egg gathering equipment. The labor-saving potential of these devices is such as to leave little doubt about the wisdom of incorporating them in new construction; a more difficult problem faces the established poultryman with houses that do not provide similar opportunities for minimizing labor inputs.

The problem facing these poultrymen gives added emphasis to the current need for limiting new investments in specialized facilities to those that can be recovered or amortized in a relatively short period of time. Poultry houses can become obsolescent in much less than 10 years, even if they are built to last 50. Continued use of an obsolescent house may be the best alternative in an unfavorable situation, but such a situation can often be avoided by more caution in making new investments or by investing in facilities of a less specialized design, adaptable for a wider variety of alternative uses. The poultry house of 20 or 30 years ago had few uses except for housing layers; some of the designs in use at present

TABLE 5.3. VARIATION IN MACHINERY INVESTMENT AND MACHINERY EXPENSE PER TILLABLE ACRE ON DAIRY FARMS IN THE MSU MAIL-IN ACCOUNT PROJECT, 1960. a/

GROUP	HIGH	MEDIUM HIGH	MIDDLE	MEDIUM LOW	LOW
	Machinery investment per tillable acre				
Southern Michigan					
-under 30 cows	$247	$155	$122	$ 93	$ 44
-30 to 49 cows	539	137	107	88	46
-50 or more cows	239	180	145	110	65
Northern Michigan					
-under 30 cows	222	138	92	65	19
-30 to 49 cows	204	136	99	82	53
	Machinery expense per tillable acre				
Southern Michigan					
-under 30 cows	$ 45	$ 25	$ 20	$ 16	$ 9
-30 to 49 cows	56	26	21	17	10
-50 or more cows	48	30	23	20	14
Northern Michigan					
-under 30 cows	40	27	18	14	6
-30 to 49 cows	53	27	21	15	8

a/ Brown, (1961). Dairy farming today. Agricultural Economics mimeos 819 and 820. Cooperative Extension Service. Michigan State University.

can be modified for general-purpose storage use or for housing other kinds of livestock.

Too Much Machinery?

A survey of any sizable group of Michigan farms of a given type would reveal wide variations in the size of the machinery inventory and the extent of its use. Table 5.3 illustrates the variation in machinery investment and machinery expense for several different groups of dairy farms included in the 1960 MSU Mail-In Account Project. In most cases, the "high" figure is 4 to 6 times as large as the "low" figure.

How can dairymen continue to operate successfully with such wide variations in machinery inputs? Part of the answer is that not all of the cooperators in any one group are equally successful, and part of the answer is that figures on machinery inputs over a period of years for any one farm would be more nearly equal than those for a single year. The dairyman with only $6 machinery expense per tillable acre in 1960 would probably have a considerably higher average machinery expense over a period of 3 to 5 years.

Normal machinery inputs, nevertheless, do vary widely on the farms of dairymen and other farmers who are relatively successful. Large inputs of machinery can be substituted for labor in farming, but the costs of mechanization are often high enough to offset most of the saving in labor expense. Under these conditions, the choice between a highly mechanized plan and a plan with minimum investment in machinery becomes almost a matter of indifference, from the viewpoint of net earnings. If capital is extremely limited, the minimum investment plan will be chosen, whereas if capital is not limited, a highly mechanized plan may offer much in the nature of personal satisfaction.

On the whole, the current situation provides wide opportunity for substituting between labor and machinery in attaining a specified level of output. The conservative operator, willing to continue with a minimum of expensive equipment, is still demonstrating an ability to survive the competition of his highly mechanized neighbor. Rarely, however, can it be shown that the latter would be more successful with less machinery, especially when the added machinery has helped to increase farm output substantially.[3]

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[3] *These findings are supported by a variety of evidence, including the following unpublished papers: Van Gigch, F. L. (1960). How much machinery can Michigan farmers afford? Wheeler, R. G. and Solon Barraclough (1955). The integration of labor and machine use in the northeast.*

CHAPTER 6. HOW BIG?

The question of farm business size has arisen in connection with each of the topics already discussed, and an approach for answering the question has already been suggested through several illustrations of comparative budgeting. Some general comments and summary will be presented here.

Note that there are many different ways of measuring business size. Total investment, total income, total expense, total acres, crop acres, number of cows, number of chickens, acres of cash crops, and total labor inputs are among the possibilities. Any one of these measures may be appropriate for measuring the size of a particular kind of business for a particular purpose. Farm size within a group of specialized Michigan dairy farms can be compared rather meaningfully in terms of cow numbers, but total labor inputs may provide a more meaningful way of comparing poultry and dairy farms.

Two Approaches

Two general approaches have been widely followed in trying to answer the question of "How big?" Both methods really involve an attempt to project future results for a particular farm business, but one involves direct forward-looking estimates of performance on the individual farm, whereas the other involves an appraisal of the success of actual farm businesses of various sizes. The latter method involves historical comparisons; the former involves comparative budgeting.

Historical Comparisons

The method of historical comparisons appeals to many as a simple and factual approach to determining optimum farm size. At first glance, this method may seem more precise than comparative budgeting, which involves making estimates or assumptions about all aspects of performance and price prospects for businesses of various sizes on the farm in question. In fact, however, the validity of the method of historical comparisons also depends upon an important assumption—the assumption that variations in the past experience of large and small farms will be repeated on the farm in question in the future.

This assumption is open to question for at least two reasons. First, we are really concerned about experience in the future, when prices, tech-

nology, and other conditions are not likely to be the same as in the past. Second, we are concerned about the variation in results which **a given operator** would experience with a larger or smaller business. This is not the same as the variation in the experience of a number of **different operators** on farms of various sizes. No group of actual farms is likely to be operated by identical individuals with identical capabilities and identical resources. The men who have operated large businesses in the past have probably differed in many respects from the men who operated small businesses. We do not know that the small-scale operators could have duplicated the results of the large-scale operators, or **vice-versa.**

Another problem in making inter-farm comparisons is the choice of a measure of size of business. Gross income is often chosen as a convenient measure of size, but when records for a single year are sorted on this basis, a biased image of the relationship between business size and net income is likely to result. This is true because the farms with abnormally low yields tend to fall in the smaller size groups and the farms with abnormally high yields tend to fall in the larger size groups. The same kind of bias tends to arise whenever any output-related measure of farm size is used. This amounts to saying that we cannot use output as a measure of size if we are trying to determine the relationship between size and output. To a lesser extent, similar problems exist in using total inputs as a measure of farm size.

For much the same reasons, sorting farm business records into high and low income groups tends to produce biased estimates of income variations associated with size. Figure 6.1 shows data relating herd size to 1957-58 labor incomes per operator on 176 specialized dairy farms in southern Michigan. Each dot represents the two-year average experience on one farm. Two lines based on group averages from these data appear in Figure 6.2; line A connects group averages for four groups sorted according to herd size; line B connects group averages for four groups sorted according to labor income per operator.

Line A shows that the 44 dairymen with the largest herds had higher incomes than the 44 dairymen with the smallest herds. On the average, labor income per operator increased about $45 for each additional cow. Looking at Line B, however, one might (mistakenly) anticipate a much larger income gain with herd expansion. A more accurate interpretation of Line B is that the low income farms had almost as large herds as the high income farms. In other words, perhaps herd size was not a very significant factor in determining labor income per operator.

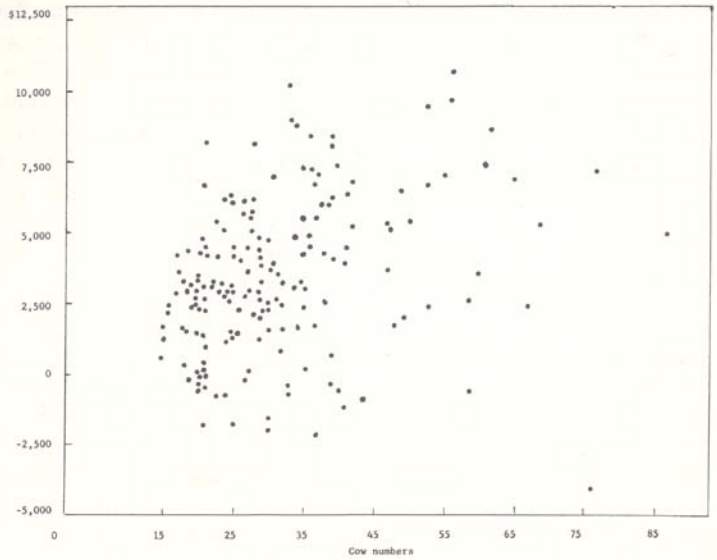

Fig. 6.1—Relation between average herd size and labor income per operator on 176 specialized dairy farms in Southern Michigan, 1957-58.

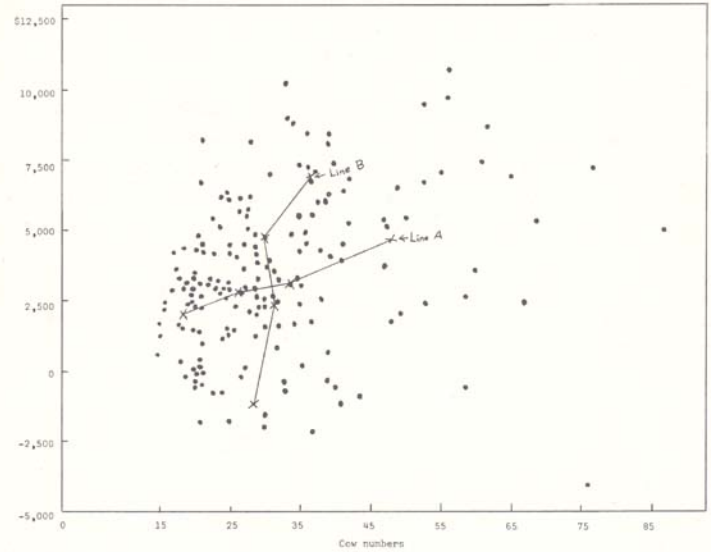

Fig. 6.2—Relation among group averages with respect to herd size and labor income per operator on 176 specialized dairy farms in Southern Michigan, 1957-58.

This conclusion is supported by data in the last column of Table 6.1, as well as by the wide scatter of the dots in Figure 6.1. Note that some dairymen in each of the four groups had labor incomes of $8,000 or more, and also that some dairymen in each group had labor incomes of minus $1,800 or more. Factors other than size of herd were of major importance in determining the final results. Similar conclusions with respect to the general problem of business size can be reached from data for poultry and fruit farms (Figure 6.3 and 6.4).

Comparative Budgeting

Whereas problems of measurement present the main difficulties in using historical comparisons as a guide in determining farm size, problems of estimation present the main problems in comparative budgeting. Here, one must estimate how a particular operator will succeed in doing something he has never done before, under conditions which he has probably never experienced before. Historical experience on the given farm is usually taken as a starting point, but experience of other farmers and evidence from experiments will probably also be considered.

If a dairyman has found himself fully occupied in caring for 18 cows in a stanchion barn, he can hardly expect to care for 30 in the future without drastic changes in facilities or additional hired help. On the other hand, experience with a modern milking parlor on a neighboring farm may suggest the accomplishments which could be expected with a change in facilities. Similarly, the dairyman who has been obtaining average herd production of 8,000 pounds per cow cannot expect to achieve 12,000 pounds per cow without adopting many of the practices followed by the dairyman with a 12,000 pound herd.

Estimating changes in performance rates with a drastic change in farm size is particularly difficult. Hired workers do not always work at the same rate and with the same effectiveness as a farm operator, and a 10-man labor force cannot always accomplish 10 times as much as one man, if for no other reason than because of the time that is consumed in

TABLE 6.1 HERD SIZE AND RANGE IN LABOR INCOME PER OPERATOR ON 176 SPECIALIZED DAIRY FARMS IN SOUTHERN MICHIGAN, 1957-58.

NUMBER OF COWS	NUMBER OF FARMS	LABOR INCOMES PER OPERATOR	
		AVERAGE	RANGE
15.4 to 21.9	44	$ 2,200	$-1,930 to 8,190
22.2 to 29.2	44	3,360	-1,820 to 8,040
29.4 to 37.6	44	3,460	-2,270 to 10,120
37.8 to 87.8	44	4,280	-4,070 to 10,980
All farms	176	$ 3,310	$-4,070 to 10,980

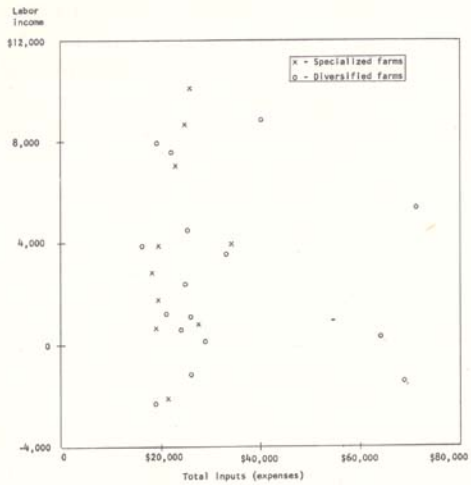

Fig. 6.3—Total inputs and labor incomes on the farms of 26 commercial egg producers in Michigan, 1960.[a]

[a] *Wheeler, R. G. (1959). Poultry farming today. Agricultural Economics mimeo 818. Cooperative Extension Service. Michigan State University.*

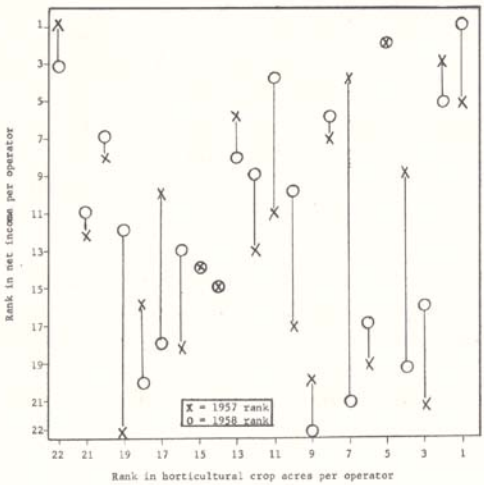

Fig. 6.4—Relationship between rank in horticultural crop acreage per operator and rank in net income per operator on 22 identical specialized fruit farms, 1957-58.[a]

[a] *Wheeler, R. G. (1959). Fruit farming today. Agricultural Economics mimeo 749. Cooperative Extension Service. Michigan State University.*

directing and coordinating their activities. The operator's attention to details, moreover, is spread thinner and thinner as a business expands, offsetting some of the gains that are possible with fuller use of machinery and other facilities. Such factors as these are crucial in determining the economies or diseconomies of scale, but seldom is there much evidence relating directly to their effects on performance in a given farm situation. Reasonable judgments about what is possible must play a large part in the evaluation.

Much of the remainder of this bulletin will be devoted to providing information that can be used in estimating results of variations in farm size and organization. Remember, however, that none of this information can provide much guidance on how YOUR performance as a worker and as a manager will vary with variations in the size of your business. Your own **realistic** judgment, tempered by knowledge of how others have succeeded, will be needed to answer that question.

Prevailing Trends

For reasons outlined earlier,[1] the general trend in Michigan agriculture and in many other states is for the typical size of farm businesses to expand about as rapidly as the capabilities of the family labor force, under the impact of continuous technological developments. A farmer and his family can easily accomplish several times as much work today as they could 20 years ago. The size of farm businesses has grown correspondingly. Recent and prospective price relationships, however, do not provide much encouragement for expanding business activities and investments to the extent of using more hired labor. In many cases, farmers are having to accept less for their own labor than they would have to pay for hired help. Larger-than-family-size units have shown no tendency to increase in numbers in Michigan over several decades. On the other hand, some consolidation of farm land holdings has been necessary to permit full use of the labor of a typical farm operator and his family.

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[1] *See Chapter 2.*

CHAPTER 7. USING FEED WISELY

The value of feed used for livestock represents more than half of gross farm income on most Michigan farms that specialize in dairy, poultry, or other livestock production. In the budgets of Table 3.1 and 3.2, for example, feed inputs represent about 55 percent of gross income for the dairy enterprise and 67 percent of gross income for the swine enterprise. Even where crop sales are sizable, feed inputs often equal almost half of gross income. Using feed economically is thus a factor of major importance in developing a successful Michigan farm business.

