

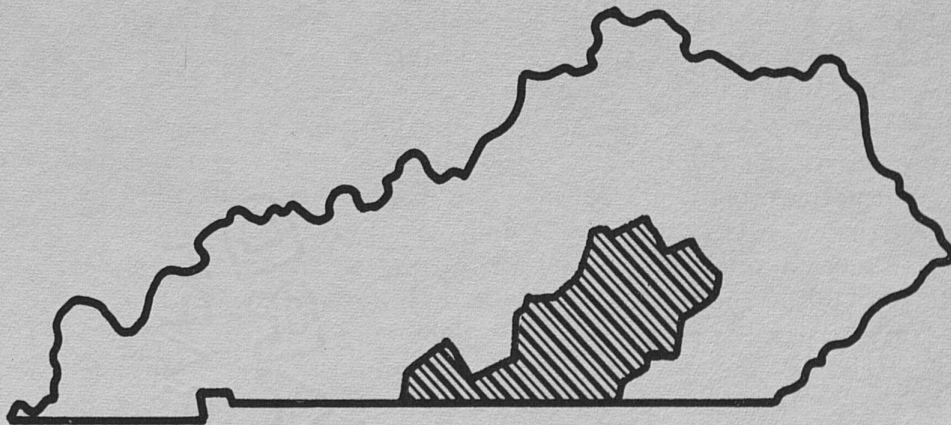
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SOME ASPECTS OF THE
**Size-of-Farm Problem in
Economic Area 5**

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SOME ASPECTS OF THE SIZE-OF-FARM PROBLEM
IN ECONOMIC AREA V ^{1/}

By Harald Jensen and Luther Keller

Farm families on small farms in Economic Area V are not getting much income for the time spent in farming. This fact, together with other evidence which follows, suggests that farm size has a lot to do with size of income from farming. Farm size is related to income in these ways: (1) The amount of income depends on the size of farm. For example, within a group of farms where neither cost advantages nor disadvantages exist for farms of various size, large farms will have, under usual price relationships, higher incomes than small farms, (2) the amount of income in relation to the amount of resources used depends on the cost advantages or disadvantages for farms of various size. For instance, if costs per unit of farm product decrease with increases in acre size (acres is only one of a number of measures of farm size), a 200-acre farm will have a net income more than twice as large as that of a 100-acre farm.

Increase in size of farm alone, however, does not guarantee larger incomes. Some farms are operated so inefficiently that a larger volume of business might mean lower incomes or even losses. Using more land and capital to operate a larger unit can increase incomes for many small farms only if management level is increased along with land and capital.

This study was made (1) to determine the relationship between farm size and income and (2) to outline alternative adjustments which are basic for increasing incomes of families on small farms. In order to study the relationship between farm size and income, we need to compare income, costs, investments and resource combinations for farms of varying size. The classification of farms in the 1950 United States Census of Agriculture makes such comparisons possible. The Census first divided farms into two large groups: (1) commercial and (2) other, which includes part-time, residential and unusual, such as institutional farms. In general, all farms that sold \$1,200 or more of farm products were classified as commercial farms. In addition, farms with farm product sales, of \$250 - \$1,199 were also classified as commercial farms, provided the farm operator worked off the farm fewer than 100 days and that the income of the farm operator and his family from nonfarm sources was less than the total value of farm products sold. The Census then divided all commercial farms into six classes on the basis of the total value of products sold. These classes are as follows:

^{1/} This study is based primarily on data from the United States Census of Agriculture, 1950. Economic Area V includes Lincoln, Rockcastle, Pulaski, Casey, Adair, Russell, Metcalfe, Cumberland, Clinton, Wayne, Monroe and Allen counties.

Class	Value of farm products sold
I	\$25,000 or more
II	\$10,000 to \$24,999
III	\$ 5,000 to \$ 9,999
IV	\$ 2,500 to \$ 4,999
V	\$ 1,200 to \$ 2,499
VI	\$ 250 to \$ 1,199

Hence, in studying the size-of-farm problem in Economic Area V we can compare income, costs, investments, and resource combinations for six different size of farm groups, for volume of sales is a measure of size. There are other measures. For example, acres are often used as a measure of size. Total capital investment or the total dollar value of all inputs or resources used during the year is also sometimes used. Acres, since they represent only one of the resources (land) used in farming, do not always accurately measure farm size. In most instances, however, acres, volume or value of output, total capital (land included) invested and dollar value of all inputs or resources used during the year go hand in hand (Table 1).

Table 1. - The Number of Commercial Farms in Size Classes, Economic Area V, Kentucky, 1949 (Source: U.S. Census and Estimates)

Class of Farm	Acres per farm	Gross Sales	Total capital invested	Total inputs used during the year	No. of Farms	Percent Farms in each class
I	402	\$25,000 & over	37,770	31,112	22	0.1
II	372	10,000-24,999	49,857	14,523	182	.9
III	236	5,000- 9,999	26,365	6,983	719	3.7
IV	142	2,500- 4,999	14,568	4,103	2,405	12.4
V	92	1,200- 2,499	7,619	2,533	6,879	35.5
VI	65	250- 1,199	4,240	1,757	9,200	47.4

According to the 1950 Census, most of the commercial farms in Economic Area V fell into Class VI, with sales of only \$250 to \$1200 (last two columns, Table 1). But a large proportion also fell into Class V, with sales of only \$1200 to \$2500. Class IV farms with sales of \$2,500 to \$5,000 ranked third in number. Thus, about 95 percent of all commercial farms in Economic Area V had sales of less than \$5,000, which leaves only 5 percent with sales of \$5,000 and above.

