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CHANGES IN FARM FINANCIAL CONDITION AND FARMING PRACTICES IN OHIO, 1986-1990

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Abstract

Highlights of a five year study of farm households are reported. Two facets of farm households, their financial condition and those farming practices affecting the environment, are analyzed. Results indicate improvements in farm household financial condition, changes to less soil erosive farming practices, but little adoption of low input farming systems.

For the past five years, the Ohio Farm Longitudinal Study has been monitoring the demographic profiles, financial condition, farm production, and off-farm employment of a representative sample of about 1,000 farm operator households. This paper summarizes trends in their financial condition and farming practices, including their use of low input practices.

Financial stress was brought to agriculture in the 1980s by high interest rates, low commodity prices, and falling land values. At the same time, there was a growing concern over the effects of farmers' cultural practices on the environment and on food quality and safety. Thus, these two facets of farm households, their financial condition and their farming practices, have been at the focal points of public debate about agriculture.

Representativeness of the Sample

The study was based on a sample of farm households that actually operated farms. The Census recorded 79,277 farms in Ohio. Budget limitations of this study dictated a sample no larger than 1,000 to represent the farm operator households in this population.

A longitudinal study is one that is designed to examine change over time. To best examine change, the panel concept is used, which implies observation of the same set of farm households over time. But the sample must also be

representative in subsequent time periods, hence a portion of the sample is replaced each period as the population itself changes. The bibliography of longitudinal studies is extensive (Abeles) and expositions on design are readily available (Coleman; Goldstein; Kessler and Greenberg).

Ohio Agricultural Statistics Service developed a list of Ohio farm households, and stratified it on the basis of estimated annual sales of farm products. The sample of operator households was then selected randomly in these strata. In early spring of each year, the sample was surveyed by telephone regarding their previous year's farming experiences. For a more detailed description of the sampling process and interview procedure, see Stout, Forster, Lobao, and Munoz.

Results

Since the range in farm size was so extreme, and the financial condition and farming practices so closely related to farm size, results are reported for several farm size categories as well as for mean values. The first farm size category is comprised of those households with less than \$40,000 gross farm sales. These operations were numerous; nearly two-thirds of all Ohio farms were in this group; however, they accounted for only 15 percent of farm products sold in the state. Their household income was primarily from off-farm sources. The term "rural residences" seemed appropriate to identify these operations. The second group includes farm households with annual gross sales of \$40,000 to \$99,999. These are typically "part-time farm operations." About one-sixth of Ohio farm operations fell into this category, and they accounted for about 25 percent of farm products sales in the state. The last group could be termed "commercial farms" with annual gross sales of \$100,000 or more. Most of these operators were fully employed on the farm, and most household income came from

the farm. Less than 17 percent of Ohio farms were in this group, yet they accounted for 60 percent of all farm product sales.

Farm Household Income

For all farm operator households in 1990, non-farm income accounted for three-fourths of all household income in 1990 (Table 1). Thus, most farm households were sustained primarily by non-farm income, primarily in the form of wages from off farm jobs. This dependence on non-farm income by the average household remained unchanged throughout the period of the study.

Only for households operating commercial farms was income from the farm the major source of household support. Spouses of commercial farm operators were as likely to work off the farm as were spouses from smaller farm operations. But commercial farm operators themselves tended to be fully employed on the farm, in contrast to high off farm employment rates by operators of smaller farms. Commercial farms had a relatively small buffer of non-farm income to protect them from changes in weather, export markets, federal monetary and fiscal policies, and federal farm programs (Table 1).

Return on Assets

Rate of return on assets is probably the best indication of the comparative economic success of farm businesses. Over the entire post World War II period, the average rate of return of farm real estate assets averaged 10.6 percent annually, which was slightly higher than the return received in other investments (Irwin, Forster, and Sherrick). Of course, these rates varied considerably from year to year.

