Economic Position of Farm Families When Money Income and Net Worth Are Combined

By Thomas A. Carlin

Farm families have historically had lower money incomes and a less equal distribution of money income than nonfarm families. However, when net worth was included in a measure of economic well-being for farm families, the median level increased and inequality in the distribution decreased. The distribution of well-being of U.S. farm families in 1966 closely approximated that of all U.S. families when the broader well-being measure was used.

Key words: Farm families, income, wealth, net worth.

Historically, the level of money income of U.S. farm families has been lower and the distribution of income among them less equal than that of nonfarm families (1, 2).[1] Since the late 1950's, the composition of income has changed for farm families. In 1960, about 42 percent of the money income per farm-operator family came from off-farm sources. By 1971 the percentage had increased to 53 percent (10). About 60 percent of those persons reporting farm earnings on 1966 Federal income tax returns had an off-farm source of income that exceeded income from farming (8, p. 6).

Net worth per farm family averages almost twice that of all U.S. families (9, p. 161) because farm families save and reinvest a large proportion of their income in the farm business. Also, farm families have benefited greatly from capital gains on farm real estate. Thus, net worth should be considered along with income when discussing the economic situation of farm families.

Why are both income and net worth important when considering the economic situation of people? Because money income alone understates the true economic situation. Two individuals with low money incomes, one having substantial net worth and the other having little, would be economically dissimilar. Yet, in most income statistics, the two would be considered together. A new concept called "economic well-being," which takes account of both income and wealth, is used in this study. The purpose is to determine the effect of net worth on the level and distribution of economic well-being among farm families.

Data Source

The data used for the study are from the Pesticide and General Farm Survey conducted by the U.S.

Department of Agriculture in 1966. This survey provides the most recent readily available information on income and net worth for farm families. Although more recent data would be preferred, the data used are believed to be valid for the purpose of this study.

After the data were edited for missing information, 5,649 observations were retained for analysis. When the observations were distributed by region and economic class of farm, the weights provided in the survey did not satisfactorily represent the population of farms based on the 1964 Census of Agriculture. A weighting scheme was devised to overcome this deficiency and provide improved estimates of farm numbers. Personal distributions of income and well-being were then developed, using individual observations and the weighting scheme.

Income Measures Used

The mean and median are the measures of central tendency used in the analysis. Because income distributions are almost always skewed to the right, the median income is typically less than the arithmetic mean. A few families with large incomes pull the mean above the level of most families. Thus, more emphasis is given to the median in this study.

The Gini ratio is used as the measure of the degree of income inequality. This is the ratio of the area between the diagonal and the Lorenz curve to the total area under the diagonal A/A+B (fig. 1). As ordinarily used, the theoretical value of the Gini ratio ranges from 0 to 1. A ratio near zero means that income was nearly equally distributed among families. A value near 1 means that most of the income is received by a few families.

The index of integration measures the overlap of

Footnotes are at end of article, p. 69.

income distributions. If the distribution for farm families is superimposed on that for nonfarm families, the index of integration measures the area common to the two distributions (fig. 2) (14). The larger the index of integration, the greater the degree of overlap.

Assumptions

Each observation in the survey was assumed to represent a family farm. Approximately 96 percent of the businesses reporting farm income for tax purposes in 1966 were sole proprietors (12). Although some of the observations may not represent families, it was assumed that such exceptions would not greatly alter the results.

Money income. Money income includes that from both farm and nonfarm sources. Nonfarm income includes wages and salaries, rental income, interest, dividends, retirement pensions, social security, and other transfer payments.

