

FARM RECORDS

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AMES, IOWA

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PREFACE

The central purpose of this book is to develop practical applications of accounts and records in the management of the farm. Treatises on farm accounting have, too often, explained the mechanical perfections of an elaborate system of accounts and then stopped without pointing out specific uses to which such a system could be put—as though the accounts were the end in themselves. On the other hand, it has been perhaps equally common for writers on the general subject of farm management to propound the theoretical aspects of farm organization and management without setting up practical means by which they could actually be applied in the management of a real farm.

To obtain maximum returns from a farm the use of records is indispensable. Without them the farmer's plans rest on approximate and often inaccurate estimates of his farm's performance. With records the plans can be based on arrays of facts much broader than memory would permit, which are just as accurate for periods 5 or 10 years in the past as for yesterday.

It will be noticed that the term "records" is used here rather than the narrower term "accounts." The strictly financial accounts of a farm are generally very simple as compared with those of a commercial or industrial undertaking. Other records referring to physical rather than financial performance are also highly useful. These include records of the consumption of feed, rates of gain on livestock, yields of crops, and other facts concerning the physical performance of the farm. Our primary purpose is to facilitate the management of the farm; therefore, we shall consider whatever forms of records promise to be of assistance.

The records should be so planned as to permit an appraisal of the methods of operation. The requirements of data needed for practical use are more exacting than for the more abstract and general concepts used in classroom discussions of principles. In the classroom the elementary concepts of land, labor, fixed or circulating capital are satisfactory. In practice the farmer seldom deals with economically "pure" elements of production. Some forms of capital and of land are often inextricably mingled. Some of the most important questions regarding organization may be concerned, not with whether sufficient capital is being combined with the land and labor, but with the specific form which the capital takes. Should a specific piece of machinery be purchased? Is the

highest yielding variety of seed being used for a particular crop? For practically successful operation the records must yield information of this type rather than the theoretically simple but practically impossible measures of "pure" land, labor, and capital.

RELATIONSHIPS BETWEEN BUDGETS AND RECORDS

It will be noted that the integration of a plan or budget with the records is given a prominent place in this book. The concept of a general budget has, in a large measure, grown up independently of the records. Records also have often been treated without regard to the budget. As a matter of fact, records and budget are parts of the same system and neither achieves its greatest usefulness without leaning heavily upon the other. Each section of the budget is a plan for a definite part of the business. To measure the degree to which that plan is attained it is necessary to set up a corresponding account for its financial aspects and, frequently, statistical records for its physical operation. The budget depends on the records both for its basic information and also for its effective operation.

There is another important relationship. The principal purpose of the budget is to facilitate the selection of enterprises. If an enterprise is to yield satisfactory returns it is necessary, first, that conditions on the specific farm be favorable to it and, second, that it be operated efficiently. Thus, the fact that a certain crop or livestock enterprise has failed to yield satisfactory returns does not necessarily indicate that it should be left out of the organization. It may be that conditions were favorable, but an undesirable technique or inefficient methods have caused it to make a poor showing in comparison with some enterprise that was better managed. Therefore, it is important that efficiency of operation be examined before the budget is drawn up. The use of records is essential to this study of efficiency.

GENERAL PLAN OF THE BOOK

The book is divided into five main parts. The first of these deals with the preliminary budget and the status of the business at the beginning of the farm year. The records of physical performance are considered immediately after the budget. There are several reasons for this. In a sense the physical operations are the sources of the financial results. Also of some importance, the discussion of some of the physical records at this state helps to disabuse the student's mind of the idea that he is seriously concerned only with financial accounts.

Part II deals with the important problem of valuation. A number of perplexing questions are raised here, and while it is not possible to give

the reader simple formulas for placing valuations on all of the many types of farm assets, it is hoped that, at least, some of the principal problems of valuation are brought to his attention. The accountant must, from the nature of his task, arrive at definite valuations which will serve the practical requirements of the business which he is analyzing.

Part III takes up the simpler forms and processes of accounting which are applicable to the farm. The general principle of double entry accounting is described briefly. This was omitted from the first edition of this book because it was assumed that students engaged in a detailed study of farm accounting are already familiar with the double entry system. In many agricultural colleges, however, this assumption proved unfounded since their curricula do not require a course in general accounting before that in farm records. In order that their students might see the process of financial accounting as a whole, rather than as fragments of single entry accounts, some instructors urged that there should be at least a brief treatment of double entry accounting in this book. Chapters 10 and 11 have been added in response to these requests. Where a less complete and systematic treatment of farm accounting is desired, the instructor and students can go directly from Chapter 9 to Chapter 12.

Part IV is concerned with what is, after all, the most important aspect of the records, their analysis and interpretation. Chapter 14 discusses the presentation and interpretation of farm income. Chapter 15 attempts to point out ways in which the records can be utilized before the end of the accounting year, a subject that has been badly neglected in the formal treatment of the subject. Chapter 16 describes the general analysis of the records for the farm as a whole, while Chapter 17 urges more accurate interpretation of the data and suggests the complexity of relationships between the various parts of the business.

Part V takes up a few of the more important special problems of farm accounting, such as accounting for perennial crops, treatment of partnerships under farm conditions, and the accounts for landowners.

Throughout the book an effort is made to avoid the presentation of methods or forms as rigid prescriptions. Neither a student nor his instructor can anticipate exactly what situations or problems the student may have to deal with later on. Consequently, the objective must be, not to equip the student with a standard set of forms, but rather to develop such a grasp of the general method that he can develop or modify forms and procedures to fit whatever problems may confront him.

JOHN A. HOPKINS

TABLE OF CONTENTS

PART I. PLANNING THE FARM BUSINESS AND THE PHYSICAL RECORDS

CHAPTER	PAGE
1. INTRODUCTION	1
Objectives of the Records	3
The Accountant, the Bookkeeper, and the Entrepreneur	3
Specific Purposes of Records—Stages of Completeness	5
2. THE FARM BUDGET	8
The Nature of the Farm Budget	9
The Crop Plan	11
The Livestock Plan	13
The Summary of the Budget	15
Checking Up on the Budget by Accounts	16
3. FARM PRODUCTION RECORDS	19
Accuracy in Physical Records	19
The Farm Map	20
Crop Records	21
Livestock Records	23
Cooperative Farm Production Records	27
4. KEEPING AND USING THE FEED RECORD	30
Importance of Feed as an Element of Cost	30
Form and Method of Keeping the Record	31
Summarizing the Feed Record	33
Interpretation and Use of the Feed Record	36
5. THE LABOR RECORD	40
Labor as an Element of Farm Cost	40
Types of Labor Records	41
Information Available from the Complete Labor Record	43
Criticism of the Use of Labor and Equipment	44
Checking Up on an Established Farm	44

PART II. THE FARM INVENTORY—VALUATION

6. TAKING THE FARM INVENTORY	51
Date of Inventory	52
Making the Physical Count	53
Grouping and Summarizing Inventories	58
7. VALUATION OF INVENTORIES	61
Methods of Valuation	62
The Basis of Valuation	64
Valuation of Specific Groups of Farm Assets	69
8. DEPRECIATION	74
What is Depreciation?	74
Methods of Computing Depreciation	76
Normal Life and Service of Selected Farm Machines	81
Obsolescence	81

9.	THE NET WORTH STATEMENT	83
	Classification of Assets	84
	Classifications of Liabilities	87
	Balance Sheet Ratios	88
	Source and Distribution of Capital	89

PART III. FINANCIAL ACCOUNTS

10.	THE RUDIMENTS OF DOUBLE ENTRY ACCOUNTING	93
	Organization of the Accounts	93
	Double Entry Accounting Methods	96
	Debits and Credits	97
	The Accounts must be in Balance	101
	Closing the Accounts	102
	The Trial Balance	105
	The Eight Column Financial Statement	106
11.	THE FUNDAMENTAL BOOKS OF DOUBLE ENTRY ACCOUNTING	109
	The Ledger	109
	The Day Book	111
	The Journal	113
	The Cash Book	114
	The Cash Journal	117
	Use of Special Columns in the Ledger	120
	Double Entry Form for Accounts Payable and Receivable	121
12.	MULTIPLE COLUMN RECORDS	122
	Basis of the Multiple Column Record	122
	The Record of Receipts	123
	The Record of Expenses	125
	Reconciling the Cash	127
	Summarizing the Columnar Record	127
13.	SINGLE ENTRY FARM RECORDS	132
	Relationship to Double Entry Accounts	132
	Records of Income	133
	Records of Farm Expense	135

PART IV. ANALYSIS OF THE FARM RECORDS

14.	INCOME STATEMENTS	143
	Form of Statement	143
	Classification of Expenses	144
	Net Farm Income	148
	Net Income Summary Figures	150
	Other Terms of Comparison	152
	Percentages and Ratios	154
	The Interpretation of Income	155
	Capital and Revenue	159
15.	CURRENT USE OF THE RECORDS	162
	Use of Quarterly Summaries	162
	The Use of Monthly Financial Summaries	166
	A Current Record of Physical Production	169
	Use of Current Records in Budgetary Control	170

16.	ANALYSIS OF THE YEAR'S RECORDS	172
	Size and Financial Status of the Business	172
	Examination of the Income Statement	173
	Income and Capital Ratios	174
	Performance on the Crops	176
	Examining the Returns from Livestock	177
	Efficiency in Use of Expense Factors	182
17.	EFFICIENCY FACTOR ANALYSIS AND DIMINISHING RETURNS	188
	Financial Ratios and Diminishing Returns	188
	The Crop System—Acres in Corn	190
	The Livestock System—Returns per \$100 Feed	193
	Use of Labor—Months of Labor Used	195
	Variation of Normal Farm Income	197
18.	THE ANALYSIS OF ENTERPRISES	200
	Methods of Approach	200
	Analysis of Crops, the Corn Enterprise	202
	The Analysis of Livestock Enterprises	204
	The General Method of Enterprise Analysis	211
19.	USE OF ACCOUNTING DATA IN BUDGETARY CONTROL	213
	Comparison of the Budget with Performance	213
	Budgetary Control Within the Year	217
	Changing to Alternative Enterprises	217
	Choosing Between Oats and Wheat	220
	Choosing Between Hogs and Feeding Steers	223
	Revision Must Treat the Farm as a Whole	226

PART V. SOME SPECIAL PROBLEMS

20.	SOME ACCOUNTS CALLING FOR SPECIAL CONSIDERATION.....	231
	Perennial Crops	231
	Accounts for Orchards	232
	The Personal Accounts	235
	Outside Investment Accounts	236
	Partnership Accounts	237
	Stock Share Partnerships	239
21.	ACCOUNTS FOR LANDLORDS	241
	The Landlord's Accounting Problems	241
	Accounts for the Crop Share Landlord	243
	Accounts for the Stock Share Landlord	247
	APPENDIX	251
	INDEX	257

LIST OF FORMS

1. Farm Budget, The Crop Plan	10
2. Farm Budget, Livestock System—Expenses	14
3. Farm Budget, Livestock Production	16
4. Farm Budget, Summary of Receipts and Expenses	17
5. Crop and Soil Treatment Record	22
6. Crop Summary	24
7. Summary of Livestock Increases and Decreases	26
8. Feed Record Form	32
9. Feed Summary Form	34
10. Source and Disposition of Feeds	35
11. Labor Record Form	42
12. Livestock Inventories	54
13. Feeds and Supplies Inventory	55
14. Inventory of Farm Machinery	56
15. Inventory of Farm Improvements	57
16. Comparative Inventory	59
17. Balance Sheet	84
18. Trial Balance	105
19. Eight Column Financial Statement	107
20. The Ledger	110
21. The Journal	114
22. Cash Book	116
23. The Cash-Journal	118
24. Multiple Column Records, Receipts	124
25. Multiple Column Records, Expenditures	126
26. Yearly Summary of Receipts	128
27. Yearly Summary of Expenses	129
28. Farm Income Statement	145
29. Comparative Income Statement	148
30. Derivation of Operating Income and Management Return	151
31. Treatment of Capital Surplus	158
32. Landlord's Receipts, Columnar Form	242
33. Landlord's Expenses, Columnar Form	244
34. Crop Share Farm, Summary of Receipts and Expenses	246
35. Stock Share Farm, Summary of Receipts and Expenses	248
36. Check on Livestock Numbers	250

LIST OF TABLES

I. Distribution of Assets on Typical Iowa Farms	86
II. Quarterly Summary of Cash Income and Expenses	164
III. Principal Income and Expense Items and Financial Ratios	174
IV. Performance on Crops and Livestock	178
V. Efficiency in Production	183
VI. Analysis of the Corn Enterprise	202
VII. Analysis of Oats Enterprise	204
VIII. The Hog Enterprise	206
IX. The Cattle Enterprise	208
X. The Poultry Enterprise	211
XI. Crop Production Plan Compared with Performance	214
XII. Livestock Expenses—Plan Compared with Performance	216
XIII. Livestock Production Plan Compared with Performance	218
XIV. Income Summary—Plan Compared with Actual	219
XV. Oats vs. Wheat	221
XVI. Revision of a Livestock System	225

LIST OF FIGURES

1. Farm Map	20
2. Organization of the Farm Accounts	94
3. Monthly Receipts and Expenses	167
4. Monthly Operating Expenses	168
5. Monthly Butterfat Production	169
6. Per Cent Working Capital as Related to Farm Returns	190
7. Income per \$100 Invested as Related to Profit	191
8. Acres of Corn as Related to Farm Returns	192
9. Yield of Corn as Related to Farm Returns	193
10. Livestock Income per \$100 Feed as Related to Farm Returns	194
11. Number of Spring Litters as Related to Farm Returns	195
12. Months of Labor as Related to Farm Returns	196
13. Crop Acres per Man as Related to Farm Returns	197
14. Labor Requirements—Wheat and Other Enterprises	222
15. Labor Requirements—Present and Contemplated Systems	227

PART I

PLANNING THE FARM BUSINESS AND THE PHYSICAL RECORDS

CHAPTER 1

INTRODUCTION

OBJECTIVES OF THE RECORDS

The principal purposes of farm records may be grouped under three general headings. In the first place they give *a history of the performance of the farm* for the period during which they have been kept. At intervals statements of the value and status of the business are obtained. These not only show the farmer where he stands financially at the time, but at later dates permit him to appraise the progress which he had made between inventory dates. The records of receipts and expenditures, of crop yields, livestock production, feed, and other consumption help explain the results obtained.

A second objective is to *provide an aid to the control of the current farm operations*. One needs to give close attention to current records to tell how well the business is conforming to plans or budgets that were set up for it. This does not refer merely to the financial plans but also to physical or technological efficiency. It is important that any unsatisfactory performance be detected promptly if it is to be remedied before more serious losses occur.

A third objective is to *provide the basic information needed in the budget or production plans*. If the budget is to be practically useful, it must reflect accurately the productive potentialities of the farm for which it is drawn. The records will give the needed information on crop yields, rates of gain obtained on livestock, butterfat production per cow, eggs per hen, and other figures of this type. They will also show the actual amounts of receipts and expenses. Without such figures as these it is necessary to fall back on estimates which may be quite inaccurate.

Incidentally, it is necessary to acquaint the student with the simpler methods of accounting by which the needed information may be obtained. It is obviously impossible in such a limited discussion to consider any very large part of the field of accounting. It is hoped, however, that the student will become familiar with the simpler techniques of bookkeeping, the purposes to which accounting can be put in farm management and the more common methods of analysis and interpretation of records.

THE ACCOUNTANT, THE BOOKKEEPER, AND THE ENTREPRENEUR

It is important that we be able to *record the significant facts with a minimum of effort and without omitting or obscuring important informa-*

tion. This has to do with the technique or the mechanics of bookkeeping. A distinction between the accountant and the bookkeeper is often made by saying that the function of the *accountant* is to design the records and develop the method by which they are to be analyzed, while the *bookkeeper* simply performs the mechanical work of recording transactions, posting, and summarizing.

In the small business, such as the farm, the accountant and bookkeeper will necessarily be the same person. Furthermore, he will not only record and summarize the data but will also interpret and use them. The man who is to keep records on his own farm must, therefore, be something of a bookkeeper as well as an accountant and an entrepreneur or farm manager.

The methods with which we are concerned are mostly those of *double entry bookkeeping*. These are reasonably simple and are standard in accounting work. They also form the basis of other so-called single entry methods, which, in general, are simply incomplete double entry records.

The methods of analysis of farm records are relatively new as compared with similar methods in other fields of accounting and as compared with the technique of keeping the primary farm records. But the analysis is plainly the most important step. Each subject taken up must, therefore, be considered in the light of the analysis and application of the data recorded. Certain steps in analysis are applicable to practically all farm businesses. Others are frequently useful but not of as wide application. Some of the more important of these will be pointed out.

Different Farmers Have Different Problems

The question "*What information does the farmer want?*" is always an important one. No two men approach the problem of management from exactly the same angle. It is obvious that the forms of accounts should vary to suit the business rather than be the same on all farms. This is another reason for *placing emphasis on methods rather than on forms*. With an understanding of the methods, suitable forms for the problems at hand may generally be devised without much trouble. Without this understanding, even the most convenient forms cannot be used to advantage.

Once the system of accounts is fitted to the farm, keeping the records currently is relatively easy. Putting down the figures and adding them up is simply a matter of routine. It is the process of analysis that involves the greatest trouble. To obtain any benefit from the figures it is necessary to watch them and study them almost continuously. This takes real mental effort, and to the great majority of people that is much harder than physical work.

An accountant, after studying the situation and conferring with the farmer, can develop a set of records which will yield the required information. A bookkeeper could compile this information with little trouble for the ordinary farm. But after this it is necessary for the farmer to do some figuring himself if he is to get any real benefit from the records. They will tell *what* was the outcome on the farm, and that is the first step toward improvement; but it is also necessary to know *why* the results were as they were. In answering this question and in figuring out *how* to improve results under the conditions of his particular farm, the farmer must use his own ingenuity.

SPECIFIC PURPOSES OF RECORDS—STAGES OF COMPLETENESS

Comparative Inventories

There are several stages to which one may go in keeping records for a farm. *The simplest possible form of records would be an inventory taken once a year.* This is simply an enumeration of assets and liabilities. It is usually taken on corresponding dates each year. It shows the financial status of the business and the relative importance of the various properties and debts.

The usefulness of the annual inventory is very limited, but by comparing inventories in succeeding years the farmer can usually get a fairly good idea of the progress of the farm as a whole. A comparison of inventories will show the growth or increase in the capital from year to year and the distribution of this capital among the various types of property. This gives a sort of cross-section of the business at that particular time. It shows how much of the capital is in the form of land, how much in equipment, horses, cattle, and cash.

If the net capital is found to be larger than at the corresponding date a year before, it is an evidence of success or growth of the business. But it does not tell the whole story. *It leaves unanswered questions of why the success, or of which factors contributed to the profitable outcome. Neither does it tell the amount of the profit for the year.* For instance, a comparison of inventories shows an increase in capital of \$1,000. But it may be that the total profit was \$2,500, and that \$1,500 was withdrawn from the business by the proprietor during the course of the year and spent for his personal living expenses. *Inventories give no explanation of what happened within the business between inventory dates.*

Records of Financial Transactions

The second stage in completeness of records is attained by adding a record of financial transactions. This means that some sort of journal or book of original entry will be needed in which to record receipts or ex-

penditures as they occur, and also a ledger in which these may be classified with regard to functional divisions of the business. **Accounts** will also be kept with persons outside of the farm business with whom there are transactions on credit.

From the financial accounts may be discovered the amounts of receipts during the year from each enterprise and the expenses for each purpose. A record may also be obtained of the personal withdrawals from the business and the investment of new funds from outside sources. From the detailed accounts of receipts and expenses the farmer may get an idea of the success obtained in some few of the functions of management. But this will be inexact.

On the one hand, the amounts of expense incurred give a very poor idea of the economy with which many of the cost factors are used. On the other hand, the volume of income is usually a very inadequate measure of the suitability of an enterprise to the farm organization in question.

Statistical Records

A third step is to add to the financial records just discussed such supplementary, statistical records as feed records, labor records, and records of yields of crops or livestock products. These may prove fully as useful as the financial records. They indicate whether the technical performance in various enterprises is up to a satisfactory standard.

Is the feed consumption excessive as compared with the physical output of pork, beef, or butterfat? Is too much labor or power being spent on various operations? Records of yields in different fields over a period of years may give valuable clues to needed soil treatment, as well as forming the basis for possible changes in cropping systems. Like the financial data, these physical measures must be interpreted in view of the specific conditions under which the particular farm operates. They are generally quite as useful as the financial records, and the information they yield is indispensable in any worth-while budgeting or planning.

Analysis of the Records

Whatever basic records may have been kept, the most important step in the whole process is that of analysis. This involves consideration of the technological performance of the farm as well as its financial returns. The various records must now be integrated and each aspect of the business studied, not by itself, but in the light of whatever information may be available on related phases.

Receipts and expenses may be expressed per acre of land or per head of livestock. Labor and equipment expense should be related to the acreages of crops raised. Quantities and values of crops should be related to the crop acreage. The quantity and value of livestock production should

be examined in view both of the feed consumption and the number of producing livestock.

In general, weak spots in the farm organization and management must be located so that steps can be taken to improve them. If the farm has special advantages in certain enterprises, these must be discovered so that the opportunities can be fully exploited.

All three types of records described above are needed to carry out the type of analysis envisioned here. The statistical records provide data needed on quantities of production and on amounts of materials, labor, and land used by the various enterprises. Financial records taken in conjunction with inventories show the gross and net returns from the whole business. These two types of information will be combined in developing operating ratios or efficiency factors so that the performance of the farm can be compared with that of other years, or with other farms of similar type. And, finally, on the basis of these comparisons, the general budget or plan of operation will be modified to increase returns in the coming year.

Again, the records must be fitted to the particular situation in which they are to be used. Like other instruments, accounts must be judged by the results they help to achieve; and it must be remembered that *diminishing returns appear in farm records as well as on other enterprises*. The more complete and accurate the records the greater the trouble involved in keeping and summarizing them. After a certain point this trouble is likely to increase faster than the benefits obtained. Careful planning and good judgment are as much needed here as in any other phase of management.

REVIEW QUESTIONS

1. How does the problem of the farm accountant differ from that of the commercial or industrial accountant with regard to the relative amounts of attention needed by financial and statistical data?
2. What is the central purpose of the farm records?
3. Name three stages to which one could go in keeping farm records.
4. What information could be obtained from annual inventories? Why would inventories alone be insufficient?
5. What information could be obtained from a financial record in addition to that from the inventories?
6. What information would be added by the supplementary, statistical records?
7. Show why types of records needed on a dairy farm would be different from those on a grain farm. On a rented farm from those on one that is owned.

CHAPTER 2

THE FARM BUDGET

The Problem

The farmer who is alert and up to date will spend considerable time making and revising plans and turning over in his mind various crop and livestock systems and practices which might be used on his farm. From these he will try to select the ones which promise to return the largest net income from the business as a whole over a period of several years. How is this plan to be drawn up in order to give him the most definite objectives toward which to work and to furnish a chart by which to guide his operations in the course of the year?

Records and accounts taken by themselves yield only history of the past. While generally interesting, this is of little direct benefit to the farmer. The crux of successful operation lies rather in well-conceived plans for the future. The records of past performance, however, play an important part; that of providing dependable information on what can be expected from the farm under conditions similar to those of the recent past. But it should be noted that the facts provided are only data—to be incorporated in the plans.

Indeed, records do not provide all the information that must go into the plans. Estimates of the effects of newly adopted technical methods must be taken into account. And so must the prospects for changed price levels of products or of various cost factors. Thus, the whole process of business planning and control must be forward looking, and recorded facts must be interpreted into their significance for the future. Before we attempt to set up records, therefore, we need to have clearly in mind the characteristics and requirements of successful business planning.

Each year a farmer needs to make more or less definite plans for the operation of his business during the coming season. This is true whether he has been keeping accounts or not. If he has no records of past performance, he will need to exercise care in his plans even more than if he has such records. If he has a record, he will naturally try to use it in planning advantageous changes in his farming system. The plans or budgets will then be more definite and easier to make and their usefulness all the more obvious.

The immediate problem is how to draw up needed plans in the most definite and usable form, and at the same time to economize effort in

the process. Of course, the greater number of farmers make no formal or written plans, but simply reckon ahead in a rough way and count on working out the details as they occur in the course of the year's business.

The man with considerable experience, and with his business at his fingertips, can adjust his business satisfactorily in this way. This is particularly true if the business is simple in its organization, and if it has already been well fitted to the economic environment. But the young farmer without the background of experience needs a more definite plan to guide him. With specific written plans on which to work, and with a record of performance gained through accounts to check up on them, it is possible to make progress more rapidly and to avoid unnecessary losses.

THE NATURE OF THE FARM BUDGET

A farm budget is a definite plan for the operation of the business during some coming period of time, usually the farm year. To be most useful, it should be worked out carefully and in considerable detail. *The plan must rest upon the resources available to the farm operator.* The foundation of the budget is, therefore, a *physical* one and will be made out in terms of acres of various crops, anticipated yields, numbers of livestock with their requirements of feeds, and the disposition of crop or livestock products.

A farmer does not plan to produce a certain number of dollars' worth of hogs, but to breed, for instance, 15 sows from which he counts on raising 90 pigs to a weight of 220 pounds. To do this he estimates that he will need 20 bushels of corn per pig, or 1,800 bushels in all. Similarly, he does not plan to produce a corn crop worth \$2,000, but finds that with the most productive cropping system of which his farm is capable he will be able to raise 60 acres of corn. From his experience he considers that the corn crop should yield 55 bushels per acre, or 3,300 bushels in all.

Value Questions Important

The probable value of the crop is an important question because the farmer's object is to make the largest possible profit. Therefore, he will apply value terms to his production plans and will consider the probable expenses and income that would be involved in each of several plans. From among these he will choose the plan that promises the most profit.

Here quantities and values cannot be divorced. An outlay of funds is necessary to operate the farm, and the outlay should be planned in connection with each section of the business so that adequate provision for each need is made without wastefulness. Alternative cropping systems should be considered in order to select the one which promises to be most highly productive. Crops raised may be disposed of in various ways. This raises the question of probable income from various combinations of crops

FORM 1. THE CROP PLAN
JOHN JONES FARM

	ACRES	EXPENSES			EXPECTED YIELD		DISPOSITION			
		Kind	Amount	Ex- pense	Per Acre	Total	Feed	Seed	Sale Amount	Sales Value
Corn for grain	70	Seed	12 bu.	\$ 60	55 bu.	3,850 bu.	3,100 bu.		750 bu.	Landlord share
Corn for silage	8	Silo filling		60	11 T.	88 T.	88 T.			
Oats	46	Twine Thresh.	150 lb.	18 50	42 bu.	1,930 bu.	1,470 bu.	160 bu.	375 bu.	Landlord share
Flax	6	Seed		8	12 bu.	72 bu.			72 bu.	\$72
Alfalfa	19	Seed (10 Lime (acres)	2 bu. 20 T.	30 50	2 1/4 T.	47 T.	47 T.			
Sweet clover	10	Seed	2 bu.	20		(pasture)				
Hay, oat	13				1 T.	13 T.	13 T.			
Soybeans	23	Seed Inoculation	35 bu.	50 23	22 bu.	506 bu.		35 bu.	361 bu. 110 bu.	\$361 Landlord share
Tillable pasture	10									
Untillable pasture	10									
Roads, waste and farm- stead	25									
Total	240			\$371						\$433

with livestock enterprises. The crop and the livestock systems are closely related. A change in a crop acreage may necessitate a change in the size of some livestock enterprise. Thus, if more corn is raised, it will be possible to produce more pork. If the acreage in hay is reduced, it will be necessary to reduce the number of dairy cows or beef cattle.

THE CROP PLAN

The crop program is the convenient place to start the plan or budget. The crops planted will depend on the productivity of the land. The size of the crop will usually determine both the size of the livestock enterprises and the amounts of grains or other crops sold. The physical basis furnished by the land thus provides a limit to both the physical and the financial output of the farm.

The crop system should be drawn up with a view to the conservation of soil fertility. The utilization of available labor throughout the year is another point to consider. *The net value of the crops produced is the chief measure of success of the system.* This is to some degree dependent on the choice of crops apart from other considerations. But this is only one of the considerations. *The current expense or efficiency in the use of cost factors is a second.* Conservation of resources in the form of land is a third. A great deal of other information should be taken into account in planning the program. It is assumed that the farmer makes intelligent use of all such pertinent information. But it will be neither possible nor necessary to show all such data in written form in the budget.

Even assuming that a farm has kept no previous records, it is convenient to draw up a definite, written plan, such as is shown in Form 1, to include the acreage and the probable yield of each crop.

Estimates of Yields

The *estimates on yields* may be obtained from experience on the farm in question if it has been operated several years. Otherwise, it will be necessary to resort to data from the census or the Department of Agriculture on yields in the county or township during past years and to modify these data to suit the farm in question. It is, of course, advisable to base the plans on estimates that are conservative and attainable except in unusually unfavorable years.

It is much easier to adjust the farm operation by disposing of a surplus of some crop than to curtail feeding operations or to go out and buy feeds to make up a deficiency. At the same time there is an obvious disadvantage in organizing the livestock enterprises on such a small scale that they cannot consume all the feed crops raised, and particularly those for which there is no ready market. The proper adjustment between crop acreages

and livestock enterprises involves a nice problem of judgment. The general principles pointed out here may serve as a guide, but they must be modified and applied to each case.

The amount of each crop needed for feed will be estimated in connection with the livestock plan but should be summarized and shown in connection with the crop plan. The crop excess which is available for sale should also be shown. Its probable price should be estimated and summarized in the crop program to help in computing probable income from the farm.

Probable Prices

The *probable prices* will have to be estimated in view of apparent trends of production and consumption. Here again there is a need for judgment, and there is no certainty as to which is the best estimate. Prices of the past are available in various government publications. These should be consulted in order to gain a perspective of the general trends. Prices of the immediate past will be of most interest in the effort to anticipate prices for the year ahead, but the farmer who bases his plans on last year's prices is likely to modify his plans each year in the wrong direction. Better than depending on prices of a single year, the trends of a period of several years should be consulted to get some idea whether present prices are or may be out of line with the general trend. But it is the trend of each price for the near future that the forward looking farmer really wants to know. And, of course, this can only be approximated roughly and with many chances for error.

The various Government Outlook publications provide the best available information on this subject. Even these must be used with judgment and must be interpreted to fit the situation of the particular farmer. Such influences as come from a light or a heavy crop carry over, a large number of hogs in the country which will be demanding feed, a strong or weak industrial situation which affects buying power of consumers, should all be considered.

Even at best the estimated values of crops are likely to be rather far afield because of unexpected weather conditions. For this reason, the crop program should be one intended to apply to a period of several years, and should be modified from year to year only in minor points.

Long-Time Crop Programs

The crop program is closely tied up with conservation or improvement of the soil. A relatively long period of years is generally necessary to build up a worn out soil; and, after it is raised to a highly productive condition, constant attention is needed to maintain it. A carefully selected

crop rotation with the use of green manure crops, or systematic use of commercial fertilizers to supply deficient elements of plant food, or the use of large amounts of barnyard manure, or all of these together, makes it possible to improve the soil gradually without heavy expense. But such a program requires a long time to carry out.

The final criterion of a program is its influence on the net income. The net income is affected by the livestock enterprises as well as by crops. Livestock also furnishes the manure needed by crops. Thus, in the last analysis, we must compare complete alternative budgets instead of crop systems alone.

A given soil-building program may be directly represented in the budget only by anticipated expenses for lime, fertilizers, and seed for green manure crops. Indirect modifications in other enterprises may be of greater consequence than these direct expenses. For instance, an additional month of labor may be needed to spread the lime and plant the green manure crop. The same crop which was planted for green manure may also furnish a couple of months of pasture for several extra head of cattle. This would modify the amounts of feeds needed by the cattle at other parts of the year and, also, the expected income from cattle. Likewise, the lime and green manure should increase the yields of crops in a year or so, if not at once.

If the budget is made up for a number of years, it should take account of any expected change in yield. Before this particular budget is adopted, it should be compared with another one in which the yields of crops, livestock income and operating expenses are estimated without the contemplated soil improvement. Adoption of the improvement program is justified only if it promises a greater net income.

The probable expenses on crops may be estimated in advance more accurately than the yields or prices. The number of months of labor hired, amounts of seeds, fertilizers, fuels, twine, and expense for threshing do not vary greatly from year to year. Or, if they do vary, it will often be possible to anticipate their changes with a fair degree of accuracy. These expenses should be reckoned and provision made for them before they actually occur.

THE LIVESTOCK PLAN

After the crops are raised, the next question is how to dispose of them most profitably. Even if most of the crops are raised for sale, there will often be roughages or unmarketable by-products. These must be converted into livestock products in order to sell them.

Livestock does more than provide an outlet for unsalable products. It also permits the use of labor to some profit during parts of the year when it

FORM 2. LIVESTOCK SYSTEM—EXPENSES

Kind of Stock	No.	Home Grown Feeds				Purchased Feeds				Other Expenses	
		Kind	Per Head	Total	Kind	Per Head	Total	Value	Kind	Value	
Milk cows	12	Corn Oats Alfalfa Silage	25 bu. 30 bu. 1.5 T. 3.5 T.	300 bu. 360 bu. 18 T. 42 T.	L. O. M.	100 lb.	1,200 lb.	\$ 24	Vet.	\$ 5	
Feeder cattle	23	Corn Oats Alfalfa Silage	30 bu. 10 bu. .6 T. 1 T.	690 bu. 230 bu. 14 T. 23 T.	L. O. M.	150 lb.	3,500 lb.	70	Vet.	5	
Other cattle	14	Corn Oats Hay Silage	15 bu. 10 bu. 1.5 T. 1.6 T.	210 bu. 140 bu. 20 T. 23 T.							
Hogs	18	Corn Oats Sk. milk	(Per cwt.) 6.3 bu. 1 bu.	2,020 bu. 320 bu. 4,000 gal.	Soybean meal Tankage Mineral		1,000 lb. 5,000 lb. 600 lb.	18 125 18	Vacc. Vet.	30 5	
Poultry	350	Corn Oats Sk. milk	$\frac{3}{4}$ bu. $\frac{3}{4}$ bu.	260 bu. 260 bu. 500 gal.	Poultry feed Tankage		2,000 lb. 700 lb.	55 18			
Horses	4	Corn Oats Hay	30 bu. 40 bu. 2 T.	120 bu. 160 bu. 8 T.							
Totals		Corn Oats Hay Silage Sk. milk		3,600 bu.* 1,470 bu. 60 T. 88 T. 4,500 gal.	L. O. M. Tankage Poultry feed Soybean meal Mineral	Total	4,700 lb. 5,700 lb. 2,000 lb. 1,000 lb. 600 lb.	94 143 55 18 18		\$328	\$45

*Includes 500 bushels corn to be purchased.—\$300.

could not be used in raising crops. It permits the conversion of some salable crops into other products which can be disposed of to better advantage. It also helps in the conservation of soil fertility and in rounding out a well-balanced and profitable farm organization.

The various livestock enterprises are planned to permit the consumption of such crops as could conveniently be fed. It is usually necessary to draw up several alternative plans. The relative advantages of each are considered, as well as the modifications which each would necessitate in the crop plan. Finally, the one which promises the greatest advantage in the form of income and convenience of operation is chosen and the details of its operation worked out as completely as is desired.

In Form 2 are the numbers of each type of stock to be kept and the costs on each. The cost elements are partly in the form of home-raised feeds and partly in the form of feeds to be bought, or other items involving cash outlay. To arrive at these estimates it will be necessary to draw on experience and on any available bulletins or books reporting the requirements of the various types of livestock.

Returns from Livestock

In computing the probable returns from the livestock it is necessary to estimate the probable production and prices for each product. These data may be summarized as in Form 3. Again, reasonably conservative estimates will be made as to the yields of butterfat, eggs, and similar products, as well as the rates of gain on hogs or cattle. Prices to be used in the computations may be obtained by studying the prices in the past few years and by considering government estimates of the number of livestock in the country, probable changes in demands, and any other information which seems to bear on the subject.

The livestock system generally contains an element of flexibility which, as the year proceeds, may be used in adjusting the disposition of the crops and their yields. Thus it is possible, in case of a larger corn crop than was expected, to dispose of part of the surplus by feeding hogs to heavier weights than originally intended, or by using more grain in the rations of other animals. If the hay crop is small, part of the roughage may be replaced by corn. In addition to this, more of the heavy crop could be sold and probably a larger amount carried over into the next year.

THE SUMMARY OF THE BUDGET

In order to bring together the estimates of expense and income, Form 4 may be used. In addition to the expected cash income, the value of farm produce to be used in the household should be brought down from the livestock and other budgets. Expected total income will be found by

FORM 3. LIVESTOCK PRODUCTION

KIND OF STOCK	PRODUCTION			DISPOSAL		
	Kind	Per Head	Total	Used on Farm Amount	Sales Amount	Sales Value
Milk cows (12)	Butterfat	300 lb.	3,600 lb.	210 lb. (\$63)	3,390 lb.	\$1,017
Feeders (23) . . .	Steers	900 lb.	20,700 lb.	.....	20,700 lb.	1,863
Other cattle . . .	Calves (8)	200 lb.	1,600 lb.	200 lb. (\$20)	1,400 lb.	140
	Old cows (3)	1,100 lb.	3,300 lb.	.....	3,300 lb.	155
Hogs (126)	Hogs	250 lb.	32,000 lb.	600 lb. (\$54)	31,400 lb.	2,198
Poultry (350) . .	Eggs	10 doz.	3,500 doz.	150 doz. (\$22)	3,350 doz.	500
	Poultry	.....	150 head	50 (\$30)	100	75
Total . . . . .	.....	.....	.....	\$189	.....	\$5,948

adding the expected cash income and the value of products to be used in the household or otherwise withdrawn from the farm business.

Essentially the same procedure is followed on the expense side of the statement. The summarized expense estimates are brought down from the crop and livestock budgets. In addition to these, other expenses will be incurred on the farm as a whole which could not very well have been included with the earlier groups of estimates. These include rent for the farm, interest to be paid on notes, upkeep or replacement of equipment, labor to be hired, and various other items. Careful consideration should be given to the needs of the farm taken as a whole and these expense items provided for in the general plan.

Again, it may be said that the budget is simply a plan for general guidance which sets forth the objectives for the year's business. Crop yields are uncertain, and changes in market prices may make other plans preferable before the end of the year. Part of the budget, particularly that part concerned with crops, will be drawn up to apply for several years. Other sections will be concerned with adjustment to temporary situations, such as high hog prices, low prices of beef cattle, and shortages of feed. At the end of the year the success of the business should be reckoned in view of these various situations.

CHECKING UP ON THE BUDGET BY ACCOUNTS

Drawing up the budget plan is only the beginning. As the year goes on, it is desirable to check up on it by records of what actually happens. These records will serve several purposes: (1) *They will help the farmer to adhere to his budgetary plan* by enabling him to watch the performance

FORM 4. SUMMARY OF RECEIPTS AND EXPENSES

RECEIPTS	EXPENSES
<i>Livestock (Form 3):</i>	<i>Operating expenses:</i>
Butterfat \$1,017	Equipment upkeep* \$150
Cattle 2,158	Truck and auto* 80
Hogs 2,198	Tractor* 150
Poultry products 575	Labor hired* 280
Total L. S. receipts \$5,948	Crop expense (Form 1) . . . 371
	Livestock expense (Form 2) . 45
	Miscellaneous* 50
	Total operating expense . . . \$1,126
<i>Crops (Form 1):</i>	<i>Feed bought:</i>
Corn \$	Commercial (Form 2) . . . \$328
Oats	Farm raised (Form 2) . . . 300
Flax 72	Total feed bought \$ 628
Soy beans 361	
Total crop sales \$ 433	<i>Fixed expenses:</i>
<i>Farm products to household:</i>	Taxes* \$200
Beef and veal \$20	Interest* 450
Dairy products 63	Insurance* 40
Eggs and poultry 52	Improvements, upkeep* . . 100
Pork 54	Total fixed expense \$ 790
Total to household \$ 189	<i>Livestock bought* \$ 811</i>
Total expected receipts	Total expenditures \$3,355
from farm \$6,570	Expected net income \$4,365
Government payments* 1,150	
Total expected receipts \$7,720	

*Items estimated from last year's records and shown for the first time on this page.

of the farm from month to month. (2) They will suggest directions in which he may find it advisable to deviate from the budget as crops exceed or fall short of expectations, or as prices change. (3) They will afford him a definite basis for criticism and modification of the budget at the end of the year, when the plan may be studied in view of its actual performance over an entire production period.

These records, which will be discussed in the following chapters, will naturally fall into two groups. One will have to do with the physical production and the physical requirements of the farm, in terms of feeds raised or consumed, yields of livestock products, and so on, regardless of whether they are sold, used on the farm, or carried over into the next year. These may be called the *physical records*. A second group, the *financial records*, will record current cash expenses and receipts as well as transactions on account.

Records Should Conform to the Budget

The budget and the records should articulate with each other as closely as possible. The budget should set forth definite objectives capable of measurement by the records. The records should permit the definite measurement of progress toward these aims in quantities of crops produced, numbers and weights of livestock, amounts of income, and expense in each section of the business. The records should also help in locating causes for failure so that these impediments to progress may be removed as quickly as possible.

This last point involves also the interpretation of material from the records. In the following chapters we shall give considerable attention to this question of interpretation.

After one or two years' records have been kept, it may be advisable to put some sections of the budget on a quarterly basis. The purchase of feeder cattle, the threshing expense, and similar items occur mostly or entirely in one quarter and are of little interest during the rest of the year. The production of butterfat or of eggs also varies so much from season to season that much more definite comparisons are possible if several summaries, rather than only one, are made per year. The full value of the records is not realized until they become an instrument for current control of the business rather than a mere source of periodic summaries.

REVIEW QUESTIONS

1. What is a budget?
2. Who has the greater need for a budget, a young farmer who is just starting or an older man who has been farming for a number of years?
3. How is the old farmer generally guided in his current operations? Could you suggest a better method?
4. Would you make up a complete new budget each year? Explain.
5. Why do we generally start our budget with the crop plan?
6. Suppose you are starting on a new farm; where will you get information on yields to use in your budget? Where would you get data on expected prices?
7. In the crop and livestock plans would you place valuations on the crops to be consumed on the farms, as well as on those you expect to sell? Explain.
8. After the farm year is begun, will the crop or the livestock operations be subject to the greater amount of control by the farmer? Explain.
9. What relationship should exist between the budget and the organization of the farm?
10. How should the form of the budget correspond to the accounts which are to be kept during the year?
11. What figures from the crop and the livestock plans are to be entered in the summary of the budget?
12. What figures will be added that were not in either of these plans?

CHAPTER 3

FARM PRODUCTION RECORDS

The Problem

What sort of statistical records should be kept to promote physical or technical efficiency of the farm? How can records of crop yields, livestock production, feed consumption, and other similar data contribute most to the financial outcome of the business?

ACCURACY IN PHYSICAL RECORDS

Before discussing the financial accounts, something should be said about the statistical records needed in the farm's operation. These consist of records of the use of land, acreages and yields of crops, and the numbers and production of livestock.

Measurements of crop production, weights of livestock, and amounts of livestock products are often difficult to obtain accurately. However, an error of 20 pounds in weight per hog amounts to 10 per cent of the gain on 200-pound hogs. If the weight is overestimated on one lot of hogs and underestimated on another, the comparison of methods by which the two were handled will be entirely misleading.

In the same way, if the corn yield is being recorded by the number of loads hauled, an error in estimating the contents of a wagon box may be seriously misleading. As an aid to accuracy, the contents of wagon boxes, corncribs, bins, and haymows should be determined accurately at the first convenient opportunity. Weights of the usual load hauled on hayracks and manure spreaders and the contents of the measure used in feeding concentrates to dairy cows, hogs, and other livestock should be determined. They should then be recorded so it will not be necessary to compute them again.

Statistical Data Affect Inventory Values

A frequent use of the scales to ascertain weights and rates of gains is a profitable way of checking up on results obtained from feed consumption by livestock. On most farms there are no scales, and actual weights are ascertained only when livestock is sold. Where this is the case, the farmer must resort to estimates; and, since these are likely to be rather erratic, he should seize every opportunity to verify them. Otherwise his production records may be of little use. A combined error of 100

pounds in the weight per steer and of a cent a pound in the value would make a great difference in the inventory on a cattle-feeding farm and would make the profit or loss figure for the year quite misleading.

THE FARM MAP

A map of the farm something like that in Figure 1 is nearly always useful. Whether it be roughly traced or carefully drawn is not important.

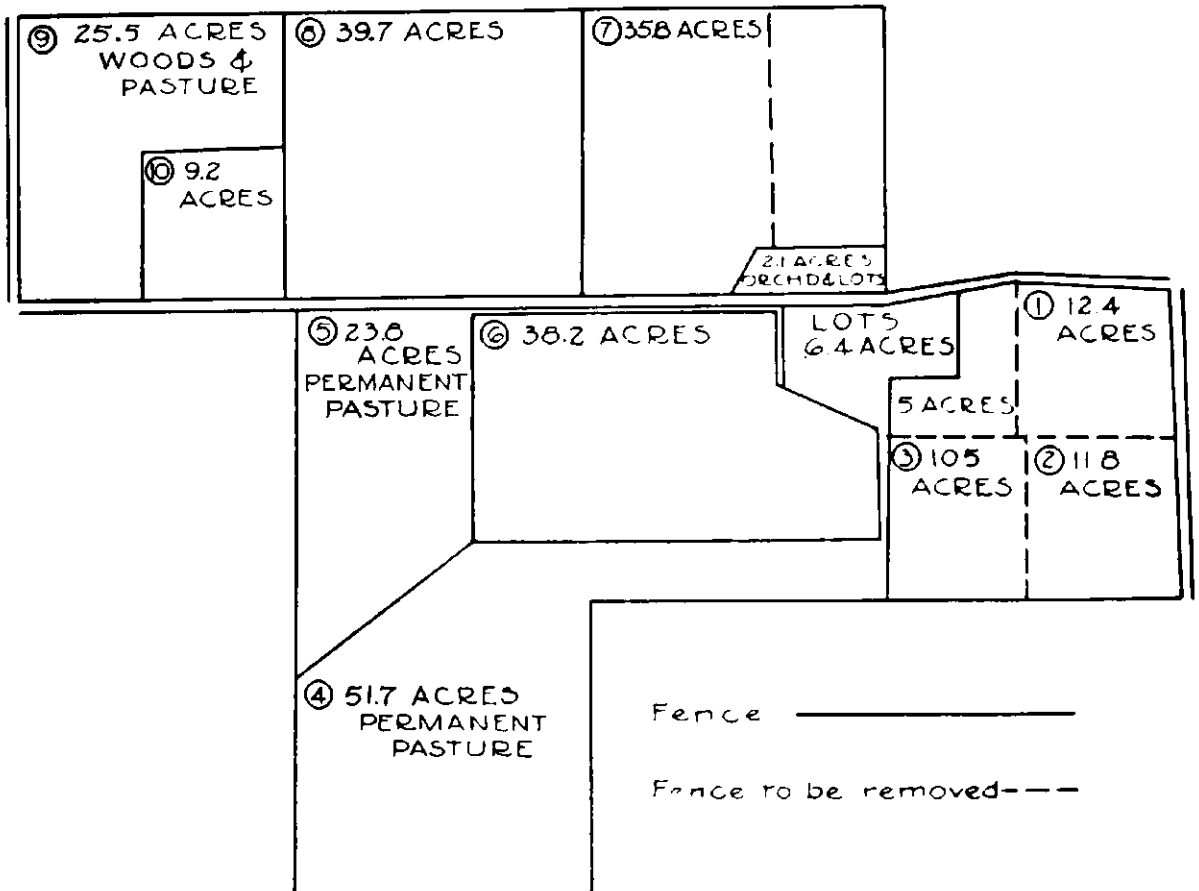


Fig. 1. Farm Map

The essential thing is a reasonable amount of accuracy in measuring acreages of the different fields. These are used in computing yields, and the need for careful measurement is obvious. It is seldom necessary to make changes in the map except when new fences are built. The farm map may even serve, where there is a fairly simple crop system, as a record of soil treatment and yields of crops. If it is large enough to permit writing several lines within the outline of each field, quantities of fertilizers applied and crop yields for each of several years may be written directly on the map. Such maps become increasingly useful the longer they are kept. They may show up the need for different soil treatment in some fields or

may indicate **the need** for some reorganization in farm layout in order to produce about the same amount of each feed crop each year in the crop rotation.

CROP RECORDS

One of the easiest and most informing crop and soil records is shown in Form 5. On practically all farms there are some fields which need different soil treatment from the rest of the farm. The extent of these differences is seldom realized until an actual record of yields has been kept for several years.

Once a start is made, it is easy to record the yields from each field each year. If the applications of manure or other fertilizer, and crop residues turned under, are noted along with the yields, these differences in productivity between fields become much more apparent. If this information is tabulated in a clear manner and in chronological order, it is possible to see almost at a glance what effect a given application of lime or fertilizer has had on the yields of a given field, how long the effects lasted, and how they compare with results from a similar application on a different part of the farm. This type of record leads to a *definite policy* of soil management and removes much of the guesswork with which a farmer generally buys and applies fertilizers.

If a few notes are kept concerning the weather during the growing season (that is, on markedly dry or wet periods, late or early frosts, and so on), it will be much easier to interpret the crop production record of specific years. This will be particularly true for records of several years back.

Results secured from the cropping system of the whole farm are generally brought together as in Form 6. It should be possible to see at a glance what use was made of the acreage of the entire farm for comparison with other farms and with the same farm in other years. Yields, total production of each crop, and the value of all crop production can be entered conveniently on the same page along with the record of land utilization. A summary of this type greatly facilitates the computation of total value of crops produced, value of feed crops raised, and other data which will be helpful later in analyzing the year's operation. We shall return to the use of these figures later on.

The figures in the crop production record should be entered when they first become available, both as a matter of convenience and for accuracy. Thus, the acreage in each crop should be noted when the planting of that crop was complete. Yields should be entered just after harvest, threshing, or corn picking, as the case may be. Where a new variety

FORM 5. CROP AND SOIL TREATMENT RECORD

FIELD No. 1 TOPOGRAPHY ROLLING				ACRES 36.5 SOIL CLAY LOAM			
Year	Crop	Yield	Soil Treatment Manure, Fertilizer, Crop Residue	Year	Crop	Yield	Soil Treatment Manure, Fertilizer, Crop Residue
1937	Oats	38 bu.		1937			
1938	Corn	46 bu.	200 t. manure on south half	1938			
1939	Corn	52 bu.		1939			
1940	Oats, 20 acres. Wheat, 16.5 a. . .	41 bu. 22 bu.	200 lbs. acid phos. per acre	1940			
1941	Clover hay	1.8 t.	Manure 250 tons on north two-thirds	1941			
1942	Corn	55 bu.	Lime, 1 ton per acre	1942			

is planted, it should be noted, as should the acreages and yields of each variety when there is more than one variety of the same crop.

LIVESTOCK RECORDS

There are so many different forms and types of livestock records that it will be obviously impossible here to take up any but the most simple and widely used ones. The records of quantities of livestock products or numbers and weights of livestock sold or bought can most conveniently be obtained in connection with the financial accounts.

For example, in the cattle account a column may be used to enter the number of pounds of butterfat as each cream check is received. At the end of the year it will take but a few minutes' work to add up these figures and obtain the total butterfat sales for the year. Similar devices may be used in the hog, poultry, and other accounts. These figures not only show the year's output but also provide the basis for such efficiency factors as the butterfat production per cow, pounds of pork produced per sow or per bushel of corn, number of eggs per hen, and various others.

The total weight, for instance, of hogs sold is a useful and interesting figure by itself. But it may either overstate or understate the amount of production. Net sales tells us more than does gross sales, and even this does not indicate net production. Net sales of each type of livestock must be adjusted for changes in the inventories. Inventories will be discussed in detail later, but certain summary data from them must be used in conjunction with purchases and sales, as shown in Form 7, in order to determine net production.

Let us suppose that a farmer finds at the end of the year that he has sold 60 hogs, weighing 200 pounds each. This makes a total of 12,000 pounds sold. But 30 of these had been purchased as feeder pigs weighing 50 pounds each, or 1,500 pounds in all. Thus, net sales were only 10,500 pounds. But this was not the net production. He has on hand 3 more sows than a year ago, and they weigh a total of 900 pounds; and in addition to this there are now 40 fall pigs weighing a total of 2,400 pounds as compared to 20 weighing 1,000 pounds a year ago. Further, 5 pigs died during the year and these weighed 400 pounds altogether when they died. Thus, the net weight of hogs produced amounted to 13,200 pounds including the pigs that died. When the latter are subtracted, the net production of marketable pork is found to be 12,800 pounds.

Similar data will be needed for each other type of productive livestock. And, assuming that the required figures have been recorded in the financial records and in the inventories, the summary of production becomes relatively simple.

FORM 6. CROP SUMMARY

CROP	FIELD No.	ACRES		YIELD		VALUE		Value Landlord's Share	Feed Units
		Owned	Rented	Av. Yield	Total Yield	Price	Total Value		
Corn for grain		44	27	61	4,340	\$.50	\$2,170	\$425	4,340
Hogged									
Silage, picked up (bu.)		7		13	90 T.	3.50	315		684
Flax		6		9	54	.96	52		130
Oats		27	19	46.5	2,144	.33	708	129	1,072
Wheat									
Soybeans (grain)		13	10	25	576	.80	461	98	691
Soybeans (hay)									
Alfalfa, 1st cut		19		2.5	48	7.00	336		912
2nd cut									
3rd cut									
Clover hay		3	10		plowed under				
Mixed hay			10	0.5	7	4.00	28		112
Total crop acres		119	76				\$4,070*	\$652	
Sweet clover and alfalfa pasture		4				10.00	40		88
Red clover pasture									
Other rotation pasture		6				6.00	36		132
Total rotation acres		129	76				\$4,146	\$652	
Bluegrass pasture		10				5.00	50		120
Farmstead		3					10*		30
Roads and waste		18	4				30*		90
							40*		90
Total farm acres		160	80		Total feed raised		\$4,276		8,493

Landlord's share:		VALUE NON-FEED CROPS		
		Kind	Yield	Value
Feed crops.....	652			
Non-feed crops.....				
Total landlord's share.....	\$652			
Total value non-feed.....*				
*Gross value, all crops.....				\$4,150

*Gross value of all crops, sum of items marked with asterisk.

COOPERATIVE FARM PRODUCTION RECORDS**Cow Test Records**

One of the most useful of farm records is that kept by the cow testing or dairy herd improvement associations. The object of these is to obtain a record of the performance of each cow in the dairy herd and of the herd as a whole. This permits the culling out of unproductive cows and a constant improvement of the herd.

The testing work is done by a cow tester employed by a cooperative organization of farmers. It is supervised in the United States by the state agricultural extension services, in cooperation with the dairy husbandry departments of the agricultural colleges, and also, in cooperation with the United States Department of Agriculture. The state extension service gives the cow tester thorough preliminary training in conducting the butterfat test, keeping the records, and in the principles of dairy cattle feeding and management so that he can be of maximum service to the farmer.

The cow testing association consists of 24 to 26 herds, so that the tester can spend one day each month on each farm. There he weighs the milk of each cow for a 24-hour period and takes a composite sample of the milkings. This sample is then tested to ascertain its butterfat content. This one day is considered as an average of the month, and each cow's monthly production is computed by multiplying this day's production by the number of days she was milked during the month. The results have been found dependable for practical farm purposes.

A feed record is combined with the milk record, and on each visit the tester weighs the grain and the roughage fed to each cow, and records this along with her production. Local farm values are then placed on the feed, and its value is compared with the income from the milk produced to get an idea of the returns that each cow is making on her feed.

The average production per cow for the entire herd is computed cumulatively by months and for the entire year. Consequently, it is possible to compare the production with that of any previous month or year and note the progress being made. The production record per cow permits the culling out of those cows which do not come up to a reasonable standard of performance. This improvement is to a large degree permanent, because disposing of the inferior cow also prevents her inferior offspring from being added to the herd.

The Cooperative Farm Management Association

The growth of cooperative farm management associations has been a recent development involving the use of farm records. These associations consist of 100 to 200 farmers who employ a trained farm management con-

sultant or fieldman to assist them with their problems. This man usually visits the farm of each cooperator once in two or three months and is available for special consultations in between times. Such associations assist the farmer in obtaining accurate records of physical production as well as financial accounts.

Each cooperating farmer keeps a record of his financial transactions, crop and livestock production, and often of feed consumption by his livestock. The fieldman takes charge of the process of summarization and analysis of records at the end of the year and helps the farmer interpret their contents.

One of the most valuable features of such an organization is that it enables each farmer to compare his performance with that of the other members of the group. Without such comparison it is very hard to tell just where the strong and the weak features of a given farm may be. The farmer who spends all his time working on the farm often finds it difficult to get a correct perspective of some of his management problems. The fieldman helps by bringing to each member the benefits of an outside point of view.

The fieldman helps set up records which will be most useful and provides a stimulus to the farmer to keep his records up to date. He does not actually keep the books. He can be of greater service in other directions, and the farmer can keep his own books with relatively little effort. The fieldman's duty is to help find any business leaks and to keep the farmer informed of any new methods that might be profitable. He brings the farmer the latest information on the business outlook and helps in the interchange of experience between members of the group.

Importance of Production Records

The importance of records of production can hardly be over-emphasized. The farmers' plans are necessarily made in terms of bushels, acres, and pounds. These are figures, therefore, which he will use directly in making his plans for each year's operation. Profits come partly as a result of wise choice in regard to costs and prices of products, but also largely from efficient use of proper physical quantities of land, labor, feeds, and other materials.