Farmers have made rapid progress in producing feed crops more economically, but there is little evidence of corresponding improvement in the economy of feed use. Livestock production rates per head have risen dramatically in recent years, but feed inputs have risen more or less proportionally, with the result that output per unit of feed has changed but little, except in poultry meat production (Figure 7.1). That feeding efficiency can be improved has been strikingly demonstrated in the commercial broiler industry where feed inputs per pound of meat have been almost halved within 30 years. The lack of any corresponding gain in the output of pork per unit of feed is surprising, especially in view of the diminishing importance of lard as compared to lean pork.

The general trend of the last two decades or more does provide a good illustration of the principle that managers will tend to substitute abundant and inexpensive resources for costlier ones in the production process. The relatively low prices of farm grains and other feeds in recent years clearly have encouraged farmers to use feed liberally, and sometimes even wastefully. Other principles of management economics can also be well illustrated by analyzing the problems of using feed. Some of the problems involved in feeding for meat, milk, and egg production will be discussed below.

Feeding for Economical Meat Production

The swine enterprise illustrates most of the problems of feeding for economical meat production. Decisions must be made on such questions as the following:

(1) To what weight will each animal be fed?

(2) What kinds of feed will be used, and in what proportions?

(3) Will full feeding be practiced, or will the daily ration be restricted to some extent?

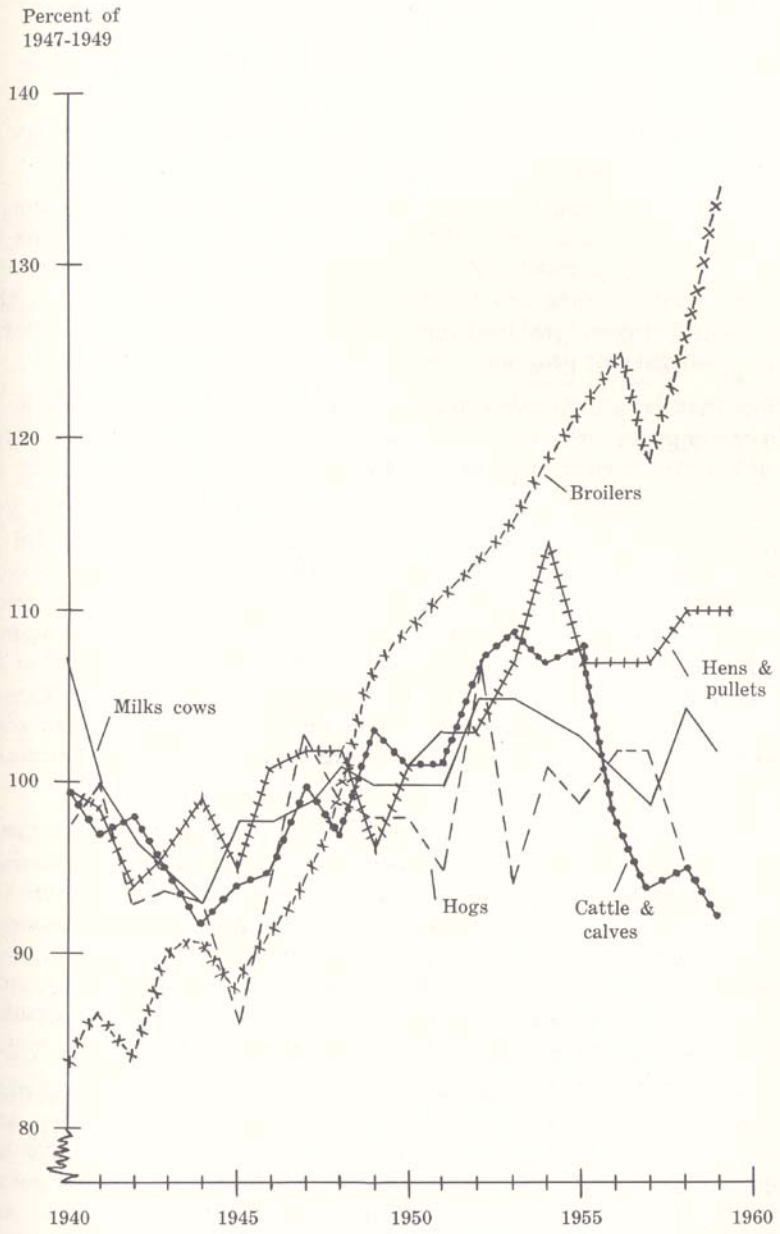

Fig. 7.1—Livestock production per unit of feed consumed, 1940-1959.[a]

[a] *Data for feeding years beginning October 1, supplied by the Farm Economics Division of the Economic research Service, U.S. Department of Agriculture.*

(4) How will the feeding program be adjusted to meet seasonal or other variations in prices of products?

(5) How will feeding efficiency be affected by housing, equipment, labor, and other inputs?

(6) How will feeding efficiency be affected by the management of the breeding herd or flock?

Pigs, like other meat animals, commonly make rapid and economical gains early in life, but eventually reach a stage where large inputs of feed produce only a small additional gain. Some growth curves derived from experimental data are illustrated in Table 7.1, which shows the relationship between total feed inputs and total liveweight gains under a specific management program.

Note that liveweight gains could have been related to age as well as to feed consumption, since under any specified management program there is a unique relationship between feed consumption and age.

Table 7.2 is based on the same experimental evidence as Table 7.1, and shows the liveweight gain for each additional pound of feed fed at various stages in the growth process. Note that one pound of 14 percent protein feed can be expected to produce a gain of nearly half a pound soon after weaning, but of less than a quarter of a pound after the animal has consumed 600 or more pounds of feed. This characteristic behavior of meat animals produces the type of growth curve illustrated in Figure 7.2—a curve that sometimes rises fairly sharply at first and then continues to rise at a gradually decreasing rate until the animal has attained its full growth.

If a pound added to the market weight of an animal is worth 4 times the cost of a pound of feed, the producer may be able to profit by feeding each animal as long as the rate of gain exceeds a quarter of a pound for each pound of feed. When 4 pounds of feed costing 16 cents, for example, will produce more than a pound of gain worth 16 cents per pound, continued feeding will be profitable if no other costs are involved. In most cases, however, the operator could not continue the feeding operation without incurring some additional costs and some additional risks.

The operator with facilities for a continuous feeding operation must also choose between feeding more lots of animals to lighter weights and fewer lots to heavier weights. In a period of about two years, for example, a feeder might use his facilities to produce 4 lots of 200-pound hogs or 3 lots of 275-pound hogs. With reliable feed consumption and price estimates he could develop budgets to show which system would be the more profitable. In doing so, he would have to take account of the probability that the 275-pound hogs would sell for less per pound than

TABLE 7.1 TOTAL GAIN OF PIGS FROM 34-POUND WEIGHT, ACCORDING TO TOTAL AMOUNT OF FEED FED, AT VARIOUS PROTEIN LEVELS.a/

FEED FED AFTER WEANING	PERCENT PROTEIN IN RATION					
	10	12	14	16	18	20
(Pounds)	(Pounds of gain)					
50	18.41	20.77	21.77	22.12	22.12	21.83
100	32.85	37.06	38.84	39.47	39.46	38.96
150	46.10	52.00	54.49	55.39	55.37	54.66
200	58.62	66.13	69.30	70.43	70.41	69.51
250	70.63	70.68	83.50	84.87	84.84	83.76
300	82.25	92.79	97.23	98.83	98.80	97.54
350	93.55	105.54	110.59	112.41	112.38	110.94
400	104.59	117.99	123.65	125.68	125.64	124.04
450	115.41	130.19	136.43	138.67	138.63	136.86
500	126.03	142.17	148.98	151.43	151.38	149.45
550	136.47	153.95	161.33	163.98	163.93	161.84
600	146.76	165.56	173.49	176.34	176.29	174.04
650	156.91	177.01	185.49	188.54	188.48	186.08
700	166.93	188.31	197.34	200.58	200.52	197.96
750	176.84	199.48	209.04	212.48	212.41	209.70
800	186.63	210.53	220.62	224.25	224.18	221.32

a/ Heady, Earl O. and Roger Woodworth, Damon V. Catron, and Gordon C. Ashton (1954). New procedures in estimating feed substitution rates and in determing economic efficiency in pork production. Iowa Agricultural Expteriment Station Research Bulletin 409, p. 939.

TABLE 7.2 GAIN OF PIGS PER POUND OF ADDITIONAL FEED FED, AFTER THE FEEDING OF SPECIFIED AMOUNTS, AT VARIOUS PROTEIN LEVELS.a/

FEED FED AFTER WEANING	PERCENT PROTEIN IN RATION					
	10	12	14	16	18	20
(Pounds)	(Pounds of gain per pounds of additional feed)					
50	.3682	.4154	.4353	.4425	.4423	.4367
100	.2888	.3258	.3414	.3470	.3469	.3425
150	.2649	.2988	.3131	.3182	.3182	.3141
200	.2504	.2825	.2961	.3009	.3008	.2970
250	.2402	.2710	.2840	.2886	.2886	.2849
300	.2324	.2622	.2748	.2792	.2792	.2756
350	.2261	.2551	.2672	.2716	.2716	.2680
400	.2207	.2490	.2612	.2654	.2652	.2620
450	.2164	.2440	.2556	.2598	.2598	.2564
500	.2124	.2396	.2510	.2552	.2550	.2518
550	.2088	.2356	.2470	.2510	.2510	.2478
600	.2058	.2322	.2432	.2472	.2472	.2440
650	.2030	.2290	.2400	.2440	.2438	.2408
700	.2004	.2260	.2370	.2400	.2408	.2376
750	.1982	.2234	.2340	.2380	.2378	.2348
800	.1958	.2210	.2316	.2354	.2354	.2324

a/ Heady, Earl O., and Roger Woodworth, Damon V. Catron, and Gordon C. Ashton, (1954). New procedures in estimating feed substitution rates and in determining economic efficiency in pork production, Iowa Agricultural Experiment Station Research Bulletin 409, p. 939.

the lighter hogs, and he would also have to consider differences in seasonal prices of market hogs, and perhaps of feeder pigs.

Another problem would be to determine the cheapest combination of grain and protein supplement. When grain is cheap relative to protein supplement, it pays to use a low protein mixture; when protein supplement is relatively cheap, a higher protein mixture becomes economical. The cheapest combinations of corn and soybean oil meal, computed on the basis of the experiments already cited, appear in Table 7.3 for hogs at various stages in the growth process.

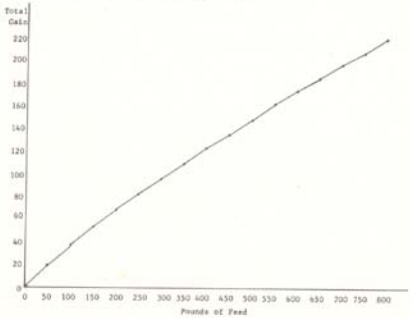

Fig. 7.2—Gain of pigs from 34-pound weight, according to total amount of 14-percent protein feed fed, based on data from Table 7.1.

Data such as those in Table 7.1 and 7.3 result from expensive and carefully controlled experiments, but this does not guarantee that they can show how the pigs on YOUR farm NEXT YEAR will perform in YOUR facilities and under YOUR management. Furthermore, they do not help in answering the question of whether or not pigs would grow more economically and produce more desirable carcasses on somewhat restricted rations, as some evidence now seems to indicate.

Similar data relating to broiler feeding become outdated almost as fast as they can be published, because of the rapid growth of knowledge about feeds, feed manufacture, and feeding practices, and because of the improved growth potential of the chick available to the broiler grower. Between 1957 and 1959, broiler producers fed about 3 pounds of corn equivalent per pound of broiler produced; 20 years earlier, the average was more than 5 pounds.[1]

Thus, no livestock feeder can expect to obtain **final** answers about how to feed most economically; he can only hope for reasonably up-to-date facts that will help him to determine the most profitable feeding system for his farm, with only a small margin of error.

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[1] *United States Department of Agriculture (1961). Changes in farm production and efficiency. Statistical Bulletin 233 (rev.), pp. 29-30.*

TABLE 7.3 LEAST-COST RATIONS PER 100 POUNDS OF GAIN, FOR PIGS AT 3 STAGES OF GROWTH, AT STATED PRICE RATIOS. a/

RATIO OF SOYBEAN OIL MEAL PRICE PER POUND TO PRICE OF CORN PER POUND	PIGS BETWEEN 34 AND 75 POUNDS			PIGS BETWEEN 75 AND 150 POUNDS			PIGS BETWEEN 150 AND 200 POUNDS		
	CORN	SOYBEAN OIL MEAL	PROTEIN LEVEL	CORN	SOYBEAN OIL MEAL	PROTEIN LEVEL	CORN	SOYBEAN OIL MEAL	PROTEIN LEVEL
	(Pounds)	(Pounds)	(Percent)	(Pounds)	(Pounds)	(Percent)	(Pounds)	(Pounds)	(Percent)
1.0	136.3	75.9	21.0	269.3	49.9	13.9	336.9	36.3	11.8
1.1	141.0	71.4	20.3	273.3	46.0	13.4	340.1	33.3	11.5
1.2	145.5	67.5	19.6	277.1	42.8	13.1	342.9	30.8	11.2
1.3	149.7	64.2	19.0	280.5	40.0	12.7	345.6	28.6	11.0
1.4	153.7	61.2	18.4	283.9	37.6	12.5	348.1	26.8	10.8
1.5	157.5	58.5	17.9	296.9	35.4	12.2	350.5	25.2	10.7
1.6	161.3	56.2	17.5	289.9	33.6	12.0	352.7	23.7	10.6
1.7	164.8	54.0	17.1	292.6	31.9	11.8	354.7	22.5	10.4
1.8	168.1	52.0	16.7	295.1	30.4	11.6	356.7	21.3	10.3
1.9	171.4	50.3	16.4	297.7	29.0	11.5	358.6	20.3	10.2
2.0	174.7	48.7	16.0	300.1	27.8	11.3	360.4	19.4	10.1
2.1	177.7	47.2	15.8	302.4	26.7	11.2	362.1	19.6	10.0
2.2	180.7	45.8	15.5	304.6	25.7	11.1	363.7	17.8	10.0
2.3	183.6	44.5	15.2	306.8	24.7	11.0	365.3	17.1	9.9
2.4	186.4	43.3	15.0	308.8	23.8	10.9	366.8	16.5	9.8
2.5	189.2	42.2	14.8	310.8	23.0	10.8	368.3	15.9	9.8
2.6	191.9	41.1	14.6	312.7	22.3	10.7	369.7	15.3	9.7
2.7	194.4	40.1	14.4	314.6	21.6	10.6	371.1	14.8	9.7
2.8	197.0	39.2	14.2	316.3	20.9	10.5	372.3	14.3	9.6
2.9	199.5	38.3	14.0	318.1	20.3	10.4	373.7	13.9	9.6
3.0	201.9	37.5	13.9	319.8	19.7	10.4	374.9	13.5	9.5
3.1	204.3	36.7	13.7	321.4	19.2	10.3	376.1	13.1	9.5
3.2	306.6	36.0	13.6	323.0	18.7	10.3	377.3	12.7	9.5
3.5	213.4	34.0	13.2	327.5	17.3	10.1	380.6	11.7	9.4
4.0	223.8	31.2	12.7	334.5	15.5	10.0	385.5	10.4	9.3

a/ Heady, Earl O. and Roger Woodworth, Damon V. C tron, and Gordon C. Ashton, (1954). New procedures in estimating feed substitution rates and in determining economic efficiency in pork production. Iowa Agricultural Experiment Station Research Bulletin 409, p. 948.

Feeding for Economical Milk Production

The dairy cow's response to heavier feeding is measured primarily in milk production, rather than in liveweight gain, although both kinds of responses may actually take place. Heavier feeding usually leads to somewhat higher milk production, although the increase in milk production is seldom continuously proportional to the increase in feeding.

As in feeding swine, we may say that diminishing returns are encountered as feed inputs are increased. In dairy feeding, however, we are primarily concerned with the response in milk production over a lactation or a shorter part of the cow's lifetime, whereas in swine feeding we are concerned with accumulated growth over the entire feeding period.

Another difference in the dairy feeding problem is that the ratio of concentrates to roughages ordinarily changes as feed inputs are expanded. Dairy cows commonly receive a pre-determined allowance of concentrates plus a more or less unlimited amount of roughage. As the cow has a limited stomach capacity, she will ordinarily reduce her consumption of roughage as her concentrate allowance is increased. In order to feed her more total nutrients, we increase her allowance of concentrates and she cuts back on roughage consumption.

