

Nature of Farming and Production Efficiency in Irrigated Area of Malheur County

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Summary

Alfalfa, irrigated pasture, small grain, and sugar beets occupy about 85 per cent of total cropland in the irrigated area of Malheur County, according to a survey of 66 farms in 1952. Alfalfa is the leading individual crop.

On the basis of topography and productivity of the soil, irrigated land is classed as suitable or not suitable for growing row crops such as beets and potatoes. In general, farmers with a significant amount of row crop land use it to the maximum extent possible in producing row crops. Forages and grains occupy nearly all the non-row crop land.

Most types of livestock are found in the area, but dairy and feeder cattle are the most important.

Seven types of farming were defined from information obtained in the survey. These seven types, with average farm incomes in 1952 for each, were:

Dairy	\$ 5,504
Dairy crop	4,994
General livestock	2,886
Field crop	8,505
Intensive crop	28,662
General crop	7,099
General	3,647

These farm income differences were due mainly to differences in degree of specialization in production, soil productivity, size of farm business, and relative profit of enterprises in 1952. Intensive crop farms had advantages in all these factors. The low incomes of general livestock farms came about from unprofitable cattle feeding operations in 1952.

The return on livestock investments for the 66 farms in 1952 was only 0.3%. Unprofitable cattle feeding brought about this low rate of return on money invested in livestock. Dairy cattle investments earned much more--an average of about 30%.

^{1/} Assistant agricultural economist and late agricultural economist, respectively.

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The main opportunities to increase production efficiency in the area are: (1) increase degree of specialization, (2) increase size of business, (3) increase use of commercial fertilizer, and (4) increase milk production per dairy cow.

Thirty years ago the Snake River Valley portion of Malheur County was a ranching and winter feeding area for range livestock. Soon thereafter intensive farming became predominate through the advent of irrigation.

Congress appropriated funds for the Vale and Owyhee Projects in 1924 and 1925. The first delivery of water to farmers from those projects was in 1930. By 1950 about 196,000 acres of land in Malheur County were under irrigation.^{1/} This included nearly all the bench and bottom land in the area adjacent to Ontario, Nyssa, and Vale.

This study dealt with farms in the Owyhee Project which included Advancement, Bench, Crystal, Ontario-Nyssa, Owyhee, Payette-Oregon Slope, Slide, and Ridgeview Projects. It did not include the Vale, Owyhee Ditch, and Warm Springs Projects.

Although the major adjustments to new types of farm production have been made, farmers still experience problems in adjusting their production to meet changing economic conditions and to maintain a high level of efficiency. Production alternatives vary within the area because of differences in soil. Many of the enterprises adaptable to the area are risky from the standpoint of providing a steady year-to-year income to farm families. High capital requirements associated with intensive farming limit the attainment or maintenance of production efficiency. These and other economic problems of the farmers in the area indicate a need for research to assist farmers in their production decisions.

This study was exploratory in nature. The main purposes were to determine the nature of the farming and farmer production problems in the area. A further aim was to provide farmers with some guides for increasing production efficiency. Since the study was exploratory, specific solutions to many of the problems experienced by the farmers could not be worked out. Results of the study, however, did shed some light on the nature of adjustments in farm production which show promise of increasing production efficiency.

Procedure

Information on farm production, cost, and income was obtained from 66 farmers in the fall of 1952. The survey was confined to the Owyhee Project area. Farms with less than 40 acres of land were excluded. Random sampling methods were used to select farms to be included in the study.

Farm incomes were computed for each farm in the study from information obtained from the farmers. Prices for input and output factors were those prevailing in the area in 1952. Values for land, machinery, livestock, and other capital assets were

^{1/} Agricultural census, 1950.

farmer estimates. The values of farm products not sold or those on hand pending sale were determined by use of market prices. Actual farmer payments for labor, custom work, and production supplies were used in the income computations.

Farms were grouped by sources of income in determining farm types. In general, farms with two-thirds or more of their receipts from a single enterprise or category of enterprises were classed as specialized farms in that particular enterprise or enterprises. Some deviations from this condition were necessary in determining farm types.

Crop Production and Land Resource Relationships

Production decisions by individual farmers are based mainly on production possibilities with the resources at hand, market price relationships, and the degree of risk associated with each enterprise. The discussion in this section relates to crops grown in the area and how the land resource affects crop production systems.

Crops Grown

Crops grown in the area were classed as forage, grain, and intensive row crops. Forage crops included irrigated pasture, alfalfa harvested for hay or seed, and clovers harvested for hay or seed. Grain crops included wheat, oats, barley, mixed small grain, and corn for grain or silage. Intensive row crops produced were sugar beets, potatoes, onions, carrot seed, sweet corn, etc.

From the standpoint of cropland acres devoted to the production of various crops, forage crops ranked first, grain crops second, and intensive row crops third in the area (Table 1). Nearly half the cropland in the sample was used in production of forage crops. About one-third of the cropland was used in production of grains. Intensive row crops occupied about one-sixth of the cropland in the sample.

