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FARM OPERATORS' LABOR ALLOCATION PLANS IN 1982 AND THEIR EXPERIENCES BY 1986

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Abstract

Data from a random sample of farm operators in Southwestern Wisconsin were used to identify farm business and household characteristics associated with the achievement of operator farm and off-farm labor allocation plans. Differences in mean characteristics of groups of similar farmers with common labor allocation plans but different outcomes were first noted. Then a probit analysis model was used to evaluate the impact of household and business attributes on the probability of observing plan fulfillment. Major factors found to influence plan fulfillment included size and type of farm; size of household; education, health status, and age of the operator; and degree of optimism expressed by the operator.

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By Thomas Romstad, James Shatava, and William E. Saupe[2/]

Introduction

The objective of this study was to identify farm business and household characteristics associated with the fulfillment of operator labor allocation plans between on-farm and off-farm work. Data used were for the year 1982 and 1986 from a random sample of farm households in Southwestern Wisconsin. These were particularly relevant years, as 1982 marked the end of the "good economic times" for Wisconsin farmers and by 1986 farmers were dealing with major financial reversals and farm financial stress. We first describe the turbulent period over which this analysis was made.

Historical Perspective Through much of the 1970's agriculture in the United States enjoyed a period of growth which briefly reversed an historical trend toward greater urbanization and disinvestment in rural areas and enterprises. During this period growth in rural employment and population outstripped that in urban areas. Domestic and international markets for grains and oilseeds were strong and farm incomes rose substantially. Although dairy products were not directly a part of the export boom, milk price supports rose steadily and inflation in agricultural land values affected dairy farmers by increasing net worth and credit access at low or negative real interest rates.

In the early 1980's high real interest rates contributed to worldwide recession, an increase in the value of the dollar and a weakening of international markets for U.S. farm exports. Increases in the price of fuel oil and related farm inputs also negatively affected farm profitability. The period of renewed investment in rural enterprises came to a close and productive resources were again seen to move away from rural industries. Continued weakness in the price of agricultural commodities and high real interest rates contributed to a decline in the value of agricultural land beginning in 1982.

The decline in land values became precipitous in 1983-84 and helped to trigger the farm financial crisis experienced in the U.S. in the mid-1980's. Between 1981 and 1987 the average value of agricultural land in Wisconsin plummeted by more than 45 percent.

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Over the period between 1979 and 1983 the poverty rate in rural areas grew almost 30 percent, and by 1987 it remained 25 percent higher than in urban areas. During the same period average real earnings of rural workers fell twice as fast as those of urban workers. Nationally, the number of farms declined by 220,000 between 1981 and 1986. In the states of Minnesota, Wisconsin, and Michigan, nearly one farm in five was estimated to be in a highly vulnerable financial position by January 1, 1986.[3/] In Wisconsin the number of farms fell from 92,000 to 82,000.

A number of factors beyond the direct control of farm operators were major contributors to the recent financial crises in domestic agriculture. However, the uneven impact among farm households in spite of the global nature of many of the circumstances confronting farm operators suggests that there may have been other factors which help to explain the observed variation in fulfillment of individual labor allocation plans.

We assume that farm operators rationally allocated their scarce labor among competing employment alternatives.[4/] Accepting operators's plans as rational responses to the existing production and financial environment, the relationship between the plans and attributes of the farm household and business were evaluated in an effort to explain variation in plan fulfillment.[5/]

Data Source The Wisconsin Family Farm Surveys of 1983 and 1987 (covering business years 1982 and 1986) provided the data used in this study. They were conducted jointly by personnel in the Economic Research Service of the U.S. Department of Agriculture (ERS, USDA) and the Department of Agricultural Economics, University of Wisconsin-Madison. The surveys covered a sample of farm operators in eight Southwestern Wisconsin Counties and the on-farm interviews were conducted by experienced enumerators.[6/]

3/ "High vulnerability" is consistent with the U.S. Department of Agriculture definition of a debt-asset ratio greater than 40 percent and negative cash flow.

4/ Evaluation of the rationality of operator labor allocation would require information not readily available regarding implicit wage rates, non-pecuniary benefits in farming, and the marginal product of labor in diverse productive enterprises.

5/ The focus of this study is not the analysis of goal hierarchies and their development (Van Kooten, Sanford), but characteristics of the family and firm associated with the observation of goal fulfillment. Although the analysis of goal hierarchies has increased in sophistication over the last thirty years, little attention has been given to the evaluation of success in realization of expressed plans.

6/ The eight counties were: Buffalo, Crawford, Jackson, LaCrosse, Monroe, Richland, Trempealeau, and Vernon. Salant et al. provides more detail on the survey, site and respondents.

The purpose of the 1983 survey was to collect information enabling policy makers and researchers to better understand the characteristics of farm businesses, farm families, and the role of off-farm employment in the structure and performance of the farm business. The sample of farms enumerated in this survey was drawn from a list frame developed by the Wisconsin Agricultural Statistical Service (WASS).[7/]

In 1987, the principals involved in the 1983 Wisconsin Family Farm Survey collaborated to repeat the enumeration of the original sample farms. Attempts were made to interview all of the households included in the original sample. Of the 529 enumerated in 1983, 400 continued to farm, 106 had left farming, and 23 were deceased.

In total, 434 farm operators or former farm operators were re-interviewed in 1987. The responses of these individuals formed the data set for this study. All of the remaining unenumerated operators were also accounted for.[8/]

Characteristics of the Study Area The eight Southwestern Wisconsin counties represented in the Wisconsin Family Farm Surveys were estimated to contain 12,240 farms representing about 13 percent of all farms in the state at the time the sample was selected.[9/] The eight county study site occupies approximately 370,000 acres or about one-tenth of the total area of the state.

7/ The farm definition used to construct the WASS population list corresponds to that used by the USDA and the Census of Agriculture and includes a place producing and selling at least $1000 of agricultural products in a normal year.

