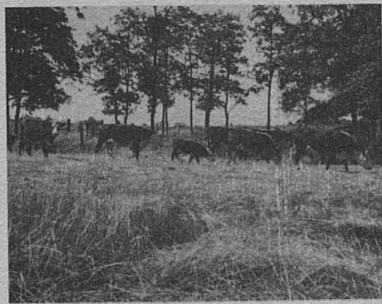


THE EARNING POWER

OF INPUTS AND INVESTMENTS ON

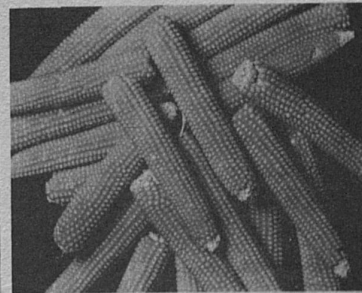
UPLAND CALLOWAY COUNTY FARMS, 1951



FORAGE AND LIVESTOCK



DARK TOBACCO



POPCORN

Glenn L. Johnson

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THE EARNING POWER
OF INPUTS AND INVESTMENTS ON
UPLAND CALLOWAY COUNTY FARMS, 1951

Glenn L. Johnson

In the summer of 1952, farm management research workers from the University of Kentucky collected financial records from a group of upland Calloway county farms. These records were gathered in order to secure data and information for use in determining the earning power of inputs and investments such as:

land
labor
forage investments
livestock investments
machinery investments, and
current expenditures

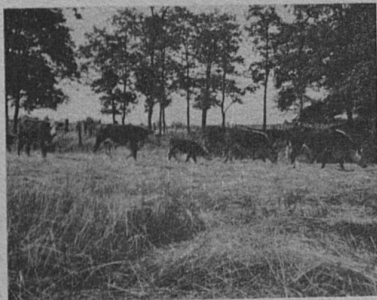
Farmers, bankers, agricultural leaders, extension men, T.V.A. specialists, soil conservation men and many others are interested in the earning power of these investments and inputs. Such information is directly useful to:

- (1) farmers, in considering long-run farm reorganizations,
- (2) leaders, in formulating local programs to promote agriculture,
- (3) extension personnel and members of governmental "service agencies" in formulating their programs, and
- (4) money lenders in appraising purposes for which loans are requested. The new developments in farming and the industrialization occurring in nearby areas serve to heighten this interest in the earning power of inputs and investments on upland Calloway county farms.

KINDS OF FARMS STUDIED

The thirty-four farm records collected and studied were from upland Calloway county farms located mainly on mixed Grenada and Calloway soils. Gross income (excluding rental value of the farm home) on these thirty-four farms in 1951 varied from a low of \$594 to a high of \$17,871. Acreages involved varied from 30 to 212, labor used varied from 1 to 24 months while the forage and livestock investment varied from a low of \$744 to a high of \$7,104 and the machinery investments varied from \$25 to \$4,960. Current expenditures on one farm were as low as \$178 while running as high as \$5,973 on another.

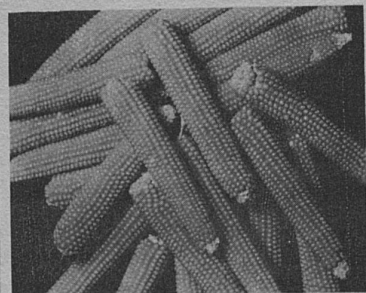
Farm-to-farm differences in investments and inputs present among the farms studied would ordinarily permit researchers to secure a rather clear-cut picture of their different earning powers. This, however, did not prove true in this instance. ^{1/} Apparently, the upland Calloway county farms studied had about three major production patterns involving (1) dark tobacco, (2) popcorn and (3) forage-livestock production. Thus, the results obtained appear to apply to a mixture of these three production patterns and are far from clear-cut for any of the three patterns.