The leading individual crops ranked according to acreages were alfalfa, irrigated pasture, wheat, small grains grown for feed, and beets. These crops occupied nearly 85 per cent of total cropland in the sample. Most of the farms sampled grew alfalfa for harvest and irrigated pasture. About two-thirds of the farms grew wheat and small grains. Less than half the farms in the sample (44 per cent) produced intensive row crops. Thirty per cent of the farms grew beets, 12 per cent grew potatoes, and 18 per cent grew one or more of the other intensive row crops.

An average of 53 per cent of farm receipts for the farms in the sample was from sale of crops. All intensive row crops were cash crops. Clover seed and wheat were the main cash crops among the forages and grains. About one-third of the farms in the sample marketed hay, primarily alfalfa, and several sold feed grains. The area produces a surplus of forage--that is, more than needed for the livestock in the area.

Land Resources in Relation to Crops Grown

Nonirrigated land in the Snake River Valley portion of Malheur County has little productive value. It is range or waste land. About one-fourth of the total land included in the sample was nonirrigated. Our primary concern is with the irrigated land, which averaged 88 acres per farm in the sample.

Adaptability of irrigated land for different crops depends on soil productivity and topography. In general, the bottom land in the area is the most productive, the bench land next, and the rolling to hilly land the least productive. Forage and small grain crops can be grown successfully on all the irrigated land. Not all the irrigated land, however, is adaptable to the growing of row crops. Row crops cannot be grown successfully on land with sufficient slope to permit a significant amount of erosion with the irrigation process. Thus, on the basis of topography, irrigated land can be classed as adaptable for row crops or not adaptable for row crops. Various degrees of soil productivity exist within each of the two land classes. The most productive of the row-crop land receives the most intensive use in row crops. Forages and grains are produced on the non row-crop land. The acreage devoted to grain is highest on the most productive of the non row-crop land.

Twenty-eight of the farms in the sample had primarily non row-crop land. Twenty-two of the farms had primarily row-crop land. The remaining 16 farms had significant quantities of both row-crop and non row-crop land. In general, farms with a significant amount of row-crop land utilized it to the maximum extent possible in production of row crops. This was because of the profitability of row crops as compared with the forage and grain crops. On the row-crop land, forages and grains were grown in rotation with row crops to the extent necessary to maintain the yields of the row crops. There were a few exceptions to this rule on use of row-crop land. A few farmers in the sample emphasized production of forage and grain crops. These were livestock farmers, or farmers with limited capital for the development of intensive row-crop enterprises.

Nature of Livestock Production

Dairying was the main livestock enterprise in the area. Cattle feeding ranked next to dairying in importance. Other livestock, primarily hogs and beef cattle, were significant sources of income on some farms.

About three-fourths of the farms in the sample had dairy cattle (Table 2). Two-thirds of these had a dairy enterprise of more than 5 cows. The farms with a dairy enterprise averaged 11.1 cows per farm. Sixty-five per cent of the farms had dairy heifers, with an average of 11.4 head per farm.

Nearly half the farmers in the sample fed cattle during 1952. Those farmers who fed cattle averaged 22.7 head per farm.

Hog production was a significant enterprise on about one-fourth of the farms. The 16 farms with a hog enterprise had an average of nearly 30 head per farm. This included hogs of all ages.

Only 10 per cent of the farms had a beef cow enterprise. Poultry production also was of minor significance in the area. Less than half the farms in the sample had hens and/or pullets.

Most dairy farms were on non row-crop land, or farms with a limited amount of row-crop land. The dairy enterprise fits well with forage and grain production programs on these farms. On the other hand, several feeder cattle enterprises were on the farms producing row crops. Feeder cattle units on row-crop farms were supplementary enterprises. That is, cattle were fed as a means of utilizing forage and grain crops produced in rotation with row crops, and beet pulp available to beet producers. The feeder cattle enterprise provided manure needed for the maintenance of soil productivity for row crops.

Capital Requirements in Farm Production

Capital investments in farm production varied with the type of production and size of operation. Individual categories of capital assets were land, machinery and equipment, livestock, and buildings. Land was the most important, representing 62 per cent of the average total capital investment for farms in the sample. Land investment averaged \$24,826 per farm, machinery investment \$7,353, livestock \$4,397, and farm buildings \$3,531 (Table 3).

Considerable variation in total capital managed and among individual asset categories existed as may be noted by the ranges presented in Table 3. Total capital investment varied from \$11,582 to \$115,694--a total range of about 100 thousand dollars. The farm with the lowest capital investment was on non row-crop land, and contained 43 acres of irrigated land. The farm with the highest capital investment was an intensive row-crop farm containing 154 acres of irrigated land. Production emphasis was in beets and potatoes on the farm with the highest total capital investment and in forages and small grain on the farm with the smallest capital investment. Between these two extremes, a variety of production systems and sizes of operations existed.

