

# *Kentucky* FARM AND HOME *Science*

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Volume 4

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Fall 1958

## READ—

Eden Shale  
Farm

Kentucky Farm  
Income

Size of Farm?

Short Reports



# Kentucky FARM AND HOME Science

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## *The Cover*



Fertilizing and seeding equipment followed closely behind the crawler tractors on the steep slopes of the Agricultural Experiment Station's Eden Shale Farm, located near Owenton. A lot of work has been done on the farm during the last three years, the highlights of which are reported in this issue of Kentucky Farm and Home Science by Frank B. Borries, Jr. The photographer was Robert C. May.

How farmers in a 33-county area can make better use of their peculiar type soil being revealed in preliminary results of 3 years' research at

## The Station's Eden Shale Farm

By FRANK B. BORRIES, JR.

There's been a lot of brush removed and soil worked on a 940-acre tract of land in Owen county since the Kentucky Agricultural Experiment's Eden Shale Farm was established in 1955.

Results of three years' intensive land-clearing, fertilizing, seeding, and planting are becoming apparent. Cattle and sheep now graze where brush grew only a short time ago, and experimental plots of crops and trees are scattered here and there.

Purpose of the farm, established at the request of farmers in the 33-county area in which the Eden Shale type of soil predominates, is to find some of the answers to the difficult problems attendant to farming on this type of soil. It was purchased mainly by local citizens, with the aid of donors in other parts of the state, and turned over to the Experiment Station.

Geologically, the Eden Shale type is the second oldest soil stratum in the state, the Central Bluegrass type being the oldest. Eden Shale areas are characterized by steep slopes—the average being 27 percent, which means that for every 100 feet one travels horizontally, the land rises 27 feet. The type has a high potash content and an underlying soil stratum that prevents proper storage of ground water. There are several million acres of such land in the Eden Hills belt. The farm in Owen county is typical of the area.

Several of the Station's departments have been conducting projects at the farm almost since it was put into operation. Their idea has been to work on specific Eden Shale problems, and they have tailored their research accordingly.

The horticulturists are investigating the possibilities of producing vegetable and fruit crops. In vege-

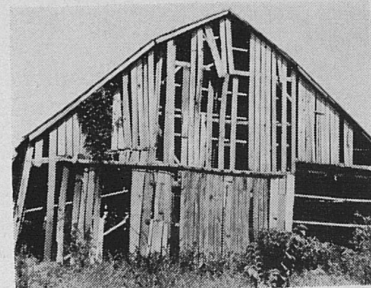
This general view of a portion of the Eden Shale Farm shows the rolling nature of most of the land. The pasture

between the trees and the farm buildings was established on recently cleared land.





(Left). This portion of a newly acquired addition to the Eden Shale Farm is typical of the appearance of the farm as a whole three years ago. Much of it consisted of a rank growth of scrub timber and brush. One of the better stands of timber, however, has been preserved for research.



(Above). When the Eden Shale Farm was established many of the existing buildings resembled this barn. It stands on land included in a newly acquired tract.

table culture, they are checking for the best varieties of snap beans, tomatoes, sweet corn, vine crops, and potatoes. Fertility programs for these crops are being studied, and the use of plastic greenhouses and plastic mulches will be tried and demonstrated as means of helping to increase the income of Eden Hills farmers.

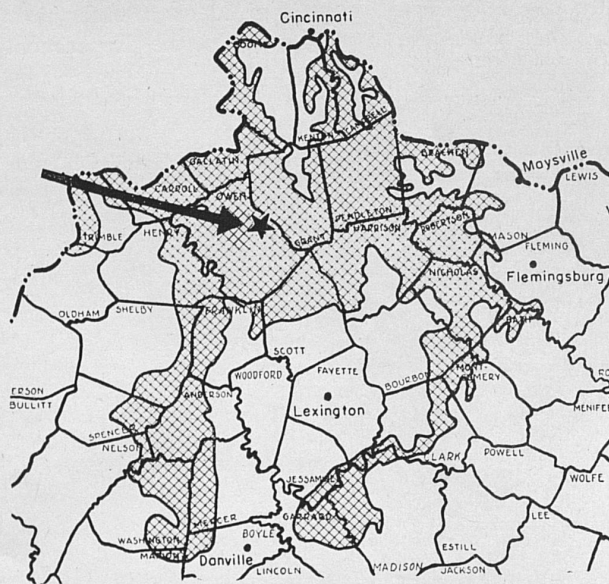
Already it has been found that tomatoes, sweet corn, and snap beans respond favorably on the Eden Shale soil. There are some indications that the flatter, terrace land is not entirely satisfactory for potatoes because of the heavy nature of the soil and some other, as yet, unknown factors.

