Wealth Accumulation by Farm Households: Evidence from a National Survey

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Abstract

Wealth affects the economic well-being of the farm households by enabling farm households to secure credit, facilitate intergenerational transfer, and provide for smoothing consumption expenditures in times of income shortfall. This paper examines the factors that are likely to influence wealth accumulation by farm households. Specifically, we use 2001 ARMS data and multivariate regression procedure to estimate two models; one for those farm households whose wealth originates primarily from the farm and another for households with both farm- and nonfarm wealth.

Keywords: farm households, wealth accumulation, life-cycle effect,

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Policy analysts, farm investors, and lenders are among those interested in monitoring and forecasting the economic well-being of the farm sector and farm households. Historically, most attention has focused on farm incomes. However, a true evaluation of economic well-being should also consider the extent of wealth accumulation by farm households. Hill (2000) points out that wealth is important because it gives rise not only to income in a variety of forms but also because it provides security, freedom to maneuver resources, and economic and political power. Further, Hill (2000) noted the lack of studies on this subject despite the fact that wealth is important indicator of well-being. We should be concerned with wealth accumulation since wealth affects the economic well-being of the farm households by enabling farm households to secure credit, facilitate intergenerational transfer, and provide for smoothing consumption expenditures in times of income shortfall.

At least since the time of Ricardo, economists have sought a general explanation of the distribution of personal income and wealth. There are several studies that have investigated the size and distribution of wealth among farm families (e.g., Ahearn and El-Osta (1991); Boyne (1965); Wunderlich (1984); El-Ost and Morehart (2002); Skees, Reed, and Pederson (1985)), but none has investigated the factors that explain wealth accumulation by farm households. On the sector level, Weldon, Moss and Erickson (1993) examined the changes in the U.S. farm wealth for the period 1960-1991 using state-level data. Their conclusions point to the importance of factors such as farm income, government program payments, and increased off-farm income in generating favorable wealth distribution. The amount of wealth held by farm households and the rate

at which they accumulate it are important indicators of family economic well-being and financial progress. Furthermore, the forms in which wealth is held provide a good measure of how responsive households can be in meeting financial crises.

Given the importance of wealth to economic well-being of farm households and of the farm sector as a whole, the purpose of this paper is to examine the factors that are likely to influence their wealth accumulation. This study is relevant to policymakers in their need to assess the economic well-being of farm households. Characteristics of the farm, operator, family, and potential successor that contribute to wealth accumulation will be identified. Specifically, we use 2001 Agricultural Resource Management Survey (ARMS) data and multivariate regression procedures to estimate two models: one for those farm households whose wealth originates primarily from the farm and another for households with both farm and nonfarm wealth. Further, an additional objective of the paper is to determine if there was discernable difference in the level of wealth accumulation between the two groups of farm households.

Sources of Farm Household Wealth

Farm household wealth is derived from a variety of sources. It ranges from physical assets of both the business and household to various types of financial assets, all differing in degree of liquidity, capital certainty, and visibility. For example, wealth held in a bank account is highly liquid, capital certain, and visible. In contrast, wealth held in real estate is illiquid, or not readily available on demand. Wealth not only reflects the collective value of assets but also considers the business and consumer debt of households. Distinguishing between the various sources of farm household wealth allows a more

comprehensive assessment of household well-being. The composition of household wealth may also be important in determining how changes in wealth affect household consumption.

Household wealth may be acquired through savings, inheritance, or appreciation of household assets. Farm household wealth combines farm assets (minus farm debt) and nonfarm assets (minus nonfarm debt). Farm household assets are dominated by farm real estate (77 percent), while physical assets (e.g., off-farm investments, nonfarm real estate, off-farm houses, recreational vehicles, etc.) represent the biggest share of nonfarm assets (33 percent). Farm net worth tends to increase with age of the farm operator. For example, 2001 Agricultural Resource Management Survey data show the average net worth from farm assets ranged from $251,816 for operators under age 35 to $580,004 for those 65 and older. Similarly, for diversified household portfolios, nonfarm net worth increases with age of the farm operator, up to 55-64 years of age ($287,702) and then declines, as farm households liquidate assets to meet consumption in later years (65 years or older, $202,565). However, the share of farm net worth varies with farm typology category. On average farm net worth represents 60 percent of wealth for 'rural residence' farm households, compared to 84 percent for 'commercial' farm households.