Net worth. The problem of tying income and net worth together is not new in economics. Income is a flow concept while net worth is a stock. Thus, addition is not appropriate. Weisbrod and Hansen (13) have suggested a way to convert net worth into a flow which can then be added to money income to obtain a new measure of well-being. Using their model, current net worth is converted to an annuity to yield a lifetime flow. The annuity is then added to current income. Weisbrod and Hansen summarized their model as follows:

$$Y_t^* = Y_t + NW_t \cdot A_n$$

where Y_t^* is the measure of well-being in time period t, Y_t is current money income, NW_t is current net worth, $A_n = r/1-(1+r)^{-n}$ = the factor which converts \$1 to an n year annuity at a given rate of interest r, and n is the life expectancy of the family beyond time period t.[2]

The Weisbrod-Hansen model requires information about the family beyond time period t. For this study, each observation was assumed to represent a family with husband and wife present. The expected life of the family, used as the value of n, was based on the life expectancy of the wife, who was assumed to be 2 years younger than her spouse (7).

Money income reported in the Pesticides Survey reflects returns from all resources including capital. To avoid double counting, returns to equity capital were estimated and excluded from current income before applying the annuity principle.[3] A precise calculation of the contribution of capital to current income, particularly for the farm, was virtually impossible. To estimate such returns, a flat amount (\$15,000) was

deducted from net worth to cover unproductive and unmeasured resources on the farm such as a house. 4-percent return to capital was then applied "productive" net worth. This rate reflects average return to farm equity between 1960 and 1969 (4).

HYPOTHETICAL LORENZ CURVE FOR FARM FAMILIES

GINI RATIO = $\dfrac{A}{A+B}$

Figure 1

HYPOTHETICAL PERSONAL INCOME DISTRIBUTIONS, FARM AND NONFARM FAMILIES
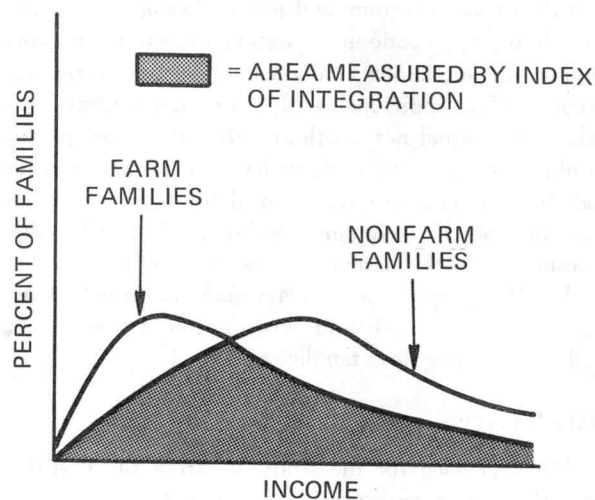
Figure 2

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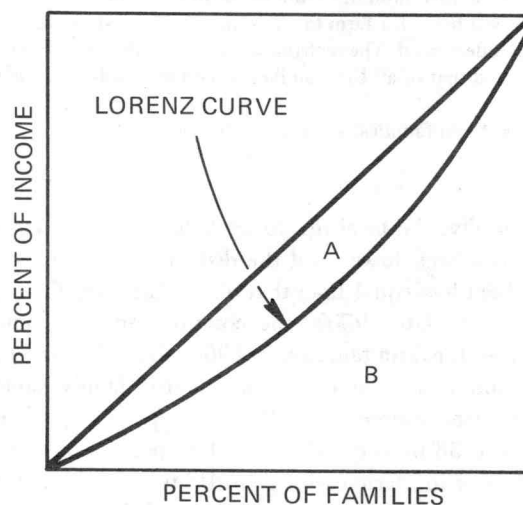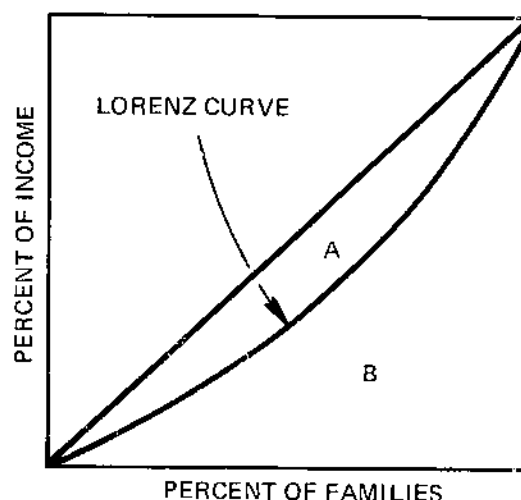$$\text{GINI RATIO} = \frac{A}{A+B}$$

