

THE EARNING POWER OF INPUTS,
INVESTMENTS, AND EXPENDITURES ON
UPLAND GRAYSON COUNTY FARMS
DURING 1951



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THE EARNING POWER OF INPUTS, INVESTMENTS, AND EXPENDITURES ON UPLAND GRAYSON COUNTY FARMS DURING 1951

The basic problems which Grayson county farmers face are not as new and revolutionary as those faced by farmers in other areas of Kentucky. Grayson county is close to Louisville and Fort Knox, where farmers have been able to obtain off-farm employment and still live on their farms. Thus, they are continually confronted with the problem of choosing between:

1. Working full-time on their farms.
2. Working part time on their farms and seeking part-time employment off their farms.
3. Seeking full-time employment off their farms.

Farmers who choose to work full-time on their farms are confronted with the problem of using the resources available to them to produce and market the products which will net the highest income. To do this farmers must:

1. Use efficient production techniques.
2. Raise those crops and livestock which can be produced and marketed to return the highest earnings to the inputs, investments, and expenditures necessary for their production.
3. Combine the quantities of inputs, investments, and expenditures in the proportions which will return the greatest income for the cost involved in using them.
4. Sell their products in the most profitable existing markets.
5. Choose the size of farm operation which may be operated most profitable with the capital available to the individual farmers.

AGRICULTURAL INTERESTS

Farmers, agricultural leaders, real estate and loan agencies, and others are always interested in the earning power of inputs, investments, and expenditures in farming. They want to know whether investments in such things as livestock and forage or machinery are paying off, and whether land is returning enough to pay for using it in certain farm production. Farmers are interested in whether family labor is earning as much when used on the farm as it could earn in industrial work. They are concerned with how the earning power of a particular input is affected by changes in quantity of other inputs and investments when they are used together. One of the primary questions in upland Grayson county farming is how investments in forage-livestock farming pay off, because the rather hilly lands of the county seem better adapted to a forage-livestock farming program than to more intensive row-crop cultivation.

THIS STUDY

Financial records from account books and by interview were taken from thirty upland Grayson county farms for the calendar year, 1951. These records were analyzed to get estimates of the following:

1. The earning power of groups of inputs, investments, and expenditures used in farming, such as land, labor, forage-livestock investments, machinery investments, and current operating expenditures.
2. How the earning power of other inputs change when used in combination with more of the inputs which are earning high returns.
3. The ways of reorganizing a farm to get higher income from the farm business.

Total Earnings and Earnings of The Last Input Unit are Estimated

In this study two types of estimates were made: (1) total earnings of the farm business, and (2) amount of change in total earnings caused by using one more unit of certain groups of inputs, such as, 126.9 acres instead of 125.9 acres of land; 15.82 instead of 14.82 months of labor; a forage-livestock investment of \$3,608 instead of \$3,607; a machinery investment of \$1,381 instead of \$1,380; or \$1,162 in other expenditures instead of \$1,161. In other words estimates were made of (1) gross income, and (2) how much was added to gross income because one more unit of a particular input was used.

In fact, most units of the inputs and investments were present for the entire year. Farm size did not change during the year and forage-livestock and machinery investments were adjusted so that they were in dollars invested for the entire year -- so, the last-unit earning is the change in gross earning caused by using that number of units instead of using one less unit of the input on the farms studied.

QUANTITY OF INPUTS USED BY THE USUAL FARM OF THE SAMPLE

Land (acres) - - - - -	126.9
Labor (months) - - - - -	15.82
Forage-livestock investments (dollars) - - - - -	\$ 3,608.00
Machinery investment (dollars) - - - - -	\$ 1,381.00
Current operating expenditures (dollars) - - - - -	\$ 1,162.00

THE EARNING POWER OF LAND

Land itself was not a high earner. The last acre of the usual 126.9 acre farm was estimated to be earning \$3.00 in 1951. "Land" was the total acreage which the operator had under his control, whether owned, rented or leased. No adjustment was made for any difference in value of the land or for the different uses to which the land was put. The land on some farms was probably utilized more fully than on other farms. On farms using a greater percentage of the land to the best advantage, higher earnings per acre would be expected. The acres of land are not as important as money earners as the quantity and organization of the investments in other productive agents used on the land. Earnings per acre of land can be increased by using more of other productive agents on the land and increasing production per acre. Less than the usual earnings would be expected if the usual number of acres were used with less than the usual amounts of the other things that are used with land to make farming pay off.

