CHANGES IN U.S. AGRICULTURE DURING THE 1970s AND EARLY 1980s:
AN EXAMINATION BASED ON CONSTANT DOLLAR SALES CATEGORIES

by

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ABSTRACT

Changes since 1970 in the distribution of selected farm character-
istics among USDA's farm sales categories were examined. Unlike most
previous examinations, the categories were adjusted for inflation in
prices received by farmers. Among the findings: proportion of medium
size farms increased, ratio of gross farm income to expenses stayed
constant at approximately 145 percent for farms with sales over
$500,000, and medium and large farms became significantly more dependent
on nonfarm income. The latter is postulated to result from a nonfarm
income treadmill which could leave few farmers who rely on farming for
most of their income.

Key Words: deflated farm sales, farm size, concentration,
           nonfarm income.

Changes in U.S. Agriculture During the 1970s and Early 1980s:
An Examination Based on Constant Dollar Sales Categories

Changes in the structure and other characteristics of U.S.
agriculture have received considerable attention over the past five to
ten years. Historical trends have been investigated (for example,
Peterson, Schertz, Stanton, Tweeten et al., U.S. Department of Agri-
culture 1979, van Blokland March 1984). Causes and implications of
these trends for agriculture and agricultural policy have been debated
(for example, Bullock, Lee, Lin, et al., O'Rourke, Tweeten). Also, the
need for a new definition of farm has been discussed (for example,
Strickland, van Blokland February 1984).

Most of these investigations have based part of their discussion on
the U.S. Department of Agriculture's (USDA's) data which classifies
farms by dollar value of farm sales. However, USDA's sales categories
have generally remained constant over time except for the addition of
sales categories at the upper end of the sales distribution. For
example, data for the $200,000 - $499,999 sales category begin only with
1969 (U.S. Department of Agriculture September 1984). Consequently,
inflation (deflation) in prices received by farmers may move a farm into
a higher (lower) sales category even though its physical structure of
production or input-output ratio has not changed. Therefore, use of
USDA's data classified by farm sales may suggest a change which more
nearly reflects change resulting from inflation rather than change
resulting from technology, growth in physical firm size, economies of
size, and other such "real" factors.

Despite the inflation in prices received by farmers since 1970, few studies of change in U.S. agriculture have attempted to correct for the effect of inflation upon the distribution of farm characteristics among farm sales categories. Three exceptions are the studies of Lin et al., Peterson, and Schertz. Each investigated the distribution of farm numbers among sales categories, and each found that inflation accounted for much of the change in the distribution of farm numbers among USDA's farm sales categories.

This study extends the analysis of these three studies. In particular, it examines changes, not only in the distribution of farm numbers, but also in the distributions of gross farm income, farm expenses, and net farm income among price adjusted farm sales categories, as well as changes in the ratio of farm to total farm family income for each price adjusted category. Compared with the data reported by USDA, a less dramatic more progressive pattern of change emerges in U.S. agriculture. Notably, during the 1970s and early 1980s the proportion of farms classified as middle size (sales of $40,000-99,999 in 1983 dollars) increased. Also, growth in the relative importance of nonfarm income for medium and large farms (sales of $40,000-499,999 in 1983 dollars) emerged as an important change.

Procedure

To account for the effect of changes in prices received by U.S. farmers upon farm sales, the end points of the sales categories used by USDA were adjusted for each year to a 1983 base year period using USDA's index of annual prices (U.S. Department of Agriculture June 1981, June

1984, and September 1984). Nineteen eighty-three was chosen as the base year because it is the latest year for which USDA has reported data by farm sales. Once the USDA sales categories were adjusted to 1983 dollars, data for the characteristics being investigated were prorated among the following categories: less than $10,000, $10-19,999, $20-39,999, $40-99,999, $100-199,999, $200-499,999, and $500,000 plus; the end points of these categories are in 1983 dollars.