Figure I

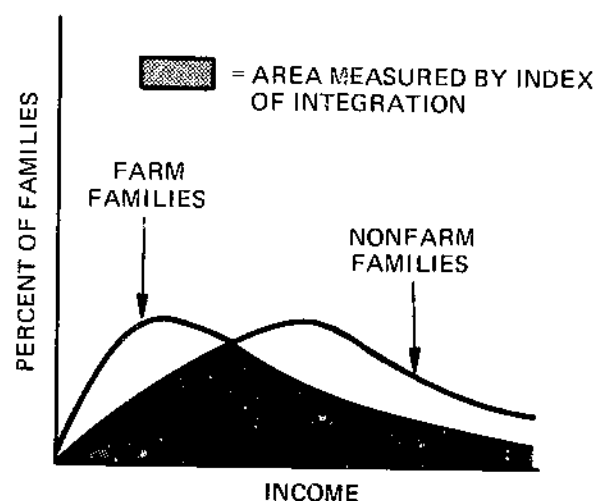### HYPOTHETICAL PERSONAL INCOME DISTRIBUTIONS, FARM AND NONFARM FAMILIES

Figure 2

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Table 1.—Distribution of farm families, by amount of money income and region, 1966[1]

Region	Number of families	Families earning—						Mean	Median	Gini ratio
		Less than $2,500	$2,500-$4,999	$5,000-$9,999	$10,000-$14,999	$15,000-$24,999	$25,000 or more			
	Thou.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Dol.	Dol.	
Northeast	227	26	17	38	15	2	2	6,700	5,900	.436
Appalachian . .	529	44	25	24	5	1	1	4,000	3,000	.469
Southeast	273	54	19	21	4	2	2[2]	3,600	2,300	.553
Delta	252	45	22	25	5	2	1	4,500	3,000	.524
Corn Belt	661	21	29	36	10	3	1	5,900	4,000	.395
Lake States . . .	343	29	32	31	7	1	2[2]	4,700	4,000	.398
Northern Plains .	271	27	32	33	6	2	2[2]	5,000	4,200	.410
Southern Plains .	293	26	23	31	11	7	2	6,900	5,200	.467
Mountain	134	24	25	35	11	3	2	6,500	5,000	.595
Pacific	166	17	24	36	15	6	2	6,800	6,100	.516
United States .	3,149	32	26	30	8	3	1	5,300	4,200	.475

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.
[2] Less than 0.5 percent.

The analysis was approached in the following way. First, distributions of money income among farm families were developed for the 10 farm production regions[4] and the United States. The stock of wealth (net worth) was converted into a flow and added to income. An annuity rate of 6 percent was used in conjunction with the 4-percent return to equity capital.[5] As a final step, money income and the annuity were combined and the distributions compared with those of all U.S. families.

Results

The distribution of money income for U.S. farm families and the 10 farm production regions serves as the benchmark for the first phase of the analysis (table 1). Based on Gini ratios, money income tends to be more unequal for farm families in the Southeast, Delta, Mountain, and Pacific regions than for all U.S. farm families. Inequality was less in the Corn Belt and Lake States.

Fifty-six percent of U.S. farm families analyzed had money incomes of less than $5,000 in 1966. Low incomes were relatively common in the Southeast, where 73 percent had money incomes of less than $5,000. Of particular interest in this study is the effect on the low-income group of incorporating net worth into a measure of well-being.

Effect of adding net worth. The average net worth of farm families analyzed in this study (table 2) was

Table 2.—Average money income, average net worth, and net worth-income ratio for farm families, by size of money income, 1966[1]

Money income size class	Average money income	Average net worth	Ratio of net worth to income
	Dollars	Dollars	
Less than $2,500	1,030	29,990	29.14
$2,500-$4,999	3,650	39,010	10.70
$5,000-$9,999	6,920	47,460	6.87
$10,000-$14,999 . . .	11,820	63,790	5.40
$15,000-$24,999 . . .	18,140	136,910	7.55
$25,000 or more	43,290	346,340	8.00
All families	5,300	46,630	8.80

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.