THIS LAND WILL NOT EARN
WITHOUT OTHER INVESTMENTS AND INPUTS



THE EARNING POWER OF LABOR

The usual amount of labor was found to be 15.82 man-months per year. The last man-month used was estimated to be earning \$78.00. This seems to be a fairly high rate of earning for the last unit of this category, considering that the man-months of labor are a measure of all the potential labor of the farm operator and all labor hired or furnished by other members of the farm family. Such earnings seem to indicate that the farmers are using their labor fairly well. A high proportion of Grayson county farmers work off the farm. This may account for labor being more fully utilized. The earnings per month of labor can be increased by using the labor with more inputs which are earning high returns.

THE EARNING POWER OF THE FORAGE-LIVESTOCK INVESTMENT

This investment category is made up of two major items:

1. Forage investment -- the estimated value of stands of grasses and legumes on the farm during the year. The value of the stands were estimated on the basis of an acre of a good grass-legume mixture having a value between \$35 and \$40, down the scale to a value of \$2 per acre for Korean lespedeza in condition to reseed itself at the beginning of the year. The cost of additional seed and fertilizer used during the year in seeding hay and pasture crops are counted as forage investments also.

2. Livestock investment -- the total investment on a year-dollar basis in all breeding stock, workstock, and feeder cattle. This means that if, for example, an investment of \$2000 in cattle was made in June and kept through the year, the year-dollar investment would be one-half of \$2,000. If the investment was made in January and kept through the year, the year-dollar investment would be \$2,000.

Since pasture and hay are of major importance in most livestock enterprises on Grayson county upland farms, it would be hard to separate the earnings due to investments in the two. One cannot well be considered without the other. It would be difficult to make livestock profitable without pasture and hay. Pasture, on the other hand, would not pay off much without livestock through which to market it. Therefore, the two were combined into one investment category and their combined earning power was estimated.

Forage-Livestock Earnings Were High

The analysis shows that in 1951, the last dollar invested in livestock and forage at the usual investment level of \$3,608 was earning 24.3 cents per year when used in combination with the usual quantities of the other inputs, investments, and expenditures. This level of earning should be more than high enough to cover interest on the investment and normal replacement costs of livestock and the forage stands. There is logical reason to believe

that the methods used in this study tended to underestimate the earning power of forage-livestock investments and to overestimate the earning power of machinery, as a result of difficulty in separating the earnings of the two. This was taken into consideration in interpreting the data and making recommendations.

Investments in forage and livestock could profitably have been higher in 1951 at the rate they were earning. Many of the farmers in this study had high investments in young livestock and pasture in 1951 which had not yet reached a most profitable level of production. Other farmers were milking beef-type cows which probably could have been used more profitably for beef production. In both of these cases high investments were involved, but lower-than-normal earnings were being realized from the investments. Higher earnings per dollar invested will be realized in later years from the young stock and pastures. Higher earnings could be realized from the investments in livestock if they were used according to the most profitable capability of their breeding.

Forage-Livestock Investments
Affected Earnings of Other
Inputs Importantly

The usual quantities of inputs other than forage-livestock investments earned low rates when used with small forage-livestock investments and higher rates when used with larger forage-livestock investments.

COMPARATIVE EARNING POWER OF OTHER
 INPUTS USED WITH SMALL AND WITH
 LARGER FORAGE-LIVESTOCK INVESTMENTS

Input, Invest- ment, or Expenditure	Usual Amount : on 30 Farms : Studied	With \$1,000 in Forage- Livestock Investment	With \$7,000 in Forage-Livestock Investment
Land	126.9 acres	\$2.40 an acre	\$3.37 an acre
Labor	15.82 months	\$62.25 a month	\$87.65 a month
Machinery	\$1,383.00	\$.38 per last \$	\$.54 per last \$
Current Expenses:	\$1,162.00	\$.70 per last \$	\$.98 per last \$

Gross earnings with \$1,000 invested in forage and livestock were \$3,981. Gross earnings with \$7,000 invested in forage and livestock and no change in other inputs were \$5,606, to give an increase of \$1,625 annually for the \$6,000 increase in forage-livestock investments. For this \$6,000, 14 or 15 good beef or dairy cows valued at about \$300 each could be purchased and about 65 acres of good pasture could be established.