FORAGE AND LIVESTOCK



DARK TOBACCO



POPCORN

This difficulty was aggravated by a tendency, among the farms studied, for the amounts of inputs and investments to be interrelated, a condition making it easy for them to reflect each other's earning power. These difficulties are handled more or less satisfactorily by supplementing the upland Calloway county data with the results of studying (1) upland Marshall and McCracken county livestock farms and (2) bottom-land farms in Calloway county. ^{2/}

^{1/} The raw uninterpreted statistical estimates are as follows: (1) regression coefficients and standard errors of estimates -- land (acres) $.563 \pm .1646$, labor (months) $.028 \pm .1153$, machinery (dollars) $.239 \pm .1131$, livestock-forage (dollars) $.001 \pm .0674$, other expenses (dollars) $.432 \pm .0988$; (2) MVP -- land, \$27.15 per acre; labor, \$9.61 per month; machinery, \$.66 per dollar; livestock-forage, \$.002 per dollar; and other expenses, \$1.61 per dollar. (3) $R = .94$. (4) $S = .127$.

^{2/} Had time permitted, new samples of farms could have been selected, on the basis of the difficulties revealed by this study, and analyzed.

Because Calloway county has relatively more small than large farms, the geometric average, which is more typical or "usual" than the common average, is used for describing Calloway farms. The thirty-four farms studied had the following geometric average or "usual" investments and inputs in 1951.

USUAL EXPENDITURES AND INPUTS ON THIRTY-FOUR FARMS STUDIED

Land - - - - -	-86.6 acres
Labor - - - - -	12.4 months
Forage-Livestock Investment - - - - -	\$2,491.
Machinery Investment - - - - -	\$1,504.
Other Expenditures - - - - -	\$1,120.

THE EARNING POWER OF LAND

Land was measured in terms of total acres per farm. For the mixed tobacco, livestock and popcorn farms studied, land appears to have had high earning power in 1951. While the estimates indicate that the usual amount of land used by the studied farms earned over \$25 per acre, this figure must be discounted for the following reasons:

- (1) the favorable popcorn and dark tobacco prices and yields of 1951, and
- (2) the fact that the amount of land used on the farms studied was related to both the amount of labor used and the forage-livestock investment, a situation which probably causes the estimated earning power of land to reflect a portion of the actual earning power of the forage-livestock investment and labor used.



LAND USES IN UPLAND CALLOWAY COUNTY

Marshall county livestock farms located mainly on Grenada and Loring silt loams, somewhat similar to the eastern Calloway county livestock farms on Grenada and Calloway soils, showed very low earning power for land. Thus, it is probable that the earning power of land in eastern Calloway county adapted mainly to livestock production is relatively low.

Calloway county farms producing more dark tobacco and popcorn probably received moderately high returns from investments in land -- say 5 to \$15 an acre, after a very rough allowance is made for the earning power of labor inputs and forage-livestock investments probably reflected in the estimated earning power of land. This moderately high rate of return was due, in part at least, to the favorable popcorn and tobacco prices and yields which prevailed in 1951. Similar studies of Calloway bottom land farms growing considerable amounts of popcorn showed land to have an earning power of over \$13 an acre under the favorable yield and price conditions of 1951.

THE EARNING POWER OF FORAGE-LIVESTOCK INVESTMENTS

Forage-livestock investments include the replacement value of hay and pasture stands plus the livestock valued at whatever value the farmers placed on them. The investment in breeding and feeder cattle purchased or sold during the year was counted for the period of time these cattle spent on the farm in figuring the livestock investment. As, by and large, forage investments do not pay off unless livestock are on hand to utilize the forage produced, no attempt was made to estimate their separate earning powers; instead, they were added together and treated as one, much as farmers do in considering forage-livestock problems.

The mixed nature of the farms studied also made it very difficult to secure a reliable estimate of the separate earning power of the forage-livestock investment.

Though the statistical analysis of the data indicated that the earning power of forage-livestock investments was extremely low, several "judgment reasons" exist for suspecting that the actual earning power of the forage-livestock investments was relatively high.