To prorate the data among the categories used in this report, it was assumed that the characteristic being investigated was uniformly distributed within each USDA sales category and, therefore, uniformly distributed with the equivalent categories expressed in 1983 dollars. The proration was then made accordingly. To illustrate the method, data for 1975 was reported by USDA for a $40,000-99,999 category. Since the annual index of prices received by farmers increased by 32.7 percent between 1975 and 1983, $40,000 of farm sales during 1975 was equivalent to $53,080 of farm sales in 1983. Likewise, $99,999 of farm sales during 1975 was equivalent to $132,699 of farm sales in 1983 prices. Assuming a uniform distribution of the characteristic (for example, gross farm income) within the $40,000-99,999 ($53,080-132,699) category, 41 percent [(132,999 - 100,000)/(132,699 - 53,080)] of gross farm income reported by farms with sales between $40,000 and $99,999 during 1975 fell within the $100,000-$199,999 category expressed in 1983 dollars. The remainder, 59 percent, fell within the 1983 dollar category of $40,000-$99,999.

Because number of farms and nonfarm income are skewed toward the smallest farm sales categories and gross farm income, farm expenses, and net farm income are skewed toward the largest farm sales categories, more complex methods which could take into account the skewness were also used to prorate the data. Methods tried included a polynomial function with variables expressed in natural logarithms (Lin et al.). The prorations generated by the different methods were similar, and the same general changes in the distribution of the characteristics were found. Therefore, only the results generated by the proration based on the uniform distribution are presented.

The categories used to present data in this study are the same ones used by USDA. Of course, when used by USDA the categories are constant over time in terms of current dollars whereas in this study the categories are constant in terms of 1983 dollars. Another difference is that USDA subdivides the less-than-$10,000 category into less-than-$2,500, $2,500-4,999, and $5,000-9,999 categories. These three categories were treated as one in this study because trends for the characteristics investigated did not differ significantly among them.

The period of analysis was restricted to post 1968. This restriction was necessitated by a change, beginning with the 1969 data, in the method used by USDA to distribute farm expenses and, therefore, net farm income among sales categories. The method used for data predating 1969 yield substantially different results than the method used for 1969 and later data (U.S. Department of Agriculture September 1981 and September