Rates of return on assets has two components: (a) operating return and (b) change in asset value. The average Ohio farm household's operating return was low, less than zero in fact, in most years of the study (Table 1). Changes in

asset values were negligible during this period. Operating return on assets for the commercial farms in this study was 7.4 percent in 1990 (Table 1), approximately the same as other years in the study. This rate of return was similar to average rates of return in off farm investments. But part-time farms and rural residences had negative operating returns.

Commercial farms owned most of the capital invested in agriculture, but they made up a small proportion of the farm households. Hence, the paradoxical statement can be made: the operating return to farm assets was "reasonable" for the average dollar invested, but it was "low" for the average farm operator household.

This evidence emphasizes the relative profitability of larger farms. In Ohio, these were family farms, not corporate owned farms. The larger farm operation enabled the operator to be employed full-time in purposeful, even aggressive management of the enterprises. Larger farm size also enabled overhead costs to be spread over more units of output, technical efficiency to be enhanced, price discounts (premiums) to be received for high volume purchases (sales), and net farm income to exceed household support requirements and be available for investment. For most Ohio farm enterprises, production technologies still enabled moderately large sized firms (\$100,000 in annual sales) to be competitive with much larger ones.

Farm Financial Stress

Farming is capital intensive. The average farm household asset base was about \$450,000 in 1990 (Table 1), most all of which was employed on the farm. Many household operating commercial farms had assets of more than \$1 million. On the average, about one-half of the farm operator households' assets were

invested in farm real estate, about 30-40 percent in other farm assets, with the remainder in bank accounts or off farm investments.

Since 1986 the financial situation of the average farm household has improved considerably (Table 1). Over the five years of this study, assets increased by 39 percent, debt remained nearly constant, and equity increased by over fifty percent. The improvement can be attributed to rising asset values, retained earnings, and a reluctance to assume new debt rather than to an actual reduction of indebtedness already incurred.

On December 31, 1990, 9 percent of farm households were in financial stress and 2 percent were in severe financial stress. Some financial problems continued, but marked improvements had been made in the past five years. At the end of 1986, the proportions of households in financial stress and severe financial stress were 18 percent and 7 percent, respectively (Table 1). Throughout the period of this study, part-time farms and rural residences lost money on farm operations but experienced much less financial stress than commercial farms because non-farm income was employed to support the farm as well as the household.

Farming Practices

Although conventional tillage (moldboard plow followed by secondary tillage operations) was still the major tillage system in 1990, a shift to less erosive tillage practices, especially on larger farm operations, occurred during 1986-1990 (Table 2). Conservation tillage practices were the predominant tillage system on nearly two-thirds of the commercial farm operations.

Crop rotations that include small grains or pasture with row crops predominated and a shift away from continuous row crops occurred (Table 2). This change was consistent with the increased wheat and hay acreage reported by these

same operations. These two important changes--more conservation tillage and less use of continuous row crop rotations--should have reduced soil erosion and nonpoint water pollution from Ohio farms. However, fertilizer and pesticide use was little changed over the period of the study. Fertilizers and pesticides continued to be one of the major components of farm expenses, accounting for 18 percent of farm production costs in 1990.

Low Input Farming Practices

Interest is growing in a set of farming practices which maintain or enhance the environment and also improve food quality and safety. Such terms as low input, sustainable, and alternative farming systems are used to identify sets of practices that may involve basic changes in farming to achieve environmental or food quality goals.

These low input, sustainable, or alternative farming systems have not been well defined, but some general principles were used in this study to characterize them. First, crop rotations should consist of multiple crops with a legume, grass, or winter cover crop as part of those rotations. Continuous row crops, such as corn-soybeans, continuous corn, or corn-soybeans-wheat rotations violate this first principle unless a winter cover crop is used. The second principle is that mechanical cultivation should replace chemical weed control whenever possible. Third, a greater proportion of plant nutrients should come from legumes, animal manure, and other organic sources and less from chemical fertilizers. Fourth, chemical pesticides should be used as a last resort in pest control. Routine applications of chemicals should be replaced with mechanical cultivation, rotations, disease resistant cultivars, and pest scouting.