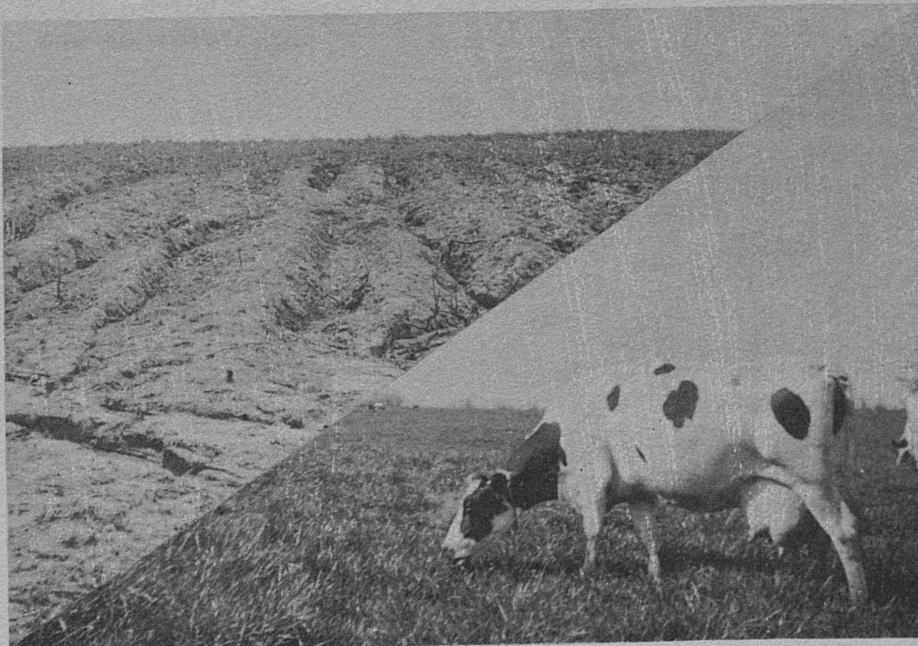
Livestock farms in eastern Calloway county should be expected to show earnings to forage-livestock investments somewhat comparable to the high earnings made by Marshall county livestock farms from forage-livestock investments. The more fertile upland farms in central and western Calloway county, however, should not be expected to earn as high returns on investments in forage (including fertilizer) and livestock; a reason for expecting this result is found in the high natural earning power of the more fertile soils of the central and western Calloway upland areas. This earning power probably substitutes for the high earning power of initial fertilizer and grass seed investments in less fertile areas. Also it should be noted that the Loring soils of Marshall county are somewhat better adapted to forage production than the Calloway soils of Calloway county.

Another reason for believing that the actual earning power of forage-livestock investments was higher than estimated statistically is found in the direct relationships between forage-livestock investments, on one hand, and

land, machinery and other expenditures used, on the other. These close relationships, it was previously noted, probably caused part of the earning power of forage-livestock investments to be reflected in the estimated earning power of land. The same is likely true with respect to the earning powers of both machinery and other expenditures.

Thus, the actual earning power of the forage-livestock investment was probably higher in 1951 in Calloway county than the statistical estimates indicate, this being especially true on farms adapted to livestock production.

ON POORER SOILS, FORAGE-LIVESTOCK --



--INVESTMENTS MAKE A BIG DIFFERENCE

It is judged that moderate forage-livestock investments may pay between 30 and 50 percent annually on livestock farms located on the poorer soils, the amount decreasing as forage-livestock investments are increased. On more productive soils, representing in themselves fairly important investments in forage production, returns to forage-livestock investments may be somewhat lower -- say 10 to 25 percent.

