



*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

## THE MIDDLE SIZED FARMING OPERATION:

### A Goods-and-Services Firm?

J. A. Ginzel, E. W. Kehrberg, and G. D. Irwin\*

Traditionally, the economics of farm number adjustments have been inferred from the relative positions of firms on a longrun average cost curve. The steep slope of the left portion of the commonly drawn curve suggests demise of the smaller units as fast as off-farm and inter-farm markets can absorb their labor and land resources. On the less steeply declining middle portion of the curve, insufficient volume of output (income) is suggested as a cause of firms quitting. The argument is supported by the fact that most empirical estimates do not show the long-run cost curve rising at large outputs. This places downward pressure on product prices, reducing per unit margins, and creating income problems for the middle group of firms. Adjustments in the farming sector are then viewed as constrained by the limitations of factor and product markets, as well as by values and traditions of farm people.

We hypothesize that another constraint on such adjustments may have developed in the increasingly common practice of combining off-farm with farm work. The argument suggests that the traditional longrun average cost curve is, in fact, not relevant to the economics of many middle sized farms.

#### THE LONGRUN COST CURVE AND ADJUSTMENT

Policy makers and researchers have observed and studied a changing agriculture and pointed to technology and capital as the main engines behind the change. The effects have been increased substitution of capital for labor and farm firm enlargement. Micro-economic studies of farm firm growth and economics of scale usually indicate a decreasing longrun average cost curve with substantially increased profits for larger sized enterprises.

Based on these results, one would expect agricul-

tural firms to be rapidly acquiring additional resources and taking advantage of lower average per unit costs of production [1, 3]. One would be led to conclude that farms on the upper end of the cost curve are in a transitory state of declining or expanding into large sized farms. Some have speculated on how many farms would be needed to produce all of the agricultural products [14]. However, large numbers of these apparently inefficient farms are listening to a different drummer. The only group with a rapid decline in numbers is that of the very small farms. Nikolitch [10] attributed 95 percent of the decline in farm numbers from 1939 to 1959 to disappearance of farms with sales of under \$2,500, and this was due to a combination of actual disappearance and changes in definitions by the census.

Studies of economies of size for farm enterprises venture into the murky areas of measuring costs and comparisons of production relationships among various scales of farming enterprises [4]. Even assuming the measures of technical relationships are accurate, the assumption usually made in developing cost comparisons is that resources are valued at new acquisition prices. However, from a societal viewpoint, it is efficient to keep resources in production as long as the return to fixed resources is positive and greater than other alternatives [6]. In the shortrun the current supply of depreciable assets may be considered more accurately at their salvage value if alternative uses would return very little or be nonexistent. In the longer run, such assets would ordinarily not be replaced, but one could hypothesize that there is a continuous supply of obsolete resources flowing from larger sized farming operations available for middle and small sized operations utilization. If this is true, middle sized farms are not necessarily less efficient users of resources than larger farms, but their presence could be one way of achieving efficiency in agriculture as a whole.

\*Research assistant, professor, and agricultural economist (Economic Research Service, USDA) at Purdue University.

## **COSTS BASED ON A GOODS-AND-SERVICES FIRM**

A more fundamental difficulty with the traditional curve may be the concept of the firm underlying the estimation. Madden [9] presents a useful alternative framework for analyzing the inconsistency between expected and observed behavior of farm sizes and growth for agriculture. A farm is defined as a *goods-and-services firm*. This definition allows considerably more alternatives for resources utilization than do narrower definitions that confine farmer's resources strictly to uses in the production of only agricultural products. From this concept, middle sized farms, viewed as goods-and-services firms, may represent an efficient rather than inefficient utilization of resources in a dynamic and changing agriculture.

A goods-and-services firm can produce agricultural goods and provide services of custom hire and labor to other farms or off-farm employers. Additional flexibility for such a firm can be obtained by use of custom services and hired labor for the production of agricultural goods. Increasing numbers of middle and small sized farmers are increasing the returns to their resources by seeking off-farm employment for their own and their family labor and capital resources. A farming operation can obtain flexibility to change, an escape valve, so to speak, for human, capital, and land resources.