THE EARNING POWER OF MACHINERY INVESTMENTS

The usual amount of machinery found on the farms studied had a value estimated at \$1,381. These estimates were made by the owners of the machinery at the beginning of 1951, and adjustments were made for any machines sold or purchased during the year.

The analysis indicated that returns to the usual investments in machinery were high under 1951 conditions. Returns to the last dollar invested were estimated at 47.9 cents annually before maintenance and depreciation were deducted. On the basis of this estimate, a considerably higher investment than usual would have been profitable unless repair and maintenance costs were extremely high. There was reason to believe that this estimate was somewhat high. Even so, the indications were that machinery was being used effectively and paid off well. The earnings of this investment have to be high enough to cover interest, repair and maintenance costs.

THE EARNING POWER OF CURRENT OPERATING EXPENDITURES

General expenses for items like gas and oil, feed purchased, custom work, hauling and freight, annual seed, fertilizer value consumed during the year, breeding fees, veterinary costs, and others are part of each year's expenditures in a farm business. Unlike investments, which may last for several years, these items are consumed during one year. Since current operating expenditures are used up during one year's operation, they would be expected to earn a dollar for each dollar expended on these items during the year plus interest on the money from the time it was spent until recovered. The estimates show that the last additional dollar of the usual amount (\$1,162) expended for these inputs returned only 87.6 cents to the farms on which they were used. This estimate was believed to be low, however. By keeping these expenses low and increasing other productive investments, these inputs can be made to earn more than a dollar for each dollar expended for them.

It appears that the returns to machinery investment may be estimated too high and that current operating expenses may be estimated too low as compared with actual returns to these expenditures. The two are closely interrelated and this makes it difficult to establish the true relationship between each of these groups of inputs, separately, and total sales from the farm. When investments in livestock and machinery are earning a high rate and earnings to labor are high, as the results in 1951 indicate, it seems that the dollars expended for feed, gas and oil, fertilizer, and such items should at least earn enough to pay for themselves. Perhaps more was expended for some of these items than should have been necessary in the operations which were carried out. For instance, feed purchased is one of the major items in this group.

From observation it appears that in 1951, livestock enterprises which consumed less bought feed and more home-grown feed were more profitable. Considering the topography and nature of Grayson county soils it appears logical that more forage and forage-consuming livestock should be grown to remedy this situation.

POSSIBLE REORGANIZATION OF THE USUAL SIZE FARM

What rule can be offered as to the way the usual size farm can be re-organized for greater profit? A basic principle is that inputs earning higher relative returns should be increased in use first.

The Last Additional Dollar in Machinery Earned High Returns

Investments in machinery were low relatively and earnings of the last additional dollar invested in machinery were high. This does not mean that machinery was earning a larger share of the total returns than other investments. At the same amount of investment, forage-livestock investments would have earned more per last dollar invested than machinery. The indications are, therefore, that more machinery could profitably be used.

ESTIMATED ANNUAL RATE OF EARNING OF THE LAST UNIT OF INPUTS WITH USUAL FARM ORGANIZATION

Land - - - - -	126.9 acres at \$3.00 per acre
Labor - - - - -	15.82 months at \$78.00 per month
Forage-Livestock Investment - - - - -	\$3,608 at 24.3 cents per dollar
Machinery Investment - - - - -	\$1,381 at 47.9 cents per dollar
Current Operating Expenditures - - - - -	\$1,162 at 87.6 cents per dollar

ESTIMATED ANNUAL LAST UNIT EARNINGS WITH MACHINERY INVESTMENT \$3,500 AND USUAL QUANTITIES OF OTHER INPUTS

Land - - - - -	126.9 acres at \$3.40 per acre
Labor - - - - -	15.82 months at \$88.26 per month
Forage-Livestock Investment - - - - -	\$3,608 at 27.5 cents per dollar
Machinery Investment - - - - -	\$3,500 at 21.4 cents per dollar
Current Operating Expenditures - - - - -	\$1,162 at 99.0 cents per dollar

With a larger machinery investment gross earnings increased from \$4,989 to \$5,645. It may be noted that all "last unit of input" earnings increased except that for machinery, which fell but was still high.

