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North Dakota EXTENSION FARM RECORDS

A Guide to Farm Management Decisions

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SUMMARY

This study was undertaken to identify farm management decision making criteria from the North Dakota Extension Electronics Farm Record Program. The Farm Record Program is described and the various reports received by the cooperators in the program are discussed in detail.

Ten factors included in the reports received by the cooperators are considered to be helpful farm management decision making guides.

They are:

1. Returns to labor and management
2. Percent return on investment
3. Crop returns per tillable acre
4. Crop expense per tillable acre
5. Fertilizer expense per acre of grain and cultivated crops
6. Seed expense per acre of grain and cultivated crops
7. Livestock returns per \$100 feed fed
8. Machinery investment per tillable acre
9. Machinery costs per tillable acre
10. Crop returns per dollar of crop expense.

Each crucial factor is discussed and their use in decision making is explained.

Using data for three years, guideline values for each of the ten crucial factors are established for five areas of the state. The guideline values are suggested goals that farm managers might strive to achieve. The values are those that some of the better farm managers in the state have achieved in their operations.

NORTH DAKOTA EXTENSION FARM RECORDS,
A GUIDE TO FARM MANAGEMENT DECISIONS

Carl E. Olson and Dennis O. Sexhus*

Extension Farm Records is an educational program designed to improve management and increase earnings on North Dakota farms by analyzing past performance. The program utilizes the electronic computer for record keeping and assimilation of data provided by the farmers cooperating in the program. The program is designed for farms of all sizes and types, including farms of an unusual nature.¹

Each farmer (cooperator) in the Extension Farm Records Program receives a depreciation schedule and farm inventory book when he enrolls in the program. Inventories, once established, have to be taken only once a year. The inventories should be taken at the beginning of the calendar year, January 1, unless the cooperator has established a fiscal year which differs from the calendar year. Crop production records, machinery and building depreciation, and livestock depreciation records are all included in the Depreciation Schedule and Farm Inventory Book.²

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¹Extension Farm Records, Cooperative Extension Service, North Dakota State University, Fargo, North Dakota, n.d., pp. 2-3.

²Anderson, Ronald A.; Sobering, Fred D.; Dorow, Norbert A.; and Olson, Fred L., Depreciation Schedule and Farm Inventory Book, Cooperative Extension Service, North Dakota State University, Fargo, North Dakota, p. 3.

Real estate is composed of land and building values. This represents the total value of the farm. The value of the land should be:

1. The purchase price if it was recently purchased,
2. Its court appraised value if recently inherited, or if not recently obtained,
3. The current market price for recent bonafide sales in the immediate area.

The value of buildings and improvements is not included in total land value. Land values have to be changed periodically over time. However, the land values should be held constant except under specific instructions.³ Since land value is largely a matter of judgment, land evaluation can lead to inaccurate investment figures as well as returns on investment.

The crop production records are completed in the fall when harvest is completed. This record is a physical production record, with no mention of prices or returns. The crop production record consists of acres, production, and yields on both owned and rented land. The crop production records are useful in determining the landlord's share of the crop in the case of rented farms with crop share rental agreements.⁴ The crop production record is useful for determining the total production for individual crops on the farm. The total crop production figures are necessary for computing the crop yield index and many of the production and efficiency measures developed for the entire individual farm operation.

³Ibid., p. 4.

⁴Ibid., p. 6.

Machinery and building depreciation should be completed at the end of the year. However, purchases and sales should be entered in the inventory book when made. The value for machinery is the purchase price if purchased within the past year. Otherwise the "undepreciated balance," as shown on the federal income tax report, is used.⁵

Livestock depreciation records are to be completed at the end of the year except for sales and purchases made during the year. The livestock depreciation record is for income tax use only.⁶

Besides the inventory book in which to list all items on inventory, each cooperator is supplied with prepared mail-in sheets on which to list his farm income and expense information for each month. Transactions are to be listed as they happen and mailed to the processing center at North Dakota State University at the end of each month. The data are then punched up on cards, processed, and 11 possible reports pertaining to each complete year of business are mailed to the cooperator at various times of the year. These reports are as follows:⁷

1. First Quarterly Report. The First Quarterly Report is received by the farmer in April and contains a listing of each transaction reported for the first three months of the year, a summary of all items into accounting groups, and a current expense and income summary for each enterprise to date.