The problem of feeding dairy cows economically thus involves such questions as the following:

(1) How many pounds of concentrates will be fed over a lactation, and how will they be distributed on a day-to-day basis?

(2) What roughages will be fed, and how many of them will be fed in unlimited quantities?

(3) How will feeding programs be adjusted with variations in the general level of market prices for milk, and with variations in base or quota situations and classified prices?

(4) How can rations be adjusted to the varying and imperfectly known performance potentials of individual cows?

The last question suggests that in dairy feeding, as in swine feeding, there will be no final answers that can eliminate the need for judgment on the part of the feeder. Data such as those in Table 7.4 can provide important guides to the probable performance of cows that can be rated "medium" or "good" on an arbitrary scale. The relationships involved in Table 7.4 are presented graphically in Figures 7.3 and 7.4.

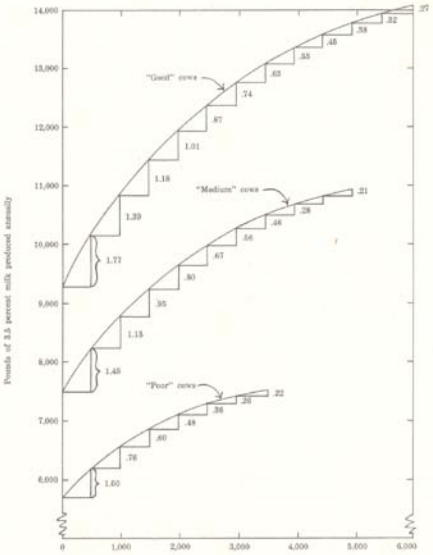

Fig. 7.3—Milk production response to different levels of grain feeding for three capabilities of Holstein cows fed "Medium" quality roughage. (Figures below curve are the additional pounds of milk produced for each additional one pound of grain fed.)

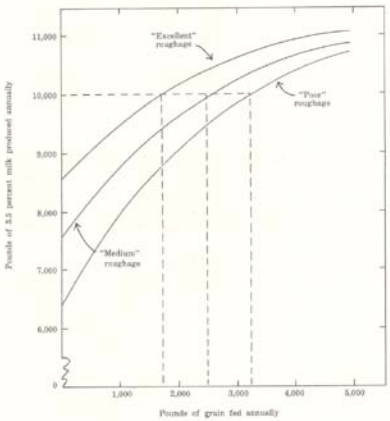

Fig. 7.4—Milk production response to different levels of grain feeding when "Excellent," "Medium," and "poor" quality roughages are fed to "Medium" cows.

TABLE 7.4 ESTIMATED RELATIONSHIP BETWEEN ANNUAL GRAIN FEEDING, ROUGHAGE CONSUMPTION, AND MILK PRODUCTION FOR TWO QUALITIES OF HOLSTEIN COWS AND THREE QUALITIES OF ROUGHAGE. a/

ROUGHAGE QUALITY	GRAIN FED YEARLY	"MEDIUM" COWS		"GOOD" COWS	
		ROUGHAGE CONSUMED	MILK PRODUCED (3.5 % TEST)	ROUGHAGE CONSUMED	MILK PRODUCED (3.5 % TEST)
	(pounds)	(pounds hay equivalent)	(pounds)	(pounds hay equivalent)	(pounds)
	0	12,110	8,450	12,355	10,500
	500	12,035	9,040	12,280	11,240
E	1,000	11,890	9,515	12,135	11,830
x	1,500	11,690	9,905	11,935	12,315
c	2,000	11,440	10,230	11,685	12,725
e	2,500	11,150	10,500	11,395	13,070
l	3,000	10,820	10,720	11,065	13,365
l	3,500	10,460	10,895	10,705	13,615
e	4,000	10,070	11,030	10,315	13,825
n	4,500	9,650	11,130	9,895	14,000
t	5,000			9,455	14,145
	5,500			8,995	14,265
	6,000				
	0	12,900	7,500	13,140	9,300
	500	12,825	8,225	13,065	10,185
	1,000	12,680	8,800	12,920	10,880
M	1,500	12,480	9,275	12,720	11,470
e	2,000	12,230	9,675	12,470	11,975
d	2,500	11,940	10,010	12,180	12,410
i	3,000	11,610	10,290	11,850	12,780
u	3,500	11,250	10,520	11,490	13,095
m	4,000	10,860	10,700	11,100	13,360
	4,500	10,440	10,840	10,680	13,585
	5,000	10,000	10,945	10,240	13,775
	5,500			9,780	13,935
	6,000			9,305	14,070
	0	13,210	6,430	13,450	7,600
	500	13,135	7,295	13,375	8,660
	1,000	12,990	7,980	13,230	9,510
	1,500	12,790	8,555	13,030	10,230
P	2,000	12,540	9,040	12,780	10,855
o	2,500	12,250	9,450	12,490	11,400
o	3,000	11,920	9,800	12,160	11,870
r	3,500	11,560	10,095	11,800	12,275
	4,000	11,170	10,340	11,410	12,620
	4,500	10,750	10,540	10,990	12,910
	5,000	10,310	10,700	10,550	13,155
	5,500	9,850	10,830	10,090	13,365
	6,000			9,615	13,540

C.R.

a/ Estimates prepared by C. R. Hoglund (1957). A budgeting guide in estimating feed inputs and milk production when 1,200 pound Holstein cows are fed variable quantities of grain and three qualities of roughage. Agricultural Economics mimeograph 670. Department of Agricultural Economics, Michigan State University. These estimates are based on various sources of data including a series of experiments report by E. Jensen, et. al. (1942). Input-output relationships in milk production, U.S.D.A. Technical Bulletin 815.

By knowing the level of milk production and feed consumption for an individual cow or an entire herd in a previous year, as determined for a benchmark plan, one can judge whether past performance is similar to that of the "medium" or "good" cows in Table 7.4. A mature cow that produced 10,500 pounds of milk testing 3.5 percent when fed an unlimited amount of medium quality roughage and 3,000 pounds of grain would have performed slightly better than the "medium" cows of Table 7.4, but by no means as well as the "good" cows. Thus if she were fed an additional 1,000 pounds of grain during the next year, she might be expected to respond with at least 400 pounds more milk, while reducing her roughage consumption by 750 pounds of hay equivalent.

If milk were worth 4 cents a pound, roughage a cent a pound, and grain 3 cents a pound, this change in feeding would add $16 to milk sales, save $7.50 worth of roughage, and add $30 to the grain bill—a rather unprofitable venture. On the other hand, the same change for a "good" cow that produced 12,780 pounds of milk on 3,000 pounds of grain in the benchmark year would add about $23.20 to milk receipts and would thus add more to receipts than to costs.

Feeding for Economical Egg Production

The main questions involved in feeding the laying flock are substantially different than those involved in feeding meat animals or a dairy herd. A single mash compounded by a commercial feed manufacturer is often the only feed for the laying flock, and this is almost always fed on an unrestricted basis. Individual feeding as practiced in the dairy herd would be highly impractical in the laying flock. Restricted feeding would also involve difficulties, since a uniform distribution of feed throughout the flock could hardly be guaranteed. Any factor disturbing to the rhythm of egg production, moreover, could be costly.

Mixed poultry feeds vary widely in price, but there is little evidence that a ration need be extremely costly to produce near-optimum performance. The balance between roughages and concentrates is of little concern to the poultryman, and he can choose the protein level that he considers ideal without any major effect on cost. Thus, one of his main problems is simply that of shopping for the best price on a ration capable of high performance. Another problem is that of detecting and eliminating physical waste of feed through spillage, loss to rodents, and similar causes.

The amount of feed used per unit of product is perhaps more sensitive to the inherent capabilities of the layer than for any other class of live-

stock. A 5-pound hen could be expected to eat as much as 64 pounds of feed yearly even if she produced no eggs. With the exceptionally high annual production of 25 dozen eggs, she would only consume about 104 pounds of feed. Between these two extremes, the amount of feed consumed per dozen eggs falls rapidly as production rises (Figure 7.5 and Table 7.5).

In general, feed consumption in the laying flock can be expected to vary with body weight, rate of lay, and the caloric content of the ration. Climate is probably another important variable, and birds kept in cold climates can be expected to require some extra feed.

Feed used in rearing flock replacements may also be considered a part of the feed needed for egg production. Leghorn pullets can be expected to consume between 18 and 24 pounds of feed during the period from date of hatch until 50 percent production is attained. Typical consumption data for medium-size strains reared with a minimum of feed waste and with low mortality are presented in Table 7.6.

Typical Feed Consumption Rates on Michigan Farms

Feed use data from controlled experiments do not always match closely with average farm performance results. The animals in farm flocks and herds are not always of the same productivity as the experimental animals, and the experimental results do not always provide a full measurement of the waste that is almost certain to take place under farm conditions. Therefore, it may be useful here to present verified estimates of actual feeding rates for a small group of southeastern Michigan farms. These data were obtained during the 1957-58 feeding year from 17 farmers who cooperated by providing monthly reports on feed supplies and feed inventories.

Steers were fed nearly 8 pounds of grain and other concentrates per pound of gain (Table 7.7).[2] Hog feeders used about 6 pounds of total concentrates per pound of gain. Average feed inputs per hog appeared to include about 60 pounds of protein supplement plus 18 bushels of corn equivalent. This is much higher than suggested by the data of Table 7.1, and it is also well above the 10 bushels of corn equivalent plus 102 pounds of protein supplement that others have found sufficient for rearing a 225-pound hog from weaning, under average-to-good performance in dry lot.[3]

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[2] *See also Karl T. Wright (1962). Cattle feeding costs and returns 1960-61. Ag. Econ. Mimeo. 862. Recommended allowances for various cattle feeding programs have been summarized by Hugh E. Henderson (1960). Beef feeding program—annual feed requirements. Cooperative Extension Service Fact Sheet No. 329. Michigan State University.*

[3] *Hoefer, J. A., H. F. Moxley, and R. E. Rust (1955). Producing pork in Michigan. Michigan Cooperative Extension Service Bulletin 335.*

TABLE 7.5 FEED CONSUMED PER HEN YEAR, BY RATE OF LAY AND BODY WEIGHT. a/

ANNUAL PRODUCTION PER LAYER			YEARLY FEED CONSUMPTION BY SIZE OF BIRD			
			4 LBS.	4.5 LBS.	5 LBS.	6 LBS.
(Eggs)	(Dozens)	(Percent)	(Pounds)			
180	15	50	80	84	88	96
210	17½	58	84	88	92	100
240	20	67	88	92	96	104
270	22½	75	92	96	100	108
300	25	83	96	100	104	112

a/ Sheppard, C. C. and Richard Wheeler. (1961). Layer and replacement flock performance. Cooperative Extension Service Fact Sheet Number 1453. Michigan State University.

TABLE 7.6 GROWTH AND FEED CONSUMPTION RATES FOR LEGHORN PULLETS. a/

AGE IN WEEKS	BODY WEIGHT IN POUNDS	CUMULATIVE FEED CONSUMPTION b/
4	0.4	1.5
8	1.0	4
12	1.7	7
16	2.4	11
20	3.0	16
24	3.4	21
52	4.5	--
76	5.0	--

a/ Sheppard, C. C. and Richard Wheeler. (1961). Layer and replacement flock performance. Cooperative Extension Service Fact Sheet Number 1453. Michigan State University.

b/ Variations of as much as 10 percent may be experienced by commercial poultrymen owing to difference among strains, rations, and environmental conditions. Excessive waste will result in even higher feed use.

Milk cows on this particular group of farms consumed about 3,700 pounds of concentrates and 6.1 tons of hay equivalent (Table 7.8). Annual production per cow averaged almost 9,000 pounds of milk testing 3.8 percent butterfat. More recent data from other farms show similar relationships between feed consumption and milk production in Southern Michigan.[4]

[4] *See also John A. Catey (1962) Mail-in accounts as a source of dairy feed information. Senior student paper, Michigan State University.*

TABLE 7.7 FEEDING RATES AND LIVESTOCK GAINS PER HEAD FOR MEAT ANIMALS ON A SAMPLE OF SOUTHERN MICHIGAN FARMS, 1957-58. a/

ITEM	STEERS	HOGS	LAMBS
Number of records	10	14	6
Concentrates fed	(Bushels)	(Bushels)	(Bushels)
Corn	48.6	11.4	3.9
	(Pounds)	(Pounds)	(Pounds)
Protein supplement	277	59	3
Other concentrates	99	362	42
Total concentrates b/	3,100	1,040	260
Harvested roughages fed			
Hay	1,240	--	300
Silage	1,000	--	--
Total harvested roughages (hay equivalent)	1,600	--	300
Average live weights			
Final	1,012	217	88
Starting	608	45	c/
Gain	404	172	c/

a/ Mulvany, James and R. G. Wheeler (1959). Feed use on grain-livestock farms in southeastern Michigan. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-97.

b/ Includes corn figured at 56 pounds per bushel.

c/ The lambs probably averaged between 50 and 60 pounds per head when the feeding period began in the fall, after the pasture season.

TABLE 7.8 ANNUAL FEEDING RATES PER HEAD FOR DAIRY AND BREEDING STOCK ON A SAMPLE OF SOUTHERN MICHIGAN FARMS, 1957-58. a/

KIND OF FEED	MILK COWS	DAIRY YOUNG STOCK	EWES	SOWS AND GILTS
Number of records	9	8	6	6
Concentrates fed	(Pounds)	(Pounds)	(Pounds)	(Pounds)
Farm grains	3,200	770	150	2,130
Other concentrates	520	150	30	410
Total	3,720	920	180	2,540
Roughages fed	(Tons)	(Tons)	(Tons)	(Tons)
Hay	3.1	1.1	0.3	--
Silage	3.1	0.6	--	--
Sub-total (hay equivalent)	4.1	1.3	0.3	--
Pasture (estimated hay equivalent)	2.0	0.6	0.3	--
Total (hay equivalent)	6.1	1.9	0.6	--

a/ Mulvany, James and R. G. Wheeler (1959). Feed use on grain-livestock farms in southeastern Michigan. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-97.

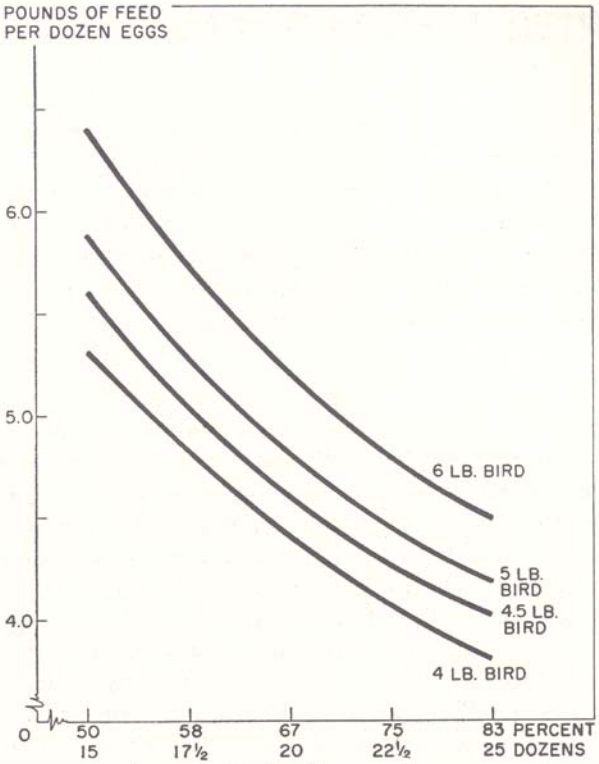

Fig. 7.5—Feed consumed per dozen eggs by rate of lay and body weight.[a]

[a] *Sheppard, C. C. and Richard Wheeler. (1961). Layer and replacement flock performance. Cooperative Extension Service Fact Sheet Number 1453. Michigan State University.*

Concentrate feeding for the ewe flocks ranged from 54 to 275 pounds per head. The lamb crop averaged just about 100 percent. Sows and gilts consumed 2,540 pounds per head yearly, while producing an average of slightly less than two litters per head.

In comparing feed consumption with feed disappearance, several types of losses appeared to be important. The shrinkage of corn in farm cribs ranged up to 20 percent or more in several cases. Losses of moldy feed, spillage, waste around feeders, and the presence of rodents were evident. Another type of "loss" occurred when the feed production calculated from estimated yields per acre could not be found in storage inventories. All these factors need to be considered in estimating future feed needs for a given herd or flock.