Land adaptability exerts much influence on production systems, as mentioned previously, and, therefore, influences the size of capital investment. However, the amount of capital a farmer has to invest also influences the production system. Intensive row-crop production requires more capital than any other type of farming in the area, because of (1) high land values associated with row-crop land and (2) high capital investments per acre required for machinery and equipment for row crop production. Irrigated land values averaged about \$200 per acre for non row-crop land and \$400 per acre for row-crop land.

Farmers with any of the production systems have some latitude as to size of capital investment in the different asset categories, particularly machinery, buildings, and livestock. Hiring of custom work, a general practice in the area, cuts down the machinery investment needed. Buildings to serve essentially the same functions can vary considerably in original cost. Control over livestock investment can be exercised by choice of size of enterprise and quality of animals. A farmer also can change the value of land he operates through the addition of irrigated acres or through practices which change productivity of the soil.

Although farmers do have some latitude in the size of investments in different asset categories for a given type of farming, the fact remains that a sizeable capital investment is needed for farming in the irrigated area of Malheur County. The capital investment figures presented do not include operating capital, supplies, and the value of the dwelling house.

Many farmers in the sample reported having insufficient capital for expansion or for the development of more efficient production organizations. These were mainly the farmers with the smaller total capital investments.

Market Prices and Price Risks

Thus far the nature of farm production in Malheur County as influenced by land adaptability and capital to invest has been discussed. Another factor in farmer production decisions is market prices. Year-to-year changes in market prices bring about price risks.

A limited amount of this study was devoted to an analysis of prices and price risks. Three crops were chosen for illustrating differences in degree of price risk. These were beets, potatoes, and onions, the three leading intensive row crops produced in Malheur County.

Variability in beet, potato, and onion prices for Oregon in the 1943-52 period is illustrated in Figure 1. During these years prices for beets were most stable, with prices of onions most variable. Potato prices varied nearly as much as onion prices. Less price risk is associated with products having the more stable year-to-year prices. For these three crops, one could conclude that beets were the safest enterprise and onions the most risky. Beet prices were relatively stable because of government support prices.

The relatively high price risk associated with onion and potato enterprises may account for the small number of farmers in the area producing these crops. Either can be a very profitable enterprise with average or above average prices. Under the situation of price uncertainty (not knowing at planting time what the price is likely to be at harvest), it is impossible for a farmer to operate at maximum efficiency. For those years when the price of a product is low he has used too many resources in its production. Conversely, when the price of the product turns out to be relatively high, he has not devoted enough of his productive resources to its production.

Another feature of the price data presented in Figure 1 worth noting is the relatively high prices for all three products in 1952. These high prices affect the incomes of farms producing row crops relative to the incomes for those without row crops.

Farm Production and Income by Farm Types

Seven types of farming were defined by use of the information in the 66 survey records. They were dairy, dairy crop, general livestock, field crop, intensive crop, general crop, and general.^{1/} Forages and grains were classed as field crops in defining the types of farming.

Land Use by Farm Types

A summary of land use for the 66 farms by farm types is shown in Table 4. Land use is presented in percentages of total cropland.

More than half of the cropland was used in production of forage crops by the dairy, dairy crop, general livestock, and field crop farm types. Intensive crop farms had the smallest percentage of cropland in forage crops. This also was true of grain crops. Grain crop production was highest for field crop and general farm types. Row crops were produced within all farm types, indicating some row-crop land was within all the farm types. Production of row crops, however, was concentrated in the intensive crop and general crop farms.

Livestock Numbers by Farm Types

A livestock summary by farm types is presented in Table 5. Livestock numbers are averages per farm for each kind of livestock. Heifer numbers (dairy and beef) are heifers of all ages. Hog numbers include hogs of all ages.

As could be expected, dairy cows and heifers were concentrated on farms classed as dairy or dairy crop types. Nearly all beef cows and beef heifers were on farms classed as general livestock. General livestock farms also had the larger feeder cattle enterprises per farm. Other types with significant feeder cattle enterprises were field crop and intensive crop farms. Most of the hogs were on farms classed as general, dairy, and dairy crop.

^{1/} Classification of the 66 farms into types was performed in accordance with the following definitions of the different types:

- Dairy: Farms with more than two-thirds of farm receipts from the dairy enterprise.
- Dairy Crop: Farms with from one-half to two-thirds of the farm receipts from the dairy enterprise.
- General Livestock: Farms with more than half of the farm receipts from the sale of livestock.
- Field Crop: Farms with more than two-thirds of farm receipts from forage and/or grain crops.
- Intensive Crop: Farms with more than two-thirds of farm receipts from sale of intensive row crops.
- General Crop: Farms with more than two-thirds of farm receipts from sale of crops, but receipts from either intensive or field crops less than two-thirds of total.
- General: Farms which did not fit into the above six types.

Land, Labor, and Capital by Farm Types

Inputs of land, labor, and capital by farm types are shown in Table 6. Percentages of total capital in each asset category also are presented in the table.

Cropland varied from an average of 73 acres for dairy crop farms to 126 acres for field crop farms. Acres of non-cropland averaged the highest for general farms--an average of 64 acres per farm.