THE EARNING POWER OF LABOR

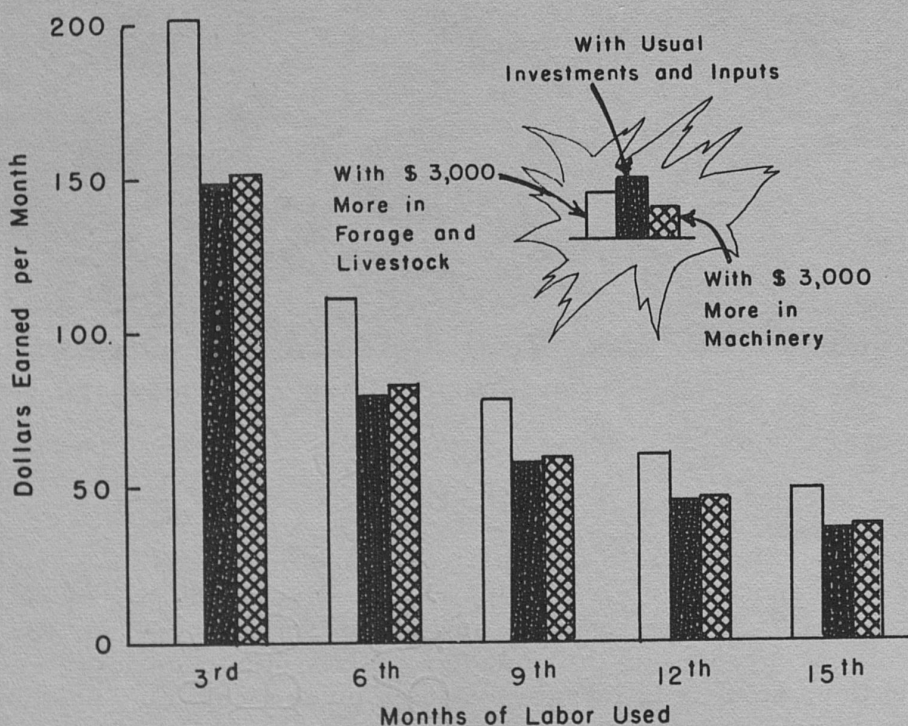
The usual amount of labor used on the farms surveyed was slightly over twelve months in 1951. This amount of labor, according to the raw statistical estimates was earning very little. Though the earning power of

labor is typically low in western Kentucky until associated with more inputs and investment than typical among the farms studied, some reasons explain why the estimate was probably lower than actual earnings.

The amount of labor used on the 34 farms studied was directly associated with both the amounts of land and machinery used. This situation made it difficult statistically to determine the separate earning powers of land, labor and machinery. And, as the estimated earning powers of both land and machinery appear unduly high, the earning power of labor is probably underestimated.

In 1951, upland livestock farms in Marshall county were earning about \$45 per month when 12 months of labor were used. Calloway bottom farms were earning about \$48 per month when 18 months of labor were used. It seems reasonable to guess that the earning power of labor on livestock farms on the less productive soils was around \$40 to \$50 a month for the usual amount of labor used. On the more productive soils of eastern and central Calloway county, labor probably had a higher earning power.

MONTHLY EARNINGS OF DIFFERENT AMOUNTS OF LABOR, AS AFFECTED BY FORAGE-LIVESTOCK AND MACHINERY INVESTMENTS, MARSHALL COUNTY UPLAND FARMS, 1951



In this connection it should be pointed out that the usual farm studied was a relatively small one producing about \$4200 worth of products for sale and home consumption, the rental value of the farm dwelling being excluded. Larger farms based on more productive soils and larger forage-livestock investments,

or both, probably earned much higher returns from labor. In this connection, it was estimated that a tripling of the forage-livestock investment on upland Marshall county livestock farms would have increased the earning power of 12 months of labor from 45 to \$75 a month.

THE EARNING POWER OF MACHINERY INVESTMENTS

Here again, the mixed types of farming included among the thirty-four farms studied made it difficult to estimate the earning power of a particular investment -- in this case -- machinery. The raw, uninterpreted estimate of machinery earning power was very high -- in the neighborhood of \$.65 annually per dollar invested. Properly interpreted, this estimate is meaningful -- uninterpreted it is probably misleading as it is doubtful whether actual returns were this high.

As previously noted, the amount of machinery used on the farms studied was related to (1) the amount of labor used and (2) the investment in forage and livestock production. This condition has probably biased upward the estimated earning power of machinery, this upward bias being offset as previously noted by downward biases in the estimated earning powers of labor used and forage-livestock investments.

When the production patterns for dark tobacco, popcorn and livestock are considered separately and in relation to soil differences, further insights useful in interpreting the estimate of machinery earning power are gained. The study of Marshall county livestock farms on soils somewhat comparable to those in east Calloway county indicated very low earning power for machinery in 1951 unless the machinery was used in connection with large investments in land development and livestock. There are many reasons to believe that this situation would prevail for livestock farms on the Calloway county soils.