CHAPTER 8. A PLANNING PROCEDURE

Whether you are establishing a new business or seeking to improve an existing business, you need sound procedures for farm planning. If you are already operating a farm, you will be able to compare the probable success of various alternatives for the future with a benchmark based at least partly upon actual experience under the present plan. No such benchmark exists if you are planning an entirely new business, but you will still be trying to compare future prospects under various alternative plans.

In either case, it will be important to identify a number of promising management alternatives at an early stage in your thinking. Perhaps you already have in mind some specific changes you want to consider; if not, a simple checklist such as contained in Figure 8.1 may stimulate your thinking about possible changes from an existing business pattern. (Answering the question in the last column, of course, will require some careful analysis, as explained more fully below.) Visiting farms and learning more about how other farmers conduct their businesses can be helpful at this stage, whether or not you are already established in business. Results of the Michigan State University farm accounting project tell much about the organization of some relatively successful farms.

Taking stock of your physical and financial resources and reviewing the results of your recent business activities may also be a useful step in developing thoughts about possible alternatives. This kind of stock-taking, moreover, will be necessary in outlining a benchmark plan as a basis for comparison. A farm inventory book can provide an easy means of maintaining a continuous annual inventory of your business assets.[1] Alternatively, forms such as shown in Figure 8.2 can be useful in planning. Field maps and sketches of the farmstead layout are useful supplements to the inventory record. An item of special interest is a net worth statement, such as illustrated in Figure 8.3.

A summary is also needed of the crop and livestock programs of a recent period. The forms in Figures 8.4, 8.5, and 8.6 provide a convenient place for recording recent history. The main additional kind of background information needed is the annual financial summary that can be

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[1] *See the "Farm inventory book and depreciation schedule for four-year continuous use", distributed by the Agricultural Economics Department of Michigan State University.*

FIGURE 8.1 A CHECK LIST OF SOME MANAGEMENT CHANGES TO CONSIDER

GENERAL NATURE OF CHANGE	ITS MEANING FOR MY FARM	HERE'S EXACTLY WHAT I HAVE IN MIND:	WILL IT PAY?
1. _____ Produce and feed more high quality roughage	a. _____ a revised rotation b. _____ more lime & fertilizer c. _____ more silo space d. _____ less grain to buy e. _____ more milk per cow f. _____ more livestock g. _____ _____		
2. _____ Increase the quantity and value of cash crops grown	a. _____ choose high value crops b. _____ plant improved varieties c. _____ use more fertilizer d. _____ control diseases & pests e. _____ find new market f. _____ _____		
3. _____ Save more more pigs per per litter	a. _____ sanitation b. _____ permanent farrowing house c. _____ farrowing house equipment d. _____ improved sow feeding e. _____ _____		
4. _____ Produce more milk per cow	a. _____ disease control b. _____ selection & breeding c. _____ pasture improvement d. _____ summer silage or green feed e. _____ winter forage & grain f. _____ records g. _____ _____		
5. _____ Accomplish more without working harder	a. _____ specialization b. _____ wise use of equipment c. _____ higher yields d. _____ cut unnecessary jobs e. _____ _____		

Continued on next page

FIGURE 8.1 (Continued)

GENERAL NATURE OF CHANGE	ITS MEANING FOR MY FARM	HERE'S EXACTLY WHAT I HAVE IN MIND:	WILL IT PAY?
5. _____ Accomplish more without working harder	a. _____ specialization b. _____ wise use of equipment c. _____ higher yields d. _____ cut unnecessary jobs e. _____ _____		
6. _____ find an extra source of income	a. _____ sideline enterprise b. _____ processing & direct selling c. _____ off-farm work d. _____ custom work e. _____ _____		
7. _____ Cut expenses	a. _____ feed for profit, not looks b. _____ resist that spending impulse c. _____ buy advantageously d. _____ _____		
8. _____ Redesign the dairy set-up	a. _____ bulk tank b. _____ milking parlor c. _____ larger herd d. _____ cropping changes e. _____ _____		
9. _____ Catch up with corn	a. _____ grow more of it b. _____ harvest as silage c. _____ aim for higher yields d. _____ mechanize handling e. _____ _____		
10. _____ Count the family in	a. _____ youth projects b. _____ family partnership c. _____ lease d. _____ farm transfer e. _____ _____		

provided by a carefully prepared income tax return. Figure 8.7 provides two columns for recording recent financial history, and also a column for a forward-looking financial summary for the benchmark plan, as well as for three more alternative plans.

At this point, it may be helpful to recall that all these kinds of background information will be useful **only** if they can help you to identify and compare important and promising alternatives for the future. In the case of an established business, one alternative for the future will usually be to continue the activities of the past without change. But even if past **activities** are continued, **results** in the future may be different, because of changes in either the physical or economic environment.

In comparing various plans or schemes of action for the future, you will want to compare the expected results of each under the physical and economic conditions likely to prevail over a period of several years ahead. For comparative purposes, then, the benchmark plan will usually be based on **activities of the past,** but on **yield and price prospects of the future.**

Crop acreages and livestock numbers represent important measures of past activities that can become the basic dimensions of a benchmark plan, especially if there have been few changes over a period of several years. Historical data of this sort can be used directly in developing a benchmark plan, as can long-term average crop yields and livestock production rates when these seem to be the best measures of future prospects. Long-term average yields, of course, may fail to reflect the benefits of current production practices, whereas yields of the most recent year or two may be even more inaccurate in representing future prospects. In other words, it is not always a simple matter to estimate the physical inputs and outputs of a benchmark plan that represents merely a continuation of past activities. When the physical inputs and outputs have been multiplied by expected prices, moreover, the financial summary for the benchmark plan may bear little resemblance to any historical records.

Describing a benchmark plan based on past experience, then, involves

(a) selecting the key activities of the past program that are to be continued in the future,

(b) estimating the inputs and outputs, measured in physical terms, that can be expected to accompany the key activities, and

(c) estimating the financial results to be expected under the prospective prices, such as those developed above in Chapter 2.

Similar descriptive information for each alternative plan will then provide a comparative basis for selecting the most promising choice for the future. In some cases, the decision will be to continue without change; in other cases, change will be indicated.

Figure 8.8 provides a form for recording basic crop and livestock data representing either the benchmark plan or an alternative to it. In this form, the production and disposition of farm feed grains can be balanced in terms of bushels of corn equivalent (C. E.) and the production and disposition of roughage can be balanced in terms of tons of hay equivalent (H. E.). The amount of each type of feed produced, plus the amount purchased, should equal the amount sold plus the amount consumed. Similarly, the number of dairy heifers raised yearly, plus the number purchased and minus the number sold, should equal the number of cows sold or otherwise removed from the milking herd.

In following this suggested planning procedure, a copy of the basic crop and livestock plan form (Figure 8.8) would be completed for each alternative to the benchmark plan. First, however, the general character of each alternative would need to take shape. The form in Figure 8.9 suggests some of the aspects that need to be considered in developing a clear image of each alternative. This list, naturally, is only intended to be suggestive of the factors that may be involved.

The estimates and computations involved in developing the kind of basic crop and livestock plan outlined in Figure 8.8 are extremely important in the entire planning process. If this kind of data is developed carefully for each plan under consideration, the comparative financial summary afforded by the last four columns of Figure 8.7 will be both easy to prepare and of real significance.

A final evaluation of several alternatives, however, requires more than a comparative financial summary. Financial risks and uncertainties must be considered, and various non-monetary factors also warrant evaluation. This requires a background of the goals and objectives of the farm operator and his family—a matter that some counselors place at the start of the planning process. Only with this background can the operator make wise decisions for the future.

Once a new or revised plan is chosen, many steps may need to be taken over a period of months or years before the plan is adopted in full. Progress toward long-range plans or goals results from a whole series of intermediate decisions taken from day to day and from year to year. The

forms appearing in Figure 8.10 provide space for recording some key features of annual plans leading toward full adoption of a previously determined long-range plan. They also provide space for recording annual accomplishments — an important step toward attaining or revising long-range goals.

Parts "a" through "d" relate exclusively to the crop and livestock aspects of the farm business. Parallel forms relating to home activities could easily be developed. Part "e" relates primarily to new investment on the farm, although it could also be used for listing new investments in the home. Part "p" represents an operating statement for the family unit, but it could be supplemented with a more detailed statement for family living expenses. Part "g" is a net worth statement for the family unit as a whole.

These forms are for **recording** plans, not for **making** them. Careful identification and evaluation of major alternatives may be as important in making intermediate decisions as in developing long-range plans.

FIGURE 8.2 FORM FOR LISTING FARM IMPROVEMENTS AND MACHINERY.

Item	CAPACITY	AGE AND CONDITION	CHANGES TO BE CONSIDERED

Farm improvements (buildings for livestock, toolsheds, feed storage, fences, water supply, tile drainage, etc.):

Power and equipment:

Points to consider:

1. Are the buildings and other improvements well suited for the present enterprise?
2. Do they need extensive repair?
3. Do they need remodeling to make them modern and convenient?
4. Are there more buildings than needed for present operating plan?
5. Can any of the buildings be used for other enterprises?
6. Is the equipment suited to the present type of farming?
7. Is the equipment modern and in good repair?
8. Does this farm have enough equipment to do the job effectively?
9. Would more equipment pay for itself by saving labor?
10. Does this farm have more equipment than it can economically justify?

FIGURE 8.3 FORM FOR NET WORTH STATEMENT
DATE:

ITEM AND DESCRIPTION	VALUE OR AMOUNT

Assets columns would itemize as follows: Real estate, Farm equipment, Auto, Livestock, Feed and supplies, Household equipment and furnishings, Clothing, jewelry, Stocks and bonds, Life insurance (cash value), Mortgages and notes receivable, Accounts receivable, Cash on hand and in bank TOTAL ASSETS

Liabilities (show yearly payments and interest charges) would itemize as follows: Real estate mortgages, Chattel mortgage debts, Other notes, Installments, balance due, Accounts payable, Other debts TOTAL LIABILITIES

FIGURE 8.4 FORM FOR LAND USE SUMMARY

KIND OF CROP OR LAND USE	ACRES 196_	ACRES MORE USUAL	YIELD PER ACRE 196_	YIELD PER ACRE MORE USUAL	PRODUCTION 196_	PRODUCTION MORE USUAL	DISPOSITION OF CASH CROPS USUAL FARM USE	DISPOSITION OF CASH CROPS SALES 196_	DISPOSITION OF CASH CROPS SALES MORE USUAL

Usual rotations:

FIGURE 8.5 FORM FOR FERTILIZER AND LIME USE SUMMARY

KIND OF MATERIAL	TOTAL PURCHASES 196_	CROPS OR FIELDS WHERE APPLIED	RATE PER ACRE	ACRES TREATED	NOTES

FIGURE 8.6 FORM FOR A TWO-YEAR HISTORY OF LIVESTOCK NUMBERS

YEAR AND MONTH	MILK COWS				OTHER CATTLE			SOWS ON HAND	PIGS BOUGHT OR FARROWED	HOGS SOLD	LAYERS ON HAND
	MILKING	TOTAL	ADDED	REMOVED	ON HAND	BOUGHT	SOLD				
196_ J											
F											
⌄⌄											
D											
196_ Average											
196_ J											
F											
⌄⌄											
D											
196_ Average											

Chicks bought (month, number, age, and sex):

O

N

FIGURE 8.7 FORM FOR A COMPARATIVE FINANCIAL SUMMARY

ITEM (FROM INCOME TAX REPORTS)	ACTUAL 196_	ACTUAL 196_	BENCHMARK DATA	ALTERNATIVE PLANS I	II	III
Receipts from schedule "F": page 1, Calves & steers, (raised) Hogs, (raised) Chickens, turkeys, Grain & hay, Vegetables, Fruits, Dairy products, Eggs Machine work, Forest products, Dividends & refunds, Other, Profit on purchased steers, Profit on purchased pigs and lambs, Profit on purchased dairy & br. stock (from sch.D), Receipts from raised dairy and br. stock (from sch. D) TOTAL RECEIPTS						
Expenses from schedule "F": page 1, Labor, Feed, Seeds & plants, Machine hired, Supplies, Repairs & maintenance, Breeding fees, Fertilizer & lime, Veterinary & medicine, Gas & oil, Storage & machinery, Taxes, Insurance, Interest, Water, electricity & phone, Rent, Freight & trucking, Auto upkeep, Other TOTAL EXPENSES						
Net Income						

FIGURE 8.8 FORM FOR RECORDING A BASIC CROP AND LIVESTOCK PLAN.

KIND OF CROP OR LAND USE	ACRES	YIELD	PROD-UCTION	OPER-ATOR'S SHARE	USED ON FARM: SEED	USED ON FARM: GRAIN (C.E.)	USED ON FARM: ROUGH. (H.E.)	SALES: QUANTITY	SALES: PRICE	SALES: VALUE
Total cropland										
Perm. pasture										
Woodland										
Other land										
Total land										

KIND OF LIVESTOCK	NUMBER	YIELD	PROD-UCTION	FARM USE	GRAIN FED (C.E.) PER HEAD	GRAIN FED (C.E.) TOTAL	ROUGHAGE FED (H.E.) PER HEAD	ROUGHAGE FED (H.E.) TOTAL	SALES: QUANTITY	SALES: PRICE	SALES: VALUE
Milk cows and milk production											
Heifers raised yearly											

Breed of cows

Butterfat test %

Pounds grain & supplement fed per cow

Litters per sow

Added Investment (Above benchmark plan): Land, Buildings, Equipment, Stock, Total

Livestock bought yearly

Feed bought yearly

Fertilizer bought yearly

FIGURE 8.9 FORM FOR IDENTIFYING SPECIFIC ALTERNATIVES TO BE CONSIDERED IN FARM AND HOME PLANNING

ITEM	ALTERNATIVE I	ALTERNATIVE II	ALTERNATIVE III

Items would include: General nature of alternative, Specific nature of changes involved, If these changes are made, how will the following be affected? Crop rotations and acreages? Fertilization practices? Other crop practices? Livestock numbers? Feeding practices? Other livestock management practices? Use of buildings? Use of machinery? Use of labor? Total investment? Use of credit? Home produced food? Purchased food? Family housing? Home equipment and furnishings? Leisure time and recreation plans? Other matters?

FIGURE 8.10 ILLUSTRATIVE FORMS FOR RECORDING YEARLY PLANS AND ACCOMPLISHMENTS IN FARM AND HOME DEVELOPMENT

A. YEARLY PLANS AND ACCOMPLISHMENTS IN CROP PRODUCTION

Rotation for fields , totaling A., under benchmark plan ; under long-term plan
Rotation for fields , totaling A., under benchmark plan ; under long-term plan

ITEM	UNIT	BENCHMARK LEVEL	FIRST YEAR		SECOND YEAR		LONG-TERM GOAL
			PLANNED	ACCOMPLISHED	PLANNED	ACCOMPLISHED	

Items would include: Crop acreages, (Total cropland), Crop yields, Crop production, Total feed production for use on farm, Corn equivalent (bu.), Hay equivalent (tons)

B. YEARLY PLANS AND ACCOMPLISHMENTS IN CROP PRODUCTION METHODS

Items would include: Use of fertilizer, Use of lime, Use of cover & green manure crops, Weed control practices Drainage, Strip cropping, Other practices.

C. YEARLY PLANS AND ACCOMPLISHMENTS IN LIVESTOCK PRODUCTION

Items would include: Livestock numbers: Number of Dairy cows, Beef cows, Heifers & h. calves, Bulls, Steers sold yearly, Sows, Hogs raised, Chicks started, Layers housed, Av. no. of layers. Production rates: Milk per cow (lbs.), Butterfat per cow (lbs.), Eggs per layer (doz.), Pigs raised per litter (No.) Quantities to be sold: Milk or butterfat (lbs.), Eggs (doz.), Chickens, Hogs.

D. YEARLY PLANS AND ACCOMPLISHMENTS IN LIVESTOCK PRODUCTION METHODS

Items would include: Feeding practices, Practices in selection or breeding, Practices related to livestock health, Seasonality of production, Practices in marketing livestock, Other practices.

FIGURE 8.10 ILLUSTRATIVE FORMS (Continued)

E. YEARLY INVESTMENT PLANS AND ACCOMPLISHMENTS

Items would include: Land & buildings, Equipment, Livestock, Other, Total new investment.