Records of production are useful during the first year chiefly in giving a detailed picture of the farm business and in affording a comparison with any available data from other farms. Over a period of several years an increasing number of useful facts becomes evident regarding the specific farm. The records suggest that different fields need different soil treatment. They give definite standards of performance in the use of feeds, in the production of butterfat and other livestock products, and do

much to change the yearly plans of the farmer from a matter of chance and guesswork into reasoned plans based on demonstrated facts and relationships.

REVIEW QUESTIONS

1. Why is the farmer deeply interested in the physical performance of his farm?
2. Would you expect a record of the financial outcome of the past year or the records of crop and livestock yields to be more directly usable in planning the business for the following year? Explain.
3. What uses could you make of a map of the farm?
4. How accurately would you draw the map?
5. What facts should be recorded each year concerning the soil management and the crop yields?
6. What uses would you make of these data?
7. What is a cooperative farm management association? What services does it perform for its members?
8. Why is it profitable for a dairyman to keep a record of the milk production of his individual cows?
9. Draw up a form that would enable you to keep track of the monthly gains, and the feeds used per hundred pounds of gain, on a lot of feeding steers.
10. A farmer is running a milk route in a small town. How would a record of the monthly production of his cows through the year be useful to him in planning to meet the requirements of his customers?
11. Can a farm be financially successful if its physical or technical performance falls below moderately efficient standards?
12. Suppose you have just moved to a newly purchased farm. Outline a group of two or three records, which should be simple and as easily kept as possible, that will help you discover the capabilities and needs of the land.
13. For your home farm, or some farm with which you are acquainted, design a group of not more than three records of physical production which would be most useful in making contemplated modifications in (a) the cropping system, and (b) the livestock system.

CHAPTER 4

KEEPING AND USING THE FEED RECORD

The Problem

How can a record be kept of the consumption of feed by the principal classes of farm livestock? What information can be obtained from this record that would help in conserving feed and controlling the feeding operations?

IMPORTANCE OF FEED AS AN ELEMENT OF COST

Feed is the largest element of cost in the ordinary livestock enterprise. In production it amounts to 60 to 80 per cent of the value of all the cost elements per hundred pounds of gain. In fattening steers, where relatively little expense is required for labor or shelter and feed consumption is high, feed may account for 75 to 85 per cent of the total costs of gains. With dairy cattle and poultry, relatively more labor is needed, and shelter, interest on investment, and so on, also amount to more than with the two types of animals just mentioned. Even here feed is still the largest cost element, taking 50 to 65 per cent of the total.

There is, however, a considerable variation in relative importance of the various elements as between different regions and types of farms. Thus, in the Northeastern States, with smaller hog enterprises and a tendency to use relatively more labor and equipment per sow, feed makes up a relatively smaller percentage of the total than in the Corn Belt. Large enterprises mean that labor can be economized better by means of large-scale methods; also large enterprises permit more efficient equipment to be used, so that these two types of cost can be kept to a minimum. On the other hand, the feed input per animal and per unit of product remains about the same as between small- and large-scale production.

The relative prices of the different cost factors also affect the proportions in which they are combined. Where feed is cheap, as in the Corn Belt, feed tends to be used freely. Where feed is higher priced, as in the Eastern States, it is profitable to economize as much as possible in its use, and to do this requires greater care of the animals, better shelter, and so on. Consequently, we generally find that feed makes up a smaller proportion of the total cost of animal production in eastern parts of the country than in the Middle West. In analyzing feed costs on a given farm, these variations should be taken into account, and local standards should be used as the yardsticks.

Variations in Feeding Efficiency and Cost

The variation in profit from farm to farm is determined more by differences in amounts and costs of feeds than by any other single factor. A comparison of feed costs and total costs between farms on an Iowa cost route showed that the 25 per cent producing hogs at the lowest cost used only 416 pounds of concentrates for a hundred pounds of gain, compared with 520 for the average and 723 for the 25 per cent producing at highest costs.

Most of these farms sold their hogs for about the same price, and there was a difference in profit of about \$6 per hundred pounds produced between the high and low groups. Four dollars of this is accounted for by the difference in cost of feed. Most of these farms produced over 20,000 pounds of hogs a year. If the hogs had all been sold at a price of \$9.70 so the average producer would break even, then the low-cost producers would have made a profit of \$260 because of efficient use of feeds, while the high-cost men would have lost \$550 from poor use of feed alone.

A study of the economy of livestock enterprises should begin with the record of the quantities of feeds used rather than with estimates of feed values. *The feed cost may run high either because it is being used wastefully or because the ration is unbalanced.* It often contains too much corn or other starchy material. Consequently, the feed record should make it possible to study the ration in detail, and that will call for a separate total of each different feed used.

FORM AND METHOD OF KEEPING THE RECORD

Various forms of feed records have been kept with reasonable satisfaction. The simplest is an estimate of the amount of each feed used by each class of livestock, made usually at monthly intervals. These estimates are added together at the end of the year, and the resulting figures are then reconciled with the inventory. Where the rations are not actually weighed, the results are likely to contain considerable error and should be used with some caution.

A form which is generally more satisfactory is shown in Form 8. By this method the daily ration is weighed, or is estimated carefully, at least once a month. The daily ration is entered on the record at the beginning of the month. If the ration is changed during the month, the new daily amount is entered at the time the change is made. No other current entries are needed. At the end of the month each ration is multiplied by the number of days it was fed. The monthly total for each feed is obtained by adding up these amounts.

This method permits a great deal of elasticity in handling the record.

FORM 8. FEED RECORD FORM

FEED RECORD

MONTH March 1941

FARM NO. _____

Date	Horse		Cattle		Hog	
	Con	Rate	Con	Rate	Con	Rate
1	1 1/2 bu	1 bu	4 bu		1 bu	2 bu
2					1/2 T.	
3						
4						
5						
6						
7						
8				On		
9				5 from		
10				stack		
11				with		
12				House		
13				1/2 to		
14				House		
15				Cattle		
16						
17						
18						
19			3 bu 1 1/2 bu			
20						
21						
22					6 bu	
23						
24						
25						
26	2 bu					
27					1 bu	
28					6.00 lb.	
29						
30						
31						
Total	47 1/2	31	111	19 1/2	35 T.	1600 lb. 104

Where the ration is not changed during the month, it is only necessary to make a single entry and then to record the total, as with oats fed to hogs in the illustration. Where a change occurs, as with corn fed to horses in Form 8, the new ration is indicated at the time its use begins.

Where a load of feed is bought with the intention of feeding it all to a single class of stock, as tankage for hogs, the total amount bought may be entered directly under that enterprise. No further entry needs to be made until another purchase occurs.

The use of hay or other roughage generally presents the most difficult problem in the feed record. Few farmers have any very definite idea of the number of pounds of hay they feed a day to a horse or cow. Furthermore, it may be practically impossible to estimate the contents of a mow or stack because of the varying tightness with which it is packed or the irregular shape of a stack.

Sometimes it is possible to weigh a ration of hay. A fairly definite idea of the weight may be had by observing how long a load of known weight lasts a given lot of stock. Otherwise, it is necessary to estimate the relative amounts fed to different lots and then to divide up the estimated contents of the mow or stack from these proportions.

A reasonably careful use of one of the methods described is capable of as great a degree of accuracy as is generally possible in actual farm operations. This is especially true since the feeding operations themselves are inexact and require a great deal of judgment and constant variation to obtain the most satisfactory results.

SUMMARIZING THE FEED RECORD

At the end of the year totals from the monthly records are brought together on a summary sheet, and the year's total consumption of each feed by each class of stock becomes available. The summary sheet is generally of the same form as the monthly records, but with a line used for each month instead of one for each day as on Form 8. A summary form is shown in Form 9.

If the current records are in good shape, it should require no more than an hour's time on the ordinary farm to copy the monthly totals on the summary sheet and add them up. No other posting or computation is necessary.

The next important step is to reconcile the feed record with the inventories and with the crop record. This not only yields information that is useful in analyzing the livestock records, but also provides a mutual check between the feed and crop records. Form 10 illustrates the general process.

FORM 9. FEED SUMMARY FORM

FEED SUMMARY FOR 1941

Month	Horses		Cattle		Sows (1)		26 Fall Pigs		150 Spring Pigs	
	Head	Days	Head	Days	Head	Days	Head	Days	Head	Days
Jan 263	4.5	65	76	10	200	8.5	76	10	200	10
Feb 348	6.0	70	74.5	16	745	16	338	15	56	375
Mar 338	8.5	45	101.5	85	480	101.5	85	104	685	6
Apr 47	4.68		148.5		600	148.5		138	958	
May 57	10.3		108.0	17.5	108.0	17.5		7.5	149	109
Jun 45	10		770	26	770	26	17	11.5	120	515
Jul 31	10.3		503	10	503	10				17
Aug 463	207		47	53						837
Sep 300	114		148.5	9.5						130
Oct 38	1.55		57		57					1065
Nov 45	1.5		117	7.7	117	7.7				1400
Dec 52	2.6		156		156					58
Total	4,331	145	1,199	570.1	12,880	7,813	198	1,005	12,880	30.5
Total	4,041	15	1,677	26	3,811	2,875	60	30	610	12
Total					16,000	6,333	79.0	601	374	346
Total									4,917	2,95
Total									442	18.5
Total									4,235	
Total									605	
Total									74	

(1) Sows and spring pigs used in pasture May - September
 (2) In horses, feeds are computed per head, in cattle per
 animal unit, in sows the unit is one sow plus baby
 till the sow is sold or bred again. There 2.2 cows
 farrowing spring pigs and 11 farrowing fall pigs are
 counted as 13 sows, in spring and fall pigs the
 feeds are computed per head

Total feed per cent
 Total milk produced
 Total lbs. concentrate per cent
 Lbs. Sam per day

On the one hand, all feed grown, purchased, or on hand at the beginning of the year is added together to determine the total supply. Next, a corresponding summary is made of feed crops sold, on hand at the end of the year, used for seed, or for feed. These two totals should balance, except for a reasonable amount of shrinkage. If the discrepancy is larger than could be accounted for by shrinkage, an effort should be made to locate the error and correct it. Failing in this, one should check over

FORM 10. SOURCE AND DISPOSITION OF FEEDS

	CORN	OATS	BARLEY	HAY	SILAGE	STRAW
<i>Source of feeds</i>						
Beginning inventory . . .	3,694	508		11.8	12	31
Purchased	497		41			
Raised	4,898	1,283	640	41.7	105	21
Total supply	9,088	1,791	681	53.5	117	52
<i>Disposal</i>						
Sold	100	104				
Used for seed		112	39			
Share rent						
Ending inventory	3,900	625	524	35.2	105	24
Shrinkage	246	70	29			10*
Total except feed	4,246	911	592	35.2	105	34
<i>Amount fed</i>						
Horses	188	523		8.0		5
Stock cattle	45			1.0		3
Feeder cattle	2,600			9.3	12	6
Hogs	1,930	337	72			3
Poultry	79	20	17			1
Total fed	4,842	880	89	18.3	12	18
Total disposal	9,088	1,791	681	53.5	117	52

*Ten tons hauled out for manure.

the inventories, the production record, and the feed record and adjust the one that seems most likely to be out of line.

If no error is found, it is likely that the discrepancy is in the feed record. There may be a miscalculation of the contents of measures used in feeding the livestock, or in contents of self-feeders, wagon boxes, and so on when the crop is fed in bulk. The discrepancy may be distributed over the various enterprises in proportion to the recorded feed consumption.

The crop disposition data should be entered in Form 10 as early as it becomes available. Disposition of old crops should be checked up in the late spring or early summer, before new crops are put into the cribs or

mows to confuse the record. A check-up at this time makes it easier to discover errors and permits a separate record of the disposal of each year's crop.

Form 10 is useful as a check on the crop record and on other records even though no detailed feed record is kept. It requires a summarization of the use or disposition of feed crops as far as the records go, and this often helps to uncover errors or omissions. In this case, the residue between the total supply of a given feed crop and the sales and inventory at the end of the year represents the amount fed plus any discrepancy. The reconciliation of source and disposition of feed, however, is much more valuable if feed records have been kept on each type of livestock.

INTERPRETATION AND USE OF THE FEED RECORD

After the feed record is summarized, it becomes possible to study the relative feeding efficiency on each separate livestock enterprise. The most should be made of this. To facilitate this study, the summary should show the feed consumption for each different lot of stock as completely as possible. Each lot of livestock that is fed a different ration or handled differently from others should also have a separate feed record. It is much more helpful to know the results obtained from the ration fed each lot of pigs after they are weaned than to know the total feed consumption for the entire hog enterprise without distinction between breeding herd, fattening hogs, and weaning pigs.

As a general thing, keeping separate records for the different types of stock involves but little extra work if the original data are recorded separately from the start. Sometimes, however, the stock are fed together; it is impossible, then, to make such a division. While this does not make the record worthless, it loses a considerable part of its benefit.

An Example

Perhaps analysis of the feed record can be made clear by means of illustrations. A record on an Iowa farm with 15 sows and producing slightly over 22,000 pounds of pork showed that the hog enterprise consumed approximately 100 bushels of corn per month from March to September. In October the consumption amounted to 170 bushels, and in the following three months to about 200 bushels per month. The greater part of the spring pig crop was sold in January and February. Consequently, the corn requirements declined to 140 bushels for February, and to slightly over 100 for March. These figures show the farmer about how much corn he will need to have available at each season during the following year if he continues to use the same system of hog production.

The figures in Form 8 show that the horses were on one-half to two-thirds of a full grain feed in the winter months from January to March, inclusive, and about three-fourths of a full ration in November and December. They were doing little or no work in the earlier months, however, and only light work part of the time in November and December. Consequently, it would seem that a worth-while saving might be made by feeding less grain during these months. The grain ration could probably be reduced by a third in these 5 months without hurting the horses. This would save about 60 bushels of corn.

The record of the feed to cattle on this farm does not distinguish between rations to milk cows, stock cows, and young stock. Consequently, it is not possible to make any very definite recommendations except that care be taken to obtain a more detailed record next year. There is one fact, however, that is fairly clear. This is that the rations do not contain enough protein-rich feeds even for fattening stock. The hay was quite largely timothy, and the only concentrates fed were corn and oats. The addition of some protein supplement to the ration should improve the production record.

On the hogs a more complete record has been kept. Here it is evident that the sows have received too little protein supplement, having had only 1,280 pounds of tankage to 53,000 pounds of corn and 11,000 pounds of oats and barley.

The fall pigs which were on hand at the beginning of the year and fed in the dry lot in the early summer seem to have had a fairly well-balanced ration—about 2,000 pounds of supplements to 23,000 pounds of starchy feeds. However, they made only a fair rate of gain, averaging .94 pounds per day from the beginning of the year until sold. Still, the feed consumption ran high and amounted to 605 pounds per hundred pounds of gain. There must have been some wastage here since 400 to 450 pounds of concentrates per hundred pounds of gain is ample. The method of feeding should be investigated to see if part of the feed is wasted by being thrown on muddy ground or if the hogs are infested with parasites or if there is some other unsatisfactory condition which causes poor gains or a wastage of feed.

The spring pigs made about the same rate of gain as the fall pigs. These pigs were kept on a fair to mediocre pasture of bluegrass and clover from the first of June until October, when they were turned into a cornfield to hog down the corn. Consequently, we are prepared to find a lower feed consumption than in the case of the fall pigs which were fed in the dry lot. Even so, the consumption of 510 pounds of concentrates per hundred pounds of gain seems high for pigs of this weight on pasture.

The next step is to examine the ration a bit more closely. We find that the supplements amounted to only about 4,100 pounds fed with 89,000 pounds of corn, oats, and barley, or about half the standard rate. The use of more supplements would probably increase the pork production per unit of feed. That is, it would be expected to increase the rate of gain per day, thereby reducing the amount of feed used per hundred pounds of gain.

Feed Analysis Deals With Quantities, Not Values

All through these illustrations no mention has been made of the value of the feeds used nor of the cost per unit of production. Naturally, when the farmer studies the data from the records, he will keep in mind the relative value of feed on the one hand, and of pork, beef, or milk on the other. But it is not possible here to describe or discuss all the possible relationships between values of feed and livestock products. Prices change rapidly, and the relationships between them are complex and do not lend themselves to the same type of control as accounting data.

The analysis in terms of physical quantities can be applied directly in checking up on the performance of a given farm. By comparing feed consumption and rates of gains with standards established by good practice, it is possible to tell with very little effort whether or not the feeds have been used economically.

In this analysis the feed record and production records should be used in close conjunction with each other. The feed record should be summarized at frequent intervals during the year to obtain maximum benefit from it. It is especially valuable to study the performance of each lot of fattening pigs or steers as soon as possible after they are sold. In this way it is possible to compare feed consumption with gains while the interest in each lot of livestock is strongest and while one remembers clearly just how they were handled.

With dairy cattle, feed and production records may be used together by feeding individual cows according to their productivity. Usually 1 pound of concentrates is fed per cow per day for each 3½ or 4 pounds of milk produced. This requires a record of the milk production by individual cows, which may be approximated by weighing the milk once or twice a month. It is assumed that the cows are fed in accordance with their previously demonstrated productive ability. If their milk yield in the immediate past were used as the sole criterion, it would be difficult to get a cow up to her full productivity once she went off her feed for a while, since low productivity would then be followed by less feed, and light feeding would prevent full production. Much other information is needed

besides that from feed records concerning the methods of handling and feeding the stock, type of pasture, sanitation, and so on.

REVIEW QUESTIONS

1. How important is feed in comparison with the other elements of expense in livestock production?
2. Draw up a form for recording the feed consumption by a single livestock enterprise. Give instructions for keeping the record.
3. Draw up a form for recording the total feed consumption on a farm.
4. How would you ascertain the corn consumption by the different livestock enterprises? The hay consumption?
5. Give instructions for summarizing the farm feed record. When should the summaries be made to be of the greatest benefit?
6. How would you reconcile the feed record with the record of crop production and the purchase of feed? Draw up a tabular form that would be of assistance here.
7. Tell how you would use the information from the feed record on hogs. What indices of feeding efficiency would you obtain? With what standards would you compare the results on your farm?

CHAPTER 5
THE LABOR RECORD

The Problem

How can a farmer decide how much labor he needs? Would it be profitable to keep a complete record of the time spent on each enterprise or on each operation? Finally, how should the equipment and power outfits be organized to make the labor most effective and to keep the combined cost for labor, power, and equipment at a minimum?

LABOR AS AN ELEMENT OF FARM COST

On an ordinary, diversified farm, labor expense is likely to absorb from 20 to 30 per cent of the gross farm income, while the equipment and power used along with it take another 15 to 25 per cent. The greater part of the labor on a farm, however, usually consists of labor of the operator and unpaid members of his family. Nevertheless, labor hired comprises one of the largest farm expenses and should be watched carefully to avoid unnecessary losses.

The typical farm is a one family farm, and its supply of labor is rather narrowly limited. The labor of the farmer himself and of members of his family comprises one of his most important resources. Under these circumstances, the practically important question is not what the labor costs, but rather what can be accomplished with it. Proper choice of enterprises to utilize available labor may make a wide difference in the net returns.

Further, in our analysis of labor cost and utilization, we should not forget that typical expenses for labor, power, and equipment vary widely from one type of farm to another. Due regard should be given to the system of farming followed on a given farm and to the specific operations which that system requires.

Indeed, if we center our attention on the cost of labor too closely, we may miss the main point altogether. A crop requires certain operations to facilitate its growth. Livestock needs certain services performed for it to stimulate its growth or its production of livestock products. The first consideration is that these operations be performed at the right time and in the most effective manner that is economically feasible. Providing that these requirements have been met, the work should be done in the cheapest manner and with the least effort possible.

Formal standards of labor performance should be used with care, though this is not to say that they may not be beneficial. The number of hours used per acre of a crop provides a useful measure of labor efficiency only if a fairly definite routine of operations is being followed, and if the standard followed refers to that particular routine. The same statement may be made for a livestock enterprise and for the number of dollars per acre spent for labor on the whole farm. In fact, such a standard for a combination of enterprises should be used only if the standard was derived from the same farm in other years, or from a group of farms of very similar type, operating under similar conditions.

Another complication in the use of data from labor records is that labor expense generally varies inversely with the amount of equipment and power used in conjunction with it. On a large, mechanized farm only half as much labor may be used per acre of corn or wheat as on a small farm with a few horses and but little machinery. This means that generally it will be preferable to combine the expense of labor, power, and equipment into a single index, rather than attempting to treat them separately. We shall return to this later in this chapter.

TYPES OF LABOR RECORDS

A Simple Labor Record for Selected Enterprises or Operations

It may often be useful to keep a record of the labor used on one or more enterprises where there is some special reason to study the efficiency or the seasonal requirements. Form 11 has been found convenient for this purpose. At the end of each day the farmer enters in the column for the operation concerned the number of hours of labor and horse or tractor work used. The number of hours of horse labor is computed by multiplying the number of hours worked by the number of horses in the team.

A summary for the year is made by totaling the columns. These figures may be compared with the rates of performance by other types of machines or sizes of teams on the same farm, or, with some caution, with performance on other farms. To obtain a seasonal distribution of labor on the enterprise it is necessary to make subtotals by months or weeks within the columns.

A Complete Labor Record for the Farm

On an occasional farm, but more often in a research project, the distribution of labor on the entire farm is studied. In order to obtain a complete record, it is necessary to record each day the amount of time each worker on the farm spent on each enterprise. To find out how efficiently

FORM 11. LABOR RECORD FORM

LABOR RECORD

COUNTY _____

FARM NO. _____

CROP Corn, 17 acres NAME Ed M. Wolf

Date	Blowing		Rearing		Harrowing		Planting		Cultivating		Picking					
	Men	Hours	Men	Hours	Men	Hours	Men	Hours	Men	Hours	Men	Hours				
7/19	4	16					5/17	3	6	6/6	24	48	10/16	6	12	
7/20	8	32			5/11	10	40	5/18	2 1/2	5	47	20	40	10/17	8	16
7/24	4	16			5/16	3	12	5/17	5	10	7/2	18	36	10/18	8	16
7/25	8	32			5/17	3	12	5/21	4	8	7/5	16	32	10/19	12	24
7/26	4	16			5/18	2 1/2	10		7/11	9	18			10/21	16	32
7/27	8	32			5/19	3	12		7/12	10	20			10/22	14	28
7/28	4	16			5/20	3	12							10/23	9	18
														10/25	16	32
														10/26	14	28
														10/28	7	14
														10/30	8	16
														11/2	7	14
														11/5	8	16
Total	44	176				26 1/2	118		14 1/2	29		97	194		133	266

each of the principal operations—such as plowing, harrowing, or cultivating—was performed, the record must tell not only the enterprise but also the size of team; and, if more than one size or type of machine was used, it must identify the machine.

Without a doubt the complete labor record is the most troublesome one that we have discussed. If it is to have any serious value it must be kept up from day to day. It cannot be filled in accurately for several days at a time. It is true that the record can be made a matter of regular routine if the farm operator subjects himself and his employees to a strict discipline in this regard. However, few farmers actually spend this amount of effort on their records, and most prefer to stop with the easier cash and feed records. After the daily labor record is complete, there is still a large amount of clerical work to do in summarizing it. It is worth while to ask ourselves what information this record can afford us and if it is worth the trouble.

INFORMATION AVAILABLE FROM THE COMPLETE LABOR RECORD

When the labor record is summarized, it will contain information on three principal questions and possibly a fourth. *First*, it will show the *amount of labor that was used at each season of the year*. This may be of some use in calling attention to the presence of slack seasons and in indicating the duration and seriousness of peak labor demands.

Second, the summary of the labor record will tell the *labor requirements of each enterprise*. This is useful information and may help in planning for greater labor economy.

Third, more definite information may be obtained regarding the *time required to perform various operations*, such as plowing, harrowing, cultivating, or harvesting a crop. This permits the development of standards of performance which help in checking up on current performance.

Fourth, the labor record permits comparison of the *relative efficiency and speed of different types of machines for the same operation*. On the ordinary farm, however, there is generally but one machine of a type. Consequently, it is necessary to fall back on information from other sources in choosing new machines.

Information from other sources, such as cost studies on groups of farms, may also be used as standards of labor performance and as representing the seasonal labor requirements on various enterprises. This leaves us, as a result of our work on the complete labor record, only a picture of the seasonal labor requirements of the specific farm and of the time actually used on different operations. It is often doubtful if this information is worth the trouble and expense of keeping this record.

In choosing the most economical size and type of machine, information from groups of farms on which cost accounts have been kept will furnish more adequate information than any farmer could obtain from his own farm alone.

CRITICISM OF THE USE OF LABOR AND EQUIPMENT

In criticizing the efficiency with which the labor, power, and equipment on a farm is used, the first and most *outstanding question is what operations are there to be accomplished*. We are in no position to plan a reorganization of power and equipment outfits, or to revise the methods by which the labor is applied, until we know just what is to be done.

One may think at first that this represents no problem at all. Each person who has been practically associated with a farm is sure that he knows just what work there is to be done and that there is no changing this list of operations. But a few moments' reflection may raise some doubts.

In the first place, some operations, such as the thinning of corn, have been performed at some time by most of the farmers in some parts of the country and have later turned out to be ineffective in raising the yield. Second, there are operations, such as discing or harrowing, which may be repeated with profit under some conditions but without effect under others. Third, it may be possible to combine operations as by the combined harvester and thresher, or by fastening pieces of equipment together as a section of a harrow behind a plow. Or there may in some cases be a choice of tools in performing the same operation, as a rotary hoe or a cultivator for the first cultivation of corn.

After a survey of the list of needed operations, it is necessary to *provide for labor, power, and equipment capable of their performance at just the times when they are most effective*. A short delay in plowing may permit the ground to bake so that clods will form when plowed. Harvesting small grain two or three days too early may result in less than the full yield, while two or three days too late may cause loss of grain from shattering. Giving careful attention to livestock at farrowing or lambing time may result in an appreciable difference in the size of the pig or lamb crop. All things considered, it seems likely that the net income of the ordinary farm may be affected more by the timeliness and effectiveness of the operations than by variations in their cost.

CHECKING UP ON AN ESTABLISHED FARM

In checking up on the use of labor on an already established farm two closely related questions need to be raised. The first is *whether or not the labor on the farm is being fully employed*. On this question the complete

labor record, if one is kept, will afford conclusive information. But a satisfactory answer to the question might be obtained without a complete labor record. Any marked irregularity in the number of hours worked during different seasons of the year should be noticed by the farmer, and should suggest opportunities of introducing new enterprises to utilize labor more fully or for changing methods to reduce the peak loads.

The equally important question of *whether or not the labor is being employed effectively* can be answered only by a careful survey along the lines just suggested. This involves an examination of the supply and type of power and its cost, of the type and size of equipment, and of the methods used in performing farm operations. These questions should not be studied separately from each other. *The problem is how the necessary operations can be performed at the least combined cost for labor, power, and equipment.* If attention is focused too closely on labor, the saving on labor may be lost in increased expenses for equipment and power. The principles just discussed and their corollaries can be made more real by applying them in the examination of an actual farm.

Planning for Economy in Operation

Data are given below on the operation of a farm of 320 acres located in Webster County, Iowa. On this farm there are raised 121 acres of corn, 70 of oats, 17 of barley, and 15 of alfalfa. There are 22 acres of tillable and 55 of non-tillable pasture. A dual-purpose cattle enterprise, mostly for beef, consists of 15 cows and heifers, 17 yearlings, 9 calves, and 2 bulls. The hog enterprise consists of 15 sows, from which 80 to 85 spring pigs are raised. There are 30 sheep and 125 hens.

The farm has been operated by the farmer and one regular, year-round hired man. There are 10 work horses and no tractor. The farm machinery used in crop production is as follows:

CROP MACHINERY

MACHINE	NUMBER	SIZE	VALUE
Wagons	3	—	\$120
Grain binder	1	8 ft.	50
Corn binder	1	—	90
Disc	1	9 ft.	15
Harrow	1	20 ft.	10
Gang plow	1	2 bottom	25
Mower	1	5 ft.	70
Hay loader	1	—	15
Manure spreader	1	50 bu.	30
Corn planter	1	2 row	40
Cultivator	2	2 row	150

As may be inferred from the values, the machinery is mostly old. Some other machines are borrowed from neighbors.

Is the labor being fully utilized, or would it be profitable to reorganize the power and equipment outfits to increase the efficiency?

There are three labor peaks on crops when working days are long and when some help on the chores is obtained from the farmer's wife. The longest of these peaks occurs from about April 20 until nearly the end of July. This is the period when it is necessary to prepare the seed bed, plant and cultivate the corn, and harvest the hay and small grains. The second peak occurs from September 1 until early in October, when the farmer trades labor with his neighbors in threshing and does his fall plowing. The third labor peak is the cornpicking season.

If a tractor were substituted for some of the horses, it would be best adapted to use on some of the seed bed preparation, such as plowing or discing. It could be equipped with a four-row corn planter, and later in the season with a four-row cultivating outfit. If a mechanical corn picker were used instead of hand-picking, the tractor would again be needed here.

How much labor would be saved if a tractor were used instead of a team of horses? A tractor with a two-bottom plow will save nearly one-third of the labor in plowing because of the greater speed of the tractor than of horses. A four-row corn planter and cultivator will reduce almost to half the labor in planting and cultivating corn. The labor in picking corn will be reduced by about a half. This amounts in all to about 720 hours in the course of the year. Except for a few days at harvest and at threshing time, the operator and one hired man should now have little trouble in handling the year's work. But we have yet to consider the effect of this shift to tractor power on the cost of power for the farm and on other farm enterprises.

What the Tractor Would Save

If a tractor were obtained, it should be possible to reduce the number of horses on the farm from 10 to 5. Since horses would now be used only for the lighter work, it might be possible to get along even with four, but a fifth should be kept for a few operations such as discing and in case one of the regular team were sick. According to the feed record, the reduction in horses would cut the feed consumption by horses from \$445 to about \$225. Reduction in other cash expenses would be small. Some space in the stable would be released for the use of other livestock enterprises. Interest on the investment in five horses and depreciation in their value would be avoided; this, according to the records, would amount to

about \$100. The total yearly saving on the horses would thus be about \$320.

What the Tractor Would Cost

On the tractor the interest and depreciation would amount to about \$140. If it were used in plowing and in planting, cultivating, and picking corn on 120 acres, it might be expected, conservatively, to be used about 600 hours per year. Allowing 40 cents per hour for fuel, oil, and repairs, this would amount to about \$250. Thus, the total expense on the tractor would be about \$80 more than on the horses it displaced.

Some new equipment would be needed to go with the tractor. A two-bottom tractor-plow, a four-row corn planter and cultivator, and a corn picker would require a new investment of between \$1,000 and \$1,200. The interest and depreciation on this would amount to about \$200.

But this is not the whole story. In the first place, the tractor is a more flexible source of power than the horses. With it, the work could be done at somewhat more timely periods. This will add something to the farm income, but it is impossible to say just how much. Second, the tractor would save a great deal of man labor, and the work would be accomplished more quickly. The four-row corn planter and cultivator would save about half the man labor on these operations. A two-row corn picker would reduce to half or less the time required in picking corn. Thus, the man labor on the crops would be reduced by about 720 hours. If this resulted in a saving of 25 cents per hour, it would amount to about \$180.

Changes in Other Directions

It is by no means certain, however, that the total amount of labor on the farm could be reduced by such an amount. On a farm of this size it would be hard to get along without hired men during the crop season. But there is a possibility of renting more land in order to utilize the new equipment outfit to the fullest degree. This would mean an increase in income for the farmer rather than a decrease in the expense.

There is another advantage to gain from the change. A smaller number of horses means more room in the stable for other livestock. Also, the saving in feed for horses would permit keeping four or five more cows. These would provide additional remunerative employment in winter when there has not previously been enough work to keep the farmer and the hired man busy for the full day.

The problem of organizing the power and equipment outfit so that it will be most efficient thus has a large number of ramifications into both the crop and the livestock systems. The highest mechanical effi-

ciency does not necessarily imply the greatest economy on a particular farm. In this case, the change in total expense would be relatively small. The final decision is more likely to turn on the question whether profitable employment can be provided for the released labor during the crop season, and on the valuation set on the greater timeliness with which the work can be performed with the tractor.

REVIEW QUESTIONS

1. Into how much detail would you go in keeping a labor record on your own farm? Explain.
2. Draw up a labor form to be used on the wheat crop.
3. Name and discuss three different uses you could make of a complete labor record.
4. How could you make use of a labor record on a single enterprise? With what standards would you compare the data from your farm?
5. How would you go about overhauling the labor and equipment plans of a farm?
6. List the enterprises that might be affected on a mixed farm by the substitution of a four-row corn cultivator for a two-row one.
7. Is it necessary that a tractor operate more cheaply for the year than the horses it displaces in order to be profitable? Discuss.

PART II
THE FARM INVENTORY—VALUATION

CHAPTER 6

TAKING THE FARM INVENTORY

The Problem

How and at what time of year should the farmer take an inventory? What methods should he follow in enumerating assets and placing a valuation on them? How can the inventory be summarized most conveniently and so that the greatest amount of useful information may be obtained from it?

The first step naturally taken by a person beginning to keep records would be to go over the business thoroughly and find out of just what property it consists and what claims are outstanding against it. These lists of properties and debts are called *inventories*.

One important object of taking an inventory is to discover the worth of each particular type of asset. *An asset may be defined as anything of value possessed by the business or any claim to values in the possession of others.* The converse of an asset is a liability, which may be defined as a claim which some person outside the business has against it—or to be more exact, against the proprietor. The *net worth*, or capital of the business, may be found by subtracting total liabilities from the total resources or assets. The net worth is one of the most significant and most frequently used terms which we shall encounter. It expresses the equity of the proprietor in the business, and its growth is a direct measure of the growth of his investment.

Taking an inventory involves two somewhat different processes. The first consists in making an actual *physical examination or count* of the assets. The second consists in *applying valuations* to the physical assets found.

An actual physical count is necessary each time. When the first inventory of a business is taken, it is necessary to go over the farm to make sure just how much of each asset there is in it; and ordinary prudence would dictate that the examination be thorough to avoid errors. In later inventories the physical count is still necessary to verify numbers, weights, and measurements. Losses, wastage, or shrinkage are always occurring; and, if the inventory is not made carefully, a considerable margin of error is likely to creep into the records from this source.

The second part of inventory taking, that of *valuation*, will be discussed later at greater length; but it may be said here that some sound

method of valuation must be applied to each inventory. Values cannot be taken as purchase prices minus income from sales. If a farmer buys a carload of cattle for \$1,000 and afterwards sells part of them to a neighbor for \$600, he cannot subtract \$600 from \$1,000 and inventory the remainder at \$400. There are two possible sources of error in such a procedure. First, there has probably been some gain in weight. Second, the sale may have been at a different price per hundred pounds or per head. The cattle sold may represent only half the carload bought, so that the remainder, taken at the cost rate, may still be worth \$500 or more.

DATE OF INVENTORY

An inventory is necessarily taken at the beginning and the end of each accounting period in order to correct such discrepancies as the one just discussed. The income for the year must be increased by the value of produce as yet unsold, such as grain in the cribs or granaries, hogs not yet marketed, and other similar assets. On the other hand, the expenses must likewise be adjusted by the decreases in value of inventories. The value of feeds on hand at the beginning of the year but consumed before its end must be charged to the operation of the business for that year. Reduced value of equipment or buildings during the year from use or weathering must also be subtracted from the inventories and added to the expenses.

The Farm Operation Year

In general, there are two primary considerations, as well as several minor ones, which will decide when the inventory is to be taken. First, is there some *date that is most significant* in the farm operation? The date when farm work begins for the year's crops, about March 1, may be the most logical. In the case of a tenant, the date he moves on the farm and, thereafter, the date of the renewal of his lease will certainly mark the beginning of the farm year.

Convenience of Inventory

The *second* major consideration in fixing upon an inventory date is that of *convenience*. This involves a number of questions which may not all point to the same date. For one thing, it is desirable to take the inventory when there is but little else to do. This means that some time during the winter—perhaps from New Year's Day to the first of March—would be most convenient. It is likely that the first of January has the advantage here, since by the first of March the farmer is likely to be thinking about the spring work, testing seed corn, or busy with spring pigs.

The amounts of crops or livestock on hand should also be considered.

Obviously, the smaller the quantity of assets to be inventoried the easier will be the work. March 1 is an easier date from this point of view than January or some earlier time. By March the last year's crops have largely been fed up so that it will be easier to inventory what is left. It is also likely that some of the livestock crop on hand in January will be disposed of by March. It must be confessed, however, that the labor saved by waiting until March applies to only part of the inventory and probably will not amount to more than an hour's work on the ordinary farm.

When the needs of the livestock and the preparations for the spring work are considered, the January 1 inventory will probably be most convenient after all. Another important consideration is that the inventory will be needed in making plans for the coming year. The winter season, when work is lightest, is the logical time to think over the plans for the coming season. By March it is necessary to begin to put some of these plans into actual effect. Consequently, it is advantageous to have the inventory and other pertinent information on hand as soon as possible.

Income Tax and the Inventory

The *financial year* of most businesses coincides with the calendar year. This is of more importance to the farmer *subject to the income tax*, which is collected on the income of the *calendar year*. It is possible to keep the records over a different period and then adjust them to the tax year, but this is troublesome and can be avoided by taking inventories at the beginning and the end of the tax year in the first place. In view of all these considerations, it would seem that the January 1-December 31 accounting year would be the most satisfactory.

MAKING THE PHYSICAL COUNT

If possible, the entire inventory should be *taken on a single day*. If this is not feasible, it should at least be taken as of a single date. Thus, if the inventory of corn in the cribs, for instance, is not actually taken until January 15, the amount found should be increased by the number of bushels which it is estimated was fed, sold, or otherwise disposed of between January 1 and January 15. Similarly, if the hog inventory was not taken until January 15, a litter of pigs farrowed on January 10 would not be included in the January 1 inventory.

Livestock and Crop Inventories

As a general thing, it will be found convenient to take a pad of rough paper to make the original notes as to numbers and weights of livestock, quantities of feeds, and other items. Numbers and weights of livestock should be noted and later transferred to a livestock inventory, such as

Form 12. An effort should be made to anticipate later needs for information on the physical as well as the financial aspects of the inventory. Numbers and weights of animals should be recorded carefully in order to have the basic data for computing rates of gains on meat animals.

If there are scales on the farm, it will be worth while to weigh some of the hogs or beef cattle to get more accurate records of weights. For instance, an error of 30 pounds apiece on a lot of 50 hogs at \$10 per hundred pounds would result in showing \$150 too much or too little income from that enterprise for the year.

Horses should be listed individually, and the same is true for valuable

FORM 12. LIVESTOCK INVENTORIES

	OPENING INVENTORY			CLOSING INVENTORY		
	No.	Weight	Value	No.	Weight	Value
<i>Cattle:</i>						
Milk Cows.....	12	14,400	\$ 700	14	16,800	\$ 840
Beef cows.....				1	700	40
Bull.....	1	1,500	\$ 90			
Total breeding stock.....	13	15,900	\$ 790	15	17,500	\$ 880
Calves.....	7	1,225	\$ 98	4	900	\$ 48
Heifers.....	6	5,400	300	6	4,800	300
Steers.....	23	8,050	805	25	10,650	\$1,118
Total young and fat.....	36	14,675	\$1,203	35	16,350	\$1,466
Total cattle.....	49	30,575	\$1,993	50	33,850	\$2,346
<i>Hogs:</i>						
Old sows.....	16	4,400	\$ 220	18	5,220	\$ 313
Gilts.....						
Spring pigs.....	13	3,250	162			
Fall pigs.....	23	1,150	115	34	2,210	133
Boars.....	1	150	15	1	560	8
Total hogs.....	53	8,950	\$ 512	53	7,990	\$ 454
<i>Horses:</i>						
Nell.....	1		\$ 50			
Molly.....	1		45	1		\$ 15
Jack.....	1		20	1		15
Pet.....	1		10	1 (Bill)		75
Total horses.....	4		\$ 125	3		\$ 105
<i>Poultry:</i>						
Hens.....	350		\$ 210	350		\$ 210
Roosters.....	12		4			
Other poultry.....						
Total poultry.....	362		\$ 214	350		\$ 210

FORM 13. FEEDS AND SUPPLIES INVENTORY

KIND OF FEED	OPENING INVENTORY		CLOSING INVENTORY	
	Quantity	Value	Quantity	Value
Ear corn.....	7,240	\$3,258	5,146	\$2,573
Shelled corn.....	742	334		
Corn (bu. in fodder).....				
Fodder.....				
Silage.....	57	200	63	220
Oats.....	2,600	780	1,800	594
Wheat.....				
Barley.....				
Hay, Alfalfa.....	45	315	35	245
Red clover.....				
Mixed.....				
Timothy.....				
Soybean.....				
Oat hay.....			7	28
Straw.....			4	12
Soybeans (grain).....			450	360
C. S. meal.....				
Linseed oil meal.....	800	14	2,600	39
Tankage.....			1,700	41
Salt.....	200	1		
Minerals.....		1	50	1
Total feed.....		\$4,903		\$4,113
Seeds, corn.....				
Lime.....		31		
Fall plowing.....	97 A.	97	59 A.	59
Wheat (seeded).....				
Alfalfa seeding.....	9 A.	18	11 A.	44
Total seeds, etc.....		\$146		\$103

bulls and registered dairy cows. But for most types of cattle, hogs, sheep, and so on, a count of numbers and a record of weights will be sufficient.

When crops are inventoried, the cribs, mows, or stacks should be measured and the contents estimated from dimensions found. The first inventory will, of course, be the hardest to take in this respect. After dimensions of cribs or bins are once recorded, it becomes an easy matter to compute their contents in future years. Finally, crops, feeds, and supplies on hand are recorded as in Form 13, so that total values may be determined for transfer to the inventory summary.

Inventories of Equipment and Buildings

Forms 14 and 15 provide a means of summarizing valuations of machinery and of permanent improvements. It should be noted that these forms facilitate not only determination of total value of each type of

long-lived assets for a given data, but also provide a basis for the corresponding inventories for future years as long as the assets last. Further, since each machine or building has its own expected length of life and rate of depreciation, it is necessary to list each one separately.

FORM 14. INVENTORY OF FARM MACHINERY

DESCRIPTION	Year Acquired	Original Cost	Estimated Total Life, Years	Annual Depreciation	Value January 1, 1940	Value January 1, 1941
<i>Crop machinery</i>						
Wagon	1924	\$104.00	23	\$ 4.50	\$ 32.00	\$ 27.50
Wagon	1936	28.50	8	3.50	14.50	11.00
Manure spreader	1935	120.00	11	11.00	72.00	61.00
Plow, 1 bottom	1937	12.00	10	1.20	9.00	7.80
Plow, tractor	1935	125.00	15	8.30	88.70	80.40
Weeder	1935	27.00	12	2.25	16.25	14.00
Disk, tractor	1937	66.00	11	6.00	48.00	42.00
Harrow, spike	1936	44.00	15	3.00	38.00	35.00
Corn planter	1924	70.00	25	3.50	14.50	11.00
Cultivator, 1 row	1933	37.00	12	3.10	16.00	12.90
Cultivator, 2 row	1924	115.00	30	4.00	47.00	43.00
Corn binder	1935	61.33	15	4.00	49.00	45.00
Corn picker	1935	222.00	12	18.50	132.50	114.00
Grain binder	1933	347.00	35	10.00	277.00	267.00
Mower	1927	65.00	15	3.00	17.00	
Mower	1940	149.00	25	6.00		143.00
Side delivery rake	1935	60.00	12	5.00	35.00	30.00
Hay loader	1936	115.00	15	7.50	89.50	82.00
Total crop machinery					\$ 995.95	\$1,026.60
<i>Livestock equipment</i>						
Harness	1934	\$ 43.00	10	\$ 4.30	\$ 19.00	\$ 14.70
Cream separator	1935	65.00	10	6.25	34.00	27.75
Milking machine	1937	125.00	8	15.60	79.00	63.40
Hog houses	1939	101.50	12	8.50	93.00	84.50
Hog waterer and oiler	1938	14.35	10	1.40	13.00	11.60
Brooder house	1937	50.00	7	7.00	29.00	22.00
Brooder stove	1936	21.00	10	2.00	13.00	11.00
Feed grinder	1937	48.00	12	4.00	36.00	32.00
Tank heater	1938	14.60	6	2.50	9.60	7.10
Total livestock equipment					\$ 325.60	\$ 274.05
<i>Special equipment</i>						
Grain elevator	1929	\$106.00	15	\$ 7.00	\$ 29.00	\$ 22.00
Ensilage cutter (1/3)	1937	60.00	10	6.00	42.00	36.00
Motor	1937	48.00	6	8.00	20.00	12.00
Tractor	1937	505.00	7	70.00	295.00	220.00
Total special equipment					\$ 386.00	\$ 290.00
Total equipment					\$1,707.55	\$1,590.65

The year when a given machine was originally acquired, its expected total useful life and its original cost together provide the basis for valuation at each inventory date until it wears out. This is subject to modification later on if the original expectation of life is found to be in error, or if substantial modification or addition is made to the asset. However, we shall return to the question of modification in these valuations later.

Identical forms may be used for inventories of equipment and of buildings. There are, however, two slightly different methods of construction, depending on whether depreciation and estimated life of each item is to be counted from the date of original purchase or from the first year when an inventory was taken. These differences are illustrated in Forms 14 and 15. In Form 14 the life of the machine is counted from the year of purchase, and all valuations are referred to the original cost. In Form 15 original cost and year of purchase are shown in the inventory merely as a convenient means of record. Instead of the total years of life, the estimated remaining years are shown, and depreciation is referred back to the first inventory rather than to the purchase price. Where the purchase price is not known or where an addition has been added to a building since it was first erected, this may be the preferable method.

FORM 15. INVENTORY OF FARM IMPROVEMENTS

Description	Year Acquired	Original Cost	Value January 1, 1940	Years Remaining Life	Annual Depreciation	Value January 1, 1941
Barn.....	1919	\$2,660	\$1,328	18	\$ 72	\$1,256
Corn crib.....	1918	620	354	28	12	342
Corn crib, temporary.....	1938	87	79	13	6	73
Silo.....	1920	360	221	30	7	214
Hog house.....	1926	272	182	30	6	176
Poultry house.....	1918	304	128	16	8	120
Machine shed.....	1918	262	88	11	8	80
Garage.....	1925	360	216	24	9	207
Windmill.....	1931	130	75	15	5	70
Fence, 1,000 rods.....		900	560	8	68	494
Fence, new, 80 rods.....	1940	84		15	6	78
Tile, 1,000 rods.....	1938	1,145	1,107	58	19	1,088
Total farm improvements.....			\$4,338		\$226	\$4,198
Dwelling.....	1923	\$3,350	\$2,213	33	\$ 67	\$2,146
Total improvements.....			\$6,551		\$293	\$6,344

The four inventory forms just discussed provide means of listing most of the farm's assets, but the forms need to be modified to suit the particular business. Also, there are certain other types of assets, not yet mentioned, for which relatively simple inventory forms can be developed.

Thus, the acreage of land should be recorded, and if there is a pronounced difference in productivity between various fields, these should be listed and valued separately.

A list should be made of bills owing to the business, and also of bills owed to other persons, notes payable, mortgages, or other obligations. The amount of cash on hand or in the bank should be recorded. An approximate list should be made of the small tools, such as forks, shovels, and axes. Seeds or supplies, such as twine, fuel, or oil, should be noted at the prices paid for them.

GROUPING AND SUMMARIZING INVENTORIES

After making the physical count, valuations are applied to the assets enumerated. Next, total values of the different groups of assets are brought together to find the total capital and the net worth of the business. More will be said about the principles underlying valuation in the next two chapters. For the present, we will assume that satisfactory valuations have been decided on and that we are ready to proceed with the summarization of the inventory.

The resources should be grouped in such a way as to make the significant relationships of different resources to the business stand out. Similar assets, or those which serve similar functions in the business, should be grouped together or placed in close proximity to each other. Contrasting types of assets, such as machinery, productive livestock, buildings, or land, may be grouped separately to make it easier to observe the proportions of the total investment which are being used for each different purpose.

In Form 16, which illustrates this summary, the relative investment in each type of asset is apparent at a glance. A number of things about the farm business may be inferred about the John Jones farm from this summary. The first thing that strikes the eye in the January 1940 inventory is that the fixed assets in the form of land and buildings make up about two-thirds of the total resources. This is typical of the farm business, and a fixed investment of \$19,000 out of \$29,000 is not in itself a cause for alarm. The working assets amount to \$2,643, and current assets to \$7,115 of which about \$1,900 is in productive livestock and about \$5,000 in feeds. We notice further that cash, which is the only really liquid asset, amounts to only \$137, while accounts payable in the form of notes and floating bills amount to \$3,400. This is not a dangerous condition, considering the \$7,115 of current assets.

How does the January 1940 inventory compare with that a year earlier? This is one of the first comparisons a farmer will naturally want

to make. In the case we are using for illustration, it is apparent that the 1940 assets are \$2,000 greater than they were a year before, while liabilities have increased slightly over \$1,000. Further examination shows where these shifts have occurred. On the side of the assets the explanation is found in the greater amount of feed and crops carried over and in the greater amount of feeding cattle on hand, while in the liabilities there have been increases both in notes and in bills owed.

FORM 16. COMPARATIVE INVENTORY

ASSETS						
	January 1, 1939	Per Cent of Total Assets	January 1, 1940	Per Cent of Total Assets	January 1, 1941	Per Cent of Total Assets
<i>Fixed assets:</i>						
Land.....	\$14,700	55	\$14,700	51	\$14,700	53
Buildings.....	4,288	16	4,338	15	4,198	15
Total fixed assets.....	\$18,988	71	\$19,038	66	\$18,898	68
<i>Working assets:</i>						
Cattle, breeding.....	\$ 835	3	\$ 790	3	\$ 880	2
Equipment.....	1,697	6	1,708	6	1,591	6
Horses.....	160	1	125	.....	105	.....
Car.....	40	.....	20	.....	340	1
Truck.....	.....	.....	.....	.....	.....	.....
Total working assets.....	\$ 2,732	10	\$ 2,643	9	\$ 2,916	9
<i>Current assets:</i>						
Cattle, fattening.....	\$ 700	3	\$ 1,203	4	\$ 1,466	5
Hogs.....	628	2	512	2	454	2
Poultry.....	180	1	214	1	210	.....
Feed and crops.....	3,320	12	5,049	18	4,216	16
Cash.....	243	1	137	.....	108	.....
Accounts receivable.....	.....	.....	.....	.....	.....	.....
Total current assets.....	\$ 5,071	19	\$ 7,115	25	\$ 6,452	23
Total assets.....	\$26,791	100	\$28,796	100	\$28,268	100
LIABILITIES						
Mortgages.....	\$ 8,016	30	\$ 7,850	27	\$ 7,684	27
Notes payable.....	1,873	7	2,960	10	1,480	5
Accounts payable.....	260	1	440	2	126	1
Total liabilities.....	\$10,149	38	\$11,250	39	\$ 9,290	33
Net worth.....	\$16,642	62	\$17,546	61	\$18,978	67
Net ratio.....	2.6	.....	2.6	.....	3.0	.....
Working ratio.....	3.7	.....	2.9	.....	5.8	.....
Current ratio.....	2.4	.....	2.1	.....	4.0	.....

The January 1941 inventory shows a \$500 decrease in assets, but a decline of approximately \$2,000 in liabilities, so that net worth increased over \$1,400. During the latter part of 1940 more of the crops raised were sold, and less feed was carried over into 1941. The proceeds and funds from sale of livestock had been used to pay off part of the notes.

If the items in these statements had been arranged indiscriminately, it would have been much harder to arrive at definite conclusions regarding the state of the business or the distribution of resources. In fact, total capital and net worth would have been the only facts easily apparent to the reader.

REVIEW QUESTIONS

1. What is an inventory?
2. What is an asset? A liability?
3. What is meant by net worth?
4. Why is it necessary to take an inventory instead of figuring the value of the property from the past year's records?
5. On what date would you take a farm inventory?
 - A. What considerations favor January 1?
 - B. What advantages has March 1?
6. Give instructions for making the physical enumeration of the assets.
7. Draw up a convenient form for the inventory of buildings; for the livestock inventory; for feeds and supplies.
8. What is a comparative inventory statement? Draw up two alternative classifications of assets for the comparative inventory.
9. What benefits can be derived from the comparative inventory? What facts can you obtain from it?
10. Draw up a set of forms for an inventory for a farm which which you are acquainted.

CHAPTER 7
VALUATION OF INVENTORIES

The Problem

What basic principles should guide us in evaluating the inventories? Can the same method be applied to all types of assets, or must each principal type of property be valued in accordance with the nature of the asset or the purpose for which it is used?

Valuation of the assets is one of the most important and perplexing problems with which the accountant has to deal. An effort will be made to point out what seem to be sound and satisfactory principles, but they cannot be discussed in great detail. Many cases will arise in which the principles need to be developed further and brought into accord with peculiar or local circumstances.

An error in valuation of an inventory may make the accounting results quite misleading. Suppose that an overoptimistic view of the grain market causes an accountant to value 2,000 bushels of wheat at \$1.00 per bushel instead of 80 cents. This means that the wheat is put at \$400 more than the price for which it is finally sold. How does this affect the records?

In the first place, if this is in the ending inventory, it will inflate the net worth by just the amount of overvaluation, making it appear to be, perhaps, \$10,400 instead of \$10,000. The error will have further consequences. An increase in net worth is counted as an accrual for the year. Thus, the income for the year just closed will appear to be \$400 more than it really was. If the true profit for the year was \$1,000, this will make it appear to be \$1,400.

This is not all. The closing inventory for one year is the opening inventory for the next one. An inflated opening inventory will reduce the apparent net income by the same amount. The inflated inventory, therefore, has the effect of shifting that amount of apparent profit from the second year into the first one. If the inventory has been undervalued, it would have just the opposite effect. The errors in valuation, therefore, violate both the primary purposes of the records, that of showing the true net worth of the business and that of showing the true relative profits made in different accounting periods.

METHODS OF VALUATION

There are many methods and theories of valuation. In the first place, the accountant has a different problem from the economist, who is studying the basic principles of value. The economist is interested in the forces which cause commodities to exchange for each other in the ratios that they do. Many of these forces, which are known to exist and are taken into account by the business man, are not susceptible to measurement.

The accountant, on the other hand, must place definite and specific valuations on the assets with which he works. He, like the economist, is unable to measure some of the basic forces. He has available only the practical facts and must use methods which are arbitrary in many respects. It is not surprising that all accountants do not agree on the best methods of valuation, nor that these methods are frequently criticized by the economist.

Considering the nature of the problem, the best we can do here is to present a brief description of relatively simple procedures which can generally be depended on to yield results which are satisfactory for practical purposes. This means that the valuations must be as accurate and basically sound as the nature of the case permits, and that they must not result in misinformation which could lead to unsound business decisions.

Valuation at Cost

Valuation at cost should be mentioned first. This means entering in the inventory the amount that was actually invested in the asset when it was acquired. For this method it can be claimed that it enables the records to show what really has happened in the business. With cost as the basis of valuation, the inventories will show the total of sums actually put into the business.

An objection to this is that information on original investment ceases to be useful or significant after the business has been in operation for some time. The information in the records should be useful as far as possible in current management, and the facts of original investment afford no guide to business decisions after conditions have changed. Furthermore, the records should show the true net worth of the business at the present time. If original cost is used as a basis of valuation, the figures will seldom conform to the true net worth. Suppose the farm was actually bought 30 years ago at a price of \$20 per acre, and surrounding farms are now selling for \$125 per acre. In such a case, the original cost becomes absurd as a basis of present net worth.

A further objection to using cost is that it can seldom be applied to things which have been produced on the farm. First, few farms have

cost accounting systems. Second, there are so many joint elements of cost on the ordinary farm that little confidence can be placed in the findings of such cost systems anyway.

Cost or Market Price, Whichever is Lower

Another common basis of valuation is cost or market price, whichever is lower. For this method is claimed the virtue of conservatism. If an asset were purchased under inflated prices, cost will not represent present worth. To find true net worth it would be necessary to write down the valuation from cost to what could actually be obtained if the asset were offered for sale. This would be represented by market price at the present time. On the other hand, market price sometimes represents too optimistic a valuation. If it exceeds the original cost, the latter figure is used to avoid the danger of overstating the net worth.

The first objection to this method is that values can be understated as well as overstated. In the case of the farm mentioned a couple of paragraphs back, valuation at the original cost would be the lower of market or cost but would be unreasonable as a basis for present net worth. The lower of market or cost is, after all, a purely arbitrary method. True, it contributes to a certain degree of financial safety, but at the expense of distorting the facts in many cases. Furthermore, the degree of conservatism differs inversely with the need for it. When prices are rising, cost will probably be the lower of the two valuation bases. But, when prices are rising, there is least need for conservatism, at least until a dangerous boom develops. When prices are falling, market price will be the lower of the two. But here an even greater degree of conservatism is needed, since next month's prices will probably be even below present ones.

Available Net Selling Price

A third possible basis for valuation is the available market price. This means the price which could probably be obtained for the asset if marketed, less the cost of marketing. This has the merit of conforming most closely to the present worth. The concept can also be extended to include a consideration of the probable trend of price until such time as the asset will actually be ready to market. This permits the use of judgment in valuation much more than either of the methods just described.

This method also has its defects. In the first place, while it may be applied to crops or livestock produced for market, it has little meaning when applied to such things as buildings or machines which are to be worn out in the business and for which no actual market exists.