With this general background, let us take a closer look at incomes and costs on these farms of varying size. (Table 2)

to management. Class VI farms had a negative return of -\$658; they were short this much after paying cash farm expenses plus reasonable charges for labor and capital investment. Even Class IV farms (farms with gross sales of \$2,500 - \$5,000 or an average product valued at \$3,887) had a negative return of -\$216. These positive and negative returns are important in our analysis. To really see their importance requires a graphic picture (Fig. 1). Here the ratio of the value of the total product to the value of the total input is plotted against the value of the total inputs for the six classes of farms. A ratio of 1.0 on the vertical axis represents the break-even point or where the value of the total product is exactly equal to the value of the total input. Thus, the horizontal line drawn at 1.0 has special significance. All farms below this line show a loss while the farms above the line show a profit.

In Table 2, Class VI, V and IV farms (farms with gross sales of less than \$5,000) show negative returns. These are also the ones below the horizontal line at 1.0 (Fig. 1), and they represent 95 percent of all commercial farms in Economic Area V. The fact that these farms show losses does not mean they are going into debt or that the families are starving. It does mean that they failed to make cash farm expenses together with the conservative wage (\$947 per mature worker) and investment costs which were charged against their labor and capital.^{3/} If the farm families on these small farms (Classes VI, V and IV) were entirely motivated by profit, they would either increase the size of their farming operations or transfer their labor and capital into employment other than farming.^{4/} Economically, the losses on these farms mean that the labor and capital employed here did not earn as much as it could either in industry or on larger farms. The positive returns or the "plus 1.0" ratios on the larger farms (farms with gross sales of \$5,000 or above) mean that these farms not only earned enough to pay for all inputs but had something left over.

Economies are associated with increased size

By connecting the values for the various classes of farms (Fig. 1) with a broken line, one can more readily visualize the economies of size available to farms in Economic Area V. As shown, the economies of size (average efficiency) increase sharply from Class VI (with gross sales of \$250 - \$1,200) to Class III farms (with gross sales of \$5,000 - \$9,999). Classes I and II farms show about the same efficiency as Class III farms. The eco-

^{3/} The \$947 was the annual average wage for hired farm labor in Kentucky, 1949.

^{4/} Of course, money income and the goods and services it will buy is only one of the goals which make up the complex of family satisfactions.

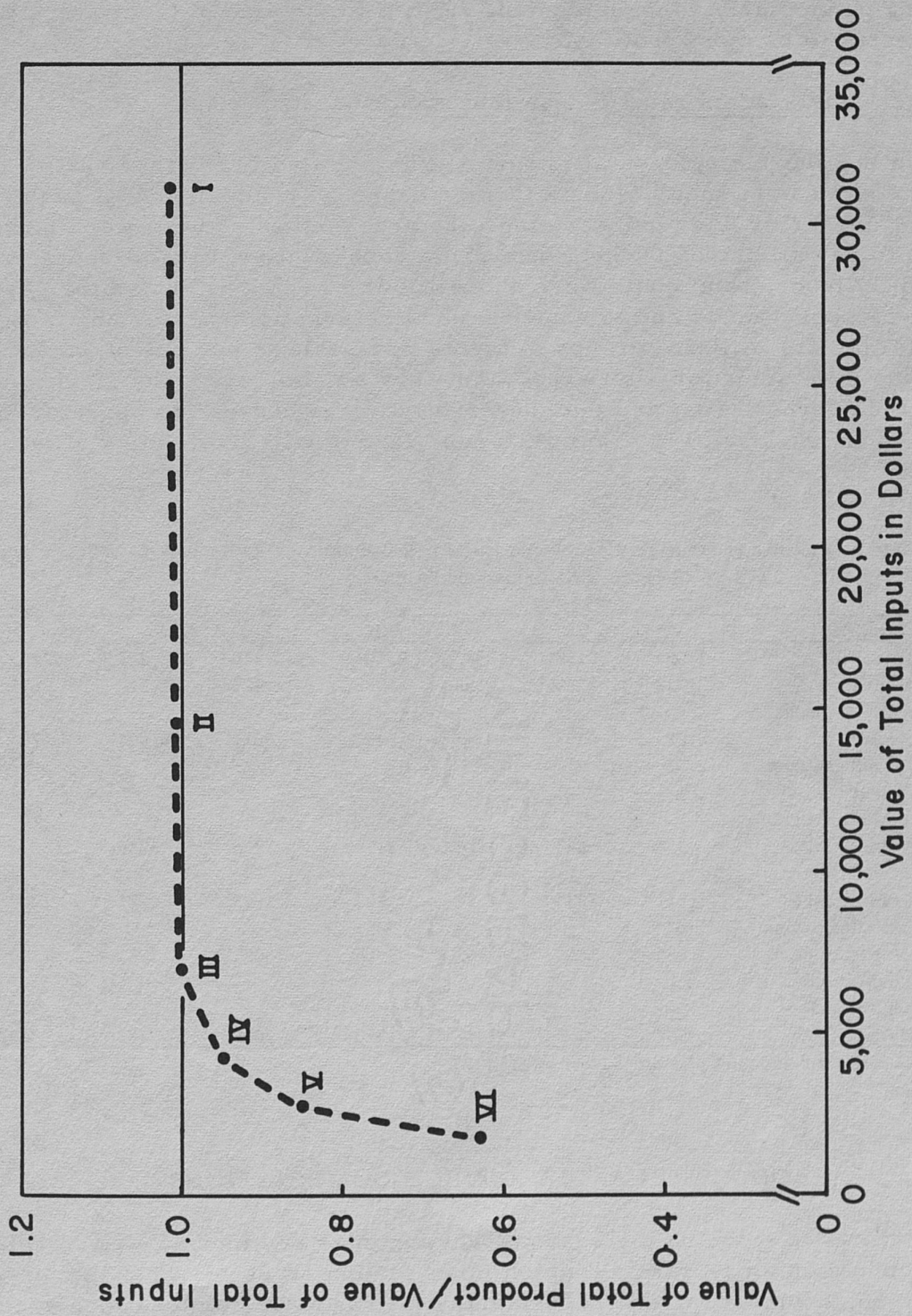


Fig. 1. - The ratio of the value of total product to the value of total inputs in relation to value of total inputs by classes of farms in Economic Area V, Kentucky, 1949. (Source: U.S. Census Data and Estimates)

nomies of size illustrated here have important implications in long-run planning particularly as such planning relates to the size of farm which can be expected to be most profitable.