1984). While restricted, the period investigated does cover the period during which changes in the structure and other characteristics of U.S. agriculture emerged as topics of national debate.
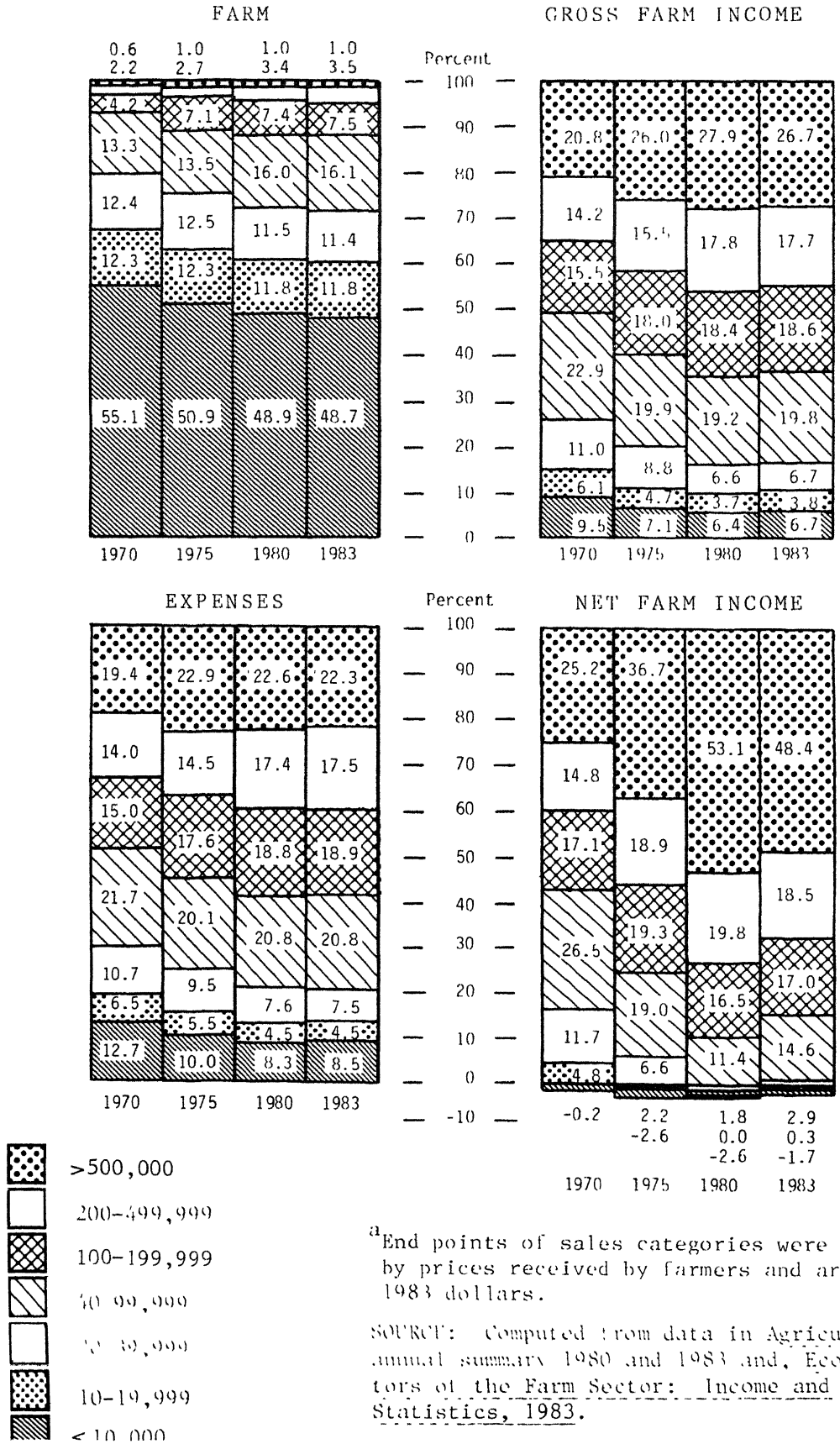
In this article, data is presented only for 1970, 1975, 1980, and 1983 to allow a compact diagramatical presentation. Data for other or all years could have been presented, but the results would not differ.

Number of Farms

Between 1970 and 1983 the proportion of farms which sold less than $10,000 of farm products in 1983 dollars declined 6.4 percentage points (Figure 1).[1] The proportion of farms in the constant 1983 dollar categories of $10,000-19,999 and $20,000-39,999 also declined, but the declines were smaller both absolutely and relatively. On the other hand, the share of farms in all sales categories over $40,000 increased, with the largest gains in terms of percentage points occurring in the $40,000-99,999 and $100,000-199,999 categories. Thus, as expected, the distribution of U.S. farms shifted toward larger farms. While the percentage change in the proportion of farms over $100,000 in sales was large, the shift toward larger farms can be characterized as progressive but not dramatic. This conclusion is similar to that reached by Lin et al., Peterson, and Schertz for the U.S. and Ehrensaft et al. for Canada.

Further examination of the number-of-farm data in Figure 1 reveals the development of a bimodal distribution on farm size during the 1970s. Note, the bimodal distribution is not the small-large farm combination usually put forth (for example, Lee and Lin et al.). Instead, it is a very small-medium size combination, where very small is defined as sales

Figure 1. Distribution of Selected Farm Characteristics by Constant Dollar Farm Sales Categories, U.S., 1970, 1975, 1980, and 1983.[a]

FARM

GROSS FARM INCOME

| 0.6 | 1.0 | 1.0 | 1.0 |
| 2.2 | 2.7 | 3.4 | 3.5 |

Percent

— 100 —

— 90 —

— 80 —

— 70 —

— 60 —

— 50 —

— 40 —

— 30 —

— 20 —

— 10 —

— 0 —

FARM column (1970, 1975, 1980, 1983):