8/ Those declining to be reinterviewed were compared to those who accepted on the basis of their responses to the 1983 Wisconsin Family Farm Survey. Statistical tests of the differences between means for important variables were conducted. The respondents and non-respondents were not different at the 95-percent confidence level. Characteristics similar in both groups included farm size (gross sales and crop acreage), age of operator, net cash farm income total household income, total assets, total debts, or net worth. Respondents and non-respondents were found to be significantly different only with respect to formal education. Respondents had completed an average of one year of formal education beyond that of non-respondents (Bentley and Saupe). Although not representative of all area farms in 1987, the survey remains representative of farms that had been in business in 1982 regardless of their status in 1987.

9/ The revised number of farms in the eight county region for 1982 was 12,290 as reported in the 1984 Wisconsin Agricultural Statistics published by the Wisconsin Agriculture Reporting Service.

State and study region comparisons reported in this section are based on 1982 data as reported in the above source unless otherwise indicated.

The geography of the area, primarily located in the driftless western upland region of Wisconsin, is defined most notably by its exclusion from the leveling forces of the most recent period of glaciation. The area is characterized by open and wooded hills with gentle to steep slopes.

to the statewide average of 201 acres. Due to the topography of the area, operators cultivated only 56 percent of their land (Bentley and Saupe). Operators in this region reported receipts from the sale of agricultural products 10 percent lower than the state average.

Five of the counties earned 20 percent or more of their average annual labor and proprietor income from farming and were rated "farming-dependent" by the USDA. Two other counties were considered "farming-important" with 14 percent of total income coming from farming. In this rural area, 38 percent of farm operators reported off-farm employment and 22 percent worked off the farm 200 days or more in 1987 (Census of Agriculture, 1987).

The importance of dairy production in the survey region corresponds to its importance statewide, representing 58 percent of cash receipts from farm marketings. About two thirds of the farms surveyed in this study were primarily engaged in dairy production. Field crops contributed about 15 percent to farm receipts in the region, closely comparable to the state average.

Labor Allocation Plans and Their Achievement

The labor allocation plans of the surveyed operators were recorded in the spring of 1983 and their experience evaluated in the spring of 1987. The 1983 survey included several questions regarding farm operator's plans for personal labor allocation between farm and off-farm alternatives. Operators indicated if they planned to devote all of their labor efforts over the following five year period to the operation of a farm business, if they planned to combine farming with an off-farm job, or if they planned to exit farming completely.

In order to identify characteristics associated with labor allocation goal achievement, sample firms were further grouped into those realizing stated plans and those not realizing plans by 1987. These groups were contrasted in an effort to distinguish family and firm characteristics which may explain variance in plan fulfillment among firms. A non-linear probability model of plan fulfillment was then specified and a binary dependent variable representing plan fulfillment evaluated with respect to selected characteristics of the household and farm enterprise.

In 1983, 62 percent of the 434 subjects that were interviewed in both surveys expressed plans to devote all of their labor efforts over the following five year period to the operation of a farm business. Twenty two percent expressed plans to combine farming with an off-farm job, (i.e. to be part-time farmers) and 16 percent expressed plans to exit farming completely.

In order to group operators according to labor allocation plans and to evaluate plan achievement, it was necessary to distinguish between full-time and part-time farming. Differences would have been obscured if essentially full-time farmers with incidental or trivial amounts of off-farm paid employment had been classified as part-time. Inspection of employment patterns in both the 1983 and 1987 surveys indicated that operators who worked off the farm three hours per week or less on average were employed in jobs that were likely not held for the purpose of supplementing farm income e.g. elected local government officials, cooperative board members, etc. Operators whose off-farm employment was greater than 156 hours per year were most often found to be employed in jobs judged more likely to be held for their monetary compensation.[10/] For the purpose of this analysis, part-time farming is distinguished from full-time farming if operators were employed more than 156 hours off the farm per year (approximately 3 hours per week per year).

Given the above distinction between part-time and full-time farming, observations were grouped by observed 1982 farm and off-farm labor allocation, planned farm and off-farm labor allocation over the following five years, and experience as observed in 1987 (Table 1). The responses of operators were first segregated into two groups on the basis of labor allocation as reported for 1982. The first group consisted of full-time farm operators who reported that operating and managing the farm business accounted for essentially all of their labor. The second group consisted of part-time operators who combined farming with an off-farm job or non-farm self-employment. Responses were further segregated on the basis of the operator's planned farm and off-farm allocation of labor over the five years between 1982 and 1987. The resulting groups were ultimately broken down by their experience as observed in 1987 (last three columns Table 1).

Descriptive Comparisons Three of the six groups so defined for 1983 are examined in this study including a) those operators that were operating farm businesses full-time in 1982 and who planned to continue to farm full-time over the following five years (n=251), b) those operators who were operating full-time in 1982 but planned to be out of farming within five years after the first survey (n=47), and c) those part-time operators in 1982 who planned to continue as part-time farmers (n=81).[11/]

The remaining groups were determined to have insufficient observations to allow for statistical analysis.

10/ Exceptions occurred in the cases of only two respondents. In both instances it was concluded that strict application of the 156 hour standard implied a change in status between years that was unjustified by the recorded responses.

11/ Studies describing the characteristics and experience of the 92 operators who had left farming by the spring of 1987 have been conducted by Saupe, and Bentley and Saupe.

Table 1. 1983 Labor Allocation Plans and Status in 1987.

Status and Plans in 1983	Total	Status in 1987: Full-Time	Part-Time	Exit
Full-Time Operators in 1982:	313	232	28	53
Planned Full-Time on Farm	251	205	20	26
Planned Part-Time on Farm	15	4	6	5
Planned Exit	47	23	2	22
Part-Time Operators in 1982:	121	15	67	39
Planned Full-Time on Farm	17	6	9	2
Planned Part-Time on Farm	81	7	50	24
Planned Exit	23	2	8	13

Source: 1983 and 1987 Wisconsin Family Farm Surveys.