Information from this study gives some insights concerning low input practices on Ohio farms. In 1990, over one-half of the respondents in the study

indicated that they considered themselves to be low input producers. But by a rather strict definition of low input farming, few farm operators had adopted these practices. For a farm to be considered low input by our principles, all of the following practices were used: the farm's crop rotation included hay or pasture, mechanical cultivation was used for row crops, and pesticide application rates were less than 1.0 pounds of active ingredient per acre on the farm's major crop. Of the 1,016 farms in the panel, only 72 farms met these four criteria. If another criterion were added to this list, manure was applied to cropland, only 56 farms in our panel were low input. Thus, by our definition, only a small proportion (about 5-7 percent) of Ohio farms were low input farms.

Performance of Low Input Practices

Results from 1990 indicated that low input farms tended to have less gross farm income than other farms (Table 3). Acreage was less and yields were lower on low input farms than on other farms. But low input farms also purchased fewer inputs, had less depreciation, and had lower interest expenses. For 1990 their net farm income was higher than that of other farms.

One could hypothesize that low input farming practices are more labor intensive and require family labor to work on the farm rather than in off farm jobs. In fact, non-farm income was slightly less (about \$2,000 per household) on low input farms than on all farms, implying more time was spent on the farm by household members. However, total household income (net farm income plus non-farm income) was higher on low input farms than on all farms.

Each farm operator in our panel was asked to identify their farm's most important crop as well as the individual herbicides, insecticides, and fungicides used during its production. Farmers' application rates of these pesticides were assumed to be the same as suggested rates used on manufacturers' labels. Since

suggested pesticide application rates varied by the method of application, farmers' use of pesticides is reported as a range (Table 3). This range represents the estimated quantity of pesticides that farmers applied to their most important crop. As expected, low input farms used substantially less pesticides than did all farms. Total chemical and fertilizer expenses for 1990 averaged about \$6,500 less on low input farms than for all farms.

Our low input farms had a much higher proportion of gross sales coming from livestock enterprises than did all farms (80 percent vs. 50 percent). Our low input criteria required farms to use a rotation that included forages, grasses or cover crops, thus it is not surprising these were mostly livestock farms.

Preliminary analysis indicates that some farm households were able to use diversified rotations, purchase fewer off farm inputs, buy less fertilizer and pesticides, obtain lower yields, and still achieve higher net farm income and household income than the average farm household. Can these farming systems be adopted successfully by a higher proportion of farm operators? The success of these households might be attributable to factors other than low input practices: to unique soil and climate characteristics (e.g., orchards in northern Ohio), to the superior management skills of the operators, to a high valued output that would lose its price premium if produced in expanded quantities, to unique farm locations near metropolitan areas that permit direct marketing to consumers. Farmers' experiences in the years ahead will be the ultimate test of the economic viability of low input systems on a widespread scale.

Conclusions

Without detailed information about farm households, farming is an enigma. Most farm households have low farm income. Yet studies have shown average

returns to resources employed in agriculture to be reasonable over the long-term. Our study helps clarify conditions in agriculture.

Most households engaged in farming have relatively small farm operations, which generate low returns. Their household income comes from off farm sources, especially off farm jobs, and their interest in farming probably is peripheral. They choose to reside in a rural environment, operating a farm enterprise on a part-time basis, devoting much of their attention to off farm jobs, household and community activities, and leisure. As the size of the farming operation increases, the operator devotes more time to it, manages it more carefully, commits more capital to it, and is more likely to expect it to earn economic returns that are competitive with off farm uses of the family's labor and capital. As farm size increases to the commercial farm size, the operator is fully employed on the farm, household income comes primarily from the farm, and returns to labor and capital resources used in farming tend to be competitive with off farm uses.

Financial stress has lessened over the five years of the study, although it remains a problem in some farm households, especially those operating commercial farms and using relatively large amounts of debt to finance their asset base. Farm operator households finance their farming operations mostly with equity capital. In fact, their use of debt is relatively low compared to non-farm businesses.