F. YEARLY INCOME PLANS AND ACCOMPLISHMENTS

Items would include: Receipts--Milk, Cattle & calves, Poultry, Eggs, Hogs, Custom work, Off-farm work, TOTAL Expenses--Labor, Feed, Seed, Machine hire, Lime & fertilizer, Breeding, vet. med., Misc. supplies, Gas & oil, Repairs & maint., Taxes & insurance, Elec. & Telephone, Interest on debt TOTAL Net income (before depreciation)--Family living expenses, Payments on loans, New investments on farm, New investments in home, Other new investments, Money to be borrowed:

G. YEARLY NET WORTH PLANS AND ACCOMPLISHMENTS

ITEM	BENCHMARK LEVEL (,19)	FIRST YEAR PLANNED	FIRST YEAR ACCOMPLISHED (, 19)	SECOND YEAR PLANNED	SECOND YEAR ACCOMPLISHED (, 19)	LONG-TERM GOAL

Items would include: Assets--Farm real estate, Farm equipment, Livestock, Feed and supplies, Personal share of auto, Household equipment and furnishings, Clothing and jewelry, Stocks and bonds, Life insurance, Mortgages and notes receivable, Accounts receivable, Cash in bank & on hand, TOTAL ASSETS

Items would include: Liabilities--Real estate mortgage debts, Chattel mortgage debts, Other notes, Installments, balance due, Accounts payable, Other debts, TOTAL LIABILITIES

Net Worth

CHAPTER 9.
REFERENCE DATA FOR PLANNING

A list of the kinds of factual data that could prove useful in planning on various types of Michigan farms would be almost endless. Each crop, each machine, each animal, and each unit of many other resources has a definite performance potential when used under particular conditions in combination with other specified resources. Knowledge of all these performance possibilities can be useful in planning, and information about market and price possibilities is equally needed.

A considerable amount of information useful for planning has been included in earlier pages of this bulletin. Price prospects were summarized in Table 2.4 through 2.7; prevailing patterns of farming were described in Chapter 3; comparative investments in various types of specialized units appeared in Tables 3.1 and 3.3; machinery investment and expense levels on the farms of dairy account cooperators appeared in Table 4.3; data on feed use as related to livestock performance appeared in Chapter 7; and various other kinds of planning data appear on other pages. The purpose of this chapter will be to supplement the above data with some additional items of fairly general usefulness.

Some practical goals or standards for crop yields on various soils in Michigan are summarized in Table 9.1. In general, these yields are within the reach of superior farmers who follow excellent practices, although they are substantially above the State average yields reported for all farms by the Crop Reporting Service.[1] In favorable years, outstanding growers will exceed the yields of Table 9.1, and a few growers may exceed these levels consistently over a period of years.

In feed crop production, there may be a wide discrepancy between the nutritive content of the plant and the nutrients available for animal feeding. Table 9.2 indicates the comparative preservation of nutrients under various systems of harvesting and storage for several important feed crops.

When corn or grass is stored in silos, a basis for estimating the contents is often needed (Table 9.3). The density of silage in a trench or bunker silo is much more variable than in a tower silo, but a figure of 35 pounds per cubic foot is probably a reasonable average, which can be adjusted as the condition of the silage seems to warrant. Finely ground, high moisture ear corn has a roughly similar density.

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[1] *See Michigan agricultural statistics (published annually).*

The time needed for various field operations varies with the kind and size of equipment, the size and shape of the field, the topography, and various other factors. Some reasonable rates for field operations with typical equipment appear in Table 9.4. Combined labor inputs for all operations involved in growing various crops and caring for various kinds of livestock appear in Table 9.5. A general indication of how some of these labor inputs are distributed seasonally can be gained from Table 9.6.

A large number of farm operations are frequently or occasionally accomplished by employing a custom operator. Rates for custom work, based on a rather extensive survey in 1957, are summarized in Table 9.7. Typical rates of electrical power consumption for various uses appear in Table 9.8.

Some standards or goals for superior dairymen appear in Table 9.9. These goals reflect the attainments of farm account cooperators and other successful dairymen. Recommended housing space and feed storage allowances for planning dairy structures appear in Table 9.10.

Poultrymen need estimates of the production performance of the hen, extending over her productive lifetime. Total egg production is one measure of this performance, but the distribution of this output according to size and grade is also important. A characteristic pattern for the total egg production curve appears in Table 9.11, this curve can be expected to vary with strain or breed, with the stimuli provided by alternative lighting programs, and with many other factors. Note that the data of Table 9.11 shows no annual cycling of production with a molting period at the end of the cycle, such as might have been expected 20 years ago. Although individual layers still go through molting periods, flock performance records no longer show clear evidence of an annual cycle of production. Season of hatch may have an effect on the shape of the total egg production curve, although the evidence on this point is somewhat indeterminate.

Typical grade-out results do show that season of hatch has a definite impact on egg size distribution (Table 9.12). The general tendency may be summarized by saying that egg size is depressed in the months of warm weather, although that is not to say that warm weather is the primary cause of the observed results.

Other data reflecting performance rates on the farms of poultry account cooperators are summarized in Table 9.13.

Labor is a major input on Michigan fruit and vegetable farms. Many of these farms, especially in the southwestern part of the State, grow a variety of horticultural crops and need to do careful planning with respect to the seasonal use of labor. Tables 9.14 and 9.15 and Figure 9.1 provide a background for estimating labor inputs on such farms. Data relating to the use of fertilizer, spray materials, and packages on such farms appear in Tables 9.16 and 9.17. The next three tables (9.18-9.20) are designed to help tree fruit growers in estimated inputs for young orchards, and the changing pattern of yields during the early bearing years.

A final reference table helpful in planning for the use of credit and in making investment decisions shows the periodic payments needed to amortize a loan in specified periods of time at various interest rates (Table 9.21).

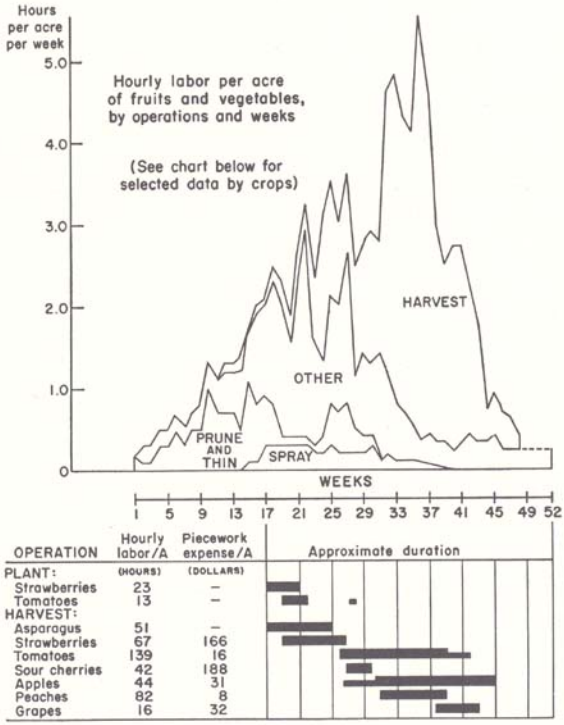

Figure 9.1. Seasonal distribution of labor on 18 fruit and vegetable farms in southwestern Michigan, 1957.

Source: Wheeler, R. G. and E. F. Lord (1958). The Southwestern Michigan fruit and vegetable farm business, 1957. I. Farm costs and returns. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-25.

TABLE 9.1 PRACTICAL STANDARDS FOR CROP YIELDS BY SOIL GROUPS. a/

CROP	UNIT	LOWLAND LOAMS, SILT LOAMS, AND CLAY LOAMS		UPLAND LOAMS, SILT LOAMS, AND CLAY LOAMS		LIGHT LOAMS AND SANDY LOAMS		LOAMY SANDS AND SANDY SOILS		MUCK SOILS	
		SOUTH. MICH.	NORTH. MICH.	SOUTH. MICH.	NORTH. MICH.	SOUTH. MICH.	NORTH. MICH.	SOUTH. MICH.	NORTH. MICH.	SOUTH. MICH.	NORTH. MICH.
Alfalfa hay	tons	3.7	3.3	3.5	3.2	2.8	2.6	2.2	2.0	---	---
Other hay	tons	3.0	2.7	2.6	2.3	1.9	1.6	1.3	1.0	2.5	2.0
Corn silage	tons	20	13	17	12	13	10	10	7	15	--
Corn, shelled	bushels	100	65	85	60	65	50	50	35	78	--
Wheat	bushels	45	41	43	50	33	31	29	24	--	--
Oats	bushels	80	80	70	70	55	60	40	40	--	--
Barley	bushels	55	55	50	50	35	32	22	20	37	--
Potatoes	cwt.	135	195	120	180	165	195	105	135	240	--
Field beans	bushels	32b/	25	27a/	20	22a/	15	--	--	--	--
Soybeans	bushels	35	--	30	--	26	--	--	--	35	--
Sugar beets	tons	22	15	20	14	12	10	--	--	17	--

a/ Nelson, L. V., S. C. Hildebrand (1960). Criteria for selecting crops to grow in Michigan. Cooperative Extension Service Fact Sheet Number 631, Michigan State University. For a more complete description of the soil groupings, see Fertilizer recommendations for Michigan crops. Extension Bulletin E-159.

b/ Except in the southern two tiers of counties, where field beans are not generally adapted.

TABLE 9.2 COMPARATIVE YIELD AND PRESERVATION OF FEED NUTRIENTS PER ACRE FOR ALFALFA-GRASS AND CORN GROWN ON LEVEL, PRODUCTIVE SOIL, UNDER EXCELLENT MANAGEMENT PRACTICES IN SOUTHERN MICHIGAN. a/

CROP AND METHOD OF HARVEST	YIELD PER ACRE	DRY MATTER REMAINING		DIGESTIBLE PROTEIN PRESERVED
		PROPORTION	QUANTITY	
	(tons, hay equivalent)	(percent)	(pounds)	(pounds)
Alfalfa-grass				
Potential in field	5.4	100	9,504	1,296
Field cured, baled	3.6	65	6,336	763
Conditioned or barn dried	4.2	78	7,392	1,008
Low moisture silage	4.6	85	8,096	1,104
Corn for silage				
Potential in field	6.7	100	12,800	600
Preserved	6.0	90	11,520	540
Corn for grain	(bushels)	(percent)	(pounds)	(pounds)
Potential in field	100	100	4,816	398
Harvested	95	95	4,575	378

a/Data from C. R. Hoglund, Department of Agricultural Economics, Michigan State University.

TABLE 9.3 ESTIMATED WEIGHT OF CORN OR GRASS SILAGE IN SETTLED, UNOPENED SILOS. a/

DEPTH OF SILAGE	INSIDE DIAMETER OF SILO IN FEET							
	12 FT.	14 FT	16 FT.	18 FT.	20 FT.	24 FT.	26 FT.	30 FT.
(feet)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)
4	5	7	9	11	13	19	22	29
6	8	11	14	17	21	30	35	47
8	11	15	20	25	31	45	52	70
10	15	20	26	33	41	59	69	92
12	19	25	33	42	52	75	88	117
14	23	31	41	52	64	92	108	144
16	28	38	49	62	77	111	130	173
18	32	44	58	73	90	130	152	203
20	38	51	67	85	105	151	177	236
22	43	59	77	97	120	173	203	270
24	49	66	87	110	135	194	228	304
26	55	74	97	123	152	219	257	342
28	61	83	108	137	169	243	286	380
30	67	91	119	151	187	269	316	421
32	74	100	131	166	205	295	346	461
34	80	109	143	181	224	323	379	504
36	87	118	155	196	242	348	409	545
38	94	128	167	212	262	377	443	590
40	101	138	180	229	280	403	473	630
42	109	148	193	244	300	432	507	675
44	117	159	207	261	320	461	541	720
50	137	186	248	310	389	560	673	875
55	155	212	283	365	444	639	750	999
60	---	240	319	415	500	720	845	1125

Note: When a silo is partially unloaded from the top, the remaining silage is more tightly packed and heavier than the same volume in an unopened silo. Therefore, compute the weight remaining as follows:

PROCEDURE	EXAMPLE
1. Use the table to find the original contents before the silo was opened.	50 feet of settled silage in a 20 foot silo weigh 389 tons.
2. Estimate depth of silage removed and determine its weight from table.	Weight removed in 32 feet = 205 tons
3. Subtract tonnage removed from original contents to find tonnage remaining.	389 tons (original contents) -205 tons (removed in 32 feet) 184 tons (remaining in 18 feet)

a/ Farm investory book and depreciation schedule (1962 edition). Agricultural Economics Department. Michigan State University.

TABLE 9.4 PERFORMANCE RATES FOR FIELD OPERATIONS. a/

OPERATION	SIZE OF MACHINE	HOURS/ACRE
Plowing	2 - 14 inch bottoms	1.11
	3 - 14 inch bottoms	.87
	3 - 16 inch bottoms	.72
Field cultivation	10 ft.	.27
	12 ft.	.20
	16 ft.	.14
Discing (tandem)	8 ft.	.32
	10 ft.	.25
Harrowing (spring & spike tooth together)	8 ft.	.30
	12 ft.	.21
	24 ft.	.10
Cultivating	2 row	.50
	4 row	.28
Cultipack or roll	10 ft.	.20
	12 ft.	.17
Rotary hoe	12 ft.	.15
	20 ft.	.09
Planting	2 row	.30
Drilling	13 hole	.46
	15 hole	.36
	17 hole	.26
Top dressing		.32
Combining		.34
Corn picking		1.2

a/Data from C. R. Hoglund, Department of Agricultural Economics, Michigan State University.

TABLE 9.5 AVERAGE LABOR INPUTS FOR CROPLAND AND LIVESTOCK ENTERPRISES. a/

ITEM	UNIT	DAYS PER YEAR
Crops		
Corn for silage	acre	1.0
Corn picked for grain	"	1.0
Corn hogged off	"	0.8
Soybeans for grain	"	0.7
Small grains for grain	"	0.6
Alfalfa and clover seeded alone(new seeding)	"	0.4
Hay - first cutting	"	0.4
- second cutting	"	0.4
- third cutting	"	0.2
Hay from oats, millet, soybeans	"	1.0
Pasture from oats or sudan grass	"	0.2
Potatoes, table stock	"	2.0
Potatoes, certified seed	"	3.0
Sugar beets	"	5.0
Sweet corn	"	5.0
Hybrid seed corn	"	7.0
Apples	"	12.0
Peaches	"	15.0
Pears	"	10.0
Cherries (not including piecework harvest labor)	"	6.0
Strawberries, raspberries	"	25.0
Grapes	"	10.0
Blueberries	"	35.0
Fruit, non-bearing	"	4.0
Cabbage, tomatoes, squash, cucumbers, melons	"	12.0
Onions	"	15.0
Peppermint, old	"	5.0
Peppermint, new	"	7.5
Asparagus	"	7.0
Maple syrup and sugar	$20 receipts	3.0
Livestock		
Milk cows	head	10.0
Beef cows	"	2.0
Steers or other cattle fattened	"	1.0
Mature bulls	"	8.0
Other young cattle	"	2.0
Breeding ewes and rams	"	0.5
Feeder lambs	"	0.1
Pigs raised (including care of sow)	litter	3.0
Pigs bought and fattened	head	0.25
Hens and ducks (average number)	"	0.10
Replacement chicks raised	"	0.01
Broiler chicks raised	"	0.005
Turkeys and geese	"	0.3
Bees	colony	0.5

a/Data from Leonard R. Kyle, Department of Agricultural Economics, Michigan State University.

TABLE 9.6 MONTHLY DISTRIBUTION OF LABOR FOR FIELD CROPS. a/

CROP	TOTAL LABOR	MONTHLY DISTRIBUTION											
		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
	(hours)	(percent)											
Corn, grain	10			5	5	20	10	5	5	5	20	20	5
Corn, silage	10			5	5	10	10	5	5	50	10		
Spring grains	6			15	5			80					
Winter grains	6							40	20	15	25		
Soybeans	7			5	5	35	5	5			30	15	
Sweet corn	5			5	5	15	10		40	25			
Alfalfa hay	8 b/					5	35	30	5	25			
Clover hay	8 b/						65	10	15	10			
Grass silage	10						72	25	1	1	1		

a/New York and Illinois data were used in preparing these estimates, which were developed by William Ross and Leonard Kyle of the Department of Agricultural Economics, Michigan State University.

b/Excludes labor in the year of seeding.