⁵Ibid., p. 3.

⁶Ibid., p. 28.

⁷Extension Farm Records, op. cit., p. 3.

2. Second Quarterly Report. The Second Quarterly Report is mailed to the farmer in July and contains a listing, summary, and enterprise totals for the fourth, fifth, and sixth months as well as the totals for the first half of the year.
3. Tax Management Report. The farmer receives the Tax Management Report in November, the equivalent of a third quarterly report. It contains the total cost and returns data for the first 10 months of the year. Using this summary and a one page form, the farm operator can estimate his income tax and have time to make desired adjustments before the end of the year for tax purposes.
4. Fourth Quarterly Report. The Fourth Quarterly Report is mailed to the farmer in January and contains a listing and summary of all transactions and enterprise totals for the entire year.
5. Income Tax Summary. In January the farmer also receives the Income Tax Summary, which provides a breakdown of all transactions into categories for reporting income tax. Its purpose is to facilitate the reporting of income tax and assure accurate records if called upon to produce them by the Internal Revenue Service.
6. Individual Analysis. Each farmer cooperator receives the Individual Analysis Report for his farm in February. Included in this report is a complete analysis of the business prepared from the mail-in and inventory information submitted. The individual analysis is complete with efficiency measures and enterprise analysis, and can be used for decision making in regard to the next production period.
7. Comparative Analysis. The Comparative Analysis Report is received by the farmer in March. It is the most useful report when making decisions about the next production period. This report enables the farmer to compare his performance the preceding year with (a) his performance in past years, and (b) the performance of other cooperators in the preceding year. Group comparison can be made on the basis of profitability, size, and type of farm. Through this comparison, the farm operator should be able to recognize some of his problems and attempt to make adjustments in the next production period.

8. Net Worth Summary. Also received by the farmer in March, the Net Worth Summary is a summary of the farmer's net worth and the change in net worth from the beginning of the year to the end. It is similar to the statement required by most lending agencies when applying for a loan, thus is intended to facilitate the obtaining of credit.
9. Quarterly Cash Flow Report. At the end of the year, each cooperator receives a summary of all cash receipts and expenses by quarter. A blank line is left under each amount in an attempt to encourage the cooperator to set up a proposed budget for the next year.
10. Enterprise Summary Report. The Enterprise Summary Report is an optional report, available upon request at any time during the year. If for some reason the farm operator wants to know how a certain enterprise is doing, he may send for this report. He will receive a complete expense and income summary for any enterprise. This report can be most useful in decision making.
11. Budget Comparison Report. The Budget Comparison Report also is available only upon request and is furnished only on a quarterly basis. It allows the cooperator to compare his business with a predetermined budget. This can be useful if a farmer wants to know how much capital is available for some purpose and still be living within his budget.

Besides all necessary materials and the 11 reports, the cooperating farmer receives timely newsletters pertaining to new farm management developments or changes in income tax reporting procedures.

With all the material available for analysis by the farmer cooperator, it seems the farmers should have no difficulty becoming better managers. The quarterly reports show the farm operator exactly how his business is progressing throughout the year. The Income Tax Summary allows the farmer to more easily and accurately compute his taxable income. The Comparison Report enables the farmer to compare his performance

with that of others. A report may be received upon request that will analyze an individual enterprise. However, there still remains the problem of how to most fully utilize the data the farm operator has at his disposal through the farm records program. There remains the problem of finding, within the masses of data, factors that may serve as guides to aid the farm operator in problem identification. For this reason, several factors have been selected for study as to their relationship to the financial success of the farm business.

