# Agricultural Adjustment And Farm Labor Underemployment In Eastern Oklahoma, 1910-1950

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# Contents

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Eastern Oklahoma has been described as an area of low farm income.[1] Many economists have characterized the problem in other low income areas, as one of chronic mis-allocation of the factors of production. Underemployment of farm labor has been cited as the most critical class of mis-allocation.[2]

Underemployment of farm labor does not mean that farm workers do not have permanent and often arduous jobs which occupy their time fully. Underemployment means that the productive capacity of the workers is not fully used. Underemployment refers to an economic surplus of labor in the sense that more labor is being used than is needed for efficient production.[3] Consequently, the monetary returns to labor per man used are lower than in other occupations using labor of comparable skill.

Few attempts have been made to estimate the actual extent of this theoretically implied underemployment of farm labor in a low income area. No such information is available for Eastern Oklahoma. This bulletin reports the results of an attempt to estimate the amount of underemployment and the need for adjustment in other farm factors of production in Eastern Oklahoma.

## THE OBJECTIVES

The specific objectives of this report are:

1. To present information, constructed from the census, on the amounts of major classes of productive resources used in Eastern Oklahoma farming in 1910 and 1950.

[1]U.S.D.A., *Counties with Lowest Farm Income and Levels of Living*, 1954; E. J. R. Booth, The Potential for Rural Development in Cherokee County, Oklahoma, OSU Experiment Station Bulletin B-548.

[2]C. E. Bishop, "Public Policy and the Low-Income Problem," *Farm Policy Forum*, Vol. 8, No. 4, (Ames: Iowa State College Press), 1956; W. E. Hendrix, "The Problem of Low Farm Incomes," in Aly, B.; and Rogge, E. A., Editors, *American Farm Policy* Vol. 1, (Columbia, Mo.: National University Extension Association Discussion and Debate Manual No. 30), 1956.

[3]The phrase "over-used" would be less misleading than the common usage of "underemployed." The latter word, however, does have the correct connotation of mis-employed or mis-allocated in production.

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2. To illustrate the amount of adjustment achieved in farm resources and resulting farm income per worker during the period 1910 to 1950.
3. To construct an aggregate farm production function from the data for 1950.
4. To estimate the amount of underemployment of farm labor and the implied need for adjustment in factor allocation in the agriculture of Eastern Oklahoma in 1950.

## THE DATA

The data used are constructed from the United States Censuses of 1910 and 1950.

### Farm Output

Farm output is measured by the value of products sold by farms plus an estimate of the value of farm products used on farms.

### Farm Labor

Farm labor is estimated as man-year equivalents of labor available for use on farms. The numbers of farm operators are reduced by the man-year equivalents of off-farm work in non-farm jobs. Adult rural males who are not farm operators are added with the assumption that they work off-the-farm at double the rate of farm operators. Adult rural females are also added on the same basis, but their man-year equivalents of farm work are reduced by the factor of one-quarter to allow for the lower rate of female participation in farm work. To these three items is added the hired farm labor force.[4] The total is referred to as farm workers or the farm labor force, most of whom are also farm operators.

### Farm Land

Farm land is entered as the total acreage of land in farms diminished by the land in buildings, roads, and wasteland.

### Current Expenses

Current expenses include the value of feed, seed, fertilizer and fuel purchases; the cost of repairs to machinery and buildings; and the rental of custom-hired implements.

### Fixed Assets

Fixed assets are computed as the total value of land, buildings, livestock, and implements on farms.

[4]The method is essentially that of A. M. Tang, *Economic Development in the Southern Piedmont*, 1860-1950, (C. Chapel Hill: University of North Carolina Press), 1958, pp. 246-7. A small amount of double-counting is possible between non-operator rural males and the hired labor force.

### Farm Income

Farm income is measured by the value of farm output less the value of current expenses as defined above. From this total is subtracted the cost of livestock purchases.