Total man months of labor used per farm ranged from an average of about 17 for general farms to 35 for intensive crop farms. Little difference in total labor per farm existed for the dairy, dairy crop, general livestock, field crop, and general farm types. Labor requirements increased sharply for farms producing intensive row crops. Evidence of this can be noted by examining the labor per cropland acre. Intensive crop and general crop farms used an average of .32 man months of labor per cropland acre. Field crop farms used the least amount of labor per cropland acre (.15 man months).

Average capital investment per farm varied from \$28,057 for dairy crop farms to \$75,755 for intensive crop farms. The proportion of total investment represented by land varied from an average of 56 per cent for dairy farms to 66 per cent for general crop and general farm types. This means that investment in machinery, livestock, and buildings combined varied from 34 per cent to 44 per cent of the total. In general, the dairy, dairy crop, and livestock crop farms had a high proportion of total investment in livestock, and crop farms had a high proportion of total investment in machinery.

The capital investment per man year labor shown in Table 6 provides an indication of how labor and capital combinations vary among farm types. Farms with \$24,000 or more capital investment per man year labor use a low amount of capital employed. Generally, farms with \$22,000 or less capital investment per man year labor use a high amount of labor relative to the amount of capital employed. Thus, the dairy, dairy crop, and general crop farms used a high amount of labor relative to capital, and the field crop, intensive crop, and general farms used a low amount of labor relative to amount of capital investment. Intensive crop farms employed the highest amount of labor per cropland acre. When taking into account the very high capital investment on these farms, however, labor inputs per dollar capital investment were low.

Receipts, Expenses, and Farm Income by Farm Types

Receipts, expenses, and farm income by farm types are summarized in Table 7. These were computed for each farm and averaged for each farm type.

The main features of the receipt, expense, and income data were:

- (1) the high receipts, low expenses relative to receipts, and high farm incomes of intensive crop farms;
- (2) the low receipts and farm income, per farm and per acre cropland, for general crop farms when taking into account the fact that these farms had 30 per cent of their cropland in intensive row crops;
- (3) the high expenses relative to receipts and low farm incomes for general livestock farms; and
- (4) the relatively low receipts, expenses, and farm income per acre of cropland for general farms.

Specialization in the production of beets, potatoes, and other intensive row crops paid in 1952, as indicated by the receipt, expense, and income figures for intensive crop farms. On the basis of the success of intensive crop farms, one could expect general crop farms to rank second in farm receipts and farm incomes. This did not materialize. The farms specializing in production of field crops ranked next to the intensive crop farms in farm receipts and farm income. General crop farms did outrank field crop farms in farm receipts and income per acre cropland. However, this difference was small. Apparently the over-all production efficiency of general crop farms was lower than for farms specializing in production of field crops or intensive crops.

The high expenses relative to receipts and low farm incomes for general livestock farms came about from two reasons: (1) the high turnover of operating capital in cattle feeding enterprises, and (2) the unfavorable operating margin of feeder cattle in 1952. Cattle prices were falling in 1952, bringing about the unfavorable narrow operating margin (difference between price paid for cattle and price received per hundred weight for finished animals).

General farms were the least specialized in production of any of the farm types. With the exception of general livestock farms, general farms had the lowest average farm income. Lower production efficiency, due to diversification in production on the general farms, was one reason for the relatively low average income for these farms.

Reasons for Income Differences

The major reasons for the income differences shown in Table 7 are differences in (1) degree of specialization, (2) soil productivity, (3) relative profitability of enterprises in 1952, (4) size of operations, and (5) efficiency in the use of capital and labor.

These five factors are associated. For example, intensive crop farms had the highest degree of specialization, the most productive soil, the most profitable enterprises in the area in 1952, and the larger size of operations as compared with other farm types. Also, efficiency in the use of capital and labor is associated with the other four factors, particularly with the degree of specialization and the relative profitability of the enterprises. This means the effect of any one factor cannot be isolated and presented exactly in terms of dollars and cents with the data at hand.

Degree of Specialization

The possibility of inefficiencies in production due to diversification on general crop and general farms already has been mentioned. Higher average income for dairy compared with dairy crop farms also suggests the possibility of greater efficiency for farms more specialized.

A high degree of specialization in production permits the development of larger enterprises than can be attained when farm resources are spread over many enterprises. Many farm enterprises in the area are too small to justify the machinery and production facilities which make efficient production possible. This is particularly true of general

farms and to a lesser extent the other farm types. It is known that, in agriculture, unit costs of production decrease with increase in the size of the enterprise until a point is reached when the enterprise is too large to be managed efficiently. There is little evidence to indicate that any of the farmers in this study had individual enterprises too large to be managed well.

Some diversification in production usually is desirable in order to more fully utilize farm resources and to maintain yields of the principal crops. Nearly all farms in the sample had some degree of diversification. Perhaps the general and general crop farms had a higher degree of diversification than consistent with maximum production efficiency.