Reproduction Value

A fourth method is that of valuing assets at what it would cost to reproduce them at present prices and under present methods of produc-

tion. This avoids the objection to the cost basis that figures, such as original cost of construction of buildings, may not be known or, even if known, may not be of present significance. Of course, this method implies the writing down of reproduction value to conform to the present depreciated condition of the asset.

The reproduction cost method is obviously adapted to long-lived or fixed assets and has little application to short-lived materials. An objection made with regard to the former type of assets is that often it might not be desired to reproduce the old building in the same form or with the same design as it now stands. Again the method should not be followed blindly. It should be expanded to mean the probable reproduction cost of a building or other asset which will serve equally well the purpose to which the present asset is being put. It is particularly important, however, to note that it is not the physical asset that the farmer would want to replace if the old one were destroyed, but the series or *stock* of services which the asset represented and with which it promised to provide him.

Method Must Conform to the Nature of Asset and Purpose of Accountant

We have seen that each of the methods discussed was capable of serving a proper purpose of valuation in some cases but not in others. Each has some points to recommend it, and each has serious defects. The best rule is to follow no rule blindly but to use judgment in selecting a method that will conform to the nature of the asset to be valued and to the purpose of the accountant. The valuations finally adopted should conform to the conservative present net worth of the business. If this is done, it is necessary to break entirely with the theory that the inventory should be composed of recorded original investments. The original investments probably do not equal the present worth, and if they are wanted, they can be found in the records of the years when they were acquired. The test of usefulness of the inventory figures is *whether they tell the present truth (allowing a reasonable margin to prevent overvaluation), and whether their use would injure or mislead any person involved in or with the business.* How do the methods of valuation just described conform to the economic basis for valuation?

THE BASIS OF VALUATION

Since the purpose of the business enterprise is to produce an income, valuation of an asset must be based on the net income anticipated from it. But this principle must be applied with some consideration to the specific nature of the asset.

- (1) If the asset in question is a salable product or one (such as a

note receivable) which can be converted into money directly, the problem of valuation is relatively simple. Here we can apply a direct valuation based on the market price less cost of marketing.

(2) If the asset is one that yields a continuous income or a series of incomes over a period of time (such as farm land, a bond, or corporation stock), a method of direct valuation slightly different from that under (1) can be resorted to. That is, we can "capitalize" or discount the anticipated future incomes to find the sum of their present values.

(3) If the asset does not yield income directly but provides services which contribute to the income of the enterprise (such as a machine, a building, a fence), then some indirect method of valuation must be resorted to in order to ascertain the present net value of the anticipated sum of services rendered.

Direct Valuations

Direct valuation assumes that there is a definite and determinable series of money incomes which is anticipated by the proprietor of the enterprise, and which can or could be transferred to someone else if the proprietor should wish to dispose of the specific asset or of the enterprise as a whole. Thus a 40-acre field can be sold by one farmer to another, after which the buyer will receive all benefits or returns from that field as long as he continues to hold and use it. If the seller and the potential buyers can estimate what the future incomes (and expenses) pertaining to that land will be, with a sufficient degree of accuracy or probability, a basis is thus established for a price—a valuation of the field.

Not all expected incomes provide a satisfactory basis for an accounting valuation. Suppose that a farmer discovers a method of cultivation capable of increasing his yield of corn. Now, obviously this will increase his income—at least until its use is adopted by so many farmers that a corresponding reduction takes place in the price of the corn grown. But can this source of income be transferred and assured to another farmer? Such a discovery might be capable of yielding millions to farmers in general, but once the secret has been told to someone else, there is no means of either limiting its spread or of guaranteeing to a purchaser of the information that he and he alone will receive any particular and specific amount of income from it. Only if the process could be patented and the users licensed and legally limited in its use could a valuation be attached with sufficient assurance to provide a basis for an accounting valuation, no matter what social benefit, or even private benefits, might conceivably result from the discovery.

If on the other hand, the improved method required a special shape of cultivator shovel which could be protected legally by a patent, then

a legally enforceable claim to the anticipated returns could be set up and could be transferred to someone else. Or, if the increased yield were obtainable through hybridization by means of two pure strains of seed corn, at least one of which was owned and held solely by the discoverer, again a condition would exist in which certain anticipated incomes could be assured to the holder and could be transferred, wholly or in part, to someone else.

Obviously, there are many puzzling problems in the process of valuation, and at best many valuations are and can be nothing more than shrewd guesses of the transferrable income yielding ability of specific assets or of the enterprise as a whole.

The Process of Capitalization

If data regarding future incomes from use of a transferrable asset can be estimated with a fair degree of probability, then a basis exists for placing a specific valuation on that asset. The process applied is known as capitalization.

Let us take as an illustration a bond which has 99 years to run to maturity and which pays \$60 annually to its holder. What will be the present price and the value of the bond? Our problem is to find the sum of values at the present time of this series of future incomes.

The \$60 which is due today is, obviously, worth just \$60. But the \$60 which is not due until a year hence is worth somewhat less at the present time. In other words, the future incomes must be "discounted." If the going rate of interest (time preference) is 5 per cent, we would expect the \$60 due in a year to be worth \$57.12. Similarly, the \$60 due in two years would be worth \$54.42; and that due in three years would be worth at present \$51.83, and so on. We could find the value of this bond by discounting each annual payment and adding up the present values. We can accomplish the same purpose by dividing the annual expected net income by the anticipated rate of interest. Thus, \$60 divided by .05 gives us \$1,200 as the present value of the annual income in question, provided that it is to run for quite a long period of years. The basic formula is thus:

$$\text{Value} = \text{annual income} \div \text{rate of interest, or } V = \frac{a}{r}$$

The same method might be applied in finding the valuation of an acre of land. Suppose the land could be rented for \$9 per acre and that taxes and other expenses amounted to \$1.50, leaving a net income of \$7.50. What is the value of the land? If the rent were expected to remain at \$7.50 net, and if the interest rate were expected to remain at 5 per cent,

by the process of capitalization described above, we would find its value to be \$150 per acre.

If the interest rate were expected to be 6 per cent, however, the same method would show the land to be worth \$125. The valuation will, thus, depend as much on the expected interest rate as on the expected income.

Limitations of the Method

Suppose that instead of a constant rate of income from the land (or of expense in operation) we expected the income to vary from year to year. In that case, the same general principle would still prevail, and valuation would be found by discounting the anticipated net incomes; but the process would be more complex than the formula described. If an owner and would-be seller expected the net rent to increase by 25 cents per year to a new level of \$10 net an acre per year after 10 years, while the prospective buyer expected rents to fall 15 cents per year until a level of \$6 an acre were reached, the two would naturally arrive at very different estimates of valuation.

This brings us to the question: Just how sound are the valuations placed by accountants or business men on their assets or their businesses? Does the process of capitalization, when applied to land or other sources of variable and uncertain income, really provide a method for determining dependable and objective valuations, or does it merely provide a means of rationalizing the market price and perhaps testing the closeness of fit of present market prices to present net incomes and present interest rates? That fertile and favorably situated farm land is capable of yielding a net income, if handled with reasonably good judgment, can easily be conceded. But what is known about the *amount* of such income in future years? Will it amount to \$10 per acre or to \$15 or to \$5? And during the next 20 years will interest rates average 4 per cent or 6 per cent or 2 per cent?

Clearly, the fact that land, long term bonds, industrial stocks, and so on, do sell for fairly definite prices at any given time indicates that farmers and other business men do form fairly consistent judgments about future incomes and future interest rates. But the equally patent fact that prices of such income series vary so widely from one year or one decade to another should cause accountants or farmers to take such judgments with a great deal of reserve.

Indirect Methods of Valuation

Where no series of incomes is anticipated directly from the asset in question, some indirect method of arriving at a valuation must be resorted

to. Here a new set of uncertainties arises to plague us. What, for instance, is the value of a machine, which together with several other implements, labor, power, seed, fertilizer, and land, is used to raise a crop of wheat? If the value of the service performed by each of the other production agents were known, the answer could easily be arrived at on the principle of derived demand; deducting the value of service performed by each of the other agents from the value of the crops produced. Unfortunately, there are usually several unknowns instead of one.

Another (though basically identical) method of approach would be to place a valuation on the series of services expected from the machine over its useful life, minus the disservices or costs of keeping and operating it. Occasionally, this method may be a feasible one. For instance, it may be possible to estimate what it would cost per acre or per year to hire the use of a combine or of a mechanical corn picker; and from the price of custom work, it would be possible to deduct estimated costs of operation to find a value (or rather net cost) of service.

Even this method is available in only a limited number of cases. With minor pieces of farm equipment, buildings, fences, and so on, specific values of services separable from services of other agents cannot be determined. This is particularly true when the various agents of production are used jointly and no individual and separate incomes result.

In such conditions, it is generally necessary to fall back on some method which is cruder and less dependable, at least in theory. The one most commonly used is to base the valuation either on cost of the asset, if recently acquired, or on replacement cost, if prices of such assets have changed since purchase. The best that can be said for this method of valuation is that the cost provides a basis for inferring something about the value of the expected services that were anticipated when the asset was bought. This is on the assumption that the purchaser was a prudent investor, or that he showed good judgment in purchasing, when he did and at the price he paid, the series or stock of anticipated net-services for use in his business.

If prices or other conditions have changed since the purchase, it is necessary to take this into account and to value the asset at what its replacement would cost. But this needs to be modified for two considerations. First, the asset previously purchased does not contain as great a store of services as when it was new and must be depreciated to its present condition. Second, technology may have changed, so that better designed equipment is now available. Further, the asset purchased for one purpose may now find its best use at something else. In this case, it is not the services for which the asset was originally purchased that

must be considered in the valuation, but those that can now most advantageously be obtained from it.

VALUATION OF SPECIFIC GROUPS OF FARM ASSETS

Current Assets

The simplest case of valuation involves cash, which needs merely to be counted. From this there are all gradations to and including land. We shall start with the consideration of current assets.

A type of current asset which seems easy to value at first is the accounts and notes receivable. These cannot be valued at their face value, however, unless they are to be paid immediately and with certainty. A sum of money due or expected some time in the future is not worth its face value at present. It should be discounted both for the length of time that is likely to elapse before it is received, and also for cost of collection and the possibility that it will not be paid at all.

Farm-raised produce in the inventory may be divided into two groups. The first consists of produce which is normally sold in its present form and has a well-defined market value. The second group consists of things which are not normally marketed and have no actual market value.

The salable products will consist of grains, marketable forage crops, and livestock produced for sale. For these, market quotations are generally obtained without much trouble. The rates used should be conservative ones and should be adjusted to farm valuation by subtracting the probable cost of delivery to market.

Work horses, dairy cows, and breeding stock of other types are not so easy to value as the stock normally marketed. About the only thing that can be done with them is to value them at conservative rates which they would probably bring in the neighborhood. In making such valuations, weights and ages should be considered, particularly with reference to the probable remaining useful life of the stock.

A more difficult problem arises with crops and livestock that are not salable. Silage is a good example. A market price cannot be used here because silage is not usually marketed. Furthermore, what value it has it derives from the value of the products it is used in producing, such as milk, butterfat, or beef. As an unfinished product it might be valued at what it has cost up to the present time. But it is seldom possible to tell what it has cost to grow a field of corn. Probably the best that can be done is to estimate the sale value of the corn that is in the silage and then add the cost, or an estimate of the cost, of ensiling.

Corn stover or straw, which are by-products of other crops, have to

be valued on a still different basis. An estimate of the approximate value of the marketable feeds which they replace is one possible basis. Another is to recognize that these crops cannot actually be marketed in their present form and so carry them at nominal rates.

Valuation of Equipment

Equipment is usually valued at cost depreciated to its present condition. This policy must sometimes be modified in case of large and expensive equipment which has undergone what is obviously a permanent change in its market or sales value. This would apply to a tractor, a mechanical corn picker, or a combine which is being superseded by a more economical or a cheaper machine. It would apply to similar machines if manufacturers announced a marked reduction in their sales prices. This conforms to the method of the lower of market price or cost.

With a cheaper piece of machinery, however, it would hardly pay to revise the valuation whenever a change occurs in the manufacturer's price policy. The farm equipment inventory consists of a relatively large number of items, none of which represents a very large investment. They are bought with the intention of using them until they wear out, and this is generally done. No useful purpose is likely to be served by making frequent adjustments in the inventories. The simplest assumption is that the price paid for a machine represents a cost of its service during its life, and this figure may be depreciated to get the annual cost of service.

In case there is no record of the original cost of a piece of machinery, it will have to be valued at the price for which it could be replaced, with, of course, an adjustment for depreciation. A separate valuation should be placed on each machine. Each will have a different depreciation rate; therefore, it will not be possible to place a lump sum valuation on all the equipment together. Individual valuation, however, involves but little additional effort and much greater accuracy.

Valuation of Buildings

In the case of farm buildings the principle of cost, or of reproduction cost, seems the most satisfactory. There is seldom any serious question regarding the proper valuation in case of a building just erected. The amount of investment in it will generally be used. As long as the building continues to be used for its original purpose and building costs remain essentially unchanged, this figure, depreciated to conform to its present condition, will continue to serve.

Most farms are bought with buildings already on them. The cost is probably not known. If the buildings are well situated and suitable for the uses of the purchaser, probably the best he could do would be to

value them at what it would cost to reproduce them at the existing level of building costs.

Replacement costs may be used for another reason. Suppose a building were put up when building costs were exceptionally high. Perhaps it actually cost \$2,000, but a few years later the same building could be erected for \$1,500. At what valuation should it be carried on the books? If it cannot be sold for more than \$1,500, the true net worth of the business would not be shown by any higher valuation.

Of course, adjustments should be made in the valuation figures for depreciation. If the building which would cost \$1,500 to replace were expected to last 20 years and was built 2 years ago, we would consider that the 2 years' use has exhausted one-tenth of its valuation when new. It would, therefore, be valued at present, not at \$1,500, but at \$1,350.

There are cases where reproduction cost does not offer a satisfactory solution without still further adjustment. Take the case of a dairy barn on a farm which has been purchased by a man who does not want to go into dairying. Perhaps the barn will be remodeled and used for feeding beef cattle. This building, which cost let us say \$2,500, is now being used for a purpose for which a \$1,000 shed would do as well. Its services to the business are no greater than those of the cheaper structure, hence it could not reasonably be valued at more.

Our general policy for valuation of permanent improvements can now be summarized as follows: Buildings or other fixed assets may be valued at their costs if known, depreciated to the present condition of the assets. If the costs are not known, or if the levels of costs have changed decidedly, or if the asset is being put to a different use than the one for which it was intended, it may be valued at what it would cost to replace it with the most economical structure that would serve the present purpose equally well, also depreciated to the present condition of the asset.

Valuation of Land

Land differs fundamentally from most of the other farm assets. Feeds, equipment, or livestock can be reproduced if we are willing to take the time and go to the necessary expense. But land—that is, the bare land without buildings, fences, or other improvements—exists in a practically fixed area. Likewise, the topographical and climatic attributes are practically unchangeable; and the chemical and physical composition of the soil can be changed only slowly and with difficulty.

Since land is not produced by man and has no original cost of production, we must look for something other than cost to explain its value. The first characteristic of "productive" land which we notice is that an income can be made by its use if farmed intelligently. Most land yields a

crop with a value greater than that of the labor and equipment used on it; therefore, people are willing to pay something for its use. Consequently, we find the sales value of land rather closely related to the amount of income that can be earned annually by its use.

Rent on land is determined largely by four conditions of the land itself, plus one set of influences outside the land. First is the *fertility* and type of soil. Probably more is heard concerning this factor than any other. The second is *topography*, the smoothness or hilliness of the land. *Climate* is the third. The fourth is *location* or accessibility of the land to markets for its products.

The crop to be raised on a given piece of land is determined by the land's characteristics, the prices of the products, and prices of the cost factors used in raising them. *Changes in prices* or in cost factors determine trends of income and comprise the fifth influence.

Current and expected incomes from land, however, do not wholly account for land prices. Particular pieces of land may have values to certain persons because of sentimental or other reasons. Thus, a man might pay more for the farm on which he was reared than would a purely disinterested person.

Under some conditions land may take on a sort of *social value*. In England and around some of our larger cities considerable land is used as "play farms" by wealthy persons. The possession of land thus comes to have a value in enhancing the social prestige of the owners, and prices paid for it are out of proportion to its income-yielding ability.

Sometimes a rapid rise occurs in prices of the farm products. When people realize what effect these changed prices will have on rents, we are likely to have a land boom. Prospective buyers bid up the land prices in attempting to obtain some of the profits from the higher rents. Consequently, land sometimes has an element of speculative value.

Adjusting the Valuation of Land

One function of the records is to show the true net worth of the business. If this is to be done, the land must be inventoried at a price at which it could be sold. There is always a danger in placing a price on anticipated changes in values. Sometimes the anticipated changes do not occur. If such valuations lead to overborrowing, they may have serious consequences. On the other hand, a policy of conservatism in valuation could hardly be of injury to the business. As a general policy, conservative market price should be used in arriving at the net worth figure.

A second function of the records is to show changes in the net worth. To do this the valuations of assets must be adjusted from time to time.

This may at first seem to conflict with the last paragraph. There is no use in changing the valuations with every little flurry in the market, since much of the short-time variation is purely temporary and, practically, could not be realized on anyhow.

The better policy, again, will be to adjust the valuations gradually, following somewhat behind the market where there is any uncertainty, so as to record only those changes which seem rather likely to remain. The general accounting policy is to err, if at all, on the side of conservatism. This policy is justified because it promotes business safety.

It was said that the accounts should show changes in net worth from year to year. A distinction should be drawn between profit made from operating the business—that is, from growing corn, feeding cattle, and so on—and the increases in net worth made by holding fixed capital such as land which is appreciating in value.

Ignoring this difference in the source of increases from 1918 to 1920 meant serious embarrassment to many farmers when land prices returned to something like their former levels after 1921. This does not mean that increases in the value of assets should not be recognized, but that in the summary of each year's business they should be kept separate from operating profits and should be recognized as belonging to a different order.

REVIEW QUESTIONS

1. How would the net income figure for this year be affected by placing an excessive valuation on a lot of fattening hogs? How would this affect the net income of next year?
2. Show how the value of land is related to the rent. On what does the rent depend?
3. Contrast the valuation of farm buildings with the principles determining the values of land.
4. Building costs and farm machinery prices decline sharply after you have equipped your farm. Contrast the policy you would follow in the accounts with regard to loss in value of buildings to the policy you would follow regarding loss in value of equipment.
5. How would you place a valuation on a lot of yearling cattle which you have raised on your own farm?
6. How would you value a crib of corn? A ton of bran purchased from a feed dealer several miles distant?
7. List the principal influences which may raise or lower the price of land.
8. Write and explain the formula for capitalization.
9. Is an increase in the the value of land to be considered as profit? Explain. How would you handle it in your accounts?

CHAPTER 8

DEPRECIATION

The Problem

Is it necessary for the books to show depreciation? How can depreciation be computed—what are the available methods, and which are ordinarily preferable?

If we buy seed, fertilizer, or some short-lived piece of equipment that wears out before the end of the year, there is no question but that its entire price should be considered an expense and deducted from the revenue of the current year. If such equipment is sold as junk, the difference between the purchase price and the junk value is considered as an expense and is deducted from revenue before the net income figure is found. If the equipment is to last two years, it becomes necessary to divide its purchase price between the two accounting periods concerned. At the end of the first year, the unexhausted value is carried forward as an inventory. It is written off only at the end of the second year, when the equipment has become worthless.

No difference in principle is introduced by equipment of a longer life. If a corn plow lasts 10 years, at the end of which time it is worthless, it simply necessitates the division of the purchase price into 10 parts. One part is considered as an expense against each of the 10 crops on which this machine is used.

The only new problem introduced is that of computing the proper number of parts into which the difference between the purchase price and the junk value is to be divided, and whether the 10 parts are to be equal in size or varying. If it is decided that greater amounts of the loss in value or depreciation are to be charged against some years than others, what guiding principle can we use in determining these amounts?

WHAT IS DEPRECIATION

Depreciation, then, is to be considered as a slow using up of a long-lived asset. The serviceability and value of the asset diminish as depreciation continues. Ultimately, the value becomes completely exhausted or reduced to junk value. Where does this value go? According to the original plans of the farmer it goes into the crop on which the asset is used. That is, he would not have obtained the equipment unless he

expected the product to be worth as much or more than the price. Once having obtained the asset, he is more or less committed to its continued use until it wears out or as long as he can get anything out of it.

In this sense, the purchase price of a depreciating asset may be considered a sort of prepayment of an expense, as for the use of a corn plow on several future crops.

It is sometimes said that if the machinery is kept in repair this may prevent depreciation. But this is seldom true. Repairs are necessary to keep the equipment up to a reasonable degree of serviceability. There is some expense of upkeep such as for lubricating oil which is needed constantly to keep some machines in operation. The replacement of broken or badly worn parts is equally necessary. The more care and attention given to the machine, and the more promptly repairs are made, the longer it will last. But they can prolong its life indefinitely only if all parts can be replaced economically, thereby preventing ultimate scrapping. This is not true of most assets with which we have to deal. Even buildings slowly approach a condition in which they are so worn and so out of date that it is profitable to replace them.

Why the Books Must Recognize the Facts of Depreciation

The accountant becomes concerned with depreciation as soon as he attempts to take an inventory and figure out the net worth of the business. What would happen if depreciation were ignored? Suppose, for instance, that a grain binder were purchased and expected to last 15 years. If no account were taken of depreciation, the machine would continue to be inventoried at the price paid. Actually, its value is constantly diminishing; and it will finally become worthless.

How can we handle the depreciation on the books? It is necessary to reduce the valuations in the *capital* accounts. This can be accomplished by crediting the *capital* accounts and at the same time debiting a *depreciation* account. The depreciation will be carried to the *income statement* as an item of expense. The depreciation for each piece of equipment should be estimated separately for the sake of accuracy, but for convenience all these sums may be added together and a single entry made for all the assets in the equipment account.

In some industries it may be desirable to build up a depreciation fund to replace the worn-out asset when replacement becomes necessary. This will very seldom be advisable in the farm business. The farmer is likely to need capital and is able to earn a higher return on funds in the farm business than he could on the same funds invested in securities which could later be liquidated to replace the machine or building. He certainly could not afford to let the funds lie idle. Also, some purchases

for replacement are made almost every year. In this way the farm depreciation fund is being drawn on annually.

METHODS OF COMPUTING DEPRECIATION

There are several possible ways of computing the rate of depreciation. The choice of method depends mostly on the rate at which the asset seems to lose its value. It also depends partly on the relative ease of computation by different methods which accomplish essentially the same result.

Annual Revaluation

First, we should mention annual revaluation. It might seem possible to make an independent revaluation of the asset each year, and from the differences between these valuations to find depreciation figures consistent with the market values of the asset. On a few things, such as horses, this method may give results as satisfactory as any alternative. In the case of horses, however, there are so many possible mishaps that no system really gives satisfactory results. The value of a horse may decline rapidly because of the development of a blemish, or it may disappear altogether because the horse has been killed in an accident.

Applied to a machine such as a cultivator or grain binder, the system of annual revaluation is very unsatisfactory. The amounts arrived at in this manner during the first couple of years of use of the machine diminish sharply because there is, at first, a rapid loss in resale value. However, equipment is purchased to be used by the farm as long as it lasts; and no resale is intended. The resale value, consequently, is of but little significance. Further, as the machine is used year after year it becomes increasingly difficult to perceive any change in resale value. The appearance of the machine changes less and less, while bearings and other wearing parts deteriorate with equal or increasing rapidity.

Changes in resale value are likely to be caused fully as much by changes in the farm business outlook or in the price level of farm machinery as by diminishing usefulness of the specific machine.

The Straight-Line Method

The straight-line method of computing depreciation is the simplest and usually the most satisfactory. This consists simply in dividing the total anticipated depreciation by the number of years the machine is expected to last to find the depreciation for each year. The total depreciation is, of course, the purchase price of the equipment or building minus the salvage value when the asset is finally discarded. A wagon costing

\$125 when new and expected to last 10 years and be worth \$2 for junk when worn out would have an annual depreciation of \$125 minus \$2 divided by 10, or \$12.30 per year.

Practically, the junk value of most farm equipment or buildings is so small and the uncertainty as to its length of life so great that it is hardly worth while to spend time or effort in making refined computations on the precise residual value.

The straight-line method is the simplest and easiest to use. But does it accord with the facts as closely as might be desired? That is, can the value of the equipment be regarded as declining at a constant rate?

Diminishing Balance Method

The diminishing balance method appears to conform more closely to the decline in the resale value. By this method a percentage of the remaining value is deducted each year for depreciation. Thus, on the wagon just used as an example the valuation at the beginning of the first year would be \$125. At the end of the year the value would be found by deducting a percentage somewhat higher than under the straight-line method, say 20 per cent. This would leave a residual value of \$100. At the end of the next year 20 per cent of this remaining sum would be deducted. The valuation would then appear as \$100 minus \$20, or \$80.

A constant percentage of a diminishing balance will result in a depreciation each year somewhat smaller than that of the preceding year. The balance would never by this process disappear altogether. At the end of the tenth year the value would still be considerably in excess of the junk value. A rate of 30 per cent would have brought the residual value down to \$3 in 10 years. Now the disadvantage of the system becomes apparent. It is unreasonable to charge as much as 30 per cent of the purchase price against the first year's revenue when the machine is expected to last as long as 10 years. The resale value may, it is true, decline as much as 30 per cent in the first year of use. However, there is but little relationship between this and the performance of the machine. The asset was obtained for use until worn out and not for resale.

Sum-of-the-Year-Digits Method

If it is desired to distribute the depreciation expense more heavily in the first years of use and more lightly in the later years, the sum-of-the-year-digits method has some advantages over the diminishing balance method. It avoids an undistributed balance at the end of the useful life and depreciates the investment to the scrap value assigned.

By this method the total amount W , that is to be distributed as

depreciation, is first computed. This is, of course, the original value of the asset in question, minus the anticipated scrap value, or $W = V_a - V_n$. Next, a distribution rate base is determined by adding up the number of successive remaining life periods. If the asset is expected to last 10 years, the base is $10 + 9 + 8 + 7 \dots + 1 = 55$. The total depreciation for the entire life of the asset is thus divided, in this case, into 55 units. Now, for the first year the depreciation is computed by taking $10/55$ of the total; for the second year, by taking $9/55$, and so on, until the depreciation for the 10th year amounts to $1/55$ of the depreciation sum.

The general formula for computing the depreciation charge, D , for any particular year, a , when the asset is expected to last n periods, is as follows:

$$D_a = \frac{2W (n-a+1)}{n(n+1)}$$

The method is relatively easy to apply. The most important question, again, is whether the loss in value occurs in accordance with the series of values obtained by it. Even granting that depreciation is more rapid in the first few years, does a ten-year asset lose $10/55$ of its usefulness and its value the first year and only $1/55$ in the tenth year?

The Compound Interest Method

A third method, called the compound interest method, goes on the assumption that the depreciation fund will be reinvested in the business and will grow there at compound interest. Consequently, the annual sums charged as depreciation are increased each year in accordance with the rate of interest adopted. These are so computed that their sum will equal the purchase price of the machine minus salvage value when it is discarded. The capital in the depreciating asset and the depreciation reserve together maintain the capital at a constant sum throughout its life, and the depreciation charge plus the interest on the unexhausted value of the machine equal the same amount each year.

The depreciation charges made according to this method may be regarded as composed of two elements, one being the new annual appropriation and the other, the interest earned during the year on the sum of the previous charges, which are presumed to be at work in the business and earning interest. With a 7 per cent interest rate the depreciation charge on a machine costing \$100 and expected to last 10 years will amount to \$7.24 for the first year. The charge for the second year will consist of \$7.24 plus 7 per cent on the amount already set aside, or \$7.74. For the third year the charge will be \$7.24 plus 7 per cent on the \$14.98 already set aside, or \$8.29.

This method can be applied by the use of the "condition percentage" formula, which is:

$$\text{Condition percentage} = 100 - 100 \frac{(1 + r)^n - 1}{(1 + r)^L - 1}$$

Where r = rate of interest

L = probable life in years

n = present age

The condition percentage found by this formula indicates the remaining percentage of the original value of the asset. Thus, with the machine mentioned just above—with a 10-year life and a 7 per cent interest rate—the value remaining is found at the end of the year to be \$92.76. The difference between this and \$100, which is \$7.24, is set aside as the depreciation charge for the year. At the end of the second year the remaining value is found to be \$85.02. The difference between this amount and the value in the preceding year (\$92.76) is \$7.74 and is the charge for the second year.

Actually, it is much more convenient to use tables already prepared to show the condition percentages rather than to solve the formula for each year for each piece of machinery on the farm.¹

Comparison of Methods

There are also various other methods of computing depreciation, each of which has its supporters and its opponents. Each of the methods described above has its shortcomings. The straight-line method in general results in depreciation charges which are too small the first few years and too large in the last years. Since repairs increase as the machine gets older, the straight-line method results in greater total cost of service from the asset in its final years, just when the quality of service is becoming poorest.

The rising cost of repairs and the more gradual decline in resale value as the machine grows older probably justify higher charges for depreciation in the earlier years, such as would be obtained by the diminishing balance method or the sum-of-the-year-digits method. Taken together with repairs and upkeep, such depreciation charges lead to a more nearly uniform total cost per unit of service throughout the life of the asset. Whether either of these methods leads to exactly an equal cost per unit of service would be hard to say. Further, the diminishing balance method has the disadvantage of leaving an undistributed balance at the end of the period.

¹ Such tables are available in Bulletin 70 of the Iowa Engineering Experiment Station. A table showing the condition percentages for machines with a life from 1 to 20 years, at 7%, is given in Appendix B.

The compound interest method assumes that the depreciation charges are being placed in some separate and productive use in which they are accumulating at compound interest. For a farm, where there is practically never a separate and identifiable fund for depreciation, this is a very unreal assumption. The sum of value to be transferred from the building or equipment fund to other accounts is simply the purchase price of the asset in question. There is no necessity to combine or confound the earning ability of the investment with this transfer of value through the device of depreciation, and no need to consider that the entire purchase price of a given machine somehow remains a unit until the machine is entirely worn out.

On the score of simplicity the straight-line method has the advantage over all others. It is the easiest to understand, and by its use it is possible at the time the asset is bought to compute in a single operation the depreciation charge for each year it is expected to last. Furthermore, this method is the most widely used of any. The sum of inaccuracies to which it leads in any given year is likely to be relatively small, and is generally made up for by the ease with which it is applied.

In passing, it should be noted that all the methods discussed so far attempt to distribute the depreciation sum of the asset by time periods during its life. For assets which are used different amounts in different years, distribution by units of use would be preferable. Thus, if a corn picker is expected to be used on a total of 4,000 acres of corn before it is worn out, the depreciation sum might be divided equally (or in some other proportion) between each acre picked.

The use of service-units in depreciation instead of time-units has much to recommend it. But it is not without limitation. Only part of the actual deterioration of the asset is related to the number of acres or other units on which it is used. Time is also a factor. A machine rusts out in time, and a building deteriorates through weathering. The perfect depreciation method would give consideration both to the units of service and the units of time.

Whatever method is used it is likely that some adjustment in the rate will be necessary as it becomes evident that the machine is going to last longer or wear out sooner than was originally expected. Thus, after 8 years it may be found that the machine which was expected to last 10 years will last only 1 more year. Then the remaining value must be charged off in the eighth and ninth years. Or, it may be decided that it will probably last longer than was expected. In this case the depreciation must be reduced for the remaining years. Fortunately, the sum of such adjustments for any particular years is likely to be relatively

small, and the adjustments do not affect either net income or net worth very seriously.

NORMAL LIFE AND SERVICE OF SELECTED FARM MACHINES

Most of the common pieces of farm machinery have a life of about 20 years, considerably longer than was formerly supposed (see Appendix, Table C). It varies, however, from 11 years for a combine to 32 years for a windmill. With individual machines the period of use differs with the amount of work done each year and with the care received, especially with regard to repair. Whether or not shelter is provided also makes a difference with some machines, but generally less than do proper repairs. A considerable proportion of farm machinery, however, does not get a chance to last out its normal life. Accidents and obsolescence end the usefulness of a large number.

A large proportion of the common farm machines are used only a week or less in the course of a year. This is particularly true of machines made for a single purpose, such as the corn binder, corn planter, grain binder, hayrake, and seeder. Wagons, engines, plows, and other machines that can be used on various enterprises work for a larger number of days; and consequently, the cost per day of service on these is considerably reduced.

OBSOLESCENCE

A new improvement or invention often makes it advisable to scrap a piece of equipment before it is worn out in order to replace it with another which will perform the same service more cheaply or will perform others in addition. Thus, in the early days of the tractor many tractors were junked or traded in at a sacrifice in order to obtain newer and more practical models. This scrapping of equipment in order to take advantage of improvements is known as obsolescence. It is, of course, very uncertain in its operation; and, when one buys a piece of new equipment, it is seldom possible to even guess whether it will become obsolete before it wears out.

Experience, however, teaches us that a new type of machine which has been in use for only a short time and is still being improved is much more likely to become obsolete than a machine that has been in practical use for a number of years. Thus, we would expect that radical improvements would be more probable in corn pickers, milking machines, or pick-up hay balers than in plows or harrows or mowing machines.

Since we cannot count on obsolescence with any degree of certainty, there is no specific provision that we can make for it; but we can at least

take it into account in a rough sort of way in computing the depreciation rates on various pieces of equipment. We may increase the depreciation rate somewhat on a newly developed type of equipment because of the probability of further improvements, and use minimum rates on a standard and older type of machine, such as a mowing machine, in which no decided change seems likely.

REVIEW QUESTIONS

1. What is meant by depreciation?
2. Are there any assets which do not depreciate? Is it possible to avoid depreciation? Explain.
3. Is depreciation a genuine expense?
4. What would happen to the net worth figure and to the profit or loss figure if depreciation were ignored?
5. Should a farmer build up a definite reserve fund for depreciation?
6. What is the straight-line method of computing depreciation?
7. Compare and contrast the diminishing balance method and the sum-of-the-year-digits method.
8. A tractor is purchased for \$1,050. It is estimated that it will last 12 years and that the scrap value will be \$50. Compute the annual values by each of the four methods described in this chapter. Plot the series of values on a sheet of cross-section paper.
9. Describe the compound interest method. Contrast to the straight-line method.
10. What is obsolescence?

CHAPTER 9

THE NET WORTH STATEMENT

The Problem

How can we summarize the financial figures from the inventory to get some indication of the financial strength of the business? What standards should we use, and how are they to be interpreted? Finally, what is a satisfactory financial ratio, and at what point does one of these standards begin to indicate an unsafe situation?

After taking an inventory, the farmer will want to know the net worth of his business and its financial strength or solvency. In Form 16 a comparative inventory was shown, from which information could be obtained regarding the condition of the business on each inventory date. Another and older form of balance sheet is shown in Form 17. Here the same data are arranged in two columns, the assets being shown in one and the liabilities in the other. Note that the total value of the assets equals or balances with the total of the liabilities or claims against the business when the proprietorship or net worth figure is included with the latter.

The Question of Solvency

The net worth figure indicates the solvency of the business, but this is the *ultimate* rather than the *immediate solvency*. By *ultimate solvency* is meant that the total resources are equal to or greater than the total liabilities in case the entire business were closed out and all the liabilities were met. When the total liabilities are not covered by the total resources, the business is said to be insolvent or bankrupt. The size of the net worth figure thus affords, in a way, a measure of the *distance* from insolvency.

The farmer will more often feel concerned about the immediate rather than the ultimate solvency. By *immediate solvency* is meant the relationship between the current liabilities and the liquid assets which can be used to pay them off if demanded. Thus, a farmer may have so little cash or other liquid assets on hand that, if immediate payment of a large bill should be demanded, he would simply be unable to meet it. In other words, he would be immediately insolvent even though amply solvent ultimately.

CLASSIFICATION OF ASSETS

To ascertain the condition of the business with regard to its immediate obligations it is necessary to classify assets as to their liquidity and liabilities as to their dates of maturity.

Fixed Assets

First, there are certain assets which the farmer will recognize as practically impossible to convert into cash to meet current obligations. These are called the *fixed assets*. They include the land, buildings, and

FORM 17. BALANCE SHEET

FARM OF JOSEPH SMITH

<i>Assets</i>		<i>Liabilities</i>	
Land.....	\$32,000	Mortgage.....	\$14,000
Buildings.....	6,000	Accounts payable.....	3,200
Horses.....	1,000	Net worth.....	28,700
Equipment.....	1,500		
Cattle.....	2,000		
Cash.....	200		
Feeds and supplies.....	3,200		
	\$45,900		\$45,900

other relatively long-lived improvements, such as fences and tiling. Farming is a type of business in which the fixed assets, which are liquidated very slowly, form a preponderant part of the total resources. In Table I it is shown that on a group of owner farms in the Corn Belt the land made up on an average 55 per cent of the assets, and buildings 16 per cent, making a total of 71 per cent in fixed assets.

Actually, the *quantities* of the fixed assets and their physical forms are more important in the operation of the farm than their value. Thus, the size of a crop will be affected by the acreage and quality of land on which it was planted, and not by the value of the land. But if a farmer is applying for a loan, he will need to convince the banker that, if he should default on its repayment, the land offered as security could be sold for more than the amount of the loan.

Working Assets

The next group, more liquid than the fixed assets just mentioned, may be called the *working assets*. These consist of such property as the farm equipment, horses, breeding or producing livestock, tractor, or auto if used in the farm business. These resources will ordinarily be worn out in the normal processes of the business. Their value may be regarded as being transferred slowly to the products of the farm operation. In this

way they are liquidated at a rate more rapid than, for instance, the farm buildings, but more slowly than the crops or feeds on hand or bills owing to the business which can be collected after a short time.

On the 10 owner farms in Table I the working assets are found to make up 10 per cent of the total assets. Equipment and stock cattle are 3 or 4 per cent each; and horses, tractor, truck, and auto make up between 1 and 2 per cent each of the total. On the rented farms the working assets amount to an average of 31 per cent of the total. Equipment amounts to 13 per cent, breeding cattle to 8 per cent, and tractor to 7 per cent.

Current Assets

The third, and most liquid, group may be called the *current assets*. These consist of cash on hand, bills receivable, crops and feed on hand, and livestock that is or will shortly be in condition for sale. *For convenience, current assets may be taken to cover all assets which in the normal operation of the business will be liquidated within the accounting year.*

On the owner farms in Table I the current assets are found to average 19 per cent of the total investment. On the rented farms they made up 69 per cent of the tenants' investment. Fattening cattle were 4 per cent of the total assets on the owner farms and 27 per cent of the tenants' assets on rented farms. Hogs amounted to 3 per cent on owned farms and 6 per cent on the rented ones, while feeds and crops on hand accounted for 12 per cent of the owners' and 35 per cent of the tenants' assets.

Classification Partly Arbitrary

The distinctions between the three classes of assets just discussed cannot be drawn with exactness. Each merges gradually into the next, and there may be considerable uncertainty as to where a certain asset should be placed. In Table I all fattening stock, such as cattle or hogs were placed in the current assets, while breeding stock which were to be kept for more than a year were classified as working assets. However, some of the breeding herd of cattle are likely to be sold within the year and replaced by young stock. It is hard to tell a year in advance which of these animals will be on hand. Also, some of the calves and yearlings are rather certain to be sold within the year, while others equally salable will be kept for replacing old cows. In Table I all breeding stock and all young stock not designated as intended for sale were put into the class of working assets.

In the case of hogs and poultry, the greater part of the breeding herd is replaced each year. Consequently, all hogs and poultry were classified

as current assets. Nevertheless, many of the breedings hogs are kept for more than one year. There may also be other assets, such as "slow" bills receivable which are difficult to place in one group or another.

Amounts and values of many farm assets change rapidly. Feeds and crops are fed to the livestock, and the market values of salable livestock fluctuate from day to day. Thus, even the best figures on the solvency of the business are strictly true only for the time at which they are taken. The business operator needs to keep this in mind and to anticipate the figures of the balance sheet as they will appear at future dates. He must make his plans with regard to the dates when outstanding obligations are to fall due, and should keep in mind the fact that income from the business varies from month to month so that it may be easier to pay off a note or bill in some months than in others.

CLASSIFICATIONS OF LIABILITIES

In planning the finances of the business it is useful to have a classification of the liabilities corresponding to that of the assets. First, we may group together liabilities in the form of mortgages or other long-time indebtedness which will not demand payment during the coming accounting period nor so soon as to force serious modification of the policy of the business.

A second group consists of obligations which are deferred for the present but which will fall due within the year. In this class may be included promissory notes, obligations based on crops in process of production, such as chattel mortgages on feeding cattle and growing crops.

In a third group we would include current obligations. This covers bills whose payment may be demanded at once or obligations which are about to mature so that the policy of the business must be shaped in view of their approaching payment.

This classification suggests a rather definite business policy. The source of the capital and the type of the obligation should, in a considerable measure, correspond to the type of the asset by which it is secured. Thus, it is poor policy to buy a long-lived asset in which the invested capital will have but a slow turnover and to obtain the necessary funds by floating bills or short-time notes. The obligations should be arranged so that earnings may carry the interest charges and the asset pay for itself during its period of use. If earnings will not do this, it is a mistake to buy the asset.

On the other hand, the obligation should not outlast the asset obtained with it. If feed is bought for a lot of hogs which are to be sold within one or two months, it would be poor policy to buy the feed on a note for six months or a year.

BALANCE SHEET RATIOS

The net worth figure shows the absolute equity or amount by which the assets in the business exceed the liabilities outstanding against it. In this figure more than any other is epitomized the financial position which the proprietor of the business has attained. But the net worth does not tell the whole story. A man with a larger net worth may have more to worry about than one with a smaller. This depends largely on the ratio between the total assets and liabilities, on the form of the obligations, and on the nearness of their maturity. Thus, a business with a total capital of \$40,000 but with \$30,000 of liabilities, of which \$10,000 are in the form of floating bills and short-time notes, is likely to cause more sleepless nights to its proprietor and more concern to its creditors than a business with \$20,000 total capital but with only a \$10,000 liability in the form of a mortgage maturing several years in the future.

Net Capital Ratio

How can the farmer obtain a measurement of his degree of financial safety so that he may compare the present condition of the business with that on some previous date? For this the *net capital ratio* is used. This is obtained by dividing the *total assets by the total liabilities*. The net capital ratio for the first business mentioned above would be $\$40,000 \div \$30,000$, or 1.3. The ratio for the second would be $\$20,000 \div \$10,000$, or 2.0. Thus, although the net worth is the same in these two cases, the net capital ratio indicates that the second business is in a much safer position than the first. A decline of one-fourth in the prices of the land or other asset would wipe out the margin of safety in the first case. In the second case, it would take a decline of 50 per cent to place the business in an equally precarious position.

Working Ratio

As a measure of financial safety over an intermediate period of time the *working ratio* may be found useful. This is obtained by dividing the sum of the working and current assets by the sum of intermediate liabilities, such as promissory notes, plus current liabilities. On the John Jones farm, as shown in Form 16, the working ratio is found to be 3.7 in 1939 and 2.9 in 1940, indicating a strong intermediate capital position. In 1940 the payment of \$1500 on notes and bills reduced the current and intermediate indebtedness by a half, and increased the working ratio to 5.8, while the net ratio rose only from 2.6 to 3.0 times the total indebtedness.

Current Ratio

The net current capital measures immediate solvency as the net worth does ultimate solvency. This measure is obtained by subtracting

the sum of current liabilities from current assets. *The degree of immediate solvency is expressed by the ratio between the current assets and the current liabilities—called the current ratio.* On the Jones farm we find that the current ratio was 2.4 in 1939, 2.1 in 1940, and 4.0 in 1941, indicating a satisfactory but not a wide margin of safety in the first two years, but a strong current position in 1941.

Narrower current ratios are quite common on farms and constitute a common defect of farm financial organization. Of course, with an apparently safe net ratio and a moderately satisfactory working ratio, there is seldom serious danger from the floating bills and short-time notes. Nevertheless, the holder of any large bill or note may give the farmer some uncomfortable days if he presses for payment at the wrong time. We may well imagine that Mr. Jones was feeling much less concerned about his business on January 1, 1941, with a net ratio of 3.0 and a current ratio of 4.0 than a year earlier when the net ratio was 2.6 and the current ratio 2.1.

SOURCE AND DISTRIBUTION OF CAPITAL

It is desirable to know something of the sources of capital invested in the business. Comparable figures may be obtained by expressing each liability or claim as a percentage of the total capital invested. In Form 16 we find that slightly over 60 per cent of the capital on the Jones farm was furnished by the proprietor as reflected by the net worth. In 1939, 30 per cent came from mortgages, but this proportion declined to 27 per cent in 1940.

The distribution of total capital among different assets furnishes a fairly clear picture of the farm business organization. In 1940, 51 per cent of the capital was invested in land, 15 per cent in buildings, 6 per cent in equipment, and 18 per cent in crops and feeds. This shows a proportion somewhat smaller than typical in land and buildings and somewhat larger in current assets.

A comparison of these percentages with those obtainable from census or other figures for the county or township will suggest how a farm compares with the typical farm in the neighborhood. Some idea of variation in these figures from farm to farm and averages for groups of moderately successful farms are shown in Table II. The changes in these analytical figures from year to year will help keep the farm operator informed of the shifts that occur from time to time in his organization.

REVIEW QUESTIONS

1. What is a net worth statement? What are its purposes?
2. What information does it contain?

3. Distinguish between ultimate and immediate insolvency.
4. What is meant by fixed assets? Current assets? Working assets? Give examples of each.
5. Describe the method you would use in analyzing a comparative inventory statement.
6. What importance attaches to the percentage of the total capital invested in fixed, working, and current assets?
7. What is the net ratio? Explain its significance.
8. Describe and discuss the working ratio.
9. What would you consider a safe current ratio for a diversified farm? Should the limits be wider or narrower for a dairy farm? For a specialized wheat farm?

PART III
FINANCIAL ACCOUNTS

CHAPTER 10

THE RUDIMENTS OF DOUBLE ENTRY ACCOUNTING

The Problem

How does the organization of the farm determine the type and organization of the accounts? What kinds of accounting systems are available to the farmer, and what are the principal advantages of each?

It is not the purpose of this book to explain the fundamental principles of accounting in detail. There are many good textbooks on this subject, and the student is referred to these if he is not already acquainted with them. Here we are interested in the application of these principles to the farm, and in the interpretation of data which they yield.

There are, however, many beginning students of farm accounting who are not familiar with general accounting principles. For these, a working knowledge of double entry bookkeeping comprises a minimum requirement if they are to plan their own accounts or modify ready-made systems to fit individual farms. Therefore, a brief explanation of the principle of debit and credit, the basis of double entry bookkeeping, is given in this chapter. In Chapters 11 and 12 we shall describe some of the special forms of accounts that have been developed primarily for farm use and explain their relationship to the conventional double entry accounts.

ORGANIZATION OF THE ACCOUNTS

Before considering specific types of financial accounts we should see how the organization of the farm dictates the form of the accounts. Accounts are intended to help answer questions regarding the business. To do this they must be so organized as to make the functional relationships between the different parts of the business stand out clearly.

External Accounts

If we classify and examine the financial transactions of a farm, we find that they fall naturally into several more-or-less definite groups. Some of these are concerned with persons outside of the business; others, with the principal capital accounts, as for land and buildings. Some are concerned with parts of the business which require expenses but do not directly bring in receipts. Still others are concerned with enterprises

which are the sources of the farm income. Finally, there are certain relationships between the farm and the proprietor, either in his role of proprietorship or in his personal withdrawals from the business. These are indicated in the diagram in Figure 2.

First, there are transactions with outside persons or firms. The farm is likely to have various transactions on credit, either in buying supplies

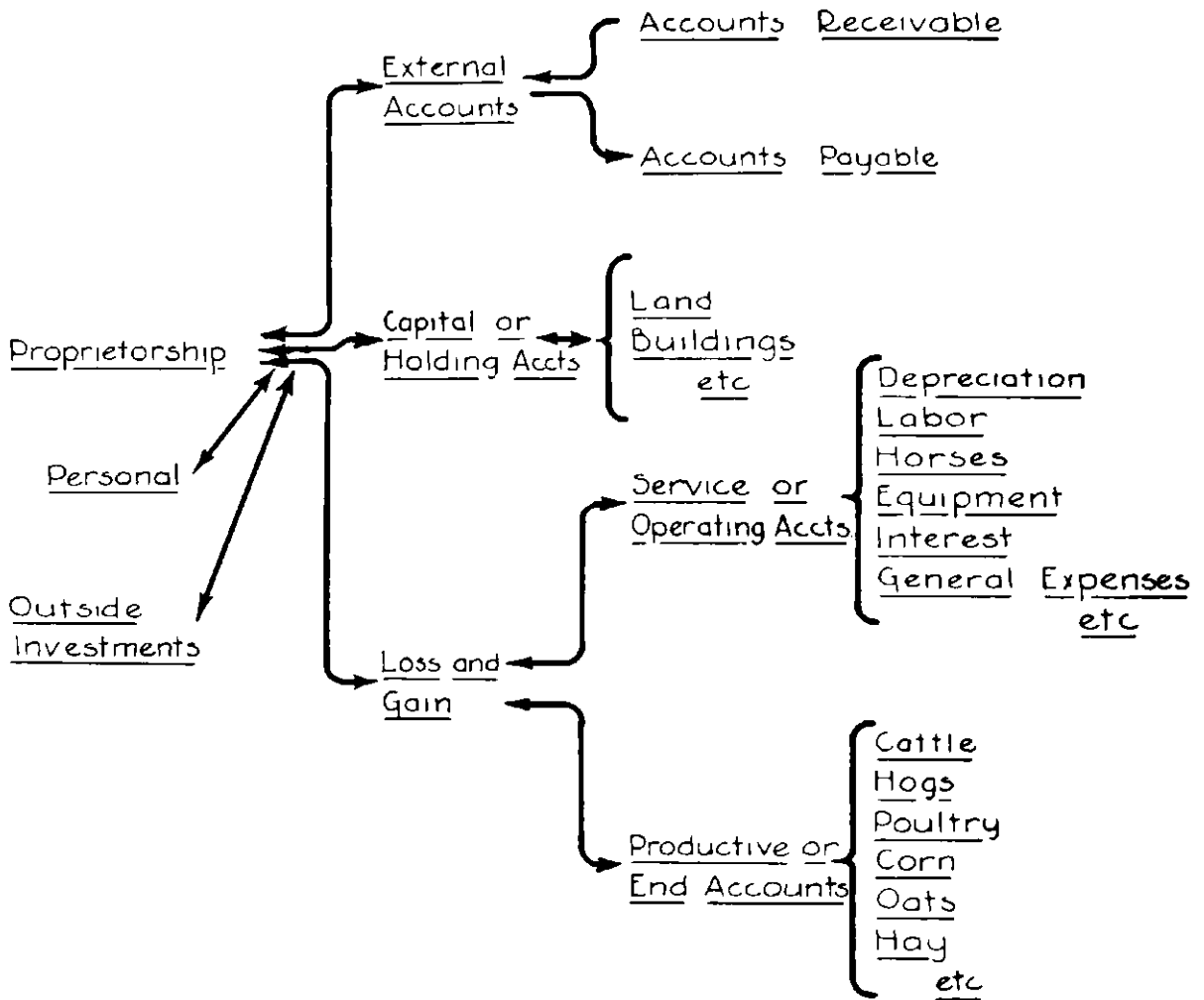


Fig. 2. Organization of the Farm Accounts

or selling products, which are not collected immediately. In order to keep track of the sums owed to or from outside persons, a separate account is kept for the dealings with each firm or person with whom business is conducted on credit.

Capital Accounts

A second section of the accounts deals with the capital investments. The principal investments are in land, buildings, fences, and other improvements and equipment. Investments in breeding stock might also

be included. But in practice it is seldom possible to separate the capital investment in livestock from current increases in the same enterprises. These sections of the business do not normally bring in a current income. The accounting problem is to keep track of the amounts of capital involved and of any additions to that capital or any depreciation in it.

Service or Operating Accounts

A third group of enterprises consists of those parts of the business which are kept to provide services for the rest of the farm. Examples are labor, horses, equipment upkeep and depreciation. The services from these departments permit such enterprises as crops or livestock to yield an income.

We may consider that there is a flow of value (expenditures) *into* the service enterprises. From them the flow takes the form of services into the so-called "productive" enterprises. Then it emerges in the form of marketable products from crop or livestock enterprises. It is possible to some extent to measure this flow between different enterprises. But added records would be necessary for this because the services may take the form of labor, which has to be measured in terms of hours, or feeds, which have to be measured in terms of bushels or tons. When these supplementary records are kept, and the entire set of records is summarized together, we have what is known as a cost accounting system. Following the transfer of values from one enterprise to another within the business, as well as accounting for anything of value coming from outside, greatly increases the complexity of the accounts. It is much easier to keep account only of the financial transactions which are carried on with outside persons and not to bother with the flows of value within the business.

"Productive" or End Enterprises

This group consists of the enterprises which stand at the end of the process of production and yield marketable products. Examples are corn, oats, hogs, cattle, and poultry. On most farms the horse enterprise would be considered as a service or operating enterprise. Its usual function is to provide power for the rest of the farm. Sometimes, however, colts are raised, and the horse enterprise becomes a source of income.

Accounts for these enterprises need merely record the receipts from the sales of products. The amounts from these sales should not be taken to indicate the relative desirability of the so-called "productive" enterprises. They do not indicate what costs were involved in production. Such costs are incurred in hiring labor, keeping equipment in repair, and in depreciation on buildings. Also, there are various elements of cost which may not be expressed in exact financial terms, as labor of the

farmer and members of his family as well as services received from other farm enterprises, such as horses.

Proprietorship—Personal Accounts

Finally, there is a group of accounts representing proprietorship, the personal accounts and enterprises outside the farm business in which the farmer may be interested. For the purpose of the accounts, it must be recognized that the business possesses an entity separate from the proprietor. The proprietor may be regarded as standing outside of the farm business and exercising control over it. He may invest funds in the business. He may withdraw funds or assets from it and use them elsewhere. His management determines whether the business is to make a profit or a loss. If a profit is made, he may decide to withdraw it or may leave it in the business. The accounts must keep track of these transfers between the farm and the proprietor, or between the farm and other businesses in which he is interested.

If the accounts are of the conventional double entry type, one account will generally be used to bring together the net receipts and net expenses from the different enterprises. This is called the loss and gain account. It is more convenient to bring such figures together and then transfer the net loss or gain for the whole business to *proprietorship* than it would be to carry individual loss or gain items directly to that account where they would be mixed in with items of other sorts. In single entry systems the function of the loss and gain account may be served by the income statement. Totals or net figures from the various enterprises may be entered directly in this statement. The net loss or gain for the year would be ascertained there as the difference between expense or debit items on the one side and the income or receipt items on the other.

DOUBLE ENTRY ACCOUNTING METHODS

Accounting systems are of two general types. First, there is the double entry system and its modifications. Second, there are various "single entry" systems, which are less complete and do not record all aspects of the transactions. Sometimes they do not even record all the transactions. Of course, the purpose of single entry systems is to save trouble by omitting data which are not wanted. A brief sketch of the double entry system will be given here, and two of the more common single entry systems will be taken up in the next two chapters.

The double entry system is standard in commercial and industrial businesses. It provides a complete and highly flexible method of keeping track of the financial transactions. Its advantages, however, are greater

with large businesses than with small ones; and it is not often used on farms. The double entry system rests on recognition of the fact that there is both a source and a destination of each value which appears in a transaction. This grows out of the fundamental balance of assets and equities which was discussed in connection with the balance sheet.

The sum of the assets in a business necessarily equals the sum of the liabilities or ownership claims against them. Each time an asset is added to one enterprise it either reduces the assets in some other enterprise or is balanced by an equal claim on the part of the proprietor or of someone outside of the business.

If an asset is added to those already on the farm, it involves one of three possible changes in other accounts: (1) The asset may have been raised on the farm, in which case the proprietor has a claim to it; or (2) it may have been bought for cash, in which case the increase in the capital account receiving the asset is balanced by an equal reduction in the cash account; or (3) it may have been bought on account, in which case a liability equal to the value of the new asset has come into existence in the accounts payable. Double entry accounting simply involves keeping track of all the changes in assets and equities (or claims) each time a transaction occurs. If the accounts are to be really complete, all of these changes *must* be recorded.

DEBITS AND CREDITS

The system of debits and credits is used in double entry accounting to maintain the fundamental balance of assets and liabilities, and at the same time keep track of all transactions or transfers of value either between the business and outside firms or between divisions of the business itself. Once the beginning student masters this basic method, he finds that the elements of accounting become fairly simple.

Stated in the simplest terms, a debit consists either of an increase in an asset or a decrease in a liability; while a credit consists of a decrease in an asset or an increase in a liability. It should be noted, however, that in this statement and in following paragraphs the term "liability" is used in the broad sense to indicate simply a claim against the business. It may be a claim by an outsider, or it may refer to the claim of the proprietor to the residual value of assets above outside claims.

The process of debit and credit can be explained best with the aid of illustrations. Suppose that a young man, Joe White, has a thousand dollars and decides to start farming as a renter. At this stage his balance sheet would appear as follows:

(1) Balance Sheet of Joe White

<i>Assets</i>		<i>Liabilities</i>	
Cash.....	\$1,000	Joe White, Proprietorship claim.....	\$1,000
Total.....	<u>\$1,000</u>	Total.....	<u>\$1,000</u>

Now assets might be (A) increased, or (B) decreased. Or liabilities might be either (C) increased, or (D) decreased. But we cannot have a change that affects a single account. Each object of value must have a source as well as a destination. Either it was obtained by exchanging another asset for it or by increasing a liability. In the first case, the account from which the other asset comes shows a decrease in content. In the second case, an increase in an asset might be balanced by an increase in a liability in either of two ways. It might be purchased on account, in which case the liability runs to someone outside the business. Or, the new asset might have been produced within the business, in which case the liability or claim runs to the proprietor.