### Period of Observation

Farm output, farm labor, current expenses and farm income are measured in terms of flow during the year of observation; either 1910 or 1950. Farm land and fixed assets are the stock observed at the date of census after the year of observation. Data in dollars for 1910 are inflated by appropriate price indices to 1950 price levels.

### Area Observed

The area observed included the 24 counties of Adair, Atoka, Bryan, Cherokee, Choctaw, Coal, Creek, Delaware, Haskell, Hughes, Latimer, LeFlore, Marshall, McCurtain, McIntosh, Muskogee, Okfuskee, Okmulgee, Pittsburg, Pontotoc, Pushmataha, Seminole, Sequoyah and Wagoner. The fact that these comprise the whole of Census Economic Areas of Oklahoma 6, 7b, 8a, 8b and 9 helps in the use of data published by economic area only. Errors of inclusion or exclusion are thus partly justified. The inclusion of some counties where the low income problem is not serious helps establish sufficient range in the observed variables for statistical estimation.

## FARM RESOURCES, ADJUSTMENT AND RESULTING INCOME, 1910 and 1950

The levels of factors of farm production used and the resulting levels of farm output and income are tabulated in Table 1 by counties for 1910 and 1950. The counties are ranked by farm income per farm worker in 1950, with the upper quartile labelled the "Developed group;" the lower quartile, "Underdeveloped;" and the remaining second and third quartiles, "Intermediate." The data are presented on a per-worker basis for ease in comparing the most important of the factor proportions.

Perhaps the most striking conclusion to be observed from Table 1 is the tremendous amount of adjustment already made in Eastern Oklahoma's agriculture. In the 40 years observed, the farm labor force dropped by 53 percent over the whole area. Farm land per worker increased 274 percent, current expenses per worker increased nearly ten-fold, and fixed assets per worker more than trebled. Even when the decreasing trend in farm workers is eliminated, current expenses increased 340 percent and fixed assets by 43 percent, both in only 38 percent during the same period and the area actually worsened in its position *vis à vis* the state. From $600 per worker in 1910 to $830 terms of dollars of constant purchasing power. On the other hand, resulting income per worker in Eastern Oklahoma farms increased by

per worker in 1950 meant that Eastern Oklahoma dropped from a farm income level 59 percent of that in the state to a level of only 48 percent. Changes in the levels of factors of production in the area were not much different than in the state. Due to many causes, such as the expensive adjustment from a cotton-corn economy to a livestock economy, real farm income in Eastern Oklahoma fell and the release of farm labor was barely fast enough to maintain improvements in farm income per worker. The importance of estimating the amount of labor surplus in the area becomes clear.

## ESTIMATES OF THE AGGREGATE FARM PRODUCTION FUNCTION

In order to estimate the amount of labor surplus in Eastern Oklahoma farming, it is necessary to fit the data just presented into a theoretical model of aggregate production.

### Model

Farm output is achieved through the interaction of productive resources. Labor, land, and capital are combined on farms to produce a complex of output which differs somewhat over the area of Eastern Oklahoma. The model used attempts to represent an aggregative average of these productive processes which are assumed to be reasonably homogenous over the 24-county area.

The underlying hypothesis is that farm labor is employed in Eastern Oklahoma in 1950 in numbers exceeding those which can be supported at reasonable levels of income. Other resources have increased sufficiently since 1910 to produce at the margin a product whose unit value is close to market price. The marginal product of labor, however, is very small, implying that labor could be withdrawn with little effect on farm output. The marginal rates of substitution between other resources and labor are therefore very small.

### Functional Form

Among many functions tried, the Cobb-Douglas function yielded the best econometric fit. Economic theory gives little help as to the form of the function used, only specifying conditions on the second derivatives. Criteria for acceptance of the Cobb-Douglas included statistical explanatory power, and coefficient estimates not significantly contradictory to economic theory.[5] Disadvantages of this function include marginal rates of resource substitution always negative, expansion paths in fixed resource combinations, marginal productivities declining at declining rates, and derived profit functions decreasing for homogeneity greater than the first degree.