Labor on small farms returns less than a conservative wage

In the short run, of vital importance in farming is whether out-of-pocket costs can be met. When a farmer cannot pay out-of-pocket cash costs he must sooner or later quit farming. To see whether returns were large enough to pay all out-of-pocket costs and a conservative wage to operators and family labor, total costs were broken down to show returns after paying all out-of-pocket costs and to show residual returns to operator and family labor (Table 3.) All size groups of farms were able to pay out-of-pocket costs and have something left over. What was left over was insufficient to pay the overhead cost and the conservative wage charged to operator and family labor on Class VI, V and IV farms (farms with gross sales of less than \$5,000).

Table 3. - Income and Costs for Commercial Farms in Economic Area V, Kentucky, 1949.
(Source: U.S. Census and Estimates)

Class of farm	VI	V	IV	III	II	I	Average
1. Total product	\$1099	\$2163	\$3887	\$7101	\$14,846	\$32,482	\$2209
2. Total inputs	1757	2533	4103	6983	14,523	31,112	2671
a. Out-of-pocket costs*	213	557	1326	3435	8811	26,901	703
b. Overhead costs other than operator and family labor	334	643	1224	2156	3966	3289	658
c. Operator and family labor	1211	1334	1554	1392	1748	921	1309
3. Returns after paying out-of-pocket costs	886	1606	2561	3666	6035	5581	1506
4. Residual returns to operator and family labor	552	963	1337	1510	2069	2292	848

* Includes cash farm expenses plus hired labor costs.

PRODUCTION AND RESOURCE COMBINATIONS

Before we examine the reasons why incomes are much lower in relation to inputs on small farms than on large farms, let us see what the different size groups of farms produce and what resource combinations are used to get this production.

Field crops most important source of income on small farms

The two most important sources of income on commercial farms in Economic Area V are field crops and livestock products other than dairy and poultry. However, on Class VI farms field crops and home-consumed products were the two most important income sources while on Class I farms poultry sales were more important than field crops sales (Fig. 2).

Income from field crops for size groups of farms varied 5 to 45 percent on the total and tended to decrease with increases in size of farm. The relative importance of income from dairy products varied from approximately 4 to 8 percent among the classes of farms. The percentage contribution of home-consumed products to gross income declined steadily with increase in size of farm. Poultry sales were a relatively unimportant income source except on Class I farms.

Income from livestock other than dairy and poultry increases with increase in farm size

The relative importance of livestock and livestock products (other than dairy and poultry) as a source of income increased steadily as size of farm increased. On Class VI farms livestock and livestock products accounted for only 15 percent of the gross income, whereas on Class I farms they made up over 67 percent of the income.

To get the complete picture, we need to know what resources are required to get the production for different classes or sizes of farms (Fig. 3). The percentage contribution of each input or resource item was based on the estimated annual use value of these inputs or resources. Thus, the annual contribution of land was estimated at 5 percent of the total land investment. The annual contribution of labor was the number of mature workers times the going wage in agriculture. Capital includes cash farm expenses, interest on buildings, machinery and livestock and depreciation on buildings and machinery.

Percentagewise, land was about equally important on all farms, irrespective of size. For all size groups it made up a relatively small portion (7 percent) of the total annual inputs.

Labor inputs rank highest on small farms while capital inputs rank highest on large farms

Labor inputs were relatively more important on the smaller farms than on the larger farms. In fact, on Class VI farms labor inputs were more important than all other inputs combined. In contrast, on the larger farms (Class IV, III, II and I) capital is by far the most important input item.