TABLE 9.7 RATES FOR CUSTOM WORK IN MICHIGAN--1957-58. a/

(Charges include machine, tractor, and operator or usual crew.)

CUSTOM JOB AND EQUIPMENT	PER UNIT			PER HOUR		
	MOST COMMON RATE 1957	USUAL RANGE FOR 1957	EXPECTED COMMON RATE 1958	MOST COMMON RATE 1957	USUAL RANGE FOR 1957	EXPECTED COMMON RATE 1958
	Per acre					
Plowing						
2-bottom	$5.00	$3.50-6.00	$5.00	$4.00	$3.50-4.50	$4.00
3-bottom	5.00	3.50-5.50	5.00	5.00	4.50-5.50	5.00
Discing						
7-foot or under	1.50	1.00-2.00	1.50	4.00	3.50-5.00	4.00
8-foot	1.50	1.00-2.00	1.50	4.50	4.00-5.50	4.50
10-foot or over	1.50	1.00-2.00	1.50	5.00	4.00-6.00	5.00
Offset	1.50	1.25-1.75	1.50	4.00	3.00-5.00	4.00
Dragging						
2-section	1.25	.75-2.00	1.25	3.50	3.00-4.00	3.50
3-section	1.25	.75-2.00	1.25	4.00	3.75-4.50	4.00
4-section	1.25	1.00-2.00	1.25	4.50	4.00-5.00	4.50
Packing						
Cultipacker	1.25	1.00-1.75	1.25	3.00	3.00-4.50	3.00
Manure handling						
Tractor loading	---	--- ---	---	4.00	3.00-5.00	4.00
Spreading	---	--- ---	---	4.00	3.50-5.00	4.00
Drilling						
With fertilizer	2.00	1.75-2.50	2.00	4.00	3.00-5.25	4.00
Without fertilizer	1.75	1.25-2.00	1.75	3.50	3.25-5.00	3.50
Band seeding	1.75	1.75-2.25	1.75	3.50	3.50-4.50	3.50
Planting corn						
2-row planter	1.75	1.00-2.50	1.75	4.50	3.00-5.00	4.50
4-row planter	1.75	1.25-2.50	1.75	---	--- ---	---
Planting potatoes						
2-row planter	6.00	5.00-8.00	6.00	---	--- ---	---
Cultivating						
2-row cultivator	1.50	1.00-2.00	1.50	3.50	3.00-4.50	3.50
4-row cultivator	1.50	1.25-2.00	1.50	---	--- ---	---
4-row rotary hoe	1.50	1.00-1.50	1.50	---	--- ---	---
Haying						
Mowing	1.50	1.00-2.00	1.50	3.25	2.50-5.00	3.25
Conditioning, crimping	1.75	1.50-3.00	1.75	---	--- ---	---
Raking, side delivery	1.25	1.00-2.00	1.25	3.00	3.00-4.00	3.00
Chopping hay and silage						
Chopper and blower with:						
1 man, 1 tractor, 2 wagons	---	--- ---	---	10.00	9.00-12.00	10.00
2 men, 2 tractors, 2-3 wagons	---	--- ---	---	12.50	10.00-15.00	12.50

(Continued)

TABLE 9.7 (CONTINUED)

CUSTOM JOB AND EQUIPMENT	PER UNIT			PER HOUR		
	MOST COMMON RATE 1957	USUAL RANGE FOR 1957	EXPECTED COMMON RATE 1958	MOST COMMON RATE 1957	USUAL RANGE FOR 1957	EXPECTED COMMON RATE 1958
Combining		Per acre				
Small grain						
5-foot combine	5.50	4.00-7.00	5.50	5.00	5.00-6.00	5.00
6-foot combine	5.50	4.50-7.00	5.50	6.00	5.00-7.00	6.00
8-12 foot combine	5.50	4.50-7.00	5.50	12.00	12.00-15.00	12.00
10-12 foot self-propelled	5.50	4.50-7.00	5.50	15.00	10.00-15.00	15.00
Field beans	6.50	6.00-8.00	6.50	6.00	5.00-6.50	6.00
Soybeans	6.00	5.00-6.00	6.00	6.00	5.00-6.00	6.00
Alfalfa and clover seed	6.50	5.00-7.00	6.50	6.00	6.00-6.50	6.00
Picking corn						
1-row picker	5.50	4.50-8.00	5.50	6.00	5.00-6.50	6.00
2-row picker	5.50	4.50-7.00	5.50	6.50	6.00-7.50	6.50
Picker-sheller	7.50	6.50-9.00	7.50	---	--- ---	---
Other harvesting work						
Digging potatoes	6.00	5.00-8.00	6.00	---	--- ---	---
Roto-beating potatoes	4.50	3.00-5.00	4.50	---	--- ---	---
Swathing grain	1.50	1.00-2.00	1.50	---	--- ---	---
Stalk shredding	1.50	1.00-2.00	1.50	4.00	4.00-5.00	4.00
Harvesting sugar beets	23.00	20.00-25.00	23.00	---	--- ---	---
Spraying						
Row crops		2.00-3.00	2.50		3.00-4.00	3.50
Orchard					4.00-5.00	5.00
For weeds		1.00-2.00	1.50			
Bulldozing					8.00-17.00	12.00
Buzzing wood					2.50-5.00	3.50
Chain-saw work					2.25-5.00	3.50
Plowing snow					4.00-4.25	4.00
Chopping orchard brush					5.00-6.00	5.00
Bulk spreading fertilizer		1.00-2.00	1.25		2.00-3.50	2.50
Applying annydrous ammonia		1.50-2.50	2.00			
Dusting potatoes		2.00-2.25	2.00			
		per bushel				
Shelling corn		.04-.10	.05		4.50-5.00	4.50
Drying corn		.05-.08	.07			
		per rod				
Tiling		.90-2.15	2.00			
		per mile				
Trucking		.15-.25	.18		4.00-4.50	4.00
		per bag				
Grinding feed		.10-.15	.15			
		per thousand				
Planting trees		8.00-15.00	10.00			

(Continued)

TABLE 9.7 (CONTINUED)

CUSTOM JOB AND EQUIPMENT	PER UNIT			PER HOUR		
	MOST COMMON RATE 1957	USUAL RANGE FOR 1957	EXPECTED COMMON RATE 1958	MOST COMMON RATE 1957	USUAL RANGE FOR 1957	EXPECTED COMMON RATE 1958
Boring post holes		per hole .10-.20	.12		4.00-5.00	4.00
Shearing sheep		per head .50-.50	.50			
Field Baling		per bale				
Automatic baler						
Hay (twine)	.11	.08-.14	.11	5.00	4.50-5.00	5.00
(wire)	.13	.12-.15	.13	---	--- ---	---
Straw (twine)	.12	.11-.15	.12	6.00	5.50-6.00	6.00
(wire)	.14	.12-.18	.14	---	--- ---	---

a/ Elwood, E. M. and M. E. Quenemoen (1958). Rates for custom work in Michigan. Cooperative Extension Service Folder F-161 (Revised). Michigan State University.

TABLE 9.8 ELECTRIC CURRENT CONSUMPTION. a/

JOB	UNIT	KILOWATT HOURS
Animal clippers	per hour	0.1
Automatic poultry feeder	per day	1.0
Barn hay curing	per ton	45-65
Barn ventilator	per cow per month	2.5
Brooding chicks	per chick	0.5-2
Chopping hay	per ton	1.7
Cleaning and candling eggs	per crate	½-1
Concrete mixer	per cubic yard	0.5
Dairy can cooler	per 100# milk in cans	1.2
Dairy bulk cooler	per 100 lbs.	1.0
Dairy hot water heater	per cow per month	7.5
Dairy hot water heater	per 100 gallons	25-35
Electric fence	per month	5.0-7.0
Electric fly screen	per month	3-6
Electric motor	per HP per hour	1.0
Electric heating cable	(60 ft.) per month	15.0
Electric welder	per hour	2-3
Farm freezer	per cu. ft. per month	7.5
Farm water pumping	1,000 gallons	1.0
Gutter cleaner	per cow per month	0.5-1.0
Hay hoist	per ton	0.33
Home milk pasteurizer	per gallon	0.5
Hot bed	per sash per day	0.75
Incubator	per 100 eggs	2-20
Irrigation	per acre per inch	1.5-3.5
Milk machine	per cow per month	1.5-3.5
Poultry house lighting	per 100 hens per month	5.0-10.0
Paint spraying	per 1000 square feet	1.5-2.0
Poultry water heater	per day	1.0
Poultry picking machine	per 100 birds	0.5-1.0
Poultry ventilation	per 500 birds per day	2.0-3.0
Silo filling	per ton	1.0-1.5
Silo unloader	per 20 minutes	1.0
Wagon unloader	per ton chopped	1.0-2.0

a/ Data supplied by Roy E. Moser, Dept. of Agricultural Economics, University of Massachusetts.

TABLE 9.9 TYPICAL PERFORMANCE RATES ON SUCCESSFUL MICHIGAN DAIRY FARMS. a/

Item	Northern Michigan	Southern Michigan
Income and physical outputs:		
Product sales per cow	$350-$400	$425-$450
Pounds of milk per cow		
-large breeds	10,000-12,000	11,000-14,000
-small breeds	7,000- 9,000	8,000-10,000
Cattle income per cow (cull cows, calves, heifers)	$60-$80	$60-$80
Total income per cow	$410-$480	$485-$530
Gross income per man	$9,000-$11,000	$12,000-$15,000
Gross income per acre	$80-$100	$100-$120
Crop value per acre	$40-$50	$50-$60
Income per $1000 invested in machinery	$1,600-$2,200	$1,800-$2,400
Expense and physical inputs:		
Labor		
Expense per acre	$16-$20	$18-$22
Expense per cow b/	$80-$120	$100-$150
Cows per man	18-25	20-27
Work units per man	300-350	350-400
Tillable acres per man	100-140	120-150
Machinery		
Expense per acre	$15-$19	$18-$22
Expense per cow b/	$75-$100	$90-$110
Buildings and improvements		
Expense per acre	$25-$35	$25-$35
Expense per cow b/	$4-$6	$5-$7
Crop		
Expense per acre	$6-$10	$10-$15
Yield index (% of average)	110-120	110-120
Expense per cow b/	$40-$50	$50-$60
Feed		
Value of feed fed per cow b/	$220-$240	$240-$260
Feed purchased per cow b/	$20-$40	$ 40-$60
Value of feed fed to herd per cwt. of milk b/	$2.00-$2.20	$2.00-$2.20
Value of feed fed to milking herd per cwt. milk	$1.60-$1.80	$1.60-$1.80
Other expenses--per cow		
Taxes (real estate) b/	$8-$12	$10-$20
Supplies, veterinary fees, breeding fees, DHIA, electricity, telephone b/	$30-$40	$30-$40
Total expense per cow b/	$290-$400	$340-$450
Investment per cow b/		
Land	$300-$400 (4-7 acres)	$600-$750 (3-6 acres)
Buildings and improvements(depreciated value)	$300-$450	$350-$500
Machinery (depreciated value)	$200-$240	$240-$350
Livestock	$325-$425	$350-$450
Feed	$140-$200	$140-$200
Total investment	$1,265-$1,715	$1,680-$2,250

a/ Cooperative Extension Service Fact Sheet No. 415. Michigan State University.

b/ Includes allowance for replacement animals.

TABLE 9.10 DAIRY HOUSING AND FEEDING SPACE ALLOWANCES. a/

ITEM	SPACE PER HEAD OR UNIT	SPACE PER MILK COW (MINIMUM)
Resting area	(sq. ft.)	(sq. ft.)
Milk cow	50 per milk cow (min.)	50
Dry cow	40 per dry cow	8
Young stock (6 wks. to freshening)	25 per head	12
Total		70
Pen area		
Maternative and isolation	100 per pen	10
Calf (individual)	15 per pen	2
Total		12
Paved area		
Milk cow	100 per milk cow	100
Dry cow	100 per dry cow	20
Young stock (6 wks. to freshening)	25 per head	12
Total		132
Holding pen	15 per milk cow (min.)	15
Feeding space--limited feeding	(inches per head)	(inches)
Hay		
Milk cow	24 per milk cow	24
Dry cow	24 per dry cow	5
Young stock	12 per head	3
Silage		
Milk cow	24 per milk cow	24
Dry cow	24 per dry cow	5
Young stock	12 per head	3
Feeding space--free choice		
Hay		
Milk cow	6 per milk cow	6
Dry cow	6 per dry cow	2
Young stock	3 per head	2
Silage		
Milk cow	6 per milk cow	6
Dry cow	6 per dry cow	2
Young stock	3 per head	2

a/ Cooperative Extension Service Fact Sheet No. 415. Michigan State University.

TABLE 9.11 EGG PRODUCTION AS RELATED TO AGE. a/

AGE (weeks)	RATE OF LAY (percent)	AGE (weeks)	RATE OF LAY (percent)
20-22	5	72-74	57
22-24	25	74-76	55
24-26	55	76-78	53
26-28	70	78-80	52
28-30	77	80-82	50
30-32	80	82-84	47
32-34	80	84-86	46
34-36	79	86-88	45
36-38	78	88-90	44
38-40	77	90-92	43
40-42	77	92-94	42
42-44	76	94-96	42
44-46	75	96-98	41
46-48	74	98-100	40
48-50	73	100-102	39
50-52	72	102-104	38
52-54	71	104-106	37
54-56	70	106-108	37
56-58	69	108-110	37
58-60	67	110-112	37
60-62	66	112-114	36
62-64	65	114-116	35
64-66	63	116-118	35
66-68	62	118-120	34
68-70	60	120-122	33
70-72	58	122-124	32

a/ Smoothed data based on farm records obtained by the Departments of Agricultural Economics and Poultry, Michigan State University.

TABLE 9.12 EGG SIZE DISTRIBUTIONS AS RELATED TO AGE AND DATA OF HATCH. a/

AGE	FEBRUARY HATCH			APRIL HATCH			JUNE HATCH			AUGUST HATCH			NOVEMBER HATCH			DECEMBER HATCH			ALL DATES OF HATCH	
	MED.	LGE.	X-LGE.	MED.	LGE.	X-LGE.	MED.	LGE.	X-LGE.	MED.	LGE.	X-LGE.	MED.	LGE.	X-LGE.	MED.	LGE.	X-LGE.	SMALL & PEEWEE	CULLS
22-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	1
24-26	15	0	0	15	0	0	12	2	1	11	3	1	1	2	3	4	1	0	84	1
26-28	31	0	0	29	2	0	25	4	2	23	6	2	24	4	3	29	2	0	68	1
28-30	45	2	0	42	5	0	37	6	4	35	9	3	37	7	3	43	4	0	52	1
30-32	54	6	0	51	9	0	46	9	5	45	12	3	48	9	3	54	6	0	39	1
32-34	59	11	1	56	14	1	52	13	6	52	15	4	55	13	3	60	10	1	28	1
34-36	59	16	3	56	17	5	53	18	7	50	23	5	57	18	3	61	15	2	21	1
36-38	55	22	6	52	23	8	50	24	9	43	33	7	56	24	3	58	21	4	16	1
38-40	49	31	8	45	33	10	44	33	11	46	34	8	51	32	5	52	30	6	11	1
40-42	42	36	12	38	38	14	38	38	14	41	38	11	46	36	8	45	36	9	9	1
42-44	36	41	15	32	43	17	33	43	16	37	42	13	41	40	11	39	40	13	7	1
44-46	32	44	18	29	45	20	31	45	18	36	44	14	45	41	14	36	42	16	5	1
46-48	27	47	21	25	47	23	28	47	20	33	45	17	34	44	17	31	44	20	4	1
48-50	23	48	25	22	48	26	25	49	22	30	46	20	30	45	21	26	46	24	3	1
50-52	18	48	29	18	48	29	22	48	25	27	44	24	25	45	25	21	46	28	3	2
52-54	17	47	32	18	47	31	23	46	27	27	42	27	23	44	29	19	45	32	2	2
54-56	16	45	35	16	46	34	23	43	30	25	40	31	20	42	34	15	45	36	2	2
56-58	14	45	38	16	46	35	23	42	32	23	41	33	18	42	37	14	45	38	1	2
58-60	12	45	40	15	46	36	22	41	34	20	42	35	19	40	40	12	45	40	1	2
60-62	11	45	41	15	45	37	20	41	36	19	40	38	13	42	42	10	45	42	1	2
62-64	9	45	42	13	45	38	17	41	38	15	39	42	9	43	44	7	45	44	1	3
64-66	8	44	44	13	43	40	15	40	41	12	38	46	7	43	46	6	44	46	1	3
66-68	8	44	44	13	42	41	14	40	42	11	38	47	5	45	46	5	44	47	1	3
68-70	10	42	45	14	40	43	14	38	45	10	38	49	5	44	48	5	44	48	0	3
70-72	10	41	46	13	40	44	12	37	48	7	39	51	4	43	50	5	44	48	0	3
72-74	9	41	46	11	40	45	9	37	50	5	40	51	2	43	51	5	43	48	0	4
74-76	10	38	48	11	37	48	7	36	53	2	40	54	2	41	53	5	42	49	0	4
76-78	10	38	48	10	36	50	6	36	54	2	40	54	2	41	53	6	41	49	0	4
78-80	10	37	49	10	33	53	4	36	56	1	40	55	3	39	54	7	40	49	0	4
80-82	9	37	50	8	33	55	2	36	58	0	41	55	2	40	54	7	39	50	0	4
82-84	9	36	51	8	32	56	2	36	58	0	41	55	3	39	54	8	38	50	0	4
84-86	9	34	53	8	30	58	1	36	59	0	40	56	4	38	54	9	36	51	0	4
86-88	8	33	55	6	30	60	0	36	60	0	40	56	4	38	54	9	35	52	0	4
88-90	7	31	58	6	29	61	0	36	60	0	39	57	6	36	54	9	33	54	0	4
90-92	6	29	61	5	29	62	0	36	60	0	39	57	7	35	54	8	32	56	0	4
92-94	5	28	63	6	28	62	0	36	60	1	38	57	8	33	55	7	31	58	0	4
94-96	4	28	64	5	27	64	0	36	60	3	37	56	7	34	55	7	30	59	0	4
96-98	4	27	65	6	26	64	0	36	60	4	36	56	8	32	56	6	29	61	0	4
98-100	5	27	64	6	26	64	0	36	60	5	36	55	8	32	56	5	28	63	0	4

a/ Smoothed data based on farm records obtained by the Departments of Agricultural Economics and Poultry, Michigan State University.