[5]Other functional forms tried included linear, quadratic, and transcendental. This problem of model choice in econometrics is discussed in E. J. R. Booth and G. G. Judge, "The Impact of the Choice of Model in Measurements of Economic Behavir," *Journal of Farm Economics*, Vol. XXXVIII, No. 2, May, 1956.

**TABLE 1.—Farm Resources and Resulting Farm Income in Eastern Oklahoma, 1910 and 1950.**

| Area | Total | | | | Per Worker | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Farms | | Farm Labor | | Farm Land | | Current Expenses[b] | | Fixed Assets | | Farm Income | |
| | 1910 | 1950 | 1910 | 1950 | 1910 | 1950 | 1910 | 1950 | 1910 | 1950 | 1910 | 1950 |
| | | | (man years) | | (Acres per worker) | | (Constant 1950 dollars per worker) | | | | | |
| Developed | | | | | | | | | | | | |
| Marshall | 1,509 | 689 | 3,042 | 1,122 | 44 | 180 | 82 | 1,468 | 2,191 | 9,314 | 841 | 1,341 |
| Okmulgee | 1,904 | 2,115 | 5,615 | 2,103 | 36 | 142 | 110 | 745 | 2,855 | 7,832 | 698 | 1,195 |
| Muskogee | 3,192 | 2,876 | 9,568 | 4,135 | 27 | 86 | 63 | 488 | 2,247 | 5,877 | 553 | 1,132 |
| Bryan | 3,345 | 2,584 | 7,645 | 4,266 | 40 | 105 | 59 | 456 | 2,122 | 5,527 | 714 | 1,100 |
| Haskell | 2,401 | 1,700 | 5,488 | 2,071 | 26 | 140 | 55 | 414 | 1,505 | 4,285 | 646 | 1,084 |
| Hughes | 3,028 | 1,929 | 6,814 | 2,815 | 32 | 122 | 55 | 506 | 1,596 | 4,874 | 792 | 977 |
| Sub-Total[a] | 15,379 | 11,893 | 38,172 | 16,512 | 33 | 117 | 68 | 573 | 2,082 | 5,866 | 686 | 1,113 |
| Intermediate | | | | | | | | | | | | |
| Seminole | 2,875 | 2,199 | 6,199 | 2,153 | 35 | 121 | 50 | 516 | 1,497 | 6,114 | 789 | 929 |
| Wagoner | 2,713 | 1,755 | 5,909 | 2,776 | 39 | 89 | 87 | 606 | 2,582 | 6,822 | 896 | 906 |
| McIntosh | 2,785 | 2,123 | 5,900 | 3,514 | 35 | 87 | 47 | 357 | 1,882 | 3,894 | 783 | 879 |
| Atoka | 1,695 | 1,869 | 4,347 | 2,496 | 33 | 165 | 61 | 589 | 2,122 | 4,535 | 457 | 863 |
| Creek | 1,914 | 2,179 | 5,987 | 2,678 | 33 | 142 | 30 | 551 | 1,966 | 5,587 | 563 | 832 |
| Coal | 1,166 | 1,054 | 3,605 | 1,375 | 28 | 187 | 50 | 1,005 | 1,561 | 6,531 | 409 | 832 |
| Okfuskee | 2,478 | 1,665 | 5,414 | 2,563 | 40 | 116 | 48 | 434 | 1,695 | 5,188 | 911 | 825 |
| Pittsburg | 2,701 | 2,474 | 9,331 | 3,167 | 22 | 181 | 57 | 664 | 1,338 | 5,423 | 443 | 811 |
| Pontotoc | 2,722 | 1,858 | 6,015 | 1,900 | 18 | 179 | 69 | 1,214 | 1,846 | 7,863 | 746 | 768 |
| McCurtain | 1,954 | 3,591 | 6,535 | 4,440 | 34 | 78 | 23 | 261 | 773 | 3,717 | 246 | 761 |
| Pushmataha | 908 | 1,563 | 3,275 | 1,785 | 23 | 185 | 29 | 563 | 936 | 4,507 | 247 | 702 |
| Latimer | 786 | 1,046 | 3,209 | 1,211 | 14 | 160 | 30 | 520 | 748 | 4,167 | 234 | 695 |
| Sub-Total[a] | 24,697 | 23,376 | 65,726 | 30,058 | 30 | 131 | 52 | 555 | 1,607 | 5,192 | 584 | 823 |
| Underdeveloped | | | | | | | | | | | | |
| Choctaw | 2,040 | 2,133 | 5,650 | 3,023 | 27 | 103 | 37 | 341 | 1,196 | 3,682 | 427 | 644 |
| Adair | 1,235 | 1,919 | 3,155 | 2,906 | 39 | 62 | 37 | 362 | 1,369 | 3,471 | 276 | 628 |
| Cherokee | 1,999 | 2,317 | 4,934 | 2,999 | 30 | 91 | 42 | 282 | 1,309 | 4,042 | 414 | 613 |
| Sequoyah | 3,302 | 2,093 | 6,990 | 2,478 | 26 | 100 | 51 | 362 | 1,306 | 4,207 | 690 | 567 |
| LeFlore | 3,433 | 3,085 | 7,985 | 3,628 | 21 | 99 | 44 | 518 | 1,157 | 4,514 | 581 | 545 |
| Delaware | 1,723 | 2,410 | 3,789 | 3,137 | 49 | 88 | 116 | 622 | 2,510 | 5,278 | 653 | 512 |
| Sub-Total[a] | 13,732 | 13,957 | 32,503 | 18,171 | 29 | 91 | 52 | 421 | 1,400 | 4,221 | 531 | 584 |
| TOTAL | 53,808 | 49,226 | 136,401 | 64,741 | 31 | 116 | 56 | 522 | 1,690 | 5,091 | 600 | 830 |
| STATE | 190,192 | 142,117 | 365,660 | 189,991 | 58 | 182 | 138 | 1,026 | 4,114 | 12,066 | 1,020 | 1,736 |
| Percent of State | 28% | 35% | 37% | 34% | 53% | 64% | 38% | 51% | 41% | 42% | 59% | 48% |