4.2, 7.1, 7.4, 7.5
13.3, 13.5, 16.0, 16.1
12.4, 12.5, 11.5, 11.4
12.3, 12.3, 11.8, 11.8
55.1, 50.9, 48.9, 48.7

1970   1975   1980   1983

GROSS FARM INCOME column (1970, 1975, 1980, 1983):

20.8, 26.0, 27.9, 26.7
14.2, 15.5, 17.8, 17.7
15.5, —, —, —
—, 18.0, 18.4, 18.6
22.9, 19.9, 19.2, 19.8
11.0, 8.8, 6.6, 6.7
6.1, 4.7, 3.7, 3.8
9.5, 7.1, 6.4, 6.7

1970   1975   1980   1983

EXPENSES

Percent

— 100 —

— 90 —

— 80 —

— 70 —

— 60 —

— 50 —

— 40 —

— 30 —

— 20 —

— 10 —

— 0 —

— -10 —

EXPENSES column (1970, 1975, 1980, 1983):

19.4, 22.9, 22.6, 22.3
14.0, 14.5, 17.4, 17.5
15.0, 17.6, 18.8, 18.9
21.7, 20.1, 20.8, 20.8
10.7, 9.5, 7.6, 7.5
6.5, 5.5, 4.5, 4.5
12.7, 10.0, 8.3, 8.5

1970   1975   1980   1983

NET FARM INCOME

NET FARM INCOME column (1970, 1975, 1980, 1983):

25.2, 36.7, 53.1, 48.4
14.8, —, —, —
17.1, 18.9, —, 18.5
26.5, 19.3, 19.8, 17.0
—, 19.0, 16.5, 14.6
11.7, 6.6, 11.4, —
4.8, —, —, —

-0.2	2.2	1.8	2.9
	-2.6	0.0	0.3
		-2.6	-1.7

1970   1975   1980   1983

Legend:
- >500,000
- 200-499,999
- 100-199,999
- 50-99,000
- 20-49,999
- 10-19,999
- <10,000

[a] End points of sales categories were deflated by prices received by farmers and are in 1983 dollars.

of less than $10,000 in 1983 dollars and medium is defined as sales of $40,000 to $99,999 in 1983 dollars. The bimodal distribution developed in part because of the growth in the proportion of medium size farm. Thus, during the 1970s and early 1980s middle size farms have not disappeared relative to other farms.

Gross Farm Income, Farm Expenses, and Net Farm Income

Similar to the distribution of farm numbers, the distributions of gross farm income and farm expenses also shifted toward the largest sales categories. Again, the change was progressive; not dramatic. One difference was that the proportion of gross farm income and expenses accounted for by medium size farms declined. Thus, while the proportion of farms which were medium size increased, their relative importance in terms of farm production declined.

In contrast to the distributions of farm numbers, gross farm income, and farm expenses, the distribution of net farm income (before inventory adjustment) became much more concentrated in a single farm sales category. Specifically, the share accounted for by farms having sales of $500,000 or more in 1983 dollars approximately doubled to around 50 percent of net farm income between 1970 and the early 1980s. Conversely, the proportion earned by farms with sales less than $100,000 in 1983 dollars decreased from 43 to 16 percent between 1970 and 1983.

One reason for the increase in concentration of net farm income was the increase in proportion of farms with sales which exceeded $500,000 in 1983 dollars. Another is illustrated by the data presented in Table 1: the ratio of gross farm income to farm expenses by farm sales

Table 1: Gross Farm Income Before Inventory Adjustments as a Percent of Farm Expenses by Constant Dollar Farm Sales Categories, U.S., 1970, 1975, 1980, and 1983.

	Farm Sales[a]							All Farms
	Less Than $10,000	$10,000- 19,999	$20,000- 39,999	$40,000- 99,999	$100,000- 199,999	$200,000- 499,999	$500,000+	
	--- Percent ---							
1970	95	124	136	140	137	134	142	132
1975	92	112	120	128	133	139	147	130
1980	93	100	105	111	118	124	149	121
1983	96	101	108	114	118	122	145	121

[a]Gross sales were deflated by prices received by farmers and are in 1983 dollars.