Agriculturally less economical locations or smaller scale units can often be utilized to a fuller extent by operating as goods-and-services firms. Furthermore, these resources may be remunerated in line with their quality and relative to other resources within agriculture and in other sectors. Before these units are classified as inefficient and to be discouraged, hypotheses should be fully tested against something more than the usual static efficiency concepts that ignore the necessity of flexibility and its costs.

### **ARE MIDDLE SIZED FARM UNITS FUNDAMENTALLY DIFFERENT?**

Tweeten and Schreiner [11, p. 3] estimated the longrun per unit cost curve for farms. Their cost curve estimates for 1965 stopped its rapid decline in cost per unit and became rather flat for farms with gross sales per year of \$30,000 and larger, or in the middle of Economic Class II. Their study included a 10 percent charge for equity capital and opportunity costs for labor with appropriate adjustments for age, sex and education. We defined middle sized farming operations as those having gross sales of agricultural products between \$2,500 to \$20,000 per year in 1964 prices, the portion where costs were declining rapidly. This includes census classes III, IV, and V commercial farms. We excluded the Class VI commer-

cial farms since this group was reduced during the 1959-1964 period.

How can one tell whether this group is more accurately characterized as a goods-and-services firm or a farm firm? As a preliminary test, we looked at census data by economic class of farm. If no differences are apparent which might be related to the concept of the firm the middle sized farmers employ, then we need to look elsewhere for explanation. If differences are found, a whole new area of analytic work will be needed to characterize and identify the influences of this group.

What are the measures by which the two types of firms might differ? We might look on clues such as the inputs used, especially the operator labor supply and the type of purchased inputs, as well as the types of product output, and value added in production.

### **Gross Income and Land Use**

The middle sized farms were the largest group, with about 45 percent of all farms. They produced one-third of the gross sales of agricultural products on two-fifths of the total land base. Large farms were the fewest in number, with 12.8 percent of the farms, but produced almost two-thirds of the gross on another two-fifths of the land in farms, Table 1. On nearly an equal share of land, the relatively few large operations produced about twice as much gross sales. Curiously, this evidence tends to support the hypothesis that large operations are much more efficient in the use of land.

### **Value Added**

However, stratification by gross sales does not accurately reflect value added on farms and is a poor indicator of efficiency. The middle sized group fares considerably better, since the value of inputs purchased was a smaller proportion of gross sales than for large farming operations, and the mix was different. Krause and Kyle hypothesized that the large grain farming units may obtain product prices 8 to 10 percent higher and input costs 8 to 10 percent lower than smaller farming units [7, p. 28]. Thus, the comparison between quantities of purchased inputs and gross sales among the groups may be understated when measured by value of middle and small sized operations.

### **Purchased Inputs**

Middle sized farms are not nearly as dependent on livestock and poultry, nor on feed stuffs purchased, as are large farms. One could hypothesize that some of the crop and animal agriculture outputs from middle sized farms are inter-farm products purchased

**TABLE 1. VALUE AND PERCENTAGE DISTRIBUTIONS, CHARACTERISTICS AND MAJOR PURCHASED INPUTS AND PRODUCT SALES, LARGE AND MIDDLE SIZED FARMING OPERATIONS, U.S. CENSUS OF AGRICULTURE, 1964<sup>a</sup>**