Thus, each transaction results, not in a single change in the balance sheet, but in a pair of changes. At first there appear to be eight possible pairs of these changes, as follows:

- A. An increase in an asset, accompanied by, (1) a decrease in some other asset, or by, (2) an increase in some liability.
- B. A decrease in an asset, accompanied by, (3) an increase in some other asset, or by, (4) a decrease in a liability.
- C. An increase in a liability, accompanied by, (5) an increase in an asset, or by, (6) a decrease in some other liability.
- D. A decrease in a liability, accompanied by, (7) a decrease in an asset, or by, (8) an increase in some other liability.

Let us illustrate these pairs of balance sheet changes. For combination No. 1, suppose that Joe White buys a pair of horses, paying \$300 cash for them. Now the balance sheet will appear as follows:

(2) Balance Sheet of Joe White

<i>Assets</i>		<i>Liabilities</i>	
Cash.....	\$ 700	Joe White, Proprietorship claim.....	\$1,000
Horses.....	300		
Total.....	<u>\$1,000</u>	Total.....	<u>\$1,000</u>

One asset, Horses, has been increased at the cost of a decrease in another asset, Cash. The balance sheet still balances at a total of \$1,000.

When this transaction is entered in the Ledger, two accounts (or divisions of the business) will be affected, Cash and Horses. Here we should mention that the debit resulting from each transaction is entered on the left-hand side of the account that receives an increase in its assets (or a decrease in its liabilities); while the counterpart of this entry is a credit which will be entered on the right-hand side of the account that is to show a decrease in its assets (or an increase in its liabilities). As a result of this transaction the Horse account will be debited because assets have been added to that account, while Cash will be credited because the assets in that account have been decreased. In the double entry Ledger these two accounts will now stand as follows:

HORSE ACCOUNT	
	(dr.)
	(cr.)
Pair of horses bo't for cash	\$300

CASH ACCOUNT	
	(dr.)
	(cr.)
Beginning inventory	\$1,000
Horses bo't for cash	\$300

For combination No. 2, let us suppose that White next buys some farm machinery for \$400, giving a note for it. After this transaction the balance sheet will be:

(3) Balance Sheet of Joe White

Assets	Liabilities
Cash	\$ 700
Horses	300
Machinery	400
Total	\$1,400
	Note payable
	Joe White, Proprietorship
	claim
	1,000
	Total
	\$1,400

To record this transaction we must set up two more accounts, Notes Payable and Machinery. The Machinery account will be debited since it receives the increase in assets. The Notes Payable account will be credited since it receives the offsetting amount of liability. After this transaction these two accounts will stand as follows:

MACHINERY ACCOUNT	
	(dr.)
	(cr.)
Machinery bo't on note pay.....	\$400

NOTES PAYABLE ACCOUNT	
	(dr.)
	(cr.)
.....	Note for machinery
.....	\$400

We do not need to illustrate combination No. 3 (a decrease in an asset accompanied by an increase in some other asset). This is simply the converse of No. 1, in which a decrease in the asset Cash accompanied the increase in the asset Horses.

For combination No. 4 (a decrease in an asset accompanied by a decrease in a liability), let us assume that Mr. White pays \$50 on the farm machinery note. The balance sheet will now be:

(4) Balance Sheet of Joe White

<i>Assets</i>		<i>Liabilities</i>	
Cash.....	\$ 650	Note payable.....	\$ 350
Horses.....	300	Joe White, Proprietorship	
Machinery.....	400	claim.....	1,000
	<hr/>		<hr/>
Total.....	\$1,350	Total.....	\$1,350

The accounts affected by this transaction will be Cash and Notes Payable. After the entry of the transaction they will appear as below, debit in Notes Payable account offsetting the credit in the Cash account.

CASH ACCOUNT

<i>(dr.)</i>	<i>(cr.)</i>
Beginning inventory.....	\$1,000
	Horses bo't for cash.....
	\$300
	Notes pay., on acct.....
	50

NOTES PAYABLE ACCOUNT

<i>(dr.)</i>	<i>(cr.)</i>
Cash on note pay.....	\$50
	Note for machinery.....
	\$400

It will be observed that the debit balance in the Cash account indicates the amount of cash still on hand, while the credit balance in the Notes Payable account indicates the amount still owed. This will not be true in all other accounts, however. In the Horse account, for instance, there may have been either an increase or a decrease in the value of the horses; in the Machinery account there has probably been a decrease in value because of depreciation, and in the Crop, Hogs, or Cattle accounts there may be increases in value because of the process of production. These are processes which will not show up in the accounts until the closing inventory is entered at the end of the accounting period.

It is not necessary for us to illustrate combination No. 5 (an increase in a liability offsetting an increase in an asset), because this is the converse of No. 2. Let us suppose, however, that Mr. White buys feed worth \$100 on an open account. This would require a debit to Feed account and

a credit to Accounts Payable. Following this, suppose that White gives the Green Feed Co. a promissory note for the \$100. This illustrates combination No. 6, in which an increase in one liability (Notes Payable) offsets a decrease in another liability (Accounts Payable). The transaction would affect these two accounts as follows:

NOTES PAYABLE ACCOUNT

	(dr.)		(cr.)
Cash on note pay.....	\$50	Note for machinery.....	\$400
		Green Feed Co., note given.....	100

ACCOUNTS PAYABLE ACCOUNT

	(dr.)		(cr.)
Note Pay. to Green Feed Co.....	\$100	Feed bo't from Green Feed Co....	\$100

Combination No. 7 (decrease in a liability offset by a decrease in an asset) has already been dealt with as the converse of No. 4 (decrease in an asset offset by a decrease in a liability). Combination No. 8 (decrease in a liability offset by an increase in another liability) has also been dealt with as the converse of No. 6 (increase in a liability offset by a decrease in another liability). Thus, we find that what appeared to be eight possible pairs of entries were really only four, and the entire set of combinations could be exemplified by combinations Nos. 1, 2, 4, and 6. And in fact, these exemplify the only types or combinations of entries that the bookkeeper can be called on to make.

ACCOUNTS MUST BE IN BALANCE

Now let us see what the entire set of accounts which we have set up for Mr. White looks like after the illustrative entries have all been made. First, however, we should note that there is also a Proprietorship account, in which is entered as a credit the proprietorship claim to the net worth of all the assets and liabilities which Mr. White placed in the business at the beginning of the year. Second, whatever net gain or net loss may have resulted from the operation of the business results in a corresponding change in the net worth, since the proprietor has claim to whatever assets remain above the claims of persons outside of the business.

At the end of the year, the balance sheet is found by taking a new inventory of all physical assets, counting the cash on hand or in the bank, and examining the accounts and notes payable (and receivable) to determine what balances are still owed. Let us suppose the balance at the end of the year on Mr. White's farm to be:

(5) Balance Sheet of Joe White

<i>Assets</i>		<i>Liabilities</i>	
Cash.....	\$ 650	Notes payable.....	\$ 450
Horses.....	275	Joe White, Proprietorship	
Machinery.....	350	claim.....	1,725
Crops.....	900		
	<hr/>		
Total.....	\$2,125	Total.....	\$2,125

There has been a depreciation in the value of horses amounting to \$25, and in machinery, to \$50. The feed purchased from the Green Feed Co. has been used up, and, consequently, there is no asset remaining in this account. Crops have been raised worth \$900 and are still on hand. In the Cash account, Mr. White started out with \$1,000 and spent \$350, leaving a balance on hand of \$650. Notes payable were given for \$500, but \$50 was paid on one note, leaving a balance owed of \$450.

When the increases and decreases in both assets and liabilities are counted up, it is found that Mr. White's net worth has increased to \$1,725.

CLOSING THE ACCOUNTS

Now we shall close the accounts, entering the assets of the closing inventory on the credit side of the accounts in which they occur. The balances owed in the Notes or Accounts Payable are entered on the debit side of these accounts. If a rationalization is desired for this procedure, it may be imagined that at the end of the year the proprietor is closing the various accounts and bringing all assets and liabilities of the business together in his own account. Thus, the assets in accounts except Proprietorship are being reduced, and consequently, such accounts will be credited under the rule that accounts are to be credited for reductions in assets.

In closing the accounts an intermediate step will be found convenient. Instead of carrying the net changes from each account to Proprietorship, it is convenient to set up a Loss and Gain account where these numerous balances can be brought together. Then only the net loss or net gain for the entire business will be transferred to Proprietorship.

To illustrate how this works let us take the Horse account. Here there was originally a debit of \$300 for the purchase of horses, but by the end of the year the horses have depreciated to \$275, a loss in value of \$25. Now as the assets are transferred from Horses to Proprietorship, the decrease in value in Horses is entered on the credit side of that account, denoting a decline in assets. Next, the \$25 balance item is entered on the debit side of the Loss and Gain account, completing the transfer of the \$25 balance from the debit side of Horse account to debit side of Loss and

Gain. It will be noted that this entry also maintains the debit and credit balance for this specific pair of entries. At the same time, the closing inventory value of horses is entered on the credit side of the Horse account, and the net worth of the business (which includes value of horses) is entered on the debit side of Proprietorship.

Finally, the debit and the credit balances in Loss and Gain are added up, and the net loss or net gain figure for the farm is found and is transferred to the Proprietorship account. Now, it will be observed that the net gain (or loss) item equals the change in net worth between the beginning and end of the year as recorded in the Proprietorship account. This brings about a balance in that account, and each of the other accounts has already been balanced and closed, so that the set of accounts as a whole is also in balance. The set of accounts for Mr. White will now appear as follows:

JOE WHITE, PROPRIETORSHIP

	(dr.)		(cr.)
Net worth, end of year.....	\$1,725	Net worth, beginning of year....	\$1,000
		Loss and gain, net gain.....	725
Total.....	<u>\$1,725</u>	Total.....	<u>\$1,725</u>

CASH ACCOUNT

	(dr.)		(cr.)
Beginning inventory.....	\$1,000	Horses bo't for cash.....	\$ 300
		Notes pay. on acct.....	50
		Closing inventory.....	650
Total.....	<u>\$1,000</u>	Total.....	<u>\$1,000</u>

HORSE ACCOUNT

	(dr.)		(cr.)
Pair of horses bo't for cash....	\$ 300	Closing inventory.....	\$ 275
		Loss and gain.....	25
Total.....	<u>\$ 300</u>	Total.....	<u>\$ 300</u>

ACCOUNTS PAYABLE ACCOUNT

	(dr.)		(cr.)
Note Pay. to Green Feed Co....	\$ 100	Feed bo't from Green Feed Co....	\$ 100
Total.....	<u>\$ 100</u>	Total.....	<u>\$ 100</u>

NOTES PAYABLE ACCOUNT

	(dr.)		(cr.)
Cash on note pay.....	\$ 50	Note for machinery.....	\$ 400
Closing inventory.....	450	Green Feed Co. note given.....	100
Total.....	\$ 500	Total.....	\$ 500

MACHINERY ACCOUNT

	(dr.)		(cr.)
Machinery bo't for note.....	\$ 400	Closing inventory.....	\$ 350
		Loss and gain.....	50
Total.....	\$ 400	Total.....	\$ 400

FEED ACCOUNT

	(dr.)		(cr.)
Feed bo't from Green Feed Co....	\$ 100	Loss and gain.....	\$ 100
Total.....	\$ 100	Total.....	\$ 100

CROP ACCOUNT

	(dr.)		(cr.)
Loss and gain.....	\$ 900	Closing inventory.....	\$ 900
Total.....	\$ 900	Total.....	\$ 900

LOSS AND GAIN ACCOUNT

	(dr.)		(cr.)
Horses.....	\$ 25	Crop acct.....	\$ 900
Machinery.....	50		
Feed.....	100		
Proprietorship, net gain.....	725		
Total.....	\$ 900	Total.....	\$ 900

We may conclude, first, that since the debits were equal to the credits for each individual transaction, the entire set of accounts was in balance at each moment, provided only that each transaction had been entered completely. A footing of all debits for the entire set of accounts at any time would have equaled the total of all credits. In other words, except for a mechanical error, it was not possible for the accounts to fail to balance.

Second, after opening and closing inventories are both entered, the net gain (or loss) balances the accounts and at the same time equals the change in net worth for the accounting period concerned.

THE TRIAL BALANCE

Before starting to close a set of accounts, the bookkeeper often wants to reassure himself as to the accuracy of the material entered in them. An opportunity for this is provided by the basic equation of debits and credits. A transcription of debit and credit totals (or balances) is called a Trial Balance, and provides one of the standard tests of accuracy used in accounting.

Suppose that we go through the Joe White Ledger, which we have been using as an example, and add up the debits and credits in each account as they stood before the closing inventories were entered. Next, these totals are entered in two columns as shown below.

FORM 18. TRIAL BALANCE

	DEBITS	CREDITS
Joe White, proprietorship	\$	\$1,000
Cash	1,000	350
Horses	300	.....
Accounts payable	100	100
Notes payable	50	500
Machinery	400	.....
Feed	100	.....
Total	\$1,950	\$1,950

Since equal debits and credits were made for each transaction, the debit and credit sums in the Trial Balance should be equal unless some mechanical error has been made. The same result could have been obtained by entering the debit or credit balance for each account rather than the totals of both debits and credits. The use of totals, however, is a simpler operation and avoids the added computations of finding balances.

It should be noted that a trial balance could be taken at any time. The only caution is that both debits and credits be entered for each transaction up to that time. Consequently, in a large business trial balances are usually taken several times a year. If an error has been made, it is easier to locate it the fewer the entries to be verified. And if a trial balance was obtained a month previously, the bookkeeper knows he does not need to look for the error prior to that earlier date.

If the credit and debit totals are found not to be equal, an error is indicated either in the accounts or in the construction of the trial balance itself. The first step naturally suggested is to verify the addition of the totals in each account and their transcription to the trial balance. If this

process is found to be correct while the error still persists, there are several places where an inaccuracy might be found.

In the first place, there might have been an error in entering an item in the book of original entry so that the debit or the credit figure was wrong. Second, there might have been an error in posting. Either a figure might have been posted in the wrong amount or posted to the wrong side of the Ledger. Once there is evidence of an error, a systematic search of the records should be started immediately. Fumbling through the pages to look in various places where the error "might" be is nearly always a waste of time, and the systematic search has to be made after all.

What does a trial balance prove? Simply that equal debit and credit entries have been made up to the time of the statement. There may still be other errors of types which the trial balance could not detect.

First, it is possible to neglect to enter a transaction entirely. And yet, since equal debit and credit figures have been left out of the Ledger, a trial balance could still be obtained. One means of detecting errors of this type where cash transactions are concerned is by frequent verification of cash on hand as compared to the amount that should be on hand according to the Cash Book.

A second type of error which would slip by the trial balance is in the posting of an entry to the right side of the Ledger, but to the wrong account.

A third type occurs when two or more equal but counterbalancing errors are made. Exactly counterbalancing errors, however, seldom occur, and any discrepancy at all between the two sides of the statement should put the bookkeeper on his guard and lead him to check through and verify the Ledger.

In spite of the fact that there are some loopholes in the trial balance, it is a valuable aid to accounting accuracy and the surest test for detection of most types of mechanical errors.

THE EIGHT COLUMN FINANCIAL STATEMENT

The eight column financial statement provides a convenient source of other statements and a highly condensed summary of the year's business. It is also helpful in that it shows what figures are to be entered in the process of closing the Ledger, and whether these are consistent with the inventories and with the debit and credit entries.

The profit or loss in each account is determined by the difference between the debits and credits plus or minus the change in inventories. The eight column statement consists of four pairs of columns. The inventories at the beginning of the year are entered first, as shown in Form 19.

Next come the debits and credits; and in the third pair of columns, the closing inventories. The last two columns are for the loss or gain figures for each account. These may be obtained by adding together the credits, the resources at the end of the year and the liabilities at the beginning of the year, then subtracting the sum of debits, liabilities at the end of the year and resources at the beginning of the year. The resulting loss or gain figures should balance the individual accounts.

It will be noted that each line balances within itself, and that the sums at the bottom of the statement also provide a similar balance.

FORM 19. EIGHT COLUMN FINANCIAL STATEMENT

	BEGINNING OF YEAR		DEBITS	CREDITS	END OF YEAR		LOSS	GAIN
	Resources	Liabilities			Resources	Liabilities		
Cash	\$1,000	\$.....	\$.....	\$350	\$ 650	\$.....	\$.....	\$.....
Horses			300		275		25	
Accounts payable			100	100				
Notes payable			50	500		450		
Machinery			400		350		50	
Feed			100				100	
Crops					900			900
Proprietorship		1,000				1,725	725	
Total	\$1,000	\$1,000	\$950	\$950	\$2,175	\$2,175	\$900	\$900

Further, each pair of columns balances likewise. That is, the sum of the debits entered during the year equals the sum of credits. Each of the balance sheets shown in the statement (the two pairs of columns showing resources and liabilities) balances when the net worth or proprietorship claim is entered in the liability column. Finally, the pair of columns containing loss and gain items balances when the net gain is entered as a balancing item in the "loss" column. A further cross-check occurs in the line of the statement summarizing the Proprietorship account. Here the net worth at the beginning of the year equals the net worth at the end of the year plus the net gain if there were no personal withdrawals from the business during the year and no new investments made in it during the year. If there were such investments or withdrawals, these must be taken into account in balancing the net worth figures against loss and gain.

A six column form of statement is sometimes used, with the resources at the beginning of the year combined with debits during the year, and liabilities at the beginning of the year combined with credits. This statement is somewhat easier to obtain than the eight column form, since the pair of combined columns can be taken off as a trial balance just before the closing inventories are entered in the Ledger. The remaining four

columns are the same as in the eight column statement. The information provided, however, is less complete than that from the eight column statement. The latter form provides at a glance a picture of the condition of the business both at the beginning and end of the year, the volume of business done, and the loss and gain from these operations.

REVIEW QUESTIONS

1. Explain the relationship between the organization of the farm and the organization of the accounts.
2. What are the principal groups of accounts on the farm? Draw up a classification of the accounts on a farm with which you are acquainted.
3. Can you suggest a better name for the accounts which yield marketable products than "productive accounts"? Explain.
4. What is the function of the Loss and Gain account? Of the Proprietorship account?
5. It has been said that double entry accounts are always in balance if all transactions have been entered. Why?

CHAPTER 11

THE FUNDAMENTAL BOOKS OF DOUBLE ENTRY ACCOUNTING

The Problem

What are the books commonly used in double entry accounting? How do they fit into the general accounting system, and how are they employed to reduce the labor of accounting to a minimum?

The bookkeeper has to record all transactions affecting the business, and second, he must classify transactions entered in them in such a way as to bring out their meaning for the business. A third problem will also demand some little thought. How can this work be accomplished with least labor and the fewest possible errors?

An understanding of the fundamental accounting books and of the common methods of saving labor will be of great assistance in designing a set of records that will fulfill these purposes. First, let us discuss briefly the fundamental books. The most important of these is the Ledger, which has already been mentioned. There are also several books of original entry in which transactions are entered before they are finally posted or transferred to the Ledger. Among these we shall mention the Day Book, Journal, Cash Book, and Cash Journal.

THE LEDGER

The conventional Ledger form is shown in Form 20. Essentially, it consists of pages divided vertically into halves, with the debit entries on the left-, and the credits on the right-hand halves. A separate page is used for each account. Incidentally, an *account* is simply the portion of the financial record that is set aside for (a) a person or firm (outside of the business) with whom there are dealings, or (b) a division of the business itself for which transactions are to be classified separately from other divisions or enterprises. As illustration, accounts may be kept for the Green Feed Co., the Smith Implement Co., Horses, Crop Machinery, Poultry, Hogs, and so on.

The Ledger provides a means of classifying transactions and an aid in summarizing the year's business, both for each individual account and, also, for the entire business. In a sense it provides a separate compartment for each division of the business as well as for each outside firm with which business is done. For this purpose a page or a part of a page is set aside

FORM 20. THE LEDGER
ACCOUNT WITH SMITH IMPLEMENT CO.

DATE	EXPLANATION	FOLIO	(Debit) VALUE	DATE	EXPLANATION	FOLIO	(Credit) VALUE
1941 May 10	Old mower, allowance.....	J4	\$15.00	1941 May 10	New mower, on account.....	J4	\$175.00
June 2	Cash on account.....	C6	50.00	June 5	Fencing material.....	J5	18.50
				June 15	Binder twine, 100 lbs.....	J5	12.25
				July 2	Parts for cultivator.....	J5	4.50

for each account where records of transactions accumulate as they occur, or at least as often as they are posted from the books of original entry.

The Ledger page provides, both on the debit and the credit side, a space for date of the transaction, followed by an explanation space. Next comes a column in which to enter the folio number from which the transaction is posted. In commercial accounts the explanation space is often neglected and left blank, since the accountant feels that he can find any explanations or details that he may want by turning back to the book of original entry. In farm accounts, however, there is more to gain by bringing together quantities, grades of produce sold, and other explanatory data. Such information helps in interpreting the results obtained from an enterprise in ways that the financial receipts or expenses alone could not. Nevertheless, it is seldom convenient to enter in the Ledger a complete explanation, and the folio reference numbers are useful in providing a key to the book of original entry. Thus, a sort of cross-reference system is maintained, and any item may be traced through the books when it becomes necessary to hunt down errors or settle any argument concerning the accounts.

It would be possible to keep a set of double entry accounts by means of the Ledger alone, since it provides a complete system for summarizing the transactions that affect all branches of the business. At first glance this sounds like a method of saving labor and simplifying the accounting system. But on closer examination, this proves to be a mistake. Entering a transaction in the Ledger requires that the bookkeeper turn to two different accounts, so the Ledger would not be a convenient place for a farmer to enter the original record of a transaction. Further, its use as a book of original entry is likely to lead to errors which would be hard to locate without some form of Journal or Cash Book for reference.

Suppose that a farmer is recording three or four transactions that have occurred during the course of a day. A calf has been sold for \$15.00, a ton of tankage purchased for \$45.00, a laborer was paid \$20.00, and eggs worth \$3.00 were traded for groceries. While the transactions are being recorded the farmer is interrupted for several minutes. When he returns to his books he may have forgotten just where he left off. In this case he could find out which debits and credits he had already entered only by going through all the accounts that might have been affected by any of the transactions that he was going to enter.

THE DAY BOOK

The simplest book of original entry is the old-fashioned Day Book, which is now seldom used. Essentially, it is a diary or memorandum. Each

time a transaction occurs, it is noted in the Day Book with all the details and descriptive material that is ever likely to be wanted for reference in the future. The facts of the transaction are simply jotted down in an informal manner at the time or as soon thereafter as is convenient. A common form of Day Book is shown below. Suppose that some equipment is bought on account. The transaction may be entered as follows:

Feb. 19, 1941.

Bought of Smith Implement Co.	
Hog waterer	\$15.00
Spray pump	5.50
Halter ties	1.20
	\$21.70
Terms, cash in 30 days	\$21.70

This entry contains complete information concerning the name of the firm dealt with, the assets concerned, values of each as well as total, terms of the transaction, date, etc. But there is nothing to indicate which accounts are to be debited and which credited. The entry is simply a memorandum from which debits and credits may be figured out later.

The first purpose of the Day Book is convenience, since it provides the simplest and easiest possible way of recording the necessary facts about a transaction as soon as it occurs. Somehow, it seems easier to enter the necessary facts as a memorandum than as the more formal debits and credits.

A second purpose is to furnish a record in which all pertinent data concerning a transaction may be found in one place. If entry were made directly in the Ledger, partly under the account debited and partly in the one credited, it would be much harder to locate all information and piece together the entire story later on in case of an argument.

A third purpose is to facilitate the entry of complete information. The Ledger is intended for classifying entries in accordance with the persons or enterprises concerned. It is intended also to facilitate summarization, and therefore, is kept as simple as possible by leaving out many details. If fuller information is wanted, the Day Book, or a similar book of original entry, provides it.

A fourth advantage is that the Day Book provides a chronological list of transactions, and in that way furnishes a sort of diary or history of the business dealings from day to day. Such a chronological record sometimes makes it easier to locate a transaction later on. It may be remembered that the transaction occurred about a certain date, but the name of the firm concerned may have been forgotten.

Another advantage is in the legal value of the Day Book or similar book of original entry, which has considerable weight as a presumably

faithful record made at the time of the transaction. This legal weight does not attach to the Ledger, which is simply a classification of entries made at later dates. Incidentally, the legal value of the book of original entry is a reason for care in making such entries, for use of indelible means of writing, and for avoiding erasures. If errors are made, they should be corrected by counterbalancing entries, or else the erroneous entries should be left in the book with lines drawn through them and with the right figures written in anew.

It was said that the Ledger could be used alone to keep a complete set of accounts, but this is not true of the Day Book. Suppose, for instance, that it were desired to figure up the balance in the account of the Smith Implement Co. with which an open account is kept. If only the Day Book were available, it would be necessary to go all through the book and pick out each separate item concerning this firm from among the mass of data relating to other accounts. Errors would be difficult to avoid. It is much more convenient to use the Ledger for this purpose.

The Day Book is being used much less than formerly because there are other and more efficient books of original entry that serve the same purposes. In commercial businesses duplicate sales slips largely take the place of the Day Book. On the farm it is possible to use sales slips from stores, check stubs, cream checks, and so on, as memoranda. The trouble with depending on such memoranda as check stubs and cream checks, however, is that they do not cover all transactions. Small items may be purchased for cash without receiving a sales slip or receipt. Or a check may be given and a sales slip received on the same transaction. In this case, there are two memoranda regarding the same transaction to provide another opportunity for confusion.

In many transactions there is neither a check stub nor a written receipt. Further, the quantity of produce may not be written down even though the amount of money is recorded at the time. To provide a simple and uniform system for recording transactions as they occur, some book of original entry is a practical necessity.

THE JOURNAL

We can enter in the Journal (shown in Form 21) all the information that would be entered in the Day Book, and handle it much more easily after it is entered. In this form the first column is for the date of the transaction. Second, comes a space for the names of accounts affected and for explanation. This is followed by a narrow column in which to enter the number of the page or folio to which the item is posted for future reference. Finally, there are two columns which constitute the distinctive

feature of the Journal as compared to the Day Book. The left hand one of these is for the amount debited, and the right hand one for the account credited.

Journalizing requires an extra process as compared to use of the Day Book. Before entry in the Journal, the transaction must be analyzed into its debit and credit components. Once this is done, however, posting is a

FORM 21. THE JOURNAL

DATE	EXPLANATION	FOLIO	DEBIT	CREDIT
1941 Feb. 19	Equipment, hog waterer \$15.00, spray pump \$5.50, halter ties \$1.20..... Smith Implement Co., terms cash in 30 days.....	L16	\$21.70	\$21.70

much simpler procedure and, indeed, is practically mechanical, since the bookkeeper can now turn directly to the account to be debited or credited without stopping to analyze each transaction as he comes to it.

Like the Day Book, the Journal provides a chronological list of transactions. It contains full information about the transactions entered in it. It facilitates and systematizes the process to an even greater degree than does the Day Book, and it possesses the same advantages in legal and other matters.

It will be observed in Form 21 that the debit is entered first and the credit afterwards, and that the name of the account credited is indented in order to make it easier to pick out debits and credits when posting.

In a large business there may be more than one Journal. One might be kept for purchases, a second for sales, a third for accounts payable, and so on. This facilitates the accounting where there is more than one bookkeeper. In farm accounting, of course, this problem seldom arises. There is, however, another purpose for special journals. They may be used to record sales of poultry, or dairy products, etc., where a large number of transactions affect the same account. By entering several sales of eggs, for instance, in the same column, it becomes possible to post the total to Egg Sales as a single figure and thereby save nearly half of the posting. This can also be accomplished through the use of the Cash Journal, which will be discussed a little later.

THE CASH BOOK

Let us suppose that the purchase of equipment and materials from the Smith Implement Co., used as an illustration on the last page, had

been for cash rather than on credit. Then the Equipment account would have been debited and the Cash account credited. Suppose that on the same day feed was bought for cash. Here again the Cash account would be credited. In the course of a month's time there would be quite a number of credits to Cash, and a number of other transactions resulting in debits to Cash.

As far as the Cash account is concerned, there is no difference between one expenditure of Cash and another. Therefore, there is nothing to be gained by posting each credit to Cash separately. The question naturally arises: Can we not find some way of saving ourselves the trouble of posting all these items separately?

If we enter all the cash receipts on one page and all the cash expenditures on another, the total of the receipts can be posted to the debit side of Cash, and the total of the expenditures to the credit side of Cash. This is the origin of the Cash Book, an example of which is shown in Form 22. With a Cash Book, nearly half the postings for cash transactions are avoided. Sometimes the Cash Book itself is used in place of this Ledger account. The only necessary caution is to remember to include the Cash Book totals in any Trial Balance or other summary statement that requires a summary of the Ledger.

Each item on the left-hand page of the Cash Book, which represents a debit to Cash, represents also a credit to some other account. Thus, the sale of eggs requires a credit to the poultry account, that is, an entry on the right-hand side of that account. Likewise, the credit to Cash for auto expense requires a debit to the Auto account. In posting to the Ledger accounts which receive the counter entries from Cash it is necessary to post to the side opposite that of the Cash Book where the item was originally entered. This may confuse the beginner for a while. But he needs to think out the relationships involved. It is as though he had made the original entries in one of the two Ledger accounts involved and is now completing the Ledger entries.

It is desirable to check up on the Cash Book and the cash on hand at more-or-less regular intervals to see if the two agree and if, therefore, it may be assumed that all entries concerning cash have been entered in the right amounts, and on the right side of the book. To assist in reconciling Cash, the amount of cash on hand (and in the bank) may be entered on the first line on the debit page of the Cash Book; and the amount on hand at the end of the month may be entered on the last line on the credit page. These entries are comparable to the beginning and closing inventory entries, respectively, in a Ledger account. At the end of the month the amount of cash on hand or in the bank plus cash spent should equal the amount on hand at the beginning of the month plus cash received.

FORM 22. CASH BOOK

CASH RECEIVED				CASH EXPENDED			
Date	Explanation	Pol.	(Dr.)	Date	Explanation	Pol.	(Cr.)
April 5	Butterfat sold, 12 lb.....	L40	\$ 3.60	April 15	Note pay., paid on machinery note.	L6	\$50.00
April 12	Eggs sold, 20 dozen.....	L44	4.20	April 18	Crop expense, clover seed.....	L34	18.75
April 24	Paul Brown, acct. receivable.....	L7	45.00	April 22	Auto, bought 2 new tires.....	L22	14.00

It will be observed that the Cash Book is capable of serving all the functions of the Day Book or Journal as far as cash is concerned. It provides a chronological list of transactions involving cash receipts on one page and of those involving cash expenditures on the other. It provides complete information concerning each transaction in one place, where the whole story of that purchase or sale may be found if need arises for it later on. The Cash Book, like the Journal, permits the entries to be made at the time of the transaction without the trouble of turning to more than one place in the books. Even more than the Journal, it promotes convenience and saves labor. With its use it is necessary to make an entry on only one line and regarding one account, since the placing of the entry on the left or right side of the Cash Book automatically indicates what is the effect of the transaction on the Cash account. And, of course, as a book of legal value the Cash Book is of as high repute as the Journal. If anything we would expect it to be even more highly regarded because of the reconciliation each month of the record with the amount of cash on hand.

THE CASH JOURNAL

The advantage of the Cash Book as a labor-saving device in posting has already been pointed out. The question may now be raised: Why not use similar columns in the Journal to reduce the labor of posting to other accounts as well? For that matter, why not combine the Cash Book and the Journal into one book?

If we take the Cash Book and add an extra column on both the debit and the credit sides for items that do not involve the handling of cash (or for the counterparts of the cash entries), we may consider these new columns as taking the place of the Journal. By using them in place of the Journal we eliminate that book from our accounting system and simplify it to that extent. There are various forms in which the Cash Journal may be drawn up. To mention two of them: We might either use one page for debit entries and the facing page for credits, or we might put the debits on the left-hand and the credits on the right-hand side of the same page and the explanation space in the middle. This is the type illustrated in Form 23.

It will be noticed that a debit and a credit entry is made for each transaction, usually on the same line. At the left is entered the amount of the debit followed by the date of the transaction and the name of the account debited. In the center of the explanation space is written the same detailed information that would have been entered in the Journal or the Cash Book. At the right of this explanation space is the name of the account to be credited. Finally, at the right of the page, in the proper

CASH JOURNAL - MONTH OF JUNE 1941

FORM 23

Personal Expend.	Misc. Dr.	Cash Receipts	Folio	Date	Account Debited	Explanation	Account Credited	Lbs B.F.	Doz Eggs	Folio	Cash Expend	Misc. Cr	Cream Sold	Eggs Sales
				June										
	60.00		L 21	3	Cash - Regular E. Machine for May - Cash						60.00			
	45.15		L 24	4	Auto	210 gals gas - Cash					45.15			
2.21			✓	5	Personal - Groceries	Cash					2.21			
	1.05		L 20	5	Equipment - Belt dressing	Cash					1.05			
		3.00	✓	6	Cash - Sold potatoes	Personal				L 8		3.00		
5.00			✓	9	Personal - Shoes	Cash					5.00			
		2.10	✓	11	Cash - Cream @ 38¢	Cattle		5.5					2.10	
		5.40	✓	13	Cash - Eggs @ 36¢	Poultry		150						5.40
	50		L 20	15	Equipment - Flood for Water System - Cash						50			
	1.50		L 24	16	Auto - Repairs	Cash					1.50			
	3.20		L 20	17	Equipment - Regular equip. repairs - Cash						3.20			
3.16			✓	19	Personal - Groceries	Cash					3.16			
		2.00	✓	21	Cash - Lume sprayer rented	Equip				L 20		2.00		
		462.00	✓	22	Cash - 17 hogs 3300# @ 94 per cent. Hogs					L 40		462.00		
		6.46	✓	23	Cash - Cream @ 38¢	Cattle		17.0					6.46	
		9.12	✓	23	Cash - Eggs @ 38¢	Poultry		240		L 47				9.12
10.37	111.40	490.08						22.5	39.0		121.77	4.67	8.56	14.52
(L 8)	6.11	(L 14)									(L 14)	6.11	(L 80)	(L 68)

column, is the amount to be credited, which is, of course, equal to the debit. Just before the date column at the left of the page and at the right, following the explanation space, are columns in which to record the numbers of the Ledger pages to which the items are posted.

As suggested in discussing the Cash Book, it is not necessary to post each cash item separately, but only the debit total and the credit total. The same principle is applied to the other special columns, such as Auto Expense, Cream Sales, Egg Sales, and so on. Whenever all items in one of these columns is to be transferred to a single account, the total at the bottom of the column is the only figure that needs to be posted. In this way the work of posting is greatly reduced.

There is nothing to prevent the extension of the same principle to other accounts as well as those shown or mentioned. The question may be raised: Why not extend the principle to cover all accounts and so do away with the Ledger entirely? There are two reasons for retaining the Ledger. In the first place, it is generally desired to make a further analysis of the contents of the Ledger accounts. Many of them contain items of more than a single type which are not to be combined and confused in totals. Thus, in the Cattle account on the debit side there may be purchases of cattle, veterinary expenses, and other items. On the credit side there are likely to be sales of cream or milk, sales of cattle, and credits of other types. If these were all combined into two totals, one on the debit and one on the credit side, much useful information would be lost.

The second reason is that, if the special column principle were extended to all accounts, and if unlike items in each account were given a separate column, the mechanical problem of handling such a large page would become difficult. Or, as an alternative, it would be necessary to spread the monthly record over several pages, losing most of the advantages of a simple record.

It is possible to draw a line pretty sharply in the extension of the special column principle. If an account is likely to be affected on the debit or credit side only once a month on an average, the use of a special column for it would waste labor instead of saving it. In posting the total from each column it is, of course, necessary to bring down the total to the bottom of the column. At least it is desirable to follow a definite procedure in this respect to avoid confusion. If there is but one figure in the column, rewriting it at the bottom and then posting it is a waste of just that much effort. If there are two items in the column, the posting of one total, it is true, saves just that much effort. But it requires just about as much trouble to go through the procedure of adding and bringing down the total as to turn to the Ledger to make one more posting. Thus,

we are brought to the conclusion that if a special column is to save labor it should receive, on an average, three or more items per month.

On the ordinary farm there are many accounts that require not over two items a month or 24 a year. For these the simplest and easiest method of posting is to use the Miscellaneous or Journal column in the same way as the ordinary Journal, posting each item from it separately.

In posting from the Cash Journal, the items in the Miscellaneous columns are posted as from the simple Journal, with the bookkeeper posting first the debits and then the credits and entering the Ledger page number in the folio column. As he passes down the page, he reads each item on the side from which he is posting and checks it off as it is posted or found to be properly a part of a special column. In the first case, the ledger folio number serves as a check mark. In the second, a check mark is placed in the ledger folio column as illustrated in Form 23. As he inspects the page after posting, the absence of a check mark opposite any item indicates that it has not been posted or verified, and calls for an examination of that entry.

It will now be seen why double entry accounting does not involve double the amount of work required by single entry systems. With the use of the special columns it is not necessary to make two entries for each transaction, and generally the number of postings will be smaller than the number of transactions.

USE OF SPECIAL COLUMNS IN THE LEDGER

In organizing a set of accounts we should always keep in mind the process of analysis that is to be carried out when the records are complete. This analysis will usually involve more-or-less subgrouping of items in the larger Ledger accounts. Thus, it will be desired to know how much of the total expense on a lot of feeding steers was for feed, how much for purchase of the steers, and so on. Now there are various ways in which this information could be obtained. It would be possible to pick out the feed expenses and add them together and to do the same for each other type of expense. Another method would be to keep separate accounts for Feed for Steers, Purchase of Feeding Cattle, Miscellaneous Expense on Steers, etc. Then at the end of the year these various accounts could be closed into a central account which would then contain only the needed subtotals from the debit and the credit sides.

A simpler and generally satisfactory method is to introduce the special column device into the Ledger, setting aside separate columns for the different classes of items on the debit and the credit sides of the Steer account. This not only yields the desired subtotals, but has the

added advantage of keeping all items concerning the enterprise together in a single account where they can all be studied over together. Further, it promotes simplicity in the general organization of the Ledger.

This device, however, should be used with some restraint. Only the accounts with several items of a given type need special columns. Thus, if the feeding steers just mentioned are all bought in a single lot, there is no gain in setting aside a special column for this item. Some accounts may be summarized best in a single debit and a single credit column, while others may require two or three columns on each side of the account.

DOUBLE ENTRY FORM FOR ACCOUNTS PAYABLE AND RECEIVABLE

Even where the farm accounts are of the single entry type, it is very convenient to use the double entry ledger form for accounts payable or receivable. Suppose that considerable business is done with the Green Feed Co. Various types of commercial feed are bought from this firm, and farm crops and other produce is sold to them from time to time. It is desirable, if only for convenience, to maintain all double entry features in recording such transactions.

If tankage is bought from the Green Co., its account should be credited, and at the same time the farm account for Commercial Feeds Purchased should be debited. If a load of corn is sold to the Green Co., it should be debited to the Green account, and the Corn account should be credited. This procedure serves a double purpose. In the first place, it contributes to the summary of farm operations in the Corn account, Commercial Feeds, and so on. In the second place, the ledger account for the Green Co. will contain a record of all transactions with that firm. Whenever the farmer wants to find out just how much he owes to the Green Co., or vice versa, he can foot up the debit and the credit columns in that account in a few minutes and determine just what the balance is.

REVIEW QUESTIONS

1. What are the purposes of the Ledger? What information about a transaction would you enter in a ledger account, and what would you leave out?
2. Is it necessary to use books of original entry, such as the Day Book or the Journal? Explain.
3. What are the advantages of books of original entry?
4. Compare and contrast the Journal with the Day Book. With the Cash Book.
5. In what ways does the Cash Book resemble and how does it differ from the Ledger?
6. Explain the principle of the Cash Journal.
7. How would you decide whether to add another column to the Cash Journal?
8. Does double entry accounting require twice as much work as single entry? Explain.

CHAPTER 12

MULTIPLE COLUMN RECORDS

The Problem

Is it possible to draw up a farm accounting form which is more easily understood by the ordinary farmer than the conventional double entry form, and which will at the same time be capable of providing a complete record of the financial transactions? Can a multiple column arrangement be used for this purpose?

BASIS OF THE MULTIPLE COLUMN RECORD

One of the most promising types of simple farm records is the multiple column form. This is derived from the cash journal, which is widely used in double entry accounting, by adding special columns until there is a column for each of the principal sources of income or expense. An example is shown in Forms 24 and 25. The general plan is to use one sheet or set of sheets for each month's transactions. The monthly totals are then added together to obtain total receipts or expenses for each section of the business for the year.

There are only a few farm enterprises that are affected by more than two entries per month. No labor is saved in the records by adding columns for sections of the business with only one or two entries. The accountant should use special columns as far as they are beneficial and then revert to the more direct double entry method. To the farmer, however, the combination of two methods in this way would be very troublesome. As a general thing, the simplest and easiest thing for the farmer is to follow a clear-cut system which provides a definite place to enter each item and to post each total to a clearly designated summary form. In such a case simplicity and clearness generally count for more than a refinement of method.

The list of accounts given in Figure 2 is too long for a special column to be provided for each. But many of these do not come into use on a given farm, and it is possible to combine some of the others without losing very valuable information. If we reduce the number of accounts to an absolute minimum, we shall find that there are scarcely more than 10

important sources of income on the ordinary farm and hardly over a dozen notable causes of expense.

On most farms there will be a few items of importance which will occur only three or four times in the course of the year and for which it is impracticable to set aside a special column each month. These may be handled somewhat like the items which are posted to the ordinary ledger accounts from the simple journal. That is, it will be necessary to have a column on the monthly record sheet for miscellaneous receipts and one for miscellaneous expenditures, and to post items from these columns to designated places on the summary sheet.

THE RECORD OF RECEIPTS

An examination of receipts on the ordinary Corn Belt farm will show that the most frequent ones are usually:

- Cream sales
- Egg sales
- Poultry sales
- Hogs
- Cattle
- Corn
- Oats
- Other crops
- Other livestock
- Receipts from bills or notes outstanding

In addition to these 10 items there may be incomes from sheep, bees, or fruit. On other farms there may be labor or teams hired out. Such items will be entered in a "miscellaneous" column.

The columnar record of receipts is shown in Form 24. It is a double page consisting of the usual date and description columns followed by a series of special columns for the receipts named in the preceding list. The columns are not placed in the exact order of their frequency of use because it is desirable to keep related types of income together as much as possible.

First, to the right of the explanation column there is a column for sales of dairy products. Then come receipts from the sale of eggs, the sale of poultry, and sale of hogs. This completes the left-hand page. A separate line is used for each entry. The right-hand half of the record contains no space for dates or explanations since space is provided for this information on the left-hand page. The second page contains sales of cattle, sales of other livestock, crop sales, columns for miscellaneous receipts and for income from notes or bills.

To the left of the date and explanation columns, there are columns

for cash received and for debits to the accounts receivable in case of items sold on account. These two columns complete the double entry aspects of the records. Each item of income will now be entered as a debit against the cash account or the accounts receivable on the one side and as a credit to the enterprise from which it came.

Beside each record of receipts from any important enterprise there is a column for the quantity of the product sold. This permits the amount of produce to be recorded at the time it is sold with very little added effort. The total amounts of sales of butterfat, pork, beef, and eggs are found incidentally to the financial summary.

THE RECORD OF EXPENSES

The record of expenses shown in Form 25, like that of receipts, consists of two pages facing each other. The left-hand page contains the necessary dates, explanations, and some of the special columns, while the right-hand page is filled with the rest of the special columns.

The farm expenses which occur most frequently are found to be:

- Purchases of feeds
- Auto expenses
- Equipment expenses or replacements
- Expenses on tractor
- Labor hired
- Upkeep of buildings and improvements
- Payments on bills and notes
- Purchases of livestock

It is desirable to keep equipment upkeep and repairs separate from new purchases. The same separation should be made of the outlays on buildings and improvements, but the expenses for new buildings, drains, or fences occur so seldom that they may easily be separated out from among the expenses of maintenance. In the summary at the end of the year, purchases of different types of livestock may be separated. Actually, the ordinary farmer makes only a few purchases of livestock in the course of a year, and it is an open question whether a separate column is worthwhile for each different livestock enterprise.

The most frequent of all expenses is rather sure to be the continual outlays made for groceries, clothing, or other personal items. It is best to keep a separate record of these expenses and to summarize and analyze them entirely apart from the farm expenses. Where a detailed record is not wanted, they may be recorded along with the farm expenses by setting aside one column for the purpose. At the end of the year the personal expenses will be separated completely from farm expenditures.

Purchases of feed will generally be separated into commercial feed-

ing stuffs, such as tankage, and feeds, such as corn or oats, which could be produced on the farm. This makes it possible to see what outlay for feeds might be saved if more land were procured or if the cropping system were changed to avoid buying these crops.

RECONCILING THE CASH

The amounts of cash received and expended can be reconciled with this record in the same manner as with the ordinary cash book. At the beginning of the month cash on hand is entered at the top of the cash receipts column. At the end of the month the amount of cash on hand and in the bank is entered at the bottom of the cash expenditures column. Now the cash at the beginning of the month plus that taken in should equal the expenditures plus the cash on hand and in the bank.

The presence of this check is a valuable aid and stimulus in maintaining the accuracy of the records. Once a farmer gets into the habit of using such a device to assure himself of the completeness and accuracy of his records he finds them easier and more interesting to keep, and enters transactions more promptly and carefully.

SUMMARIZING THE COLUMNAR RECORD

At the end of the month the special columns are footed up, and the totals are carried to a summary, such as Forms 26 and 27. Here the monthly figures are added together to obtain the totals for each type of receipt or expense for different quarters and for the whole year. These totals can be entered directly in the farm income statement.

The yearly summary sheet will also give the total quantity of dairy products sold, dozens of eggs, pounds of hogs, and amounts of each other product. To these figures will be added the quantities used in the household in order to obtain total production for the year. These figures will be used in obtaining the production per cow, per sow, or per hen.

There are some figures on the monthly sheets which will not be carried to the yearly summary. Receipts from notes or accounts receivable will not be added because articles sold on account have already been entered in the income columns along with the cash sales from the same enterprises. If receipts from bills receivable were added to farm income, they would be included twice. The same reason will make it necessary to omit, from expenses, payments on accounts owed. Since we are interested here only in the farm income and expense, we will not carry the personal expenditures to the year's summary.

In the monthly record of expenditures new equipment and current

FORM 26. YEARLY SUMMARY OF RECEIPTS

YEARLY SUMMARY OF RECEIPTS														
FARM NO. YEAR														
	TOTAL RECEIPTS BY MONTHS		DAIRY PRODUCTS SOLD		EGGS SOLD		POULTRY SOLD		HOGS SOLD			CATTLE SOLD		
	No.	Value	Lbs.	Value	Doz.	Value	No.	Value	No.	Weight	Value	No.	Weight	Value
January	994	41	122	54 99	195	61 63			53	11060	877 79			
February	754	24	130	35 83	57	1 56						6	4740	378 85
March	102	96	147	20 18	178	32 53								
Total 1 st Quarter	1531	11	399	111 20	412	107 52			53	11060	877 79	6	4740	378 85
April	987	32	174	85 27	205	42 76	14	13 72	36	7880	748 20			
May	298	90	179	78 76	174	29 39			6	1450	137 85			
June	89	14	180	10 28	89	16 42								
Total 2 nd Quarter	1375	36	533	234 28	768	111 57	14	13 72	42	9330	886 05			
July	198	85	126	72 30	74	12 94			4	1350	98 55			
August	830	79	162	76 64	40	7 71	67	74 73	3	1180	93 08			
September	160	87	576	75 68	33	6 46	60	57 70						
Total 3 rd Quarter	1190	73	788	274 72	152	27 11	127	108 41	7	2530	191 63			
October	133	44	785	75 80	14	3 08	61	14 74						
November	77	57	372	81 36			50	119 68	9	1800	312 50			
December	615	31	281	36 52	59	11 08	36	37 73	16	3720	371 68	7	2230	156 10
Total 4 th Quarter	1228	29	1162	64 68	73	14 16	250	217 72	25	5520	687 18	7	2230	156 10
Total for Year	5353	24	3102	819 68	1125	230 36	388	334 32	117	28440	2637 05	10	6970	531 95
NOTES:														

YEARLY SUMMARY OF RECEIPTS												
FARM NO. YEAR												
OTHER LIVESTOCK SOLD			CROP SALES						MISC RECEIPTS			
No.	Weight	Value	Value	BU.	Value	BU.	Value	QU.	Value			
			CORN	OATS		OTHER CROPS						
												5 00
												9 95
												14 95
						262	97 00					
												55 90
												2 44
						262	97 00					58 34
												15 00
												15 00
						262	97 00					11 24

FORM 27. YEARLY SUMMARY OF EXPENSES

YEARLY SUMMARY OF EXPENDITURES

FARM NO. YEAR

	TOTAL EXPENSES BY MONTHS	FEED BOUGHT				EQUIPMENT & MACHINERY				LABOR	LIVESTOCK BOUGHT			
		Commercial		Farm Raised		Repairs	Auto Expense	Truck Expense	Tractor Expense		Cattle			
		Amt	Value	Amt	Value						No	Weight	Value	
January	206.38		8.70			1.50	57.52	27.72						
February	557.40		40.00			8.35	44.10	12.40						
March	218.80		15.35			7.35	26.30		18.88					
Total for Quarter	982.64		113.25			17.20	128.05	42.62	18.88	4.00	1,000	175.00		
April	382.18		48.60			1.45	13.28		32.72					
May	51.10		47.35											
June	207.30		63.70			15	26.00			45.65				
Total 2 nd Quarter	640.78		159.65			18.10	39.33		32.72	45.65				
July	134.20		50			6.00	11.97		30.21	53.00				
August	352.22		330				72.87		39.40	60.00				
September	93.01		16.30			2.43	20.61		17.70	14.50				
Total 3 rd Quarter	614.43		201.10			24.93	105.97		87.31	127.50				
October	64.73		5.80			3.55	9.07		1.50	45.00				
November	157.79					16.30	24.71		9.07	60.54				
December	313.07		16.10			1.39	60.56	110.00		3.00				
Total 4 th Quarter	535.76		21.90			34.14	100.55	110.00	10.54	108.54				
Total for Year	3388.61		394.70			101.44	378.40	152.62	149.43	285.64	1,100	175.00		
NOTES														

YEARLY SUMMARY OF EXPENDITURES

FARM NO. YEAR

LIVESTOCK BOUGHT						OTHER FARM EXPENSE								
Poultry		Hogs		Other Stock		IMPROVEMENTS UPKEEP	Livestock Expense	Crop Expense	Rent	Taxes	Insurance	Interest Paid	Misc.	
No	Value	No	Weight	Value	No									Weight	Value
													2670	
												21800	310	
	24.00						4.50			124.30			95	
	24.00						4.50			124.30		21800	30.75	
	30.00					1.00	45.00	10.00			2695	150.00	6.08	
								70.00					75	
	30.00					1.00	45.00	80.00			2695	150.00	12.58	
								52.65		124.00			32.50	
								52.65		124.00			32.50	
	1	2.00		52.00									15.00	
								83.74					14.25	
	1	2.00		52.00				83.74					29.25	
	59.00	1	2.00	52.00		1.00	49.50	216.39		248.30	2695	368.00	104.88	
NOTES														
NEW INVESTMENT IN FARM DURING YEAR														
	Date	Explanation						New Equip	New Bldg	Other				
	Mar 20	Plow						125.00						
	May 10	Hay Rake						67.50						
	June 5	New Auto						550.00						

upkeep of equipment are both entered in the same column for convenience. But we do not want to include the total price of new machinery as an expense against the operation of the year in question, but only the year's depreciation. Consequently, new machinery will not be carried to the summary of expenses. Circles may be drawn around these figures when they are entered. These circled items are then carried to the inventory sheets, and only the depreciation is entered in the income statement. Outlays for new equipment may be summarized by carrying such items to the space for *new investment* in the lower right-hand corner of the summary of expenditures shown in Form 27. The same methods will be used in separating outlays for new buildings, fences, drains, and so on, from upkeep of permanent improvements.

Under the general heading *other farm expense* on the monthly expense sheet will be entered a variety of items such as rent, interest payments, insurance, taxes, crop expenses, and livestock expenses. These include an important part of the farm expense and should be separated for further analysis. In posting the monthly totals these items should be sorted out from the *other expenses* and entered in the proper columns in the summary.

Quarterly Summaries and Budgetary Control

On the summary sheets spaces are provided for quarterly totals in addition to the totals at the end of the year. If a farmer is attempting to make any current use of a budget, these are very useful. At the end of any quarter they permit comparison of actual income and expense with the amounts expected from the plan.

Even without any definite budget these quarterly summaries are very beneficial. A comparison with figures for the corresponding quarter in the preceding year is almost certain to yield information which is both interesting and useful. Such summaries permit the appraisal of new methods and call any laxity of management to the farmer's attention promptly and definitely.

Once the farmer adopts the habit of summarizing his records at regular intervals during the year, he finds it relatively easy to make the preliminary analysis. In these forms the quarterly, as well as the monthly, summaries of receipts are spread out before him on a single page and all of the expenses on another. The figures to be compared are found close together for adjacent months and quarters and in the corresponding location on another page for the preceding year. Ordinary curiosity can generally be depended on to lead to the next step.

The Income Statement from Columnar Records

The income statements shown in Forms 28 (p. 145) and 29 (p. 149) may be used for the columnar records as well as for the double entry accounts. The total sales of each of the different classes of livestock or crops are taken from the columnar yearly summary and entered in one of these forms. Increases in current assets or in inventories of breeding stock are added up in the inventories and placed in the statement, together with the value of farm products used by the household. These items are now added to the sales of crops and livestock to find the gross income.

On the expense side of the statement the process is similar. Totals of the various columns of operating and fixed expenses in the columnar yearly summary are carried to the expense section of the income statement and are entered and added in the same way as though they came from the ledger. Next, decreases in inventories or depreciation totals are brought over from the inventory sheets and added to the cash outlays in order to obtain the total debits. The total debits are now subtracted from gross income to find net income.

REVIEW QUESTIONS

1. Show how the columnar farm records conform to the principles of double entry bookkeeping.
2. Reorganize Forms 24 and 25 to fit a farm with which you are acquainted where dairying and pork production are of minor importance.
3. What advantages have the columnar records over the conventional cash journal and ledger?
4. How can you reconcile the "cash" when using the columnar records?
5. Why are payments on bills owed not included with expenses in summarizing the records at the end of the year?
6. Explain how you would make use of the quarterly totals of receipts and expenses in the operation of your farm.
7. How would you compute the value of the net increase for a livestock enterprise?

CHAPTER 13

SINGLE ENTRY FARM RECORDS

The Problem

A large number of the record forms advised by extension services are of the single entry type. How are these records drawn up? What are their advantages and disadvantages compared with double entry accounts or multiple column records?

RELATIONSHIP TO DOUBLE ENTRY ACCOUNTS

Single entry records are those in which each transaction is entered in only one account. Since each value handled actually has two aspects, a source and a destination, these records are really incomplete and lack the unity of double entry accounts.

Contrary to a widespread belief, the single entry accounts are not basically different from the double entry ones. In single entry records, if corn is sold, a single entry is made in the crop account. No further entry is made to indicate whether the sale increased the cash on hand or was on account. Now, if another entry were to be added in the cash account, these entries would become identical with double entry. Thus, the single entry is properly regarded as an incomplete record and not as a different kind.

The object of single entry accounts is to reduce work in keeping the records. There is some saving by dropping the books of original entry. However, the saving is likely to be less than the beginner expects. For instance, in double entry accounts, items affecting the cash account would still have been posted as totals. A decided disadvantage is that, since there is no account with "cash," it is impossible to check up on the accuracy of the record by comparison with the amount of cash on hand.

What has just been said refers to transactions during the year. Inventories, balance sheets, and production records are not modified in any way by the use of the single entry financial record.

In the accounts payable or receivable it is necessary to keep a record with each person who buys from the business or sells to it on account. Such transactions must be entered twice, just as would be done in double entry. They will be entered once in the account payable or receivable and once in the farm enterprise account.

Recording Current Transactions

The problem of organization of accounts is, if anything, more important here than with double entry accounts. The double entry system is very flexible and may be adapted to a wide variety of uses and types of accounts. Single entry records are almost always planned to obtain specific information regarding each enterprise. This necessitates a slightly different form for each of a large number of accounts. The result is a record which may be kept and summarized with the smallest possible amount of effort as long as it is applied only to the particular type of farm for which it was designed. But, when kept on some other type of farm, or on a farm larger than ordinary, the forms are likely to prove too rigid and inelastic for most advantageous results.

Consequently, it is very difficult to generalize on the forms of single entry records. In the following few pages an effort will be made to describe the principal forms needed by the typical farm of the Corn Belt and the general method of using the records and summarizing at the end of the year.

Accounts Payable and Receivable

For bills owed by or owing to the business, a form essentially that of the double entry ledger is generally found most convenient, as was stated in Chapter 11. It is necessary to keep a separate account with each firm or person with whom any large amount of business is being carried on. One side of the page is used for a record of the bills contracted, together with the dates, and a description of the transactions. The other half page is used to record payments as they are made.