Source: Economic Indicators of the Farm Sector: Income and Balance Sheet Statistics, 1983.

categories expressed in 1983 dollars. The ratio represents the relative amount available for unpaid operator and family labor, management, and equity capital. In 1970, this proxy for profit margin was approximately the same for all farm sales categories in excess of $20,000 in 1983 dollars, 132 to 142 percent. Even for the sales category of $10,000-19,999 in 1983 dollars the ratio of gross farm income to farm expenses was 124 percent. By the early 1980s, substantial declines had occurred in the ratio for all categories except $500,000 plus. Everything else constant, this phenomenon translates into an increasing share of net farm income for farms with sales in excess of $500,000 in 1983 dollars.

A reason for the continuing high ratio of gross farm income to farm expenses for the largest farms is suggested by the data in Figure 1 —cost containment. Between 1970 and 1983, the share of farm expenses paid by farms with sales over $500,000 in 1983 dollars increased by 2.9 percentage points. In contrast, their share of gross farm income increased 5.9 percentage points. For no other category with $40,000 or more in sales did the share of expenses increase (decrease) less (more) than the share of gross farm income.

One explanation for the cost effectiveness of the largest farms may be economies of size in purchasing inputs (Farris and Armstrong, Krause and Kyle, Tew et al.). Associated with this explanation is the possibility that these farms may be large enough to possess oligopsony market power especially in their local input markets. This power may not be

explicitly used by the largest farmers but may be implicitly acknow-
ledged by input suppliers who recognize the size and importance of their
purchases and accordingly pass along higher input discounts. To
understand the on-going change in U.S. agriculture, research is needed
to verify if these two and/or other factor(s) explain the continuing
high returns for farms with sales exceeding $500,000. Should the
research find that market power exists, then one of the basic economic
tenets underpinning farm price support programs, pure competition
(Houthakker), would be violated for the largest farms.

Lastly, the high ratio of gross farm income to expenses for farms
with over $500,000 in sales suggests that statements such as farms with
a debt-to-asset ratio of 40 percent or more are experiencing financial
stress may be somewhat misleading (Melichar, p. 9). Large farms, which
are more likely to have high debt-to-asset ratios (Melichar, p. 9),
would also appear to be more likely to finance high debt loads without
much financial stress.

Nonfarm Income

For the farm sector in 1970, non-farm income was 55 percent of
total farm operator family income before farm inventory adjustments
(U.S. Department of Agriculture September 1984). Reflecting the export
boom, this proportion decreased to 44 percent in 1973. It then resumed
its pre-1970 increase, reaching 52 percent in 1975, 58 percent in 1980,
and 60 percent in 1983. Thus, the relative importance of nonfarm income
increased only moderately between 1970 and 1983.

When individual sales categories are examined, however, a different picture emerges (Figure 2). Share of farm operator family income accounted for by nonfarm income changed little between 1975 and 1983 for farms with sales under $10,000 or more than $500,000 in 1983 dollars. On the other hand, by the early 1980s nonfarm income had on average become the only source of income for farms with $10,000-19,999 in sales, the dominant source for farms with sales of $20,000-39,999, the majority source for farms with sales of $40,000-99,999, about 30 percent of farm family income for farms with sales of $100,000-199,999, and approximately 20 percent of farm family income for farms with sales of $200,000-499,999. Thus, during the 1970s and early 1980s nonfarm income became a significant source of income for medium and large farms as well as for very small and small farms.

The growing importance of nonfarm income for ever larger farmers begs the need for an explanation of this increasing dependence. Schultz and Houthakker have shown that economic growth and its associated technological change, working through Engel's Law, will cause income per hour of labor input in the farm sector to decline relative to income per hour of labor input in the nonfarm sector. The result is a recurring farm income problem. Off-farm employment can increase the survivability of a farm during periods of farm financial stress (Barlett, Gladwin and Zabawa, Kada, and Salent). Thus, in response to a farm income problem, individual farmers may either become larger, find off-farm work (more broadly, nonfarm income), or exit farming (Gladwin and Zabawa).