Conceptual Framework

Let us assume that the farm household maximizes expected value of a household utility function, which depends on the leisure of the members of the household (L_{it}) and the household's wealth (W_{it}), where wealth is measured as household net worth (total assets

minus total debt) and a vector of factors exogenous to income and time allocation decisions (E_{it}). Specifically:

$$Max\ U_t = U(L_{it}, W_{it}; E_{it}) \quad (1)$$

where t=1…..T and i is equal to the number of individuals in the household. In each period t, farm household's wealth (W_{it}) is represented by summing household's initial wealth (W_{t-1}) which is derived from either or both farm and nonfarm wealth, the farm business income, off-farm work income, and other non-work income (I_t), such as increase in equity (land, building and operators dwelling, and other real estate) and increase in value of financial assets. Farm business income is defined as the value of production ($P_{it}Q_{it}$) (where P_{it} is vector of output price and Q_{it} is quantity of output produced) minus production costs ($C_{it}X_{it}$) (where C_{it} is vector of input prices and X_{it} is quantity of inputs used). Off-farm work income is represented by ($\omega_{it}O_{it}$), where ω_{it} is a vector of wages earned by each household member and O_{it} is the vector of the household members' time allocated to off-farm work. Therefore,

$$W_t = W_{t-1} + (P_{it}Q_{it} - C_{it}X_{it}) + \omega_{it}O_{it} + I_t \quad (2)$$

The level of utility that a household can achieve is constrained by the farm's production function as well as the household members' time endowment. As shown in equation 3, farm's production is a function of the vector of the household member's time allocated to farm's work (F_{it}), the vector of quantities of inputs utilized in the production process (X_{it}) and a vector of exogenous characteristics than can alter farm's production efficiency (Θ_t).

$$Q_{it} = Q_{it}(F_{it}, X_{it}; \Theta_t) \quad (3)$$

Households time constraint can be expressed as:

$$\tau_{it} = F_{it} + O_{it} + L_{it} \quad (4)$$

Equation 4 shows that total household time constraint (τ_{it}) is allocated between farm labor (F_{it}), off-farm labor (O_{it}), and leisure. The household utility maximization problem can be expressed as:

$$\begin{aligned} &Max\ U_t = U(L_{it}, W_{it}; E_{it}) \\ &\text{subject to} \\ &W_t = W_{t-1} + (P_{it}Q_{it} - C_{it}X_{it}) + \omega_{it}O_{it} + I_t \quad (5) \\ &Q_{it} = Q_{it}(F_{it}, X_{it}; \Theta_t) \\ &\tau_{it} = F_{it} + O_{it} + L_{it} \end{aligned}$$

Agents select time allocation, both farm and off-farm and inputs employed in the farm production process to maximize the expected value of the utility function. One can appeal to a reduced form of the maximization problem that will be function of various farm, operator and other characteristics that have an impact on the wealth accumulation process of farm households. Specifically, the following empirical model is estimated in this study.

$$W_i = \alpha_0 + \alpha_1 G_{1,i} + \alpha_2 G_{2,i} + ... + \alpha_k G_{k,i} + \phi_i \quad (6)$$

where W_i is the wealth (net worth) of farm household, G is an explanatory variable, α is a coefficient to be estimated, and ϕ_i is the error term. The subscript (i) represents two sets of households, i=1 for farm households with only farm wealth, i=2 for farm households with both farm and nonfarm wealth.

