

## The Influence of Financial, Production, and Operator Characteristics on Dairy Farm Transfer Plans

By Christopher A. Wolf

### Abstract

The farm transfer plans of dairy farms were examined. Operator age, specialization in the dairy enterprise, and owner equity were all positively and significantly related to farm transfer plans. The larger, more financially sound, and successful farms were much more likely to have formal farm transfer plans.

The typical life-cycle of a farm involves growth in size and income through investment at younger farm operator ages followed by disinvestment nearing retirement. This disinvestment may involve a transfer to a new generation or a farm exit. Standard farm management education, either through classroom or extension work, focuses on the normative "optimal" farm transfer (e.g., Kay and Edwards). Research in agricultural economics has not often verified or examined actual farm behavior with empirical studies (Gale examines US Census of Agriculture data; Kimhi, and Kimhi and Nachlieli examine transfer in Israeli farms; Glaubien, Tietje, and Weiss examine empirical evidence from Austrian farms). Examination of farm transfer, and farm characteristics related to farm transfer, facilitates industry strategic planning as well as guiding educational and business programs.

The long-term trend in the dairy farm industry has been toward fewer, larger farms for a century or more. However, recent years have seemingly witnessed an acceleration of this trend. Total U.S. dairy farms with \$1,000 or more of sales declined from 213,961 in 1978 to 96,546 in 1997 - a decline of 55 percent (Table 1). Michigan saw dairy farm numbers decline by 4,586 (-56%) over the same period. Most of the decline in herd numbers came from the smaller herd size categories as many small herds either expanded to a larger size category or exited. Meanwhile, growth in number of dairy herds with 500 or more cows grew by 125 percent (1978 to 1987) followed by 333

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percent (1987 to 1997) in Michigan. Those impressive growth rates are largely a function of the small initial number of farms in this size category. Note, however, that the 200 - 499 cow herd size category also grew quickly reflecting the trend to larger dairy herds.

Farm investment and transfer are important considerations driving structural change. Dairy farm operations require large capital investments in facilities and breeding livestock. Often these investments take future generations and farm transfer into consideration. Past research indicates that farm size, income, specialization, and operator education are important considerations affecting the farm transfer decision (Kimhi; Kimhi and Nachlieli; Glauben, Tietje, and Weiss). A survey of the Michigan dairy farm industry was implemented in 1999 to assess, among other factors, the current industry conditions and future plans of dairy farmers. These data allow an assessment of the influence of these farm and operator characteristics on farm transfer plans.

The purpose of this article is to examine whether, and how, farm transfer plans were affected by farm production, financial, organizational, and operator characteristics. As expected, the study finds that farm retirement and transfer plans were increasingly common as the age of the primary farm operator increased. Larger and more financially successful farms were more likely to have farm transfer plans.

*Table 1. Number of dairy farms by herd size, 1978-1997.*

	Herd Size (cows)					Total
	< 50	50-99	100-199	200-499	500+	
Michigan						
1978 dairy farms	5362	2098	661	75	4	8200
1987 dairy farms	3091	1723	791	141	9	5755
1997 dairy farms	1605	1048	714	208	39	3614
US						
1978 dairy farms	149,484	48,144	12,156	3334	843	213,961
1987 dairy farms	89,740	48,315	14,837	4253	1267	158,410
1997 dairy farms	43,348	33,472	12,602	4880	2244	96,546

Source: US Department of Agriculture. *Census of Agriculture: 1978, 1987, and 1997.*

## Data

In 1999, surveys were sent to 1,500 dairy farmers selected randomly by the Michigan Agricultural Statistical Service.<sup>1</sup> This survey requested information on farm size, management practices and issues, operator profiles, expected changes in future herd size, management characteristics, as well as financial and other economic data. The 458 respondents, representing a 30.5% response rate, included 323 active dairy farmers, 70.5% of respondents, and 135 inactive farmers, 29.5% of respondents.

The average farm had a milking herd size of 163 cows (Table 2). The average respondent operated 664 acres and derived 83 percent of their revenues from the dairy enterprise. The average farm operator was fifty-four years old with some college education. The average net farm income for 1998, an exceptional farm milk price year, was \$126, 235. Average owner equity was 71 percent.