Adjustments For A More Profitable Organization

Further adjustment seems feasible for a more profitable organization of the farm business. Since the earnings of machinery investments are believed to be overestimated and earnings underestimated for forage-livestock investments, forage-livestock investments could profitably be increased considerably and labor and current operating expenditures slightly to reach a more balanced input combination on a farm of the usual acreage.

**A MORE PROFITABLE ORGANIZATION
FOR FARM OF USUAL ACREAGE**

Land - - - - -	126.9 acres earning \$3.92 per acre
Labor - - - - -	16.0 months earning \$100.61 a month
Forage-Livestock Investment - - -	\$7,000.00 earning 16.4 percent
Machinery Investment - - - - -	\$3,500.00 earning 24.5 percent
Current Operating Expenditures - -	\$1,300.00 earning \$1.02 per dollar

A farm with this organization, average management, and under the production and marketing conditions of 1951, would have earned a gross of approximately \$6,508. Although smaller investments in forage-livestock and machinery would have earned a higher return on the last dollar invested in these items, total and net returns would have been less. Therefore, more money could have been invested profitably in such investment items.

Under the more profitable organization, land, labor, and current operating expenditures earned higher returns because these were used with more of the supporting investments. When used more effectively, machinery makes labor earnings higher. With more invested in forage and livestock which were earning high returns, earnings of other inputs used were higher also.

Funds Needed to Balance
The Farm Business

The money required for reorganization of the farm may have to be borrowed by some farmers. Would this be sound business? Judging from the indicated larger returns, it would. For the additional livestock and forage an increase in investment of \$3,392 would be needed. With this amount of money seven or eight good cows valued at \$275 to \$300 each could be purchased and 30 to 35 acres of good forage and pasture could be established with an average fertilizer and seed cost of about \$30 an acre. With an additional \$2,119 for machinery, such items as a tractor outfit, fertilizer spreader, and milking machine could be owned. In some cases, good second-hand items of machinery may be better

buys than new machinery, and some items may be owned jointly with neighboring farmers. At least \$138 more would be needed for extra gas, oil, and other current-expense items. More probably could be spent profitably for the items in this category as the earning power of such items was believed to be underestimated.

The above figures add up to a total of \$5,649 needed to carry out the reorganization. For these additional investments and expenditures, with more efficient use of land and labor, an estimated increase of \$1,519 in annual gross income would be expected. Each farmer would have to decide whether or not that rate of earning would be high enough to pay him to take the risk involved in making the additional investments.

Suppose the farmer owned his farm debt-free but needed to borrow \$5,000 for the additional investments and could get this amount at 6 percent and pay back the debt at the rate of \$1,000 per year. At the end of the first year after paying interest, debt due, current operating expenses, and allowing 15 percent for depreciation on forage-livestock and machinery investments, \$2,333 would be left for general upkeep of the farm, buildings, and family living (value of house rent was not included in income) unless income was received from some other source. At this rate, in five years all assets would be debt-free and a better standard of living could be realized. If labor could be used more efficiently so that some off-farm work could be done, net income could be increased beyond the estimated amount. Better than average management might increase the net even further.

SCALE OF OPERATIONS

Estimates show that after a more profitable balance of the farm business has been attained, the business could profitably be expanded to twice its size. Because the input items are combined in the most profitable proportions, all inputs including land, would need to be exactly doubled from the organization suggested as "A More Profitable Organization For Farm of Usual Acreage." To carry out this expansion an additional \$23,000 would be required. From such an organization and size of farm business, a gross income of approximately \$12,000 would have been expected under the usual conditions of 1951. Earnings of the last additional unit of each input would be lower than when smaller quantities were used, but would still be high enough to make their use profitable.