On the other hand, tobacco and popcorn producing farms located on the more productive of the Calloway county soils should be expected to earn relatively high returns to machinery. This would be especially true in a year, such as 1951, when the yields and prices of both dark tobacco and popcorn were favorable. It can be concluded, with some confidence, therefore:

1. that the returns to machinery investments were probably low on livestock farms situated on poor undeveloped soils,
2. that returns to machinery investments were probably moderate on livestock farms situated on productive soils or on well developed poorer soils, and
3. that returns to machinery on farms producing dark tobacco and popcorn on the better soils were high in 1951, a year of favorable prices and yields.

THE EARNING POWER OF OTHER EXPENDITURES

Besides the investments and inputs considered above, a year's farm business involves expenditures for gas, oil, annual seeds, breeding fees, custom work, fertilizers (whose values are consumed in one year), etc. The raw uninterpreted estimates indicate that Calloway county upland farms were receiving around \$1.60 for each dollar spent on such items in 1951.

This estimate is probably somewhat higher than what actually existed for the following reason. Other expenditures and the forage-livestock investment were directly related among the farms studied, a situation which probably caused the earning power of the forage-livestock investment (as previously noted) to be somewhat under-estimated and the earning power of other expenditures to be over-estimated. The favorable prices and yields for dark tobacco and popcorn, in 1951, however, probably caused the earning power of other expenditures to be somewhat higher than ordinary. Hence, despite probable biases in the estimate, it appears that returns to other expenditures probably were greater than dollar for dollar but lower than \$1.60 on the dollar. This conclusion is substantiated by the study of Calloway bottom land farms where returns to other expenditures were estimated at \$1.07 per dollar spent.

CALLOWAY'S SMALL FARMS ARE DROPPING OUT OR BECOMING LARGER

Between the 1940 and 1950 censuses, it is estimated that Calloway county lost 552 farms producing more than \$250 (at 1950 prices) worth of products for sale. Though 286 farms were eliminated by the creation of Kentucky Dam, the loss of farms between 1940 and 1950 was made up

primarily of farms producing between \$250 and \$4,999 worth of products for sale. Actually 578 such farms moved out of this category, 552 becoming rural residences, being abandoned, or being consolidated, while 26 moved up to gross incomes above \$5,000. Despite the loss of several large bottom-land farms in creating Kentucky Lake, there were 26 more farms producing over \$5,000 in 1950 than in 1940. Of the 1480 farms producing products worth between \$250 and \$2,499 in 1950, a large number have likely been converted to rural residences, abandoned, or consolidated since then. More farms producing over \$5,000 -- fewer producing between \$250 and \$2,500 -- these are the trends.

THE RELATIONSHIP BETWEEN SIZE AND EFFICIENCY

The usual size among the farms studied, it will be recalled, was 86 acres involving associated investments and inputs capable of producing a gross income of \$4,200. The associated inputs, included 12 months of labor, about \$2,500 in forage-livestock investments, \$1,500 in machinery and around \$1,100 in other expenditures. Such a farm organization could absorb an investment of \$5,000 in forage and livestock with up to \$1,800 in other expenditures. With land valued at \$150 an acre, this would bring the total investment to around \$19,500. This figure begins to approach that required to produce a reasonable standard of living, wherever reasonable living standards are obtained from farming in the United States. Reaching such a level of investment would not involve inefficiencies due to size of operations; actually the land resource could probably be expanded much beyond this level if associated with appropriate expansions in other investments and inputs without incurring serious inefficiencies due to scale of operations.

When records from all of the thirty-four farms were analyzed, the larger farms appeared to be more efficient than the smaller ones. But, the increases in efficiency due to increases in size of business probably occurred primarily among the smallest farms. It is probable that increases in efficiency do not continue to occur as farms increase in size indefinitely.

These findings make the trends noted in the last section appear proper and sensible -- the findings indicate that small farms should be expected to drop out of farming or get larger.

CONCLUSION CONCERNING THE EARNING POWER OF INPUTS AND INVESTMENTS ON UPLAND CALLOWAY COUNTY FARMS

Previous pages of this report have indicated that serious difficulties exist in using the raw estimates derived from analyzing the thirty-four farm business records statistically. However, when the estimates were

rather carefully interpreted in view of other studies made in the Purchase Area and in view of what is generally known about Calloway county farms, considerable information was gained concerning the earning power of various investments and inputs on Calloway county farms. Though this process of evaluating the raw estimates in terms of other information reflects the judgment of the researcher and those consulted in the process, the results are useful in describing the general picture for Calloway county upland farms.