The same form is used to record sales on account. The value of the sale is entered on the left-hand side of the sheet and payments to the business on the right-hand side. Fundamentally, this is exactly the same as the debit and credit principle. The account is debited for whatever value it receives and is credited for whatever value is received from it.

RECORDS OF INCOME

The records of farm income fall into four general groups, each of which uses similar or even identical forms. These consist of records of crops sales, sales of livestock, livestock products, and a miscellaneous group of accounts. In view of the discussion of double entry methods, it may be easier to understand these forms if each is regarded as the credit side of a double entry account slightly modified.

Sales of Crops

If there are only small and infrequent crop sales, a single account may be sufficient. If they are more important, it may be desired to record sales separately for the two or three principal crops. Sales of new crops may be kept separate from those of crops raised in the preceding year. A separate page or part of a page would, of course, be needed for each of such divisions. The form shown below will furnish the general model for the crop sales accounts.

CROP SALES

DATE	DESCRIPTION	PRICE	AMOUNT	VALUE
Sept. 20	Wheat sold at	\$0.80	225 bu.	\$180.00

Livestock Sales

The record of the livestock sales does not differ greatly in form from the crop sales record. Generally, there will be a separate record for each class of livestock produced—hogs, cattle, poultry, and perhaps sheep. Where there is a dairy and a beef herd or a herd of grades and a herd of purebreds, it may be desired to keep a separate record for each.

In recording sales of livestock, it is best to note both the weights and number of animals sold. The weights will be needed in computing physical production of the different enterprises. The number of head will be used to reconcile sales and purchases with inventories at the beginning and the end of the year, and in computing such indices as the number of pigs weaned or raised per sow. The form of the records will be essentially as follows:

SALES OF CATTLE

DATE	EXPLANATION	PRICE	NUMBER	WEIGHT	VALUE
May 10	Steers sold to N. Black at	\$0.08	10 head	11,000	\$880

The only difference between the record of sales of crops and livestock is in that the number of livestock is recorded as well as the weights. A common form for crop and livestock sales should prove satisfactory, with the number of head of livestock written at the end of the explanation.

In some single entry records purchases and sales of the same class of livestock are entered on the same page in adjacent columns. This may be confusing, however, to the beginner. There is always a possibility of entering a value in the wrong column.

Sales of Livestock Products

Sales of cream, eggs, wool, and other such items are somewhat simpler to record than sales of livestock. Little or no explanation is needed beyond the date of sale, the quantity, and the price. Consequently, the form can be condensed into a form half a page in width. The form of the cream sales record, as given below, permits the entry of a large number of transactions on the same page and makes it easy to summarize both the quantity and value of sales at the end of the year.

SALE OF CREAM

DATE	PRICE	AMOUNT	VALUE	DATE	PRICE	AMOUNT	VALUE
Jan. 5	Cream at .30	22.6	\$6.78				
Feb. 2	Cream at .28	18.4	\$5.15				

Miscellaneous Receipts

There are various small receipts which do not fit in under any of the three groups just discussed. These include sales of wood, old machinery, receipts from work away from the farm, such as road dragging, and other similar items. Such items, however, must be recorded in order to find the complete farm income. A form similar to that for crop or livestock sales may be used for this purpose.

Summarizing the Income

In summarizing the income, totals from the various income records may be brought together in essentially the same form as the income statements described in previous chapters. Form 28 (p. 145) may be used to advantage. If net increases for the different livestock enterprises are wanted, Form 7 may be used. Of course, the totals from the different income accounts may be combined in various ways. The different forms lead to the same figure of net income, but the gross income and expense and some of the elements of income are different because they are arrived at by different methods.

RECORDS OF FARM EXPENSE

Farm expenses, like the income, may be divided into a small number of groups or types, each of which is recorded separately. Among these, purchases of livestock and purchases of feeds correspond to sales of livestock and sales of crops in the income records. Expense in the maintenance of equipment and outlay for the purchase of new equipment, however, introduce new questions and call for somewhat different forms.

Expenses for labor hired, rent, taxes, and insurance require relatively simple records of similar type.

Purchases of Livestock

Records of livestock purchases do not generally contain a very large number of entries. Sometimes, only three or four head of cattle and a few breeding hogs are purchased in the course of the year. If feeder cattle or feeder hogs are bought, it is better to keep separate records for these.

The form used in recording sales of livestock may be used also in keeping account of purchases. The entries will include the number of head bought, the weights, prices, and total value. The values will be needed in the financial summary, and weights and number of head will be used in figuring net production of livestock.

PURCHASES OF HOGS

DATE	EXPLANATION	PRICE	WEIGHT	VALUE
Aug. 8	Bought three gilts at	\$20 per head	750 lbs.	\$60.00

Purchases of Feeds

The record of feeds bought corresponds closely to that of crops sold. Separate records may be kept of the purchase of commercial feeds and of feeds which can be grown on the farm. The record will show the kind of feed bought, the date, the price paid per ton or hundred pounds, the amount, and the total value.

COMMERCIAL FEEDS BOUGHT

DATE	DESCRIPTION	PRICE	AMOUNT	VALUE
Jan. 15	Tankage at	\$50 per ton	1 ton	\$50.00
Feb. 1	Bran at	\$1.50 per cwt.	600 lbs.	9.00

Equipment Expense

Under equipment expense will be entered repairs to farm machinery, repairs to harness or incubators, purchases of small tools, shovels and forks, and small purchases of nails and other such items. It may sometimes be desired to separate expenses on crop equipment from those on livestock equipment. This would help in computing the index of equipment expense per acre of crops. It may be accomplished easily by using two columns for the entry of values instead of one, as is illustrated below.

EXPENSES ON EQUIPMENT

DATE	DESCRIPTION	CROP EQUIPMENT	LIVESTOCK EQUIPMENT
Mar. 15	Plow shares	\$4.50	
Apr. 6	Milk buckets bought		\$3.80
Apr. 25	Repairs to disc	2.50	

Auto Expense

As a usual thing only a part of the expense on the auto is chargeable against the farm business. Some sort of an estimate must be made at the end of the year to divide auto expense between the personal account and the farm business in proportion to the amount it was used by each. It may not be possible to separate expense for gas and oil used by the auto from that used by the tractor, particularly when gas or oil is bought by the barrel. The record of gas and oil may be kept separate from the repairs and other expenses on the car. This calls for a multiple column form such as that shown below.

AUTO EXPENSE

DATE	GAS AND OIL			OTHER AUTO EXPENSE		
	Gal. Gas	Qts. Oil	Value	Date	Description	Value
Jan. 6	10		\$ 2.20	Jan. 1	Value of car	\$500.00
10	5	2	1.60	2	License	12.00
				8	Repairs	2.80

(Bottom of page)

Total	560	140	\$158.80	Dec. 31	Gas and oil used by car	\$106.40
					Total debits	760.60
					Remaining value of car	400.00
					Net auto expense	360.60
					One-half expense to farm	180.30

At the end of the year the estimated value of the oil and gas used is added to the other expenses on the car. For convenience the inventory value of the car at the beginning of the year is added to the expenses, and the remaining value is subtracted at the end of the year, thus automatically adding depreciation. Finally, at the bottom of the page the share of the auto expense chargeable to the farm business is computed and noted before it is carried to the summary of expenses.

Labor Hired

Hired labor is an important item on some farms; on others, it amounts to very little. A definite place to record this expense should be provided, however. It may be recorded as in the form below. The number of days or months of labor hired should be put down, as well as the amount of wages paid. The number of months will be needed in computing the total months of labor hired for the year and in arriving at such indices as the number of acres of crops per year of man labor.

LABOR HIRED

DATE	EXPLANATION	MONTHS OR DAYS	VALUE
Apr. 2	Jim Brown—wages for March	1 mo.	\$40.00

Miscellaneous Expenses

There still remain such expenses as taxes, rent, interest payments, insurance, seeds, threshing bills, and veterinary bills. Some of these are items of considerable importance and should be shown separately in the income statement at the end of the year. Most of these expenses occur only a few times during the year. They may be recorded conveniently in a form such as the following:

MISCELLANEOUS EXPENSES

DATE	EXPLANATION	RENT	TAXES	INSUR- ANCE	INTEREST	MISC. CROP EXPENSES	MISC. LIVESTOCK EXPENSES
Apr. 10	First half taxes		\$98.00				
May 2	Fire insurance			\$16.40			
May 8	Soybeans, seed					\$18.00	

New Equipment and New Permanent Improvements

Accounts of investments in new equipment and in new improvements such as fences, drains, or buildings should be kept. In the case of new improvements, it is generally necessary to add together several different items, such as various materials, wages paid to carpenters, or other labor hired for this purpose. The total investment in the new fence or building is then carried to the inventory at the end of the year as a single figure and is depreciated for each year's use.

The purchase of new equipment is recorded in much the same way as purchases of livestock. A full description of the machine is likely to be

needed later for the inventory. The size of the machine and its expected life should be noted when it is bought.

As with purchases of livestock, the entire cost of new machinery or new improvements may be added in with the debits without causing an error in net farm income. The increased value of the inventory at the end of the year offsets the value of the new investment. Any large new investment, however, would distort the gross income figure. In order to make gross income figures comparable, it is preferable to keep such investments out of the current expense, charging only the year's depreciation against current operation.

NEW IMPROVEMENTS

DATE	DESCRIPTION	VALUE	TOTAL VALUE
Aug. 5	Posts for new fence, 100 at .30	\$30.00	
8	Wire	55.00	
17	Extra labor hired, building fence	16.00	
	Total cost of fence, to inventory		\$101.00
Sept. 6	Tile bought for new drain	\$47.50	

Summarizing the Expense

At the end of the year the expense items are summarized in much the same manner as the income figures. Each record is added up and the sums are brought together in the income statement. The depreciation on equipment, buildings, and permanent improvement inventories are added to expenses, as are any reductions in inventories of livestock, feeds, or other operating assets. The whole group of expense items is then added to find total debits. As with the multiple column records, the total debits are subtracted from total farm income to find the net farm income. The value of labor furnished by the farm operator and members of his family and estimated interest on his investment are then subtracted. The result is a figure representing the returns on his management, or profit above these allowances.

REVIEW QUESTIONS

1. What is meant by single entry records? How are they related to double entry accounts?
2. To what degree does the single entry record save labor compared with double entry accounts?
3. Draw up a form for recording the receipts from sales of crops; for sales of livestock; for sales of livestock products.
4. Draw up a form for recording expenses on equipment; on feeds bought.

5. Give instructions for summarizing the income from a single entry set of records.
6. Compare the accuracy of single entry records with double entry accounts.
7. Compare the amount of information available from the single and double entry records.

PART IV
ANALYSIS OF THE FARM RECORDS

CHAPTER 14

INCOME STATEMENTS

The Problem

How can the data on income and expenses be summarized so that they will give a truthful picture of the year's performance and help to explain the satisfactory or unsatisfactory income?

The most important step in keeping farm records is to summarize the financial history of the business at the end of the year to see what lessons it holds for future guidance. The study of the income and expense figures should bring to light more fully than any other single analysis the relationships between the different parts of the business. It should show up trends in income over the past years which are to the advantage of the business, as well as the disadvantageous tendencies which should be improved upon.

Every effort should be made to summarize the income figures in accordance with both the causal influences at work on the business and also relationships between different enterprises. Improvements in the business may require either a diversion of resources from one enterprise to another or the discontinuance or reorganization of an enterprise. Consequently, it will be necessary to study the income and expense related to each enterprise or department.

FORM OF STATEMENT

The form of the income statement must be such as to facilitate analysis of the records. This calls for the grouping of similar items of income or expense in a way that makes their significance stand out without requiring too much effort on the part of the farmer. Mere presentation of the facts is not sufficient. Furthermore, poor presentation of data is likely to deprive the statement of much of its usefulness.

The farmer will want to know the amount of income received from each main section of his business, as income from crop sales, sales of livestock, or livestock products. On the side of expenses a corresponding classification should be made. But the parallelism cannot be maintained completely. There are many expenses which apply partly on one section of the farm business and partly on another. Some outlays on crops result

in greater income from the livestock by increasing the supply of feeds available. *The division of receipts and expenses by enterprises has only a limited significance. The farm must be treated as a whole.*

Amount of Detail Needed

There is always a question about how much detail to use in the statement. This will have to be decided in each separate case. A generally satisfactory answer is that *unlike items should not be combined if that will obscure useful information*, and yet the classification should not go so far that it is difficult to grasp it as a whole.

The loss and gain account is itself a sort of income statement; however, it is likely to contain too much information on some points and too little on others. There may be several accounts of similar types which can be combined into one figure without obscuring any useful facts. On the other hand, the loss and gain account contains only balances from the various enterprises, whereas it is generally desirable to know the total income and the total expense.

Classes of Income

If we go through the ledger and foot up the debits and the credits in each account, noting them on opposite halves of a sheet of paper, and if we group together the similar items of income or expense, we will obtain a statement much like that shown in Form 28. Here the receipts are grouped into those from the sale of livestock and livestock products, sales of crops, and miscellaneous receipts. In addition to the actual cash receipts we have the value of farm produce used in the household and the value of increases in inventories. Sometimes, also, there are increases in value of some of the working assets, either from raising horses or breeding stock or from new purchases.

On livestock feeding farms gross income may be adjusted by deducting sums paid for the purchase of feeders. These do not represent part of the produce of the farm, and when they are sold they greatly increase the gross receipts. In fact, they increase both the debit and the credit sides of the statement so that gross receipts from a cattle-feeding farm cannot be compared directly with those from a farm which sells only its own produce. This disparity could be removed by subtracting the purchase price of the feeders from livestock sales before arriving at the total income.

CLASSIFICATION OF EXPENSES

On the expense side of the statement there is a classification by the main causes of outlay. Following the general scheme developed with the

income, we first summarize the cash expenses and later add any decreases in inventories in order to obtain the total debits. In addition to this, we also separate operating expenses from the fixed expense items. By operating expenses is meant those items which vary with the size and economy of operation from year to year. Fixed expenses are those which are

FORM 28
FARM INCOME STATEMENT, FARM OF JOHN JONES FOR 1940

DEBITS	CREDITS
<i>Operating expenses:</i>	<i>Livestock sales:</i>
Equipment repairs \$329	Dairy products sold \$1,200
Auto expense (farm share) 83	Cattle sold 2,529
Tractor expense 105	Hogs sold 1,755
Labor hired 349	Poultry and eggs 415
Livestock expense 56	Total livestock sales \$5,899
Crop expense 389	Less livestock bought 899
Miscellaneous 42	Net livestock sales \$5,010
Total operating expense \$1,353	
<i>Fixed expenses:</i>	<i>Crop sales:</i>
Taxes \$282	Corn sold \$2,213
Interest paid 453	Other crops 77
Insurance 12	Total crops sold \$2,290
Improvements, repairs 126	
Total fixed expense \$ 873	<i>Miscellaneous receipts:</i>
Feed bought \$1,295	Labor and machine work \$ 40
Total cash expense \$3,521	Crop share rent 652
	Government payments 1,261
<i>New investments:</i>	Miscellaneous receipts 56
New machinery \$527	\$2,009
New horses 75	Gross sales \$9,309
New improvements	<i>Sale and salvage of capital:</i>
Total new investment \$ 602	Equipment sold \$ 23
<i>Decrease in inventories:</i>	Products used in household \$ 188
Decrease, liquid assets \$632	<i>Increase in inventories:</i>
Decrease, breeding stock	Increase liquid assets \$
Decrease, other working assets	Increase breeding stock 90
Decrease, fixed assets 140	Increase, other working assets 183
Total decrease in assets \$ 772	Total increase in assets \$ 273
Total debits \$4,895	Total credits \$9,793
Net farm income* \$4,898	
Net cash income† 5,788	

*Total credits minus total debits.

†Gross sales minus total cash expenses.

largely determined in advance of the year's operation and subject to little or no control on the part of the farmer.

Operating Expenses

Among operating expenses are those for upkeep of machinery and equipment, the farm share of expense on the auto, tractor expenses, the wages of hired labor, and the cost of purchased groceries used in boarding labor. There are also various livestock expenses, such as for veterinary fees, breeding fees, medicines, dips, and registration of purebred stock. On crops there are such expenses as fertilizers, threshing, hail insurance, and seeds. The sum of these operating expenses gives us a figure of great value in gauging the economy with which the business has been operated.

Outlays for feed represent purchases of materials which have already been produced by someone else. They do not correspond to outlays for operating the farm and should not be included with operating expenses. Heavy feeding operations increase the debits when the feed is bought, and also the receipts when the livestock or livestock products raised from it are sold. This makes income statements for farms buying large amounts of feed difficult to compare with those which feed only their own crops. In the Iowa farm accounts comparability is obtained by the use of a "gross profit" figure. To get this figure the purchases of feeds are deducted from the gross income.

Fixed Expenses

Among fixed expenses the principal items are for rent of land, payment of taxes, interest on borrowed funds, and the upkeep of buildings, fences, and drains. These figures will differ considerably between farms operated under different forms of tenure. On the farm operated by its owner, there will be no rent charge, but there will be larger taxes and perhaps a large amount of interest paid on mortgage indebtedness. On the rented farm, interest and tax payments will be small, but there will be a large figure for rent.

On the ordinary farm, the total fixed expense amounts to a relatively large part of the total outlay. Once the farmer buys or rents his farm, there is but little variation from year to year in the interest on the mortgage or the rent unless the farm is rented on shares. These items should be given serious consideration before the farming operations are begun since little can be done about them afterwards. Having obtained control of a given layout of land and improvements, and having his own labor

available for use, the farmer has a problem each year of operating his business so as to get back his operating expenses and as large a return as possible on his labor and fixed investments.

The payment of interest on money borrowed will be entered in the ordinary farm income statement along with other fixed expenses. This is in some respects at variance with the usual form of the industrial income statement, in which payments for interest on borrowed funds are usually subtracted after the operating income has been found. Thus, the difference is only one of the location of the item, arising from a difference in point of view.

Depreciation

After the fixed expenses, it is necessary to add to the debits any decreases in current assets and the depreciation on working or fixed assets in order to obtain the total amount that should be debited against the operation of the business during the year. When the total expenses or debits are subtracted from gross income, we have the net farm income, which is the amount available to remunerate the farmer for his work and the use of his land and capital.

A word should be said about methods of handling purchases of new equipment or new permanent improvements. The method followed in Form 28 is to enter the purchase price of the new capital goods on the debit side of the statement, and then add in the remaining or depreciated value at the end of the year with the closing inventory. This results in an increase of inventory on the credit side which offsets all but the depreciation on the capital goods, new as well as old.

An alternative method is to enter only the depreciation in value of equipment or improvements on the debit side of the statement. The net effect of the two methods is identical. The method followed in Form 28, however, yields additional information in telling us how much new capital investment was made during the year. On the other hand, if a new building is erected or expensive equipment is purchased during the year, the method used in Form 28 results in a large increase in both the total debit and the total credit figure for the year, so that these figures lose their comparability between years.

Each farm will be a separate problem in planning the income statement. The degree to which it is worth while to subdivide and classify the operating expenses will depend on the policy and purposes of the farmer and the type of farm he is operating.

NET FARM INCOME

There are many net income figures that could be derived from a statement such as Form 28. To put the matter another way, the receipts and expenditures could be combined in various ways, and various "net" or "profit" figures could be derived at various stages of the process. We might add together all cash receipts from whatever source (including sale of capital goods or even land) and obtain a total cash sales figure. Or, we might add together only sales of current produce and obtain a total cash income figure. From the gross sales we may deduct cash expenses (excluding new investments), and so obtain net cash income. Or, we may go a couple of steps further and adjust for capital purchases, inventory changes, and farm produce used in the household, and so obtain net farm income. Each of these figures is, in a sense "right," but each signifies something different. Thus, the important thing is not to use some certain summary figure to the exclusion of others, but rather to use the figure that is most significant for the purpose at hand, and to understand the construction of the summary term used, as well as the purpose for which it is appropriate.

Among the various summary income terms, *net farm income* is one of the most useful. This figure is obtained, as shown in Form 28, by subtracting the total business debits from total business credits. All sales, increases in inventories, and values of farm produce are included in the debits. Consequently, the resulting figure shows the net earnings from the use of all the farmers' own resources, including his capital, land, labor by himself and members of his family, as well as his management. Expressed in another way, it is from this sum that he must obtain his living (if he is not to dip into his capital) and build up his investment.

The Comparative Income Statement

A further analysis may be made by the use of a comparative income statement as shown in Form 29. This enables the operator to make a direct comparison between corresponding income or expense figures for different years. He can thus detect various trends in his business and see just where his larger income originates, or which enterprises are responsible for larger outlays than in preceding years.

NET INCOME SUMMARY FIGURES

Gross Income and Gross Profits

In Form 30 is shown the derivation of net operating income and of management return. First, if we add together gross sales, as obtained

**FORM 29. COMPARATIVE INCOME STATEMENT, FARM OF
JOHN JONES**

	1939		1940	
	Amount	Per Cent	Amount	Per Cent
<i>Receipts:</i>				
Dairy products	\$ 755		\$1,200	
Cattle sold	1,590		2,529	
Hogs sold	1,710		1,755	
Poultry and eggs	349		415	
Sheep sold	153			
Total livestock sales	\$4,557		\$5,899	
Less livestock purchased	910		889	
Net livestock sales	\$3,647	42	\$5,010	51
Corn sold	\$ 598	7	\$2,213	23
Other crops			77	1
Government payments	1,393	16	1,261	13
Miscellaneous receipts	93	1	96	
Crop share rent	614	7	652	7
Gross sales	\$6,345	73	\$9,309	95
Products used by household	\$ 155	2	\$ 188	2
Equipment sold			23	
Increase liquid assets	2,125	24		
Increase breeding stock			90	1
Increase in working assets			183	2
Total credits	\$8,625	100	\$9,793	100
<i>Expenses:</i>				
Equipment repairs	\$ 178	2	\$ 329	3
Auto expense (farm share)	76	1	83	1
Tractor expense	183	2	105	1
Labor and groceries	326	4	349	4
Livestock expense	56	1	56	
Crop expense	142	2	389	5
Miscellaneous operating expense	49		42	
Total operating expense	\$1,010	12	\$1,353	14
Taxes	274	3	282	3
Interest	464	6	453	5
Insurance	38		12	
Improvements, repairs	109	1	126	1
Total fixed expense	\$ 885	10	\$ 873	9
Feed bought	\$1,278	15	\$1,295	14
New improvements	139	2		
New machinery	245	3	527	5
Horses bought			75	1
Decrease liquid assets			632	6
Decrease breeding stock	45			
Decrease other working assets	44	1		
Decrease fixed assets			140	1
Total debits	\$3,646	43	\$4,895	50
Net farm income	\$4,979	57	\$4,898	50
Depreciation working assets	\$ 289	3	\$ 396	4
Depreciation fixed assets	\$ 139	2	\$ 140	1
Net operating income	\$6,003		\$5,911	

in Form 28, and the value of produce used in the household, then subtract purchases of livestock, and add or subtract the change in inventory of liquid assets and of livestock raised, we obtain the figure gross income. This term indicates the volume of business done, and is comparable between farms whether or not they purchase feeding stock.

Suppose, however, that of three farms, one purchases and fattens feeder cattle or feeder hogs on feeds raised on the farm; the second, operates in the same way but buys feed as well as the livestock; while the third one sells only livestock that has been raised on that farm and fattened on home-raised feeds. To obtain a fair degree of comparability between these three farms, it is necessary to correct for the difference in feed bought as well as in livestock bought. Consequently, in this case we may use *gross profit*, which is obtained by subtracting feed purchases from the gross income figure.

Net Operating Income

Next, we may want to make a comparison of net earnings between two farms where one is rented and the other owned, or where one has a different load of debt and is paying different interest rates from the other. If the comparison is to be between returns on the entire farms, rather than returns to the two operators (and regardless of who owns the various assets), *net operating income* may be used. This is obtained by subtracting operating expenses and depreciation on working assets from the gross profit.

At this stage of the procedure, it is possible to obtain a cross check on the mechanical accuracy with which Forms 28 and 30 have been computed. Subtraction of the fixed expenses and of depreciation on fixed assets from operating income should yield the same net farm income figure as was obtained in Form 28. All the same data are used in Form 28 as in Form 30, though they are combined in somewhat different order. Principal difference is that purchases and sales of equipment or improvements were entered on one side of the statement in Form 28, and net change in value of inventory on the other; while in Form 30, only the net difference between the figures, depreciation, is entered.

Management Returns

Finally, the farmer will want to see whether he earned the going rate of return on his various resources and made anything over this that could be attributed to management. This leads us to the *management return* figure. To determine this figure it is necessary to deduct from income the going rate of return on each resource except management. Thus, at

FORM 30. DERIVATION OF OPERATING INCOME AND
MANAGEMENT RETURN

Gross sales	\$9,309	
Produce used by household	188	
Increase in liquid assets*		
Increase in breeding stock	90	
<i>Subtract:</i>		\$9,587
Decrease in liquid assets		632
Gross income		\$8,955
<i>Subtract:</i>		
Feed bought		\$1,295
Gross profit		\$7,660
<i>Subtract:</i>		
Operating expense	\$1,353	
Depreciation on working assets	396	
Total		\$1,749
Net operating income		5,911
<i>Subtract:</i>		
Fixed expense		\$ 873
Depreciation on fixed assets		140
Net farm income		\$4,898
Net operating income		\$5,911
<i>Subtract:</i>		
Labor of operator, 12 months @ \$50	\$ 600	
Unpaid family labor, 2 months @ \$40	80	
Interest on working and liquid capital @ 6%	577	
Rental value of all land operated	1,800	
Total		\$3,057
Management return		\$2,854

*Includes young livestock and fattening animals as well as feeds, seeds, and supplies.

the bottom of Form 30, deductions are made for wages on the operator's own labor and that of unpaid members of his family at rates representing what it would cost to hire the same work done. Next, interest is deducted on the current and working capital at rates which the proprietor could have earned on the same capital in safe investments for an intermediate period of time. Finally, we deduct an allowance for rental value of the land (prior to deductions for taxes, upkeep of improvements, interest on mortgage, or any of the other expenses which a landlord would have to pay out of the gross rent received).

The residue, *management return*, is attributed to the grade of management. It should be remembered, however, that the accuracy and significance of this figure depends on whether the deductions for operator's and family labor, interest, and rent, have been made at the proper rates. If one of these was computed at a rate higher (or lower) than the market, then the management return will be too low (or too high) just to that extent.

Management return is a highly useful figure in comparing the grade of management on different farms. It should be used with some care, however. First, it can be used only in comparing farms of similar type, since in any particular year, prices may favor one enterprise as compared to others. Further, it should be used only in a comparison between farms operating under similar conditions, and that means, for one thing, that it should be used only in comparing farms which are all located in the same type of farming area. Neither should management returns be used to compare different farms nor even the same farm, between different years, since relative prices vary from one year to another.

OTHER TERMS OF COMPARISON

Operators Labor Income

Other terms may also be used to compare the profitability of different farms. Several of these can be derived from the data in Form 30. One of the more common of these is *operator's labor income*. This may be obtained from net operating income by deduction of fixed expense, depreciation on fixed assets, the allowances for unpaid family labor, interest on current and working assets, and rental value of the farm. This figure shows what the operator is earning on his own labor and management combined. The figure is derived as follows:

Net operating income.....		\$5,911
Deduct:		
Fixed expenses except interest.....	\$ 420	
Depreciation on fixed assets.....	140	
Unpaid family labor.....	80	
Interest on current and working cap- ital	577	
Rental value of farm	1,800	
		<hr/>
Total		\$3,017
		<hr/>
Operator's labor income		\$2,894

Earnings on Capital and Management

Sometimes, it is desired to compute the rate of earnings on capital used. In this case, deductions are made for the use of factors of production except capital.

Net operating income.....		\$5,911
Deduct:		
Fixed expense except interest.....	\$ 420	
Depreciation on fixed assets.....	140	
Operator's and unpaid family labor....	680	
Rental value of farm.....	1,800	
		<hr/>
Total		\$3,040
		<hr/>
Earnings on capital (and management).....		\$2,871

The difficulty with a figure such as this is that earnings on capital (excluding investment in land) are usually relatively small in comparison with other elements of income. Consequently, the figure is likely to be rather widely erratic.

More commonly, the investments in strictly capital goods and land are lumped together and the summary figure found represents earnings on total investment (and management), as below.

Net operating income.....		\$5,911
Deduct:		
Fixed expense except interest.....	\$420	
Depreciation on fixed assets.....	140	
Operator's and unpaid family labor.....	680	
		<hr/>
Total		\$1,240
		<hr/>
Earnings on investment (and management).....		\$4,671

Obviously, each of these summary terms has somewhat similar limitations. That is, the accountant cannot be too certain about the proper rate at which allowance should be made for any single factor, and the entire discrepancy, both from erroneous rates and from unusual price situations, appears in the earnings attributed to the single remaining factor. Consequently, summary figures which pertain to the whole business rather than to some single production factor are generally more dependable and meaningful than the various residuals.

PERCENTAGES AND RATIOS

The relative importance of different sources of income or expense is much easier to grasp by the use of percentages. As the size of the business changes, the relative figures indicate any shift in importance of elements of the business much more clearly than do the absolute figures. In a general or mixed farming section the percentage of income from livestock, it is frequently said, should not fall much below 80 per cent. Such figures, however, will vary from one type of farm to another.

On the other side of the statement, the business is likely to be in a rather precarious condition when the fixed charges, including interest on mortgages or other borrowed funds and taxes, become greater than 80 per cent of the average gross income taken over a period of several years. Operating expenses are likely to take 20 or 30 per cent of income. If fixed expenses take another 50 per cent, there is very little margin left for safety in a poor year.

The Gross Ratio

The gross ratio, or the ratio of total expense to income, is a good measure of the profit-making ability of the business. Operating and fixed expenses, as well as purchases of livestock and feed, should be included on the expense side. The net income expresses the amount by which income exceeds expense, while the gross ratio expresses the percentage of gross income consumed by expenses and is, therefore, independent of the absolute size of the business. The degree this ratio can be reduced from year to year is an excellent measurement of the operator's progress in financial efficiency. If, on the other hand, the gross ratio begins to increase and expenses take first 75, then 80, then 85 per cent of the gross income, it is a rather sure sign that the business is being permitted to drift along and the operator is becoming more and more careless.

The gross income and the gross ratio both affect total profit and should be considered together. Thus, a farm with a gross income of \$10,000 and a gross ratio of 70 would have a net income of \$3,000, while a farm with a gross income of \$15,000 and a gross ratio of 75 would have a net income of \$3,750. In this case the loss in efficiency of operation has been more than made up by the increase in size.

The Operating Ratio

The operating ratio is the percentage which operating expenses absorb out of the gross income. This ratio reflects directly the efficiency of the current operation of the farm. It shows the proportion of total income used in hiring labor, buying feeds, and keeping equipment in

operation. Such fixed expenses as taxes or upkeep of buildings continue in about the same amount regardless of the current operating policy, and not much can be done about them. Improvement of the efficiency of operation is promptly reflected in the operating ratio, which should be watched closely from year to year.

The percentage earned on the net worth is a measurement of the rate at which the business is capable of growing. This may be computed by deducting from net income the allowance for labor by the farm operator and then dividing the remainder by the net worth. Indices and ratios between investment and income will be discussed in a later chapter.

Even at the end of the first year the income statement affords valuable information as to sources of income and outlay and the relative importance of each. But after two or three years tendencies within the business which were not visible before begin to come to light, and the statements become more valuable the longer the series grows.

THE INTERPRETATION OF INCOME

Let us define net income tentatively as surplus resulting from the business operations which could be withdrawn without reducing the future scale of the business.

Suppose, for instance, that a farmer has grown a larger crop of grain intended for feed than the year before and has a large amount of it on hand. Is the difference to be counted as income? True it has not been converted into cash nor, perhaps, into a directly salable product. But as a feed crop it offers an opportunity for producing more salable livestock. It may therefore be called *unrealized income*. To wait until the feed had been consumed and the livestock sold before acknowledging the income would violate one of the functions of the records in that they should show the relative success of different operating periods.

On the other side there may be uncertainty about some expense item. Some feed may have been purchased, but only half of it used up before the end of the accounting year. Should the entire expense be charged against the year in which the purchase occurred, or should a part of it be carried over into the year following when the feed will actually be consumed? Obviously, the latter is the preferable method. It will be necessary either to omit a part of the expense for the feed or else to make a counterbalancing entry in the form of an inventory of unused feed. The first method would not be truthful since the expense has actually been incurred and the cash has been expended. The second will show the total amount of outlay and will give the added information as to the amount by which the inventory exceeds that of the preceding year.

This is typical of a great many cases in which an outlay made in one year carries over in a greater or lesser degree into the next year, or even for several years. For example, suppose a set of harness were to be bought which will last for, perhaps, 10 years. Sooner or later it will be used up in the operation of the business. Evidently, we cannot deduct its entire price from the current year's income, although one-tenth of the price might be so charged. Again, the problem could be solved satisfactorily by entering the price of the new harness on the expense side of the statement and then entering its remaining value on the income side.

Acquisition of Large New Assets

In the acquisition of new assets of large value, the totals of the income statement may be distorted by following this practice. Suppose a new barn is built. The depreciation which might properly be charged against the current year's operation would be quite small in proportion to the total expense. Here the *capital surplus* account, which records changes in the value of capital apart from current income, comes into use. By placing the cost of the new barn in the *capital surplus* and charging against the current year's income only depreciation for that year, we can avoid the apparent inflation of the expense and the corresponding inflation of the inventory increase figure.

The converse of this example occurs in disposing of some asset not produced in the current year. Again, there are alternative methods which might be used and different types of assets to dispose of. A 2-year old steer may be sold. This represents the product partly of one year and partly of another. But evidently, the steer was raised for the purpose of sale. We are justified in entering the total price of the steer in the current year's income and permitting the reduction in inventory of livestock to reduce net income to the proper amount.

The indicated accounting practices in these two cases appear to be at variance. In what way do the cases differ? First, and more fundamentally, the current year's operation is concerned only with the *current service* of the new barn, not with the total amount of capital invested in it. The year's income summary would only have been confused by putting into it a large new capital investment. The value of the steer at the beginning of the year, on the other hand, represents a product in process of production and soon to be marketed. Second, comes the matter of convenience and of comparability of results between years. Entering, for instance, \$4,000 for the cost of the barn on the debit side, and \$3,900 for its depreciated value on the credit side of the income statement, would, it is true, still permit us to find the correct net income for the

year; but would throw the gross income and expense figures completely out of line with preceding and following years. But do the records not contain the same type of fault if we enter \$100 for the sale of the steer on the credit side and offset \$50 of this with an item for decrease of inventory of steers on the debit side? As a matter of principle this is perfectly true. The only reason for following such a procedure is in its convenience. Ordinarily, it is not worth while to go through the records and correct each individual current income figure for such inventory increases or decreases. Besides, since several cases of this type are likely to occur each year, the net annual credits and debits are not likely to fluctuate very much from this reason anyhow.

Disposition of Large Assets

But suppose a large asset not produced for market, such as a whole herd of dairy cattle or a 40-acre field is sold. Here, the *surplus* account again comes into use. The sale may be credited to *surplus*, as is done in Form 31, and not to the operation of the current year.

This does not answer all possible problems in connection with the sale. The dairy herd may be sold at a price higher than the book valuation. What about this increase? The available alternatives may be illustrated by a comparison of two different cases. In the one, let us suppose that the dairy herd, valued on the books at \$2,000, is sold immediately after the beginning of the accounting year at \$2,500. This \$500 was not made by the operation of the farm business. It should not be attributed to current operation, and an adjustment should be made in the surplus account.

Suppose, in a second case, several heifers have freshened during the year and the herd was disposed of several months later. An increase in value has occurred from the maturing of these heifers. This should be counted as a part of the current year's income and should be carried to the loss and gain account in the books and entered in the income statement.

Thus, it is sometimes difficult to tell just where to draw the line between items which should and those which should not be counted as income. How can we define the difference between *income*, or *revenue*, and *capital*?

CAPITAL AND REVENUE

If the proprietor of a business makes a new investment to acquire new land or erect a new building, there is no doubt that this is an addition to the capital and not an expense against revenue. If a new machine is purchased, or a new fence is run where there was none before, or some

new breeding stock purchased, the outlay should also be considered as an addition to the capital.

If, on the other hand, a purchase of fuel or twine is made, there is

**FORM 31. TREATMENT OF CAPITAL SURPLUS
LAND ACCOUNT**

Jan. 1	Opening inventory, 200 acres at \$100	\$20,000	Mar. 1	Cash, sale of 40 acres at \$150	\$ 6,000
Mar. 1	Capital surplus Profit on 40 acres sold \$50 above inventory valuation	2,000	Dec. 31	Closing inventory 160 acres at \$125	20,000
Dec. 31	Capital surplus Increase in valuation 160 acres from \$100 to \$125	4,000			
		<u>\$26,000</u>			<u>\$26,000</u>

BUILDINGS ACCOUNT

Jan. 1	Opening inventory	\$5,000	Dec. 31	Closing inventory	\$3,800
				Depreciation	400
				Capital surplus decrease in value of barn, built under inflated prices	800
		<u>\$5,000</u>			<u>\$5,000</u>

CAPITAL SURPLUS ACCOUNT

Dec. 31	Buildings Decrease in value of barn, built under inflated prices	\$ 800	Dec. 31	Land Increase in market valuation, 160 acres from \$100 to \$125 per acre	\$4,000
	Proprietorship account Net adjustment in valuation of land and buildings	5,200		Land Profit above inventory price on 40 acres	2,000
		<u>\$6,000</u>			<u>\$6,000</u>

PROPRIETORSHIP ACCOUNT

			Dec. 31	Capital surplus Net increase in valuations	\$5,200
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no doubt that this is to be classed as a charge against revenue. A repair to a machine or the replacing of posts in an old fence would undoubtedly be classified in the same manner.

All cases are not so simple, however. Suppose the old fence is to be repaired by putting on it some woven wire, whereas it had originally consisted only of a few strands of barbed wire. With the woven wire, it becomes a hog-tight fence and performs services that it could not before. Also, the expense of the woven wire has performed two different functions. In the first place, it has accomplished a repair necessary to keep the fence up to a serviceable condition. As a repair, it should be charged against the year's revenue. But, in the second place, it has accomplished an improvement over not only the previous condition of the fence, but even over its original condition. As an improvement it would be added to the capital account. Evidently, the way out will be to charge against revenue what would have been the necessary repairs. The excess in expense may then be added to the inventory of capital.

Alteration of Old Assets

The question of where to draw the line may indeed be difficult in many specific cases. Suppose a dairy barn has been built, and after several years the farm operator decides not to keep a dairy any longer but to feed steers instead. He then goes to some expense in remodeling the barn into a feeding shed, pulls out the stanchions, and makes other adjustments. How is this new expense to be regarded? It permits the use of the building for a purpose for which it could not have been used before. But a feeding shed could have been built more cheaply than a dairy barn in the first place. There has been no actual addition to the aggregate capital because the feeding shed is worth no more, and perhaps less, than a dairy barn would have been.

Suppose the dairy barn cost \$2,500 and a feeding shed to perform the same services could have been built for \$1,500. The expenses of remodeling were, let us say, \$200. Evidently, the farmer is abandoning a certain amount of capital as unsuited to his business organization. Then he will have to write down the capital figure. Evidently, also, the expenditure of the \$200 is necessary to make the remaining capital worth \$1,500. Will it not be necessary then for him to write down the valuation of the barn to such a figure that the addition of the \$200 in new capital outlay will bring the total up to \$1,500—the value of the converted building?

Distinction Between Capital and Revenue

A distinction may be drawn between capital and revenue by raising the question of whether or not the gain in value can be withdrawn with-

out consequently prejudicing the business and reducing its scale of operation. Net income made by raising a crop may be converted into cash and the cash spent for personal uses, and yet as large a crop may be grown the year following. But if we withdraw and spend funds that should be used to build up a depreciation fund to replace buildings or machines, the capacity of the farm will soon be reduced by a lack of equipment.

Or, to take another case, suppose that the farm land which was bought for \$20,000 could now be sold for \$30,000. It may appear at first that this gain of \$10,000 could be withdrawn and spent like any other profit. But how could it be realized? Either a third of the land might be sold, or \$10,000 might be raised by mortgaging the entire farm. In either case the scope of future operation of the business as well as its future earnings have been restricted. Evidently, it will be necessary to count this gain as an increase in capital as distinguished from profit.

But, it may be said, why not simply ignore the increase in the value of the land since it cannot be spent? This may be answered by recalling that one of the functions of the records is to show the true net worth of the business. If the land is not taken at the valuation for which it could actually be sold, this will not be done.

Necessity for Correct Depreciation Policy

The same reasons apply in more common cases. Suppose, for instance, that an extremely liberal depreciation policy is followed, so that the value of depreciating buildings and machinery is written down, and a depreciation reserve is built up twice as fast as the property in question actually wears out. It may be said that this is a safe policy and that no one is hurt by it; nevertheless, it violates the basic principle that the accounts should show the true worth of the business. It also makes comparison impossible between the books of farms with liberal and those with strict depreciation policies.

If the opposite policy were used and the depreciations were not completely written off, or if assets whose value had fallen were not marked down on the inventories, again the books would show a condition that did not exist. This might result in the farmer's deluding himself into believing that he is in a stronger position than is actually the case. Overexpansion or overborrowing with a consequent excessive load of interest charges might be the result.

Form of Income

Even after the farmer has assured himself that the figure shown on his book represents a real net income, *he may not be able to withdraw it and spend it on short notice.* Gains produced on a herd of growing baby

beeves may represent net income, but this net income is in an unrealized form. If the cattle were sold before they were in proper condition for marketing, it would seriously reduce the income that might finally be realized from them.

Sometimes, also, a growing business may offer such favorable opportunities for reinvestment of net income that it would be very poor policy to withdraw it. The farmer or other business man, therefore, must not only be careful not to confuse the capital gains with the net income, but he needs to interpret his net income figures in the light of the condition of the business before he decides how much to withdraw for personal or outside uses.

REVIEW QUESTIONS

1. Draw up a form for an income statement.
2. What information will this statement contain?
3. What is the significance of the net farm income?
4. Compare management return with operator's labor income, as to method of construction; as to significance.
5. Draw up a form of income statement that will permit a comparison between years. What is the advantage of a statement of this type?
6. What is the significance of the operating ratio? Of the gross ratio?
7. What is the significance of the percentage which income is of the total capital?
8. Explain why the comparative income statements become more useful if they are available for a series of several years.
9. What is meant by net income?
10. How would you decide if an outlay is to be considered as a current expense or as addition to the capital? Distinguish between capital and revenue.
11. What is the function of the "capital surplus" account?
12. Is an increase in the market value of land a profit which may be withdrawn from the business and spent? Explain.
13. What objections would you raise against a policy intended to show liberal earnings at the expense of the depreciation reserves?
14. If the type of business under consideration were recognized as a losing venture, how would this affect the policy with regard to the withdrawal of profits? The maintenance of depreciation reserves?

CHAPTER 15

CURRENT USE OF THE RECORDS

The Problem

Can the accounts be used as an aid to the current management of the farm, or is it necessary to wait until the year is ended so that the entire production period can be studied? Which figures can be used currently, and in what manner may they be of help?

Most of the discussion of accounts, particularly of farm accounts, is directed toward their analysis and the utilization of their material at the end of the year. At this time the production period is complete, and it is possible to study the operation of the farm and its enterprises as a completed whole. It is only at the end of the production period that a comprehensive analysis of the organization of the farm can be made and the organization plan revised for the following year.

Need for Current Utilization

Unfortunately, but little information is likely to be obtained at the end of the year concerning the success of current methods of management as contrasted to the underlying organization. Also, it is often advisable to modify the organization plans in some details as the year goes on in order to take advantage of unforeseen circumstances. This requires prompt action, and the end of the year is too late.

The primary purpose of the accounts is to facilitate the control of the business, but an instrument of control that can be exercised only after the end of a period of 12 months is likely to have but little effect in a business where conditions change as rapidly as in farming. At the end of the year it is too late to do anything about the business operation for this period. The significance of many of the figures relating to months at the beginning of the year is likely to be forgotten. The information should have been summarized and interpreted while there was an opportunity to take constructive steps toward improving the outcome.

USE OF QUARTERLY SUMMARIES

There are generally some expenditures for improvement contemplated and provided for in the budget. Some of these might be postponed for a year if necessary. Consequently, it is very desirable to summarize

the income and expenses from quarter to quarter to see if funds are going to be available for the improvement. If the income is found to be running short, steps may be taken to modify the farm plans in accordance. The quarterly income and expense may be compared both with figures in the budget and with figures of corresponding periods in past years.

In Table II is shown the quarterly receipts and expenses for the John Jones farm for 1939 and 1940. Such comparisons will serve to bring out the possibilities of the quarterly summaries.

At the end of the first quarter of 1940 it is apparent that expenditures are running higher and receipts lower than a year before. Mr. Jones needs to check over his prospects for the remainder of the year to make sure that he is not running into an embarrassing financial situation. A more detailed examination of the figures shows that the greater part of the unfavorable showing as far as income is concerned was caused by the receipt of a government benefit payment during the first quarter of 1939, whereas, in 1940 the corresponding payment had been made prior to the beginning of this quarter.

On the other side, operating expenses for the first quarter of 1940 had also been running heavier than the year before, particularly for auto expense and for labor hired. These are both expenses which are subject to some degree of control. The largest differences in expenses, however, come from the purchase of a new automobile and from heavier purchase of feed. The latter is to be explained largely by the fact that there are more cattle on feed in 1940 than there were in 1939, and, also, by the fact that Jones believed he saw an advantageous opportunity to anticipate needs for the next few months. The purchase of the automobile is a type of item that may generally be deferred and, consequently, whether it was a wise purchase depends on the amount of cash Mr. Jones had on hand and the condition of the old car as well as the outlook.

In the second quarter Mr. Jones has decided to try harder to keep down operating expenses, which, consequently, run lower on nearly all items than they did either in the preceding quarter or in the preceding year. Further, the heavy purchase of feed in the first quarter, made it unnecessary to buy feed in the second. The receipts are found to be much larger in the second quarter largely because of the sealing of about 1,500 bushels of corn at government loan rates which yielded a return of \$203 above the market price. Also, there were somewhat larger livestock sales, and the milk cows, more of which had freshened in the fall, were producing considerably more milk.

In the third quarter the sale of cattle brings in \$550 more than the corresponding sale in 1939. There is a sale of 3,000 bushels of corn, and

TABLE II. QUARTERLY SUMMARY OF CASH INCOME AND EXPENSES*

	FIRST QUARTER		SECOND QUARTER		THIRD QUARTER		FOURTH QUARTER	
	1939	1940	1939	1940	1939	1940	1939	1940
<i>Income:</i>								
Dairy products.....	\$ 248	\$ 425	\$ 226	\$ 365	\$ 151	\$ 231	\$ 130	\$ 179
Cattle.....	85	214	29	214	1,454	2,009	22	92
Sheep.....	153							
Poultry.....	74	71	115	129	9	20	11	18
Eggs sold.....	473	164	75	200	241	233	72	75
Hogs.....				710		1,555	921	1,158
Crops.....	458	203		203	38	510	598	25
Government payments.....		2		7	17		897	548
Labor and machine work.....			6		5		65	31
Miscellaneous receipts.....		20						56
Machinery sold.....				3				
Total operator's cash income.....	\$ 1,491	\$ 896	\$ 451	\$ 1,831	\$ 1,983	\$ 4,660	\$ 2,716	\$ 2,182
<i>Operating expenses:</i>								
Equipment repairs.....	\$ 19	\$ 15	\$ 53	\$ 67	\$ 43	\$ 108	\$ 63	\$ 139
Auto expense.....	24	53	12	3	15	4	25	23
Labor hired.....	9	80	100	71	183	117	34	81
Livestock expense.....	4	2	37	44	5	8	10	2
Crop expense.....	70	229	51	106	21	50		4
Tractor expense.....	16	37	25	18	54	13		37
Miscellaneous expense.....	11	2	1		17	16	20	24
Total operating expense.....	\$ 153	\$ 418	\$ 279	\$ 309	\$ 338	\$ 316	\$ 240	\$ 310
Net operating income.....	1,338	478	172	1,522	1,645	4,344	2,476	1,872
Feeds bought, commercial.....	\$ 36	\$ 87	\$ 81	\$ 150	\$ 64	\$ 28	\$ 72	\$ 124
Feeds bought, farm raised.....	157	477	168		166	363	534	66
New equipment.....	48	403	84	124	113			
New improvements.....					189			
Livestock bought.....			26	23		75	884	866

Fixed expenses:									
Upkeep of buildings.....	\$ 97	\$ 2	\$ 7	\$ 40	\$ 57	\$ 39	\$ 45	\$ 45	\$ 45
Taxes (operator share).....	129	101	185	46	124	116	97	101	101
Interest paid.....	19	167					26	124	124
Insurance on buildings.....		6					19	6	6
Total operator's fixed expense.....	\$ 245	\$ 276	\$ 192	\$ 86	\$ 181	\$ 155	\$ 187	\$ 276	\$ 276
Total expenses.....	\$ 639	\$ 1,661	\$ 830	\$ 692	\$ 1,051	\$ 937	\$ 1,917	\$ 1,642	\$ 1,642
Net cash income.....	\$ 852	\$ 765†	\$ 379†	\$ 1,139	\$ 932	\$ 3,723	\$ 799	\$ 540	\$ 540
Quantities of products sold:									
Butterfat, lbs.....	815	1,201	749	1,134	600	753	386	491	491
Eggs, dozen.....	527	483	906	1,014	533	688	423	385	385

*Yearly totals of figures shown in this table do not in all cases equal the total income or expense items shown in Form 29. Some land was rented and the landlord's share of income or expense is included in the total for the farm as given in Form 29. This table shows only the operator's receipts and expenses.

†Net deficit.

the receipt of a \$510 government benefit payment. On the expense side, operating expenses have been kept slightly below 1939 while there were also fewer other outlays.

In the fourth quarter receipts are smaller than in 1939 largely because the sale of crops and the government benefit payment had already been received. Mr. Jones has more funds on hand from the sales of the third quarter. Consequently, net income, which was running far above 1939 in the second and third quarters, declined sharply in the fourth.

This example shows that it is possible for a farmer who is keeping records to check up on the returns as well as the outgo from the farm currently as he goes along. Considering the variability in the expenses for equipment and for labor between the corresponding quarters of 1940 and 1941 for this farm, it will be realized that neglecting to watch the current returns may very quickly lead to an embarrassing financial situation. On the other hand, close attention to the records may be expected to show up a dangerous condition before it has gone too far.

THE USE OF MONTHLY FINANCIAL SUMMARIES

With any form of record which is summarized and posted by months, such as that discussed in Chapter 12, it is possible to compare monthly totals of receipts or expenses with those of preceding years. But this is seldom desirable. A month is a relatively short period, and farm income and expense items vary considerably from one month to the next. Crops or livestock may be sold in one month this year and in the following month next year. Threshing, or the payment of other regular bills, may occur in different months in different years; but such items are much less likely to vary in occurrence from one quarter to another. Then, too, it should be remembered that making out a comparative income statement each month is likely to become a tiresome chore; while such a statement once in three months is much less troublesome. Consequently, we are much more likely to use quarterly summaries than monthly ones.

On a dairy or poultry farm where receipts and expenses follow a fairly regular course throughout the year, the monthly summary may be quite useful, but on a farm which sells crops or which feeds livestock, month to month fluctuations may follow a very irregular course. The farm whose monthly transactions are summarized in Figure 3 sells chiefly corn, hogs, and cattle. The monthly receipts show some evidence of a seasonal trend, but this is overshadowed by a few large sales each year. Thus, in June, 1940, hogs and corn are sold amounting to about \$1,000. In 1939 about \$1,500 worth of feeding cattle were sold in Sep-

tember, while in 1940 the feeding cattle were sold in August and brought in \$2,000. In September, 1940, about \$1,500 was received from sale of corn carried over from the old crop in contrast to a sale of old corn in October, 1939. In each year there was a sale of hogs in December.

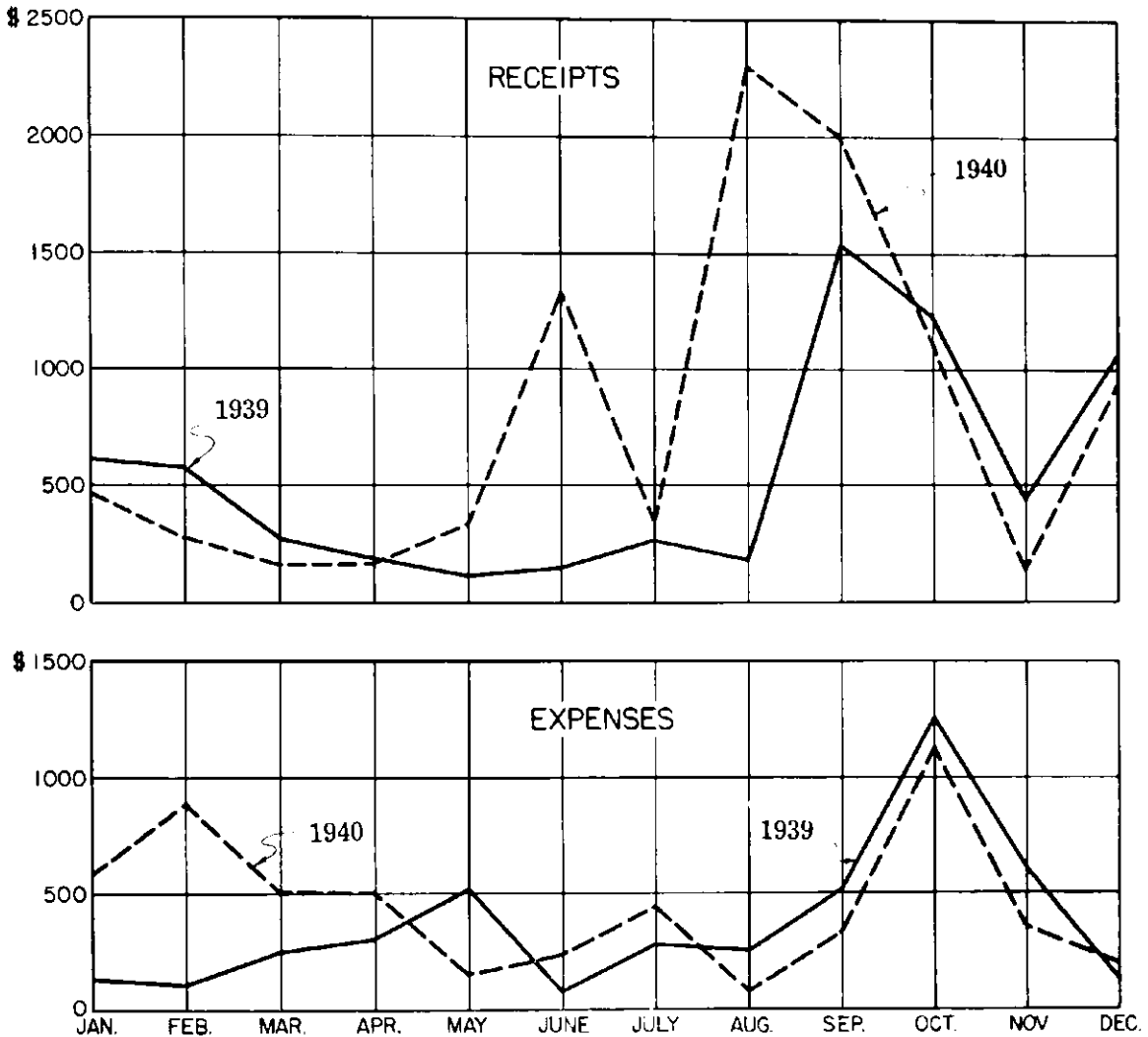


Fig. 3. Monthly variations in farm receipts and expenses. Comparison of trends for two years.

Seasonal fluctuation of total expenses on a crop and livestock farm of this type is somewhat similar in character to that of total receipts. On the farm we have been discussing, 1940 total outlay tended to run above that of 1939 because of the greater number of steers and hogs that were being fed. Purchases of \$250 to \$300 of feed occurred in January, March, and July. In February total expenditures were raised sharply by the purchase of a new automobile. The relatively high expenditures of May, 1939, and of April, 1940, are to be explained by the payment of

interest on the mortgage in these months. Making such a payment at the end of one month or at the beginning of the next one makes it hard to compare such monthly summaries. In this case, it happens that feeder cattle were purchased in October in each of the years shown, which gives the appearance of seasonal regularity at the end of the year. But, varying the purchase date by a week or two might have given the graph quite a different appearance.