Data

Data for the analysis were taken from the 2001 Agricultural Resource Management Study (ARMS, formerly known as Farm Costs and Returns Survey (FCRS)). The ARMS is

conducted annually by the Economic Research Service and the National Agricultural Statistics Service. ARMS uses a multi-phase sampling design and allows each sampled farm to represent a number of farms that are similar in the population, the number of which being the survey expansion factor (see Kott; Dubman for more technical detail). The expansion factor, in turn, is defined as the inverse of the probability of the surveyed farm being selected. The survey collects data to measure the financial condition (farm income, expenses, assets, and debts) and operating characteristics of farm businesses, the cost of producing agricultural commodities, and the well-being of farm operator households.

The target population in the survey is operators associated with farm businesses representing agricultural production across the United States. A farm is defined as an establishment that sold or normally would have sold at least $1,000 of agricultural products (cash grains) during the year. Farms can be organized as sole proprietorships, partnerships, family corporations, nonfamily corporations, or cooperatives. Data are collected from one operator per farm, the senior farm operator. A senior farm operator is the operator who makes most of the day-to-day management decisions. For the purpose of this study, operator households organized as nonfamily corporations or cooperatives and farms not growing cash grains were excluded.

In this study farm households are divided into two groups based on their sources of wealth. The first group consist of farm households who have entire wealth (net worth) in farming and the second group consists of farm households who have both farm and

nonfarm wealth. Farm households with only farm wealth (farm is the only source of wealth) have significantly higher net worth, $635,800 compared to $534,700 for farm households who have farm and nonfarm wealth. One thing that stands out in the descriptive statistics between these households is that 34 percent of operators and spouses of households that have both farm and nonfarm wealth tend to work off-farm. These households also operate smaller farms. Summary statistics for each variable utilized in the analysis are presented in Table 1.

In addition to the age and education level of the operator, as predicted by theory (Jappelli), several other factors are assumed to affect wealth accumulation by the two groups of farm households. For example, size of farm, either measured by land area operated or volume of production, is assumed to affect farm wealth and therefore total wealth of farm households. Many farm households generate income both from the farm and from working off the farm (either through wages and salaries, or off-farm business income). Therefore, working strategies, such as only operator works off the farm or only spouse works off the farm, both work off the farm are likely to impact wealth accumulation (Mishra et al.). The extent and type of off-farm work also has implications on the level of nonfarm income and the investment portfolio of farm households. For example, farm households who receive income from off-farm sources are more likely to have investments in financial markets, real estate, and other types of investment (Mishra and Morehart). Accordingly, the wealth portfolio (farm and nonfarm) of the two groups of farm households (farm specialized and diversified) are likely to be different.

Farm type, which indicates the kind of farm products grown on the farm, has an impact on farm income and hence the wealth of the farm household. It is assumed that the two groups of households will be engaged in different kinds of farming operations in terms of the inputs used, time allocation decisions, and use of other resources available to farm household. For example, farm households that focus on farming would be more likely ti utilize farm resources more efficiently, devote more time to farm production than farm households who have a well-diversified wealth portfolio. Further, farm households whose main focus is farming would try to expand land area operated (to achieve economies of scale). Finally, farm location will have a differential impact on wealth accumulation. It is our contention that farms located near metro areas are more likely to be engaged in leasing out land, and working off the farm, while the demand for land (for various nonfarm development options) boosts the value of land and therefore the wealth of farm households (Barnard, Wiebe, and Breneman).

Results

Table 2 presents weighted least squares estimates of factors affecting farm household wealth accumulation (as depicted in equation 6) for households with only farm wealth and households with farm and nonfarm wealth. The adjusted R^2 of 0.11 and 0.14 for households with only farm wealth and households with farm and nonfarm wealth, respectively, indicates that the explanatory variables used in the weighted least squares regression model explained 11 percent and 14 percent of the variation in wealth accumulation. These levels of explained variation are fairly typical when analyses are based on cross-sectional data. In the case of households with only farm wealth, the estimated model in equation 9 reveals that ten variables are significantly correlated with

wealth accumulation. The sixth column in Table 2 presents the t-test results of the differences in parameters between households with only farm wealth and households with farm and nonfarm wealth.