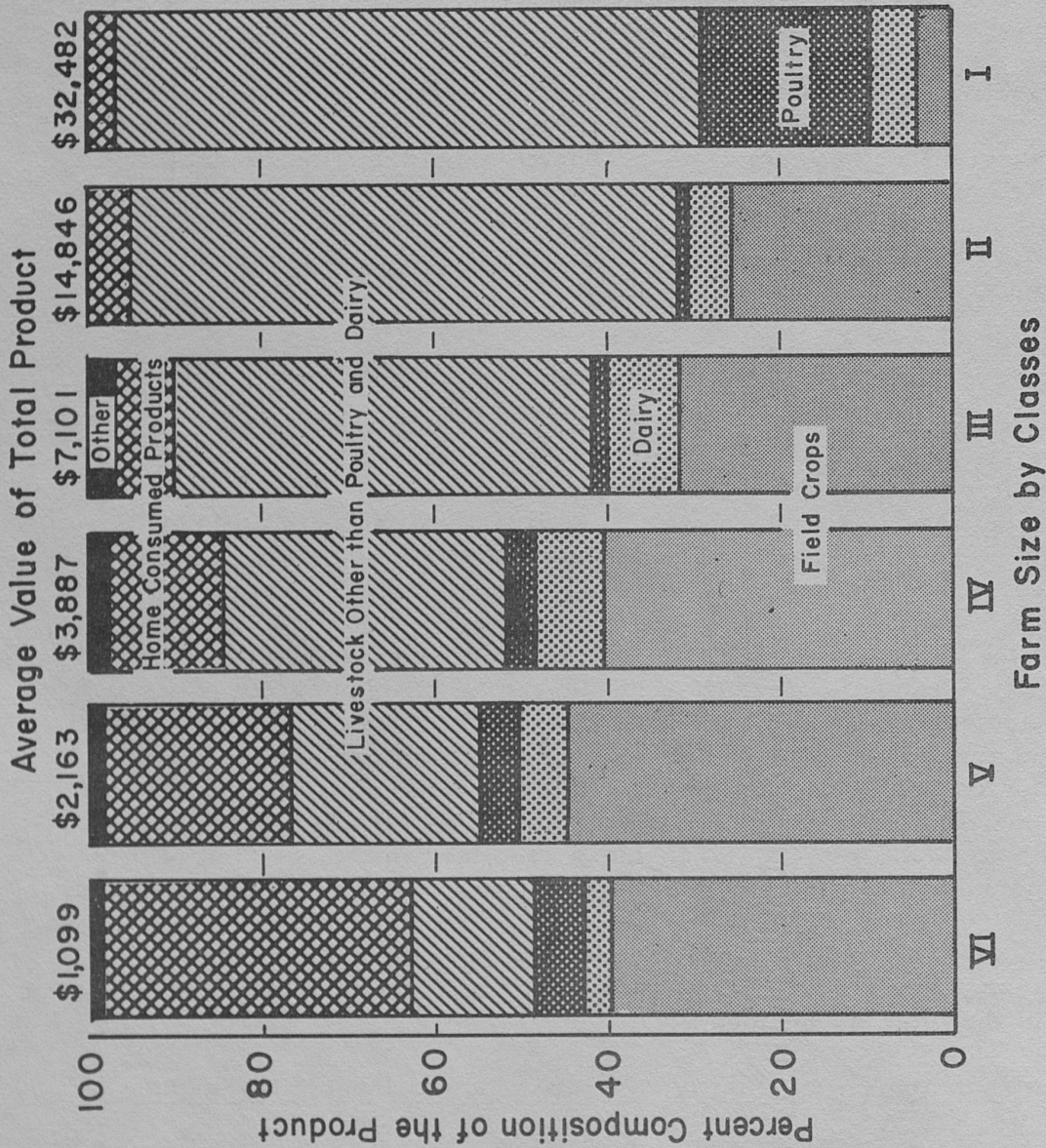


Fig. 2. - The percentage composition of the product for classes of farms in Economic Area V, Kentucky, 1949. (Source: U.S. Census, 1949.)

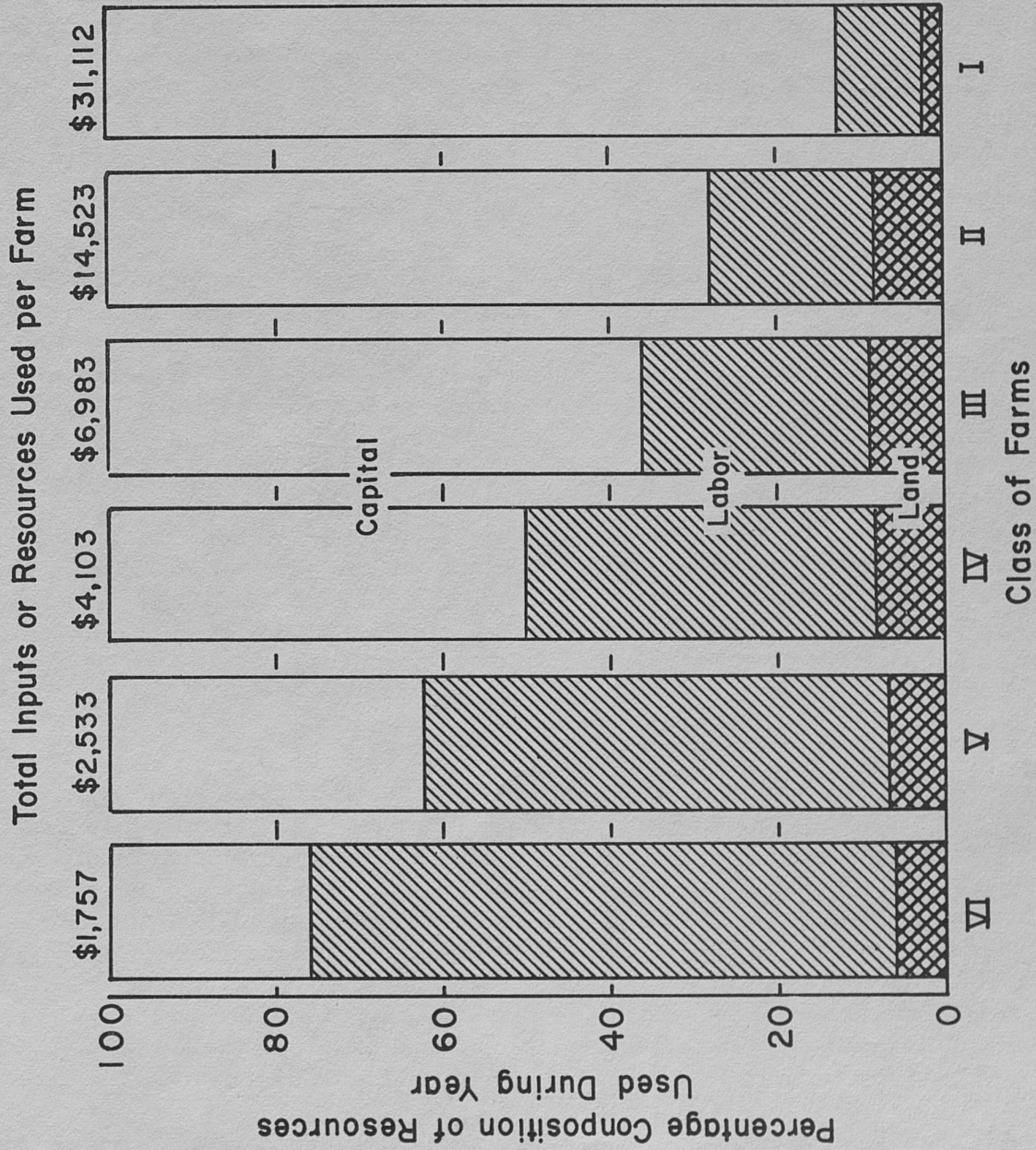


Fig. 3. - The percentage composition of inputs or resources used per year by classes of farms in Economic Area V, Kentucky, 1949. (Source: U.S. Census and Estimates.)