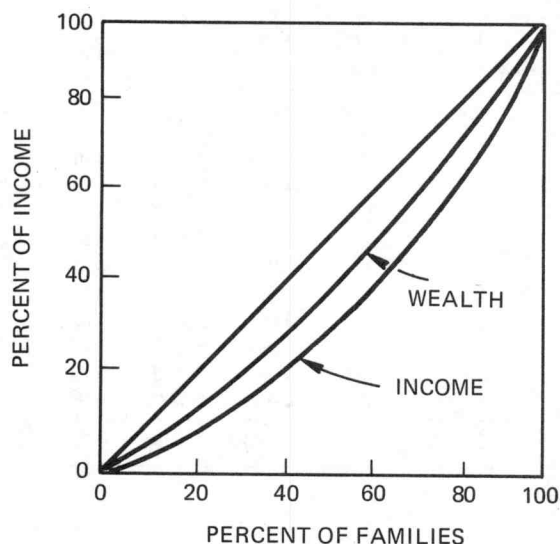## LORENZ CURVES FOR MONEY INCOME AND WEALTH FOR U.S. FARM FAMILIES, 1966

Figure 3

LORENZ CURVES FOR MONEY INCOME AND WELL-BEING FOR U.S. FARM FAMILIES, 1966
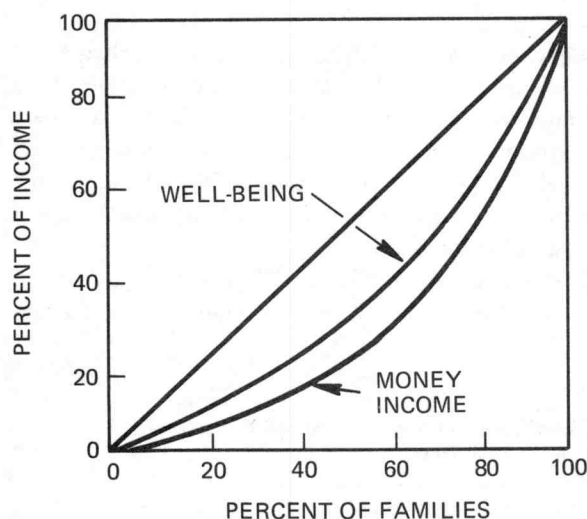

Figure 4

approximately twice that obtained by Projector and Weiss for all U.S. families (6).[6] The favorable net worths of farm families may offset their relatively low money income position. For example, one-fifth of the families received only 3 percent of total money income, yet they owned about 12 percent of total net worth of all farm families (fig. 3). Thus the economic well-being of this low-income group is better than money income comparisons alone might suggest.

When net worth was converted into a flow and added to money income, the median well-being measure for U.S. farm families increased by $1,900 (table 3 and 1 and fig. 4). The effect of net worth was substantially different among regions. In the Southeast and Delta regions, where average net worth was relatively low, the median increased about $1,400. However, the median increased $2,500 for the Southern Plains, where average net worth was the highest. Except for the Mountain regions, distribution of money income and net worth among farm families was considerably more equal than the distribution of money income. Although the Mountain region had the second highest net worth, the median increased the least—$1,300. Distribution of net worth among families in the Mountain States is probably less equal than that of families in other regions.

Slightly over 1 million farm families had money income of less than $2,500 in 1966. When net worth was added to money income, 54 percent moved to a higher well-being group (table 4). Thus, only 15 percent of the families had levels of well-being below $2,500, compared with 32 percent with money incomes at this level. Approximately 61 percent of families with money incomes of $2,500 to $4,999 moved to a higher group with the incorporation of net worth.