THE CRUCIAL FACTORS

Ten factors are being considered as possible production guides. It is felt that these 10 factors, called the crucial factors, provide some insights into the success of a farm manager and may aid him in problem identification. The crucial factors are as follows:

1. Returns to labor and management
2. Percent return on investment
3. Crop returns per tillable acre
4. Crop expense per tillable acre
5. Fertilizer expense per acre, grain, and cultivated crops
6. Seed expense per acre, grain, and cultivated crops
7. Livestock returns per \$100 feed fed
8. Machinery investment per tillable acre
9. Machinery cost per tillable acre
10. Crop returns per dollar crop expense.

Return to labor and management is a measure of the net earnings to the family labor and management after deducting a 6 percent interest

charge on average working capital and a 5 percent interest charge on average fixed investment in land and buildings. Return to labor and management is a comparative measure of the farm operator's management ability. It tends to put all operators on a more equal basis regarding size of operation. It cannot, however, remove all the effects of size.⁸

Percent return on investment is the rate of return on capital after removal of all labor charges, paid and unpaid.⁹ It is computed by dividing the return to capital and family labor, less labor charge, by the average investment. The charge for operator labor is \$400 per month and unpaid labor is \$200 per month.¹⁰ In analyzing the performance of the farm business with respect to percent return on investment, the farm operator must compare his return on investment with the opportunity cost of capital. In other words, the farm operator should be receiving a comparable or higher return by investing his capital in the farm business than he can get by investing it elsewhere. The opportunity cost of capital may vary among farmers, but it may be concluded that the farm operator's percent return on investment should be equal to or greater than the market rate of interest. A return lower than the market rate of interest indicates that either the resources are employed in the wrong

⁸Anderson, Ronald A., Mail-In Extension Farm Records, General Records Summary 1-4, Extension Service, North Dakota State University, Fargo, North Dakota, October, 1967, p. 14.

⁹Paid labor is hired labor and is an out-of-the-pocket cost. Unpaid labor is operator labor and labor provided by the immediate family.

¹⁰Ibid., p. 7.

business or the resources are misallocated in the right business. It is up to the individual farm operator to "do his homework" to discover where his problem lies. The accuracy of land evaluation has much bearing on how meaningful this factor is.

Crop returns per tillable acre are the total returns from all crops divided by the number of tillable acres in the farm unit. Returns from crops include closing (December 31) value of crop inventories, plus sales of crop commodities, plus home-grown grain used for feed and seed, plus the landlord's share of the crop, minus the opening (January 1) value of crop inventories. Tillable acres include all acres in grains, row crops, tame hay, tame pasture, summerfallow, and soil bank.¹¹

Crop expense per tillable acre is the total direct crop expense divided by the number of tillable acres in the farm unit. The items included in crop expense are seed, fertilizer, weed spray, crop insurance, and other direct crop expenses not including machinery costs.¹²

Crop returns are directly related to crop expense. Crop returns, due to an increase in crop expense, can be increased only to a point. Beyond this point, the added cost of producing an additional unit of output is greater than the added returns from that unit of output. Conversely, crop expense can be reduced only to a point; below this point adequate production cannot be maintained. Thus, it can be concluded that the value of both crop returns per tillable acre and crop expense per

¹¹Ibid., p. 7.

¹²Ibid.

tillable acre must fall within a certain range of values. Either above or below this range the net income from crops will decline.

Fertilizer and seed costs per acre of grain and cultivated crop are the cost of fertilizer and seed used divided by the number of crop acres planted. These two factors are measures of two of the most important single variable costs in the farm operation. Reflected in fertilizer cost per acre of grain and cultivated crops is the type of fertilizer used and rate of application. Reflected in seed costs per acre of grain and cultivated crop are the type and quality of seed and the seeding rate. Both home-grown and purchased seed are included in seed cost.

Livestock returns per \$100 feed fed is the total livestock returns divided by the value of feed fed in hundreds of dollars. Total livestock returns include the closing (December 31) value of livestock inventories, plus sales, plus value of animals butchered for home use, minus livestock purchases, minus the beginning (January 1) value of livestock inventories. Value of feed includes purchased feeds, plus the value of home-raised crops fed, plus the value of pasture used.