The experience of those full-time operators who reported plans to continue full-time farming between 1982 and 1987 is of interest in identifying attributes associated with plan fulfillment. The difference observed between plans and outcomes for this group, especially considering the number who left farming, suggests that some significant distinction may have existed in 1983 between those 82 percent who remained full-time operators and those 10 percent who did not. Identification of characteristics associated with goal achievement would be useful to farm operators, extension agents and agricultural credit analysts.

The second group, made up of operators who were full-time farmers in 1982 and who planned to exit, is of particular interest because nearly half of the operators in this group did not carry through on their plans. Identification of characteristics that impede the movement of resources out of agriculture would be of interest.

The third group identified for further study, consisting of those who planned to remain part-time operators, may provide some insight into the role played by part-time farming in the long term plans of farm operators. The fact that nearly three quarters of the operators in this group fulfilled their plans suggests that part-time farming may be a stable, viable activity for farmers in this region.

Farm Household and Business Attributes

Within each of the three status and plan groups identified above, mean characteristics of those that achieved their labor allocation plans were compared to those that did not with respect to 20 household and farm business characteristics. The characteristics were selected based on the expected impact on the ability of the firm to respond to changing conditions, and are described in Table 2. The means of the attributes were tested for significant differences to help identify relatively important characteristics. Tables 3 through 5 report the results of the tests.

Full Time Farmers That Planned to Continue as Full-Time Farmers In Table 3 several contrasts are revealed between operators who carried out plans to continue farming full-time and those who had left farming by 1986. Those who carried out their plans to continue farming full-time were younger on average than those who left and they and their spouses had completed more years of formal education. The continuing full-time farm operators also had larger households, larger net cash farm income, and larger farms, whether measured by number of cows, value of total owned assets, or number of crop acres farmed. They also displayed more optimism toward goal achievement.

Those that planned to continue farming full-time but exited were not different regarding debt to asset ratio in 1982 than those who remained.

Full-time Farmers That Planned to Exit The distinction between those who fulfilled their plans to leave full-time farming and those who continued to farm full-time is less clearly demonstrated in the means of the characteristics selected for evaluation. Table 4 compares characteristics of those who followed through on plans to leave farming with those who remained. Those who fulfilled plans to leave farming had more formal education than those who remained and lived in a county with a lower regional unemployment rate. However, the two groups were not different in respect to other characteristics considered.

Part-Time Farmers that Planned to Continue Part-Time In Table 5 those who fulfilled plans to continue farming part-time are compared with those who exited. Those who realized their plans to continue farming part-time were found to have completed more years of formal education and to have greater total assets than those who left farming. They also reported a smaller percentage of gross sales from dairy as compared to those who did not fulfill plans to continue farming part-time.

Table 2. Characteristics of the Farm Household and Business That Were Expected to Affect Plan Fulfillment.

Age of the Operator

Years of Formal Education Completed by the Operator

Years of Formal Education Completed by the Spouse
Hours of Vocational Training Completed by the Operator

Hours of Vocational Training Completed by the Spouse

Hours of Off-Farm Wage Work Performed by the Operator

Hours of Off-Farm Wage Work Performed by the Spouse
Number of Children in the Household Less than 16 years

Total Household Size
Number of Dairy Cows on the Farm

Percent of Gross Sales Earned From Dairy Production
Number of Crop Acres Cultivated
Value of Non-Farm Assets Owned by the Household

Total Household Assets
Net Cash Farm Income

Total Off-Farm Wage Income of the Household
Debt to Asset Ratio

Return on Assets
Weighted Average Regional Unemployment Rate
Optimism of the Operator Toward Goal Achievement (1 if operator thought there was a greater than 50 percent chance of achievement, 0 otherwise)

Table 3. Characteristics in 1982 of Full-Time Operators Who Planned to Continue Farming Full-Time.

	Were Full-Time in 1986 (n=205)	Had Exited by 1986 (n=26)		
	MEAN	MEAN	t	
AGE OF THE OPERATOR	45.57	55.00	-3.439	***
OPERATOR EDUCATION	11.54	10.23	2.252	***
SPOUSE EDUCATION	12.28	11.17	2.582	***
OPERATOR VOC. TRAINING	19.61	7.54	1.391	
SPOUSE VOC. TRAINING	1.23	1.31	-0.086	
WAGE WORK OFF-FARM (OP.)	4.58	1.31	0.823	
WAGE WORK OFF-FARM (SP.)	543.26	264.15	2.407	***
NUMBER OF CHILDREN (<16)	1.15	0.69	2.077	***
HOUSEHOLD SIZE	3.91	2.85	3.875	***
NUMBER OF COWS	39.59	25.54	2.852	***
% GROSS SALES FROM DAIRY	0.68	0.56	1.343	
CROP ACRES CULTIVATED	195.49	119.89	3.550	***
NON-FARM ASSETS	21764.23	34191.15	-0.837	
TOTAL HOUSEHOLD ASSETS	382612.67	300206.21	1.907	**
NET CASH FARM INCOME	20084.41	10592.18	1.992	***
TOTAL OFF-FARM WAGE INCOME	5160.20	5248.71	-0.064	
DEBT TO ASSET RATIO	0.23	0.18	0.838	
RETURN ON ASSETS	0.06	0.04	1.385	
REGIONAL UNEMPLOYMENT RATE	0.07	0.07	1.346	
OPTIMISM (1 IF > 50%)	0.71	0.39	3.146	***

Source: 1983 and 1987 Wisconsin Family Farm Surveys.

** Significant at the 90% level.
*** Significant at the 95% level.

Table 4. Characteristics in 1982 of Full-Time Operators Who Planned to Exit Farming.