However, if we consider only the *operating expenses* and omit the fixed expenses and the purchases of feed, equipment, and livestock, the seasonal fluctuation of expenses generally becomes much more regular. This is illustrated in Figure 4, which shows the operating expenses for

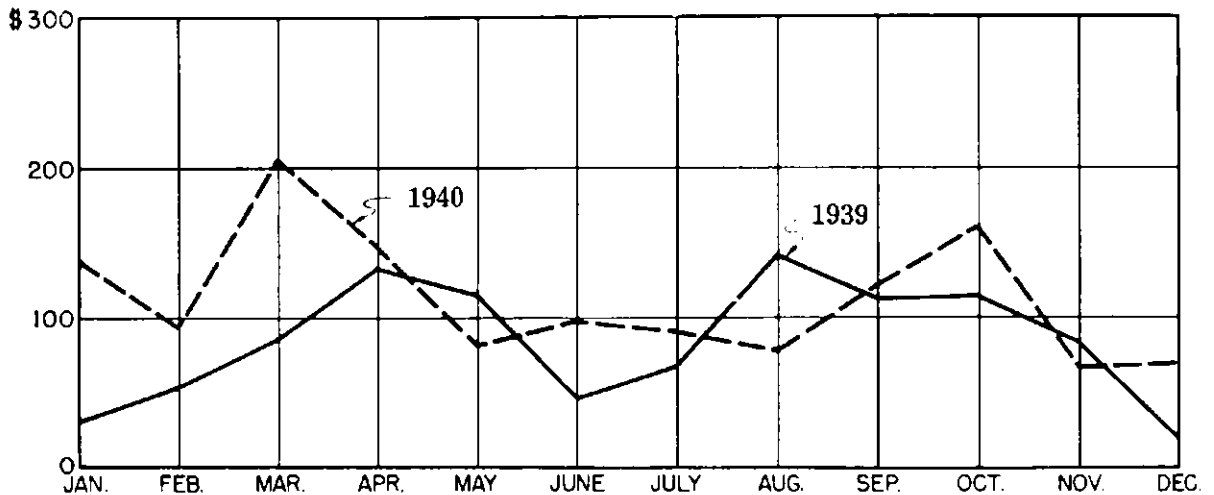


Fig. 4. Monthly variations in operating expenses.

the same farm. This graph is capable of showing the farmer, as he goes along from month to month, whether his expenses for operation are running above or below the figures for the same months in the past year, and how much.

Actually the operating expenses are most worth watching. They are the ones most subject to control, and any laxness in financial operation affects them immediately. On the other hand, the replacements of equipment and the purchases of new livestock may to a considerable degree be undertaken or avoided altogether, depending upon how much money there is on hand and on the immediate outlook. These last two items of outlay generally represent some business expansion, and are thus in an entirely different category from the month to month expenses for labor, equipment repairs, and such items. The operating expenses are subject to a different sort of control and, therefore, should be watched separately from the more irregular and unusual outlays or investments.

A CURRENT RECORD OF PHYSICAL PRODUCTION

It is very useful to have a record of physical production from month to month. This is particularly true of such enterprises as the dairy or poultry, where production is continuous throughout the year and is subject to variation from changes in rations or in methods of handling the livestock.

Figure 5 shows a chart of the monthly butterfat production on the Jones farm. The same number of cows are kept each year, but more of them had been bred to freshen in the fall in 1939 than the year before. Consequently, the production during the winter months of 1940 ran

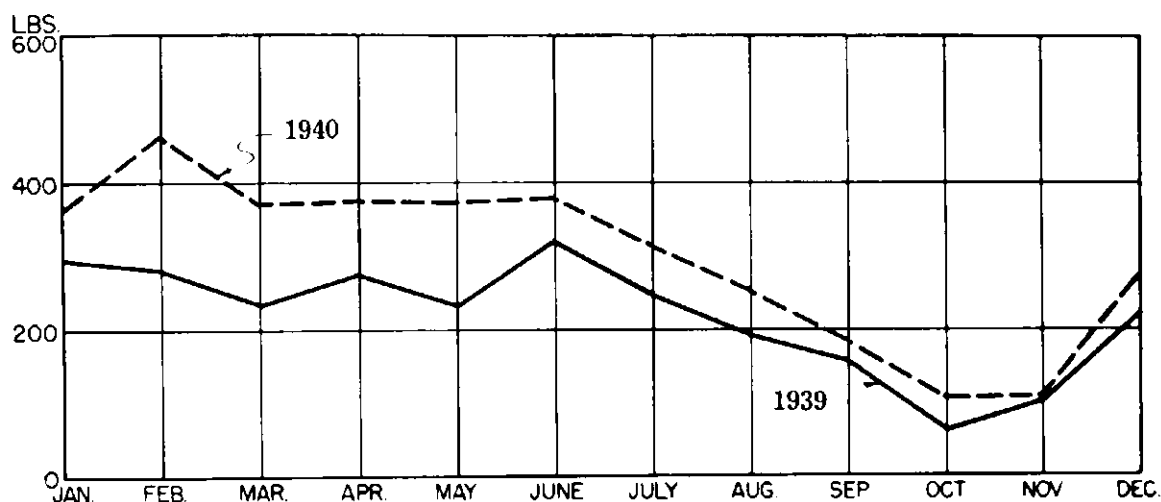


Fig. 5. Monthly butterfat production.

higher than during the same months of 1939. Also, more attention was given to the rations in 1940 and, therefore, production was better maintained than in 1939.

Such a graph as this gives a very clear visual comparison of the effect of different methods of handling the herd. A decline in production is shown promptly; and, if it is found to be caused by the current methods of handling the herd or by the ration, it may be possible to take steps to correct the method before it has caused still further damage and, perhaps, to restore the earlier rate of production.

The same general method of recording monthly production is applicable to the flock of laying hens. With fattening stock it may be modified somewhat, and the average weight per head may be recorded monthly, or as often as desired. After one feeding period has been recorded in this manner, later rates of gain can be compared with the first record. If notes are made on the rations used each time and of any peculiar conditions under which the livestock was fed, it is generally possible to detect

the cause of unsatisfactory, or of very satisfactory, rates of gain. This information should be of great benefit in obtaining the most successful outcome possible.

If a feed record is kept on a livestock enterprise, this also should be summarized monthly in order to show the current feed consumption. The consumption should be compared with the production or the rates of gains obtained. If the rates of gain per hundred pounds of feed begin to fall below a reasonable standard, a careful examination of methods, rations, and sanitation should be made to find the cause for the losses. By such methods the careful and alert farmer is able to feel that he is really *managing* his farm instead of merely repeating a more or less standardized routine and then trusting to luck that the results will be satisfactory.

USE OF CURRENT RECORDS IN BUDGETARY CONTROL

The current summaries are important not only in checking up on general feeding efficiency, but also in adjusting feeding plans to market prices. Fattening hogs and cattle gain more slowly as they become older and heavier. Finally, the value of the daily gain is only equal to that of the feed consumed. This point of marginal returns varies with prices both of the livestock and of feeds. These prices are continually changing and the farmer must change his feeding plans in accordance if he is to maximize his returns. To have the needed information at hand he must keep a running summary both of feed consumption and of the weights of the animals.

If the farmer is making any effort to follow a budget, he will find it necessary to watch his records closely from month to month. A budget implies an effort at controlling both the outlay and the returns of the business. In order to attain the objectives of the budget, the farm operator must keep in close touch with his records so he will know where additional effort is needed.

It is also essential to know when to deviate from the strict following of the budgetary plan. If weather or price conditions change markedly in the course of the year, it may be that a change in the budget in some minor respect would result in greater returns than a strict following of the plan.

REVIEW QUESTIONS

1. Explain how the monthly or quarterly summaries are related to farm organization, and how related to farm management.
2. Why are yearly summaries insufficient for the purposes of management?

3. What monthly financial figures would you expect to find most useful: **total** receipts or receipts from individual enterprises? **Total expenses** or **individual** elements of expense?
5. Are there any expense elements you would prefer to omit from your **figures** for monthly comparisons? Explain.
6. How would you make use of monthly records of production of a **dairy herd**? Of rates of gain on cattle or hogs?
7. What is the relationship of the current summaries to the budget?

CHAPTER 16

ANALYSIS OF THE YEAR'S RECORDS

The Problem

Can we develop a definite method for examining the financial records and the crop and livestock records so that each will contribute to a unified and practically useful criticism of the farm operation?

In studying the operation of the farm we find that we need to examine five more-or-less distinct problems:

1. The size and financial status of the business.
2. The record of income and expense.
3. The performance of the cropping system.
4. Efficiency and rate of production of the livestock system.
5. Efficiency and economy attained in handling the service or expense enterprises, chiefly the labor, power, and equipment.

SIZE AND FINANCIAL STATUS OF THE BUSINESS

The first source to which we naturally turn in ascertaining the size of the business is the net worth statement or comparative inventory. Here we find the total investment and net worth at the beginning and the end of the current year as well as for earlier years as far back as the records have been kept. From comparisons of inventory figures we can get a definite notion both of the rate at which the net worth and total capital are growing, and also of changes in the elements which compose total capital.

For example, in Form 16 we found that on the John Jones farm, total assets in the business January 1, 1941, amounted to \$28,268, about \$500 less than those of the previous year, but \$1,500 greater than two years before. Liabilities, however, had been reduced by nearly \$2,000 within the last year. Further, net worth increased about \$1,500 during 1940 as against \$900 during 1939. A further examination shows where the changes in assets occurred, chiefly in feeds and livestock on hand. Fixed and working assets have remained relatively constant.

The next question is to decide whether or not the financial situation is satisfactory and recorded changes desirable. The problem of solvency has been discussed in Chapter 9 and will not be repeated here. However, the increase in percentage of investment in current assets from 1939 to

1941 indicates a strengthening of the financial situation and ability to adjust farm operations to any changes that may occur in the business outlook.

Merely because the general financial situation is strong, however, we should not turn away from the financial statement without giving some attention to the relative amounts invested in individual assets. There may be too much, as well as too little, invested in any one type of asset. Each should be considered in its relation to the rest of the business. On the Jones farm we note that both in January, 1941, and a year earlier there were investments of \$4,000 or \$5,000 in crops and feed on hand. Was this too much? The livestock on hand was worth only about half as much as the feed. Cash on hand amounted to only \$108 on January 1, 1941. Was this sum adequate for the operation of the business? Farmers frequently let business opportunities slip away from them because they are short of ready cash.

EXAMINATION OF THE INCOME STATEMENT

The second step is to examine the income and expenses. The income figures will indicate the value of business done. The expense figures show the current input into the business and, also, reflect the economy with which it is operated. The income statement shows, first, the success of the year's operation in the net income figure. Second, it shows the relative importance of various sources of income and expense. Third, it permits comparison of the income with the capital invested. Indices of the rate of turnover of the capital and the rate of earning on investment can easily be developed. A fourth use of the income statement is to permit comparison of returns with those of earlier years and with returns on other farms, if such figures are available.

As an illustration, the income statement for the John Jones farm (Form 29) shows a net income for 1940 of \$4,898, which is a very satisfactory figure for a 240-acre farm. To permit comparison with the performance in other years and on other farms of comparable size, some of the principle income and expense items from Form 29 have been transferred to Table III. Corresponding figures for the average of 33 similar 240-acre farms are also shown.

Sales of dairy products, cattle, and crops were larger in 1940 than in 1939. However, part of the sales in 1940 were evidently obtained by the depletion of inventories, while in 1939 inventories were being increased. After changes in inventories are taken into account, we find that gross income and gross profit were only about \$400 higher in 1940 than in 1939.

TABLE III. PRINCIPAL INCOME AND EXPENSE ITEMS AND FINANCIAL RATIOS

	JONES FARM		AVERAGE OF 33 FARMS
	1939	1940	1940
Dairy products sold.....	\$ 755	\$1,200	\$ 554
Cattle sold.....	1,590	2,529	3,503
Hogs sold.....	1,710	1,755	1,849
Poultry and eggs.....	349	415	271
Total livestock sales*.....	4,557	5,899	6,220
Less livestock purchased.....	910	889	2,546
Net livestock sales.....	3,647	5,010	3,674
Crops sold †.....	1,212	2,942	1,159
Increases in inventories.....	2,214		1,680
Less inventory decreases.....		499	
Gross income*.....	8,580	8,955	7,748
Less feed bought.....	1,278	1,295	1,307
Gross profits.....	7,302	7,660	6,441
Operating expense.....	1,010	1,353	1,499
Fixed expense.....	885	873	815
Net farm income*.....	4,978	4,898	3,557
Management return*.....	2,948	2,854	1,757
Operating ratio.....	12	14	19
Gross ratio.....	37	36	47
Gross income per \$100 invested.....	\$29.70	\$29.00	\$21.30
Per cent net income on gross capital.....	19	18	10
Per cent earned on capital used.....	16.1	15.1	9.1
Gross income per crop acre.....	\$45.66	\$50.10	\$45.30

*Includes minor items which are not listed here.

†Including crops given to landlord for rent.

Comparison of the Jones' figures with average for the 33 farms shows that Jones is selling about twice as much dairy produce as the average, but is feeding fewer cattle and receiving only about two-thirds as much gross income from cattle sales. On the other hand, Jones buys fewer feeder cattle, so that his net livestock sales and his gross income are \$1,200 or \$1,300 larger than the average. Jones' operating expenses were somewhat larger in 1940 than in 1939, but are slightly less than average for the group. His management return, with larger net sales and slightly smaller expenses, is about \$1,100 greater than average. Evidently, any defects in organization or operation of the business must be relatively minor. Nevertheless, it may be possible to improve the results still further and the business should be checked over with this in mind.

INCOME AND CAPITAL RATIOS

Computation of a few financial ratios helps us to grasp the relationships between income and expense on the one hand and between the

amount of capital employed and income on the other. Ratios between revenue elements often help us to see conditions which are not at all clear from the absolute figures.

Ratios of Expense to Income

The *operating ratio* is one of the most useful of these indices. This is the percentage of the income that is required to cover operating expenses. It is a direct measure of efficiency and shows how many cents out of each dollar of receipts were used in current operation. On the Jones farm the operating ratio is found to be 14 for 1940 compared to 12 in 1939 and 19 for the average of the 33 farms. In other words, Jones is much more efficient in keeping down his expenses per dollar of gross sales than is the average farmer of the group. Nevertheless, operating expenses have risen somewhat faster than has gross income since 1939.

The *gross ratio* is a measure of the aggregate financial efficiency. It is computed by expressing total expense, including operating and fixed expenses plus purchase of feeds, as a percentage of gross income. On the Jones farm the gross ratio was 36 for 1940 and 37 for 1939, in favorable contrast to 47 for the 33 farms.

The Rate of Turnover

One of the most common financial indices is the rate of turnover, or the *gross income per \$100 of total capital used*. The farm business is one in which the rate of turnover is generally small, yet the advantage of a rapid turnover in farming is as great as in other types of business. If approximately the same rate of profit is made each time the capital is turned, a business with a capital of \$30,000 and a gross income of \$9,000 or 30 per cent will get ahead twice as fast as one with the same capital but a turnover of only 15 per cent, or \$4,500.

On the Jones farm the rate of turnover was \$29.00 per \$100 in 1940 and \$29.70 in 1939. On the average of the 33 farms, the rate for 1940 was only \$21.30. Jones has evidently been notably successful in doing a large volume of business on a moderate investment, or to put it in another way, has been highly efficient in the use of his investment.

The rate of turnover varies widely between different types of assets. On investments in land the rate of turnover may be only \$8 or \$10 per \$100, while on investments in livestock and equipment it may rise well above \$100. Accordingly, the rate of turnover on the capital of tenants is much higher than on that of owners, and is one reason why renters are able to make their capital grow so rapidly if they follow efficient and profitable farming methods. Of course, the rate of turnover must be considered in conjunction with the margin of profit. Insofar as

farmers are correctly informed on both of these ratios, we would expect an asset with a high rate of turnover to yield ordinarily a correspondingly low margin of profit. But with year to year fluctuations in relative prices and with variations in the managerial capacities of farmers, there are generally opportunities for the alert operator to obtain both rapid turnover and satisfactory profit margins now on one type of venture and then on another.

The ratio in which net income stands to gross income is probably the most satisfactory indication of the profit margin obtained on the volume of business done. On the Jones farm net income in 1940 amounted to 55 per cent of the gross income compared to 46 per cent for the average of the 33 farms, even though the entire group represents a high level of managerial ability.

The *per cent earned on total capital* is rather widely used as a measure of the general success of the farm operation. It is obtained by subtracting the estimated value of labor performed by the farm operator and unpaid members of his family from the net earnings of the farm before interest payments are deducted. The resulting figure is then divided by the total capital managed. Derivation of earnings on the total investment (plus the effect of management) was shown in Chapter 14, and amounted to \$4,671 for the Jones farm. This figure divided by the January total value of capital managed (\$30,872) gives the rate earned on investment in the Jones farm as 15.1 per cent for 1940. The similar rate for 1939 was 16.1 per cent, and the average rate earned on the 33 farms was 9.1 per cent.

When compared with the prevailing rate of interest this rate gives some indication of the desirability of borrowing funds for expanding the business. Thus, if interest is 6 per cent while 8 per cent has been earned on the investment, it is likely that a moderate increase in capital used would more than pay interest on the loan. Of course, it is necessary to go beneath the surface to find whether there are promising specific uses to which the added capital could be put. Furthermore, it should be remembered that diminishing returns apply and that the rate earned is likely to decline as more capital is employed by a given farmer with his limited managerial capacity.

PERFORMANCE ON THE CROPS

The financial factors give us an indication of the success of the business as a whole; but in order to improve results, it is necessary to take appropriate action in specific enterprises. Consequently, we must

extend our analysis to cover the crop, livestock, and service or expense divisions. These must be studied partly in financial, but largely in physical terms which express the outcome per unit of land, per head of livestock, or per month of labor. At the same time we must keep before us the relationships between crop and livestock performance and the financial indices showing the outcome of the entire farm.

Acreages and yields of crops are examined in comparison with those of previous years and with average yields for the county or state. If yield figures are available for similar farms, on the same general soil type, these are even more helpful than the county averages.

The Jones farm, as shown in Table IV, is slightly larger than the average of the group of farms with which it is being compared. It has, however, 79 per cent of its land in crops as compared to 75 per cent for the group. Jones has slightly smaller percentages of his land in corn and oats, the two major crops in the area, and has nearly 60 acres in various minor crops including sorgo, soybeans, oat hay, and flax. Has he made a wise choice of crops? The gross value of crops raised per acre throws some light on this question. For 1940 this figure was \$21.30 for Jones' farm as compared to \$22.30 for the average of the 33 farms. Evidently, the extra trouble involved in caring for the larger number of crops was not offset by higher value of crop production.

The yields do not differ greatly from the group average. Corn averaged 61 bushels per acre as compared to 64 for the group, and as compared with 68 bushels in the previous year, when weather conditions were somewhat more favorable. Oat yields are slightly higher than either his own of the preceding year or the average for the group. In examining the yields attention should be given to the conditions under which the crops were raised and to the cultural methods used, as well as the weather conditions in that particular year. The cultural methods most suitable in a wet season may be undesirable in a dry year.

To facilitate the study of the crop system, the soil and crop records referred to in an earlier chapter should be kept up fully from year to year, and the crop yields should be summarized in such a way that comparisons between years will be as easy as possible.

EXAMINING THE RETURNS FROM LIVESTOCK

After an examination of the crops, the next step will be to study the profit and efficiency of the livestock through which the crops are marketed. Here the outcome is affected by a large number of influences and each enterprise is influenced by somewhat different factors.

TABLE IV. PERFORMANCE ON CROPS AND LIVESTOCK

	JONES FARM		AVERAGE OF 33 FARMS 1940
	1939	1940	
<i>Performance on crops</i>			
Acres in farm.....	240	240	226
Acres in crops.....	190	195	171
Per cent land in crops.....	79	79	75
Gross value of crops per acre.....	\$20.60	\$21.30	\$22.30
Corn, acres.....	82	73	71
yield per acre, bu.....	68	61	64
Oats, acres.....	82	46	44
yield per acre, bu.....	38	47	45
Alfalfa hay, acres.....	17	19	30
yield per acre, tons.....	3.5	2.5	.....
Other hay, acres.....	.....	13	30
yield per acre, tons.....	.....	.7	2.1
<i>Performance on livestock</i>			
Per cent gross income from livestock.....	63	61	73
Per cent value of feed crops fed to produc- tive livestock.....	47	68	n.a.
Returns per \$100 of feed fed.....	\$188	\$166	\$142
<i>Hogs</i>			
Number litters of pigs.....	13	17	22
Hogs produced, lbs.....	32,365	32,197	33,000
Pigs weaned per litter.....	7.3	7.0	6.5
Value hog increase per litter.....	\$115	\$101	\$87
Gain per day on fattening pigs, lbs.....	1.2	1.1	n.a.
<i>Cattle</i>			
Number milk cows.....	11.3	11.8	7
Animal units other cattle.....	7.4	6.9	n.a.
Pounds butterfat per milk cow.....	252	317	235
Value dairy products per cow.....	\$72	\$107	\$75
Value beef increase per animal unit.....	\$19	\$27	\$20
<i>Poultry</i>			
Number laying hens.....	250	350	104
Dozen eggs sold.....	2,387	2,571	n.a.
Pounds poultry sold.....	100	152	n.a.
Eggs per hen.....	123	94	103
Total poultry income.....	\$399	\$430	\$231
Income per hen.....	\$1.60	\$1.23	\$2.22

n.: Not available.

Relative Importance of Livestock

One of the first questions is: How important are the livestock enterprises as compared to the crops? One of the simplest measures is the percentage of gross income which comes from livestock production. This is obtained by dividing total value of livestock production, including sales, plus value used in the household, minus purchases, and plus or minus

changes in inventories, by the gross income of the farm. Work stock are omitted from the calculation.

This factor indicates the degree of specialization in livestock, or in other words, the degree to which crop products are further elaborated before they are sold. A considerable variation may be expected between different farm areas. Changes in the percentage between years on the same farm indicate the drift into or out of livestock production.

On the Jones farm 61 per cent of gross income came from livestock in 1940 as compared to 63 per cent in 1939, and as compared to 73 per cent on the average of the group of farms. This farm is evidently much less specialized in livestock production than the rest of the group.

Another indication of the relative importance of livestock production may be obtained by computing the percentage of feed produced (in terms of value) that was fed to productive livestock. Jones fed 68 per cent of his feed crops compared to only 47 per cent in the previous year. With less favorable livestock prices, however, the greater proportion of feed crops fed in 1940 brought in a smaller percentage of gross income. From this, we may suggest the importance of trying to look ahead as far as possible and taking the outlook for various prices into account in planning the livestock operations.

Returns per \$100 of Feed

The *returns per \$100 of feed* is one of the most useful approximate measures of feeding efficiency afforded by simple farm records. To obtain this index the total income (net increase) from productive livestock is divided by the total value of feed they have consumed, expressed in hundreds of dollars. This figure is only approximate unless feed records are kept, because it will be necessary to estimate the amounts and values of home-raised feeds, which make up the greater part of those used.

On the farm we have been using as an illustration returns per \$100 of feed amounted to \$166, as compared to \$142 for the average of the 33 farms. Since Jones is doing so much better than his neighbors, should he not exploit the advantage still further and enlarge his livestock enterprises? Incidentally, the returns on feed for 1940 are shown to be considerably below those obtained in 1939, at least partly, we may infer, because of the less favorable livestock prices in 1940 as compared to feed prices.

Numerous cost studies have indicated that the feed usually amounts to about 75 per cent of the total costs on livestock. Therefore, we can say that as a general rule livestock income should exceed the value of feed by at least a third for the farmer to make any profit on these

enterprises. On this basis, Mr. Jones is probably making quite satisfactory return. Such a statement, however, should not be taken without qualification, for the proportion of feed to other costs differs between livestock enterprises. With hogs and with fattening cattle, feed may account for around 80 per cent of the total costs. In these cases the "break even" point would be indicated by returns of about \$125 per \$100 of feed. With poultry and dairy cows, on the other hand, more expense for shelter and more labor is required per dollar of sales. Feed in these cases may account for only 50 to 60 per cent of total costs of production, and a "break even" point of \$166 to \$200 per \$100 of feed is required.

Analysis of the Hog Enterprise

After preliminary examination of the livestock system as a whole, the next step is to examine the different enterprises in more detail. This analysis will vary to some degree from one enterprise to another. In general, the indices on returns from the use of feed should be computed for each enterprise.

The records of physical production will be drawn on to see if a given enterprise comes up to approved standards of technical performance. Among the most useful measures will be rates of gains per day per head of fattening stock, amounts of feeds consumed per unit of production, ratios between protein and carbohydrates fed, and production per head per year for milk cows and laying hens.

One of the most frequently used of the physical indices is the number of pigs weaned per sow farrowing. This index is closely connected with net income from hogs because the expense on the sow and litter up to weaning time varies but little with the number of pigs weaned, while returns per sow vary closely with the number of pigs raised.

The pounds of pork produced per litter is affected both by the number of pigs weaned and the influences which make for good or poor gains later on. The pork produced includes not only pork sold, but also the increase or decrease in weight of inventories and any pork butchered and used in the household.

On the Jones farm about 32,000 pounds of hogs were produced both in 1939 and 1940. This is nearly the same as the average for the group of farms. Jones raised 17 litters of pigs in 1940 and 13 in 1939, compared to 22 litters for the group. Jones was successful in raising unusually large litters, but also purchased a small number of feeder pigs in 1939. At this point we might ask whether or not he should breed more sows and try to raise all the pigs he fattens rather than buying feeders and risking the introduction of disease into his herd of hogs.

One good indication of performance in the hog enterprise is the rate of gain per pig per day. Gains have been satisfactory on the Jones farm both in 1939 and 1940, but were not quite so good in the latter year. Partly as a result of the poorer gains, the hogs were sold in lighter weights in 1940 and the receipts per litter of pigs were lower.

Variations in returns for feed go a long way toward explaining the differences in net returns between different years or between different farms. If feed records have been kept, it becomes possible to compute returns per \$100 of feed on hogs or any other individual enterprise.

A figure indicating returns per bushel of corn can be obtained by dividing the number of bushels of corn fed into the total livestock returns on corn. The latter is computed by deducting expenses other than corn from the total livestock income. Other feeds supplementary to the corn will be needed if the corn is fed, but their purchase is unnecessary if the corn is sold. The farmer may therefore focus his attention on the disposition of the corn. Like the returns per \$100 of feed fed to hogs, however, a feed record must be kept if accurate data are to be available for its computation.

Analysis of the Cattle Enterprise

In studying the cattle enterprise we must consider returns both from dairy products and from beef. An index of the former is obtained by dividing the total value of dairy products for the year by the number of milk cows. The beef income may be expressed either as income per animal unit or as beef income per cow in the breeding herd. The animal unit of cattle consists of one cow, steer, or bull, or one heifer over two years of age, two yearlings, or four calves.

On the Jones farm we find in Table IV that 12 cows were milked in the year 1940, as compared to 7 cows for the average of the group. Further, Jones' receipts both from dairy products and from beef were about a third higher than the average, reflecting either high-producing animals or heavy feeding. Of course, the returns per animal are affected both by the production rate and by the prices obtained for the products. Both of these can be determined from the records.

One of the most informing indices available from the records on a dairy farm is the number of pounds of butterfat produced per cow. This is easily determined if care is taken to enter the quantities sold each time a cream check is received. Of course, it is necessary to add to the sales the amount consumed in the household.

On the Jones farm the production of 317 pounds of butterfat per cow is a big increase over the previous year's 252 pounds and is far

above the 235-pound average for the 33 farms. This improvement comes partly from better rations and partly from replacement of poor yielders by better stock.

Poultry

In analyzing the poultry enterprise the most valuable index is *egg production per hen*. On the Jones farm the enterprise consisted of 350 hens in 1940 and was much larger than the average of 104 hens in the 33 farms. Evidently, Jones attempted to expand poultry production early in the year but later neglected to give the hens the needed care. Consequently, egg production decreased from 123 the year before to only 94 eggs per hen in 1940, compared to an average of 103 for the group. Jones' poultry income for 1940 was about \$30 higher than in 1939, but he had 100 more hens to feed—a decidedly unprofitable change.

In summing up the survey of the livestock enterprises, it may be said in general that Jones appears to be getting excellent returns. A closer examination, however, discloses questions that may lead to still further improvements. In the hog enterprise, it is not apparent from the figures why more hogs are not raised since hog returns have been satisfactory in comparison to those received by other farmers. Other facts, not recorded in the records, however, need to be considered. Perhaps more hog equipment or housing is needed, though this should not be difficult to provide. In the poultry enterprise, we have evidently uncovered a weak spot in the farm organization. Either the poultry should receive more care, or the size of the enterprise should be reduced to avoid an apparent loss.

Such data as those in Table IV may be compared to standards provided by experiment stations or to averages on other farms. Even though we have not gone into great detail in this chapter, it may be seen that such comparisons help greatly in discovering the strong or weak points of the farm under discussion. We shall return to the problem of more detailed analysis of the individual enterprises in Chapter 18.

EFFICIENCY IN USE OF EXPENSE FACTORS

It is as necessary to check up on the effectiveness and economy with which the expense factors are used as it is to study rates of income from the different enterprises. Some study should be made of efficiency in the use of labor, horses, or tractors and farm equipment. More elaborate analysis of the use of labor on each farm operation, however, would require a detailed labor record. Still something can be done toward getting an index of efficiency on the farm as a whole.

Efficiency in the Use of Labor

Probably the best index of labor efficiency within reach of the farmer with relatively simple records is the *number of acres of crops handled per 12 months of labor*. This is easily obtained. From the production records we get the number of months of labor hired. To this is added the number of months of labor performed by the operator and members of his family. Dividing the number of months of labor by

TABLE V. EFFICIENCY IN PRODUCTION

	JONES FARM		AVERAGE OF 33 FARMS
	1939	1940	1940
<i>Labor</i>			
Months labor used on farm	25	26	24
Crop acres per man	99	98	94
Livestock units per man	30	27	38
Labor cost per \$100 of gross income	\$13.12	\$11.48	\$14.26
<i>Horses</i>			
Number work horses	4	4	3
Crop acres per horse	48	49	57
Per cent crops fed to horses	6.4	4.5	n.a.
<i>Power investment per crop acre</i>	\$2.37	\$1.77	\$5.20
<i>Power cost per crop acre</i>	2.51	2.42	n.a.
<i>Equipment</i>			
Investment in machinery per crop acre	5.18	4.61	5.10
Crop equipment expense per crop acre	1.74	1.59	1.90
<i>Total labor, power, and equipment expense per crop acre</i>	\$11.10	\$10.96	n.a.
As per cent of gross income	25	24	n.a.

n.a. Not available.

12 gives us the number of man-years of labor. This is next divided into the crop acreage to find the acreage of crops handled per man.

On the Jones farm we find in Table V that 98 acres were handled per man in 1940 compared to 94 for the average of the 33 farms, or slightly more than average.

The total crop acreage is, however, a rather gross figure and combines crops such as corn and hay which call for widely different amounts of labor per acre. An index of the number of tilled acres per man would be more significant and more comparable between farms or between years on the same farm.

Livestock Units

Crop acreage per farm is likely to be misleading for another reason. One farm may produce little more than crops, while another has crops and also a large number of livestock for the farmer and his hired man to look after. Consequently, a corresponding index should be computed to represent the amount of livestock handled per man. *The number of livestock units per man-year* may be used for this purpose.

A livestock unit consists of one horse, or cow, or a number of other livestock which can be considered as equivalent in requirements of feed and labor. If the animal is on the farm only part of the year, it is counted fractionally. Thus, the cow that is kept from January 1 until the end of June would be counted as one-half of an animal unit. Approximately the following numbers of other animals may be counted as an animal unit: 2 yearling cattle, 4 calves, 7 sheep, 14 lambs, 3 sows, 5 hogs weighing 200 pounds, 10 shoats weighing 100 pounds each, or 100 hens. The unit is sometimes considered as 1,000 pounds live weight.

Another method of appraising the labor efficiency is by combining the crops and livestock in terms of productive man work units and then computing the number of man work units handled per man-year. *The productive man work unit is the average amount of work accomplished per day* (usually per 10-hour day). Thus, if it requires on an average 20 hours to raise and harvest an acre of corn, it is counted as two work units, while an acre of oats that requires 10 hours is counted as one work unit; the dairy cow that requires an average of 140 hours of labor per year is counted as 14 work units, and so on. The index of labor efficiency in terms of work units consists of the number of work units accomplished per man per year. Thus, on the Jones farm approximately 530 days of labor in the course of the year would be required to care for the crops raised and the livestock handled at average rates of efficiency. There were 26 months of man labor used on the farm during the year, or 2.2 man years. Consequently, each man accomplished 240 productive man work units.

The man work unit varies widely between different states and regions with variations in size and type of farm, and with the farming methods in use (see Appendix, Table D). The man work unit index should, consequently, be used with due regard to conditions prevailing in the neighborhood where a given farm is situated. A low index of man work units per man year may be caused by low labor efficiency or it may be caused by small fields, rough crop land, or other local conditions.

Still another index of labor efficiency is found in the *cost of labor per \$100 of gross income*. Total cost of labor is taken here to mean the sum of wages paid hired labor, plus value of perquisites to hired labor,

and value of operator's and unpaid family labor. This sum is divided by the number of hundreds of dollars of gross income received from the farm during the year. It will be observed, however, that the index is affected by everything that influences the gross income, as well as by labor efficiency narrowly interpreted. Furthermore, labor may be saved at the cost of expensive use of power or by the use of expensive equipment. Consequently, we should consider power and machinery costs at the same time as labor efficiency.

Efficiency in Use of Power

On farms operated with horses, the number of acres of crops raised per work horse may be used as a measure of efficiency in the use of power. The same limitations apply here, however, as to the use of the number of crop acres per man. That is, acres of tilled crops would probably afford a better index than total crop acres.

The percentage of crops fed to the horses gives us a valuable index supplementary to crop acres per horse. This is necessarily computed on the basis of value rather than amount of crops raised. If 10 per cent of the feed raised on the farm is fed to horses, that leaves only 90 per cent available for sale or for the production of salable livestock products. On farms without tractors the percentage of crops utilized in providing power may vary from 6 or 7 per cent to 15 per cent under Corn Belt conditions. Where there is a tractor as well as horses the percentage will naturally be lower.

On farms with both horses and tractors it is naturally more difficult to find a satisfactory index of power cost. Probably *total cost of power per acre* is the best. This is obtained by adding together the interest and depreciation on horses and on tractor, plus feed, veterinary expenses, shoeing, and such items for horses, and fuel, oil, and repairs for the tractor. The sum is then divided by the number of acres of crops raised. On the Jones farm this index is found to amount to \$2.42 in 1940 as compared to \$2.51 in 1939. The difficulty with the index is that, unless there is a detailed labor record and a detailed feed record, it can only be obtained by the aid of some rather rough estimates. Therefore, it should be considered as only approximate.

Equipment Expense per Crop Acre

An indication of the economy with which capital is invested in power units and in crop equipment may be obtained by taking the total of such investments, and dividing by the number of acres in crops. On the Jones farm these two types of investments per acre of crops are both much lower than average for the 33 farms. The explanation is

found in the fact that the equipment and tractor are both old and have already been depreciated to a low valuation.

The annual expense for equipment on crops may be expressed conveniently as *equipment expense per crop acre*. Most of these expenses are recorded in the equipment account. The missing elements, such as interest and depreciation, can easily be computed. Crop equipment is not usually a very large element but is worth watching. Thus, the Jones farm, as shown in Table V, had a crop equipment expense of only \$1.59 per acre compared to \$1.74 in 1939 and \$1.90 for the group of farms.

It was mentioned previously that low expenses for labor might be offset by high power or equipment costs. The farmer is less interested in keeping down any one particular expense of this type than he is in operating at the maximum economy for labor, power, and equipment combined. As an index of this combined economy we may use either the combined labor, power, and equipment expense per crop acre, or the percentage of gross income that is absorbed for these purposes. On the Jones farm these expenses required approximately \$11 per crop acre, and 24 or 25 per cent of gross income both in 1939 and in 1940. Note that total expenses for these purposes include repairs, interest, horse feed, depreciation, fuel, etc., not only on the tractor, crop machinery, and horses, but also on special machinery such as threshing outfit, feed grinder, the farm share of expenses on the auto, and so on.

In making a full appraisal of the results of farm operation, as far as the records permit, both the inputs into the business and the output must be taken into account. The question should be raised whether it is not possible to have too many, as well as too few, acres of crops per man. Would Mr. Jones make a larger net income if he hired more labor rather than less? Is he spreading his labor too thinly when he handles 98 acres of crops per 12 months of labor? This question will be dealt with in the next chapter.

The first part of the process of analysis has been described in this chapter. It consists of making a systematic examination of the organization and operation of the business as revealed by the records. First, the general outcome of the business as shown by the income statement is examined. Next, the crop system and the livestock enterprises are studied to see if they have come up to reasonably good standards of operation. Finally, the expense or service enterprises are examined to see if the fullest possible economy is being obtained in the use of labor, power, and equipment. Comparison must be made both with other farms in the same year and with other years on the same farm in order to measure improvement.

If reasonably adequate records are kept and if this analysis is carried out carefully, few serious defects, or "leaks," are likely to go undetected. Our next subject will be the more difficult problem of just where to stop in seeking improvement in each of several directions and obtaining the best possible balance among the different elements of the business.

REVIEW QUESTIONS

1. List as many ways as you can in which the size of the business might be expressed.
2. Why is the growth of the investment in productive livestock important? Could this figure become too large for a given farm?
3. Describe the process of analysis in which you would use income and financial statements.
4. What is the significance of gross income per \$100 invested?
5. How would you compute the rate of earnings by capital?
6. How would you analyze the crop performance on your farm?
7. Why is the return per \$100 of feed an important factor on the ordinary farm?
8. Draw up a plan for the analysis of the dairy enterprise as far as it is possible from simple farm accounts.
9. How would you go about studying the economy with which power is used on a farm having both horses and tractor?

CHAPTER 17

EFFICIENCY FACTOR ANALYSIS AND DIMINISHING RETURNS

The Problem

Is it possible for an efficiency factor to be "too good"? May the returns stop increasing and then decline if such a factor increases beyond a certain point, even though increases are supposed to be accompanied by greater net income or management returns?

Under any given situation there is one most effective combination of the factors of production. When any factor is used in excess of the amount required for this most productive combination, diminishing returns are likely to result. In similar fashion, when any enterprise is expanded beyond the most economical size in proportion to other enterprises, it is a truism that a smaller total net income and profit will be received from the whole business.

Let us take some of the most important of the efficiency factors which were discussed in the last chapter and see how net farm income and management returns change from low to medium and then to high values of the factors. For this purpose a study was made of the correlation between efficiency factors and the returns on 610 farms in 1929.¹

FINANCIAL RATIOS AND DIMINISHING RETURNS

Proportion of Capital in Working Assets

In the last chapter it was said that a relatively high investment in working capital is usually associated with a rapid rate of turnover and higher returns. On the other hand, we often hear it said that some farm is "overstocked" or "overequipped." This implies that it is possible to have too much working capital as well as too little. What is the point of highest returns?

¹The relationships shown in the graphs in this chapter were discovered by the methods of curvilinear multiple correlation, using a modification of the Ezekiel method. This involves the use of the conventional multiple correlation methods as a first approximation to the relationships existing. After this, a series of freehand curves are used as successive approximations until further approximations fail to reduce appreciably the standard error of estimate. For an explanation of this method see Ezekiel, Mordecai, "Methods of Correlation Analysis," Chapter 14. The factors used in this study and their average values for the years covered were as follows:

In the group of farms studied it was found that as the percentage in working capital increased there was a tendency for livestock income per man to rise and for the number of acres of crops handled per man to decline. The greater percentage in working capital is generally an indication of greater intensity of culture, particularly toward greater livestock production.

On the 610 farms whose records were studied for 1929, the average investment in working capital (that is, current plus working assets, including livestock, equipment, and feeds and crops on hand) amounted to about 20 per cent of the entire capital. Figure 6 shows that net return increased with higher percentages in working capital until it was about 15 per cent greater than the average, or 35 per cent in total. After this point the curve of net income began to turn downward as working capital exceeded the amount needed to work the land and employ the labor to best advantage.

The curve of "profit," or management return, is in general similar to the curve for net income. This curve turns downward at a point about 5 per cent greater than average for the group of farms. This represents about 25 per cent investment in working capital as contrasted to 35 per cent on the net income curve.

Why is the point of diminishing returns located at different points on the two curves? In finding management returns we deduct interest on the farmer's own capital and wages for his own labor. In other words, as the percentage in working capital increases up to 35 per cent, the net

Footnote—Continued

FACTORS	AVERAGE 1927	AVERAGE 1928	AVERAGE 1929	AVERAGE 1930
Net farm income	\$1,952	\$2,068	\$3,721	\$1,678
Management return or "profit"	\$160	\$458	\$600	\$1,224
Per cent investment in working capital			20	21
Gross income per \$100 invested	\$13.50	\$17.00	\$16.50	\$12.40
Per cent total expense to total income	54	47	48	73
Acres corn	65	71	72	78
Yield corn per acre, bushels	39	49	47	42
Livestock income per \$100 feed	\$140	\$135	\$152	\$116
Number litters spring pigs	14	12	13.3	13.2
Hog income per sow			\$167	\$135
Dairy income per cow			\$100	\$88
Months labor used	23	22	23	22
Crop acres per man	71	82	88	92
Number farms studied	323	450	610	690

The study is summarized in Iowa Research Bulletin No. 160, *The Use of Efficiency Factors in the Analysis of Farm Records*, by John A. Hopkins (1933).

income increases also; but after 25 per cent, the increase is not sufficient to cover the going rate of interest on the added capital.

Income per \$100 Invested

Do diminishing returns occur on the rate of turnover? The average rate of turnover on the farms studied was \$16.50 per \$100 of investment. Figure 7 shows that profits increased with more rapid turnover at least up to about \$35 per \$100 of investment. From a rate of about \$10 per

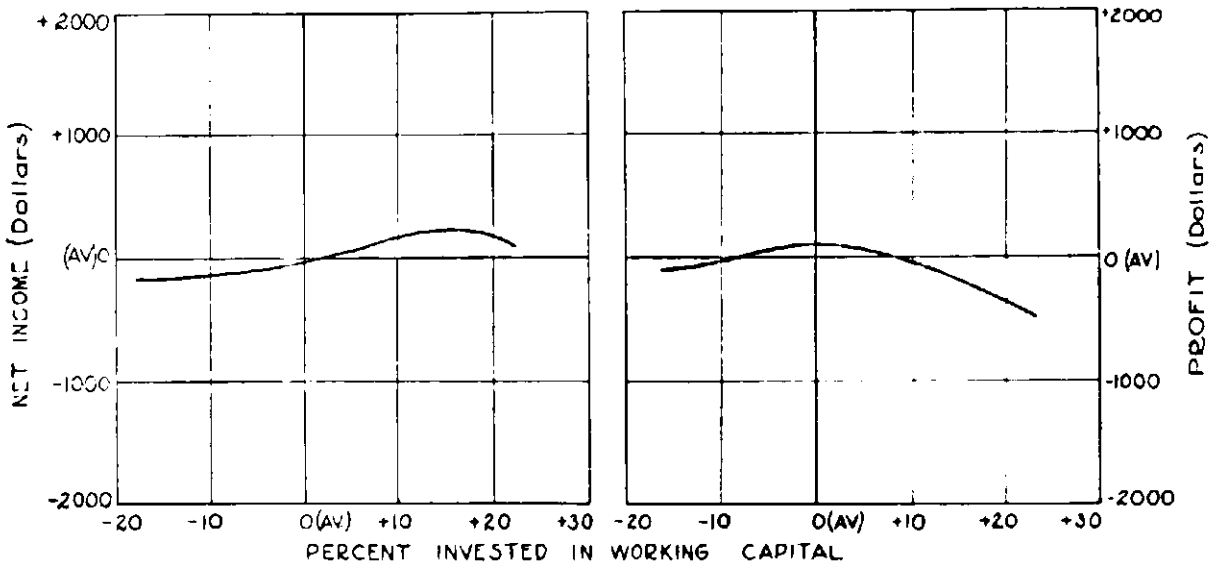


Fig. 6. Per Cent Working Capital as Related to Farm Returns

\$100 up to \$25 per \$100 the profit rises rapidly; but, as the rate of turnover is increased beyond this point, the profits rise but little, suggesting a diminution in the rate of improvement if not an absolute decline in returns.

An increase in the rate of turnover generally accompanies a larger proportionate investment in working capital. It is usually accompanied by an increase in the operating ratio, that is, the percentage which operating expenses are of the total income. The rate of turnover may rise because of increased income from any productive enterprise. It may come from higher crop yields, larger livestock production in proportion to the size of farm or higher production per cow or per sow. In any of these directions, however, higher expenses are usually required to get the greater income. After a certain point, expenses are likely to increase faster than returns, leading to the downward inflection in the curve of profits.

THE CROP SYSTEM—ACRES IN CORN

The acreages in the most important crops will naturally be among the strongest influences on net income and profits. In the greater part

of the United States, the corn crop is one of the most important. Figure 8 shows how net income and profits varied with the number of acres in corn in the 1929 Iowa farm records.

The average acreage in corn on these farms was 72. Figure 8 shows that the farms with smaller acreages of corn had small returns. Both net income and profit rose more rapidly after the corn crop passed 60 acres than before. An increase from 20 to 60 acres was accompanied by a \$200 increase in net income. The next 40-acre increase, from 60 to 100,

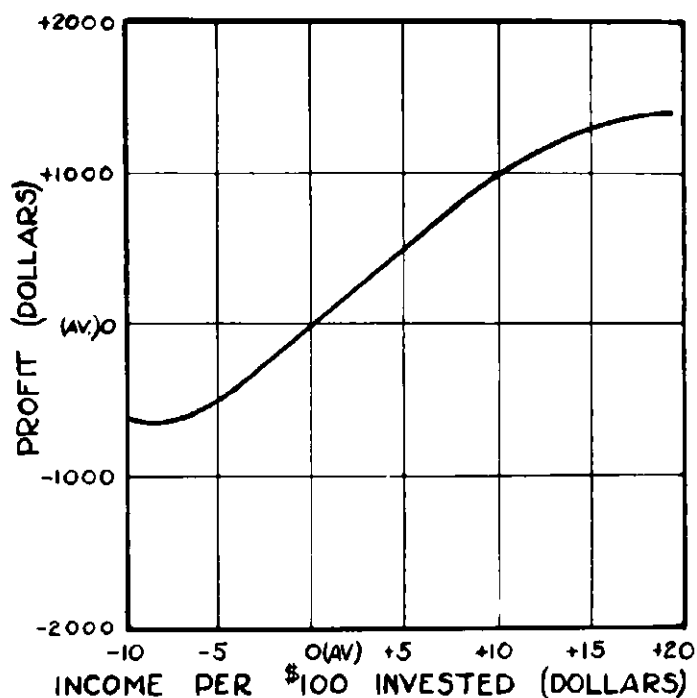


Fig. 7. Income per \$100 Invested as Related to Profit

was accompanied by a \$500 rise in net income. As corn rose from 100 to 140 acres, net income increased \$800. Up to this point, then, we find *increasing* returns.

The point of diminishing returns for the whole group of records taken together seemed to be at about 140 acres. A further examination raises the question of whether or not the whole group of farms *should* be taken together. Some of them were in the smooth and highly productive cash-grain section of north central Iowa. Part of them were in rolling or rough country. May not diminishing returns set in at different points on smooth and rough land? To throw some light on this the farms were divided into two groups, those in the cash-grain area and those in rougher sections. The curves of diminishing returns were very similar in shape for the two areas, but they turned downward at different points. In the rougher areas diminishing returns set in at 130 or 135 acres. In the more

level sections, crops are easier to handle, and the downturn in net income did not occur until 150 or 160 acres.

The curves of relationship between corn acreage and profit are also shown in Figure 8. The point of diminishing profit was at a slightly larger acreage than with net income. This seems to be explained by the fact that the largest acreages of corn tended to be on specialized crop farms. It is possible for the more efficient of these farms to have smaller net incomes and yet larger management returns than farms with both large crop

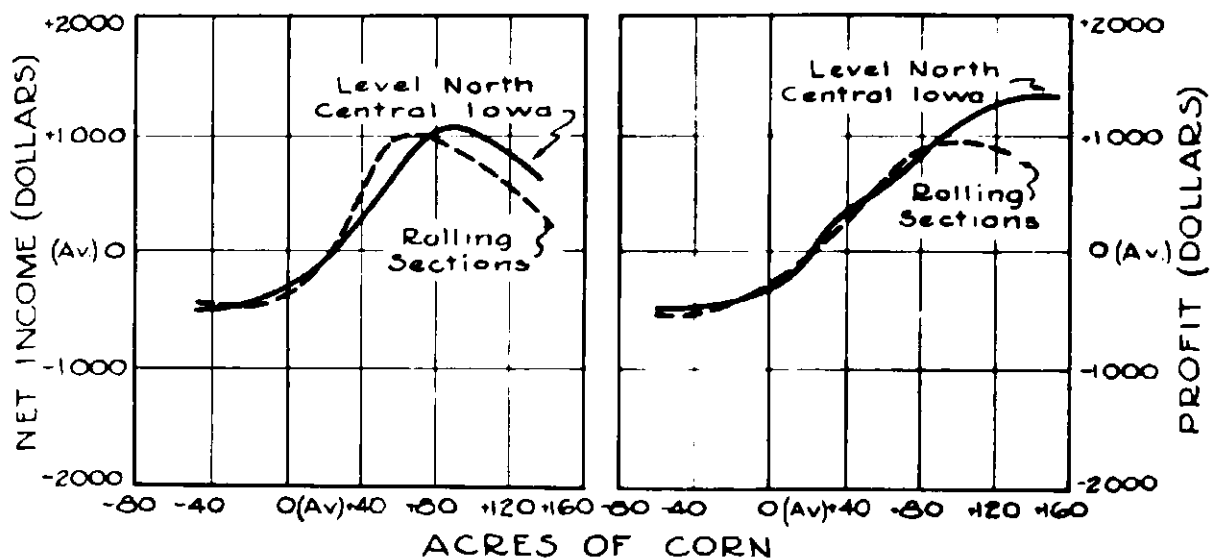


Fig. 8. Acres of Corn as Related to Farm Returns

acres and large numbers of livestock. That is, the specialized crop farms tend to have smaller expenses per dollar of sales.

Yield of Corn

The yield of corn per acre may be taken as the most outstanding single indication of the success of crop-production and soil-management methods for farms in the Corn Belt. Higher corn yields lead to higher returns per \$100 of capital invested and to a lower rate of expense per dollar of income. The farms with higher yields also showed a tendency to feed more livestock and had greater livestock incomes per man employed.

Figure 9 shows that net income and profits both increased with higher corn yields. Profits rose at a decidedly slower rate than did net income. An increase in yield from 30 bushels per acre to 60 was accompanied by an increase of about \$1,100 in net income but only \$700 in profits. A larger investment and more labor is required to get the higher yields. It is noteworthy that net income and profits both con-

tinued to increase with the yield as far as the significant data extended, that is, up to about 80 bushels per acre.

Remember, however, that these data represent variations between different farms and not the effects of obtaining different yields on the same farm. On the farms in this study practically no fertilizer was used. Higher yields of corn, therefore, represented partly the effects of local weather conditions, partly differences in soil types between different farms, and partly the effects of the farmer's soil management program

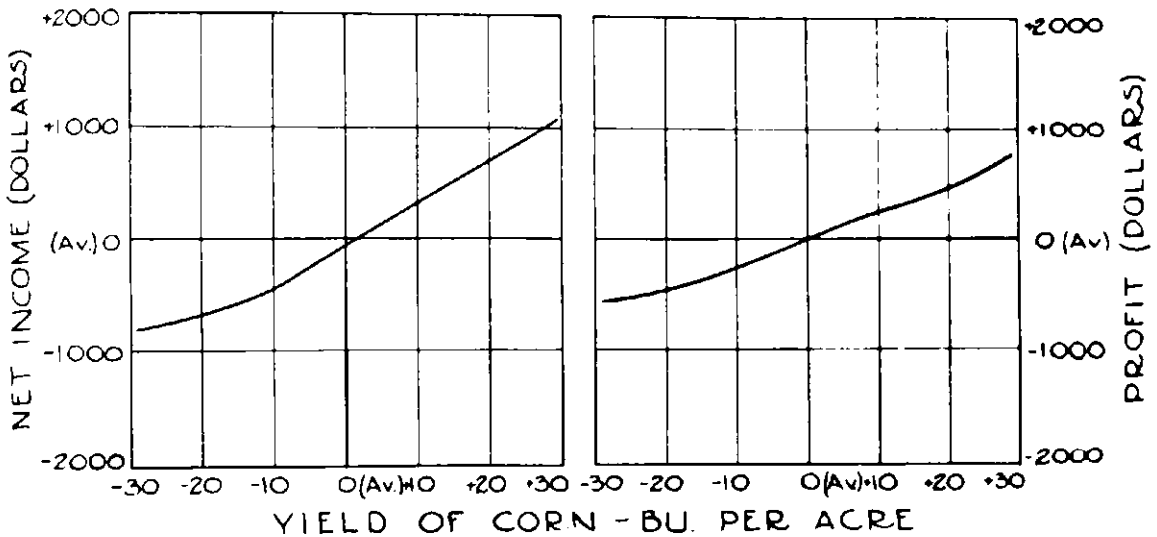


Fig. 9. Yield of Corn as Related to Farm Returns

or lack of program during the years past. In older sections of the country where fertilizer is used more often and more heavily we would expect to find some sign of diminishing returns with varying applications of fertilizer.

THE LIVESTOCK SYSTEM—RETURNS PER \$100 FEED

The returns per \$100 of feed to all productive livestock give us an indication of the general success of the farmer as a feeder combined with his judgment in selecting and combining rations. Figure 10 shows that both net income and management returns follow curves of increasing and diminishing returns with changes in the returns per \$100 of feed. The point of highest returns was between \$200 and \$220 per \$100 of feed consumed. Where livestock income per \$100 of feed was greater than this, net income and profit both tended to decline.

The explanation seems to be that higher expenses in other directions are necessary in order to get greater income from the feed used. Higher returns can be obtained by giving the livestock more care (that is, by

more labor) or by better and more expensive shelter. Highest returns per \$100 of feed are commonly obtained on high grade and expensive stock. On the investment in this stock there is a higher expense for interest as well as some increases in other directions.

Also, the intensification which is necessary to get the highest returns on feed makes it impossible to handle as large a business as otherwise. Consequently, gain in *efficiency* on livestock is offset by a loss of *capacity*. The farmer's problem is not simply to get the highest possible return

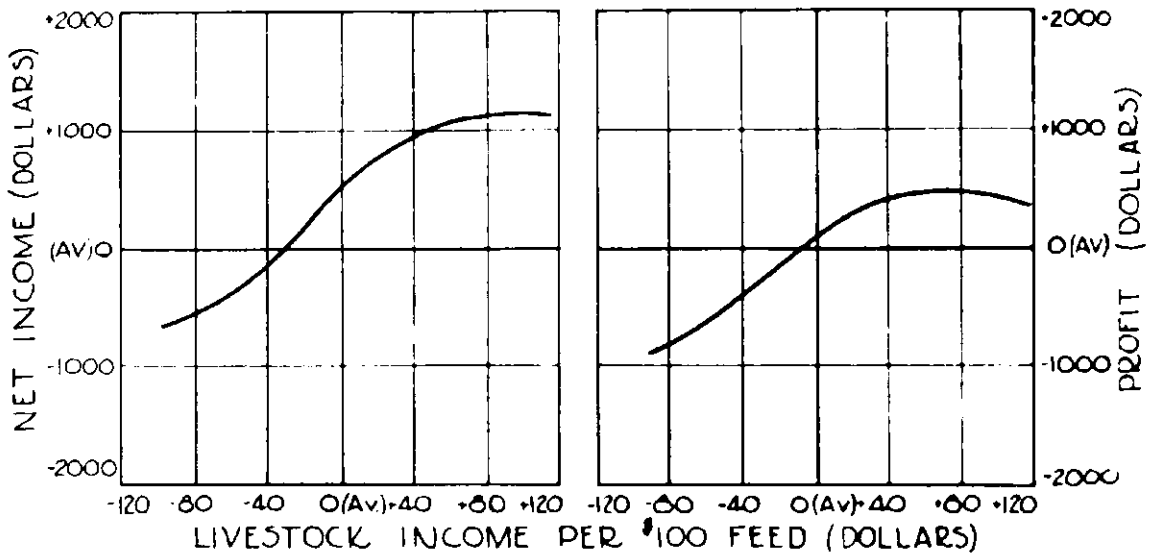


Fig. 10. Livestock Income per \$100 Feed as Related to Farm Returns

per dollar of feed, but to balance efficiency of enterprises with size of enterprises so that he will get the highest total net return.

The returns per \$100 of feed are found to be closely related to the rate of turnover on the capital invested and inversely related to the operating ratio. The farms with the highest returns per \$100 of feed are found to handle somewhat smaller acreages of crops per man. These are the farms where an effort was made to get the greatest returns per dollar of feed and per unit of livestock. This seems to have prevented handling either large acreages of crops or large livestock enterprises.

Size of the Hog Enterprise

The size of the hog enterprise is generally closely associated with the amount of corn raised and with the amount of labor available to take care of the hogs, particularly at farrowing time. With larger hog enterprises, there is usually a greater livestock income per man employed, but the returns per \$100 of feed decline as each man spreads his attention over a large number of hogs.

Figure 11 shows clear evidence of diminishing returns with increases

in size of the hog enterprise when that is expressed by the number of litters of spring pigs raised. *Net income* is found to increase with the size of the enterprise up to 35 or 40 litters. Above that size, net income declines. The same general type of relationship obtains for *management returns*. Here, however, the increase is less steep for the first or increasing phase of the curve. Also, the decline in profit sets in after a size of about 25 litters is passed. As the size of enterprise is increased to 35 or 40 litters, the downward pitch of the curve becomes quite sharp.