#### Strawberry Varieties Tested

Greenhouse research has been limited to variety testing; so far, the Valiant tomato variety seems to be the best. Use of plastic greenhouses has proved economical and profitable when properly managed.

Blakemore, Tennessee Beauty, and Pocahontas strawberry varieties are being tested for adaptability; so far, Pocahontas has yielded best, though all varieties yielded more than 500 crates to the acre. No results have been tabulated yet on black and red raspberry varieties being tested; nor are there results on apple production. Both standard and dwarf-type trees are being checked. Peach trials are hampered owing to difficulty of establishing an orchard on the tight clay soils, while grape and nut trials are not far enough along for data to be obtained. Production of an ornamental, asters, however, shows promise.

The foresters have centered most of their work on Christmas tree production. This is the third year



The Eden Shale Farm (indicated by the star) is located in Owen county, 4 miles east of Owenton. The shaded area shows the extent of the Eden Shale type of soil in 33 northern and central Kentucky counties.

they have planted a five-acre plot to Scotch, Austrian, red, and white pine; Norway spruce; and Douglas fir. This species trial is to be continued for 8 years; at the end of the eighth year the first plot planted

will be harvested and the plot replanted, thus continuing the cycle. For some time, Christmas tree production has been promoted by many persons as a good thing for Kentucky; the forestry section,

before giving enthusiastic approval, wants to see what results will come from the Eden Shale plantings.

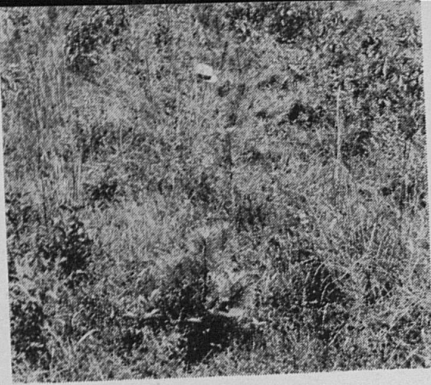
An important factor in Christmas tree production is how one controls brush and weeds, especially in



(Left). This sturdy legume-grass mixture now thrives where trees and brush flourished among rocks only a short time ago. The wooded area in the background will be cleared as time permits.

(Below). The field in the background was cleared last year and a legume pasture stand is now protecting the slope against erosion.





(Above) Weed control in Christmas tree plantations is one of the problems being studied by the foresters.

(Right) Tree fruit varieties, such as these dwarf apples, are being tested to find those best adapted to the Eden Shale area.



the new plantation. Young seedlings are frequently choked by heavy weed and grass growth. About a 90 percent survival of desired species has been obtained on plots on which the weeds were hand-chopped in mid-spring as a prelude to a mid-July spray program.

Among the enemies of young tree plantings are rabbits which, in seeking winter food, can quickly wreck a tree stand. This winter the foresters will be trying a new rabbit-repellent spray.

The other forestry project is a check on an eight-acre tract of established timber. Records are being kept on the annual growth, and the slower-growing, less vigorous, less-valuable species will be eliminated. A long-range program being considered is one concerning the management of native cedar and locust stands.

The animal husbandmen are working on sheep and beef projects. No swine research is contemplated as yet because the area generally is not a swine-useful section.

A purebred Hereford herd of about 30 animals, both polled and horned, has been established. The objective is to use all available means of production testing and selective breeding to develop a herd suitable in respect to conformation and breeding type, in addition to performance and the production of carcass quality. A beef-bull performance test is also planned. Feeding work to check rate of gain, feeding efficiency, and carcass quality on steers developed from the basic herd will be started next year.

All beef females have been bred artificially to TR Zato Heir 181, a fine Hereford bull of which the

The black and red raspberry varieties (foreground) are being checked by the horticulturists. In the background are strawberry variety plots.