Source: U. S. Census of Agriculture and Population, 1910 and 1950
a Total or weighted average for the group
b Includes livestock purchases

## Results

The estimated regression is now presented:

$$\hat{Y}=0.600\ X_1^{\ 0.034}\ X_2^{\ 0.334}\ X_3^{\ 0.324}\ X_4^{\ 0.407}$$

Where $Y$ = value of farm output in 1949 (dollars),
$X_1$ = available labor force during 1949 (man years),
$X_2$ = useable farm land in 1950 (acres),
$X_3$ = current expenses in 1949 (dollars), and
$X_4$ = value of fixed assets in 1950 (dollars).

Fitted in logarithms, the explanatory power was $R^2$ (log Y, log $X_i$) = 0.890. Although the "t" statistics have little meaning in regard to the coefficient estimates in natural units, their size in the logarithmic fitting process was comforting:

$t_1 = 0.293$, $t_2 = 2.635$, $t_3 = 1.520$, and $t_4 = 1.522$.

The hypothesis that (the logarithm of) labor contributes little to (the logarithm of) farm output at the margin is therefore not rejected (for the linear in logarithm form).[6] Thus the hypothesis of labor underemployment is not rejected. But the other theoretical determinants of output appear statistically important to the model. Land is significant at a high level of confidence. The two capital variables also appear statistically significant at roughly the 8 percent level. None of the coefficient estimates conflict with theoretical preconceptions.

[6] $P\ (0 < t < 0.293) = 0.61$ under the hypothesis that the universe $b_1 = 0$.

## Analysis

Table 2 lists the results implied by the estimated production function. Under column headings of "present," the levels of resource use and output are presented for an average county of the area and for the high- and low-ranked county in terms of farm income per worker. Factor proportions, marginal value products and marginal rates of substitution are included.