The crops fed are not based on actual feed records, but are computed as the residual factor of total crops produced, sales, purchases, seed used, and inventory change.¹³ Livestock return per \$100 feed fed is an excellent measure of livestock performance because it contains all feed costs of production. All that is necessary in using livestock returns per \$100 of feed as a management guide is the percentage of total cost accounted for by feed cost.

¹³Ibid., p. 7.

For example, if feed costs comprise 50 percent of the total cost for one livestock enterprise, the farm operator must be receiving \$200 returns for every \$100 of feed in order to break even. However, if feed costs comprise 75 percent of the total cost for a livestock enterprise, a return of \$133 per \$100 of feed must be realized in order to break even. The use of this ratio depends a great deal on the type of livestock enterprise the farm operator is operating. This ratio is greatly dependent on the accuracy of computing feed costs, since in the analysis it is a residual.

Machinery investment per tillable acre is the total machinery investment on the farm divided by the number of tillable acres. Machinery investment is the average of the opening and closing investment in machinery. Machinery investment includes tractors, trucks, machinery, livestock equipment, general equipment, and the farm share of the auto investment.¹⁴

Machinery cost per tillable acre is the total cost of using machinery on the farm divided by the number of tillable acres. Machinery costs include fuel, repairs, depreciation, and custom work hired. Income from custom work done for others was deducted to compensate for fuel, repairs, depreciation, and other machine costs which should not be charged to the crop acres on the farm to which the machines "belong."¹⁵

Machinery cost and machinery investment are included in this study because they make up such a large share of total farm investment and total

¹⁴Ibid., p. 7.

¹⁵Ibid.

variable cost. With the present cost-price situation it may be well to examine machinery costs and investment with regards to profitability of the farm business.

Crop returns per dollar crop expense is an efficiency factor indicating the amount of returns realized for every dollar spent for seed, fertilizer, weed spray, and other variable costs, not including machinery. Crop returns per dollar crop expense is not a factor included in the farm records analysis, but it is easy for each farm operator to compute for his own farm business as well as for the other farm operators included in the comparison report.

In this study it is assumed that profit maximization is the goal of all farmers. Although this may or may not be the actual goal of all farmers, it is a criterion by which to measure success. Such things as leisure, satisfaction, and personal preferences, which often are goals in themselves, cannot be quantified as easily as dollars.

THE CRUCIAL FACTORS IN DECISION MAKING

There are several factors which have an effect upon the profitability of a farm business. Many of these factors are obviously related to profits; in several others the relation is not as evident. For example, it is obvious that increasing the size of the operation has some effect on the level of profits of the business, whereas the effects of increasing a factor, such as crop expense per tillable acre, may not be so obvious. It is the object of this study to deal with both types of factors.

Size of the farm business is perhaps the largest single determinant of the level of farm profits. Size of a farm business may be measured in

several different ways. The first and most obvious way to measure size is in physical units of land; that is, number of acres, number of sections, or number of square miles. In North Dakota the most common way to measure the size of the business is by the number of acres in the farm unit.

However, size of the farm business also may be measured in ways other than physical units of land. One is by total value of products produced. There are cases where this measure may be more meaningful than acres. For example, in comparing a 400-acre sugar beet farm in the Red River Valley with a 2,000-acre cattle ranch in Western North Dakota, it would be misleading to say that the 2,000-acre ranch is larger. It is likely that the 400-acre sugar beet farm is producing a much greater value of total product. Therefore, in a situation where a great variety of farm types exist, size may be determined better by value of product produced than by the number of acres in the farm.

A third method of determining size of a farm is by the total investment in the farm business. The previous example of the sugar beet versus the cattle ranch also would be applicable here. It is likely that the total investment in the sugar beet operation is greater than the investment in the ranch, even though there are fewer acres in the sugar beet farm. The criteria used for judging size of an operation depend, to a large extent, upon the situation.

There are also other measures of the size of a farm business. However, within the five analysis areas of North Dakota the farm type is fairly homogeneous. Therefore, ranking according to the number of acres is a good indication of farm size. Between areas, however, number of acres is not as meaningful as a measure of farm size.