Whether or not such a large-scale expansion would be feasible would depend on individual situations. Availability of adjacent land is one factor involved. Efficiency of operation might be lower unless the entire farm was in one tract. However, this study was not confined to farms of one tract. For a farmer who had managed to accumulate a sizeable sum of money and had one or two sons who could be depended on to stay on the farm -- perhaps one returning from service with the Armed Forces who was interested in farming and expected to stay on the farm -- such an expansion may be recommended. Hardships could result from going too deeply in debt if economic conditions became less favorable than existed when the money was borrowed.

Consider a 50-Percent
Increase in Size

If a 100-percent expansion appears too great a step from the balanced farming position, let a 50-percent expansion be considered.

Suppose at the end of one year a better balance was attained between the inputs on the usual size farm and the operator wishes to expand his operation.

The situation is:

1. The farm is showing signs of improvement.
2. The operator has shown that he intends to succeed in getting ahead.
3. He still owes \$4,000, but has demonstrated that he is a good credit risk.

The next move would be to raise the additional money needed for the expansion. This should not be too hard for him to do in view of the situation.

REQUIREMENTS FOR 50 PERCENT EXPANSION

For 63 acres of land, about - - - - -	\$6,000
For the increase in livestock and forage - - - - -	\$3,500
For the increase in machinery - - - - -	\$1,750
More gas, oil, seed, feed, etc. - - - - -	\$ 650
For a total of - - - - -	-\$11,900

**THE ORGANIZATION AND EXPECTED EARNINGS
AFTER THE 50 PERCENT EXPANSION**

Land - - - - -	190 acres at \$3.71 per acre
Labor - - - - -	24 months at \$95.11 a month
Forage-livestock Investment - - - - -	\$10,500 at \$.154 per dollar
Machinery Investment - - - - -	\$ 5,250 at \$.233 per dollar
Current Operating Expenditures - - - - -	\$ 1,950 at \$.966 per dollar

The estimated gross income for this organization was \$9,228. After paying interest, making a \$1,000 payment on the total debt, getting back the current operating expenses, and setting aside 15 percent for replacement and maintenance of livestock-forage and machinery investments, almost \$3,000 would remain for general upkeep of buildings, farm, and family living.

Each year that another \$1,000 was paid on the debt the farmer has increased his assets that much. Each year interest would be less. At the end of about 15 years, if the same rate of earnings continued, the farm and investments should be debt free and a considerably higher standard of living could be enjoyed.

GENERAL CONCLUSIONS

Under the production and marketing conditions of 1951, the following general statements can be made concerning Grayson county upland farming on the basis of this study and some knowledge of agriculture in Grayson county.

1. Farmers with farms of the usual size should increase investments in forage-livestock and machinery on their farms before increasing acreage of the farms.
2. During 1951, labor on Grayson county upland farms earned a fair rate of return. The high price of burley tobacco probably contributed substantially to the earnings of labor. Labor earnings can be increased further by using the same amount with more of the high producing livestock and forage.
3. Investments in livestock and forage were paying off well during 1951. These investments could be paying higher returns if investments were made in higher producing livestock and if the most profitable markets were patronized. This seems to be especially true of the dairy industry. Many low-producing cows are being milked in the county. Investments in these low-producing cows could more profitably be put into higher-producing cows by buying a better grade of dairy cattle and breeding for higher production. A higher producing herd can be built up at low cost by breeding artificially. By producing graded milk higher prices can be received for milk.
4. Machinery on the farms studied was earning a high rate of return. The earning power of machinery was probably overestimated, but indications were that machinery was used effectively during 1951.
5. Current operating expenditures were not earning as much as appears desirable. This indicates that too much of this category is being used in relation to other inputs, which in turn means that items in this category should be used more sparingly. Perhaps more forage and forage-consuming livestock should be grown since feed purchased was a major item in this category.
6. The results of this study indicate that the pasture-livestock program advocated by state and federal agencies is sound for Grayson county farmers. Farmers who have developed this type of program are earning higher returns and at the same time conserving the soil.

7. With the usual management, level of production, and price ratios which existed in 1951, a farm business could be expanded to furnish a better than average standard of farm living, pay off debts, and maintain and operate the farm after the expanded business was put into operation.
8. Debts must be paid. -- Before going deeply in debt, farmers should be sure payment terms are such as can be met.