Figure 2: Percent of Total Farm Family Income Earned as Nonfarm Income by Constant Dollar Farm Sales Categories, U.S., 1970, 1975, 1980, and 1983.
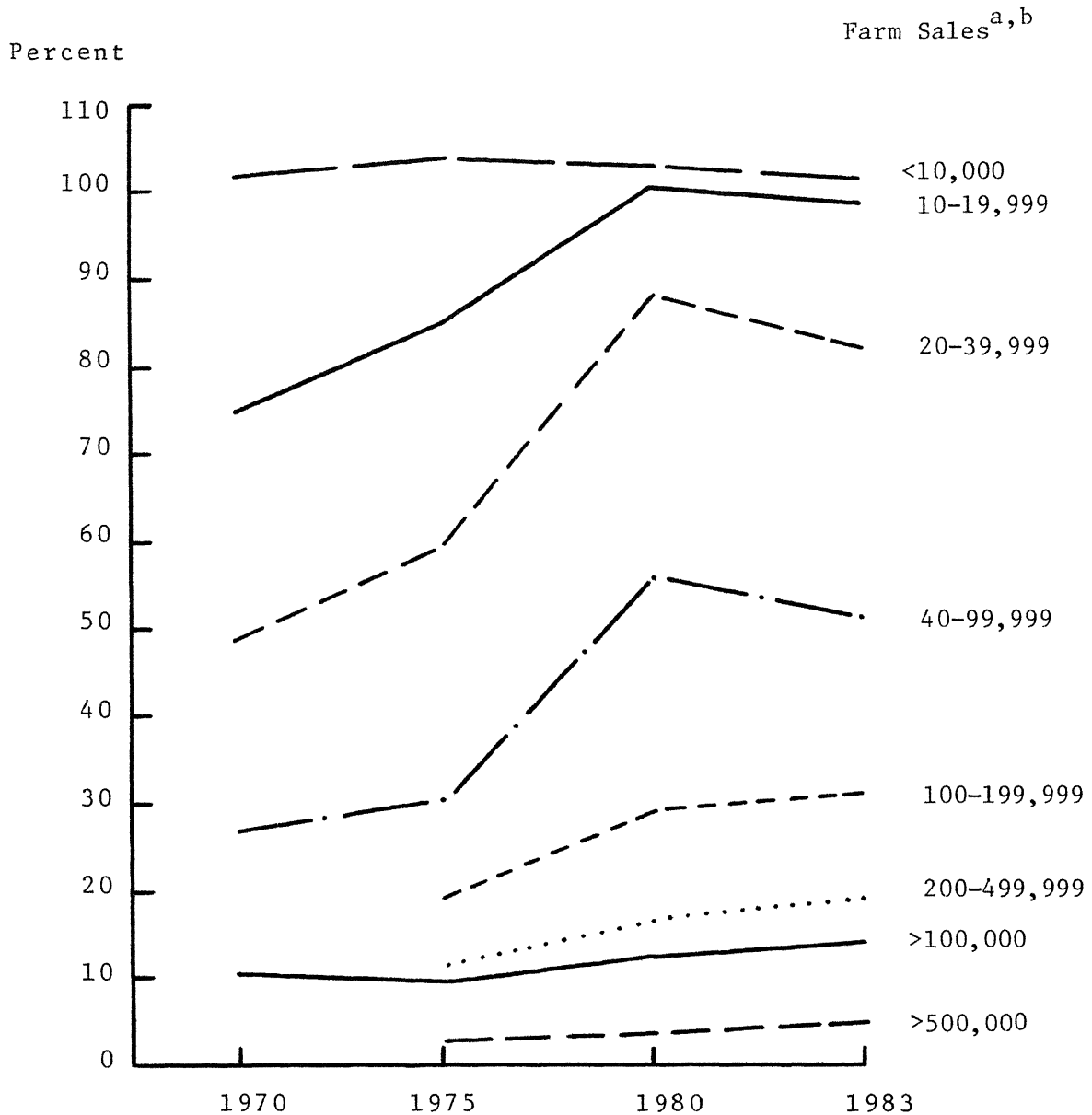
Farm Sales[a,b]

Percent

aEnd points of sales categories were deflated by prices received by farmers and are in 1983 dollars.

bNonfarm income did not become available for the $100,000 - $199,999, $200,000 - $499,999, and $500,000 plus categories until 1975.