	Were Full-Time in 1986 (n=23)	Had Exited by 1986 (n=22)	
	MEAN	MEAN	t
AGE OF THE OPERATOR	62.30	60.77	0.473
OPERATOR EDUCATION	8.70	10.32	-2.146 ***
SPOUSE EDUCATION	10.67	11.59	-1.129
OPERATOR VOC. TRAINING	0.00	1.09	-1.000
SPOUSE VOC. TRAINING	0.00	0.14	-0.997
WAGE WORK OFF-FARM (OP.)	1.30	0.00	1.000
WAGE WORK OFF-FARM (SP.)	605.35	372.73	0.779
NUMBER OF CHILDREN (<16)	0.13	0.36	-1.285
HOUSEHOLD SIZE	2.74	2.50	0.673
NUMBER OF COWS	25.35	17.23	1.448
% GROSS SALES FROM DAIRY	0.60	0.44	1.339
CROP ACRES CULTIVATED	121.74	93.36	1.309
NON-FARM ASSETS	46599.48	30915.36	0.810
TOTAL HOUSEHOLD ASSETS	269531.89	248780.98	0.478
NET CASH FARM INCOME	17722.81	14137.24	0.510
TOTAL OFF-FARM WAGE INCOME	9703.13	7290.95	0.942
DEBT TO ASSET RATIO	0.07	0.10	-0.666
RETURN ON ASSETS	0.06	0.04	1.189
REGIONAL UNEMPLOYMENT RATE	0.07	0.06	1.668 **
OPTIMISM (1 IF > 50%)	0.56	0.50	0.428

Source: 1983 and 1987 Wisconsin Family Farm Surveys.

** Significant at the 90% level.
*** Significant at the 95% level.

Table 5. Characteristics in 1982 of Part-Time Operators Who Planned to Continue Part-Time.

	Were Part-Time in 1986 (n=50)	Had Exited by 1986 (n=24)		
	MEAN	MEAN	t	
AGE OF THE OPERATOR	48.30	46.80	0.57	
OPERATOR EDUCATION	13.30	11.90	2.08	***
SPOUSE EDUCATION	13.10	12.30	1.45	
OPERATOR VOC. TRAINING	25.10	9.10	1.11	
SPOUSE VOC. TRAINING	3.20	2.40	0.34	
WAGE WORK OFF-FARM (OP.)	1697.00	1682.00	0.08	
WAGE WORK OFF-FARM (SP.)	1300.00	856.00	2.44	
NUMBER OF CHILDREN (<16)	1.06	1.00	0.20	
HOUSEHOLD SIZE	4.18	3.92	0.58	
NUMBER OF COWS	11.02	13.33	-0.46	
% GROSS SALES FROM DAIRY	0.23	0.43	-1.79	**
CROP ACRES CULTIVATED	88.92	82.30	0.31	
NON-FARM ASSETS	23298.00	18977.00	0.37	
TOTAL HOUSEHOLD ASSETS	244395.00	180854.00	1.70	**
NET CASH FARM INCOME	576.70	917.00	-0.10	
TOTAL OFF-FARM WAGE INCOME	28497.00	25033.00	0.83	
DEBT TO ASSET RATIO	0.20	0.20	-0.08	
RETURN ON ASSETS	0.01	0.05	-0.98	
REGIONAL UNEMPLOYMENT RATE	0.07	0.07	0.60	
OPTIMISM (1 IF > 50%)	0.66	0.58	0.62	

Source: 1983 and 1987 Wisconsin Family Farm Surveys.

** Significant at the 90% level.
*** Significant at the 95% level.

Estimated Models of Plan Fulfillment

A probit analysis was made to evaluate the impact of household and business attributes on the probability of observing plan fulfillment in the sample. A binary dependent variable representing goal achievement or non-achievement was specified for each of three groups; (a) those full-time operators planning to continue to farm full-time, (b) those full-time operators who planned to leave farming, and (c) those part-time operators who planned to continue farming part-time. This binary dependent variable was

regressed on characteristics of the farm household and business that were hypothesized to affect the firm's ability to fulfill plans. A non-linear probability model was employed to accommodate the binary nature of the dependent variable.

Definition of Variables It was expected that the probability of achieving labor allocation plans was a function of a number of explanatory variables reflecting human capital characteristics and business attributes of the household and firm. A description of the variables used in the probit analysis is presented in Table 6.

Estimated Model of Plan Fulfillment for Full-Time Farmers Planning to Continue Full-Time The group of 251 full-time operators who in 1983 reported plans to continue farming full time averaged slightly over 46 years of age, had an average of 27 years of farm operating and management experience, operated farms of 190 crop acres and earned $19,061 net cash farm income. They reported total household income of $29,694 in 1982 and total assets of $378,740. Average household size for this group was 3.7 members.

In descriptive Table 3, it was shown that operators who would fulfill plans to continue farming full time were significantly different from those who would exit on the basis of age, education, number of children in the household, farm size, and degree of optimism shown toward plan achievement. In order to evaluate the effect of several of these household and business characteristics on the likelihood of achieving plans to continue full-time farming, a multivariate probit model was estimated. It was hypothesized that a model of plan achievement for the group of 251 full-time operators who planned to continue farming full-time could be specified as follows:

$$\begin{aligned} \text{ACHIEVE} = \; & B_{io} + B_{i1}\,\text{EDUCATION} + B_{i2}\,\text{TRAINING} \\ & + B_{i3}\,\text{CHILDREN} + B_{i4}\,\text{ILLNESS} + B_{i5}\,\text{OUTLOOK} \\ & + B_{i6}\,\text{GROSS SALES} + B_{i7}\,\text{DAIRY DUMMY} + B_{i8}\,\text{PARTNERSHIP} \end{aligned}$$

It was anticipated that the ability of operators to follow through on labor allocation goals was closely tied to the formal educational background of the operator. The amount of vocational training completed by the operator was also expected to improve the operator's capacity to fulfill labor allocation goals. Job skills and access to information about employment opportunities were assumed to be tied to the level of education and training attained. Both formal and vocational education were expected to affect the operator's ability to obtain off-farm work as well as improve farm management capabilities thereby enhancing the probability of fulfilling plans.