When these judgments about the earning power of investments and inputs are refined further and expressed in specific terms, they provide considerable basis for envisioning profitable readjustments for upland Calloway farms. Thus, on this basis, it is concluded that the usual quantities of each input and investment had about the following earning powers on livestock farms situated on eastern Calloway county upland soils in 1951:

Land, 86 acres - - - - -	2-\$5 per acre
Labor, 12 months - - - - -	40-\$50 per month
Forage-Livestock Investments, \$2500 - - - - -	30 to 50 percent
Machinery Investments, \$1500 - - - - -	5 to 15 percent
Other Expenditures, \$1100 - - - - -	90 to 110 % on the \$

The gross income resulting from these assets was probably somewhat less in 1951 than the \$4200 averaged from these assets by the 34 farms studied.

These same assets used in the production of popcorn and dark tobacco, as well as livestock, on the more productive central and western Calloway county upland soils probably eared returns about as follows in 1951:

Land, 86 acres - - - - -	8-\$15 per acre
Labor, 12 months - - - - -	45-\$65 per month
Forage-Livestock Investments, \$2500 - - - - -	10 to 25 percent
Machinery Investment, \$1500 - - - - -	15 to 25 percent
Other Expenditures, \$1100 - - - - -	Something over 100% on the \$

The gross income earned by these assets in 1951 was probably somewhat higher than the \$4200 earned by this combination of assets on the typical farm studied, the difference being due primarily to the higher fertility of the soil.

PROBABLE DESIRABLE READJUSTMENTS ON CALLOWAY COUNTY FARMS

The above "conclusions" indicate very roughly the patterns of readjustment needed for Calloway county farms.

First and foremost, the over-all earning capacity of many Calloway county farms needs to be increased. This necessarily involves the use of more inputs and larger investments.

On farms limited primarily to livestock, the indications are that the key investments to be made are in forage and livestock production. While good data are not available, it can be surmised that fertilization rates, pasture seeding and livestock quality can all be profitably increased. Data for 1951 from similar farms in Marshall county indicate that expansions in the key forage-livestock investment are also important in increasing the earning power of associated labor inputs and machinery investments. Once present acreages are developed, acreage expansions logically follow.

For the west and central Calloway county farms, which are better adapted to dark tobacco and popcorn production, the indications are that these two enterprises should not be seriously curtailed so long as prices and yields somewhat similar to those received in 1951. can be anticipated. This suggests that the expansion in investments required to raise central and west Calloway county farm incomes should be largely in the intensification of these enterprises and forage-livestock production plus expansion of acreage. Observations in the area indicate that the forage enterprise can be intensified through the use of fertilizers and better pasture mixtures. It is also quite likely that dark tobacco and popcorn yields can be increased through more intensive use of fertilizers and cover crops. In this connection it should be noted that popcorn prices are relatively unstable and that dark tobacco, of course, has faced and continues to face a weak long-run demand picture. It appears that important inefficiencies are not likely to be encountered as farm sizes are expanded up to 200 acres, at least.

CALLOWAY COUNTY FARMS HAD HIGH EARNING POWER IN 1951

Despite the difficulties experienced in isolating the earning powers of individual investments and inputs such as machinery, labor, land, forage-livestock investments, etc., some Calloway farms were earning high over-all rates of return in investments and inputs and high incomes.

One farm had 212 acres, used 23 months of labor, had \$5,261 in its forage-livestock investment, had \$4,960 worth of machinery and had other expenses amounting to \$5,973. From these investments and inputs \$17,871 was grossed above the value of feeder cattle purchased.

Another farm had 155 acres, used 25 months of labor, had \$6,302 in its forage-livestock investment, had \$3,214 worth of machinery and had other expenses of \$1,928. This farm grossed \$11,688 from these inputs and investments.

Good farm incomes can be secured from developing Calloway county upland farms under 1951 conditions. "The benefits to be reaped from developing a substantial farm business are great. Ownership of an improved productive farm is a source of community respect, security, family stability and a good standard of living. Only a small proportion of urban laborers are ever able to command the important things in life to the extent they are commanded by persons owning good productive farms."

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