TABLE 9.13 PERFORMANCE RATES ON COMMERCIAL POULTRY FARMS. a/

ITEM	AMOUNT	RANGE
Income and physical outputs		
Egg receipts per layer	$6.45	$4.54 to $9.00
Eggs sold per layer	17.3 doz.	12.1 to 20.7 doz.
Average price per dozen	$ .37	$ .32 to .47
Average price per dozen, wholesale farms	$ .34	
Fowl receipts per average layer	$ .32	0 to $ .76
Average price per head	$ .47	$ .30 to $ .70
Replacements added per average layer (specialized farms)	0.7 head	
Expenses and physical inputs		
Loss from laying flock (specialized farms)	16 percent	
Cost of purchased feed per layer	$2.78	$1.15 to $3.76
Cost of home-grown feed per layer	$ .32	0 to $1.18
Cost of all feed per layer	$3.10	$2.36 to $3.82
Quantity of all feed per layer	98 lbs.	81 to 109 lbs.
Quantity of feed per dozen eggs	5.7 lbs.	4.4 to 7.8 lbs.
Quantity of feed for full rearing of pullets	24 lbs.	
Miscellaneous expenses per layer:		
Veterinary & medicine	$ .02	0 to $ .17
Egg cartons	$ .06	0 to $ .47
Heating fuel	.015	0 to .05
Other poultry supplies	.06	0 to .28
Electricity & telephone (specialized farms)	.14	$ .08 to .26
Taxes & insurance	.13	.04 to .43
Gasoline & oil (specialized farms)	.11	.03 to .32
Other machinery and improvement items (specialized farms)	.72	.45 to 1.19
Layers per man equivalent (specialized farms)	2,040 head	960 to 4,090 head

a/ Wheeler, R. G. (1961). Poultry farming today. Agr. Econ. Mimeo 818. Cooperative Extension Service. Michigan State University.

TABLE 9.14 HOURLY AND PIECEWORK LABOR INPUTS PER ACRE FOR SELECTED BEARING FRUIT AND VEGETABLE CROPS. a/

CROP	FARMS GROWING	ACREAGE PER FARM GROWING	DIRECT HOURLY LABOR			PIECEWORK LABOR
			HARVEST	PRE-HARVEST	TOTAL	
	(number)	(acres)	(hours)	(hours)	(hours)	(dollars)
Apples	11	20	44	32	76	31
Peaches	12	11	82	53	135	8
Cherries (tart)	12	4	42	20	62	188
Grapes	6	6	16	44	60	32
Black raspberries	5	7	29	47	76	110
Asparagus	7	5	51	6	57	0
Strawberries	11	7	67	16	83	166
Tomatoes	12	6	139	47	186	16

a/ Wheeler, R. G. and E. F. Lord (1958). The southwestern Michigan fruit and vegetable farm business 1957. II. Crop costs and returns. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-25.

TABLE 9.15 PRE-HARVEST LABOR INPUTS PER ACRE FOR SELECTED BEARING FRUIT AND VEGETABLE CROPS. a/

CROP	PRUNE	THIN	SPRAY	PREPARE SOIL AND PLANT	CULTIVATE (TRACTOR)	OTHER b/	TOTAL
	(Hours per acre)						
Apples	17	1	10	--	1	3	32
Peaches	18	21	6	--	4	4	53
Cherries	9	--	5	--	4	2	20
Grapes	33c/	--	6	--	3	2	44
Black raspberries	24	--	3	--	3	17	47
Asparagus	--	--	1	--	4	1	6
Strawberries	--	--	2	--	--	14	16
Tomatoes	--	--	3	26d/	3	15	47

a/ Wheeler, R. G. and E. F. Lord (1958). The southwestern Michigan fruit and vegetable farm business, 1957. II. Crop costs and returns. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-25.

b/ Includes irrigation, mulching, hoeing, and other work.

c/ Includes tieing.

d/ Includes time for growing plants on three farms.

TABLE 9.16 EXPENSES FOR FERTILIZER AND SPRAY MATERIALS PER ACRE OF SELECTED BEARING FRUIT AND VEGETABLE CROPS. a/

CROP	FERTILIZER, LIME, MULCH		SPRAY MATERIALS	
	AVERAGE	RANGE	AVERAGE	RANGE
	(Dollars per acre)			
Apples	13	1 to 24	63	37 to 90
Peaches	16	4 to 47	31	17 to 63
Cherries (tart)	12	4 to 29	23	8 to 37
Grapes	31	5 to 39b/	11	7 to 13
Black raspberries	20	4 to 40	10	3 to 14
Asparagus	42	20 to 75	8	1 to 24
Strawberries	13	0 to 30	9	0 to 25
Tomatoes	20	1 to 37	16	2 to 37

a/ Wheeler, R. G. and E. F. Lord (1958). The southwestern Michigan fruit and vegetable farm business, 1957. II. Crop costs and returns. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-25.

b/ One grower spent a larger amount in building up organic matter, liming, and making heavy corrective applications of fertilizer.

TABLE 9.17 PACKAGE EXPENSE PER UNIT OF SELECTED FRUIT AND VEGETABLE CROPS. a/

CROP	PACKAGE	PRICE OF PACKAGE TYPICAL	PRICE OF PACKAGE RANGE	AVERAGE PACKAGE EXPENSE PER UNIT PACKED
Apples and peaches	Complete bushel b/	$.52	$.52 to .58	
	Open bushel	.26	.25 to .28	
	All			$.52 per bu.
Grapes	Jumbos (12 qt.)	.19	.19 to .19½	
	8-box carton (16 qt.)	.80		
	All			.34 per 100 lbs.
Black raspberries	24-pt. crate c/	.80	.67d/ to .80	.76 per crate
Strawberries	16-qt. crate c/	.70	.53d/ to .78	.69 per crate
Tomatoes	8-basket crate c/	.82	.82 to .87	
	8-qt. carton	.15½	.15 to .16	
	Jumbos (12 qt.)	.19	.19 to .19½	
	16-qt. crate c/	.55d/	.55d/ to .68	
	All			1.77 per 100 lbs.

a/ Wheeler, R. G. and E. F. Lord (1958). The southwestern Michigan fruit and vegetable farm business, 1957. II. Crop costs and returns. Michigan Agricultural Experiment Station Quarterly Bulletin article 41-25.

b/ Includes cover, linear, fringe, and pad.

c/ Includes individual baskets.

d/ These prices were for used crates.

TABLE 9.18 SELECTED ANNUAL INPUTS PER ACRE FOR YOUNG ORCHARDS. a/

LABOR AND EXPENSE INPUTS	APPLES (54 TREES PER ACRE) THROUGH PLANTING YEAR	AGE OF TREES 1-5	6-10	11 & OLDER	PEARS (108 TREES PER ACRE) THROUGH PLANTING YEAR	AGE OF TREES 1-5	6-10	11 & OLDER
Pre-harvest labor(hrs.)								
Preparation & planning	24	1	-	-	33	1	-	-
Fertilizing & seeding	4	2	2	1	4	2	2	1
Hoeing & cultivating or mowing	14	12	8	6	20	20	7	5
Spraying	6	10	13	15	4	7	7	9
Pruning	2	4	8	12-22	2	3	6	12-18
Miscellaneous	2	2	4	6	2	2	4	6
Total hours	52	31	35	37-50	65	35	26	31-39
Expense for materials								
Trees	$51	$2	$-	$-	$103	$2	$-	$-
Tree guards	6	-	-	-	12	-	-	-
Fertilizer & lime	36	14	14	15-20	34	11	12	14-17
Cover crop seed	9	3	3	-	9	3	3	-
Spray & bait	13	18	33	50-60	13	15	19	26-38
Machinery operating expense	25	8	10	16	31	9	9	12

LABOR AND EXPENSE INPUTS	TART CHERRIES (108 TREES PER ACRE) THROUGH PLANTING YEAR	AGE OF TREES 1-5	6-10	11 & OLDER	SWEET CHERRIES (90 TREES PER ACRE) THROUGH PLANTING YEAR	AGE OF TREES 1-5	6-10	11 & OLDER
Pre-harvest labor(hrs.)								
Preparation & planting	32	2	-	-	29	2	-	-
Fertilizing & seeding	4	2	2	2	4	2	2	2
Hoeing & cultivating or mowing	24	18	6	4	21	19	7	4
Spraying	6	8	10	11	6	8	10	13
Pruning	3	7	9	10	3	6	9	10
Miscellaneous	3	2	2	3	3	2	2	3
Total hours	72	39	29	30	66	39	30	32
Expense for materials								
Trees	$103	$3	$-	$-	$99	$3	$-	$-
Tree guards	12	-	-	-	10	-	-	-
Fertilizer & lime	32	13	17	22-26	36	13	17	23-26
Cover crop seed	9	3	3	3	9	3	3	3
Spray & bait	11	18	20	23	11	16	26	31
Machinery operating expense	31	9	10	12	28	9	11	13

Note: The data are intended to apply to commercial plantings in Michigan but are based on synthesis of data from many studies in various parts of the country. Individual growers may find that their inputs and yields will vary by as much as 50 to 100% from rates that are believed typical for the industry.

Estimates are included for pre-harvest labor, cost of materials and machinery operating expense for orchards from the planting year to those with trees over ten years of age.

In using the tables note that:

(1) The planting year includes clearing and cover-crop seeding in the year before trees are planted.

(2) Machinery operating expense does not include depreciation, interest and other overhead charges.

(3) Expenses for materials are based on 1959-60 price levels.

a/ Ricks, D. J., R. P. Larsen, and R. G. Wheeler (1961). Inputs and relative yields for young orchards. Cooperative Extension Service Fact Sheet No. 1055. Michigan State University.

TABLE 9.18 CONTINUED

LABOR AND EXPENSE INPUTS	PEACHES (108 TREES PER ACRE)				PLUMS (108 TREES PER ACRE)			
	THROUGH PLANTING YEAR	AGE OF TREES 1-5	6-10	11 & OLDER	THROUGH PLANTING YEAR	AGE OF TREES 1-5	6-10	11 & OLDER
Pre-harvest labor(hrs.)								
Preparation & planning	32	2	-	-	32	2	-	-
Fertilizing & seeding	4	2	2	2	4	2	2	2
Hoeing & cultivating or mowing	24	16	4	4	24	16	4	3
Spraying	4	8	11	12	6	8	10	12
Thinning	-	5	15	22	-	-	-	-
Pruning	4	9	12	18-23	3	5	8	11
Miscellaneous	3	2	2	3	3	2	2	3
Total hours	71	44	46	61-66	72	35	26	31
Expense for materials								
Trees	$92	$3	$-	$-	$103	$2	$-	$-
Tree guards	12	-	-	-	12	-	-	-
Fertilizer & lime	36	13	17	22-26	36	13	12	16-20
Cover crop seed	9	3	3	3	9	3	3	-
Spray & bait	9	23	30	35	11	16	20	26
Machinery operating expense	31	11	13	14	31	9	10	12

Note: The data are intended to apply to commercial plantings in Michigan but are based on synthesis of data from many studies in various parts of the country. Individual growers may find that their inputs and yields will vary by as much as 50 to 100% from rates that are believed typical for the industry.

Estimates are included for pre-harvest labor, cost of materials and machinery operating expense for orchards from the planting year to those with trees over ten years of age.

In using the tables note that:

(1) The planting year includes clearing and cover-crop seeding in the year before trees are planted.

(2) Machinery operating expense does not include depreciation, interest and other overhead charges.

(3) Expenses for materials are based on 1959-60 price levels.

a/ Ricks, D. J., R. P. Larsen, and R. G. Wheeler (1961). Inputs and relative yields for young orchards. Cooperative Extension Service Fact Sheet No. 1055. Michigan State University.

TABLE 9.19 YIELDS OF YOUNG ORCHARDS, RELATIVE TO MATURE PRODUCTION BY KINDS AND AGE. a/

AGE	APPLES	PEARS	TART CHERRIES	SWEET CHERRIES	PEACHES	PLUMS
(Years)	(Percent of mature production)					
1	0	0	0	0	0	0
2	0	0	0	0	10	0
3	0	0	10	0	20	0
4	0	0	20	0	35	10
5	0	0	30	15	50	20
6	10	10	40	20	65	30
7	20	20	50	25	80	50
8	30	30	65	30	90	60
9	40	40	80	40	100	75
10	50	50	95	50	100	90
11	60	60	100	60	100	95
12	70	70	100	70	100	100
13	80	80	100	85	100	100
14	90	90	100	95	100	100
15	100	100	100	100	90	100

a/ Ricks, D. J., R. P. Larsen, and R. G. Wheeler (1961). Inputs and relative yields for young orchards. Cooperative Extension Service Fact Sheet No. 1055. Michigan State University.

TABLE 9.20 YIELDS OF BEARING ORCHARDS, AT THREE LEVELS, BY KINDS. a/

LEVEL	APPLES	PEARS	TART CHERRIES	SWEET CHERRIES	PEACHES	PLUMS
	(Bushels)	(Bushels)	(Tons)	(Tons)	(Bushels)	(Tons)
State average, 1957-59b/	176	127	1.8	2.5	150	2.3
Account cooperators 1957-59c/	247	174	2.3	3.2	161	-
High standard, mature trees, 1960d/	700	500	7.0	8.0	600	7.0

a/ Ricks, D. J., R. P. Larsen, and R. G. Wheeler (1961). Inputs and relative yields for young orchards. Cooperative Extension Service Fact Sheet No. 1055. Michigan State University.

b/ Michigan agricultural statistics, 1960. Michigan Department of Agriculture. These averages include some young bearing orchards as well as mature orchards.

c/ These averages include some young bearing orchards as well as mature orchards.

d/ The third level is a high standard or goal for fully mature orchards.