A Holstein dairy herd has been established at the Eden Shale Farm, to be used in a long-time project comparing a limited grain-high roughage ration with a standard concentrate ration. Of the 28 cows on the farm, 23 are purebred and 5 grade.

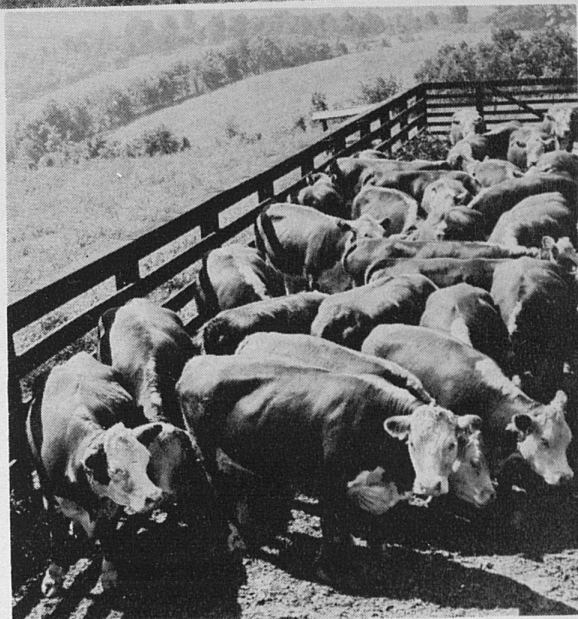


University owns a one-sixth interest. His progeny have taken high honors in many major U. S. shows.

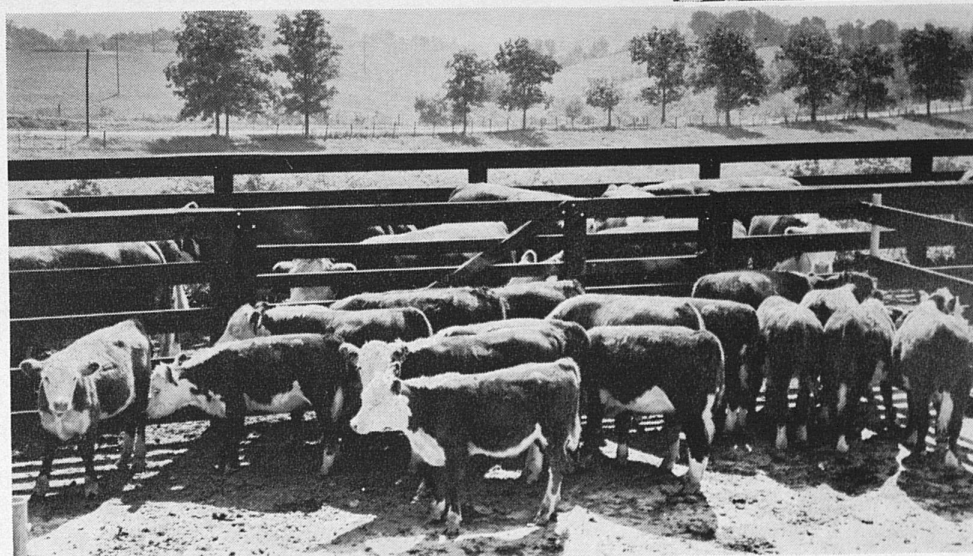
In feed and forage utilization work, the animal husbandry section has tentative plans for running comparison tests, checking the value of a bromegrass-alfalfa silage ration with a corn ration. Some fattening work is also planned.

As for sheep, some 200 head of western ewe lambs were put on the farm this year and will be used in winter ration experiments. A fattening trial involving 292 western wether lambs was conducted at the farm this past year.

The dairy herd consists of 28 Holstein cows. Members of the dairy research staff have underway an experiment to determine the relative efficiency for milk production of a limited grain-high roughage ration compared with a standard concentrate ration.



(Above) About 30 Herefords constitute the beef cattle herd.



(Left) These are the first beef calves to be born in the Eden Shale herd. They were sired by TR Zato Heir 181.