Item <sup>b</sup>	Total <sup>c</sup>	Large <sup>d</sup>	Middle <sup>e</sup>
Operators (M)	3,158	405	1,414
Land in Farms (MM ac.)	1,110	456	467
Land & Building Value (MM)	\$159,577	\$69,973	\$65,176
Off-Farm Income (MM)	\$ 10,053	\$ 1,132	\$ 3,758
Off-Farm Wages & Salaries (MM)	\$ 6,451	\$ 428	\$ 2,287
Gross Ag Product Sales (MM)	\$ 35,294	\$22,127	\$11,878
Purchased Inputs (MM)			
Feeds for Animal Ag	\$ 5,511.8	\$ 3,694.0	\$ 1,512.7
Animals Purchased	\$ 4,177.4	\$ 2,220.8	\$ 811.3
Hired Labor	\$ 2,798.6	\$ 2,144.0	\$ 557.3
Petroleum Products	\$ 1,786.7	\$ 800.2	\$ 843.4
Fertilizers	\$ 1,771.6	\$ 971.0	\$ 680.8
Machine & Custom Hire	\$ 958.7	\$ 372.4	\$ 334.3
Seed & Bulbs	\$ 660.7	\$ 343.5	\$ 270.2
Percentage Distribution			
Operators	100	12.8	44.8
Land in Farms	100	41.1	42.1
Land & Building Values	100	43.8	40.8
Off-Farm Income	100	11.3	37.4
Off-Farm Wages & Salaries	100	6.6	35.5
Gross Ag Product Sales	100	62.7	33.7
Animal Ag Products	----	53.7	52.9
Crop Sales	----	46.3	47.1
Purchased Input			
Feeds for Animal Ag	100	67.0	27.4
Animals Purchased	100	77.1	19.4
Hired Labor	100	76.6	19.9
Petroleum Products	100	44.7	47.2
Fertilizers	100	54.8	38.4
Machine & Custom Hire	100	59.2	34.6
Seeds & Bulbs	100	51.9	40.9

<sup>a</sup>Derived from the 1964 U.S. Census of Agriculture, Volume II, Chapters 6 and 7.

<sup>b</sup>(M) — Thousands, (MM) — Millions.

<sup>c</sup>Totals include all farms, commercial, noncommercial and abnormal, figures are rounded.

<sup>d</sup>Includes Census classes I and II, commercial farms.

<sup>e</sup>Includes Census classes III, IV, and V, commercial farms.

by large farms for further processing or utilization. Examples of this are feeder pig production, cow-calf herds, cash-grain produced, etc. on middle sized farms which become inputs to other farms.

Middle sized operations purchased a lower percentage of their gross sales for the seven major inputs than large operations, and the figure varies by input. They produced one-third of the gross sales but purchased 47.2 percent of the petroleum products, 40.9 percent of seeds and bulbs, and 38.4 percent of the fertilizer. Percentage of total expenditures for hired labor, animals purchased and feed stuffs were less than the share of gross sales. These figures, of course, give no indication of the amount of home raised feed used. They do indicate some characteristics of the purchased input market.

Large sized farming operations produced about two-thirds of the gross sales, but they purchased over three-fourths of the animals moving inter-farm, and of the hired labor, and two-thirds of the feed stuffs. They purchased lower percentages of petroleum products and fertilizer relative to gross sales, 44.7 percent and 54.8 percent, respectively, Table 1. These statistics are based upon value of purchase and not quantity.

The value of inter-farm purchases has been increasing. Nikolitch reported that in 1959, farms with gross sales over \$100,000 had purchases of inputs from other farms amounting to 27.9 percent of their gross sales. The figure declines by size group, until those with sales of \$2,500 to \$5,000 had inputs from other farms amounting to 14.2 percent of their gross [10, p. 14]. This supports the hypothesis that gross sales do not accurately reflect the value added by different strata of farms and that middle sized farms contribution to agriculture is underestimated by gross sales statistics alone.

### Machine Durables

Technological change has occurred quite rapidly in the case of farm machinery. The Corn Belt has seen greatly increased tractor horsepower ratings, larger row crops machinery, and increased capacity of harvesting and drying equipment. Due to these rather rapid changes, equipment for larger farms often becomes obsolete before its useful life has ended. One could argue that small and middle sized farms are an important market for obsolete equipment from larger farms. Perhaps, if there were a substantial increase in the number of large farms and a decrease of middle sized and small farms, the salvage value and demand for obsolete equipment from larger farms would be reduced. The rate of technological change for large farms might then be reduced or the cost of changes increased due to decreased salvage value for the

continuous flow of obsolete equipment.