The test, using the multiplicative dummy variable approach (see Pindyck and Rubinfeld), is used to highlight any significant parameter differences across the two types of farm households. Based on the values of the t-statistics, farm organization and farm size (if farm sales greater than $250,000) exhibit statistical significant differences on wealth accumulation for the two sets of households. Additionally, farms specializing in production of other crops (such as tobacco, cotton, vegetables, fruits and nuts, and nursery and green house) and livestock production show statistical differences across the two types of farm households.

Results show that personal characteristics such as age and educational level of the operator are important determinants of wealth accumulation in both groups of farm households. The coefficient for operator age (OPAGE) is positive and statistically significant at the 1 percent level for both sets of farm households. Further, results show a classic inverted U-shaped wealth/age profile for the two household groups, as depicted by a negative and statistically significant coefficient for operator age squared term (OPAGES/100). However, the disinvestment stage starts at an earlier age for the group of households whose wealth originates primarily from the farm. The coefficient for educational level of the operator (OPEDUC) is positive and statistically significant at the 1 percent level for both models. Results show a positive correlation between education

and wealth accumulation for both groups of households and support the classical notion that education increases income and wealth levels. Results are consistent with the human capital theory (Becker). Furthermore, our results are consistent with the findings of Jappelli.

Farm households generate income from farming and off-farm work. Working members of farm families choose livelihood strategies that best compliments their abilities. Additionally, incidence of dual career livelihood strategy, where operator and spouses work either onfarm or off-farm or both is common in farming families (Mishra et al., 2002). Results show that in the case of households that have only farm wealth, a livelihood strategy where operators and spouses both work off the farm (OPSPWOFF) tends to have a negative impact on wealth accumulation. One explanation is that operators and spouses who work off the farm are not able to have enough income from farming and therefore work off the farm to increase their household income. Their marginal utility of time from working off the farm is greater that from onfarm work. The coefficient for farm organization (SOLE) and wealth accumulation is negative and statistically significant for the two groups of farm households considered in this analysis. Results indicate, however, that farm-specialized households with farms organized as sole proprietorship, in contrast to other forms of farm legal organization, have significantly lower wealth than the small share of farms with a corporate or other organizational form. A possible reason for this is that, unlike partnership or corporations where different people contribute to the asset base, farm organized as sole proprietorships have limited amounts of money that can be invested in the farm and in other high-valued farm related

assets.

Farm size measured by the value of agricultural products sold by the farm is significant and positively related to wealth in both groups of farm households. Intermediate ($100,000-$250,00 in sales; SIZE100_250) and large-sized farms ($250,000 or more in sales; SIZE250) tend to have higher wealth compared to small farms for both group of households, which is consistent with the fact that land contributes a larger share toward total farm household assets and farm wealth after controlling for major farm product type.

The coefficient for soil productivity is negative and statistically significant at the 5 percent level for the group of households whose wealth originates both from farm and off-farm. Results suggest an inverse relationship between soil productivity and farm wealth, particularly for the group of farm households with a diversified wealth portfolio. This finding is consistent with the fact that operators who are operating farms with highly productive soils tend to be larger, more efficient, and highly leveraged (Ryan and Keonig), and as a result have lower net worth (or wealth).

Farm growth is positively correlated with wealth accumulation. However, the coefficient for farm growth (ACRES_01) is only statistically significant, at the 1 percent level, for the diversified group (have both farm and nonfarm wealth). Results indicate that households who increased their land holdings between 1996-2001 tended to accumulate more wealth than farm households whose farm size remained constant or declined over the same period. One reason for this could be that any increase in operated acres for diversified farm households (both farm and non-farm wealth) was achieved through

owning, or buying more land. Unlike the farm specialized households, where any increase in operated acres, decreased household wealth (although statistically insignificant) was primarily through rented land rather that buying land. In both groups of farm households, dairy and livestock operations contribute more toward wealth accumulation than operations with other types of production. One possible reason is that dairy and livestock farms are capital intensive and farm assets are usually owned, rather than rented or leased, by the farm households.