Soil Productivity

Soil productivity was one of the factors determining the farm types. Thus, some of the income differences among farm types must be due to differences in soil productivity.

A crop yield index was computed for each farm in the sample in order to obtain some information on how soil productivity varies among the farms. The crop yield indexes computed were averaged by farm types in order to get soil productivity comparisons among the farm types. The results were as follows:

<u>Type of farming</u>	<u>Crop yield index</u>	<u>Receipts per cropland acre</u>
Intensive crop	120	\$ 424
General crop	109	170
General livestock	106	183
Field crop	104	137
Dairy	97	149
Dairy crop	95	134
General	88	93

An index of 100 represents average crop yields. An index of 120 means yields are 20 per cent above average. Indexes below 100 represent crop yields below average in the area.

With the exception of farms with significant portion of receipts from livestock or dairy enterprises, ranking of the farm types from the standpoint of crop yield index is consistent with the ranks in accordance with receipts per acre cropland. One of the causes for the difference in receipts per cropland acre was variation in soil productivity.

Relative Profitability of Enterprises

The relative profitability of farm enterprises in an area in any one year depends mainly on the relative prices of farm products. Information on prices received for the different products produced by the individual farmers surveyed was insufficient for working out price indexes for comparison among farm types. It was indicated previously, however, that prices of intensive crops were higher in 1952 than the 1948-52 average (Figure 1), and that cattle prices were lower than in the years immediately before 1952. Prices of clover seed and hay were a little lower in 1952 than in 1950 or 1951 for Oregon. Grain prices held firm through 1952.

Rarely can the prices or price relationships among farm products in one year be considered typical of a series of years. In 1952, the intensive row crop farmers in Malheur County fared better price-wise than could be expected over a number of years. If 1950 prices had been received for the 1952 production of onions, beets, and potatoes, average farm income for intensive crop farms would have been about \$9,000. This is nearly \$20,000 less than the farm income indicated in Table 7 for these farms. Prices for onions and potatoes were low in 1950 (Figure 1). Average farm income for intensive crop farms figured on the basis of 1948-52 average prices for potatoes, beets, and onions would be about \$10,000 less than that received by these farms in 1952.

The field crop farms could not be given a significant advantage or disadvantage on prices. General livestock farms were at a disadvantage on prices because of the unfavorable operating margin in 1952. It is not known whether prices received for milk by the dairy farmers in the survey were low, high, or average relative to previous years. For the state, milk for manufacturing was a little higher in 1952 than the three preceding years.^{1/}

Size of Operation

Size of operation is measured by the total inputs of land, labor, and capital per farm. These inputs varied among farm types (Table 6). Total land, labor, and capital inputs were highest for intensive crop farms. This is another reason why farm incomes for intensive crop farms were relatively high. Dairy, dairy crop, and general type farms were smallest in size. These farms averaged the lowest in farm receipts per farm.

Efficiency in the Use of Capital and Labor

Efficient use of capital means investing wisely in productive assets. It means investing more in those assets which will yield high returns than in assets which have a low productive value. A high production efficiency also includes a balance in the amount of labor used relative to land, machinery, and other capital items.

Returns per dollar investment in land, machinery, livestock, and operation were derived for the sample farms. Investment in operation was cash operating expenses, including expenditures for such items as irrigation water, fertilizer, seeds, custom work, and supplies. Estimated returns on these classes of capital investments (land, machinery, etc.) were as follows:

Item	Returns
	Per cent
Land	6.2
Machinery	17.3
Livestock	0.4
Operation	40.0

Returns on cash operating expenses of 40 per cent represent an amount above the original investment. This means, on the average, each dollar invested by the farmers in operation returned \$1.40.

^{1/} B. W. Coyle and R. K. Ganger. Oregon's Dairy Industry 1925-1953. Oregon State College, Extension Bulletin 741, p. 29.

The per cent return figures indicate that the earning power of cash operating expenses and machinery was high in 1952 in the area. On the other hand, the earning power of a livestock investment was almost nothing. The low return on livestock was due to the unprofitability of beef cattle.

Returns to labor were estimated jointly with returns to different classes of capital. Labor returns averaged \$181 per man month for the 66 farms in 1952. Operator, family, and hired labor were combined for the determination of labor returns. Labor was worth more than \$181 per month on farms with higher than average incomes, and less than \$181 per month on farms with less than average farm incomes.

Production efficiency indexes for the different farm types were computed on the basis of the estimated returns to different kinds of capital investments and to labor. The computed production efficiency indexes were as follows:

Farm type	Efficiency index
Dairy	110
Dairy crop	106
General livestock	88
Field crop	104
Intensive crop	114
General crop	94
General	90
Average, all farms	100

An index of 100 means average efficiency in the use of labor and capital. An index of more than 100 indicates better than average efficiency, and an index of less than 100 indicates less than average efficiency. ^{1/} The dairy, dairy crop, field crop, and intensive crop farms were better than average in production efficiency. General livestock, general crop, and general farms were below average in production efficiency.