The results of this study appear to be opposite to those obtained by Weisbrod and Hansen for all U.S. families. Weisbrod and Hansen concluded that the distribution of well-being became less equal with the addition of net worth (13, pp. 1320-1321). The result for farm families differs because the net worth-income ratio decreased as money income increased (table 2). For all U.S. families, Weisbrod and Hansen found that the net worth-income ratio increased with the level of money income. The economic position of older farm families contributes considerably to the decreasing net worth-income ratio found in this study. Many of them have low money incomes while, at the same time, they typically have large net worths (table 5).

Comparison with all U.S. families. The analysis was repeated for farm families, using the 4-percent annuity rate. This procedure allowed direct comparison of results for the farm group with those of Weisbrod and Hansen. The distribution of well-being of farm families is almost identical to that of all U.S. families when wealth and nonmoney income are considered (table 6 and figs. 5 and 6). The index of integration, based on money income between farm and all U.S. families, was 0.76 in 1966 (11). When wealth was added, the index jumped to 0.91.

Comparison of cross-sectional findings from different years may appear questionable because underlying

Table 3.—Distribution of farm families by amount of money income and annuity, by regions, 1966[1]

(Returns to capital at 4 percent and annuity interest at 6 percent)

Region	Families earning—						Mean	Median	Gini ratio	Average net worth[2]
	Less than $2,500	$2,500-$4,999	$5,000-$9,999	$10,000-$14,999	$15,000-$24,999	$25,000 or more				
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Dol.	Dol.		Dol.
Northeast	6	22	41	21	7	3	8,800	7,800	.349	45,300
Appalachian	24	31	32	9	3	1	5,700	4,500	.414	29,600
Southeast	37	25	24	9	4	1	5,300	3,700	.499	31,700
Delta	27	28	28	11	4	2	6,300	4,400	.470	32,700
Corn Belt	6	22	47	17	6	2	8,300	7,100	.331	48,700
Lake States	11	29	45	10	4	1	6,600	5,700	.320	37,700
Northern Plains . .	10	25	42	16	6	1	7,700	6,500	.349	55,800
Southern Plains . .	7	19	40	18	11	5	10,000	7,700	.406	68,100
Mountain	12	18	37	20	10	3	11,500	6,300	.586	67,300
Pacific	6	12	48	20	10	4	9,800	8,300	.412	62,500
United States . . .	15	24	39	14	6	2	7,600	6,100	.414	46,600

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.
[2] Unpublished data from Dorwin L. Williams, Economic Research Service.

Table 4.—Distribution of U.S. farm families by money income and by combined money income and annuity, 1966[1]

Money income size class	Distribution by money income	Money income-annuity size class					
		Less than $2,500	$2,500-$4,999	$5,000-$9,999	$10,000-$14,999	$15,000-$24,999	$25,000 or more
	Thou.	Thou.	Thou.	Thou.	Thou.	Thou.	Thou.
Less than $2,500	1,001	460	448	75	12	6	
$2,500-$4,999	806		313	463	26	2	2
$5,000-$9,999	962			685	246	26	5
$10,000-$14,999 . . .	263				171	89	3
$15,000-$24,000 . . .	84					63	21
$25,000 or more	33						33
Total	3,149	460	761	1,223	455	186	64

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.

economic conditions may differ. However, there is some evidence that the distribution of net worth for the population as a whole has remained stable—at least between 1953 and 1962 (5).

Older farm families. Because of their usually low incomes and high net worths, older farm families—those whose heads were 65 or over—were analyzed separately. Money income was more unequally distributed among older farm families than for all farm families (tables 7 and 1). In 1966, 60 percent of older farm families had money incomes of less than $2,500. They accounted for 31 percent of all farm families in that income class.

Although the addition of net worth and nonmoney income reduced the degree of inequality of well-being for older families, the effect was not as great for all farm families (tables 7 and 3). However, the increase in median—$3,400—was higher and the reduction in the percentage of families in the lowest income class was greater for older farm families than those for all farm families.