These photographs illustrate some of the difficulties encountered in laying out agronomy plots on the Eden Shale Farm because of the steep slopes. The stakes designate various pasture mixtures and tillage treatments. In the background of the picture above, on the "terrace" land, are tobacco, corn, and other plots.

Heifer calves born on the farm will be used in the experiment which will continue for about 10 years. Approximately 50 animals will be used. Each will complete at least one lactation and will remain in the herd through her productive life.

The effect of minimum grain feeding on growth and lifetime milk production will be determined.

Emphasis will be placed on the production of excellent quality forage which will be fed to all experimental animals. The work is designed to show how effectively good quality hay, silage, and pasture forage produced on Kentucky hill land can be used to replace most of the concentrates normally fed to growing heifers and producing cows.

The agronomists have placed pasture renovation high on their priority list of projects. They have 15 plots on two sites, one a north slope and the other a south. Seedings of different legumes and grasses into bluegrass sod with different tillage and fertilizer treatments are under way. Already the study has indicated that old, thin sods can be made more productive through proper fertilization and liming, as needed, and drilling in the legumes. Light-to-moderate disking, enough to disturb but not destroy the old sod before seeding, has given good results. Plowing or heavy disking was not necessary to establish a new seeding.



Additional study in the future will be given to fertilizer treatments and other management needed to maintain a proper balance of grasses and legumes in a pasture mixture.

In silage production, the workers are checking yields of corn, sorghum, corn-and-sorghum, sudan-grass, and millet. In 1956 and 1957 yields of up to 20 tons of silage per acre were produced on the ridges.

Tobacco varieties are being compared, chiefly for the effect of high-potash soils on the yield and quality of burley. Four alfalfa varieties are under test in a demonstration planting. Other grass and legume varieties will be checked as time and funds permit. This same statement applies to the work being undertaken at the Eden Shale Farm by all Experiment Station departments. As additional funds and personnel become available more work can be undertaken, and additional information will become available on ways to help the thousands of farmers in that area achieve a better income from their hilly acres.



# The Relative Position of Kentucky Farm Income Compared With Rest of U.S.

**Total cash receipts here are about 1.84% of national agricultural income**

By D. MILTON SHUFFETT and PAUL JUSTICE

Many changes have occurred in agricultural income during the past 30 years in both Kentucky and the United States. Total income has increased, owing to expanding total output and improvement in prices. Income changes have varied widely by commodity groups as consumer demands have shifted. This report compares Kentucky agricultural income with that of the nation to furnish information on the relative income position of Kentucky farmers as agriculture has changed through mechanization and other technological developments.

## Kentucky's Share

Kentucky's share of total cash receipts from farm marketings trended upward from an average of 1.53 percent of the U. S. total during 1924-28 to an average of 1.85 percent during 1937-41 (Fig. 1). Since

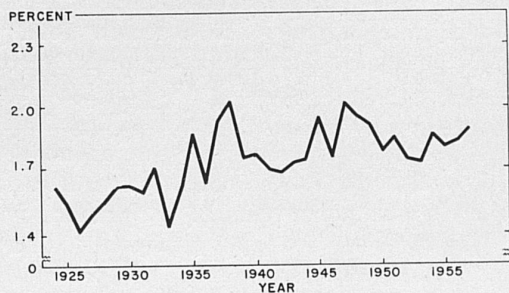


Fig. 1.— Total cash receipts from farm marketings, Kentucky as percent of United States, 1924-57.

1941 no trend has been apparent in Kentucky cash receipts relative to the national total, although short-run variations have occurred, owing to weather conditions, livestock production cycles, and other such factors. Kentucky cash receipts averaged 1.84 percent of the total for the country during 1953-57.