The number of household members under the age of 16 was assumed to make financial and other demands on household resources. These demands were expected to negatively impact the household's ability to respond to changing circumstances and decrease the operator's ability to follow through on labor allocation plans.

Table 6. Variables Included in Probit Analysis.

Variable	Description	Units
ACHIEVE	Binary Dependent Variable = 1 if respondents fulfilled plans as reported in 1983, 0 otherwise.	1, 0
Human Capital Characteristics		
AGE	Operator's age	years
AGE SQ	Operator's age squared	years
CHILDREN	Number of household members under the age of 16	number
EDUCATION	Dummy variable: 1 if operator reported completion of at least 12 years of education, 0 otherwise	1, 0
ILLNESS	Number of weeks of work limiting illness or injury reported by operators in 1982	weeks
OP HOURS OFF	Number of hours operator spent working in self or wage employment off the farm	hours
OUTLOOK	Dummy variable: 1 if operator viewed likelihood of success in labor allocation greater than 50 percent, 0 otherwise	1, 0
TRAINING	Number of hours of vocational training completed prior to 1983 survey	hours
Business Characteristics		
DAIRY DUMMY	Dummy variable: 1 if dairy production represents at least half of gross sales, 0 otherwise	1, 0
D/A RATIO	Debt to asset ratio of the farm household	proportion
GROSS SALES	Gross farm sales of agricultural products	dollars
PARTNERSHIP	Dummy variable: 1 if business organized as a partnership, 0 otherwise	1, 0
TOTAL ASSETS	Value of all assets owned by the farm household	dollars

The number of weeks of work limiting illness or injury reported by operators in 1982 was expected to reduce the probability of fulfilling plans. The number of weeks of illness reported in 1982 was taken as an indicator of possible future work limiting conditions. Although farm operators undoubtedly incorporate health status in their labor allocation plans, apparently temporary or non-chronic conditions noted in 1982 were considered to be indicators of future limitations unanticipated by the operator.

It was reasoned that, controlling for other business and household attributes, the optimism expressed by the operator reflected important unmeasured variables such as entrepreneurial skills. It was expected that the degree of expressed optimism would increase the probability of plan achievement.

Gross farm sales was included in the model as a proxy for firm size. It was hypothesized that the size of the firm was positively related to the probability of fulfilling plans for two reasons. First, the management of larger farms requires a greater commitment of time, ceteris paribus, providing a stable employment opportunity. Saupe and Gould found that in the Wisconsin study area, the larger the farm operated, the greater the number of total farm hours worked regardless of off-farm work status (Saupe and Gould, p. 14). The second reason to believe that farm size affects the probability of carrying out labor allocation plans is given by evidence that larger farms fare better in crises than smaller one (Lines, Gineo). This may be due to the greater resources of larger farms which provide the firm a buffer against the effects of short term adversity.

The dairy dummy was included as a proxy for farm type. It was anticipated that the type of farm operated influences success in fulfilling plans to farm full-time because of the varying labor requirements and price cycles of different commodities. Dairy production, for example, demands a relatively greater commitment of labor and therefore limits off-farm work opportunities. In 1982, 78 percent of respondents operating dairy farms in the study area reported no off-farm work, while only 47 percent of operators managing non-dairy farms reported no off-farm employment (Saupe and Salant, p. 4).

Dairy production was also characterized by high capital investment which lends an inertia to its production cycle. This high capital investment makes it difficult to quickly alter the productive mix of dairy farms, especially in times of crisis when the resale value of highly specific assets may be declining. The difficulty of liquidating large capital investments unique to dairy production in times of crisis was expected to dampen the response of dairy producers to changing economic circumstances. Dairy production was expected to be positively associated with plan fulfillment.

Partnerships were distinguished from single owner manager farms in order to take account of the increased management capacity they were assumed to possess. Greater financial flexibility was also assumed to be gained by the presence of multiple owners, increasing the probability of plan achievement.

The results of the probit model estimated for full-time farmers planning to continue are presented in Table 7. A significant amount of explanatory power is suggested with a chi-squared value of 15.52.[12/] However, the model performed poorly in predicting non-fulfillment. The estimated coefficients of the explanatory variables are of the expected sign with the exception of ILLNESS. Although insignificant at conventional levels, illness was expected to decrease the probability of fulfilling plans to continue farming full time. This result may be attributable to a low observance of work limiting health conditions among the 251 full-time farm operators who planned to continue full-time farming. It is also possible that the definition of the dependent variable confers full-time status on operators who were otherwise unable to retain an off-farm job due to disability.

The estimated coefficient of the probit model indicates a negative relationship between the number of children in the average household and the probability of fulfilling plans to continue full-time farming. The results of the probit analysis suggest that an increase of one percent in the average number of children in sample households would decrease the likelihood of study operators achieving plans to continue farming full-time by approximately .07 percent.

The size of the farm operated also appears to be related to plan fulfillment. An increase by one percent in the average level of gross farm sales of sample farms would be expected to increase the likelihood of continuing in full-time farming by .11 percent. The dummy variable representing farm type was found to significantly influence plan fulfillment.

The level of optimism expressed by the operator toward the probability of fulfilling plans also seemed to be weakly associated with success, although the coefficient was not statistically significant. The relationship between optimism and the probability of fulfilling plans may acknowledge the contribution of some latent variable such as entrepreneurship. A positive feeling toward management proficiency and conviction regarding the reasonableness of stated goals may have tangible effects on performance and outcome. Alternatively, the observed effect of optimism may simply suggest the existence of explanatory variables omitted in the specification of the model.