The two extreme counties and the statistically typical county provide a useful comparison, since their output levels are quite similar. Differences in farm income per worker may be assumed to be largely explained by differences in resource use and resource combinations.

The major difference between Marshall and Delaware counties is labor inputs. Delaware has more fixed assets per acre even though it has more acres than Marshall. Current expenses differ but little. But Delaware used almost three times as much labor as Marshall. The effect of this relative labor surplus is clearly indicated in comparative levels of income per worker.

Marginal value productivities, or the contribution to output value of the last increment of a resource, were close to market prices in all cases but labor. A marginal value product of land of $4.45 per acre

in Marshall county is not far different from local cash rents for good farm land.[7] Some increased use of land is indicated on the whole, since cash rents had not reached $3.87 per acre on the average.

Current expenses yield $1.03 at the margin in Marshall county, indicating that this resource has been used to the point where its return is close to short-term interest charges of around 6 percent per annum. For the whole area, investment in current expenses does not appear to be large enough. These expenses return 29 cents on the dollar at the margin. With short-term production loans costing no more than 6 cents on the dollar, the difference of 23 cents must be explained by some mixture of capital rationing by lenders, risk aversion by borrowers, and, perhaps, by lack of knowledge of the marginal productivity of farm production expenses in the area.

Fixed assets, on the other hand, are used at economic levels in Eastern Oklahoma, if our 1950 estimates are reliable. The value of fixed assets at the margin is around 10 cents on the dollar in all counties of the area. This value is approximately the actual yearly cost of a long-term, land-based mortgage. Such a mortgage would cost 10.1 cents annually per dollar loaned for principal and interest payments at 5 percent for 14 years.[8]

The results for labor productivity at the margin are clear. Labor in Eastern Oklahoma adds less than $50 per man year to the value of farm output. Put another way, the removal of one farm worker's contribution to farm output would not significantly reduce the value of farm production and consequently farm income. The level of farm income per worker would evidently be greatly improved by emigration from farms.

In summary, the underlying hypothesis of the model is acceptable. Mis-allocation of resources in Eastern Oklahoma's farming is mainly a case of labor underemployment. Certainly farm sizes and production expenses could be economically increased, but their use is efficient relative to the gross surplus of farm labor still remaining. These conclusions do not mean that farm labor has any better local opportunities for economic use. They do imply a need for further adjustment and the concomitant opportunities. The next section attempts to measure this need.

[7]No published figures on cash rents by counties were available. In 1950, the state averaged $1.19 per acre for all land rented on cash rent basis, including lands rented for less than a full year and large amounts of range lands for extensive cattle or sheep grazing. To estimate the cash value of share-renting schemes is almost impossible due to the unknown output distribution and yield from the rented land. Unpublished survey estimates of 1956 cash rents in Adair and Sequoyah counties in the files of the USDA—FERD at Oklahoma State University showed a range of from $0.30 to $5.00 per acre year, depending on the location and use of the rented land.

[8]Land and buildings compose 72 percent of the total value of the area's fixed assets. Federal Land Bank new loans were at 5 percent for a typical 33 years. Production Credit Association loans for livestock were typically renewed for three years at 7 percent. Machinery loans from all sources averaged around 10 percent for three years. These loans would average 15.3 cents on the dollar for the area's mixture of fixed assets. Many of these assets are fully owned by farmers and have a low salvage value.

## UNDEREMPLOYMENT OF FARM LABOR

Using the estimated production function, an estimate of the actual amount of labor underemployment is now attempted. Adjustment needs for other farm resources in relation to farm labor will also be presented.

### Model

In order to measure the amount of labor underemployment in Eastern Oklahoma's farming, several assumptions must be made relative to target income, farm land, farm capital, and farm output.