Finally, location of the farm relative to an urban area has an impact on wealth through land valuation. The coefficient for farm location near metro counties (METRO) is positive and statistically significant at the 5 percent level of significance for the diversified group (have both farm and nonfarm wealth) of farm households. Results show that farm households that are located in metro areas have more farm and nonfam wealth. This is because those households are more likely to have family members working off the farm and receiving employer provided investment/saving benefits (stocks and 401(K)) that increase their nonfarm wealth. Further, the price of their land is influenced due to urban proximity and demand for farmland for nonfarm use development, thereby increasing their farm wealth (Moss and Schmitz; Goodwin, Mishra, and Ortalo-Magne).

Summary and Conclusions

Wealth affects the economic well-being of the farm households by enabling farm households to secure credit, facilitate intergenerational transfer, and provide for

smoothing consumption expenditures in times of income shortfall. Therefore, a true evaluation of economic well-being should also consider the extent of wealth accumulation by farm households. This study examines the factors that are likely to influence their wealth accumulation of farm households. Using 2001 Agricultural Resource Management Survey (ARMS) data and multivariate regression procedure two models; one for those farm households whose wealth originates primarily from the farm and another for households with both farm and nonfarm wealth were estimated. The study also examined any discernable differences in the level of wealth accumulation among the two groups of households.

Results showed that differences exist in the wealth accumulation among two groups of farm households based on factors like farm organization, farm size, and farms specializing in livestock and other crops. Results also showed a classic inverted U-shaped wealth/age profile for the two groups of farm households considered in this analysis. However, the disinvestment tended to start at an earlier age for the group of households whose wealth originates primarily from the farm. Findings from this study show a positive correlation between education and wealth accumulation for both groups of households. In the case of households with only farm wealth, a livelihood strategy where both operators and spouses both work off the farm tend had a negative impact on wealth. Intermediate ($100,000-$250,00 in sales) and large sized farms ($250,000 or more in sales) tended to have higher wealth, for both group of households which is consistent with the fact that land contributes a larger share toward total assets. Finally, farm type and farm location had a positive and significant impact on wealth

accumulation. Results showed that farm households located in or near metro areas tended to have more wealth in comparison to farm households whose wealth originates from farm and nonfam sources.

Wealth accumulation plays many roles in enhancing the economic well-being of families. It can be converted directly into cash, and thus can be used to meet immediate consumption needs. Results here have pointed out ways in which farm households accumulate wealth and various factors that affect the accumulation process. Along with the life-cycle effect, which was captured by operator's age, human capital (education) play very important role in determining wealth levels of farm households. Ways to enhance and educated the farm families and their members about advantages of savings and savings for later life (retirement) will prove to be beneficial in an era, where retirement savings is a hot issue. Results point to the importance of land in the wealth portfolio of farm households and the influence of farms' location on wealth accumulation. The findings highlight the importance of maintaining stable agricultural economy, particularly for farm households who derive their wealth from farming, with their accompanying influence on land market and their subsequent influence on farm households' equity position, and on farm households debt servicing capacity.

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Table 1: Definitions and means of variables used in weighted least squares