The decreasing importance of labor and the increasing importance of capital as farms increase in size is clearly illustrated in Fig. 3. This means that the amount of capital used per worker increased as farm size increased. This is one reason why incomes are much higher in relation to inputs on large farms than on small farms. For any one input or resource to be productive, it must have enough of other inputs or resources to go with it. Land by itself is not productive. Neither is labor by itself, nor capital by itself. Let us see how productive labor, land and capital are on farms of different size.

PRODUCTIVITY OF LABOR, LAND AND CAPITAL

We said earlier that operators on many small farms are not getting much return for the time they spend farming. In other words, on many small farms labor is not very productive. We have already talked about residual returns to labor. We defined residual returns to labor as what is left after subtracting all inputs (including a fair return to land and capital), except labor inputs, from gross income. This gives a rough estimate of what labor is worth. Heretofore, we have either figured the residual return to all labor or to all operator and family labor for different class farms. Since large farms employ more workers than small farms, we need to compute the residual returns to labor per worker to find out how productive labor is on farms of varying size. We first computed the average number of workers per farm and the residual returns to labor per worker for the six classes of farms (lines 1 and 2, Table 4).

Returns to labor per worker is low on small farms

Notice that the residual to labor per worker increases steadily from \$441 on Class VI farms to \$1356 on Class I farms. Part of this difference in returns among the size groups can be explained by the amount of other resources used along with labor. For instance, notice how acres and total investment per worker increased from Class VI up through Class II farms and land and capital inputs per worker increased without exception from Class VI through Class I farms. Actually, land and capital inputs per worker gives a more accurate picture of the resources used along with labor. These inputs included cash farm expenses which ran high on the larger farms, particularly in the form of feed and feeder livestock purchases.

Total product per worker increases as capital and land per worker increases

In order to determine how much land and capital add to total production, total product per worker was compared with land and capital per worker (Fig. 4). This comparison gives a rough idea of what one farm worker produced with various amounts of land and capital. Total product per worker increased from \$845 on the smallest farms to \$9667 on the largest (Class I). At the same time time, land and capital inputs per worker increased from \$405 to \$8311. Notice that total product per worker increased throughout as land and capital inputs per worker increased.

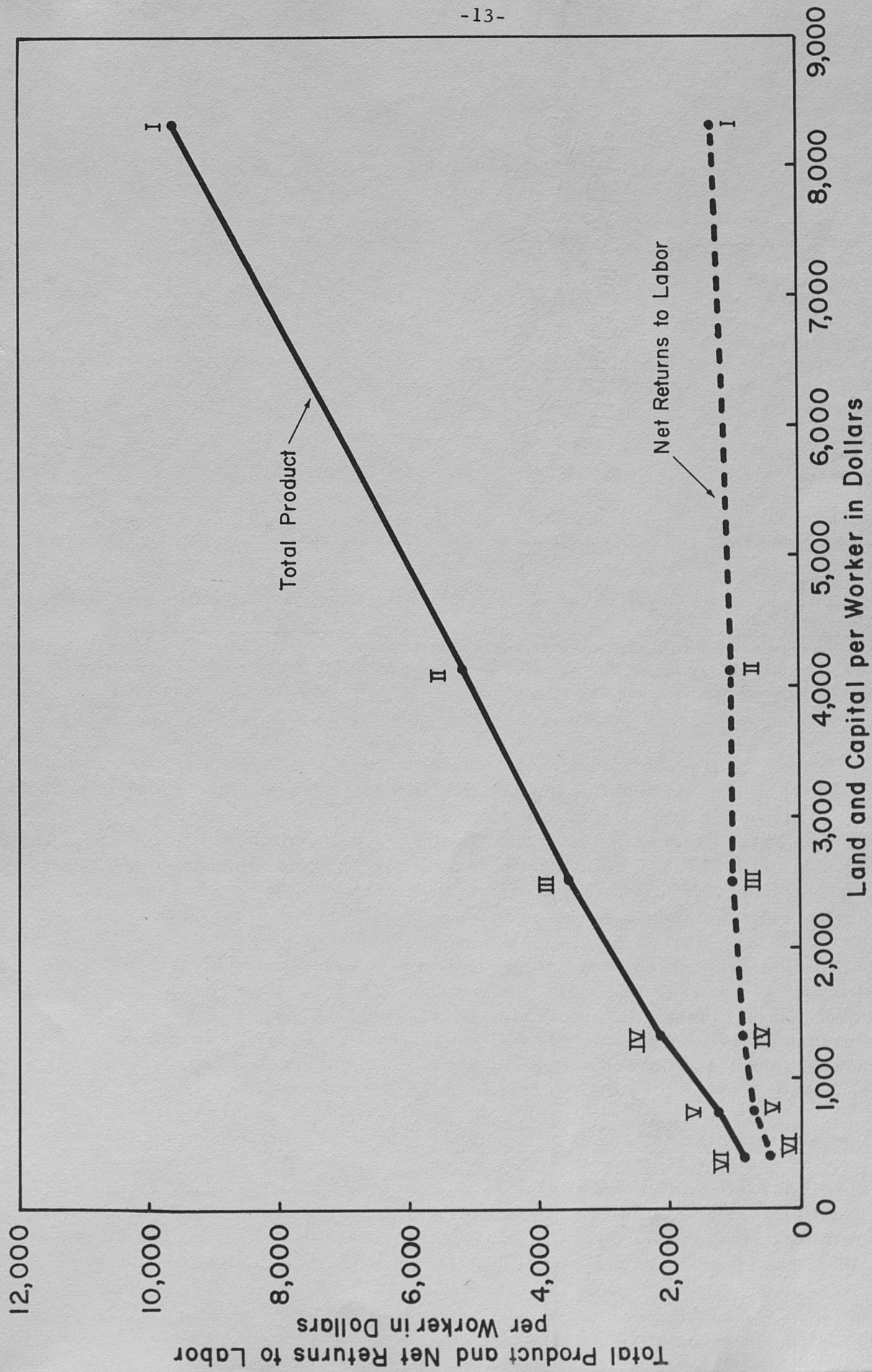


Fig. 4. - Productivity of land and capital, Economic Area V, Kentucky, 1949.
(Source: U.S. Census and Estimates)