Sixty-eight percent of the older farm families with money incomes of less than $2,500 moved to a higher well-being class when nonmoney income was considered (table 8). Thus, about 32 percent of the families in the under-$2,500 class remained there after net worth was added to money income.[7]

Concluding Remarks

Although the study suggests that there is little difference in total economic well-being between farm and nonfarm families, the underlying components differ between the two groups. Nonfarm families typically have higher money incomes than farm families but lower net worths. Considerable public money is channeled into the

Table 5.—Average income, average net worth, and net worth-income ratio for farm families, by age of family head, 1966[1]

Age of family head	Number of families	Average total income	Average net worth	Ratio of net worth to income
	Thousands	Dollars	Dollars	
Less than 35 years . . .	335	5,960	31,500	5.28
35-54 years	1,493	6,300	48,280	7.67
55-64 years	807	4,510	46,930	10.40
65 years and over . . .	514	3,210	51,250	15.98
All families	3,149	5,300	46,630	8.80

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.

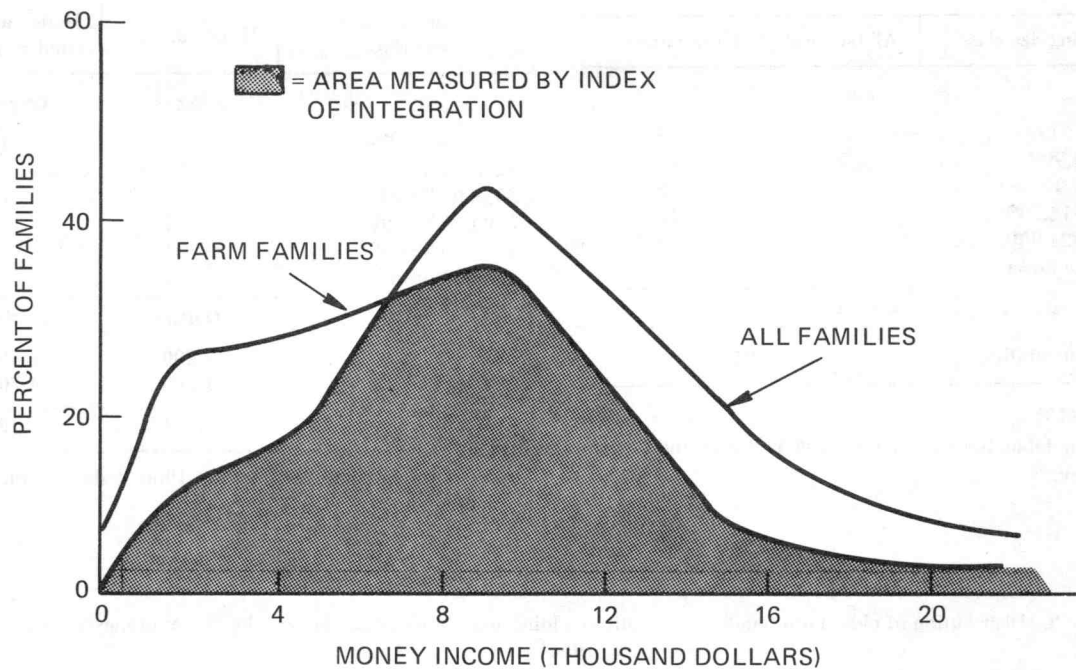# DISTRIBUTION OF MONEY INCOME OF ALL U.S. FAMILIES AND FARM FAMILIES

Figure 5

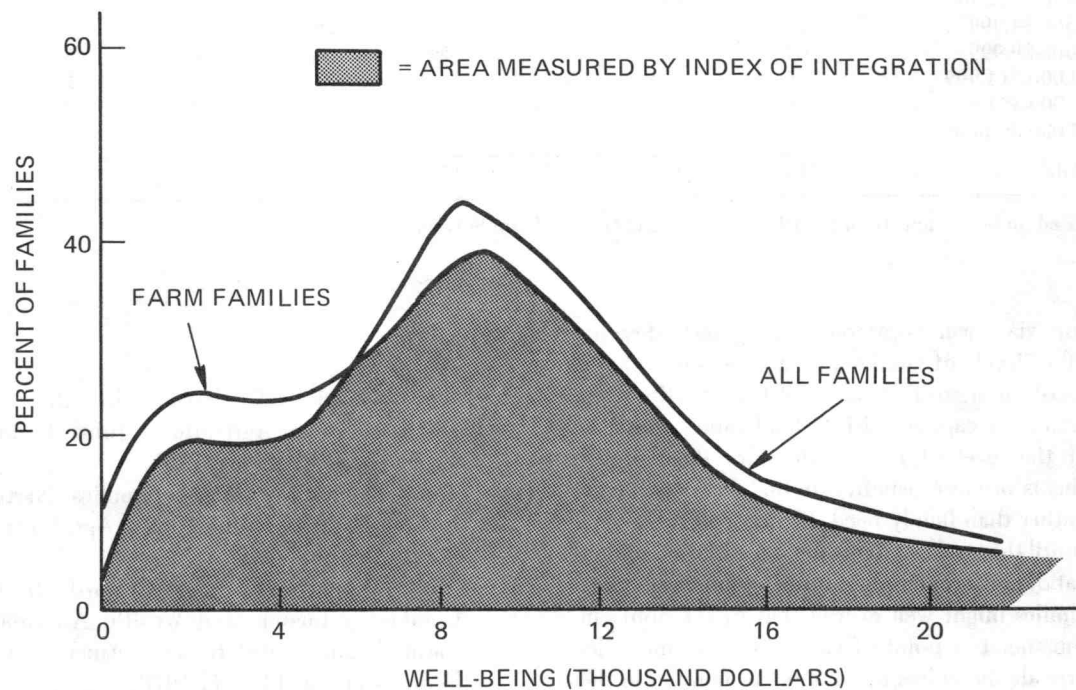# DISTRIBUTION OF WELL-BEING OF ALL U.S. FAMILIES AND FARM FAMILIES

Figure 6

Table 6.—Distribution of well-being for all families in 1962, reported by Weisbrod and Hansen, and for farm families in 1966, 4-percent annuity

Well-being size class	All families[1]	Farm families[2]
	Percent	Percent
Less than $3,000	18	23
$3,000-$4,999	17	21
$5,000-$9,999	42	38
$10,000-$14,999	15	13
$15,000-$24,999	6	4
$25,000 and over	2	1
Gini ratio	.42	.41
Index of integration ..	.91	

[1] Source: (13).