Over the period of this study, farming practices slowly changed. Tillage practices have become less soil erosive. Although row crops remained important, crop rotations included more wheat and hay. The intensive use of fertilizer and pesticides remained problematic. Economic forces guiding these trends were the continued development of conservation tillage technology, relatively low corn and

soybean prices, and federal farm programs that shifted erosive land out of row crops to conservation uses. Crop nutrients continued to be supplied mostly by commercial fertilizers, partly because of a relatively small livestock industry. Less than 10 percent of Ohio cropland had some of its nutrient need supplied by manure. Herbicides continued to substitute for more labor intensive mechanical methods of weed control. Low input farming was found on relatively few farms, but preliminary evidence concerning its economic performance was encouraging.

Table 1. Ohio Farm Operator Household Income and Financial Condition, 1986-1990.

	1990, by Gross Sales			1986	1987	1988	1990
	Less than \$40,000	\$40- 99,999	\$100,000 or More	All Farms	All Farms	All Farms	All Farms
Net Farm ^a	-4.4	7.2	58.9	5.9	7.3	8.1	8.0
Non-Farm ^a	26.6	23.0	12.9	21.8	25.2	26.7	23.7
Total Household ^a	2.2	30.2	71.8	27.7	32.5	34.8	31.7
Return on Assets (%) ^b	-3.8	-1.1	7.4	-3.4	-1.3	0.6	-1.5
Assets ^a	356	474	823	326	365	396	453
Liabilities ^a	26	53	154	59	52	52	52
Equity ^a	331	421	668	267	131	344	401
Debt/Asset (%)	7	11	19	18	14	13	11
Share of Farm in							
Financial Stress (%) ^c	6	12	18	18	16	12	9
Severe Financial Stress (%) ^d	1	2	3	7	5	4	2

^a\$1,000/farm.

^bReturn on assets includes only operating returns during previous year. Asset appreciation not included.

^cFinancial stress is defined as a deb-to-asset ratio of 0.4 or greater.

^dSevere financial stress is defined as a debt-to-asset ratio of 0.7 or greater.

Source: Survey data.

Table 2. Distribution of Cropping Practices, by Farm Size, Ohio Farm Operator Households, 1986 and 1990.

	1986, by Gross Sales				1990, by Gross Sales			
	Less than \$40,000	\$40 - \$99,999	\$100,00 0 or More	All Farms	Less than \$40,000	\$40 - \$99,999	\$100,00 0 or More	All Farms
Percent of Farms by Predominant Tillage								
Conventional	63	58	43	59	57	50	37	53
Conservation	34	39	55	38	34	46	62	40
Other	3	3	2	3	9	4	1	7
Percent of Farms by Predominant Crop Rotation Used								
Continuous Row Crop	15	20	27	17	16	11	15	15
Row Crop/Small Grain	31	38	27	31	34	48	43	38
Other, Including Rotation with Pasture or Hay	54	42	46	52	50	41	42	47

Source: Survey data.

Table 3. Characteristics of Low Input Farms vs. Other Farms, Ohio Farm Longitudinal Study, 1990.

	Low Input Farms	All Farms
Number of Observations	56	1016
<u>Crop Yields</u>		
Corn (bu./acre)	104.0	111.7
Soybeans (bu./acre)	40.7	42.0
Hay (tons/acre)	5.0	6.0
<u>Pesticide Use</u>		
Active Ingredients on Primary Crop (pounds/acre)	0.6-0.8	1.9-2.3
<u>Income Statement, 1990</u> (\$000)		
Gross Farm Income	40.4	58.4
- Total Farm Expenses	29.0	57.0
+ Imputed Value of Residence	6.5	6.6
= Net Farm Income	17.9	8.0
<u>Net Worth Statement, Dec. 31, 1990</u> (\$000)		
Assets	359.7	453.0
- Liabilities	16.7	52.0
= Net Worth	343.0	401.0

Source: Survey Data

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