**Target Income.** A target of $2,000 farm income per farm worker is arbitarily selected for the study area which, in 1950, averaged $830 per worker. The figure compares with $1,957 for the nation in 1950 and with $2,205 for the rest of Oklahoma outside our 24-county area. Farm income, as measured herein, is the monetary value of farm output reduced by current expenses (at no interest) and thus comprises the total returns to farm labor, farm operator management, and farm asset ownership. It is therefore the estimate of economic welfare in farming. Current expenses include livestock purchase costs, which are assumed to vary in constant proportions with other current costs.

**Farm Land.** Farm land in each county is assumed fixed. This implies no transfers of land outside of agriculture and no increase in the use of county land for farming. Reorganization of existing land into more economic units is possible.

**Farm Capital.** Although allowed to vary jointly, current expenses and fixed assets were held in the proportions found in each county.[9] These proportions do not vary greatly between counties.

More refined assumptions allowing both inputs to change until their marginal value products were close to local prices would involve excessive computation and perhaps also represent a less realistic process of adjustment in an area where capital rationing may well be severe.

**Farm Output.** The estimated county levels of farm output will be held constant. Substitution of capital for labor will then proceed along iso-product contour. The constant dollar value of farm output in the area has actually declined by 34 percent since 1910. With a majority of the farm output complex in surplus, the assumption seems realistic. Allowing the output to change could involve output price changes and government program restrictions.

### Method

The method of estimating the new levels of farm labor and capital implied by the model is arithmetical but tedious. The following alge-

[9]With the Cobb-Douglas function, this assumption also fixes the marginal rates of substitution between fixed and variable capital.

braic statement of the model was solved using logarithms and iteration. The solution applies to the levels of resource use in any county.

$$\hat{Y} = AX_1^{b1} X_3^{b3 + b4},$$

$$2000\ X_1 = Y - BX_3 - LP \text{ and}$$

$$X_4 = CX_3$$

where $A = 0.600\ X^{b2}\ C^{b4}$,

$B = (LP + X_3) \div X_3$,

$C = X_4 \div X_3$ in the proportions used originally, and

$LP =$ cost of livestock purchased.

This system can be reduced to a single quadratic equation of the form,

$$B^{-1} (\hat{Y} - 2000\ X_1)\ X_1^{d} = E,$$

where $d = b_1 \div (b_3 + b_4)$ and

$$E = \left[\frac{\hat{Y}}{A}\right]^{\frac{1}{b_3 + b_4}}$$

The iteration was found to converge rapidly since the exponent d is quite small. Accuracy up to five digits was imposed and the results checked back in the functional estimate. Real solutions existed in all the equations solved.

## Results

Table 2 contains the results of this method under column headings of "Target." The work involved precluded the calculation of more than three sets of results. However, these adequately cover the range.

Reasonableness can be claimed for the results. New average factor proportions all lie within the range of feasibility. Nevertheless, a target average of 286 acres per worker would involve considerable adjustment in farm sizes for Eastern Oklahoma. Farm size would need to increase at least to 286 acres per farm, and up to 376 acres per farm if the present average of 1.3 workers per farm were maintained. Whether these target sizes are possible may be judged from 1950 data for those farms in the area whose yearly output was valued at $2,500 or more. One-third of these farms were at least 260 acres in size. The adjustment process analysed here assumes that the land no longer used by farmers who change their occupation is sold or rented to the farmers who remain. The target sizes of farms are feasible only to this extent. However, those farm workers who decided to change their occupation in order to increase their incomes could maintain their acreages as a part-time farm, as many have already done.