Table 4. - Resource and Product Ratios for Productivity of Labor, Land and Capital, Economic Area V, Kentucky, 1949 (Source: U. S. Census and Estimates)

Class of farm	VI	V	IV	III	II	I	Average
Number of workers (man-years of all labor)	1.30	1.48	1.82	2.01	2.87	3.36	1.47
Residual to labor per worker	\$441	\$699	\$829	\$1005	\$1059	\$1356	\$635
Acres per worker	50	62	78	117	130	120	64
Total investment per worker*	\$3262	\$5148	\$8004	\$13,117	\$17,372	\$11,241	\$5454
Land and capital inputs per worker**	\$405	\$763	\$1,308	\$2,528	\$4,114	\$8,311	\$867
Total product per worker	\$845	\$1,461	\$2,136	\$3,533	\$5,173	\$9,667	\$1,503

* Includes investment in land, buildings, machinery and livestock.
 ** These are the annual inputs, not the investments themselves, and include cash farm expenses, interest on land, buildings, machinery and livestock together with depreciation on buildings and machinery.

From the figures one might surmise that any one farm operator could take \$8311 in land and capital inputs (annual inputs) and produce \$9667 in product. This notion may be entirely wrong. To illustrate, we have already seen that Class I farms had nearly 3.4 workers per farm and produced \$32,482 in product with \$27,927 in input of other resources (other than labor); but one farm operator with \$27,927 in other resources and employing 2.4 men is a different situation than 3.4 men each with about \$8311 in other resources.

Net returns to labor per worker were also compared with land and capital inputs per worker (Fig. 4). Net returns to labor per worker increased through Class I farms with increases in land and capital per worker. The rate of increase was sharper from Class VI through Class III farms than from Class III farms and beyond. Returns from adding additional land and capital are usually greater for small farms than for large farms.

On small farms the total cost of producing \$1 in product was more than \$1

High profits in relation to costs is a measure of over-all efficiency or productivity. For farms to show a profit, the cost of producing \$1 in product must cost less than \$1. Our study shows that Class I farms produced \$1 of product with about \$0.95 (Fig. 5). This \$0.95 included all inputs -

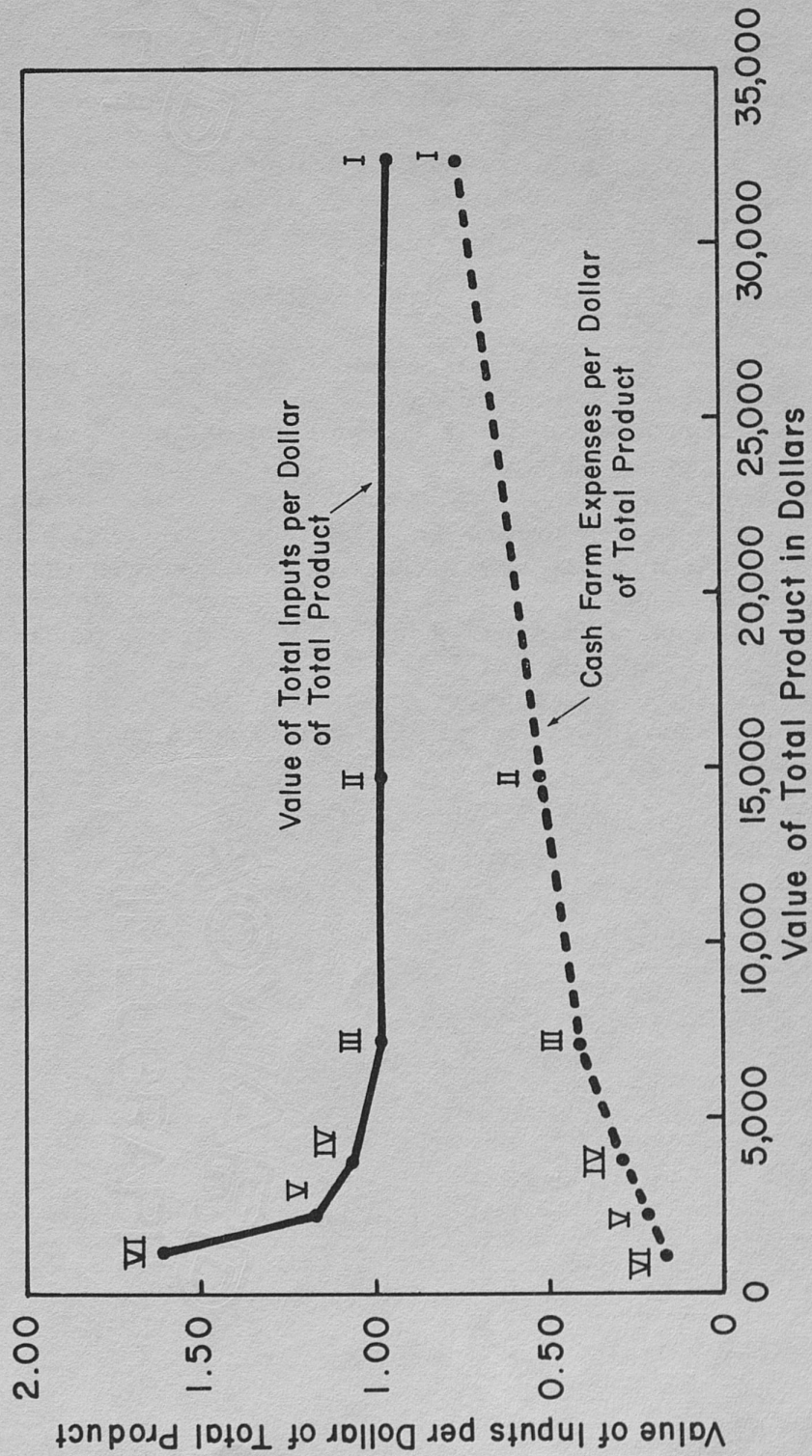


Fig. 5. - Value of inputs in relation to value of product for classes of farms in Economic Area V, Kentucky, 1949. (Source: U.S. Census and Estimates)