[2] Based on tabulations from the 1966 Pesticide and General Farm Survey.

Table 7.—Distribution of older U.S. farm families by alternative concepts of economic well-being, 1966[1]

Money income size class	Money income	Money income and annuity
	Percent	Percent
Less than $2,500	60	19
$2,500-$4,999	25	35
$5,000-$9,999	12	29
$10,000-$14,999 ...	1	9
$15,000-$24,999 ...	1	5
$25,000 or more	1	3
	Dollars	Dollars
Mean	3,200	7,400
Median	1,600	4,700
Gini ratio	.511	.494

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.

Table 8.—Distribution of older farm families as a result of adding annuity to money income, by size of money income, 1966[1]

Money income size class	Distribution by money income	Income-annuity size class					
		Less than $2,500	$2,500-$4,999	$5,000-$9,999	$10,000-$14,999	$15,000-$24,999	$25,000 or more
	Thou.	Thou.	Thou.	Thou.	Thou.	Thou.	Thou.
Less than $2,500	308	99	156	41	7	5	
$2,500-$4,999	126		22	85	16	2	1
$5,000-$9,999	64			24	25	10	5
$10,000-$14,999 ...	6					5	1
$15,000-$24,999 ...	6					4	2
$25,000 or more	4						4
Total	514	99	178	150	48	26	13

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.

farm sector via farm commodity programs, directly affecting the level of well-being as measured here. Economists often argue that many of the benefits from farm programs get capitalized into land values and thus may affect the level of net worth more than money income. This is because benefits are tied directly to land resources rather than family need. If these programs were expanded until the level of money income of farm families equaled that of nonfarm families, the economic well-being of farm families might well exceed that of the nonfarm group. From society's point of view, it may be more desirable to provide direct income support to families in the farm sector than to further enhance the level of net worth.