Although size must be taken into account in long-run analysis, other factors influence the profitability of the farm operation in the short run. Ten of these other factors were selected from the farm records printouts to be analyzed as to their relationship with profitability. It is hypothesized that these 10 factors may aid the farm operator in recognizing problems and suggesting possible solutions. These 10 factors, called crucial factors, were discussed in the previous section. The 10 production factors serve two functions as decision making aids. They are:

1. To point out the overall profitability of the farm business.
2. To serve as a tool for locating problem areas within the farm business.

PROCEDURE IN USING THE CRUCIAL FACTORS

Two of the 10 factors chosen are designed to indicate the overall success of the farm business. These two factors are measures of efficiency of resource use, and included in each factor is an adjustment for size. The two factors are:

1. Returns to labor and management
2. Percent return on investment.

Returns to labor and management attempt to adjust for size by removing the returns to capital. This is done by subtracting from returns to capital and family labor a charge on capital, both durable and nondurable. Percent returns on investment adjust for size simply due to the fact that it is a percentage.

These two factors should be used together to determine the overall success of the farm operation. Any one factor by itself can be a misleading indicator of profitability. It is possible for a farm operator to have a relatively high return to labor and management and a relatively low percent return on investment, and overall profitability may be low. Conversely, it is possible for a farm operator to have a relatively low return to labor and management and a relatively high percent return on investment, and overall profitability may still be low. In either case the farm operator should consider both percent return on investment and returns to labor and management. Either factor being high tells little about the overall profitability of the farm business. However, if both factors are relatively high, it may be assumed that the farm operator is doing at least a satisfactory job of managing the factors of production.

If a farm operator, after looking at the two factors of overall success of the farm business, realizes he is not receiving adequate returns, he must then look in more detail at the components of farm profitability. Since virtually all income is derived from either crops or livestock, either the crop enterprises or the livestock enterprises must be causing the problem.

In North Dakota most of the farm income is derived from crops; therefore, it may be best to examine the crop end of the farm business first. There are three factors which will give the farm operator some notion as to the profitability of the crop portion of the farm business.

These three factors are:

1. Crop returns per tillable acre
2. Crop expense per tillable acre
3. Crop returns per crop expense.

These three factors, just as the two factors of overall farm success, must be used in conjunction with one another if they are to be meaningful. Crop returns without a knowledge of crop expense are meaningless. Crop expense without any knowledge of crop returns is also meaningless. However, the two factors together, plus the ratio of the two factors, give a fairly thorough analysis of the combined crop enterprises.

The goal of the farmer, assuming he is a profit maximizer, is to produce where the difference between crop returns per tillable acre and crop expense per tillable acre is the greatest. This is the point where profits will be maximized in the crop enterprises.

The first step, then, is for the farmer to consider his crop returns per tillable acre. If his crop returns per tillable acre are lower than the average crop returns per tillable acre of the farms he is comparing with, a possible problem is indicated. By possible problem is meant that there could be factors, such as poor land, which would make an increase in returns to crop enterprise impossible. However, assuming his land is of essentially the same quality and productivity as that of the farmers with whom he is comparing, and other factors being equal, lower than average crop returns per tillable acre indicate that a problem in resource allocation may exist. Then the farm operator must look

to crop expense per tillable acre for at least part of the answer. If he is relatively low in crop expense per tillable acre, the problem is likely one of applying too little of a variable resource such as fertilizer. If his crop expense per tillable acre is in line with the averages of other cooperators while his crop returns are low, it is then likely he is misallocating his mixture of resources within crop expense in some way.

If the crop expense factor is relatively close to "optimum" but crop returns are relatively low, the farm operator should then look at the individual components of crop expense. Two are included in the 10 crucial factors. They are:

1. Fertilizer cost per acre grain and cultivated crop
2. Seed cost per acre grain and cultivated crop.

Fertilizer cost per acre grain and cultivated crop is a very crucial factor on North Dakota grain farms. Fertilizer cost is a factor for which the optimum level of application is difficult to quantify. However, assuming that the most profitable cooperators are applying a close-to-optimum level of fertilizer, the farm operator should compare his fertilizer costs with those of the most profitable farmers. If his factor is considerably above or below the average for the most profitable farmers, it is a pretty safe guess that less or more fertilizer should be applied.