The upward trend in relative cash receipts for Kentucky agriculture reached a peak in 1938 when Kentucky farmers received a record 2.04 percent of

the cash income from farming. Crop production was high in Kentucky in 1938 as compared with the U. S. The upward trend in relative income during 1924-38 was primarily due to a relative increase in income from crops, although relative livestock income increased slightly (Fig. 2). Burley production was in-

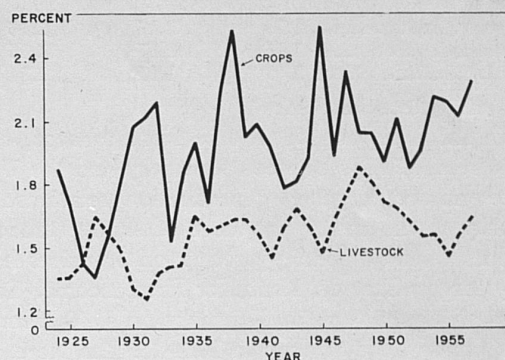


Fig. 2.— Cash receipts from farm marketings of crops and livestock, Kentucky as percent of United States, 1924-57.

creasing during this period, and burley was favored by a strong demand owing to increased outlets in blended cigarettes. Wheat production in the state reached a longtime low in the late 1920's and increased thereafter. Also, beef cattle numbers were low in Kentucky during the early 1920's relative to the U. S., and a build-up in cattle numbers resulted in relatively more income from this source.

## Cash Receipts, 1947-51

Cash receipts from farming were high in Kentucky as compared with the nation during 1947-51. Increases in income from beef cattle and hogs accounted for the favorable income during these years. Beef cattle prices were very favorable during 1947-51. The U. S. was at a low point in the beef cattle cycle, while Kentucky cattle numbers were high. The same cyclical phenomenon occurred for hogs so that both beef cattle and hog numbers in Kentucky were at peak highs for the 35-year period relative to the United States. The result was a sharp increase in the percentage of the nation's livestock income received by Kentucky farmers.

After 1951 hog numbers in Kentucky declined

sharply relative to the U. S. Another increase in U. S. beef cattle numbers brought the ratio between Kentucky and the U. S. back in line with the longtime trend. The combination of these factors resulted in a relative decline in Kentucky income, but the decline was from a short-run favorable position in livestock and income appears to be currently in line with about the expected ratio as compared with the "normal" for the past 30 years.

The following tabulation shows average cash receipts from farm marketings in Kentucky as a percentage of the United States for selected periods.

	1924-28	1937-41	1953-57
Crops .....	1.58	2.17	2.16
Livestock .....	1.47	1.57	1.55
Total .....	1.53	1.85	1.84

### Production Relationships

With the exception of income from tobacco, cash income relationships between Kentucky and the U. S. are determined largely by production relationships. Kentucky is the major producer of burley tobacco, and fluctuations in burley production or prices have a very large effect on Kentucky farm income. Total output of agriculture in Kentucky was 40 percent higher during 1953-57 than in 1924-28. The increased total output resulted from increases in both crops and livestock. The relationship between Kentucky production and U. S. production was fairly stable over the 1924-57 period, with no indication of a pronounced trend in relative outputs (Fig. 3). Kentucky

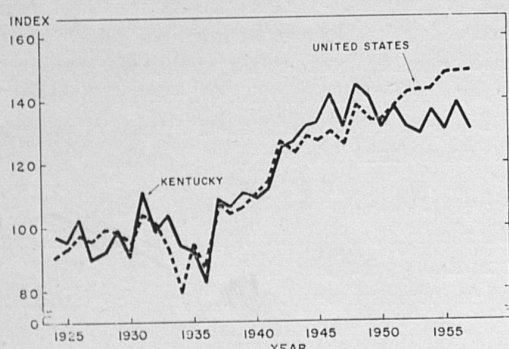


Fig. 3.—Index of total agricultural production, Kentucky and United States, 1924-57 (1935-39 average = 100).

agricultural output was high relative to the U. S. during the late 1940's, but U. S. production has increased much more rapidly than that of Kentucky since 1950. These differences resulted mainly from relatively high crop production during the 1940's in Kentucky and more rapid increases in livestock production nationally since 1950. Also, crop production

has levelled off in Kentucky since 1950, owing to decreases in tobacco allotments and poor growing seasons in some years while nationally the output of crops has continued to expand.