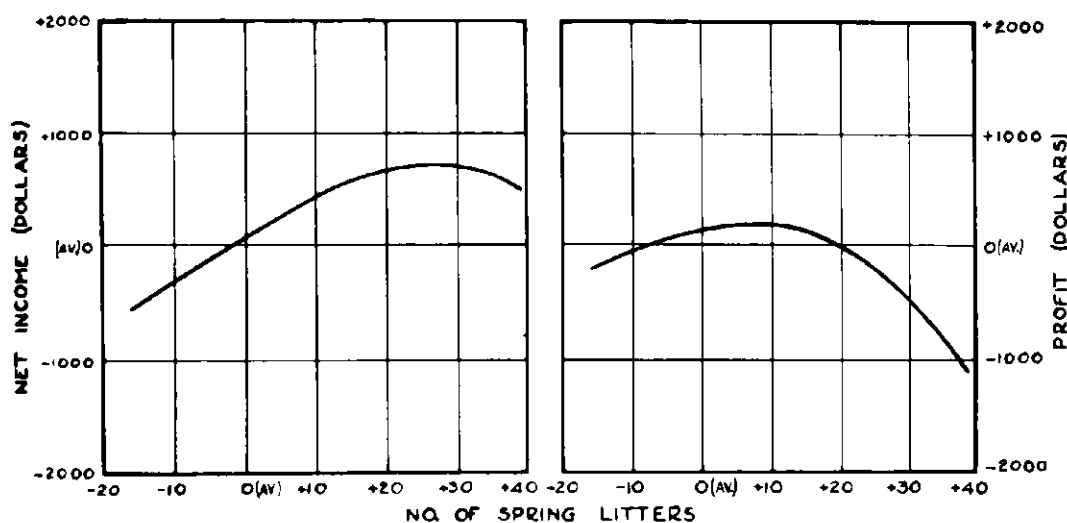


Fig. 11. Number of Spring Litters as Related to Farm Returns

These curves probably reflect the inability of one man to take good care of more than about 25 sows with the equipment found on the ordinary farm. With larger herds, the farmer must either give less careful attention to each litter, or he must hire labor for this purpose, and the hired labor may not give the pigs the best attention. Lack of such care is most noticeable at farrowing time, but it may also seriously affect the results later in the season.

Figure 11 shows that the profit curve starts to decline at about 25 litters compared with 35 litters for the net income curve. Thus, the farmer needs to consider carefully not only whether the added size of enterprise adds to his net income, but also whether he is getting an increase in income greater than the added trouble and investment required. He should also consider whether or not he is increasing the hog enterprise so much as to get it out of balance with the rest of the business.

USE OF LABOR—MONTHS OF LABOR USED

What amount of labor should be combined with the land and equipment for the most profitable results? An increase in the number of

months of labor used on a farm is usually accompanied by an increase in the size of one or of several enterprises. Thus, when farms are arranged in accordance with the number of months of labor used, there is a roughly proportionate variation in the acreage of corn and the number of litters of pigs.

Figure 12 shows the relationship between the amount of labor used and the net income and expense on these farms, which averaged about 200 acres. The net income increases with the number of months of

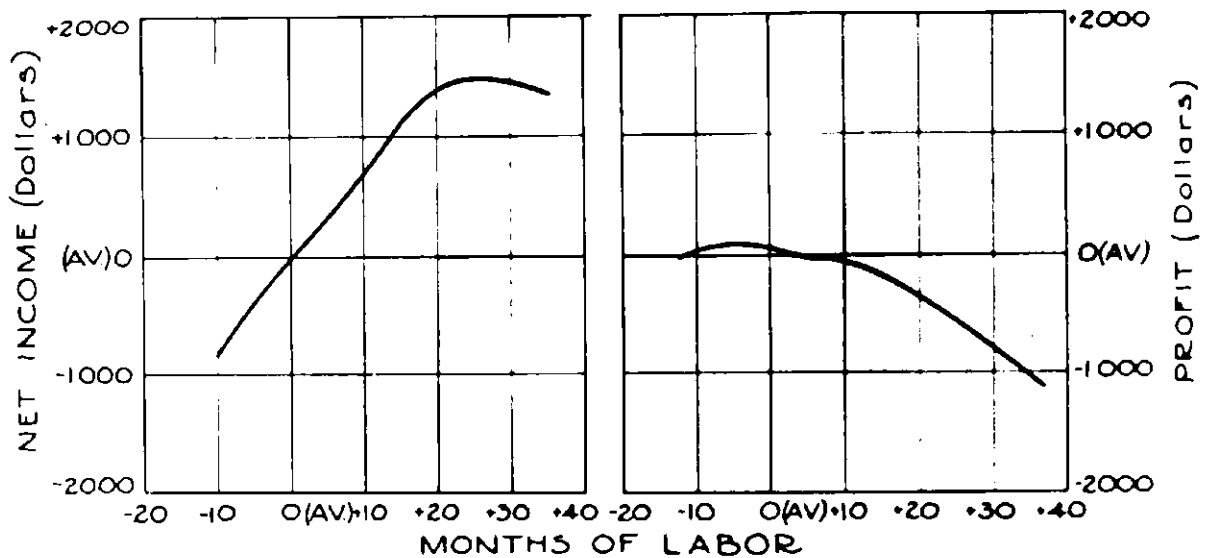


Fig. 12. Months of Labor as Related to Farm Returns

labor up to about 45 months. Beyond 45 months, on these farms, the added product was insufficient to cover wages and other expenses involved in keeping the men busy. The profit, on the other hand, increased with the amount of labor only up to about 18 or 20 months. After this point profits declined slightly until labor amounted to about 30 months, and then more rapidly. In other words, the increase in output above 18 or 20 months of labor on these farms was insufficient to cover the increased cost of equipment and other associated expenses.

Acres of Crops Handled per Man

The number of acres of crops handled per 12 months of labor is affected by two influences. In the first place, it is directly related to the efficiency with which labor is used. Second, it is inversely related to intensity with which the land is worked.

On the farms studied there was more evidence of variation in efficiency than in intensity. There was some variation in the latter, but it did not seem to be the principal cause of the differences in results. Farms with 75 acres of land per 12 months of labor in 1929 and 1930

yielded only 5 bushels of corn per acre more than those with 150 acres per 12 months. Also, farms with 75 crop acres per man had a turnover of \$16 per \$100 invested as compared with \$13 on farms with 150 crop acres per man, and the livestock returns per \$100 of feed were \$139 and \$132, respectively. These are mostly indications of efficiency.

The effects on net income and on profit are shown in Figure 13. Here the farms were divided into two groups: Those in which livestock enterprises predominated are in one group, and the crop farms and diversified

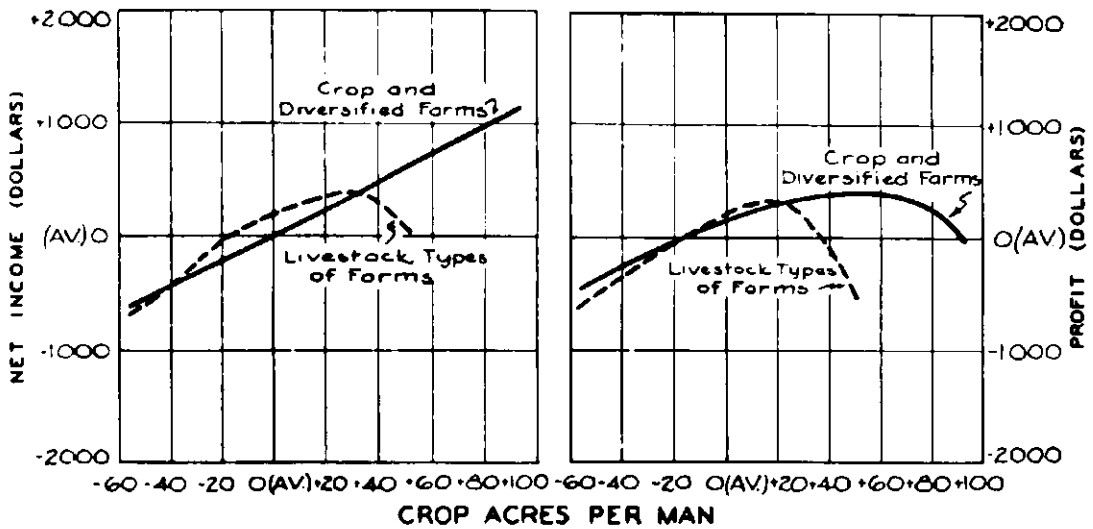


Fig. 13. Crop Acres per Man as Related to Farm Returns

farms in the other. Up to about 110 acres of crops per man, the net income and management returns from the two groups rise in almost parallel lines. Beyond this point the curves diverge. On the livestock farms net income began to decline after about 120 crop acres, and profits declined after 110 acres. On crop farms the net farm income continued to rise with the crop acreage per man, but the management return began to decline after 150 acres. The rate of decline was less in the smoother than in the rougher farming areas.

VARIATION OF NORMAL FARM INCOME

Net income and profit on each farm tend to differ in a more-or-less regular way from the normal or average in the neighborhood because of such influences as we have just discussed. That is, each farm has a "normal income" which differs from the average of the group. By considering the influence of each of these factors as shown in the graphs, it should be possible to tell approximately what the variation from average for a particular farm should be. The caution should be added,

however, that these relationships are strictly valid only under the same conditions as on the farms from which the data were obtained.

Thus, under the conditions of 1927-1929, if we take a Corn Belt farm with 30 acres more of corn, 6 more litters of spring pigs, and employing 6 more months of labor than the average farm, and read the influences of these from the curves, we find that the added acres of corn may be expected to increase net income by about \$400, the added litters of pigs by \$250, and the added labor by \$400. Thus, we would expect this farm to have a net income about \$1,050 above the average in the neighborhood.

In the same way we would find from the curves indicating the relationships between these three factors and management returns that we might normally expect this farm to show a profit about \$400 greater than the average.

Of course, we know that net income and profit will vary from many other causes besides these; but at least we now know how much influence to expect from these three important factors. If the accounts of the farm show that net income and management returns were less than anticipated amounts, we would expect that some unfavorable influences are at work. The next step is to conduct a systematic search to see if we can locate them and do something to improve the situation.

On the other hand, if actual returns are greater than expected, we would conclude that the organization of the business contains some advantage which, if understood, might be exploited still further. By ascertaining the approximate influence of factors which can be handled like the three mentioned, we have taken the first step towards evaluating those which remain.

REVIEW QUESTIONS

1. What measurements other than acreage should be used to express the size of farm business?
2. Why does the number of sows not increase as rapidly as the acreage on the typical Corn Belt farm?
3. Why does the relationship between the farm profit and the number of months of labor tend to conform to a curve of diminishing returns?
4. Draw up a list of not over six factors which would show the growth of all the important aspects of your farm business from year to year.
5. What relationship exists between the number of crop acres handled per man and the farm income and profit?
6. Explain the relationship between the income per \$100 invested and the management earnings.
7. What sort of relationship would you expect between the yield of corn and net income and profit on a farm using commercial fertilizer heavily?

8. Why does profit not rise continuously with the returns per \$100 of feed?
9. Plan an index to take the place of hog income per sow on farms which purchase the greater number of the pigs they fattened instead of keeping a breeding herd.

CHAPTER 18

THE ANALYSIS OF ENTERPRISES

The Problem

How shall we go about making a detailed examination of an individual enterprise? What methods should we use, and what should we look for?

METHODS OF APPROACH

The analysis of a farm enterprise requires investigation along two different lines. First, is the output all that could be desired? Second, could the input of labor and materials be reduced without lowering the returns? Each of these questions has a technical and an economic aspect.

Output of Enterprise

The first question that will probably occur to a farmer is whether or not the output of an enterprise could be increased. Is the yield of corn or the milk production per cow up to a satisfactory technical standard? No amount of good management can overcome the disadvantage of a low grade cow or an inferior strain of seed corn. We should compare crop yields or rates of gains on livestock with those obtained on outstanding farms or at experimental stations to see if a different technique would increase the output without greatly increasing expenses.

In some cases it is desirable to express the output in value per acre or per head of livestock rather than in physical terms. This applies particularly where the enterprise has more than one product. Beef and milk from a dual-purpose herd of cattle provide a good example. On other enterprises the physical figure is simpler and just as good. In many localities the value of the corn crop per acre gives no more information than does the number of bushels because the stalks are not marketable. Where the stalks are marketable and where some strains of corn produce more stalks than others, the value per acre is a more complete measure than the yield of grain.

Physical Costs

Another line of investigation applies to the outlays of labor and materials used in operating the enterprise. Ordinarily, the first step is to consider whether or not the most satisfactory technical methods are

being used. *Satisfactory practices* do not necessarily require heavy outlays. Testing seeds, treating seeds for fungus or other diseases, inoculating legume seeds before planting, and clean pasture for hogs are examples of practices which are often essential to satisfactory returns, and which may have relatively little financial cost.

The next thing is to examine the efficiency of the labor and of the use of feeds and other materials. This may involve both the types of machines used and the speed or technique of their operation. With livestock, the number of pounds of feed consumed per hundred pounds of gain may indicate that the feeding system needs revision, or that there is a wastage at some point.

Economic Costs

After examining the physical costs, economic costs should be considered. One factor of importance is the *prices of the cost factors*. Most of them are obtained at market price. Sometimes, there is little opportunity for saving. Sometimes, they may be bought at opportune times. In other cases, it is possible to substitute a cheaper product and obtain the same results, as by buying the ingredients and mixing feeds, fertilizers, or spray materials instead of buying expensive proprietary brands.

As with output, there are some cases in which input may be expressed in terms of value better than as hours of labor or physical amounts of materials. The operating cost per acre for crops is a good example of an index of economic input. The operating cost per acre of corn includes the value of the seed, fertilizer bought, labor, use of equipment, power, hail insurance, and so on, but not fixed charges, as for the use of land, buildings, or for other resources which represent past investments or are beyond the farmer's control.

The *operating cost* thus summarizes, in a single figure, the success of the operator in keeping down expenses to as low a figure as possible. It should be regarded simply as an *index* or *efficiency factor*, and not as an exact measure of input. It is significant and valid where all, or essentially all, of the inputs are purchased on the open market or have easily determined prices. It is most significant on large farms, where practically all the labor is hired, but is of little or no validity on small farms, where the work is done by the farmer himself and is, therefore, of indeterminate value.

Remember that technical standards of performance change from time to time. As each new method is discovered, a problem of adapting it to the various farm conditions is also raised. The analysis of an enterprise must, therefore, consider whether the operator has adopted the

most up-to-date methods and whether he has adapted them satisfactorily to the conditions of his farm. Many farmers are efficient in their technique, but are using a technique which is out of date and uneconomical.

ANALYSIS OF CROPS, THE CORN ENTERPRISE

The principles of enterprise analysis can be shown most effectively by examples. Table VI shows the salient figures from the corn enterprise

TABLE VI. ANALYSIS OF THE CORN ENTERPRISE

	THIS FARM		AVERAGE 18 FARMS THIS YEAR
	Last Year	This Year	
Acres.....	57.7	99.4	65.9
Yield per acre, bu.....	54.6	46.3	50.7
Value of crop per acre.....	\$33.64	\$33.27	\$36.40
<i>Labor used</i>			
Hours labor per acre			
Growing.....	15.2	14.4	10.1
Picking.....	7.5	9.2	6.7
Hours horse work per acre			
Growing.....	35.1	35.4	24.1
Picking.....	22.9	21.4	12.2
Tons manure per acre.....	4.8	2.1	2.0
Operating cost index.....	\$18.87	\$16.40	\$11.76

on an Iowa farm, along with corresponding figures for the preceding year and for the average of 18 farms in the same neighborhood.

The figures on yield per acre show that this farm obtained a yield 8.3 bushels smaller than in the preceding year and 4.4 bushels smaller than the average yield on the group of 18 farms. At the same time the number of hours of labor exceeded the average for the group by nearly a half. The same was true of the hours of horse work.

If these requirements in the growing of the crop be converted to value terms and added together, along with other items of outlay, we obtain an operating cost index of \$16.40, as compared with \$18.87 for the preceding year and \$11.76 for the 18 farms. The high requirements of cost factors and the low returns from the crop suggest that this enterprise may need a rather thorough overhauling.

The higher yield last year suggests that this year's crop may have been injured by unfavorable weather or that the treatment of the soil was unsatisfactory. If the weather was partly at fault, the farmer will know this. At the same time, the portion of corn land covered with manure

was smaller than a year ago. This probably accounts for part of the difference in yield. Incidentally, a part of the manure hauled out this year was put on land for oats, which may be regarded as a poor farming practice, since the corn would undoubtedly have given a larger return for the manure. This serves to illustrate the need for a wise choice in utilizing limited resources.

In explaining the high labor cost, the practices used in preparing the seed bed and caring for the crop, the nature of the power and equipment used and the layout of the field should be examined. The crop history shows, first, that the 99 acres of corn on this farm were raised in seven different fields, or parts of fields, ranging in size from 6 to 21 acres. These small, inconvenient fields may be blamed for a part of the ineffective use of labor. A further study of the labor record shows that the operations in growing the crop were performed more often than is usual or generally needed on most farms. Three of the seven fields were disced three times, and one was disced four times, whereas, twice should be enough if the work is done thoroughly. A four-horse team was used on a nine-foot disc, while a fifth horse would have increased the speed by nearly a quarter. Three of the fields were harrowed four times, and one was covered five times, whereas, three times, twice before planting and once after, should be enough.

More than the ordinary amount of work was also used on cultivation. Four of the fields were cultivated four times. With the amount of work put on the seed bed before planting, three cultivations, or even two, should have sufficed, since the land was not particularly weedy. A large part of the cultivation was also done with a one-row cultivator. A two-row machine would almost have doubled the performance per hour of labor.

Most of the errors of management in the production of this crop could have been discovered by a careful examination of the methods used and without actual records of the number of hours, or even of the yields. The advantage of the records is in that they tend to make the defects stand out in something like their true importance.

It is not so easy to translate these facts of technical operation into their meaning for the farm income. For this purpose it is necessary to consider: (1) the competing demands for labor by other enterprises, (2) the amounts of cash outlays that would actually be saved by the improved methods, and (3) any increases in actual cash income that might result. This problem can be handled by the budgeting method and will be discussed in the next chapter.

Examination of the Small Grains Crops

The small grains will be studied in much the same way as the corn enterprise. Table VII shows that the yield on the oats crop on the same farm as the corn was 14.2 bushels above the average for the 18 farms, and 17.1 bushels above the yield for the preceding year. Taking the grain and the straw together, the crop at market prices amounts to nearly \$6

TABLE VII. ANALYSIS OF OATS ENTERPRISE

	THIS FARM		AVERAGE 18 FARMS THIS YEAR
	Last Year	This Year	
Acres.....	41.5	42.4	19.8
Yield per acre, bu.....	41.1	58.2	44.0
Value of crop per acre.....	\$17.18	\$27.42	\$21.18
<i>Requirements in production</i>			
Hours labor per acre.....	6.0	6.9	8.2
Hours horse work per acre.....	5.3	6.4	12.8
Tractor hours per acre.....	.6	.7	.....
Bu. seed per acre.....	3.6	3.7	3.7
Index of operating cost.....	\$7.34	\$7.97	\$10.07

more than the route average. The high yield was caused partly by the application of manure referred to in discussing the corn crop.

The index of operating costs was about 20 per cent lower than for the average of the group of farms but slightly higher than last year. The cause of this is found to be in lower labor and horse labor requirements than the average for the group of farms. Part of the low horse labor requirement is to be attributed to the use of a tractor in cutting the grain.

Further examination of the enterprise follows the same course as with the corn crop. The strain of seed and any treatment it received before planting should be considered. The size of teams used and the operations performed in preparing the seed bed should be studied to see if efficiency can be increased still further. Alternately, returns from the use of manure on corn instead of oats should be considered carefully. It is quite possible to obtain a favorable result from one enterprise at too high a cost to others.

THE ANALYSIS OF LIVESTOCK ENTERPRISES

In studying the livestock enterprises, the same general methods will be used as with the crops, but with appropriate modifications. With the crops, labor is generally the largest element of cost. With livestock, efficiency in the use of labor is generally less important than feeding

efficiency. The yield per acre will be replaced by such indices as the number of pigs weaned per litter, the pounds of pork per sow, the pounds of butterfat per milk cow, and the number of eggs per hen. The hours of labor and of horse work per acre will be replaced as measures of input by the pounds of the main types of feed consumed per unit of livestock.

The Hog Enterprise

For illustration of the analysis of the livestock enterprises we will use data from the John Jones farm which has been drawn on for examples throughout the book. The first question is naturally about the size of the enterprise. The records show (Table VIII) that Jones produced about 6,000 pounds less pork than the average of the 448 producing farms used for comparison. Jones' production was very nearly the same in 1940 as in 1939; but in the former year, 24 feeder pigs had been purchased and 4 fewer litters of pigs raised on the farm. The relative importance of hogs on the farm was approximately the same in the two years, and differed but little from that of the group of farms, since Jones produced 157 pounds of live hogs per acre of rotated land as compared to 165 for the group average. Jones, however, did very well in raising his pigs up to weaning, with 7.0 pigs weaned per litter as compared to 6.5 for the average of the group. Hence, a question may be raised whether he should not increase even further the number of sows bred.

Next, we may examine the returns from the enterprise in comparison with the value of feeds consumed. It has been remarked already that feed is the largest single element of cost in hog production, and ordinarily accounts for around 80 per cent of total. How did Jones' receipt from hogs compare to the feed cost? We find in Table VIII that 1940 returns per \$100 of feed and pasture to hogs amounted to only \$121, equal to the average for the 448 hog-producing farms, but much below the figure of \$157 in 1939. Further, the 1940 figure is probably not quite large enough to cover the expenses for other cost elements in addition to the feed. What has been the difficulty in 1940, and how should Jones attempt to remedy it?

In the first place, we should consider any changes that may have occurred in feed and in hog prices. Feed prices have risen notably since 1939 with corn up from 40 cents per bushel to 52 cents, and the prices of hogs have not risen proportionately. Next, Jones will want to consider the number of pigs weaned per litter, the rates at which the hogs gained in weight, while on feed, and the amount of feed consumed per hundred pounds of gain. It has already been shown that

efficiency in the use of the breeding herd was quite satisfactory, with 7.0 pigs weaned per litter in 1940. The rate of gain on the fattening pigs of 1.1 pounds per day is only fair, and Jones should try to determine whether poor rations or poor sanitation may be the cause. At this point, he is obliged to take account of some influences and facts that are not likely

TABLE VIII. THE HOG ENTERPRISE

	JONES FARM		AVERAGE OF 448 FARMS
	1939	1940	1940
<i>Size of enterprise</i>			
Number of spring litters	13	12	16
Number of fall litters	0	5	8
Total number of litters	13	17	24
Total number of pigs weaned	107	130	156
Total pounds of hogs produced	32,365	32,197	38,000
Pounds hogs produced per acre rotated land...	161	157	165
Pigs weaned per litter	7.3	7.0	6.5
Total number pigs died after weaning	9	9	11
Net value of hog increase	\$1,491	\$1,722	\$2,095
Feed cost	926	1,407	1,708
Pasture cost	25	35	40
Total feed and pasture cost	\$951	\$1,442	\$1,748
Return over feed and pasture	\$540	\$280	\$347
Returns per \$100 feed and pasture	\$157	\$121	\$120
Hog returns per litter	\$115	\$101	\$87
Gain on fattening pigs per day, lbs.	1.2	1.1	n.a.
Average weight of hogs sold, lbs.	300	266	254
Average sale price per cwt.	\$5.17	\$5.50	\$5.30
Feed and pasture cost per cwt.	\$2.94	\$4.48	\$4.61
Returns per cwt. above feed cost	\$2.23	\$1.02	\$.69
<i>Pounds feed per 100 lbs. gain</i>			
Corn	304	365	348
Small grain	44	39	57
Tankage	3	3	7
Other protein feed	1	16	13
Mill feeds	6	.....	3
Milk, dry equivalent	6	10	6
Total pounds feed	364	433	434
Corn equivalent (grain fed), bu.	6.2	7.2	7.2
Total protein feeds, lbs.	16	29	29

n.a. Information not available.

to be shown in his records, and should check over the methods he is using and the results obtained on the hogs.

Feed consumption for the enterprise taken as a whole is found to be almost exactly equal to the average for the group of farms, with 433 pounds of concentrates consumed per 100 pounds of gain. This, however, is nearly a fifth higher than the year before and is further evidence that some unfavorable condition has crept into the enterprise. A more detailed summary of the rates of feed consumption on each separate lot of hogs, and on the fattening pigs separate from the breeding herd, however, would help much in locating the specific difficulty.

The value of feeds consumed per hundred pounds of hog production is a useful index of the combined skill in feeding, and in selecting feeds which will give economical results. In this case, the feed cost index amounted to \$4.48 as compared to \$4.61 for the group of farms, and to \$2.94 in the preceding year. The first comparison shows that feeding economy on this farm, at least has not been poorer than average. When compared to the year before the index reflects, first, the change in feed prices and, second, the decline in physical feeding efficiency and in the rates of gains obtained. The index is consequently to be regarded merely as an indicator of over-all economy and other and more specific means must be used in locating reasons for unsatisfactory results. Even so, the feed value per hundred pounds of gain is more significant with the hog enterprise than with most other livestock. Decidedly the greater part of the feed consumed by hogs is marketable and, therefore, the valuation applied to it more nearly represents a true opportunity cost than with such livestock as a herd of beef cattle or sheep which consume large quantities of roughage that does not have a genuine market alternative.

The Cattle Enterprise

The cattle enterprise is usually more difficult to analyze than the hog enterprise. It often includes milk cows, other cows kept for raising beef calves, young stock, and fattening stock. Its product generally consists of both beef and butterfat or milk. With a straight dairy herd the analysis is more simple than with the dual-purpose herd. The cattle enterprise on the Jones farm (excluding the commercial steer feeding enterprise, which is almost entirely separate) will be used as an example. It is of the dual-purpose type and is of interest because it involves problems of beef production as well as butterfat.

Of course, there is no direct measure of profitableness of an enterprise apart from the rest of a closely knit farm business. However, an indication of relative success as between cattle enterprises on different

farms or between different years on the same farm may be obtained from the income per \$100 of feed fed to cattle. A similar index is the income per head above cash outlays plus values of marketable feeds. On the Jones farm we find that this amounts to \$67 in 1940 as compared to \$41 on the average of 78 similar high-producing dual-purpose herds.

On the Jones farm about two-thirds of the receipts from the cattle was from butterfat production and one-third from beef or veal. With 12 cows in 1940, total income from cattle amounted to \$1,922, as against

TABLE IX. THE CATTLE ENTERPRISE

	JONES FARM		AVERAGE, 78 SIMILAR HERDS
	1939	1940	1940
Average number milk cows.....	11	12	14
Number other dairy cattle.....	8	14	17.5
Dairy income per cow.....	\$74	\$105	\$98
Beef increase per cow.....	\$43	\$55	\$34
Total income per cow.....	\$117	\$160	\$132
Feed and pasture cost per cow (all dairy cattle)	\$85	\$86	\$77
Returns per \$100 feed and pasture.....	\$138	\$186	\$170
Income over feed and cash expense per cow (all dairy cattle).....	\$27	\$67	\$41
Pounds butterfat per cow.....	252	317	323
<i>Feed to milk cows, per cow</i>			
Corn, lbs.....	876	650	1,318
Small grain, lbs.....	1,594	1,664	1,043
Protein feed (20% protein or less), lbs.....			112
Protein feed (more than 20%), lbs.....	236	50	230
Total concentrates.....	2,706	2,364	2,703
Silage, tons.....	5.5	3.4	2.4
Hay and stover, tons.....	2.5	1.5	2.2
Total dairy income from milk cows.....	\$817	\$1,262	\$1,341
Beef increase from all dairy cattle.....	\$475	\$660	\$466
Total returns.....	\$1,292	\$1,922	\$1,807
Total value feed, to all dairy cattle.....	\$802	\$891	\$897
Pasture value, all dairy cattle.....	\$135	\$141	\$188
Total feed and pasture cost.....	\$937	\$1,032	\$1,085
Cash expenses.....	\$61	\$82	\$145
Total feed and cash expenses.....	\$998	\$1,114	\$1,230
Total return over feed and cash expenses.....	\$294	\$808	\$577

\$1,292 from 11 cows in 1939. Total income per cow thus amounted to \$160 in 1940 compared to the average of \$132 on the 78 farms, and compared to \$117 on the Jones farm in 1939. Gross returns are therefore on a relatively high level and show improvement from the previous year. How was the improvement accomplished, and is the income for 1940 adequate to cover all costs?

First, we should look at the rate of butterfat production per cow. This amounted to 317 pounds in 1940 as compared to 323 for the group of farms, and compared to 252 pounds for the previous year. This explains over half of the increase in Jones' dairy income. A large part of the remainder was brought about by a rise in butterfat price from 29 to 33 cents per pound. The rest comes from slightly larger beef production and higher beef prices.

As with the hog enterprise, the farmer will want to check over the changes in methods used and the effect of replacements of cows to form some judgment on the relative amount of improvement in output from each cause. Next, he will examine the cost and make-up of the ration to see if it is properly balanced and composed of the feeds likely to yield maximum returns per dollar of cost.

On the Jones farm we find that the value of feed and pasture per cow amounted to \$86 in 1940 compared to \$85 the year before, and \$77 for the average of the group in 1940. When we examine Jones' dairy ration, we find that it contained considerably less corn, more oats, and less protein supplement than the average of the group. Part of the deficiency of protein supplement is made up by use of alfalfa hay. Nevertheless, Jones should consider at this point whether he is feeding enough protein or should buy more supplement.

The index of returns per \$100 of feed brings together the results of feeding efficiency and of production per cow. On this farm it amounted to \$186 in 1940, which should be sufficient to cover fully the expenses for labor, shelter, interest on dairy investment, and so on. Further, it compares favorably with the \$170 average return per \$100 of feed received from the average of the group of farms. The returns per \$100 of feed should be used with caution, however, as was said a page or so back. Only about two-thirds of the total feed to cattle on this farm is directly marketable (even including the corn in silage which might have been harvested as grain). The cattle enterprise is only partly a means of converting one type of marketable product to another; it also provides a means of marketing pasture and hay.

The process of analysis just described is likely to uncover any very serious defects in the cattle enterprise but there are many other ques-

tions which the farmer will want to investigate also before he stops. Is it most profitable to sell the calves when small, or should they be kept and fed out as baby beeves? Is the breed of cows the best under the conditions of this farm? If fluid milk is being sold, the percentage of butterfat it contains is likely to be an important consideration. If butterfat is sold, as on the Jones farm, the skimmed milk provides an important protein supplement for hog and poultry production. In planning for future production, the prospective prices of butterfat on the one hand and of feeds on the other should be watched continuously. And there are also other questions on which the farmer needs to keep information in order to obtain maximum returns.

The Poultry Enterprise

The principal financial measures of success in the poultry enterprise will be the income per hen and the returns per \$100 of feed. On the Jones farm the total increase per hen in 1940 amounted to only \$1.23 as compared to \$2.46 for the average of 278 farms with poultry records, and \$1.59 in the preceding year, a very poor level of production. At the same time, returns per \$100 of feed amounted to \$147 in 1940 compared to \$164 for the group of farms, and \$254 in 1939. Since feed generally accounts for 50 to 60 per cent of total costs on poultry, it is doubtful if Jones was breaking even on this enterprise in 1940.

The best physical indication of efficiency on poultry is the number of eggs laid per hen. Jones' hens laid an average of only 94 in 1940 as compared to 123 in 1939, and 124 for the average of the group of farms. Evidently, the flock has declined seriously both in physical productivity and in profitableness since 1939.

The reason for the trouble apparently is that after making a relatively good return on a flock of 250 hens that had been allowed to forage for part of their feed in 1939, Jones tried to expand the flock materially in 1940 without making adequate provision for their feed or care. The flock of 250 had done relatively well with slight care. But the flock of 350 found less feed to pick up per hen, and as a result produced very poorly.

As with other enterprises, a farmer with whom poultry production is of major importance wants to go into considerably more detail than is permitted by Table X. The makeup of the ration, the sanitary methods employed, the breed or strain of hens, arrangements for marketing the eggs, and some other questions, will need to be looked into before the poultryman is satisfied that he has done everything possible to increase his returns from this enterprise.

THE GENERAL METHOD OF ENTERPRISE ANALYSIS

The same general method has been used in studying each of the five enterprises discussed in this chapter. First, an attempt was made to appraise the output of the enterprise both in terms of value of the marketable products, and also by physical measures of the output per acre of land or per animal.

Next, the inputs of labor, feed, or other cost elements, were measured in physical terms as far as possible. When there were market opportu-

TABLE X. THE POULTRY ENTERPRISE

	JONES FARM		AVERAGE 278 FARMS
	1939	1940	1940
Number laying hens.....	250	350	180
Egg sales and home used.....	\$356	\$404	\$316
Poultry sales and home used.....	\$43	\$26	\$127
Total poultry increase.....	\$399	\$430	\$443
Total value of feed fed.....	\$157	\$293	\$272
Return over feed value.....	\$242	\$137	\$171
Value of feed purchased.....	\$30	\$80	\$108
Returns per \$100 of feed.....	\$254	\$147	\$164
Number eggs per hen.....	123	94	124
Egg income per hen.....	\$1.42	\$1.15	\$1.76
Meat increase per hen.....	\$.17	\$.08	\$.70
Total increase per hen.....	\$1.59	\$1.23	\$2.46
Value feed per hen.....	\$.63	\$.84	\$1.51
Return per hen over feed.....	\$.96	\$.39	\$.95

ities, the cost factors were sometimes expressed also in terms of value. If possible, these valuations of marketable cost elements were compared with the income received to get an index, though not an exact measurement, of the contribution which the enterprise made toward covering the farm overhead expense and toward the net farm income. These various indices were found to be most useful in comparison with the performance on the same farm in previous years, and next in comparison with performance on other farms.

The next step was to examine in detail the technique used in handling the crop or livestock enterprise to see if a change in method would reduce the expense or increase the output. At this point, the technique of analysis had to be modified to suit the peculiar problems of each

different enterprise. In studying crops, the analysis had to do chiefly with the effectiveness with which labor and horse labor were used, and with the methods of maintaining yields. In studying livestock enterprises, labor was less important, and the principal problem was how to make the most economical use of feeds.

Throughout such an analysis, it must be kept in mind that these detailed studies of enterprises are simply subordinate parts of a broader study of the farm business as a whole. The farmer must keep in mind not only efficiency in operation of each enterprise, but also the relative sizes of different projects, in order to make the most profitable use of the resources at his disposal. This problem of planning for the whole business will be discussed more at length in the following chapter.

REVIEW QUESTIONS

1. Describe the general process of analysis of an enterprise.
2. Would the analysis of two enterprises such as corn and oats give you a basis on which to decide whether the relative acreage of the two crops should be changed? Explain.
3. What factors would you use in measuring the output of a small grains crop? How would you measure the output of the hog enterprise? Contrast these two sets of factors.
4. Contrast the measures of input into the same two enterprises.
5. Draw up and explain a list of factors you would use in analyzing a steer feeding enterprise.
6. Draw up and explain a list of factors you would use in examining the efficiency and economy of a dairy enterprise.
7. Explain the meaning of the income per hundred dollars of feed fed to hogs.
8. What is the significance of the income from the cattle above marketable feed and cash expenses?
9. For what purpose would you compare the data from your farm with data from a number of other farms? What advantages would there be in comparing the performance of your own farm for several years past?

CHAPTER 19

USE OF ACCOUNTING DATA IN BUDGETARY CONTROL

The Problem

How can the farmer use data from his records of the past year to find out whether he lived up to his budgetary plans, and to improve his plan for the coming year?

COMPARISON OF THE BUDGET WITH PERFORMANCE

At the end of the record year, we are able to place a more definite evaluation on the budget plan than when it was made. Data from actual records permit us to subject the original plans to an acid test. For the first year of operation it is necessary to make plans solely on the basis of general impressions regarding the yielding capacity of the land and of the livestock. If records have been kept previously, as was the case on the John Jones farm, the budgetary plan can be made much more accurately. But even here, there will be some discrepancy between plan and performance, particularly in new enterprises and in those that are to be expanded or contracted. In any event, it will be very profitable to make a careful comparison between the plan which the farmer intended to put into effect and the performance which he actually achieved. Let us illustrate the process by which the comparison can be made.

Re-Examination of the Crop Plan

In Form I was shown John Jones' crop plan for the year. This was based on the yields of past years, but contemplated some shift in acreages, including the production of 6 acres of flax, a crop with which Jones had had no previous experience. How did his performance compare with intended production? The process of comparison is illustrated in Table XI.

Parallel columns are used to compare figures representing the plan and those showing actual performance for each important phase of the crop plan. Pairs of columns are thus used for crop acres, crop expenses, amount of production, amount of the crop that was fed, and amount sold. On the Jones farm, it is shown that acreages planted and harvested were about the same as those planned. With a favorable season and higher than expected yields, however, certain contrasts are apparent

TABLE XI. CROP PRODUCTION PLAN COMPARED WITH PERFORMANCE

	ACRES		EXPENSE*		PRODUCTION		AMOUNT FED		AMOUNT SOLD†	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Corn for grain.....	70	71	\$ 60	\$ 48	3,850 bu.	4,340 bu.	3,100 bu.	3,490 bu.	750 bu.‡	850 bu.‡
Corn for silage.....	8	7	60	54	88 T.	90 T.	88 T.	90 T.		
Oats.....	46	46	68	76	1,930 bu.	2,144 bu.	1,470 bu.	1,590 bu.	375 bu.‡	400 bu.‡
Flax.....	6	6	8	8	72 bu.	54 bu.			72 bu.	54 bu.
Alfalfa.....	19	19	80	79	47 T.	48 T.	47 T.	48 T.		
Sweet clover.....	10	10	20	24	pasture)					
Oat hay.....	13	13			13 T.	7 T.	13 T.	7 T.		
Soybeans.....	23	23	73	63	506 bu.	576 bu.			361 bu.	326 bu.
Pasture.....	20	20							110 bu.‡	130 bu.‡
Roads, farmstead, etc.....	25	25								
Total.....	240	240	\$371	\$352						

*Operator's share, does not include landlord's share of expense

†An additional pair of columns should be added for income from crop sales, if such sales are expected

‡Landlord's share.

between the two sets of data. Heavy corn yields meant that a smaller acreage of corn was needed to fill the silo, and this left an additional acre to harvest for grain. The extra acre and the high yields led to a total yield of grain 400 bushels greater than anticipated. Oats also yielded more than expected, while the flax and the oat hay did not come up to expectations. Crop expenses amounted in total to about the amount anticipated, although there were differences in some individual items. Amounts sold or turned over to the landlord (76 acres of land operated was rented) varied from the budgeted amounts in accordance with the variations in yields.

The Livestock Plan

Tables XII and XIII permit comparison of the plan with performance in the livestock enterprises. As the year progressed, Mr. Jones changed some of his feeding plans in some enterprises, and in others found that more feed was needed than expected. Thus, with heavier yields of oats than anticipated, he was able to put relatively more oats and less corn in the rations for milk cows and horses. Feeder cattle and hogs required more grain than was expected. With the young cattle he decided to use more roughage and less grain than originally intended.

Greater quantities of supplements were used for most enterprises than originally intended. Also prices of commercial feeds rose during the year along with the prices of grain. Consequently, \$70 more than expected was spent for commercial feeds.

Production of livestock also differed from the budget in various ways. The milk cows produced slightly more than expected. Feeder cattle when sold weighed slightly less than the budgeted figure, but the calves were kept on hand longer than planned and brought in \$100 more than according to the plan. Also, more of the old cows were sold off than intended. Hogs produced very nearly the expected amount of gain, but the poultry was down rather badly from the budget.

Comparison of the Revenue Figures

Budgeted receipts and expenses are compared with actual revenues in Table XIV. Heavier purchases of feeders and of replacement animals than allowed for in the budget offset the heavier sales. A large amount of corn was sold out of inventories, thus swelling crop receipts. But \$600 of this was offset by corn purchased early in the year. It should be noted here that the total sales or receipts may be affected by these changes in inventories, which may not have been in the farmer's mind when he made his original plans. Consequently, figures representing the

TABLE XII. LIVESTOCK EXPENSES—PLAN COMPARED WITH PERFORMANCE

LIVESTOCK ENTERPRISE	HOME GROWN FEEDS				PURCHASED FEEDS				OTHER EXPENSES	
	KIND	AMOUNT		KIND	AMOUNT		VALUE		Plan	Actual
		Plan	Actual		Plan	Actual	Plan	Actual		
Milk cows	Corn	300 bu.	280	L. O. M.	1,200 lb.	2,000 lb.	\$ 24	\$ 46	\$ 5	\$ 8
	Oats	360 bu.	465							
	Alfalfa	18 T.	20 T.							
	Silage	42 T.	44 T.							
Feeder cattle	Corn	690 bu.	750 bu.	L. O. M.	3,500 lb.	4,400 lb.	70	102	5	.
	Oats	230 bu.	275 bu.							
	Alfalfa	14 T.	13 T.							
	Silage	23 T.	24 T.							
Other cattle	Corn	210 bu.	190 bu.
	Oats	140 bu.	120 bu.							
	Hay	20 T.	24 T.							
	Silage	23 T.	22 T.							
Hogs	Corn	2,020 bu.	2,100 bu.	S. B. meal Tankage Mineral	1,000 lb. 5,000 lb. 600 lb.	2,000 lb. 4,600 lb. 700 lb.	18 125 18	40 112 23	35	42
	Oats	320 bu.	350 bu.							
	S. milk	4,000 gal.	4,200 gal.							
Poultry	Corn	260 bu.	225 bu.	Poultry feed Tankage	2,000 lb. 700 lb.	2,400 lb. 400 lb.	55 18	57 10	.	6
	Oats	260 bu.	300 bu.							
	S. milk	500 gal.	600 gal.							
Horses	Corn	120 bu.	100 bu.
	Oats	160 bu.	180 bu.							
	Hay	2 T.	3 T.							
Total							\$328	\$369	\$45	\$56

changes in inventories must be introduced if a fair comparison is to be made between anticipated and actual income. The change in the corresponding inventory must be borne in mind when any particular income or expense item is compared with the budget.

Another modification must also be introduced in the present case. Down to and including the figure for operator's net income, the data in Table XIV refer to the operator alone. But 76 acres of the land operated had been rented on a crop share basis. Statements of revenue which were presented earlier in Forms 28 and 29 dealt with the entire farm. If a comparison is desired with these statements, it is necessary to take the landlord's share of receipts and expenses into account. Estimates of these can be added to the comparison, as shown at the bottom of Table XIV.

BUDGETARY CONTROL WITHIN THE YEAR

To be of maximum service the accounts should be used within the year for the current control of the business. The budget generally provides for some improvements within the year, but the income may be greater or smaller than expected. Suppose, for instance, that a new fence was to be built during the slack season of the late summer, and at the middle of the year the income is found to be running lower than in previous years. This improvement may then be deferred until a more opportune time and financial embarrassment avoided.

It may be possible by watching the expense or income on various enterprises and modifying the plans to economize feeds or cash outlays, or, if results are more favorable than expected, to exploit some favorable enterprise further. If feed records are kept, it is often possible to detect unfavorable returns and to modify the rations while there is still an opportunity.

Another current use of the records is that in closing an enterprise before the end of the year, it is profitable to summarize its records and analyze it while fresh in mind. Thus, much more information is likely to be obtained from a study of the steer enterprise if the feeding records, records of rates of gains, and financial returns are studied immediately after the cattle are sold. In this way favorable or unfavorable tendencies come to light more clearly, and it is possible to modify plans for the next feeding period well in advance.

CHANGING TO ALTERNATIVE ENTERPRISES

The question of whether or not to change from one enterprise to another which gives better promise often comes up. It may either mean the complete replacement of one enterprise such as oats by another

TABLE XIII. LIVESTOCK PRODUCTION PLAN COMPARED WITH PERFORMANCE

LIVESTOCK ENTERPRISE	PRODUCTION				DISPOSAL				
	KIND	AMOUNT		USED ON FARM		AMOUNT SALES		VALUE SALES	
		Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Milk cows	3,600 lb.	3,801 lb.	210 lb.	222 lb.	3,390 lb.	3,579 lb.	\$1,017	\$1,200	
Feeders	20,700 lb.	19,130 lb.			20,700 lb.	19,130 lb.	1,863	2,009	
Other cattle	1,600 lb.	2,450 lb.	200 lb.		1,400 lb.	2,450 lb.	140	245	
	3,300 lb.	5,648 lb.			3,300 lb.	5,648 lb.	155	275	
Hogs	32,000 lb.	32,197 lb.	600 lb.	650 lb.	31,400 lb.	31,697 lb.	2,198	1,755	
Poultry	3,500 doz.	2,751 doz.	150 doz.	222 doz.	3,350 doz.	2,571 doz.	500	377	
	150	85	50	25	100	60	75	38	
Total							\$5,948	\$5,899	

such as wheat, or it may more often be concerned with the proper balance between two enterprises already on the farm, such as the hogs and cattle.

In general, the decision can be made on the basis of the financial and production records. Complete cost records afford but little in the way of additional information. Computation of costs on any one enterprise is conditioned by the requirements of the others for labor, land, buildings, equipment, power, and other factors.

Further, it will be impossible to base a decision wholly on data

TABLE XIV. INCOME SUMMARY—PLAN COMPARED WITH ACTUAL

	EXPECTED INCOME	ACTUAL INCOME
<i>Receipts</i>		
Livestock sales.....	\$5,948	\$5,899
Less livestock bought.....	811	889
Net livestock sales.....	\$5,137	\$5,010
Crop sales.....	433	2,290
Products to household.....	189	188
Government payments.....	1,150	1,261
Miscellaneous receipts.....		96
Gross sales.....	\$6,909	\$8,845
<i>Expenses</i>		
Crop expense.....	\$ 371	\$ 352
Livestock expense.....	45	56
Other operating expense.....	710	908
Total operating expense.....	\$1,126	\$1,316
Feed bought		
Commercial.....	\$ 328	\$ 389
Farm raised.....	300	906
Fixed expenses.....	790	793
Total expenses.....	\$2,546	\$3,404
Investment in new equipment.....		\$ 602
Total expenditures.....	\$2,546	\$4,006
Sale and salvage of equipment.....		23
Net receipts.....	4,365	4,762
Subtract decrease in inventories.....		499
Operator's net farm income.....	\$4,365	\$4,363
Add landlord's receipts.....	\$ 494	\$ 652
Subtract landlord's expenses.....	110	117
Net income, entire farm.....	\$4,749	\$4,898

from the two enterprises concerned. Interrelationships between these and the rest of the farm must be given fully as much consideration. Thus, a baby beef enterprise affects the pasture requirements of the farm and the disposition of corn, roughage, and other crops produced. In the winter the baby beef enterprise uses labor that would otherwise be put to little or no productive use. In summer the same enterprise demands attention at a time when the labor is needed by growing crops. The cows and fattening calves both need shelter, and if barn accommodations are limited, this means smaller quarters for other livestock. At the same time, the direct expense on the beef enterprise may be quite small and may be practically limited to the purchase of small amounts of protein supplements for balancing the home-raised grains.

The cost of production of the beef may be of little significance in comparison with changes in status of other enterprises. The only way it is feasible to decide whether to include this enterprise is by drawing up two farm plans or budgets, one with and the other without the beef enterprise. The total expenses and total income on the whole farm business in the two alternative plans must be compared to see whether the cattle add more than the reduction they cause in the hog and other enterprises. It is the *maximum net farm income* that must be the objective, and not the profit or loss on an individual enterprise.

CHOOSING BETWEEN OATS AND WHEAT

The nature of the problems in planning the budget for the following year can best be made clear by illustrations. Suppose we first take the case of a farmer who has been raising oats but who, because of the low prices of oats, considers replacing them with wheat. This case is taken up first because it is one of the simpler ones and illustrates the relationship between the crops and the other farm enterprises.

This man has been raising 20 acres of oats and has a year's record on the costs of his oat crop. He also has information on the requirements and returns on oat and wheat production on a group of other farms nearby, on which detailed accounting records have been kept. From these data, which are summarized in Table XV, he is able to compare the requirements on the oat and wheat crops on similar farms and to compare his performance with that of his neighbors on oats, but not wheat.

The yield of oats on this farm has been averaging approximately 44 bushels, which is just under the average of the group of farms. Wheat has been averaging 22.6 bushels in the neighborhood and presumably would yield as well on this farm. Oats have been selling for about 35 cents per bushel on the farm, and wheat for approximately 90 cents.

The wheat crop would thus promise to bring in approximately \$5.00 per acre more than the oats, or \$100 more for the 20 acres.

The next step is to examine the outlays in the production of wheat as compared with oats. The oats have required about 3.5 bushels of seed per acre valued at about \$1.70, and wheat will require 1.8 bushels valued at \$2.20. This will make expense for seed about \$10.00 greater on 20 acres of wheat. Differences in other actual expenses are negligible. Wheat, however, may be expected to require more hours of labor and

TABLE XV. OATS VS. WHEAT

	OATS ON THIS FARM (3 yr. av.)	OATS AV. OF 28 FARMS	WHEAT AV. OF 28 FARMS	EXPECTED COST AND RETURNS ON 20 ACRES	
				Oats	Wheat
Acres raised	16.7	28.2	18.1		
Yield per acre, bu.	43.8	44.1	22.6	882	452
		PER ACRE		TOTAL	
Seed, bu.	3.2	3.7	1.8	74	36
Value seed	\$1.60	\$1.85	\$2.70	\$33.20	\$47.00
Twine, lbs.	2.6	2.6	3.1	52	62
Value twine	\$.34	\$.34	\$.40	\$6.80	\$8.00
Labor, hours	9.7	9.0	11.7	180	234
Horse hours	13.8	13.1	18.2	262	364
Tractor hours	.4	.5	.7	10	14
Straw, tons	.7	.7	.8	14	16
Price, per bu., grain	\$.35	\$.35	\$.90		
Value grain	\$15.33	\$15.43	\$20.34	\$306.60	\$406.80
Value straw	\$2.10	\$2.10	\$2.80	\$42.00	\$48.00

horse labor than oats since more care and a greater amount of work are needed in preparing the land for seeding. From records on cost route farms we would expect this to amount to about 50 hours of labor and 100 hours of horse work. At 30 cents per hour for labor and 12 cents for horse work, this amounts to \$27. This, together with the greater value of the seed wheat, would increase the expense by \$37 over the oats and would cut the net advantage of the wheat from \$100 to about \$60.

Competition of Crops for Labor

However, the labor on the wheat is required at a time of year when it is more likely to be needed by other crops. It may be seen from Figure 14 that wheat is cut in the early summer at a time when there are other heavy labor requirements by the corn crop and hay harvest. The values of the labor used by the two crops can hardly be

compared directly by the number of hours concerned or by placing on them the same money value per hour.

Labor is not the only consideration in taking care of the crop. Since the small grain normally follows corn in the rotation, we must also consider if it will be possible to get the corn off the ground in time to plant the wheat. On this farm 12 to 15 acres of corn are put in the silo each year. This will make it much easier to plant wheat, since it will not be so difficult to hog down the remaining few acres or cut it for fodder and

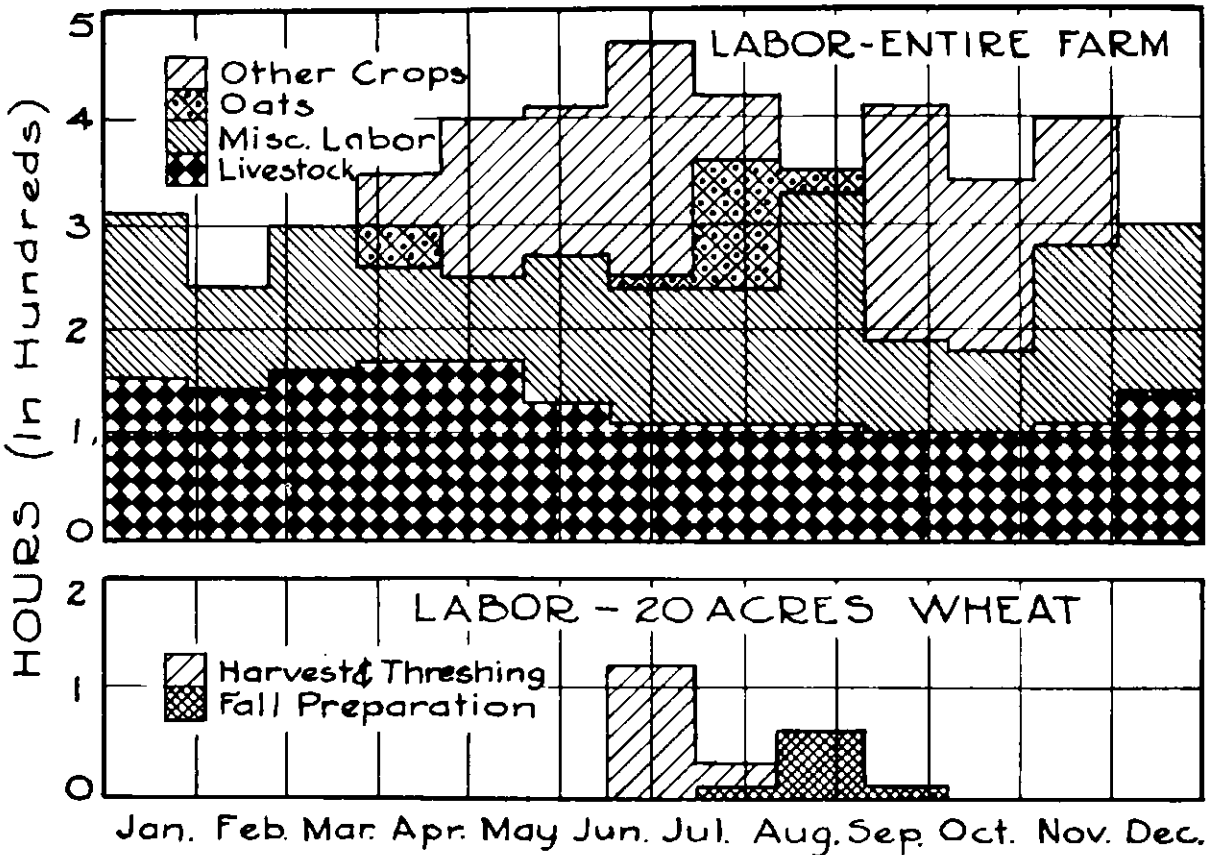


Fig. 14. Labor Requirements—Wheat and Other Enterprises

carry it off the ground. On other farms where no corn is ensiled, the difficulty of clearing the land from corn may make it practically impossible to plant wheat. In the spring, however, since there would be no oats to plant, it would be possible to start earlier on the spring plowing for corn.

In the harvest season the competition of other crops for labor is more serious. The weeks in which the wheat harvest would fall already contain the peak season for labor. If wheat is added, this peak will be even more pronounced. This may result in retarding the hay harvest or in rushing through the final cultivation of the corn and so affect

other crops disadvantageously. If wheat is planted, it will be necessary to hire additional labor just when labor is the hardest to get.

Effects on Livestock

A change from oats to wheat will also have an effect on the livestock enterprises. About 200 to 250 bushels of oats raised on this farm have generally been sold. The rest has been fed, the greater part of it to horses. If wheat is raised instead of oats, it will be necessary to reduce the size of some of the livestock enterprises or else buy grain to take the place of the oats. However, since the wheat crop is, in this case, of more value than oats, it would be possible to do this with a worth-while profit if the feed supply were the only question involved.

To sum up, it would seem that the net farm income could be increased by about \$60 by raising 20 acres of wheat instead of an equal acreage of oats. On this farm, cutting corn for silage makes it possible to plant wheat without much trouble. In the harvest season, however, the fact that the wheat harvest would compete with work on corn and hay may prove a serious obstacle. This fairly simple budget problem, in fact, touches most of the other important enterprises of the farm when we have examined all the questions concerned. Nevertheless, if the method outlined is followed, it is possible to lay before the farm operator all the necessary facts on which to base his decision.

CHOOSING BETWEEN HOGS AND FEEDING STEERS

Changing the relative sizes of livestock enterprises generally involves more complicated and difficult problems than changing crops. Changing the size of a livestock enterprise means changes in the size of various crops raised for feed and the supply of feedstuffs available for other livestock. In addition to this, there is also the problem of seasonal labor requirements, as with crops. The nature of these questions may be made more clear by a problem involving changes in relative sizes of the hog and feeder cattle enterprises. The farm in question consists of 160 acres. On it there is a rough area of 37 acres best left in permanent pasture. This and 24 acres of rotation pasture have been used in feeding about 44 head of steers per year, besides a small general-purpose cattle enterprise. The hog enterprise has consisted of 8 sows producing about 15,000 pounds of pork per year.

The steers have been bought in the fall and turned into the stalk fields for a month or six weeks. They have been started on feed during the winter and finished on pasture in August or September. During the winter they have consumed about 90 tons of silage and 12 tons of hay

besides 800 bushels of corn. However, the cattle have not given a very large return on the feed and labor; and the farmer is considering raising more hogs to replace at least part of the steers. It is not possible to replace the steers entirely by hogs because of the permanent pasture land. After allowing for pasture for the breeding herd and the horses, there is still permanent pasture enough for one carload of 20 steers. But there would be no need for the 24 acres of rotation pasture, and the crop system could be changed to a 4-year rotation instead of a 5-year one. The question now is whether or not it would be possible to replace the other 24 steers with hogs.

Effect on Crops

The two livestock enterprises are closely related to the crop system. With the silage requirements of the steers reduced by more than half, it would not be economical to fill the silo. This would make it necessary to produce more hay for roughage for the remaining carload of steers in place of the silage. Corn previously cut for silage could now be husked for grain. Reduction in the pasture to the 37-acre minimum would make available 24 acres more land for the crop system. For 20 steers and the other livestock, the farmer estimates that it would be necessary to cut about 28 tons of hay, if hay is to be used as the sole roughage. This would call for about 25 acres for hay instead of 20, and would mean considerable modification in the crop system as shown in Table XVI.