Seed cost per acre grain and cultivated crop is another crucial factor in the farm organization. Seed cost reflects seed type, intensity of application, and quality of seed used. Again, there is an optimum level of seed cost, either above or below which is less profitable. The

guide for the farmer to follow is to attempt to approximate the seed cost of the most successful farmers in the area.

Crop returns per crop expense is an efficiency measure which tells how much the crop enterprises are returning for each dollar invested in the variable costs other than machinery expense. In itself the ratio is rather meaningless. However, when used in conjunction with its components, crop returns per tillable acre and crop expense per tillable acre, it becomes more meaningful. Crop returns per crop expense is intended to be a general guide to use in examining the performance of the crop enterprises. However, even if it is found to be equal to that of the most profitable farmers, there is a chance of both crop returns and crop expense being too low. Therefore, if this ratio is used, it must be used with either of the other two factors, crop returns or crop expense, before it becomes meaningful.

There are two other factors associated with the crop enterprises of the farm business. These factors are:

1. Machinery investment per tillable acre
2. Machinery cost per tillable acre.

Both of these factors are considered crucial because machinery expense is such a large percent of crop expense and machinery investment is such a large percent of total investment on the farm.

Machinery investment per acre is associated largely with size of the business. The small farms have a rather high machinery investment per acre, the medium sized farms have a somewhat lower machinery investment per acre, and as farms tend to get larger the machinery investment

per tillable acre continues to decline.¹⁶ This is caused by the relationship between durable capital in the form of machinery and labor. On a small farm, the ratio of machinery to labor is high. As farms increase in size, less machinery is needed per acre and machinery investment per acre begins to decline. The decline of machinery investment per acre as the farm gets larger is known as economy of size or scale.

The level of machinery investment can have a great influence on return to investment. A high machinery investment may result in a low return on investment for the farm firm. Although machinery is only one of the investment factors, it is an important part of total investment and should be analyzed for the overall farm operation for profitability.

There are basically two ways to lower per acre machinery investment. These are:

1. Sell some machinery
2. Use existing machinery on more acres.

The first alternative is seldom done because of the great difference between purchase price and salvage value. However, it may be well for the farmer to look at his long-run replacement pattern if his machinery investment per tillable acre is consistently high. A relatively high machinery investment should also tell the farmer to consider the possibility of renting or buying more of the land resource, or perhaps doing some custom work, to lower his per acre machinery costs.

Machinery cost per tillable acre is the largest variable cost associated with most crop enterprises. For this reason alone, it is considered crucial. A relatively low machinery cost, provided returns are

¹⁶Anderson, Ronald A., Mail-In Extension Farm Records, General Records Summary 1, Extension Service, North Dakota State University, Fargo, North Dakota, October, 1967, p. 36.

low, implies that the farm may have too little machinery for its size. On the contrary, a relatively high machinery cost, which is more common, implies the farm may have a more than adequate amount of machinery. A high machinery cost per tillable acre may imply the farm operator is spending too much on repairs. Each of the individual components of machinery cost should be examined if this factor is too high.

After having examined the crop portion of the farm business, it may be useful to examine the livestock portion of the business. The need to examine the livestock enterprises would be of consequence only if livestock comprises a significant portion of farm income.

Livestock returns per \$100 feed fed is the measure of the productivity of all livestock enterprises. This measure should be used with some reservation in the North Dakota farm records program because the determination of feed fed is not based on actual feed records.¹⁷ However, assuming the measure is accurate, it can be a very meaningful measure of livestock productivity. If the value of a farm operator's livestock returns per \$100 feed fed is relatively low, he should then study the various feeds that make up feed expenses. Also, a knowledge of type of livestock is necessary in using this factor because the percent of total costs accounted for by feed differs among enterprises.

Much individual study is required in discovering problems in a livestock enterprise because of the many feeding alternatives available to the farmer. In livestock production, many livestock enterprise

¹⁷Ibid., p. 18.

alternatives are also available. One must consider the possibility of dropping or adding an enterprise as well as how to improve existing enterprises. If a farmer has only one livestock enterprise, he can use this factor to compare with research results published from experiments conducted in the field of the particular enterprise.