cash farm expenses, interest on land, buildings, livestock and machinery, depreciation on buildings and machinery plus a charge for hired, operator and family labor. On Class II, it cost about \$0.97 to produce \$1 of product while on Class III farms the cost was \$0.98. On Class IV, V and VI farms it cost more than \$1 to produce \$1 of product; costs on those farms were \$1.06, \$1.17 and \$1.60, respectively, for \$1 of product. For these small farms, these figures indicate losses.

Small farms had the lowest cash costs per \$1 of product

Of course, we know that these small farms did not pay operator and family labor and their investment inputs at the going rate of return. For farms that do not have to pay for their own labor and their investment inputs, cash farm expenses per \$1 of product may be more meaningful, at least in the short run. It is when cash farm expenses cannot be met that farm families sooner or later must give up farming. Data shown in Fig. 5 help to explain why many small farmers are able to stay in business, even when total product may not be great enough to cover all costs. Since only cash costs have to be paid in the short-run, all classes of farms (including the small farms) have some income left over for themselves. However, when considering all inputs, the small farms definitely come out short. This fact becomes very apparent when we compare the returns in farming with those in industry.

OPPORTUNITY RETURNS TO FARM LABOR AND CAPITAL IN THE PURCHASE

To compare the returns of labor and investment in capital and land in farming with the opportunity return for these resources in industry, we first need to arrive at suitable wage and interest rates as a basis for figuring the opportunity returns. An annual wage of \$2,900 was figured as a reasonable wage opportunity for farm labor in nonagricultural employment, and 5 percent was chosen as a fair interest rate on capital.^{5/} The top line (Fig. 6) shows the opportunity returns to Kentucky farm labor and capital as figured on the basis of these rates. The opportunity returns for one man without any capital (only his labor) in industry is \$2,900. The opportunity return in industry for one man with \$6,000 of capital invested and earning 5 percent is \$2,900 plus \$300 or \$3,200, etc. Thus, the top line represents the real cost (opportunity returns) of using labor and capital in farming.

Dollar costs of using labor and capital on small farms appear high

These opportunity returns are then compared with the value actually added per worker by these resources when used on the various classes of farms (the broken line, Fig. 6). Note that the value added per worker when employing his resources in farming falls below the "opportunity-returns-in-industry line" for all classes of farms. Value added as computed does not include any allowance for rental value of farm dwelling. Even if this had been included the value-added-per-worker line would still be below the opportunity-returns-in-industry line even for Class II farms. (Class II farms had the highest average value added per worker of the six classes). The crucial point to observe is how far the value added per worker on the small farms is below the opportunity line (i. e., for Classes IV, V and VI). In terms of income only, families on these small farms would be much better off working for wages in industry and letting their capital out at 5 percent. Such a change represents one of the alternative solutions to the size of farm problems in Economic Area V. Let us take a further look at alternative actions which small farm families might take to solve their low income problem.

^{5/} \$2,900 was computed as a simple average of the mean weekly wage in manufacturing in Michigan, Indiana, Illinois and Tennessee times 52. (From U.S. Dept. of Labor, Bureau of Labor Statistics, Monthly Labor Rev., Vol. 70, 1950, Table C-5). Earnings were given only for selected states. Ohio would have been preferred over Indiana and Illinois, and Kentucky over Tennessee, but the opportunity for exercising these preferences was not available.