The Michigan dairy farm respondent age distribution was dominated by older farm operators (Table 3). Nearly 60 percent

*Table 2. Summary statistics.*

Variable	All farms	Retire			
		(< 10 years)	Not retire	Transfer farm	No transfer
Herd size (cows)	163 (244) <sup>1</sup>	137 (112)	165 (180)	221 (399)	107 (80)
Acres Operated	664 (538)	628 (360)	656 (489)	795 (741)	546 (321)
Operator Age	54 (12.1)	60 (10)	48 (11)	62 (8.9)	55 (10.8)
Operator Education (years)	14 (2.9)	13 (2.8)	15 (3.0)	15 (3.0)	14 (2.8)
Specialization <sup>2</sup> (%)	83 (13.1)	82.5 (14.3)	83.3 (11.9)	83.4 (13.6)	80.4 (15.0)
Families <sup>3</sup> (#)	1.7 (0.9)	1.9 (1.0)	1.6 (0.8)	2.1 (1.1)	1.5 (0.8)
Net farm income (\$)	126,235 (284,329)	107,333 (175,049)	146,343 (361,002)	158,428 (249,444)	62,870 (83,198)
Equity (%)	71 (29)	75 (26)	67 (28)	72 (26)	79 (25)
Family draw (\$)	32,900 (33,062)	33,145 (35,074)	32,038 (29,816)	38,913 (37,893)	30,658 (34,610)
Observations <sup>4</sup> (#)	323	142	149	89	61

1. Values in parentheses are standard deviations.

2. Specialization is the percent of farm revenues derived from the dairy enterprise.

3. Families refers to the number of families drawing income from the farm business.

4. As the respondents had the option to decline to answer specific questions, the number of observations varies by question.

of all dairy operators surveyed were over the age of fifty. In 1999, dairy operators over sixty years of age represented the largest age category, while those operators under 30 years of age represented the smallest category, comprising only 1.1% of farms.

The survey inquired about whether the operator planned to retire in the next ten years. If so, the farm transfer plans were elicited. Table 3 displays the percentage of respondents planning to retire in the next ten years and whether or not they plan to transfer the farm to the next generation. The most critical future plans to determining future dairy industry structure are those operators who are over fifty years of age. Among operators over fifty years of age, 74 percent reported plans to retire in the next ten years while only 44 percent reported that the farm would be transferred to the next generation. That 51 percent of the farm operators of all ages planned to retire in the next ten years, with only 28 percent having plans to transfer the farm, indicates potential natural exits from the industry. Younger operators were less likely to report their future plans because such plans are generally not relevant at young age.

The rate of plans to transfer increases with the age of the operator. This is a natural phenomenon related to the general tendency to avoid dealing with retirement and transfer issues. Using this information, we expect that the relative number of operators in the 40-49 age category with plans to transfer their farm will increase as they age. The gap between retirees and transfers might indicate a continued decline in the number of operators in the future as existing farmers buy land and other inputs from retiring operators.

*Table 3. Age of owners and retirement plans, Michigan dairy farms, 1999.*

Age of the farms principal operator	Number of farms reporting	Percent of farms reporting	Operator retiring in next 10 years	Farm being transferred to next generation
Below 30	3	1.1	0.0	0.0
30-39	20	7.6	0.0	0.0
40-49	85	32.2	23.5	5.9
50-59	69	26.1	63.8	26.1
60 and up	87	33.0	81.6	58.6
Total	264	100.0	51.1	28.0

With respect to summary statistics, the farms with primary operators planning to retire in the next 10 years had smaller herds and less net farm income but were similar to the herds planning to continue in other respects (Table 2). Of the farms where the primary operator planned to retire in the next 10 years, those with plans to transfer the operation had a herd size more than twice that of the farms with no transfer plans. In addition, net farm income was 2.5 times the size of the farms without transfer plans. While the correlations are clear, we can use a more formal estimation to arrive at the magnitudes of these effects.

### Estimation and Results

Following past research on farm transfer, we hypothesize that farm and operator characteristics both influence and are influenced by the farm transfer plans. Current herd size indicates the investment in dairy production to this point and is expected to be positively related to farm transfer plans. Similarly, acres operated, another farm size measure, is expected to be positively related to farm transfer, as land is related to forage and grain production as well as manure disposal by dairy farms. Operator age and education are both hypothesized to be positively related to farm transfer plans. Operator age squared is also included to examine the potential for a quadratic effect. The number of families that are drawing income from the farm business may indicate that the future farm operator is already involved in the business. Net farm income, family draw, and equity are indicators of the financial success of the business. One popular and intuitive hypothesis is that children are more likely to be drawn to successful businesses. Therefore, the null hypothesis is that these financial success variables should be positively related to farm transfer plans.