GUIDELINE VALUES OF THE CRUCIAL FACTORS

The records of all farmers cooperating in the electronic farm records program since the mail-in system was started in 1964 were used for determining the suggested guideline level of the factors of production. The data are available in the electronic farm records summaries, 1964, 1965, and 1966. The data were combined for the three-year period for each analysis area. The averages for all cooperators, the most profitable 40 percent and the least profitable 40 percent were calculated for each of the 10 factors over the three-year period. The complete results can be seen in Table 1.

Since the farmers cooperating in the program are recognized as the better farmers in the state,¹⁸ it can be fairly safe to assume that the most profitable of the cooperators must be operating somewhat close to optimum. Therefore, the values for the 10 factors obtained by the most profitable 40 percent of the cooperators are assumed in this study

¹⁸The average farm size of farmers cooperating in the electronic farm records system in 1966 was 1,649 acres compared with an average of all farmers of 789 acres. The cooperators had an average capital investment of \$116,871 and gross sales of \$38,871 compared to capital investment of \$59,788 and gross sales of \$12,300 for all farmers.

to be close to the optimum level. Each of the values for the most profitable 40 percent has been rounded and represents a goal for which all farmers within each area may strive. These guideline values are shown in Table 2.

The guideline values for the crucial factors are most meaningful for the East Central, Northwest, and Southwest analysis areas. This is because there are many more observations in these areas and the type of farm is relatively homogeneous within each of the areas.

The Southeast and Red River Valley areas are characterized by a greater variety of farm types. Also, the number of observations in those two areas is too few for a meaningful analysis.

A HYPOTHETICAL CASE STUDY

A typical small grain farm in East Central North Dakota will be used as an example of how these factors may be used in analysis. The following is a stepwise analysis of how the farm operator should examine his business by use of the present farm records system.

Upon receiving his individual analysis and comparative analysis reports, the farm operator should isolate the 10 factors considered crucial. His 10 factors have the following values:

Returns to labor and management = \$6,000

Percent return on investment = 5 percent

Crop returns per tillable acre = \$22.00

Crop expense per tillable acre = \$2.00

Fertilizer cost per acre grain and cultivated crop = \$1.50

Seed cost per acre grain and cultivated crop = \$2.30

TABLE 1. AVERAGES OF THE 10 CRUCIAL FACTORS BY AREA, 1964-1966

Average	Number of Farms	Total Size Acres	Returns to Labor and Management	Percent Return on Investment	Crop Return Per Tillable Acre	Crop Expense Per Tillable Acre
Average of all Cooperators						
East Central	140	1,462	\$10,448	8.78	\$27.83	\$ 3.45
Northwest	67	1,828	14,070	10.12	26.85	2.48
Southwest	58	2,058	8,174	6.59	21.28	2.54
Southeast ^a	10	1,380	12,612	9.07	32.03	4.89
Red River Valley	40	972	12,865	8.60	44.83	7.82
Statewide	315	1,540	11,175	8.64	28.71	3.68
Averages for the Most Profitable 40 Percent of Cooperators						
East Central	43	1,925	\$19,369	12.06	\$31.08	\$ 3.55
Northwest	36	2,134	21,247	12.61	28.71	2.32
Southwest	29	2,524	14,334	8.91	22.56	2.50
Southeast ^a	5	1,861	16,528	10.33	29.03	4.50
Red River Valley	17	1,174	24,084	12.19	54.65	10.20
Statewide	130	1,923	19,273	11.46	31.53	3.88
Averages for the Least Profitable 40 Percent of the Cooperators						
East Central	43	1,189	\$ 2,370	3.07	\$23.36	\$ 3.10
Northwest	31	1,468	5,616	5.84	24.12	2.85
Southwest	29	1,576	1,747	3.05	19.31	2.61
Southeast ^a	5	899	8,696	7.51	35.32	5.32
Red River Valley	23	827	4,106	3.77	35.05	5.70
Statewide	131	1,189	3,546	4.01	25.15	3.47

- continued -

^a1966 data only.