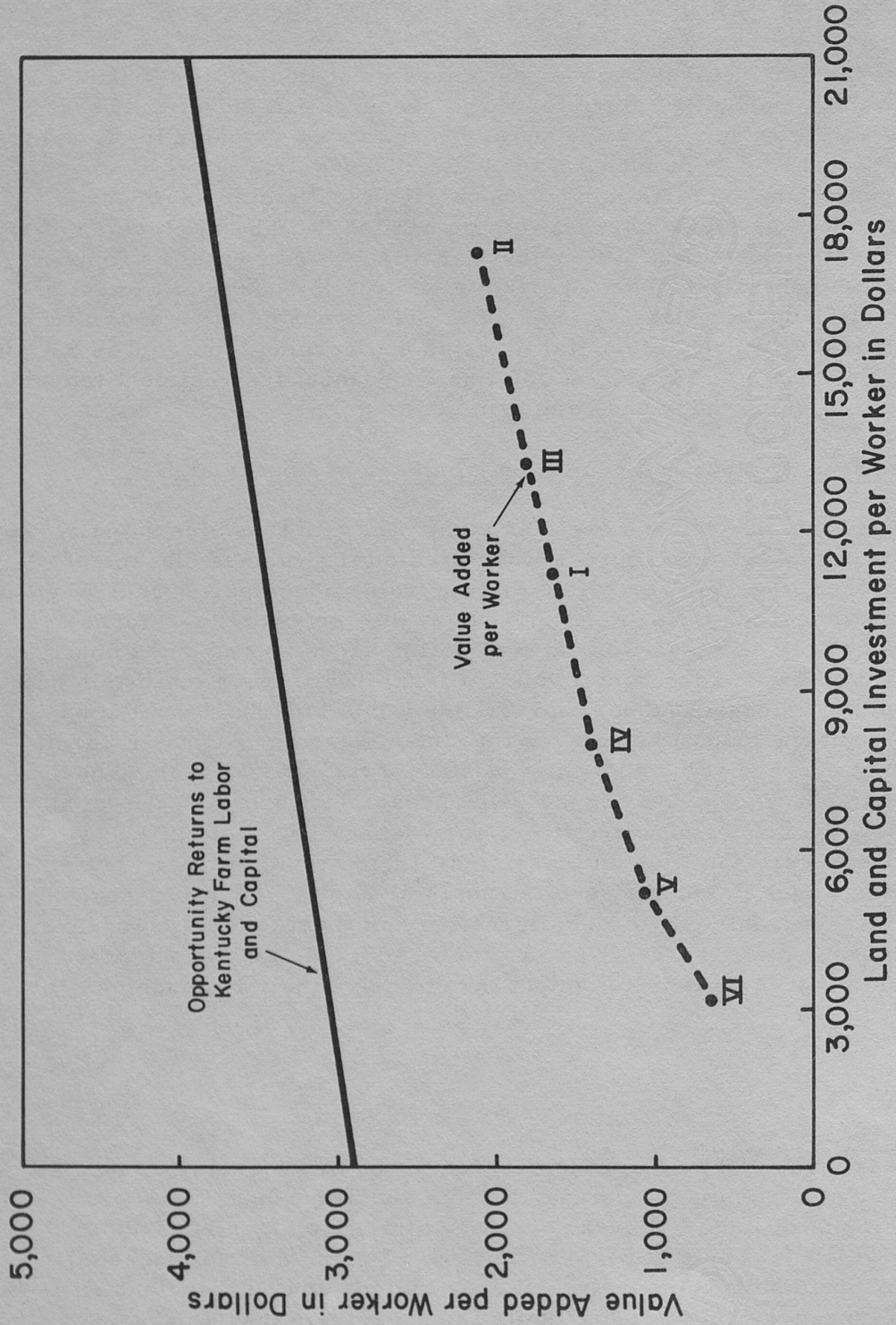


Fig. 6. - Opportunity returns compared with value added per worker in relation to capital and land value per worker, Economic Area V, Kentucky, 1949. (Source: U.S. Census and Estimates)

POSSIBLE SOLUTIONS TO THE SIZE-OF-FARM PROBLEM

First of all a study such as this can provide no blanket answers or solutions which apply to each and every farm. Each individual farm family situation differs and the way in which each farm family solves its problems depends on the relative value placed on income, security, independence, companionship, community prestige and other goals. Moreover, the conclusions which can be drawn from this study are based on average returns and average costs for various classes or size groups of farms. Each group is likely to include numerous deviations from the average. Nevertheless, a study such as this points up some very important farm problems together with some possible answers.

For example, from this study we conclude that operators of small farms have either relatively low or negative returns to their labor. Now, if these operators wish to increase their returns, here are some possible alternatives. If they want to stay in farming, they must somehow or other increase their land and capital per worker; in some instances, management will also have to be increased. Possible alternatives for getting control of more land and capital are renting more land, borrowing money, buying a larger farm, or doing custom work for others. If the operators are willing to work partly in farming and partly in industry, part-time farming may be an alternative. Part-time farming can serve to increase resources per worker in farming and thereby increase returns to labor on small farms. If small-farm families are willing to move completely out of farming, full off-farm employment is a way of increasing returns to their labor.

It is quite clear then that many operators of small farms are not getting very much return for the time they devote to farming. To increase their incomes, obtaining off-farm employment and/or increasing their land and capital per worker appear as the most effective alternatives. If these alternatives are unavailable or appear unsatisfactory, then farm families on small farms will have to continue to use mostly labor in their farming activity and the returns from their labor will continue low.

The extent to which these alternatives are unavailable and/or unacceptable suggests other aspects of the low income problem as it relates to size of farm. This study has emphasized mainly one aspect, namely, the relationship between income on the one hand and capital, labor and other inputs and product combinations on the other. But an integrated approach to the problem requires study and understanding of other aspects as well.

OTHER ASPECTS OF THE SIZE-OF-FARM PROBLEMS

Moving from farm into off-farm employment requires mobility. Families on small farms may be immobile for a number of reasons. Some may value "life on the farm" so highly that the added income in off-farm employment is considered worth less than the happiness experienced from living and working on the farm. Some stay on the farm perhaps because they lack or believe they lack the necessary skills and training for off-farm employment. Some remain on the farm perhaps because they lack knowledge of off-farm employment opportunities or because they fear to move. Others remain on the farm, perhaps, not because they would not prefer to move but because they do not have enough money to get established elsewhere. Until causes for immobility are understood and until steps are taken to overcome immobility wherever it is considered as an obstacle to greater human satisfactions, off-farm employment can hardly be considered as a realistic alternative for solving the income problem on small farms.

The analysis of this study suggests that if families on small farms want to stay in farming that they must somehow or other increase their land and capital per worker if they desire to increase their incomes. Some of these families may very well be seeking ways of attaining more land and capital. Some may be held back because they can find no land to rent. Some may be held back because they can't borrow money with which to buy land, machinery, livestock, fertilizer or other inputs. Still others may hold themselves back because they consider expansion of operations with borrowed money too risky. Until the reasons why families on small farms fail to increase land and capital per worker are clearly understood and until steps are taken to facilitate such increases, increasing land and capital per worker can hardly be considered as a real alternative for solving the income problem on small farms.

Increasing land and capital per worker to increase incomes on small farms would be a poor practice in instances where managerial skills are inadequate for profitable use of additional land and capital. A large farm business nowadays requires considerable skill and know-how in management and decision-making for financial success. Until more is known about the managerial skills and capacities existing on small farms and until steps are taken to improve these skills where they are lacking, increasing size of farm can hardly be considered as a realistic alternative for solving the income problem on small farms.