The low efficiency index for general livestock farms reflects the effect of fall- ing cattle prices in 1952. The unfavorable operating margin between the price of feeder cattle and price of slaughter animals caused feeder cattle enterprises to be unprofitable that year.

General and general crop farms had low efficiency indexes, probably because of too much diversification. Disadvantages of the diversification exhibited on these farms were (1) insufficient size of individual farm enterprises and (2) lack of balance in the combination of productive assets. More specialization (fewer and larger enterprises) would contribute to a better balance in combination of resources.

^{1/} Indexes were computed by obtaining the ratio of expected farm receipts and actual farm receipts. The expected farm receipts for each farm type were obtained by use of the following estimation equation: $Y = 1.868X_1 + .18397X_2 + .15554X_3 + .00138X_4 + .45723X_5 + 53311$, where Y=farm receipts, X_1 =land capital, X_2 =machinery capital, X_3 =livestock capital, X_4 =man months labor, and X_5 =cash operating expenses.

The highest production efficiency was attained by intensive crop farms. As indicated earlier, intensive crop farms had some advantages in specialization, size of operation, and in prices in 1952.

Dairy and dairy crop farms ranked next to intensive crop farms in production efficiency. One reason for the high ranking of dairy farms was higher returns on dairy cattle investments than indicated previously for livestock. A separate analysis of the dairy farms indicated returns on the dairy cattle investment to be about 30 per cent, as compared with almost nothing for livestock on all farms. This high return on dairy cattle was partly offset by low returns to labor on dairy and dairy crop farms. The estimated returns to labor on dairy and dairy crop farms were \$90 per man month.

Opportunities to Increase Production Efficiency

Opportunities to increase production efficiency differ among farm types and among individual farms within each of the types. On the basis of data in this study, the following show promise of increasing production efficiency: (1) increase in degree of specialization, (2) increase in size of operations, (3) increase in the use of commercial fertilizer, and (4) increase in milk production per cow.

More specialization in production is a possibility for increasing production efficiency, particularly for the general farms. Increase in size of operations (total inputs of land, labor, and capital) usually will accompany an increase in degree of specialization because more capital is needed to increase specialization. Shortage of capital for farm development is a limitation to increases in size and specialization.

Natural variations in soil productivity limit the possibilities of obtaining crop yields on non-row cropland equal to yields on row cropland. Increased use of commercial fertilizers, however, does have possibilities. Nearly all farmers in the sample growing row crops did use commercial fertilizer (one did not). Of the remaining farmers (those who did not grow row crops), only half used commercial fertilizer. This means about one-third of the farmers in the sample did not use commercial fertilizer. Yields of forage and grain crops could be increased profitably by the application of fertilizer, particularly nitrogen.

Milk production per cow on dairy and dairy crop farms averages 6,600 pounds of 4.5 per cent milk. Although this production differs but little from the state average, there is considerable opportunity to raise the production level through upgrading of dairy herds. Another way is to increase size of dairy herds. It was pointed out in the previous section that returns on the dairy investment were high while returns to labor on dairy farms were relatively low. Increase in the size of dairy herds and production per cow on these farms would contribute to higher returns to labor.

Other specific ways to increase production efficiency could not be determined from the data at hand. However, one general recommendation on capital investment can be made. Production efficiency is higher when farmers invest more on those capital assets which will yield high rates of return than on assets with low earning power. Possible returns on various investment alternatives differ among individual farms. Some figuring by individual farmers on the most effective use of capital they have to invest would pay.

Table 1. Average Acres and Per Cent of Total Cropland Used in Production of Different Crops

Kind of crops	Per farm, 66 sample farms		Farms growing crop	
	Acres	Per cent total cropland	Per cent	Acres per farm
<u>Forage Crops</u>				
Alfalfa, for harvest	24.2	27	89	27.1
Pasture (irrigated)	15.9	18	91	17.5
Other forage crops /1.	2.4	3	15	13.2
Total forage crops.	42.5	48	--	--
<u>Grain Crops</u>				
Wheat.	12.8	15	64	20.1
Small grains /2	10.3	12	68	15.1
Corn (grain and silage)	6.5	7	42	15.3
Total grain crops	29.6	34	--	--
<u>Intensive Crops</u>				
Sugar beets	8.7	10	30	28.7
Potatoes	2.2	3	12	18.2
Other intensive crops /3	3.0	3	18	16.5
Total intensive crops.	13.9	16	--	--
Garden and idle	2.0	2	--	--
TOTAL CROPLAND.	88.0	100	--	--

/1 Includes red clover, Ladino, white clover, sweet clover; hay or seed.

/2 Includes oats and barley, and combinations of oats and barley with wheat.

/3 Includes onions, sweet corn, carrots, rutabagas, strawberries, and lettuce.