SOURCE: Anderson, Ronald A., Mail-In Extension Farm Records, General Record Summaries 1, 2, 3, and 4, Extension Service, North Dakota State University, Fargo, North Dakota, October, 1967.

TABLE 2. GUIDELINE LEVEL OF EIGHT DECISION MAKING PRODUCTION FACTORS

	Crop Returns Per Tillable Acre	Fertilizer		Crop Returns Per Dollar Expense	Crop Expense Per Tillable Acre	Seed		Crop Expense Per Tillable Acre	Crop Returns Per Tillable Acre	Machinery Investment Per Tillable Acre	Machinery Cost Per Tillable Acre	Livestock Returns Per \$100 Feed Fed
		Crop Expense Per Tillable Acre	Cost Per Acre Grain And Cultivated Crop			Cost Per Acre Grain And Cultivated Crop	Cost Per Acre Grain and Cultivated Crop					
East Central	\$30.00	\$ 3.50	\$ 8.50	\$ 2.30	\$2.40	\$13.50	\$ 6.30	\$150				
Northwest	28.00	2.30	12.00	1.20	2.00	14.00	5.80	140				
Southwest	22.00	2.50	9.00	1.60	2.20	13.50	5.60	180				
Southeast ^a	29.00	4.50	6.40	1.60	3.30	25.00	11.00	240				
Red River Valley	50.00	10.00	5.30	4.00	4.60	18.00	9.00	390				

^a1966 data only.

Livestock returns per \$100 feed fed = 0.00

Machinery investment per tillable acre = \$16.00

Machinery cost per tillable acre = \$6.50

Crop return per dollar crop expense = \$11.00

The size of the farm is 1,000 acres. There is no livestock so the only decisions he faces is how to improve the crop enterprise.

The farm operator first examines returns to labor and management and percent return on investment. Both of these factors are lower than he believes he should be receiving. Since his farm contains only small grain enterprises, in his search for problem areas the crop enterprises naturally are the only ones considered.

He then looks at the ratio of crop returns/crop expense. This ratio is 11.0 compared with the suggested level of 8.5. This merely points out something may be wrong in his crop expense or crop returns factors. He then considers the two factors, crop returns per tillable acre and crop expense per tillable acre. His crop returns of \$22.00 per tillable acre are \$8.00 less than guideline levels. One of the causes of low crop returns per acre is crop expense per tillable acre. His crop expense per tillable acre is \$2.00, almost half of what is suggested. Therefore, he concludes that some of the available resources are not being applied to the optimum level. However, knowing this is of no use unless the analysis can be carried further to determine which resources are misallocated.

After discovering the problem of low crop expense per tillable acre, the farm operator must examine some of the components of crop expense. Two of the major components are seed and fertilizer. Seed and

fertilizer costs are given in terms of cost per acre of grain and cultivated crops rather than tillable acres. The reason for this is that seed and fertilizer cost is not applied to all tillable acres. The farm operator's factor for seed cost is close to the guideline level. However, fertilizer cost is well below the guideline value. Therefore, he can conclude that he applied too little fertilizer to the crops and this is one contributor to the problem. He can also consider machinery cost per tillable acre. In this case, his machinery cost is slightly higher than suggested, but the difference is quite small.

The problem of low returns on investment may be contributed in part to a higher than suggested machinery investment per tillable acre. However, there is little that can be done to reduce this investment immediately. In his long-range planning, the farm operator can arrange for his investment in machinery to become closer to the suggested level through the obtaining of more land or liquidating some machinery through his replacement policy.

The above has been an example of how the farm records can be used for problem identification. Each farmer's situation is unique, and this must be taken into consideration in the use of this table of "guideline" values. Such things as hail, drouth, disease, or some other act of nature can, in any given year, make this table of values meaningless. Care must be taken in the use of these values so as not to use them as a hard and fast rule but rather as a general guideline to follow. These guideline factors must be combined with other knowledge of the farm and farmers.