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Appendix

Three annuity rates were used in conjunction with a 4-percent return to equity to test the sensitivity of the system. The first combination assumed that the annuity rate and the return to equity were both 4 percent. The second combination assumed a slightly better rate of return on the annuity than could be obtained on equity—6 percent. The last case assumed that the annuity interest rate was 10 percent, greatly exceeding the return to equity.

The annuity rate used had little effect on the equality of the distribution of economic well-being (table A-1). The Gini ratio was reduced from 0.475 to

Table A-1.—Distribution of farm families by amount of money income plus annuity at alternative annuity rates, U.S. farm families, 1966[1]

Money income size class	Distribution by money income	Money income plus—		
		4-percent annuity	6-percent annuity	10-percent annuity
	Percent	*Percent*	*Percent*	*Percent*
Less than $2,500 .	32	17	15	11
$2,500-$4,999 ..	26	26	24	20
$5,000-$9,999 ..	30	39	39	38
$10,000-$14,999 .	8	13	14	18
$15,000-$24,999 .	3	4	6	9
$25,000 or more .	1	1	2	4
	Dollars	*Dollars*	*Dollars*	*Dollars*
Mean	5,300	6,900	7,600	9,200
Median	4,200	5,700	6,100	7,200
Gini ratio	.475	.411	.414	.415

[1] Based on tabulations from the 1966 Pesticide and General Farm Survey.

0.411 with the inclusion of net worth, assuming a 4-percent annuity. However, when the annuity rate was increased to 6 and 10 percent, the Gini ratio changed only slightly. Without a valid statistical test of significance for differences in the Gini ratio, the variations noted above cannot be evaluated as meaningful.

The annuity rate greatly affected the mean and median levels of economic well-being—a result which was not surprising. The higher the annuity rate, the higher the payment. The median increased $1,500 with a 4-percent annuity and $3,000 with a 10-percent annuity above that of money income alone. Although the percentage of families with incomes between $2,500 and $9,999 changed only slightly as the annuity rate increased, the percentage with incomes of less than $2,500 substantially decreased. Also, the percentage of families with incomes of $10,000 or more greatly increased as the annuity rate increased.

Footnotes

[1] Italic numbers in parentheses refer to items in References, page 68.

[2] The annuity formula gives more weight to net worth as the age of the family head increases. An older individual can enjoy a higher level of consumption from a given net worth over his remaining lifetime than a younger individual.

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[3]The annuity principle allows for both an interest return and the consumption of the principle over the lifetime of the individual. It is the interest return during the first year of the annuity that we wish to avoid double counting. The return to capital is merely subtracted out and then added back in as interest.

[4]Farm production regions: Northeast—Maine, N.H., Vt., Mass., R.I., Conn., N.Y., N.J., Pa., Del., Md.; Appalachian—Va., W. Va., N.C., Ky., Tenn.; Southeast—S.C., Ga., Fla., Ala.; Delta—Miss., Ark., La.; Corn Belt—Ohio, Ind., Ill., Iowa., Mo.; Lake States—Mich., Wis., Minn.; Northern Plains—N. Dak., S. Dak., Nebr., Kans.; Southern Plains—Okla., Tex,; Mountain—Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.; Pacific—Wash., Oreg., Calif.

[5]The results were expected to be sensitive to both the rate of return to capital and the interest rate used in calculating the annuity. Three combinations of these were used to test the sensitivity of the system. The results are presented in the appendix.

[6]Projector and Weiss estimated the average net worth of all U.S. families and unrelated individuals in 1962 at $20,980. For comparison, an index of proprietor's equities in agriculture was developed and used to deflate the net worth of farm families in 1966 to 1962 levels. The resulting figure for all U.S. farm families was $40,110.

[7]Several alternatives are available to older farm families for liquidating their real estate assets for use as retirement income. However, many older low-income farm people own real estate which they cannot sell without losing their home and a major source of income. A program has been suggested which would allow older farm people to consume their equity over time while still retaining the other benefits of property (3).