SOURCE: Computed from data in Agricultural Prices, annual summary 1980 and 1983 and Economic Indicators of the Farm Sector: Income and Balance Sheet Statistics, 1983.

Development of nonfarm income sources therefore permits farm families to hold onto their farm production resources even though the farming operation is not large enough to provide an "adequate" or "desired" income level. However, this survival strategy also has the effect of bidding farm resources away from existing or would be full-time farmers. Therefore, farmers, including full-time farmers, who need to expand their farms to meet the economic pressures of maintaining net farm income levels must bid for the remaining farm resources against each other. They must also bid against new entrants and existing farmers who are using nonfarm income to finance expansion. Some farmers with relatively little or no nonfarm income, especially the smaller ones who probably have the greatest financial difficulty, will opt for nonfarm income to solve their income problem. Again, farm resources are denied full-time farmers by nonfarm income. In turn, some of these full-time farmers, pushed by low farm income, will be forced or will be willing to accept a nonfarm source of income.

Continuing economic development will continuously lower labor returns in agriculture vis-a-vis labor returns in the nonfarm sector and will cause this scenario to be repeated. The net results will be an increasingly larger amount of farm resources held through an outside capital, nonfarm income, and increasingly larger farmers becoming dependent on nonfarm income for an increasingly larger share of their total income.

The farm sector therefore appears to be on a treadmill with respect to nonfarm income. The end result would be the demise of the farm as the main source of income for all farmers, large and small alike. In addition, nonfarm income of parents and siblings can be used to pass the farm from one generation to the next without relying on farm generated income for the intergenerational transfer. Thus, there is also the potential for a landed class to arise, based not on large farm size but on nonfarm income.

Summary and Conclusions

After taking inflation into account, the major changes in U.S. agriculture were not the increasing concentration of farm numbers in the largest farm sales categories nor the increasing concentration of farm production on farms with large farm sales. Instead, it was (1) the concentration of net farm income in the hands of farms with sales over $500,000 in 1983 dollars and (2) the increasing dependence of farms with sales between $10,000 and $500,000 in 1983 dollars on nonfarm income.

The increasing concentration of net farm income is attributed in part to the continuing high ratio of gross farm income to farm expenses for farms with sales over $500,000 in 1983 dollars while the ratio for farms with smaller farm sales declined. The increasing dependence on nonfarm income is postulated to result from a nonfarm income treadmill. The treadmill grows out of economic development, Engel's Law, and the observation that nonfarm income allows a farm family to hold onto its farm production resources even though the farm is not large enough to

supply an adequate income. The consequence would be an agriculture with few if any farmers who rely on farming for most of their income and the potential for a landed class based on nonfarm income.

Time will tell if full-time farming will become a rustic memory. In the meantime, research is needed on several topics related to change in U.S. agriculture, including: why has the ratio of gross farm income to farm expenses remained high for farms with sales over $500,000, is this ratio likely to continue to remain high, and what impact does nonfarm income have on the intergenerational transfer of farm resources?

FOOTNOTE

[1] As a comparison, the data reported by USDA yields a 21.3 percentage point decline in the proportion of farms with sales under $10,000 (U.S. Department of Agriculture September 1984). Therefore, the analysis using deflated sales categories suggests that inflation in the prices received by farmers between 1970 and 1983 accounted for approximately 70 percent [(21.3 - 6.4)/21.3] of the decline in the proportion of farms with sales less the $10,000.

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