Table 2. Numbers of Different Kinds of Livestock
Per Farm

Kind of livestock	Average number per farm in sample	Farms with specified kind of livestock	
		Per cent	Number per farm
Dairy cows	8.1	73	11.1
Dairy heifers	6.8	65	11.4
Beef cows	1.1	9	11.8
Beef heifers	1.4	12	11.2
Feeder cattle	10.3	45	22.7
Hogs	7.2	24	29.9
Hens and pullets	19.1	42	45.0

Table 3. Capital Investment in Farm Production

Item	Average, 66 farms	Range		Percentage of total and percentage range		
		High farm	Low farm	Average, 66 farms	Range	
					High farm	Low farm
				Per cent	Per cent	Per cent
Total.....	\$40,104	\$115,964	\$11,582	100	--	--
Land.....	24,826	61,600	4,600	62	86	32
Machinery and equipment...	7,353	33,665	325	18	51	3
Livestock.....	4,397	21,425	0	11	35	0
Buildings/1...	3,531	30,562	0	9	26	0

/1 Building investment does not include dwelling house.

Table 4. Land Use Summary by Types of Farms (Per Farm)

Type of farm	Number of farms	Total crop-land Acres	Per cent of cropland in--											Garden and idle	
			Forage crops			Grain crops				Intensive crops					
			Alfalfa/1	Pasture	Other/2	Total	Wheat	Small grain/3	Corn/4	Total	Sugar beets	Pota-toes	Other/5		Total
Dairy	14	77	30	32	0	62	9	15	9	33	1	2	1	4	1
Dairy crop	13	73	37	18	1	56	6	18	7	31	6	0	6	12	1
General livestock	9	82	26	26	1	53	12	11	12	35	8	0	2	10	2
Field crop	7	126	31	13	8	52	32	8	5	45	0	0	2	2	1
Intensive crop	7	109	15	5	3	23	18	2	2	22	31	16	7	54	1
General crop	6	91	26	8	2	36	14	14	5	33	26	0	4	30	1
General	10	86	19	17	4	40	16	12	11	39	9	0	8	17	4

/1 Includes acreage of alfalfa harvested for hay, for seed, or for both hay and seed.

/2 Includes red, Ladino, sweet and white clovers, harvested for hay or seed.

/3 Includes oats and barley, and mixed small grain.

/4 Includes corn grown for grain and silage.

/5 Includes onions, beans, sweet corn, carrots, strawberries, rutabagas, and lettuce.

Table 5. Livestock Summary by Types of Farms (Per Farm)

Kind of livestock	Dairy	Dairy-crop	General livestock	Field crop	Intensive crop	General crop	General
Dairy cows	19.0	12.0	4.0	2.1	0.3	1.3	4.9
Dairy heifers	15.1	11.8	2.3	1.0	0.0	0.7	4.9
Beef cows	0.1	0.0	6.6	0.0	0.0	0.0	1.0
Beef heifers	0.0	0.0	8.3	0.0	0.0	1.0	0.9
Feeder cattle ^{/1}	2.5	1.5	33.6	12.0	20.7	8.5	4.4
Hogs ^{/2}	11.2	6.6	4.8	1.1	0.0	0.0	18.4

^{/1} Feeder cattle refers to total number fed per farm during the year.

^{/2} Includes sows and other hogs.

Table 6. Land, Labor, and Capital Inputs Per Farm by Farm Types

Type of farm	Number of farms	Land		Labor				Capital investment ^{/2}					
		Total	Crop-land	Total Man years ^{/1}	Hired	Operator and family	Per acre cropland	Total investment	Per cent of total investment in--		Per man year labor		
									Acres	Acres		Months	Months
								Per cent	Per cent	Per cent	Per cent		
Dairy	14	100	77	1.75	2.8	18.2	.27	\$33,641	56	13	20	11	\$19,224
Dairy crop	13	106	73	1.53	1.3	17.0	.25	28,057	58	19	16	7	18,396
General livestock	9	111	82	1.66	3.0	16.9	.24	36,330	58	12	22	8	21,912
Field crop	7	157	126	1.58	2.8	16.2	.15	48,482	69	22	5	4	30,624
Intensive crop	7	121	109	2.92	14.8	20.2	.32	75,755	63	22	1	14	25,968
General crop	6	105	91	2.44	15.0	14.3	.32	44,605	66	20	6	8	18,264
General	10	150	86	1.41	1.5	15.4	.20	34,253	66	19	8	7	24,324
ALL FARMS	66	119	88	1.81	4.7	17.0	.25	40,104	62	18	11	9	22,176

^{/1} Does not include custom operations requiring the services of both machinery and labor.

^{/2} Does not include value of dwelling house.