### Output Mix

The mix of products produced are not uniformly distributed among all strata of farming operations. Large farms tend to concentrate in specialty crop and confinement livestock operations. Farms with \$100,000 gross sales or over, in 1964, generated one-fourth of the gross sales for agriculture but sold four-fifths of the sugar cane, two-thirds of the vegetables, about one-half of the fruit and nuts and over two-fifths of the rice. The numbers of these farms increased 57 percent from 1959 to 1964 with the largest part of the increase from feed lots, poultry and turkey farms. Many of these farms have small land bases, as one-tenth have less than 50 acres and only two-fifths have over 1,000 acres [12, pp. 606-609].

### Off-Farm Labor Use

Middle sized farms are also changing, and especially in two directions. Their farms are getting larger and more income is coming from off-farm sources [2]. The off-farm income exceeded gross sales of agricultural products on 38.7 percent of all farms in 1964 up from 29.8 percent in 1954. The South had 47.4 percent of all farms with off-farm income exceeding the gross value of agricultural sales while the North had only 30.1 percent and the national average was 38.7 percent of all farms in 1964, Table 2. Several studies have indicated that part-time farming is not a transitory movement out of agriculture but a permanent form of employment [8, 13].

Middle and small sized farming operations households received almost 90 percent of all the off-farm income in 1964. Almost 81 percent of all farm households derived some income from off-farm sources, and it was a sizeable income of \$10.1 billion, while gross agricultural sales were \$35.3 billion. Wages, salaries and non-farm business or professions net income accounted for almost two-thirds of the total off-farm income of these groups. For the large farms, a larger portion of the off-farm earnings come from capital rather than labor. Thus, in a sense they too are a goods-and-services firm.

The rate that land and some other resources are available for reorganization may depend mostly upon retirement of older farmers and younger farmers who leave agriculture. Many are currently on small and middle sized farming operations. In 1964, 3.1 million farm operators reported their ages, 742.3 thousands of these were between 55 and 64 years old and 548.3 thousand were 65 years or older. It was not possible to calculate average age of farm operators for the three size groups but the census did report that farm

operators 35 to 44 years of age have proportionally more of the farm resources and value of production than any other age group. Operators 55 years of age or older, as a group, control less than a proportionate share of the resources and value of production than any other age group [12, pp. 512 and 642]. This supports a hypothesis that many older farm operators are on small and middle sized units and their resources will be available for reorganization in the near future. Whether they are reorganized into larger farms or become part-time operations under a goods-and-services concept requires further investigation.

#### WHAT DIFFERENCE DOES IT MAKE?

Middle sized farming operations are the largest group of farm operators and control a significant portion of agriculture's land, labor and capital. They are important demanders of inputs, contributors of agricultural outputs and potential suppliers of re-

sources to other farmers or to other sectors. Major differences exist between large and middle sized farming operations, organizations and behavior as evidenced by differences in the mix of and value of purchased inputs, proportion of value added to gross sales from "farm origin inputs" and the increasing expansion of income earned by farm families from off-farm sources. It is possible that middle sized farming operations are utilizing their resources efficiently when viewed as goods-and-services firms. If so, narrower definitions of farms confined to agricultural goods production in static models are producing misleading implications for the shape of the longrun average cost curve and the efficiency of resource utilization for middle sized farming operations.

The census data neither refute nor confirm that a goods-and-services firm concept may be appropriate. They do suggest that the idea merits a serious consideration. In particular, the following types of questions could be examined:

**TABLE 2. OFF-FARM EMPLOYMENT, FARM OPERATORS AND OTHER HOUSEHOLD MEMBERS, U.S. AND REGIONS, 1964<sup>a</sup>**

Item <sup>b</sup>	Total U.S.	Regions		
		North	South	West
Total Farms (M)	3,157.8	1,479.6	1,372.7	305.5
Farms, Off-Farm Income				
Exceeds Gross Sales (%)	38.7	30.1	47.4	41.4
Operators Working Off-Farm (M)	1,462.7	642.5	667.5	152.2
Days/Year Worked Off-Farm (%)				
1-99	30.7	35.7	27.2	25.0
100 and over	69.3	64.3	72.8	75.0
Other Members Off-Farm (M)	1,177.6	541.3	503.6	132.7
Days/Year Worked Off-Farm (%)				
1-99	50.2	52.8	45.0	58.7
100 and over	49.8	47.3	55.0	41.2
Non-Farm Employment (%)	92.3	91.4	93.7	89.9
Farm Employment (%)	7.7	8.6	6.3	10.1

<sup>a</sup>1964 U.S. *Agricultural Census*, Volume II, Chapter 5, "Characteristics of Farm Operators and Persons Living on Farms."