The failure of vocational education to demonstrate a significant impact on plan achievement may be due to the type of vocational training in which the operator participated. It may also be that skills training, while not necessarily directed toward off-farm employment, enhanced operators' off-farm employment opportunities as much as it improved their on-farm proficiency. The contradictory effects of vocational training may have been offsetting in this group.

12/ The correct classification of 81.7 percent represents the cases of plan fulfillment. However, the remaining cases of non-fulfillment were all incorrectly predicted to be cases of fulfillment. Several alternative specifications of the model were considered, but results were not improved.

Table 7. Estimated Probit Coefficients for Full-Time Operators Planning to Continue (N=251).

Independent Variable	Expected Sign	Units	Mean	Estimated Coefficient	Standard Error	Marginal Impacts	Elasticity
INTERCEPT				0.2148	0.2253		
GROSS SALES	+	$	72664	2.984E-06[c]	0.298E-05	7.446E-07	0.1107
DAIRY DUMMY	+	0, 1	0.8446	0.3947[c]	0.2431		
PARTNERSHIP	+	0, 1	0.1673	0.1681	0.2845		
CHILDREN	-	#	1.2072	-0.1225[b]	0.0645	-0.0306	-0.0755
ILLNESS	-	weeks	2.4343	0.0007	0.0092	0.0002	0.0008
EDUCATION	+	0, 1	0.7171	0.2196	0.2194		
TRAINING	+	hours	16.876	0.0018	0.0024	0.0004	0.0154
OUTLOOK	+	0, 1	0.6813	0.2224	0.2058		
Log-Likelihood:			-111.79				
Chi-Squared (D.F.)			15.52				
Percent Predicted Correctly							
Entire Sample:			81.7				
ACHIEVE = 0 (n=46)			0				
ACHIEVE = 1 (n=205)			100.0				

Note: The superscript "a" denotes significance at the .05 level, "b" denotes significance at the .10 level, and "c" denotes significance at the .20 level.

ACHIEVE is a dummy variable equal to 1 if operator fulfilled plans to continue farming full-time, 0 otherwise.

Finally, structuring the farm as a partnership failed to exhibit significant contributions to the explanation of success in achieving plans to continue farming full time. It appears that during this period of agricultural crisis, operators who structured their farms as partnerships enjoyed no distinct advantage over sole proprietor farms.

Estimated Model for Operators Planning to Exit Full-Time Farming

The group of operators that reported plans to exit over the five years following the 1983 survey averaged 62 years of age, had an average of 37 years of farm management experience, managed farms of 108 crop acres and earned $15,970 net cash farm income. Total household income for those full-time farmers planning to exit was $32,973. These farm operators reported $259,390 in total assets and a relatively low debt of $21,917. Average household size for this group was 2.6 members.

It was noted earlier in Table 4 that of the 45 full-time farmers who planned to exit in 1983, those that would exit by 1987 were similar in many respects to those who would remain. The only conspicuous difference detected in 1983 was in the level of formal education completed by the operator, the number of dairy animals on the farm, and the unemployment rate in the community.

The characteristics measured in 1983 portray the group of full-time operators planning to exit largely as prospective retirees. The fact that approximately half of those planning to exit full-time farming failed to fulfill their plans may indicate that this group was not as homogeneous as the attribute means might suggest. In order to evaluate the effects of several household and business attributes on the likelihood of plan achievement a multivariate probit model was estimated.

The model estimated for operators planning to exit was different from that estimated for those planning to continue farming full-time in two respects. First, the age of the operator (AGE) was included in order to account for differences in the motivation and obstacles operators may have in exiting farming. Many of those planning to leave farming were older and probably motivated by a desire to stop working. Those wishing to retire faced the task of converting their capital assets into passive income streams to provide a sufficient retirement income, or into cash for debt payment. In times of low capital asset values, prospective retirees may decide to remain in agriculture awaiting higher asset resale values in the future. Alternatively, younger operators who are typically found to hold greater debt may find the return in farming insufficient to cover their debt service obligations (Salant et al.). These operators may plan to leave farming in order to meet their obligations or to avoid being forced off the farm in default proceedings.

Age is included in the model to account for differences in the ability of younger and older operators to secure desired off-farm employment. Older farmers not of retirement age may find the entry level off-farm job market less accessible than younger operators. Increasing age was therefore hypothesized to be negatively associated with fulfilling plans to exit farming for younger operators. For operators who planned to retire upon exit (i.e.

not seek off-farm employment), age was expected to be positively associated with plan realization. The age variable was included in the model with its square (AGE SQ.) in order to allow for this change in the direction of effect.

The second modification made in the model previously estimated was the substitution of TOTAL ASSETS as a proxy for farm size. TOTAL ASSETS replaces GROSS SALES as a farm size proxy because TOTAL ASSETS are reasoned to provide a better measure of the resources available for conversion to self-employment or retirement income. It was hypothesized that greater holdings of capital assets increase the feasibility of retirement for older operators wishing to exit, and transfer to non-farm related employment for young farmers.

The results of the probit analysis described for 45 full-time operators planning to exit are presented in Table 8. A significant amount of explanatory and predictive power is demonstrated with a Chi-Square value of 13.228 and a correct classification of 68.9 percent. The estimated coefficients are of the expected sign with the exception of OUTLOOK. An increase in the proportion of operators reporting an optimistic outlook in 1983 was estimated to decrease success in leaving the farm business. The likelihood of fulfilling plans to exit farming was also decreased for dairy farms.

The likelihood of fulfilling plans to exit farming was increased by having at least a high school education. This result is consistent with the findings of Gould and Saupe who note that years of formal education are positively associated with the probability of off-farm work and with the wage rate received by farm spouses.