### Comparison of Net Farm Income

While cash farm income trended upward in Kentucky relative to the U. S. during 1924-40 and has remained about stable since, the total net income of Kentucky farmers trended slightly downward relative to the U. S. during the period 1929-40. Since 1940 there appears to be no trend in relative net income for Kentucky (Fig. 4). Kentucky farmers received

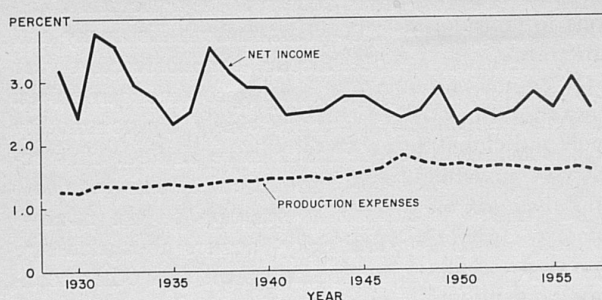


Fig. 4.—Total net farm income and total production expenses, Kentucky as percent of United States, 1929-57.

3.19 percent of the nation's net farm income during 1929-33, 2.61 percent during 1940-44, and 2.68 percent during 1953-57. It is somewhat a paradox that while cash receipts were increasing relatively prior to 1940 net farm income was declining. The reason was an increase in production expenses. Total production expenses for Kentucky averaged 1.29 percent of the total for the U. S. during 1929-33, 1.49 percent during 1941-45, and 1.57 percent during 1953-57. Family labor is not included as a part of production expenses, and family labor has been used extensively in tobacco production in Kentucky. As the farm population was declining and burley production increasing, more hired labor was needed in tobacco. Production expenses for labor, fertilizer and lime, interest on farm mortgages, and maintenance and operation of machinery have increased in Kentucky relative to the U. S., while taxes and net rent to nonfarm landlords have declined. Although production expenses have increased in Kentucky relative to the U. S., production expenses relative to cash receipts are still less in Kentucky than for the Nation as a whole, owing to small farms and the heavy use of family labor in Kentucky agriculture.

The comparison of cash income, production, and

(Continued on Page 12)

# How Large Should Farm Be To Provide Good Living?

By LUTHER H. KELLER

How large must a farm be to provide a farm family with a satisfactory level of living? Can small units compete with the large specialized farms in producing agricultural products. These are crucial questions in considering needed adjustments in Kentucky agriculture.

Of course, no blanket answers can be given for these questions that would fit all farm conditions. Each individual farm family's situation differs, and the way in which each farm family solves its problems depends on the relative values it places on income, security, independence, companionship, community prestige, and other goals. Some farm families may be content to continue farming provided they can obtain \$2,000 for their labor, while other families might not be satisfied with a labor return of less than \$4,000 or even more.

## Farm Size and Income

Disregarding for the moment goals other than income, let's look at some data on farm size and income on commercial farms in Kentucky. The 1950 Census of Agriculture divides commercial farms into six size-classes based on the value of products sold (Table 1). Approximately 86 percent of the 134,594

Table 1.—Size distribution of commercial farms in Kentucky, 1949.

Class	Acres Per Farm	Value of Products Sold	Total Capital Invested Per Farm	No. Comm. Farms	% of all Comm. Farms
I	659	\$25,000 or more	\$101,563	882	.6
II	317	10,000 to 24,999	57,412	4,684	3.5
III	182	5,000 to 9,999	27,636	13,043	9.7
IV	125	2,500 to 4,999	14,924	28,610	21.3
V	94	1,200 to 2,499	8,583	43,792	32.5
VI	73	250 to 1,199	4,947	43,584	32.4

commercial farms in Kentucky in 1949 had a gross income of less than \$5,000, while 14 percent had a gross income of \$5,000 or greater. Table 1 also shows the amount of capital invested and acres per farm for each of these groups of farms. Of course, capital investment and acres per farm increased as gross income increased, but not in so great a proportion.

Class I farms (over \$25,000 gross) had about 9 times as many acres and about 20 times as much capital investment as Class VI farms (less than \$1,200 gross), but their gross income was approximately 37 times as great.

Data in the 1950 census also enable us to estimate production costs and returns to labor for these six classes of commercial farms. Cost of production includes both out-of-pocket costs (cash) and overhead costs (depreciation and investment charge). By subtracting production costs from gross income an estimate of the net return to farm labor can be made. Then by dividing the net return to labor by the number of farm workers per farm we have a measure of the relative earning rate of labor on farms of varying size (Table 2).

Table 2.—Income and resource ratios for commercial farms in Kentucky, 1949.