The farm consists of eight fields differing slightly in size. To conform essentially to a 4-year rotation, and to raise as much as possible of the most valuable crop, corn, with the field layout on this particular farm, approximately 56 acres of corn, 24 of oats, 8 of wheat, and 25 of hay would be planted as shown in Table XVI. As far as the financial returns are concerned, it would be desirable to raise more wheat and less oats. But no corn is now to be cut for silage, and it becomes more difficult to clear the land of corn in time to plant wheat. It is possible to plant about eight acres of wheat because this man counts on hogging down five or six acres of corn and on cutting two or three acres for fodder.

Not only the acreages but also the yields of crops would be changed under the new system. This farm has been averaging 60 bushels of corn per acre, since it has been in corn only two years in five. But now with two years of corn in four, we could not count on as high a yield. Consequently, in Table XVI the yield is estimated at three bushels per acre less than previously obtained. At this rate a total production of 3,180 bushels might be expected from the 56 acres of corn instead of 2,060 from 32 acres.

The total corn production would now be about 1,100 bushels greater than before. In addition to this, the corn requirement of the steers would be reduced by about 400 bushels, but not more than this because the steers previously received about 450 bushels of corn in silage in addition to that fed as grain. The extra 1,500 bushels now available for hogs or

TABLE XVI. REVISION OF A LIVESTOCK SYSTEM

	PRESENT SYSTEM	CONTEMPLATED SYSTEM
Hogs:		
No. sows.....	8	18
No. spring pigs.....	43	90
No. fall pigs.....	32	72
Lbs. pork produced.....	15,400	35,000
Bu. corn to hogs.....	1,200	2,600
Bu. oats to hogs.....	130	200
Tons tankage.....	1 ³ / ₄	5 ¹ / ₄
Receipts from hogs.....	\$1,587	\$3,500
Steers:		
No. head fed.....	44	20
Weight when bought.....	765	750
Weight when sold.....	1060	1050
Gain per head.....	295	300
Lbs. beef produced.....	10,800	6,000
Tons cottonseed meal.....	6	3
Bu. corn to steers.....	830	450
Cost cottonseed meal.....	\$300	\$150
Tons hay.....	12	15
Tons silage.....	92	
Price when bought, per cwt.....	\$7.80	\$8.00
Price when sold.....	\$9.60	\$10.00
Total increase in value.....	\$1,850	\$900

CROP SYSTEM

	PRESENT SYSTEM		CONTEMPLATED SYSTEM	
	Acres	Yield	Acres	Yield
Corn.....	32	2,060 bu.*	56	3,180 bu. †
Silage.....	13	105 t.		
Oats.....	16	700 bu.	24	1,050 bu.
Wheat.....	8	175 bu.	8	175 bu.
Hay.....	20	22 t.	25	28 t.
Pasture.....	61		37	
Lots and roads.....	10		10	
	160		160	
Crop Sales				
Wheat.....	150 bu.	\$135.00	150 bu.	\$135.00
Oats.....			200	80.00

*Including corn picked up after silage.

†Yield estimated at 57 bu.—3 bu. less than obtained under old system.

other livestock would be capable of producing about 20,000 pounds of pork at the rate of gains obtained on this farm in the past. This would mean increasing the number of sows bred from 8 to 18.

Changes in Labor Requirements

The labor requirements of the farm would also be changed considerably as shown in Figure 15. The difference in labor between the hog and steer enterprises would not be so great as between the old and new crop systems. In the first place, the heavy labor load at silo filling time would disappear completely in the new system. Second, the requirements a little later in the fall in picking corn would be three-fourths greater. The requirements in preparing the land and planting corn and oats in the spring, and in cultivating corn would be increased, as would the labor at hay harvest.

Effect on Income

The farm income would be reduced about \$950 by cutting the number of steers fed from 44 to 20, as shown in Table XVI. The production of 35,000 pounds of pork instead of 15,000 would increase the income by about \$1,900 at the same level of prices for hogs. At the same time, the greater acreage of oats would leave a surplus for sale, increasing the income from sales of crops by probably \$100. The labor expense would probably be increased somewhat, and the purchase of more tankage for hogs would more than offset the reduction in the cottonseed meal for steers. In all, the changes incidental to the shift toward greater hog production might be expected to increase net income by \$800 or \$900. The net result would be a more intensive farming program, with changes in the crop system almost as great as with the livestock.

REVISION MUST TREAT THE FARM AS A WHOLE

In each of these examples of budget revision it was necessary to take into account effects of proposed changes on other enterprises, as well as on those directly concerned. In each case livestock enterprises were affected as well as crops. Labor and power requirements were modified as well as direct out-of-pocket expenses and direct receipts. It may not be amiss here to outline the general plan of procedure in any comprehensive budget revision which occurs after records have been kept for a year or more.

It was said in Chapter 2 that the convenient place to start in planning the original budget was with the crops, since the amount and type of production depends on characteristics of the land. The first step, then,

is to consider whether or not the net farm income could be increased profitably by a revision of the rotation or crop system. We should consider the amount and value both of salable crops and of feeds to be consumed by the livestock. The records will furnish information on yields and disposition of crops, as well as on direct expenses incurred and direct

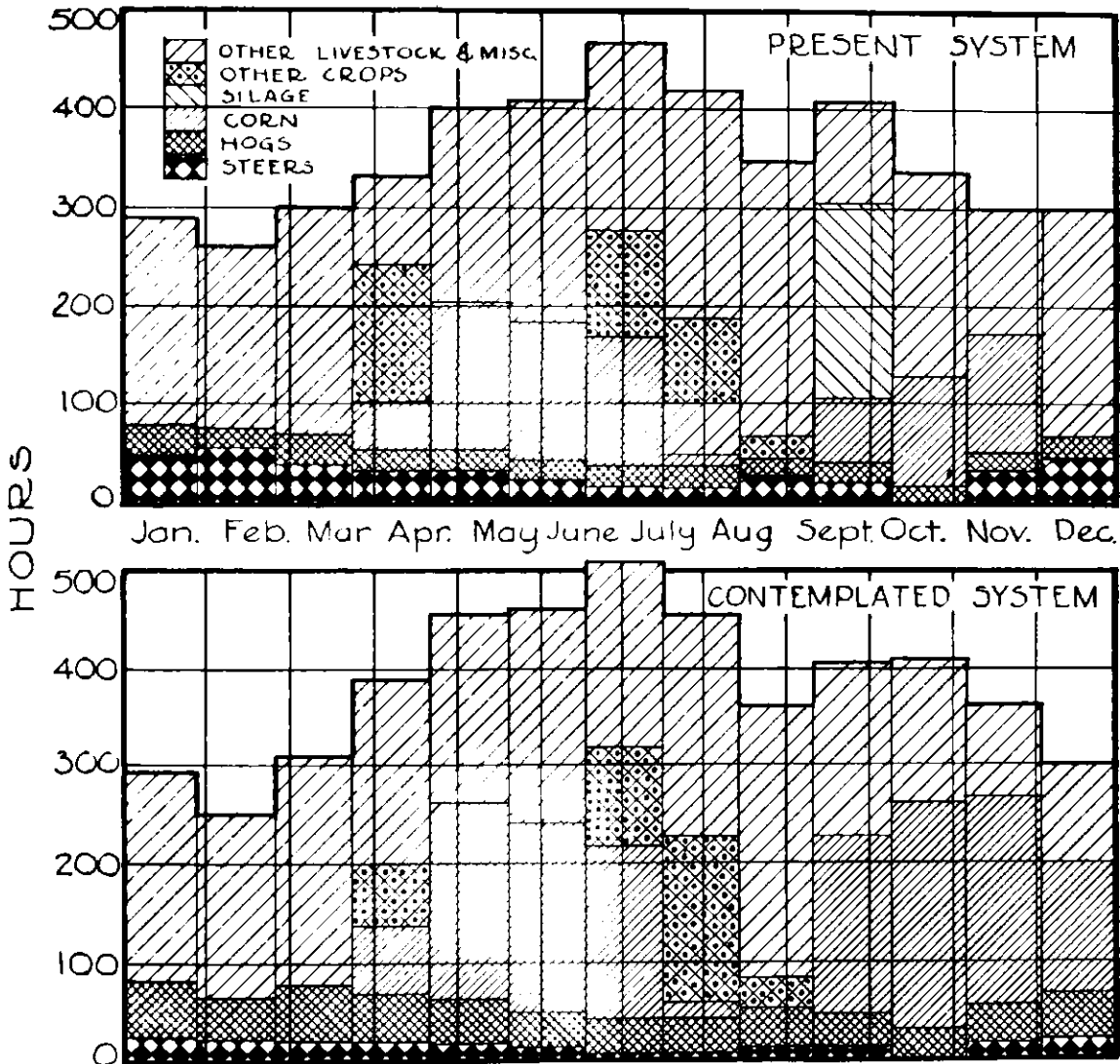


Fig. 15. Labor Requirements—Present and Contemplated Systems

income from the crop sales. If there are labor records, they will show the seasonal labor requirements of the crop system and will suggest any need for lightening the load in peak seasons.

The second major step is, logically, to make a similar examination of the livestock enterprises. This will include both a consideration of the degree to which livestock enterprises articulate with the rest of the farm,

and also of the efficiency of their operation. Some of the more important questions to be raised are: Do livestock enterprises conflict with crops in their seasonal demands for labor; are they such as to make maximum returns for feed crops; or is it necessary to buy large amounts of feeds or sell crops that might profitably be fed? Another important question is whether or not the buildings and equipment on the farm would permit changing to another type of livestock production.

The third step is to see if complete utilization of expense factors is being obtained. Is the labor fully used the year round, or would some added employment in slack seasons increase the income? Is the power used on the farm the most economical possible? Could some horses be dispensed with and their feed given to income-yielding stock? Would a tractor be more economical for some purposes? Could more modern or efficient equipment be used to conserve labor in peak seasons? Could labor be saved by modifying the layout of buildings or fields?

Net Farm Income the Criterion

The evaluation of any proposed budget is in the amount of net farm income it promises to produce regularly from year to year. Obtaining the greatest net income involves two things: first, a budget which plans for the fullest possible utilization of available resources; and, second, the highest possible efficiency in current farm operation. For the first of these, the farm records provide the basic information. For the second, the records permit computation of efficiency factors capable of showing the farm manager when he has deviated from reasonable standards of performance.

At the same time that relationships between enterprises are being examined, the internal efficiency of operation in each one must also be watched. It is possible that more favorable results might be obtained by eliminating low-producing cows, sows or hens, by modifying rations used by livestock, or planting higher-yielding varieties of crops than by any feasible changes in the farm organization.

It is useless to manage efficiently a badly organized business, but it may be quite as unprofitable to operate a well organized one inefficiently. To give attention to efficiency alone would be to assume that the organization is the best possible under existing conditions, and this is seldom justified. On the other hand, to give attention to the farm's budget only is to assume that efficiency is already at the highest possible level in all departments. The budget must be framed in terms of attainable performance on the farm in question, but it will be defective from the start if it accepts, uncritically, the rates of performance already attained.

PART V
SOME SPECIAL PROBLEMS

CHAPTER 20

SOME ACCOUNTS CALLING FOR SPECIAL CONSIDERATION

The Problem

How is an account to be kept for orchards or perennial crops in which investments are made some time before any returns are received? How are transactions between the farm business and the household or outside enterprise to be kept account of? How can accounts be kept for a partnership? These are some of the special accounting problems which the farmer may encounter.

PERENNIAL CROPS

If an exact inventory were made, it would be necessary to put some sort of valuation on fall preparation for the next year's crops. Fall plowing would be carried forward into the next year as an inventory at cost, as nearly as that can be ascertained. Wheat in the ground would be inventoried at the farm value of the seed plus the cost of planting. These would be inventoried at the end of the year in which the costs were incurred, because they represent investments from which returns will be received later on.

The same general principle determines the procedure in handling perennial crops such as alfalfa, asparagus, or small fruits. The inventory at the end of the year when the crop is planted consists of the cost of the seed plus the value or cost of labor, horse labor, and equipment used in planting. It will be practically impossible to ascertain any exact value of this work. A record could be kept of the amount of time spent in preparing the land and planting, or the time may be estimated and then reasonable rates applied for man and horse labor and the use of equipment.

As an ideal accounting procedure, the cost of planting a perennial crop such as alfalfa should be distributed over the years during which it continues to yield. A reasonably conservative period of life should be assumed as a basis for the depreciation charge necessary to accomplish this purpose.

This ideal procedure, however, will often be impossible to attain. In the first place, no very definite rule can be given for formulation of a

depreciation rate. The length of life cannot be assumed with much assurance. And neither will it be known, when the crop is first planted, whether yields will be relatively uniform for several years until the crop is plowed up, or whether they will decline after two or three years. In the first case, a uniform annual depreciation rate would be most reasonable. In the second case, the depreciation should vary more or less with the yield.

Indeed, the crop may winterkill in the first year. If this occurs there is nothing to do but charge the cost of seeding to *loss and gain*. If the crop dies out at the end of two years instead of lasting four or five as expected, the remaining value of the inventory of planting costs must, again, be carried to *loss and gain*. It is true that the loss of an occasional seeding is a type of expense that must be considered in the long run in deciding whether to grow alfalfa. But this does not affect the valuation of the specific inventory after a stand has died out. The inventory must show the present value of the business, and the value of a stand of alfalfa that winterkilled is obviously zero.

ACCOUNTS FOR ORCHARDS

Accounts for an orchard do not differ in principle from those for perennial crops. The investments made in planting the orchard and bringing it into bearing are carried forward until it begins to yield returns. Then the total accumulated investment is depreciated at a rate which conforms to the expected life of the orchard.

Planting the Orchard

When the orchard is planted, an account should be opened to summarize each principal type of investment or expense incurred. The largest initial investment will be for the purchase of the land. It differs from the other investments in that it will still be present after the trees have been cut down. It should, therefore, be kept in an account by itself and not confused with the orchard which is growing on it.

When the orchard is planted, an account should be opened for nursery stock and another for any labor hired to prepare the land or to plant trees. Other accounts will be for fertilizers, use of equipment, use of horses or tractor, rent or interest on investment in land, taxes, and other expenses.

After planting is complete and the trees have been taken care of for the first year, the various expense accounts just described will be closed into a central account for *orchard investment*, which will appear somewhat as below. The balance will then be carried forward as the opening

inventory for the next year. Each year until it begins bearing, the orchard is considered to be worth what it has cost up to that time.

ORCHARD INVESTMENT ACCOUNT (FIRST YEAR)

		<i>Debits</i>			<i>Credits</i>
Dec. 31	Nursery stock.....	\$320	Dec. 31	Closing inventory	
	Labor.....	125		to proprietor.....	\$840
	Equipment use.....	60			
	Horse work.....	110			
	Taxes.....	30			
	Materials.....	35			
	Rent.....	160			
		\$840			\$840

The Period of Development

During the developmental period of the orchard new investments continue to be made from year to year. Labor hired for pruning and spraying should be charged against an account for *orchard labor*. Other accounts will be for the use of horses, equipment, purchases of spray material, and other current expenses. The balances of these accounts will be added to the inventory value of the orchard at the end of each year.

In the second year, a new type of expense begins to appear. This is an interest charge on capital already invested in the orchard. If any part of the invested capital is borrowed, it will be charged at the rate actually paid. Interest on owned capital should be charged at a conservative rate, usually the net rate which could be obtained for capital in relatively long-time investments.

Interplanted Crops

During the early years of development, interplanted crops may be used to bring in some returns. How should expenses be divided between these and the orchard itself? The most satisfactory method seems to be to treat interplanted crops and the orchard as separate enterprises. Rent of the land may be divided between orchard and interplanted crop in proportion to the amount of land used by each. If the trees are planted 36 feet apart and the interplanted crop occupies strips of 24 feet between each pair of tree rows, two-thirds of the rent will be charged to the interplanted crop and one-third to the orchard. Other joint expenses are divided in a similar fashion. Expenses applying wholly to one enterprise or the other are not divided.

Another method of handling interplanted crops is to charge all expenses to the orchard and then credit intercrop receipts to the orchard.

This is less likely to be satisfactory. During the early years of the orchard, the trees do not need and do not use all the land. The purpose of the interplanted crop is primarily to obtain some return from the land not needed by the trees. Losses or gains from the two enterprises should not be confused. If the intercrop should be a failure, a combination of the two enterprises would result in loading the orchard account with expenses which are not necessary to it. If the intercrop should yield a high return, this might completely offset current investment in the orchard or even result in a credit balance so that it would appear to have cost nothing.

Accounts for the Bearing Orchard

When the trees come into bearing, the accounts are changed considerably. An *orchard operation* account will now be opened. Current operating expense accounts will thereafter be closed into it rather than into *orchard investment*. Second, several new expense accounts will be opened. There will be expenses for harvesting, purchase of containers, marketing expenses, and possibly advertising. These will all be closed into *orchard operation*. Third, accounts must be opened for sales of fruit. Generally, there should be a separate account for each main variety.

Depreciation of Orchard Investment

A fourth change is that, after the trees come into bearing, the *orchard investment* account must be depreciated and depreciation charged against the receipts of each year. The proper rate of depreciation is likely to be hard to determine with satisfaction.

The productive life of the orchard is quite uncertain. Whatever is known of the life history of other orchards in the neighborhood should be taken into consideration. The length of bearing period of any particular orchard will be affected by the care it receives. Still, the length of time it will be profitable to operate the orchard is very uncertain, so the estimate should be a conservative one.

The next problem is to decide on a method for distributing depreciation. The ideal method would probably be some way by which an equal depreciation charge would be made against each bushel of fruit raised during the entire productive life of the orchard, but this is impossible since the number of years and the yield per year are both largely unknown. A uniform charge per year would also be objectionable since it would result in heavy charges against the light yields of the first few years and the last few years of bearing. Probably a method which will give increased charges until the orchard reaches full bearing and a

uniform rate thereafter will be most satisfactory in the long run. Thus, if the orchard is expected to increase in bearing for 5 years and to bear for 20 years thereafter, a depreciation charge of 2½ per cent might be made the first year and this increased by ½ per cent for each of the next four years. Thereafter, the 4½ per cent rate would be used up to the last year or two, when the distribution of the balance might be readjusted in accordance with the outlook at that time. Of course, this is merely one possibility. There are many other systems which might be used.

THE PERSONAL ACCOUNTS

During the year the farmer is continually taking farm produce for use in the household, or is taking funds from the sale of farm produce to buy groceries or clothing. On the other hand, there are frequent personal contributions to the farm business. Funds obtained from outside sources may be used for the farm. The farmer and members of his family devote their time to work for the farm, as well as providing board and lodging for the hired labor.

It will be necessary to credit the farm for anything withdrawn from the business and to debit it with the personal contributions before the true profit or loss on the business can be found. Farm produce used by the household is really a part of the income from the farm even though it was not received in the form of cash; and the labor or other services of the proprietor are really costs against the business even though not paid for on the same terms as the hired labor.

For convenience in summarizing these transactions, a *personal* account and an *outside investment* account are often used. The net withdrawals or contributions are then carried to the *proprietorship* account as single figures.

The outlay for groceries, clothes, and other personal uses nearly always comes out of the same cash account as the farm expenses; consequently, it is easier to check up the accuracy of the accounts, and particularly of the cash account, if a complete record of the personal transactions is kept.

Produce raised on the farm and used by the family is debited to the *personal* account and credited to the farm enterprise concerned at a reasonable value; that is, usually at the market price minus the cost of delivery to market. If labor or teams are used in cultivating a garden for the family, this should be charged at the rates for such work prevailing in the neighborhood. It will usually be necessary to estimate the amounts of many of the farm products as well as their value, since an actual record of eggs or cream used in the house from day to day is seldom kept. Such

estimates may be made at the end of the year, although monthly estimates are generally more accurate.

In cases where farm products, such as eggs, are exchanged for family supplies, such as groceries, the farm enterprise concerned should be credited for the value of the produce and the *personal* account debited for the groceries received.

On the other side, the *personal* account should be credited for the labor of the proprietor and members of his family at rates corresponding to the wages that would be necessary to hire the same work done. Board for the hired man should be credited to the *personal* account at the cost involved. The *labor* account should be debited for both of these items.

The *personal* account should be charged for the use of the house and any other buildings used by the family, and the *land and buildings* account credited for the same. Sometimes, the valuation of these buildings is left out of the farm inventory, making these entries unnecessary.

In closing the accounts the net withdrawal through the *personal* account is carried directly to *proprietorship* rather than to *loss and gain*. The *loss and gain* account is used only for the purpose of summarizing the income and expenses on the farm business. The net loss or gain shows how much was made on the operation of the farm. The net personal withdrawal shows how much of this was taken out of the business by the proprietor and spent.

OUTSIDE INVESTMENT ACCOUNTS

There are frequently investments in threshing rigs, stocks or bonds, or some property not a part of the farm, for which it is desired to keep accounts without opening an entirely separate set of books. If work is done with a custom threshing rig, or some similar outside investment, the farm *labor* account should be credited for it and the outside enterprise debited. If, on the other hand, the farm receives some service from the other property, it should be charged in the same way as in the case of personal accounts.

There is no necessary limit to the number of outside enterprises that can be carried in the same set of books with the farm business. They all have a common proprietorship, and transfers between them can be handled the same as between separate sections of the same business, or between personal and farm accounts. The only caution to be observed is in making sure that all transfers are duly recorded.

At the end of the year it will be necessary, as with the *personal* account, to close the outside investments into some account other than *farm loss and gain*. A separate loss and gain account may be used and the net loss or gain on the various outside enterprises then carried to *proprietorship*. If there are several investments, the former would be the preferable policy. This would keep the *personal* account free for the recording of personal withdrawals and contributions only and would permit a summary of the outside investments in figures unobscured by the farm or personal transactions.

Investment in outside accounts will be kept separate from the *farm net worth* for the same reason as the different loss or gain figures. The *proprietorship* account, therefore, will frequently contain more than one figure of net worth, as *farm net worth*, *outside net worth*, and so on.

PARTNERSHIP ACCOUNTS

A partnership is a business organization in which two or more persons have put together their capital, or capital and labor, or professional ability, without incorporating, and with the intention of sharing the profits. The contributions of capital may be equal or unequal. The profits may be shared equally or in some other ratio agreed upon.

It is very advantageous to have a regular written agreement specifying the proportions of capital to be furnished by each partner and the proportions in which the profits are to be shared. Many arguments and much litigation is avoided thereby. A written contract is not necessary, however; the partnership may be set up by an informal oral agreement. There is greater need for careful bookkeeping in the case of a partnership than in a business with a single proprietor. The accounts are needed for the same purposes as with the individual proprietor, but there is the additional need to keep straight the business relationships between the partners and to assist in the division of profits.

The Opening Entries

The differences in accounting technique between a partnership and a business owned by a single individual rest on the differences in proprietorship. These appear when the books are first opened. Since there are two or more proprietors, it is necessary to open more than one account for capital, crediting each partner for his contribution.

Suppose two men decide to start farming in partnership, each to contribute the same net capital to the business. John Adams is to provide land worth \$20,000 but with a \$10,000 mortgage against it. Joe

Johnson is to contribute \$10,000 in cash. The entry in the journal recording the opening of the partnership and amount of capital furnished by each partner will be:

Jan. 1, 1940. A partnership opened by John Adams and Joe Johnson, for general farming, with equal contributions of capital and equal division of profits, with the original investments as follows:

	DEBITS	CREDITS
Land	\$20,000	
John Adams, Capital		\$10,000
Mortgage payable		10,000
Cash	10,000	
Joe Johnson, Capital		10,000

Accounts will now be opened in the ledger for each proprietor and for each of the assets or liabilities named. The entries will then be posted to the proper accounts in the same manner as any other inventory.

Current Entries

During the year transactions made with outside persons are entered in the same manner as though there were a single proprietor, because to the outsider the business constitutes a single entity and not two separate men doing business independently.

Within the business, however, it is necessary to have a separate drawing account or personal account for each partner. Funds or farm produce withdrawn and used for personal purposes are debited to the proper drawing account, which is used in the same manner as the personal account in the business with a single proprietor.

Sometimes, by the terms of the partnership agreement, the partners are permitted to draw salaries from month to month during the year. These constitute a prior share in the division of profits. The salaries need not necessarily be equal. According to the agreement only one partner might be allowed a salary, depending on the amount of time spent in the business. Legally, however, the salaries of partners are regarded as divisions of the profits and not as expenses in the same sense as wages paid to hired help.

Closing the Partnership Accounts

At the end of the year, and sometimes oftener, an effort is made to settle up the accounts by division of the remaining profits or by each partner taking out such amounts as will equalize their withdrawals. In the ordinary partnership no particular difficulties arise in the closing

process. The various farm enterprise accounts are closed into the *loss and gain* account as with any other business. The net loss or gain is then divided in the proportions in which the partners are to participate in the earnings. These amounts of profit are credited to the respective *capital* accounts.

It often happens that one or more of the partners decides to leave part of his profits in the business. The partnership agreement should provide for the rate of interest to be allowed on such loans or additions to capital. The interest in such cases constitutes an expense which is to be credited to the *personal* account of the partner concerned and debited to the *loss and gain* account.

STOCK SHARE PARTNERSHIPS

A stock share form of farm tenure is in reality a form of partnership.¹ It differs from the ordinary partnership in that all expenses are not shared equally. In the usual stock share lease, it is agreed that the owner of the farm is to furnish the land and buildings and to pay the taxes, repairs on the buildings and fences, and grass seed. The tenant is to provide all the labor, equipment, and horses. Other expenses are shared equally, and the income is divided equally.

In a stock share partnership, it is necessary to use a *separate loss and gain account for each partner* because there are some expenses not borne equally but carried wholly by one partner. Examples are: the expenses on real estate which are paid wholly by the landlord, or wages paid for labor, expenses on equipment or horses, which are paid entirely by the tenant. Usually, there is also a *joint loss and gain* account for expenses or receipts which are divided between the partners. This is handled like *loss and gain* in the ordinary partnership.

At the end of the year the *individual* loss and gain accounts are closed to the capital accounts of the partners concerned. The loss and gain account for the *joint* income or expense is divided and handled as with a simple partnership.

On a stock share farm it is frequently desirable to set up one current drawing account for the withdrawals or contributions of each partner in joint enterprises, and a separate account for undivided farm expenses or personal transactions. This makes it much easier to analyze the outcome of the business as it affects each partner at the end of the year. The current drawing accounts also make it possible to see at a glance

¹ A clause in the agreement or partnership contract may, however, avoid some of the legal responsibilities of the ordinary partnership.

whether each partner has withdrawn more or less than his share. Contributions to shared accounts, such as payments for feeds, are credited to the current drawing accounts since they, too, affect the net standing of the partners.

REVIEW QUESTIONS

1. How do orchard accounts differ from accounts for enterprises found on the ordinary mixed farm?
2. What are the objects of keeping accounts for the orchard during its period of development?
3. Would you consider interest on the investment a legitimate element in the expenses of the orchard? Give arguments on both sides of the question.
4. Write out a list of the accounts you would need for the young orchard. What disposition would you make of the balances in these accounts at the end of the year?
5. How would you handle an account for an interplanted crop?
6. What changes take place in the records as the orchard comes into bearing? What new accounts would you open?
7. Suppose a field of alfalfa winterkilled. What would you do with the balance in the account?
8. Some farmers do not consider the fact that farm produce is used in the household. Criticize.
9. Explain how it is possible to keep, in the same ledger, records for other business projects besides the farm.
10. Draw up a multiple column ledger sheet for the personal account. How would you examine this record to ascertain in greater detail the relationship between personal activities and the farm?
11. What is a partnership?
12. Explain the differences in the accounts of the single proprietorship and the partnership and show how they result from the difference in proprietorship.
13. Describe the organization of the accounts for a stock share partnership.
14. What procedure is to be followed if one partner decides to leave his share of the earnings in the business?

CHAPTER 21

ACCOUNTS FOR LANDLORDS

The Problem

Do landlords as well as tenants need farm records? What are their special problems for which records would be of benefit? How should the regular farm records which we have been discussing be modified to serve the landlord's need?

With increasing numbers of rented farms in many parts of the country, the special accounting problems of landlords have aroused more interest. Unfortunately, no widely usable systems of landlords' records have as yet been developed. This chapter attempts to do two things: first, to consider the principal problems of landlord accounts; and, second, to make a few suggestions for forms which might be used on crop share and stock share farms.

THE LANDLORD'S ACCOUNTING PROBLEMS

The landlord has much the same need as the tenant for farm records. He needs to know what the farm has produced and whether it is yielding as well as it should. In this connection the records which he needs are generally simpler than those kept by the farm owner-operator or the tenant. If the landlord is renting for a share of the crops, his record of receipts will be much simpler and briefer than those of the operator. His income, in this case, all comes from a relatively few large sales in the course of the year. The tenant will probably have several livestock enterprises. These will not enter into the landlord's records at all on the strictly crop share farm. The record of expenses will also be simpler. The landlord will not be concerned about the expenses of maintaining equipment or horses, in hiring labor, or in buying feed.

Even on a stock share farm the landlord will not be concerned with as many nor as varied transactions as the farm operator. Some enterprises, such as poultry, will be the tenant's concern alone. His receipts will consist of half, or some other proportion, of the sales of crops and of those livestock enterprises which are operated jointly, such as the dairy, beef cattle, hogs, or sheep. His expenses will consist of purchases of seeds, part of the fertilizers, and feeds for the joint enterprises. He will

also have some expenses which the tenant will not, such as taxes, insurance on buildings, and upkeep of buildings and fences. He will not ordinarily have to pay wages and will have no expenses on equipment or horses.

The landlord will also need accounts in order to keep track of his dealings with the tenant. He needs a record of rent payments from the tenant in case any part of the farm is rented for cash. He may purchase, with his own funds, things that are to be divided with the tenant; or the tenant may make joint purchases which will have to be settled for later. It is highly important that there be a clear and complete set of records to prevent any misunderstanding, particularly on a stock share farm where both parties are concerned with frequent joint sales and expenses. Otherwise, disputes are apt to arise and may break up what could and should have been an entirely friendly business relationship.

ACCOUNTS FOR THE CROP SHARE LANDLORD

The accounts of the crop share landlord will be relatively simple, as already suggested. Also, since he will be concerned with a relatively small number of transactions, it is not likely that he will need to post and summarize his records more often than once a quarter. The forms shown in the following pages are drawn up with this in mind and provide for posting once a quarter. For simplicity and flexibility the forms are patterned after the columnar forms discussed in Chapter 12.

Receipts of Crop Share Landlord

The receipts of the crop share landlord come principally from his share of crops. In the cash grain areas these crops may be only two or three in number. The sales may all be made in one or two transactions for each crop. This requires only the simplest and briefest of records.

Sales of crops may be recorded by the use of page 1 of Form 32. This does not differ from Form 24 in principle. A column is provided at the left of the page for the date of transaction. This is followed by a space for explanation of the nature of transaction, persons concerned, or other items. To the right of the page, columns are provided for recording quantities of each principal crop sold and the income from each sale. An additional column to the extreme right may be used for any important type of income on the specific farm which needs to be recorded separately, but for which no special heading is provided.

The four columns directly to the right of the explanation space may need to be described in greater detail. First, there may be open accounts between the landlord and tenant. The landlord may advance funds or

other things of value to the tenant, or the tenant may owe the landlord some back rent or other obligation. The first column to the right of the explanation space will be used to record payments by the tenant on such accounts.

Next, there may be some items of income which are divided between tenant and landlord. The total amount received from such a sale would be entered in column 3 and the tenant's share in column 2. Column 3 permits a check on the footings of columns to the right. The total of column 3 should equal the total of all columns to the right plus the total of any figures in column 2. This check should be made before the quarterly totals are posted to the year's summary. Usually the pasture and hay land on a crop share farm is rented for cash. This receipt may be entered in column 4.

Expenses on the Crop Share Farm

Expenses on the crop share farm may be recorded in a form such as page 1 of Form 33. The general design and purpose of this form is similar to that of Form 32. Payments or advances to the tenant on open accounts are recorded in column 1. Columns 2 and 3 are to record the tenant's share of any joint expense and the total of any expense recorded, respectively. Columns 4 to 7, inclusive, are for landlord's expenses in current operations of the farm, such as for threshing, and purchase of seeds or fertilizer. Columns 8 to 11 are for fixed expenses, as fire insurance, taxes, interest paid on any mortgages, or other obligations the landlord may owe on this farm. Column 12 provides a place to record any new investments made in the farm for new buildings, new fences, new lines of tile drains, and similar items.

Summary of Receipts and Expenses on Crop Share Farm

At the end of each quarter totals of the columns of receipts and expenses are posted to Form 34. Here the gross income and total expense figures are obtained for each quarter. At the end of the year, depreciation on fixed assets is deducted, and the landlord's net earnings for the year are found.

Various ratios and factors may now be derived to help the landlord interpret the performance of the farm and the earnings which he has received from it. First, the total quantities of each crop sold should be recorded for future reference and for comparison with other years. The yield per acre obtained on the principal crops should be recorded in lines 32, 33, and so on. These figures are as important to the landlord as to the tenant.

Two financial ratios of particular interest to most landowners are

FORM 34. CROP SHARE FARM, SUMMARY OF RECEIPTS AND EXPENSES

CROP SHARE FARM		SUMMARY OF RECEIPTS AND EXPENSES				YEAR....
	CREDITS	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	TOTAL FOR YEAR
1	Cash Rent					
2	Corn Sold					
3	Other Crops Sold					
4	"					
5						
6	Total Cash Receipts					
7	Increase Liquid Assets					
8	Gross Income					
	DEBITS					
	Operating Expense					
9	Threshing, etc.					
10	Seeds Bought					
11	Fertilizer, Lime					
12						
13	Other Oper. Expense					
14	Total Oper. Expense					
	Fixed Expense					
15	Upkeep, Bldgs & Fences					
16	Insurance					
17	Taxes					
18	Total Fixed Expense					
19	Gross Income (Item 8)					
20	Less Oper. Exp. (Item 14)					
21	Net Oper. Income					
22	Less Fixed Exp. (Item 18)					
23	Net Cash Income					
24	Less Depr. Fixed Assets					
25	Net Earnings					
26	Less Interest Paid					
27	Earned on Net Investment					
28	Earned per Acre					
29	Earned on Total Capital					
30	Bushels Corn Sold					
31	Bushels Oats Sold					
32	Yield per Acre, Corn					
33	Yield per Acre, Oats					

suggested in lines 28 and 29 of Form 34. The first of these is the net earnings per acre. This is obtained by dividing the landlord's net earnings for the year (line 25) by the number of acres in the farm. The per cent earned on total capital is found by dividing net returns (line 25) by the total value of land and permanent improvements, plus any other capital the landlord may have invested in the farm. Note that the net earnings figure is obtained without deduction of interest payments on borrowed capital. This figure is more nearly comparable between different years if the obligations against the farm are increased or are paid off.

ACCOUNTS FOR THE STOCK SHARE LANDLORD

The owner of a farm rented on the stock share basis is to be regarded more nearly as a partner in the farm operation than as a man who merely hires out his land. Consequently, his accounts will contain a wider variety of entries. This calls for a more elaborate set of accounts than with crop share renting.

Receipts on the Stock Share Farm

On the stock share farm there will be sources of income similar to those on the crop share farm. Page 1 of Form 32 can therefore be used for both types of tenure. But there will also be income from the sale of livestock and livestock products. The usual stock share lease provides that half (sometimes a different proportion) of the income from this source is to be divided between landlord and tenant. Means must, therefore, be provided for the entry of receipts from these additional sources.

Page 2 of Form 32 is provided for this purpose. It will face page 1, the two making a double-page form. Columns 11 and 12 provide a place to enter the amount and value of dairy products sold. Other columns to the right are for recording numbers, weights, and receipts from sales of livestock.

The cross check of totals will be made by the use of column 3 just as with the crop share form. Again, totals will be posted quarterly so that the landlord may keep the performance of the farm before him currently and not have to wait until the end of the year to see how it is coming out.

Expenses on the Stock Share Farm

The addition of page 2 of Form 33 permits this form to be used to keep track of the landlord's expenses. Most of the added expenses on the stock share farm have to do with livestock on which landlord and tenant share the outlay. This does not include horses, which are pro-

FORM 35. STOCK SHARE FARM, SUMMARY OF RECEIPTS AND EXPENSES

STOCK SHARE FARM		SUMMARY OF RECEIPTS AND EXPENSES					YEAR
	CREDITS	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	TOTAL FOR YEAR	
1	Corn Sold						
2	Other Crops						
3							
4	Dairy Receipts						
5	Cattle Sold						
6	Hogs Sold						
7							
8	Total Cash Receipts						
9	Increase Liquid Assets						
10	Increase Livestock						
11	Produce to Landlord						
12	Gross Income						
13	Less Livestock Bought						
14	Less Feeds Bot. Comm'l						
15	" " " " , H.G.						
16	Gross Profit						
	DEBITS						
	Operating Expense						
17	Threshing, etc.						
18	Seeds Bought						
19	Fertilizer, Lime						
20	Misc. Livestock Exp.						
21	Labor Hired						
22	Tractor Expense						
23							
24	Misc. Oper. Exp.						
25	Total Oper. Exp.						
	Fixed Expense						
26	Upkeep Bldgs & Fences						
27	Insurance						
28	Taxes						
29	Total Fixed Expense						
30	Total Cash Expense						
31	Net Cash Income (18-30)						
32	Gross Profit (Item 16)						
33	Less Opr. Exp. (Item 25)						
34	Less Depre. on Livestock						
35	Net Oper. Income						
36	Less Fixed Exp. (Item 29)						
37	Less Decrease Liquid Assets						
38	Less Depre. Fixed Assets						
39	Net Earnings						
40	Less Interest Paid						
41	Earned on Net Invest.						

vided entirely by the tenant. It may not include poultry, which is usually kept at the expense of the tenant and sold by him. If there is a tractor, the landlord commonly pays half the cost of fuel and oil, since this takes the place of feed that would have been consumed out of the common store by the horses.

Miscellaneous expenses on livestock are recorded in column 13. Landlord's expenses on the tractor are entered in column 14. Since the tenant and landlord will share the receipts from livestock sales, they also share in any purchase of feeds. These are entered in columns 17 to 20. Purchases of livestock are entered in columns 21 to 26. These usually consist of purchases of breeding stock, but may in some cases include feeder cattle or feeder pigs.

Summary on the Stock Share Farm

Totals of receipts and expenses are carried forward at the end of each quarter to the proper column on Form 35. At the end of the year the quarterly totals are added to get the year's totals. Next, an analysis similar to that for the crop share farm is carried out. The financial summary here is considerably longer than for the crop share farm because of livestock receipts and expenses and other joint items. Other items which need to be added at the end of the year include produce of the farm which is used in the landlord's household and increases or decreases in the landlord's share of the inventories of current assets, livestock, and so on.

The stock share landlord will want a record of crop yields. He will also need to compute several of the farm efficiency factors for livestock which were discussed in Chapter 16. Among these will be the value of livestock products per \$100 of feed, pounds of butterfat produced per milk cow, number of pigs weaned per litter, and pounds of hogs sold per litter. As financial indices of the year's performance, the landlord will probably compute the net earnings per acre and the per cent earned on total capital as indicated earlier in this chapter for the crop share farm.

The landlord, like the tenant, will want to know the net increase in various livestock enterprises. This permits comparison of performance for the same enterprise between years and, to a limited extent, some comparisons between enterprises within the same year. The net increase for each of these enterprises may be computed by the use of Form 7, which was discussed in Chapter 3.

Checking on Disposition of Livestock

The landlord will generally want to check up on the disposition of livestock raised on his farm if he is renting it on a stock share basis.

This may be done by the use of Form 36 shown below. The number of livestock on hand is added to those bought or raised during the year to find the total from all sources. This figure should balance with the total number disposed of. The latter figure is obtained by adding to the

FORM 36. CHECK ON LIVESTOCK NUMBERS

	HOGS	CATTLE	SHEEP
No. on hand at first of year	36	14	60
No. bought	2	1	1
No. raised	64	9	58
Total from all sources	102	24	119
No. sold	50	8	58
No. died	7	—	4
No. butchered	3	—	2
No. on hand at end of year	42	16	55
Total accounted for	102	24	119

number sold, the number that died, those that were butchered, and the number on hand at the end of the year.

This form has several advantages. It is a businesslike check-up on the landlord's share of the property. It assures him of the correctness of the physical inventories; and, of course, it is usually capable of detecting any dishonesty on the part of the tenant. Such a check makes for more businesslike relationships between landlord and tenant, and prevents confusion and disagreement.

REVIEW QUESTIONS

1. How does the landlord's need for records differ from the needs of the owner-operator?
2. What figures on physical production does the landlord need on a crop share farm? On a stock share farm?
3. How would the landlord's accounts on a cash rented farm differ from those on a crop share farm?
4. Turn to Chapter 16 and suggest additional farm efficiency factors or financial ratios which you think would be helpful to the crop share landlord.
5. Find out from a stock share landlord whom you know what receipts and expenses he pays entirely on his farm. Find out which ones he divides with the tenant. Revise Forms 32, 33, and 35 to meet his needs.

APPENDIX

RULES FOR ESTIMATING GRAINS AND ROUGHAGES

1. *To find the number of bushels of grain or shelled corn in a bin:* Measure length, width, and average depth of the grain in the bin. Obtain total cubic feet of grain by multiplying the length by the width by the depth (all in feet). Divide by $1\frac{1}{4}$ (or multiply by 0.8) to find bushels.

2. *To find the number of bushels of ear corn in crib:* Rectangular Crib—Multiply the length by the width by the average depth (all in feet) and divide by $2\frac{1}{2}$ (or multiply by 0.4) to find bushels. Round Crib—Multiply the distance around the crib by the diameter by the depth of the corn (all in feet) and divide by 10.

3. *To find the number of tons of hay in a stack:* * Rectangular Stacks—Secure the overthrow, O (the distance from the ground, close to stack, on one side over the top of the stack to the ground on the other side); the width, W; and the length, L (all in feet). The contents in cubic feet may then be determined as follows:

A. For low round-topped stacks
 $[(.52 \times O) - (.44 \times W)] \times WL = \text{cu. ft.}$

B. For high round-topped stacks
 $[(.52 \times O) - (.46 \times W)] \times WL = \text{cu. ft.}$

Divide the number of cubic feet thus secured by the following cubic feet allowed per ton:

	1 to 3 months	Over 3 months
When settled:		
Alfalfa hay	485	470
Timothy	640	625
Wild hay	600	450

For clover hay use about the same as alfalfa or slightly higher (500 to 512). Most corn belt hay stacks come under class A above.

4. *To find the number of tons of hay in mow:* Multiply the length by the width by the height (all in feet) and divide by 400 to 525, depending on the kind of hay and how long it has been in the mow.

5. *To find the number of tons of straw:* Follow the same method as is used with hay except that about twice as

many cubic feet (900 to 1,000) are allowed per ton.

6. *To find tons of silage in silo:* † The weights of silage in the following table are for silage that has been settled at least one month. The total amount of silage in a silo can easily be determined if one knows the diameter of the silo and the depth of the silage in it.

A. The amount of silage in a silo may be taken directly from table if no silage has been removed.

B. To estimate amount of silage in silo one month or more after filling:

(1) Determine original height of settled silage and read tonnage from table.

(2) Determine depth of settled silage removed and read tonnage from table.

(3) The tonnage remaining is obtained by subtracting (2) from (1). Example: A 14' silo was filled to a depth of 35' (settled height) and 16' have been removed. Find tonnage remaining.

Total capacity before removal of silage	106.6 tons
Weight of the 16' of silage removed	45.2 tons
Amount remaining	61.4 tons

C. Suggested corrections:

(1) If corn is put in silo while in the milk stage, add 10-15% to weights given in table.

(2) If corn is past the usual stage of maturity and contains less water than usual, deduct 10-15%.

(3) If grain is unusually heavy in proportion to stalk, add 5-10%.

(4) If very little or no grain is present, deduct 10%. (Under normal conditions grain represents from 30% to 35% of the total weight of corn silage.)

(5) Fineness and tramping have no effect on the volume per ton of silage.

* From U. S. D. A. Leaflet No. 72, by W. H. Hosterman, Feb., 1931.

† From Bul. 222, Kansas Agricultural Experiment Station.

APPENDIX TABLE A
ESTIMATED WEIGHTS OF SETTLED CORN SILAGE ONE MONTH
OR MORE AFTER FILLING
(From Kansas Bulletin No. 222)

DEPTH OF SILAGE IN FEET	DIAMETER OF SILO IN FEET					
	10' Tons	12' Tons	14' Tons	16' Tons	18' Tons	20' Tons
1	1.3	1.8	2.5	3.2	4.1	5.0
2	2.5	3.7	5.0	6.1	8.2	10.2
3	3.9	5.5	8.0	9.9	12.5	15.4
4	5.2	7.5	10.2	13.3	16.8	20.8
5	6.6	9.5	12.9	16.8	21.2	26.2
6	7.9	11.4	15.6	20.3	25.7	31.8
7	9.4	13.5	18.4	24.0	30.3	37.5
8	10.8	15.6	21.2	27.7	35.0	43.2
9	12.3	17.7	24.0	31.4	39.7	49.0
10	13.7	19.8	27.0	35.2	44.5	55.0
11	15.3	22.0	29.9	39.0	49.3	61.3
12	16.8	24.2	32.9	42.9	54.3	67.1
13	18.3	26.4	35.9	46.9	59.3	73.3
14	19.9	28.7	39.0	50.9	64.4	79.6
15	21.4	30.9	42.0	54.9	69.3	85.7
16	23.1	33.2	45.2	59.0	74.6	92.2
17	24.6	35.5	48.3	63.4	79.7	98.5
18	26.2	37.8	51.4	67.1	84.8	104.8
19	27.8	40.1	54.6	71.2	90.0	111.3
20	29.5	42.4	57.8	75.4	95.3	117.8
21	31.0	44.7	61.0	79.4	100.3	124.0
22	32.7	47.0	64.0	83.6	105.6	131.0
23	34.3	49.4	67.3	87.8	110.5	137.2
24	35.9	51.7	70.4	91.9	116.1	143.6
25	37.6	54.2	73.7	96.2	121.6	150.3
26	39.2	56.5	76.9	100.3	126.8	156.8
27	40.9	59.0	80.2	104.7	132.4	163.6
28	42.6	61.3	83.4	108.9	137.6	170.1
29	44.3	63.8	86.9	113.4	143.3	177.1
30	45.9	66.1	90.1	117.6	148.6	183.7
31	47.6	68.5	93.4	121.9	154.1	189.9
32	49.3	70.9	96.7	126.2	159.5	196.2
33	51.0	73.4	100.0	130.5	165.0	202.4
34	52.7	75.8	103.3	134.8	170.5	208.7
35	54.4	78.3	106.6	139.1	175.9	214.9
36		80.7	110.0	143.5	181.4	221.0
37		83.1	113.3	147.8	186.9	227.4
38		85.5	116.6	152.1	192.4	233.7
39		88.0	119.9	156.4	197.8	239.9
40		90.4	123.2	160.7	203.3	246.2
41			126.5	165.0	208.8	252.4
42			129.8	169.3	214.2	258.7
43			133.1	173.6	219.7	264.9
44			136.4	177.9	225.2	271.2
45			139.7	182.2	230.6	277.4

APPENDIX TABLE C
ESTIMATED LIFE, ANNUAL SERVICE, AND COST OF SERVICE OF
SELECTED FARM MACHINES*

Machine	Average Cost New	Average Estimated Life, Years	Average Annual Service, Days	Average Annual Repairs	Total Annual Cost†	Cost of Service per Day
Gang plow	\$ 83	28	8	\$ 1.70	\$ 8.22	\$1.03
Tractor plow	127	17	16	4.65	17.37	1.09
Disk harrow	115	18	14	1.65	12.80	0.91
Spike t. harrow	43	22	10	0.75	4.51	0.45
Spring t. harrow	55	21	7	0.90	5.82	0.83
Rotary hoe	97	18	5.5	0.85	10.26	1.86
Seeder, broadcast	31	21	3.5	0.50	3.28	0.94
Grain drill	156	28	5.5	0.90	13.14	2.38
Corn planter	91	21	6	1.25	9.40	1.57
Cultivator, 1 row	45	24	10	0.65	4.43	0.44
Cultivator, 2 row	104	21	12	1.45	10.76	0.90
Cultivator, tractor	121	15	17	2.25	15.29	0.90
Mower	89	21	9	3.15	11.12	1.24
Hay rake	43	28	5	0.65	4.02	0.84
Sweep rake	66	19	5	1.20	7.41	1.48
Side delivery rake	106	21	6.5	1.00	10.48	1.61
Hay loader	118	21	8	1.15	11.71	1.46
Grain binder	248	24	5	4.70	25.40	5.08
Combine	821	11	22	22.25	130.59	5.94
Corn binder	211	21	5	3.50	22.39	4.48
Corn picker	632	12	14	8.65	87.01	6.22
Feed grinder	127	19	13	1.80	13.76	1.06
Ensilage cutter	373	18	7	6.00	42.19	6.03
Manure spreader	154	18	28	2.00	16.94	0.60
Tractor	1,075	14	79	13.40	131.47	1.66
Truck	729	15	55	20.40	98.98	1.80
Wagon	81	30	37	1.85	8.05	0.22
Trailer	26	28	9	1.50	3.54	0.39
Portable elevator	257	26	12	2.35	23.21	1.94
Windmill	97	32	149	2.10	9.35	0.06

*Information provided by Professor J. B. Davidson, Agricultural Engineering Department, Iowa State College.

†Includes depreciation; repairs; interest at 5%; housing, insurance, and taxes at 2.4% of present value.

APPENDIX TABLE D

PRODUCTIVE MAN WORK UNITS ON MAJOR ENTERPRISES

	DAYS OF LABOR REQUIRED			
	Illinois ^a	Minnesota ^b	Kentucky ^c	New York ^d
Corn, husked from stalk.....	.95	1.3	3.2	5.0 ^e
Silage.....	n.a.	1.9	4.3	3.5
Oats, threshed.....	.67	.7	1.2	1.5
Soy beans for grain.....	.42 ^f	.9	.....	.....
Alfalfa hay.....	1.30	1.0	2.0	1.0 ^g
Soybean hay.....	1.50	1.4	2.0	.....
Other hay.....	.92	.6	1.1	1.0 ^g
Dairy cow.....	12.00	13.5	15.0	15.0
Beef breeding herd (animal unit).....	2.10	4.0	1.0	2.0 ^h
Hens (100 hens).....	29.30	26.0	15.0	20.0
Hogs (100 lbs. produced).....	.30	.25	.36	3.0 ⁱ
Sheep (animal unit).....	3.67	1.6	2.1 ^j	0.5 ^k

^a Sixteenth Annual Report of the Farm Bureau Farm Management Service, 1940, (Mimeo.) Dept. of Agri. Econ. Univ. of Ill., Apr. 1941, p. 20.

^b Annual Report of the Southwestern Minnesota Farm Management Service, 1940, Mimeo. Rept. No. 121, Division of Agri. Econ., Univ. of Minn., Apr. 1941, p. 4.

^c By courtesy of Roy E. Proctor, Dept. of Farm Economics, University of Kentucky.

^d Information provided by Department of Agricultural Economics, Cornell University.

^e Corn cut and shocked.

^f Harvested by combine.

^g Per cutting.

^h Heifers, calves, bulls, or steers.

ⁱ Per sow until pigs are weaned; 0.5 M. W. U. counted per pig raised.

^j For seven sheep.

^k Per ewe or buck.

n.a. Not available.

INDEX

- Account, definition, 109
Accounts payable and receivable, double entry forms, 121
Accounts payable, in single entry, 133
Accountant, compared to bookkeeper, 3-4
Accuracy, in production records, 19
Analysis of records, 6-7, 172-187
Assets, classification, 84-87
 current, 85
 current, valuation, 69
 definition, 51
 fixed, 84
 procedure in purchase or sale, 156-158
 working, 84-85
- Balance sheet ratios, 88-89
Budget, farm, 8-18
 as related to records, 16-18
 compared with actual performance, 215-217, 219
 general process of revision, 226-228
Budgetary control, use of accounting data, 213-228
 use of current records, 170
 use of quarterly summaries, 130
 within the year, 217
Buildings, farm, valuation, 57-58, 70-71
- Capacity of mows, stacks, and silos, 251
Capital, and revenue, 159-160
 earnings on total, 176
 proportion in working assets, 188-190
 ratios, 88-89, 174-176
 source and distribution, 89
Capitalization, 66-67
Cash book, 114-117
Cash journal, 117-119
Cash, reconciliation, 127
Cattle enterprise analysis, 181-182, 207-210
Closing accounts, process, 102-104
Corn acreage, and farm returns, 191-192
Corn enterprise, analysis, 202-203
Corn yield, and farm returns, 192-193
Cost, as basis of valuation, 62-63
Cow test records, 27
Crop acres per man, 196-197
Crops, analysis of enterprises, 176-177, 202-205
 choosing between oats and wheat, 220-223
 perennial, accounts for, 231-232
Crop plan, 11-13
 re-examination at end of year, 213-215
Crop records, 21-22
Crop share landlord's accounts, 243-247
Crop system, analysis, 190-193
Current ratio, 88-89
Current use of records, 162-170
- Daybook, 111-113
Debit and credit, 97-99
 examples, 99-101
Depreciation, 74-82, 147, 160-161
 condition percentage table, 253
 definition, 74-75
 methods of computation, 76-81
 of orchard account, 234-235
Double entry accounts must balance, 101-102
 accounts payable and receivable, 121
 and balance sheet changes, 98-101
 closing accounts, 102-104
 fundamental books, 109-121
 rudiments, 93-108
- Earnings on capital and management, 153
Efficiency factor analysis, 188-198
Eight-column financial statement, 106-107
Enterprises, analysis, 200-212
 choice of alternatives, 217, 219-226
Equipment expense per crop acre, 185-186
 valuation, 70
Estimating grains and roughages in mows, stacks, silos, 251
Expenses, classification, 144-147
Expense factors, efficiency in use, 182-186
Expenses, multiple column records, 125-127
 single entry record, 135-139
- Farm management association, 27-28
Feeds and supplies, inventory, 55
Feed, importance as cost element, 30-31
Feed record, 30-39
Feed record, form, 31-33
 interpretation and analysis, 36-38
 summary, 33-36
Feed, returns from livestock per \$100 fed, 179-180, 193-194
Financial ratios and diminishing returns, 188-190
Financial transactions, records of, 5-6
Fixed expenses, 146-147
- Gross income, 150-151
Gross profit, 150-151
Gross ratio, 154-155, 175

- Hog enterprise, analysis, 180-181, 194-195, 205-207
- Improvements, farm, inventory, 57-58
- Income and capital ratios, 174-176
 farm, and business policy, 161
 interpretation, 155-158
 statements, 143-161
- Income statement, from columnar records, 131
 in annual analysis, 173-174
- Income summary figures, 150-154
- Inventories, comparative, 25
- Inventory, date, 52-53
 farm, 51-60
 equipment, 55-57
 livestock, 54
 physical count, 53-55
- Inventories, valuation, 61-73
- Investment, income per \$100, 190
- Journal, 113-114
- Labor, amount used and farm returns, 195-196
 and equipment, criticism of economy, 44-48
 efficiency in use, 183, 196-197
 importance as cost element, 40-41
 record, 40-48
 record, information provided, 43-44
 records, types, 41, 43
- Land, valuation, 71-73
- Landlords, accounts for, 241-250
- Ledger, 109-111
 special columns, 120-121
- Liability, definition, 51
- Liabilities, classification, 87
- Livestock, check on numbers, 250
 enterprises, analysis, 204-211
- Livestock enterprises, choosing between hogs and feeding cattle, 223-226
- Livestock plan, 13-16
 re-examination at end of year, 215-216
- Livestock production, net, computation, 23
 records, 23-26
- Livestock returns, analysis, 177-182
- Livestock system, analysis, 193-195
- Livestock units, 184
- Machines, estimated life, annual service and cost, 254
- Machines, selected, normal life, 81
- Management return, 151-152
- Man work units, 184, 255
- Map, of farm, 20
- Monthly financial summaries, 166-168
- Multiple column records, 122-131
- Multiple column record, summarizing, 127-130
- Net capital ratio, 88
- Net farm income, 148, 228
- Net operating income, 150-151
- Net worth, 51
- Net worth statement, 82-89
- Normal farm income, 197-198
- Obsolescence, 81-82
- Operating expenses, 146
- Operating expenses, monthly comparisons, 168
- Operating ratio, 155, 175
- Operator's labor income, 152-153
- Orchards, accounts for, 232-235
- Organization of accounts, 93-96
- Outside investment accounts, 236-237
- Partnership accounts, 237-240
- Perennial crops, accounts for, 231-232
- Personal accounts, 235-236
- Physical production, current record, 169-170
- Poultry enterprise analysis, 182, 210-211
- Power, efficiency in use, 185
- Price, net available, as basis of valuation, 63
- Production records, 19-29
- Proprietorship, 96
- Purposes of records, 23-27
- Quarterly summaries, 162-166
 and budgetary control, 130
- Receipts, multiple column record, 123-125
 single entry records, 133-135
- Revenue, and capital, 159-160
- Silage, estimating weight in silo, 251-252
- Single entry records, 132-139
- Size of business, 172-173
- Small grain, analysis of enterprise, 204
- Solvency, 83
- Statistical records, 6
- Stock share landlord's accounts, 247-250
 partnership accounts, 239-240
- Tractor, comparing cost with horses, 46-47
- Trial balance, 105-106
- Turnover, rate, 175-176
- Values and quantities in the budget, 9-11
- Value, reproduction, 63-64
- Valuation, direct, 65-66
 farm inventories, 61-73
 indirect, 67-68
 methods, 62-68
- Working ratio, 88