Table 7. Farm Receipts, Expenses, and Income per Farm by Farm Types

Type of farm	Number of farms	Total cropland Acres	Receipts/1			Expenses/2			Income/3		
			Total	From crops Per cent	From live-stock Per cent	Total	Per cent of farm receipts	Per cropland acre	Total	Per cropland acre	
											Per cent
Dairy	14	77	\$11,452	19	81	\$149	\$5,948	52.0	\$77	\$5,504	\$72
Dairy crop	13	73	9,750	39	61	134	4,756	49.0	65	4,994	69
General live-stock	9	82	13,327	36	64	183	10,441	78.0	143	2,886	40
Field crop	7	126	17,304	84	16	137	8,799	51.0	70	8,505	67
Intensive crop	7	109	46,174	99	1	424	17,512	38.0	160	28,662	264
General crop	6	91	15,457	86	14	170	8,358	54.0	92	7,099	78
General	10	86	8,021	60	40	93	4,374	55.0	51	3,647	42
ALL FARMS	66	88	15,520	53	47	176	7,835	50.5	89	7,685	87

/1 Includes cash receipts from sale of crops and livestock, and noncash receipts in form of changes in inventory value of crops and livestock and value of farm privileges (excluding dwelling house).

/2 Includes cash expenses plus depreciation on farm buildings (except dwelling house), machinery, and equipment.

/3 Difference between farm receipts and farm expenses. This is an estimate of the earnings of operator and family labor, management, and capital.

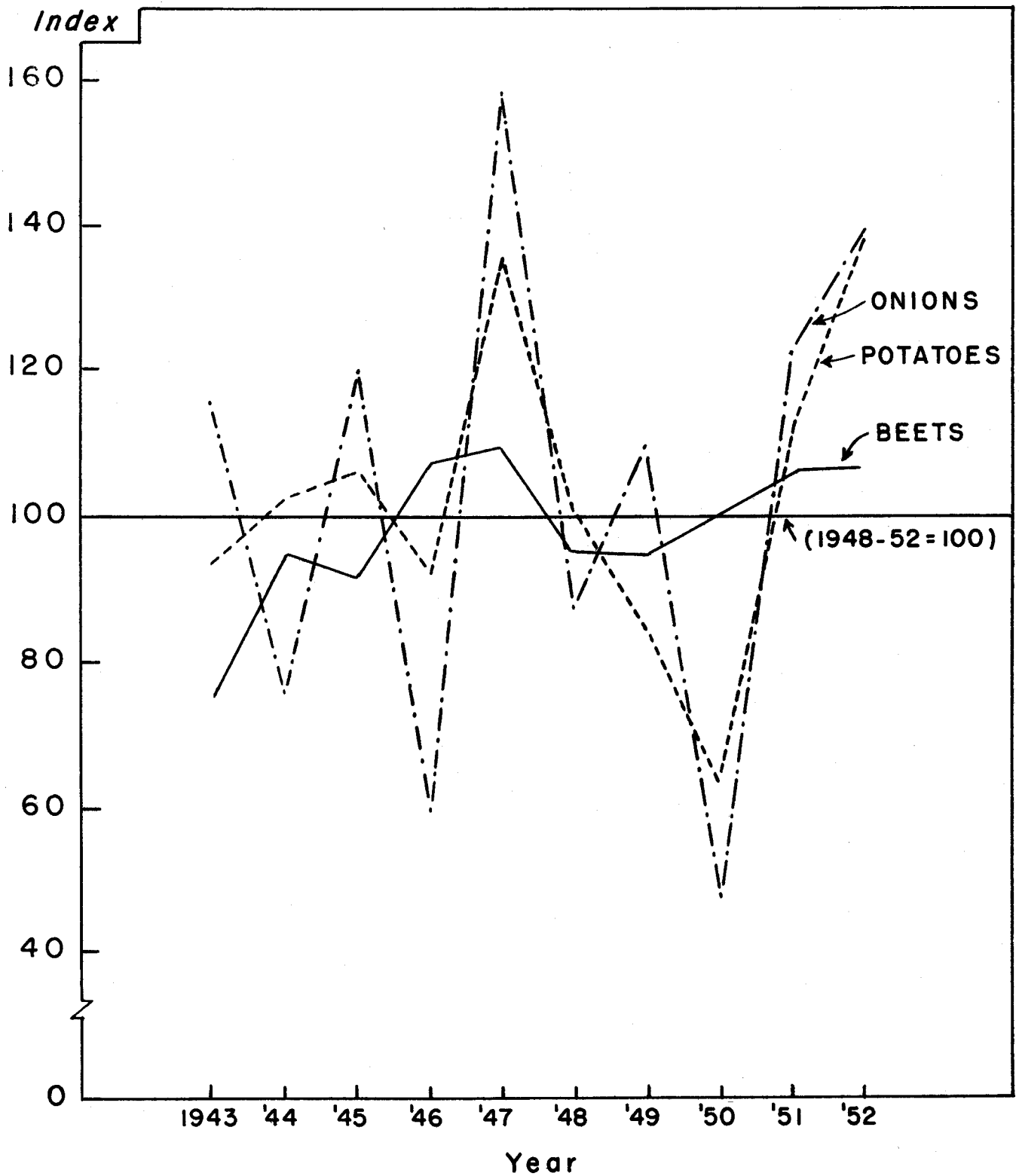


Figure I. Index of Beet, Potato, and Onion Prices, 1943 - 1952 (1948 - 52 = 100)

Source: BAE, USDA (Annual Reports)