Class of Farm	Net Labor Income Per Farm	Net Labor Income Per Worker	Investment Per Worker	Acres Per Worker
I	\$ 9,382	\$ 1,561	\$ 16,889	110
II	4,774	1,478	17,722	98
III	2,703	1,306	13,282	88
IV	1,634	1,021	9,279	78
V	884	660	6,342	70
VI	436	357	4,069	60

These estimates indicate that on the average labor returns were considerably higher on the larger farms. In fact, net labor returns increased from \$357 per worker on Class VI farms to \$1,561 per worker on Class I farms. Even on Class I farms these estimates indicate that labor in some cases was probably not earning so much as would be possible for it to earn in off-farm opportunities where such opportunities are available. Of course these are average figures. Labor returns are undoubtedly much higher on some farms yet less than these averages for the relatively inefficient farms.

## Why Higher Labor Returns?

Why are larger farms able to obtain higher labor returns? Part of the differences arise because larger farms are able to utilize more fully their resources; i. e., their labor, machines, land, etc. On many small farms a part of the capacity of some of these resources may go unused. Also, the larger farms are able to spread certain fixed costs (such as depreciation, taxes, interest on mortgages, etc.) over more units of output, thus reducing the unit costs of production.

(Continued on Page 12)

## Relative Position of Kentucky

(Continued from Page 10)

net income for Kentucky and U. S. farmers indicates that Kentucky's agriculture has advanced at about the same rate as that of the nation over the past 30 years. While we have maintained our relative status in the nation's agriculture, Kentucky is still low in income per farm and per farm person as compared with the U. S. During 1953-57 realized gross income per farm averaged \$3,340 in Kentucky and \$6,750 in the U. S. In terms of net income, the average per-farm income was 50 percent higher for the country than for Kentucky (\$2,397 for the U. S. and \$1,586 for Kentucky). The prevalence of small farms in Kentucky has resulted in a continuation of low income available to farm families as compared with the remainder of the country.

## How Large Should Farm Be?

(Continued from Page 11)

Another explanation can be found in the ratio in which land and capital investments are combined with labor. Labor returns are determined to a large degree by the amount and quality of other resources that are combined with the labor. The ratio of both land and capital to labor is much lower on the small farms than on the large farms (Table 2). For example, the average Class I farm had about 110 acres per worker and an investment of nearly \$17,000 per worker, compared with 60 acres per worker and an investment of \$4,049 per worker for the average Class VI farm.

What is the significance of these facts for Kentucky farmers? They suggest that unless operators of many small farms are going to be content with low labor returns, they must somehow find ways of expanding the size of their farm operation, of increasing the ratio of land and/or capital to labor; or they must turn to opportunities for working at off-farm employment. Some combination of these alternatives may be possible for small farmers in some areas.

Possible ways of obtaining more land and capital include renting or buying more land, buying a larger farm, borrowing money for improvements and development of the present farm, doing custom work for others, and/or forming partnership arrangements. In many cases, managerial skills will also have to be improved. To the extent that farmers are primarily motivated by income goals, the evidence seems to indicate that Kentucky farms are likely to become considerably larger both in terms of acres and capital investment.

## Varied Research Projects Reported

By FRANK B. BORRIES, JR.

Here are capsule reports on research conducted during the year by various departments of the Kentucky Agricultural Experiment Station and substations:

\* \* \*

**NEW TIMOTHY GRASS VARIETY**—A new variety of timothy grass called Clair has been released for Kentucky use. It was named after an Indiana farmer who several years ago gave the seed to the Kentucky station for testing. The new timothy is a vigorous, early-maturing variety with good aftermath production.

\* \* \*

**TERRAMYCIN IN SALT HELP BEEVES' GAIN**—Use of the antibiotic terramycin in salt given to steers on test at the station produced unexpectedly favorable gains. The steers, when implanted with stilbestrol (a synthetic hormone which stimulates rate of gain) averaged 0.26 pounds more daily gain than non-implanted steers. But when the pelleted steers got the terramycin in their salt, they gained an additional 0.22 pound a day. This made a total of 0.48 pound of gain daily from using the stilbestrol and the terramycin in the salt.

Kentucky Agricultural Experiment Station  
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Lexington, Ky.

*Frank B. Borries, Jr.*  
Director

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