The number of weeks of work limiting illness suffered by the operator in 1983 was seen to increase the likelihood of carrying through on plans to exit. An increase of one week in the mean number of weeks of disability observed in the sample (9.33) would be expected to increase the occurrence of exit by .15 percent.

Estimated Model for Part-Time Farmers Planning to Continue Part-Time The final group chosen for econometric analysis was that of 74 part-time farmers who planned to continue combining farm and off-farm work in their production strategy. The earlier comparison in Table 5 of the characteristics of these operators indicated formal education, gross sales from dairy, and total assets were the only characteristics for which the means differed significantly between the two groups.

Operators who reported plans to continue part-time farming over the five years following the 1983 survey were similar in age (47.8) to those who planned to continue in full-time farming (46.3) and younger than those who planned to leave full-time farming (61.5). Operators in this group managed farms averaging 87 crop acres, earned $687 (Std. Dev., $17,328) in net cash farm income and reported total household income of $31,998. They held $223,790 in total assets and $45,317 in debts. Average household size for this group was 4.8 members.

Table 8. Estimated Probit Coefficients for Full-Time Operator's Planning to Exit (N=45).

Independent Variable	Expected Sign	Units	Mean	Estimated Coefficient	Standard Error	Marginal Impacts	Elasticity
INTERCEPT				3.5103	5.047		
TOTAL ASSETS	+	$	25940	5.968E-07	0.171E-05	2.378E-07	0.1261
D/A RATIO	+	prop.	0.0850	1.4185	2.256	0.5651	0.0977
DAIRY DUMMY	-	0, 1	0.6444	-1.0478[b]	0.5827		
PARTNERSHIP	+	0, 1	0.2000	0.5733	0.5820		
AGE	-	years	61.6	-0.1442	0.1483	0.0097	1.2251
AGE SQ.	+	years		0.0014	0.0012		
ILLNESS	+	weeks	9.3333	0.0192[c]	0.0124	0.0077	0.1462
EDUCATION	+	0,1	0.3333	1.1881[a]	0.5953		
TRAINING	+	hours	0.5333	0.1854	12.3419	0.0738	0.0806
OUTLOOK	+	0, 1	0.5333	-0.5829[c]	0.4510		
Log-Likelihood:			-24.566				
Chi-Squared (D.F.)			13.228				
Percent Predicted Correctly							
Entire Sample			68.9				
ACHIEVE = 0 (n=23)			73.9				
ACHIEVE = 1 (n=22)			63.6				

Note: The superscript "a" denotes significance at the .05 level, "b" denotes significance at the .10 level, and "c" denotes significance at the .20 level.

ACHIEVE is a dummy variable equal to 1 if operator fulfilled plans to exit full-time farming, 0 if they remained full-time.

The fact that approximately one-third of those planning to continue in part-time farming failed to fulfill their plans may indicate that this group, like those planning to exit full-time farming was not as homogeneous as a simple comparison of attribute means might suggest. A multivariate probit model was again specified in order to more systematically evaluate the possible differences in household and business attributes and their effects on those planning to continue in part-time farming. A model similar to that estimated for those planning to exit was specified for this group, with the addition of the number of hours spent in off-farm work, either for wages or in self employment (OP HOURS OFF), added as a proxy for familiarity with the off-farm labor market. It was hypothesized that the more involvement operators had in the off-farm labor market, the closer they were to shifting completely out of the farming business.

The hypothesized effect of each explanatory variable and results of the probit analysis for part-time farmers planning to continue in that strategy are presented in Table 9. Once again a significant amount of explanatory power is demonstrated with a Chi-Square value of 14.555 and a correct classification of 73.0 percent of the entire sample. The estimated coefficients were of the expected sign with the exception D/A RATIO and PARTNERSHIP, although neither of these coefficients was significant. The importance of dairy production was negatively associated with maintaining a part-time farm.

The size of the farm, as measured by total assets, contributed significantly to the likelihood of maintaining a part-time farm. A one percent increase in the average value of total assets is estimated to increase continuation part-time farming by .24 percent.

The age of the operator also contributed to the likelihood of fulfilling plans to continue in part-time farming. Below the age of 53, increases in age contribute positively to the probability of fulfilling plans. After the age of 53, increases in age reduce that probability. An increase of one year (2.09 percent) in the average age of operators in the sample can be expected to increase the observation of success in fulfilling plans to continue part-time farming by .84 percent.

Summary and Conclusions

The probit model for full-time farmers planning to continue identified several household and business attributes associated with the probability of fulfillment.

The size of farm, measured by gross sales, was found to affect the probability of continuing to farm full time. Since the residual cash flow required for family consumption represents a smaller proportion of gross sales for larger farms, these farms may have been more resilient when confronted with declining commodity prices. Larger farms may also provide greater flexibility in adjusting production while operators of smaller farms may have been required to supplement farm income with off-farm employment.

Table 9. Estimated Probit Coefficients for Part-Time Operators Planning to Continue (N=74).

Independent Variable	Expected Sign	Units	Mean	Estimated Coefficient	Standard Error	Marginal Impacts	Elasticity
INTERCEPT				-4.5484[c]	2.9017		
TOTAL ASSETS	+	$	223800	2.053E-06[c]	0.133E-07	7.074E-07	0.2343
D/A RATIO	-	prop.	0.2025	0.1824	1.1032	0.0629	0.0188
DAIRY DUMMY	-	0, 1	0.3378	-0.8147[c]	0.4304		
PARTNERSHIP	+	0, 1	0.0811	-0.1567	0.6707		
AGE	+	years	47.8	0.1805[c]	0.1209	0.0057	0.4040
AGE SQ.	-	years		-0.0017[c]	0.0013		
ILLNESS	-	weeks	3.4865	-0.0083	0.0140	-0.0029	-0.0147
EDUCATION	+	0, 1	0.8378	0.5927	0.4763		
TRAINING	+	hours	19.9189	0.0008	0.0038	0.0003	0.0077
OFF-FARM HOURS	-	hours	1692	-0.0002	0.0003	-0.0001	-0.2131
OUTLOOK	+	0, 1	0.6351	0.4341	0.3472		
Log-Likelihood:			-39.439				
Chi-Squared (D.F.)			14.555				
Percent Predicted Correctly							
Entire Sample:			73.0				
ACHIEVE = 0 (n=24)			41.7				
ACHIEVE = 1 (n=50)			88.0				

Note: The superscript "a" denotes significance at the .05 level, "b" represents significance at the .10 level, and "c" represents significance at the .20 level.