As for the target amounts of capital managed per farmer, it is clear that the increases are large. On the average, current expenses would need to increase from $348 to $868 per worker and fixed assets from

**Table 2.—1950 Input-Output Levels and Estimated Functional Constants for Marshall, Delaware, and the 24-County Geometric Mean with Required Input Levels for a Target of $2,000 of Farm Income per Worker.**

| Item | Marshall County | | Geometric Mean | | Delaware County | |
|---|---|---|---|---|---|---|
| | Present | Target a | Present | Target a | Present | Target a |
| Levels of Output and Factors | | | | | | |
| Output Value ($000) | 3,151 | 3,151* | 3,511 | 3,511* | 3,557 | 3,557* |
| Labor (Number) | 1,122 | 737 | 2,539 | 1,060 | 3,138 | 736 |
| Land ('000 acres) | 202 | 202* | 303 | 303* | 275 | 275* |
| Current Expenses ($000) | 848 | 865 | 884 | 920 | 1,309 | 1,399 |
| Fixed Assets ($000) | 10,451 | 10,656 | 13,006 | 13,543 | 16,564 | 17,714 |
| Average Factor Proportions | | | | | | |
| Land: Labor (acres per man) | 180 | 274 | 119 | 286 | 88 | 373 |
| Current Expenses: Labor ($ per man) | 756 | 1,174 | 348 | 868 | 417 | 1,902 |
| Fixed Assets: Labor ($ per man) | 9,314 | 14,464 | 5,123 | 12,772 | 5,278 | 24,074 |
| Current Expenses: Land ($ per acre) | 4 | 4 | 3 | 3 | 5 | 5 |
| Fixed Assets: Land ($ per acre) | 52 | 53 | 43 | 45 | 60 | 64 |
| Fixed Assets: Current Expenses | 12 | 12* | 15 | 15* | 13 | 13* |
| Marginal Value Products | | | | | | |
| Labor ($ per man) | 81.14 | 123.57 | 46 81 | 112.06 | 46.26 | 197.28 |
| Land ($ per acre) | 4.45 | 4 45* | 3.87 | 3.87* | 5.21 | 5.21* |
| Current Expenses | 1.03 | 1.01 | 1.29 | 1.24 | 1.06 | 0.99 |
| Fixed Assets | 0.10 | 0.10 | 0.11 | 0.11 | 0.11 | 0.10 |
| Marginal Substitution Rates b | | | | | | |
| Land: Labor (acres per man) | 18 | 27 | 12 | 29 | 9 | 38 |
| Current Expenses: Labor ($ per man) | 79 | 122 | 36 | 91 | 43 | 198 |
| Fixed Assets: Labor ($ per man) | 775 | 1,204 | 426 | 1,063 | 439 | 2,003 |
| Current Expenses: Land ($ per acre) | 4 | 4 | 3 | 3 | 5 | 5 |
| Fixed Assets: Land ($ per acre) | 42 | 43 | 35 | 37 | 49 | 53 |
| Fixed Assets: Current Expenses | 10 | 10* | 12 | 12* | 10 | 10* |
| Farm Income per Worker ($ per man) | 1,341 | 2,000 | 857 | 2,000 | 512 | 2,000 |

*Assumed identical to the present level by assumption or implication.
a $(Y - X_3 - \text{Livestock Purchased}) \div X_1 = 2{,}000$, assuming $\hat{Y}$, $X_2$, $X_4/X_3$ fixed at county levels.
b Negative sign omitted.

$5,123 to $12,772 per worker. In Delaware county, due to the large decrease in farm labor required, fixed assets per worker would have to increase five-fold to $24,074. But this amount of capitalization is not unknown in the area. In Census Economic Area 8b, wherein Delaware county is located, the value of land and buildings alone averaged over $10,000 per farm producing $2,500 worth of output in 1950. To say it is feasible for a farm family to manage assets totaling $25,000 does not lessen the difficulty of making so large an adjustment. That so large an adjustment is required is a major conclusion of this report.

Only for labor is the marginal value productivity radically changed. At the geometric mean, labor would add $112 per man year at the margin to the value of the areas' farm output. This level is still a long way from being in equilibrium with the wage rate of unskilled labor in places where jobs are available. In fact, at 250 man days of 8 hours, the implied wage rate for farm labor would increase from 2 to 6 cents an hour. Farm income per worker, which includes returns to management, land and capital, all of which are assumed fully owned by farmers, would increase from 43 cents to $1.00 per hour on the same basis.