TABLE 9.21 PERIODIC PAYMENTS REQUIRED TO PAY OFF A DEBT OF $1, by SELECTED INTEREST RATES AND BY NUMBER OF PAYMENTS TO BE MADE. a/

NUMBER OF PERIODIC PAYMENTS	INTEREST RATE PER PERIOD					
	ONE-HALF OF 1 PERCENT	1 1/2 PERCENT	4 PERCENT	5 PERCENT	6 PERCENT	7 PERCENT
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1--------	1.00500000	1.01500000	1.04000000	1.05000000	1.06000000	1.07000000
2--------	.50375312	.51127792	.53019608	.53780488	.54543689	.55309179
3--------	.33667221	.34338296	.36034854	.36720856	.37410981	.38105167
4--------	.25313279	.25944478	.27549005	.28201183	.28859149	2.9522812
5--------	.20300997	.20908932	.22462711	.23097480	.23739640	.24389069
6--------	.16959546	.17552521	.19076190	.19701747	.20336263	.20979580
7--------	.14572854	.15155616	.16660961	.17281982	.17913502	.18555322
8--------	.12782886	.13358402	.14852783	.15472181	.16103594	.16746776
9--------	.11390736	.11960982	.13449299	.14069008	.14702224	.15348647
10-------	.10277057	.10843418	.12329094	.12950458	.13586796	.14237750
11-------	.09365903	.09929384	.11414904	.12038889	.12679294	.13335690
12-------	.08606643	.09167999	.10655217	.11282541	.11927703	.12590199
13-------	.07964224	.08524036	.10014373	.10645577	.11296011	.11965085
14-------	.07413609	.07972332	.09466897	.10102397	.10758491	.11434494
15-------	.06936436	.07494436	.08994110	.09634229	.10296276	.10979462
16-------	.06518937	.07076508	.08582000	.09226991	.09895214	.10585765
17-------	.06150579	.06707966	.08219852	.08869914	.09544480	.10242519
18-------	.05823173	.06380578	.07899333	.08554622	.09235654	.09941260
19-------	.05530253	.06087847	.07613862	.08274501	.08962086	.09675301
20-------	.05266645	.05824574	.07358175	.08024259	.08718456	.09439293
21-------	.05058163	.05586550	.07128011	.07799611	.08500455	.09228900
22-------	.04811380	.05370331	.06919881	.07597051	.08304557	.09040577
23-------	.04613465	.05173075	.06730906	.07413682	.08127848	.08871393
24-------	.04432061	.04992410	.06558683	.07247090	.07967900	.08718902
25-------	.04265186	.04826345	.06401196	.07095246	.07822672	.08581052
26-------	.04111153	.04673196	.06256738	.06956432	.07690435	.08456103
27-------	.03968565	.04531527	.06123854	.06829186	.07569717	.08342573
28-------	.03836167	.04400108	.06001298	.06712253	.07459255	.08239193
29-------	.03712914	.04277878	.05887993	.06604551	.07357961	.08144865
30-------	.03597892	.04163919	.05783010	.06505144	.07264891	.08058640
31-------	.03490304	.04057430	.05685535	.06413212	.07179222	.07979691
32-------	.03389453	.03957710	.05593859	.06328042	.07100234	.07907292
33-------	.03294727	.03864144	.05510357	.06249004	.07027293	.07840807
34-------	.03205586	.03776189	.05431477	.06175545	.06959843	.07779674
35-------	.03121550	.03693363	.05357732	.06107171	.06897386	.07723396
36-------	.03042194	.03615240	.05288688	.06043446	.06839483	.07671531
37-------	.02967139	.03541437	.05223957	.05983979	.06785743	.07623685
38-------	.02896045	.03471613	.05163192	.05928423	.06735812	.07579505
39-------	.02828607	.03405463	.05106083	.05876462	.06689377	.07538676
40-------	.02764552	.03342710	.05052349	.05827816	.06646154	.07500914

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CHAPTER 10. RECORDS FOR YOUR FARM

Records play a vital role in making plans and management decisions. Conversely, developing a useful set of records is an important part of farm planning. Some important considerations in developing and using a set of farm records will be summarized below.

Objectives of Farm Records

At least five important objectives need to be served by the set of records you develop for your farm business. These are as follows:

1. *To comply with tax reporting requirements.*
   Keeping records is no longer optional in relation to the data needed for tax reporting. Most farmers are now familiar with the records needed for preparing their annual federal income tax return. Many must also keep records as a basis for remitting social security taxes on the wages of their employees. The self-employment tax represents another need for accurate business records. Some Michigan farmers are also subject to the Michigan Business Activities Tax.
2. *To measure financial success and progress.*
   Farmers have reason to be interested in their financial progress from month to month and from year to year. For this purpose they need to measure changes in net farm income, total family income, family expenses, and changes in family net worth.
3. *To provide comparisons of operating results.*
   Comparing operating ratios and results with performance on other farm units may draw attention to possibilities for improvement. This is also true of comparisons with earlier performance on the same unit.
4. *To aid in planning for the future.*
   Records of past performance on an individual farm can be useful in estimating the future effects of making possible changes in plans and operations. Some useful kinds of data include past performance with respect to crop yields, milk production rates, egg production rates, feed consumption, labor inputs, and similar items. A record of prices paid and received is also useful. Data on farm expenses and income are useful in planning for the future as well as in measuring past progress. There is also a need for a field-by-field record of crop sequences, liming, and fertilizer applications.
5. *To aid in obtaining credit.*
   Lending agencies are almost always more receptive to borrowers who can demonstrate past results from well kept sets of records, including both operating statements and net worth statements.

The Scope of Farm Records

The scope of farm records may vary from a very simple record for a narrow and specific purpose, such as a field map showing lime applications, to a broad and comprehensive set of complete farm business and family financial reports. Five of the many alternatives are the subject for brief comment below.

1. Single Enterprise Cost Accounts.

These attempt to measure costs and returns for a single farm enterprise or product, such as eggs or tomatoes.

Advantages — These can provide some performance data for planning.

Disadvantages — They depend upon arbitrary allocations of joint costs, and they serve few of the purposes listed above.

2. Income Tax Records.

As a minimum for income tax, records of receipts, expenses, and depreciation are needed.

Advantages — These can measure farm financial results and serve tax reporting needs with a minimum of effort.

Disadvantages — They may lack data that would be useful for evaluating performance of individual farm enterprises and for planning future adjustments. They do not cover the family's non-farm income or expenditures.

3. Comprehensive farm business records.

These would include an income tax record supplemented by inventories and quantitative performance data for individual enterprises. Various other special records might be needed to provide comprehensive information about the farm business.

Advantages — Such records can provide much data for analysis and planning with a small amount of effort above the minimum needed for tax reporting.

Disadvantages — They fail to provide a complete record of family finances.

4. Comprehensive farm business and family financial records.

These records include family financial information as well as the farm business data for income tax purposes and for planning.

Advantages — These can serve all the purposes listed in the previous section. In addition, records including both farm and family receipts expenses, and cash balances provide a basis for making continuous cross checks to detect omissions in the record-keeping process.

Disadvantages — Unless carefully planned, faithfully continued, and wisely interpreted, they may consume more effort than justified by the benefits received.

5. Complete farm cost accounts.

In such records, all charges and income for the farm business as a whole are recorded and allocated to various enterprise accounts.

Advantages — These are designed to measure the financial success of each separate farm enterprise as well as of the business as a whole.

Disadvantages — They ordinarily depend upon many arbitrary assumptions about the allocating of joint costs, and they are of only limited value for planning, relative to the effort and skill required.

Limitations of Unit-Cost Data

Many farmers would list average, unit, cost-of-production data as a primary need for decision-making. Such data have important limitations, however, including the following:

1. They are usually backward-looking, not forward-looking, being based on history.
2. They may be heavily influenced by historical accidents, such as a favorable crop year or a disease epidemic.
3. They are often based on group averages, which reflect a different situation than prevails on many non-average farms.
4. They are nearly always based upon arbitrary decisions about how to allocate costs among enterprises or among time periods.
5. They do not distinguish between costs that vary with changes in output and costs that are fixed over considerable ranges of output. (Property taxes, depreciation, and upkeep expenses will be about the same in total whether a dairy barn is full, half full, or empty.)
6. They do not show the effect of changes in volume on expenses that vary with output. (Labor inputs per dozen eggs vary widely with size of flock and rate of production.)

Thus,

7. They seldom tell a farm operator what costs to expect in the future if he continues without change.
8. They rarely, if ever, tell a farm operator what costs to expect in the future if he does make changes in his business.

And,

9. They can provide only limited guidance to a prospective producer who will probably not operate under **average** conditions.

Useful Kinds of Information

Uses will be found for many different kinds of information that can be noted in farm or family records. Probably no two families would have exactly similar needs in this respect. Some commonly recorded items, classified under farm and family headings, are as follows:

Farm business information

1. Operating expenses and income.
2. Capital investments and receipts.
3. Quantities of inputs and outputs.
4. Prices of inputs and outputs.
5. Depreciation of machinery, buildings, land improvements, and purchased livestock.
6. Annual inventories showing quantities and values of land, depreciable property, livestock, feed, and supplies.
7. Monthly or daily inventories of livestock numbers and quantities of feed on hand.
8. Facts about accounts payable and receivable.

Family financial information

1. Family expenses and income.
2. Quantities and prices of items bought.
3. Facts about accounts and other obligations payable or receivable.
4. Lists of insurance policies and other valuable documents.
5. Purchase and inventory records of furnishings and other personal property.
6. Comparative net worth statements.

Characteristics of Desirable Records

Regardless of the general scope of a set of records, and regardless of the specific items to be included, certain characteristics are highly desirable. Some such characteristics are listed below, with illustrations based on the records needed for a commercial poultry farm.

1. **Completeness,** relative to chosen objectives.

Omission of a few key items of information may greatly reduce the value of an otherwise adequate record. Lack of data for computing average laying flock size, for example, would limit the analytical value of a record that included all expenses, receipts, and total egg production.

2. **Accuracy,** within acceptable limits of tolerance.

Errors and omissions can often be located and corrected by simple cross-checking procedures. For example, the number of birds inventoried at the beginning of the year, plus additions, minus sales and deaths, should equal the number at the end of the year. Also, cash on hand at the beginning of the month, plus cash farm and family receipts, minus cash farm and family expenses, should equal cash on hand at the end of the month.

3. **Simplicity,** consistent with the chosen objectives.

A record system is of little value unless the record keeper can understand it, maintain it easily, and interpret it readily. Errors can multiply under a system that invites excessive copying of entries from one location to another.

4. **Convenience,** especially with respect to making original entries where the transaction or activity takes place.

A pen record sheet, not an office account book, is the logical place to a record egg production, for example.

5. **Sufficient space,** for recording all descriptive details in an organized fashion.

Effort is wasted and accuracy may be sacrificed when record forms lack generous space for individual entries.

6. **Accessibility,** to detailed facts about individual transactions.

The record-keeper may want to locate a five-year old transaction by searching through certain classifications, such as "taxes", by following a chronological series of entries, or by some other procedure.

7. **Classification,** appropriate to the chosen objectives.

Enough columns or lines for detailed classification will eliminate such problems as the need for re-sorting "feed" expenses to get separate totals for "laying-flock feed", "broiler feed", "dairy feed", etc.

Some Key Decisions

After the general scope for a set of records has been determined and after selecting the kinds of information that are to be recorded, there are still several key decisions that affect the design of the system. Five of these are noted below.

1. The accounting period

Most farmers file income tax returns based on a calendar-year accounting period. In some cases, however, a different fiscal year has already been established, or is regarded as desirable. In addition, there

is the question of whether or not periodic summaries are to be made within the annual accounting period. Generally these would be monthly or quarterly summaries. In some cases, however, as with an egg production record in a commercial poultry flock, a four-week summary period might prove desirable. There may be a need for keeping labor records on a weekly basis, or for summarizing retail receipts on a daily basis.

2. Cash or accrual basis

For income tax purposes, the cash basis of accounting is far more frequently used on Michigan farms than is the accrual basis. The accrual basis offers certain advantages when inventories fluctuate drastically, but the cash basis has advantages with respect to simplicity and in some cases with respect to minimizing tax obligations. Closely related to the choice between cash and accrual accounting in general is the specific question of whether expenses are to be entered **when paid** or **when incurred.** If expenses are charged to open accounts and recorded only as a lump sum payment, much detail useful in enterprise analysis may be lost.

3. Landlord-tenant accounting

On tenant-operated farms, the design of the record keeping system usually needs to provide for entries of receipts and expenses representing the separate shares of the landlord and tenant.

4. Planning the forms for original entries

Most farmers probably need to think of meeting their record needs by a **set** of records rather than by a single account book. As already mentioned, the logical place to make many original entries is at the point where the activity takes place. This may mean recording milk production in the milkroom, egg production in the laying house, or cash expenses in a pocket memo book. Separate and carefully designed forms or books can contribute greatly to immediate and accurate recording. Additional planning is needed, however, to avoid copying transactions to a greater extent than necessary, and to facilitate the final summary of information.

5. Developing useful summaries

Original entries may need to be preserved for occasional reference, but they have seldom served their full purpose until incorporated in summaries for a period of time or a kind of activity. The tasks of (a) planning the original entries and (b) developing useful summaries are closely related, since the kind of summaries that can be prepared will depend upon the kinds of information recorded, and the kinds of information recorded need to be planned with the respect to the summaries desired.

Some Practical Possibilities

Michigan farmers can choose among several basic alternatives with respect to record-keeping forms and systems. In addition, they can supplement these basic alternatives with many different kinds of special record forms. Some of the basic alternatives are as follows:

1. The MSU Income Tax Record Book, and MSU Farm Inventory Book, and the MSU Family Living Record Book are available from county offices of the Cooperative Extension Service of Michigan State University.

2. Other general account books are available from commercial sources. Also the Farmers' Home Administration provides its borrowers with a special FHA record book.

3. Farmers who are particularly interested in records and see special needs may chose to design their own individual set of record forms.

4. Another alternative is to employ a commercial bookkeeping service and use its forms and procedures.

A brief selection of special records is listed below:

1. The check book
2. The pocket diary
3. The auto or truck record
4. The farm map
5. The DHIA record book
6. Pen record cards for the laying flock.

Special forms can be incorporated as parts of a total record-keeping system, and can serve for both original-entry and summary purposes. The truck or auto expense summary form in Figure 10.1 illustrates how this can be done. The costs of operating a truck or auto are often sizable enough to warrant special study and analysis, and several special circumstances make this problem useful for illustrative purposes.

In many cases, the expenses for the farm auto are partly personal and partly business, requiring special handling for income-tax accounting. The charges for operating the farm auto include some items that are repeated frequently during the year — purchase of gasoline, for example; some items that are paid only occasionally—registration fees, for example;

FIGURE 10.1 Form For a Monthly, Annual, or Lifetime Truck or Auto Expense Summary

Vehicle_____; Original cost or basis $_____; Initial speedometer reading_____

Item _____

Quantity data: Speedometer reading (end), Distance traveled (miles), Gas used (gals.), Oil used (qts.)
Deliveries (tons or___), Miles per gallon of gas

Expenses: Gasoline, Oil, Grease, Antifreeze, Tires & tubes, Battery, Repairs - major, Repairs - minor,
Insurance, Registration, Other fees

Sub-total
Depreciation
Total
Average costs:

and some charges that must be estimated or pro-rated — depreciation, for example. Some of these expenses may be paid in cash away from home, some may be paid by check, and the gasoline may be drawn from a general purpose farm storage tank.

If gasoline and other expenses are frequently paid in cash while away from home, a special notebook or diary carried in the car would be a logical place for the original entry. Only the total cost and the total gallonage from this book would need to be transferred at monthly or quarterly intervals to the expense summary form (Figure 10.1). If gasoline is drawn from a farm tank for several different vehicles, a card near the storage tank could be used to account for the gallonage used in each vehicle; then the total gallonage and a charge could be made at intervals in the summary form.

Note that this form is designed equally well for monthly, quarterly, or annual use. The original entries for a variety of items such as insurance, registration, and certain maintenance expenses would be made in the checkbook. At appropriate intervals, these would be transferred to the expense summary form. If this form were regarded as a part of the farm record book or the permanent farm record system, the individual entries would not need to be duplicated again in a general account book.

The expense summary provides a combination of permanent expense record and analysis form, since the physical data and the financial data permit the computation and recording of such analysis factors as gasoline mileage and average cost per mile or per ton. The average cost data, of course, would be of limited value on a monthly basis but might be of value on an annual basis or for the life of the vehicle.

A form such as the one illustrated in Figure 10.1 could easily become a part of an individually designed set of comprehensive farm business and family financial records where a monthly cash balance for all farm and family transactions is made.

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