ACHIEVE is a dummy variable equal to 1 if operator fulfilled plans to continue farming full-time, 0 if they exited.

Farm type was also found to affect the probability of fulfilling plans to continue farming full-time. Farms receiving fifty percent or more of their gross sales from the sale of dairy products were more likely to continue providing full-time employment for the operator. The positive impact attributed to dairy production may have been due to the benefits of favorable dairy price support levels and relative profitability during the study period. Although milk prices fell gradually between 1982 and 1987, returns to dairy production responded to the agricultural recession more slowly than returns to grain production (Bentley and Saupe).

The value of dairy producing assets declined over the study period and may have discouraged some full-time operators from exiting. Dairy farms in the eight county study area were 17 percent larger than non-dairy farms in 1982 as measured by total market value of farm land and buildings (Salant, Saupe, and Belknap). The value of farm land with improvements, which represents by far the largest component of total farm assets, fell by an average of approximately 32 percent in the study area over the four years between surveys. In three counties land values fell by over 40 percent, and in one, by 49 percent.

The number of children in the household was seen to negatively affect the likelihood of fulfilling plans to maintain a full-time farm. Children make claims on both time and financial resources and increase the family consumption requirement.

Estimation of the model specified for full-time operators planning to exit also identified farm type as a factor explaining variance in plan fulfillment. The loss in agricultural asset values may help to explain the failure of many dairy farmers to carry through on plans to leave farming. The negative impact of dairy production on the probability of exit may also be due to favorable prices relative to the return on other crops over the study period.

Education was found to significantly increase the probability of fulfilling plans to exit from full-time farming.[13/] The negative impact of operator optimism on the likelihood of fulfilling plans to exit may reflect the unexpected sharp decline in land value experienced in the mid-1980's. Many farmers who had been optimistic about plans for retirement were frustrated by the loss in asset value and found themselves unable to afford retirement.

The probit model specified for part-time farmers planning to continue part-time identified age as a significant contributor to plan fulfillment. Age positively affects the likelihood of realizing plans to continue farming part-time for younger operators and negatively affects such plans for older farmers. The mean age of the sample operators in 1983 (approximately 48) was below that at which increases in age begin to negatively affect the

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13/ Education was also associated with the probability of fulfilling plans to continue farming full-time, although not above the 75 percent level of confidence.

probability of success (approximately age 53). It appears that as the population of part-time farm operators in the study area grows older on average, the benefits associated with experience and smaller households may be overcome by difficulties finding and maintaining off-farm employment.

The negative effect of dairy production on the likelihood of continuing in part-time farming may be due to dairy production's time requirements. Because of rigidity in the labor input requirements of dairy production, part-time dairy operations appear to represent an unstable, transitory state between full-time production and exit.

Farm size, measured by total assets, was found to be positively associated with the probability of fulfilling plans to continue farming part-time. The importance of farm size to the maintenance of a part-time farming operation may be attributable to economies of size in agriculture.

It should be emphasized that the estimated effects discussed above of various household and business attributes on labor allocation plans are based on a study period characterized by severe financial stress in agriculture. While these circumstances result in an interesting period for study, the more typical effect of some of the attributes may have been masked by the farm crisis.

Bibliography

Bentley, Susan and William Saupe, "Exits From Farming in Southwestern Wisconsin From 1982-86" Unpublished Manuscript, USDA-ERS, 1989.

Gineo, Wayne M., Boris E. Bravo-Ureta, and James J. Wadsworth, "Financial Stress in Dairy Farming: Evidence from New England", Scientific Contribution No. 101, Storrs Agricultural Experiment Station, University of Connecticut, Storrs.

Gould, Brian W. and William E. Saupe, "Off-Farm Labor Market Entry and Exit", Amer. J. Of Agr. Econ., 71:4 (1989).

Gould, Brian W., William E. Saupe, and Richard M. Klemme, "Conservation Tillage: The Role of Farm and Operator Characteristics and the Perception of Soil Erosion" Land Economics 65:2 (1989).

Lines, Allan E. and Mitchell Morehort, "Financial Health of U.S. Farm Businesses in 1984: A region, Type, and Size Analysis", Agricultural Finance Review, 47(1987).

Salant, Priscilla, William Saupe and John Belknap, "Highlights of the 1983 Wisconsin Family Farm Survey" College of Agriculture and Life Sciences, University of Wisconsin-Madison, 1984.

Sanford, Scott, Luther Tweeten, Cheryl Rogers and Irving Russell, "Origins, Current situation and Future Plans of Farmers in East Central Oklahoma", Agricultural Research Center, Langston University, Research Report No. P-861, (Nov. 1984).

Saupe, William, and Brian Gould, "Multiple Job Holding Among Farm Families: Results from the Wisconsin Family Farm Surveys" Staff Paper No. 289, Department of Agricultural Economics, University of Wisconsin-Madison, June 1988.

Saupe, William, and Priscilla Salant, "Combining Farm and Off-Farm Employment as a Farm Management Strategy", in Managing the Farm, 18:7 (Nov., 1985).

Van Kooten, G. C., Richard A. Schoney, and Keith A. Hayward, "An Alternative Approach to the Evaluation of Goal Hierarchies Among Farmers" W. Jour. of Agric. Econ. 11:1 (July 1986).