The empirical model utilized is a probit model of existence of farm transfer plans. The probit model is defined as

$$\Pr(y = x) = \Phi(xb)$$

where  $\Phi$  is the standard cumulative normal distribution. The probit model has the estimation form

$$y = b'x + e$$

where  $y = 0$  for farms without transfer plans, and  
 $y = 1$  for farms with transfer plans.

The explanatory variables,  $x$ , are the characteristics discussed above. The probit yields coefficients which reflect the effect of a unit change in each explanatory variable on the probability of having farm transfer plans.

The probit estimation results can be found in Table 4. The coefficient signs were as expected. Operator education was negatively related to farm transfer, but further consideration reveals that this may reflect the fact that older operators, closer to retirement and thus more likely to have farm transfer plans, likely have less formal education. Operator age was positively related to transfer plans, while operator age squared was negatively related; this suggests that there exists an age after which the farmer is using up assets without the presence of a future generation. The intercept, primary operator age, specialization in the dairy enterprise, and owner equity were all significantly different from zero at a 10 percent or greater confidence level.

*Table 4. Estimation results.*

Variable	Coefficient	Marginal Effect
Intercept	-14.33513* (6.06091) <sup>1</sup>	
Herd size	0.00137 (0.00203)	+0.0005
Acres Operated	0.00084 (0.00066)	+0.0003
Operator Age	0.32402* (0.17920)	+0.1277
Age squared	-0.00232 (0.00143)	-0.0009
Operator Education	-0.10477 (0.14902)	-0.0413
Specialization	0.02974* (0.01687)	+0.0117
Families	0.19844 (0.20939)	+0.0782
Equity	0.12863* (0.06909)	+0.0507
Log-likelihood		-38.95
% Correct prediction of transfer plans		56.2

<sup>1</sup>Denotes significant at 10% level.

The interpretation of the marginal effects is the amount that the probability of farm transfer increases per unit of dependent variable increase. For example, the marginal effect of herd size is 0.0005 which means that the probability of farm transfer increases by one-half of one percent for every 100 cow increase in herd size. Operator age was the largest marginal effect with every year of operator age increasing the likelihood of existing transfer plans by 12.77 percent. However, the squared effect of -0.09 percent means that the likelihood of a farm transfer plan actually decreases with operator age after the operator reached seventy-one years of age. More specialized dairy enterprises were more likely to have a farm transfer plan, which reflects the general notion that dairy farming is a relatively stable, full-time occupation, and that these farms are likely to remain specialized dairy farms in the future generation. Finally, equity increases, which reflect solvency, positively increased the likelihood of farm transfer by five percentage points. The model correctly predicted the presence of a farm transfer plan 56 percent of the time, indicating that there are other farm and operator characteristics that contributed to farm transfer plans.

## Summary and Conclusions

A survey of Michigan dairy farms revealed that the primary farm managers on Michigan dairy farms were generally above fifty years of age and almost all above forty. The survey respondents indicated a general lack of plans to transfer the farm. This situation may indicate a future concern if the lack of estate transfer plans does not change prior to retirement of these producers. Without farm transfers, these agricultural resources may be absorbed by existing farms or removed from agriculture.

Empirical investigation of the presence of formal farm transfer plans utilizing a probit model revealed the marginal effects of farm production, financial, and operator characteristics. Operator age, specialization in the dairy enterprise, and owner equity were all positively, and significantly related to farm transfer plans. Operator age had a quadratic effect and increased the likelihood at a decreasing rate. The general findings of this research support the contention that successful farms beget a continuation of the desire to remain in farming by the next generation. The larger, more financially sound and

successful farms were much more likely to have formal farm transfer plans.

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## Endnote

1 The information collected represented the current time and status, 1999, for all on-going production and operation characteristics. However, any information that is an annual total, such as yearly total milk production or corn production, or this requires a clear starting and ending date, such as some financial information, necessarily reflects 1998 values.