## Analysis

The results can best be analyzed with reference to Table 3. Adjustment needs in the farm economy of Eastern Oklahoma in 1950 are demonstrated. Remembering that the target income is by no means excessive and that the estimating process yielded results that were not in conflict with the factual situation, it is clear that a truly immense adjustment is required in the farm population of the area.

Requisite adjustments in capital appear small; in the order of only 4 percent increases. But the farm labor force is underemployed to the extent of 58 percent. Some 38,000 farm workers, who presently support a farm population of 125,000 people, would need to find employment outside of farming in order to reach the adjustment target for the area. With no other population loss from these counties, the total population would decline by 21 percent. That this is feasible is demon-

**Table 3.—Levels of Major Farm Inputs and Population in Eastern Oklahoma Required for a Target Farm Income of $2,000 per Worker with Comparisons.**

| Item | Present Level | Target Level [a] | Absolute Change | Percentage Change |
|---|---|---|---|---|
| | | | | percent |
| Income per Worker ($ per man) | 830 | 2,000 | 1,170 | 141.0 |
| Farm Labor Force (numbers) | 64,741 | 27,042 | 37,699 | — 58.2 |
| Current Expenses ($000) | 33,806 | 33,793 | 13 | 4.0 |
| Fixed Assets ($000) | 330,155 | 330,024 | 131 | 4.0 |
| Farms [b] (number) | 49,226 | 20,561 | 28,665 | — 58.2 |
| Farm Population [b] (numbers) | 214,228 | 89,483 | 124,745 | — 58.2 |
| Total Population (numbers) | 588,225 | 463,480 | 124,745 | — 21.2 |
| 1940-50 Population [c] (numbers) | 752,991 | 588,225 | 164,766 | — 21.9 |

a See Table 2 and the text for details of assumptions for target level.
b Assuming that proportions between item and farm labor force remain constant.
c Actual 1940 population for "present" and 1950 population for "target" levels.

strated by the 1940-50 decade. Tarver estimated that the 24-county area lost nearly 32 percent of its 1940 population plus its natural increase during the decade.[10] Disregarding natural increase, the area's population declined by 22 percent in this decade.

## SUMMARY

1. Levels of resource use and resulting farm income in 1910 and 1950 were tabulated for 24 counties of Eastern Oklahoma.

2. Quite apart from underlying changes in the complex of farm output, a large scale adjustment in farm resource use has occurred in Eastern Oklahoma. The farm labor force dropped by 53 percent, farm land per worker increased by 274 percent, current expenses rose by ten-fold, and fixed assets more than trebled.

3. In spite of these adjustments, which paralleled those in the rest of Oklahoma, farm income per worker has risen only 38 percent. This rise, from an average of $600 to $830 per worker in constant dollars, was not enough to keep up with the state average. Farm income per worker in Eastern Oklahoma was running at only 48 percent of the state average in 1950.

4. An aggregate farm production function was estimated for 1950 data for Eastern Oklahoma. Factor mis-allocation was most noticeable in the case of the labor resource. The value of labor's marginal productivity was only $46 per man year, an estimate not significantly different from zero.

5. Using a target of $2,000 farm income per worker, the rate of farm labor underemployment in Eastern Oklahoma was estimated at 58 percent of the 1950 work force. With an increase of only 4 percent in total capital requirements, 38,000 farm workers would need to leave the farm labor force so that the remaining workers could achieve the target income per worker. This reduction of the farm labor force could involve some 125,000 of the farm population. With no increase in the availability of local non-farm employment, this could mean an exodus matching the area's population loss in the 1940-50 decade.

6. Although little change in total land or capital would be required to attain the target income, large adjustments in land and capital per farm would be needed. Farm sizes would have to double, and the capital managed by a farmer would have to increase almost three-fold.

[10]J. D. Tarver, *Population Change and Migration in Oklahoma,* 1940-50, Oklahoma State Experiment Station Bulletin 485, January, 1957, pp. 26-7.

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