<sup>b</sup>(M) – Thousands.

(1) Are the outputs produced, efficiency of resources used, and longrun average cost curves similar or substantially different for farming operations viewed as agricultural goods producers or as goods-and-services firms?

(2) How does the firm growth-decline process influence the interaction among farms? Regional and sector studies of a changing agricultural structure need to analyze the simultaneous process of growth and decline in the competition for limited resources

and the use of existing resources [5].

(3) Can it be verified that the treatment of depreciable assets and labor resources adequately reflect production costs for farming operations in current studies?

(4) Are social values, responses, and adjustments for middle sized farming operations, many of which are organized as goods-and-services firms, substantially different or similar to large sized farming operations?

### REFERENCES

1. Dean, G. W. and H. D. Carter, "Cost-Size Relationships for Cash-Crop Farms in a Highly Commercialized Agriculture," *J. of Farm Econ.*, Vol. 43, No. 2, pp. 264-277, 1961.
2. Duvick, R. D., "Part-Time Farming in Two Areas of Southern Michigan, 1959-1963," *Quarterly Bulletin of the Michigan Agr. Exp. Sta.*, Vol. 49, No. 8, pp. 64-78, Aug. 1966.
3. Faris, J. E. and D. L. Armstrong, "Economies Associated with Size, Kern County Cash-Crop Farms, California," *Giannini Foundation Report No. 269*, Calif. Agr. Exp. Sta., Dec. 1963.
4. Hunter, E. C. and J. P. Madden, *Economies of Size for Specialized Beef Feedlots in Colorado*, USDA A. E. Rep. No. 91, May 1966.
5. Irwin, G. D., "Discussion: Firm Growth Research Opportunities and Techniques," *J. of Farm Econ.*, Vol. 48, No. 5, pp. 1532-1535.
6. Johnson, G. L. and L. S. Hardin, *Economics of Forage Evaluation*, Agr. Exp. Sta. Bul. No. 623, Purdue University, April 1955.
7. Krause, K. and L. Kyle, "Economic Factors Underlying the Incidence of Large Farming Units, the Current Situation and Probable Trends," paper presented at the American Agr. Econ. Assoc. Meetings, Aug. 10, 1970.
8. Loomis, R. A., D. E. McKee, and J. T. Bonnen, "The Role of Part-Time Farming in Agricultural Adjustment in Southern Michigan," *Quarterly Bulletin*, Vol. 44, No. 4, pp. 644-653, May 1962.
9. Madden, J. P., *Economies of Size in Farming*, USDA A. E. Rep. No. 107, Feb. 1967.
10. Nikolitch, R., *The Expanding and Contracting Sectors of American Agriculture*, USDA A. E. Rep. No. 74, May 1965.
11. Tweeten, L. and D. Schreiner, "The Economic Impact of Public Policy and Technology on Marginal Farms and the Non-Farm Rural Population," unpublished paper, Oklahoma State University, 1970.
12. *United States Census of Agriculture (1964)*, Dept. of Commerce, Washington, D. C.
13. Wayt, W. A. and T. J. Dix, *Adjusting the Commercial Family Farm to Part-Time Operations in Southern Ohio*, Ohio Agr. Exp. Sta. Res. Cir. No. 97, March 1961.
14. Wirth, M. E. and L. F. Rogers, "The Changing Nature and Environment of U.S. Farm Firms," *A New Look At Agricultural Finance Research*, Agr. Finance Program Rep. No. 1, University of Ill., 1970.