Variables	Definition	Means[1]	
		Households with only farm wealth	Households with both farm and non-farm wealth
OPAGE	Age of operator	55	55
OPEDUC	Education of operator (years)	12.69*	13.20
	Presence of young persons, dummy variables:		
CHILD6	=1 if person's age was under 6; 0 otherwise	0.10	0.09
CHILD13_18	=1 if person's was between 13 and 18; 0 otherwise	0.16	0.20
	Off-farm labor participation, dummy variables:		
OPWOFF	=1 if only the operator worked off-farm; 0 otherwise	0.06	0.14
SPWOFF	=1 if only the spouse worked off-farm; 0 otherwise	0.11	0.13
OPSPWOFF	=1 if both operator and spouse worked off-farm; 0 otherwise	0.23	0.34
	Farm organization, dummy variable:		
SOLE	=1 if sole proprietorship; 0 otherwise	0.91	0.93
	Farm size, dummy variables:		
SIZE100_250	=1 if sales were between $100,000 and $249,999; 0 otherwise	0.12	0.08
SIZE250	=1 if sales were $250,000 or more; 0 otherwise	0.13	0.06
PRODINDEX	Productivity index (0=least productive, 100=most productive)	72.20	72.64
	Farm tenure, dummy variable:		
FULLOWN	=1 if farm was fully owned; 0 otherwise	0.55	0.57
	Past indebtedness dummy variable:		
FDEBT_01	=1 if farm debt in 2001 was more than in 1996; 0 otherwise	0.18	0.17
	Income stream, dummy variable:		
INCOME_01	=1 if household income in 2001 was below 1996's income; 0 otherwise	0.15	0.20
	Farm growth, dummy variable:		
ACRES_01	=1 if household operated more acres in 2001 than in 1996; 0 otherwise	0.15	0.18
	Expected government support, dummy variable:		
GOVPAYEXP	=1 if support was expected regardless of prices over next 4 years; 0 otherwise	0.23	0.27
	Type of farm specialization, dummy variables:		
CASHGRAIN	1= if farm specialized in cash grain production; 0 otherwise	0.10	0.11
OTHCROPS	1= if farm specialized in production of other crops; 0 otherwise	0.31	0.32
DAIRY	1= if farm specialized in dairy production; 0 otherwise	0.06	0.04
LIVESTOCK	1=if farm specialized in production of beef cattle or hogs; 0 otherwise	0.35	0.35
	Regional dummy variables:		
NONMETROF	=1, if farm was located in non-metro farming county; 0 otherwise	0.15	0.13
METRO	=1, if farm was located in metro county; 0 otherwise	0.32	0.35
HHNW	Total farm household wealth ($10,000)	63.58*	53.47
Sample		836	4,603

[1] All estimates have coefficients of variation [(standard error/estimate)*100] of less than25 percent. * Difference of mean of non-binary variables in the 'Households with only farm wealth' category relative to mean in 'Households with both farm and non-farm wealth' category is significant at 5% level or better.

Table 2--Weighted least squares estimates of farm household wealth (*HHNW*) model, by type of accumulated wealth, 2001

	Dependent variable: Total farm household wealth (***HHNW***)				
	Only farm wealth (*O*)		Both farm and non-farm wealth (*B*)		H_o: $\alpha_O = \alpha_B$
Variables[1]	α_O	*t*-statistic	α_B	*t*-statistic	*t*-statistic[2]
INTERCEPT	-205.54	-3.30[c]	-137.43	-4.10[c]	-0.97
OPAGE	5.04	3.63[c]	3.61	6.15[c]	1.12
OPAGESQ/100	-3.64	-3.05[c]	-2.18	-4.36[c]	-1.35
OPEDUC	9.57	3.89[c]	5.80	4.65[c]	1.19
CHILD6	-3.30	-0.28	4.84	0.79	-0.63
CHILD13_18	-4.19	-0.22	0.78	0.14	-0.25
OPWOFF	-3.94	-0.31	7.67	1.25	-0.92
SPWOFF	-22.34	-1.08	-15.80	-1.44	-0.25
OPSPWOFF	-14.13	-1.83[a]	-2.83	-0.71	-1.33
SOLE	-60.54	-2.90[c]	-18.12	-2.09[b]	-1.87[b]
SIZE100_250	48.52	2.20[b]	33.68	7.17[c]	0.69
SIZE250	151.14	6.01[c]	93.35	8.97[c]	1.93[b]
PRODINDEX	-0.09	-0.25	-0.28	-1.92[b]	0.51
FULLOWN	9.19	1.31	2.66	0.59	0.74
FDEBT_01	8.44	0.57	-0.53	-0.14	0.58
INCOME_01	-12.71	-1.53	0.34	0.08	-1.37
ACRES_01	-2.15	-0.20	15.49	5.19[c]	-1.60
GOVPAYEXP	-11.15	-0.91	5.72	1.48	-1.19
CASHGRAIN	20.34	1.53	8.27	1.39	0.89
OTHCROPS	38.86	3.48[c]	4.33	0.53	2.78[b]
DAIRY	31.82	1.86[a]	10.46	1.71[a]	1.14
LIVESTOCK	37.01	4.24[c]	15.89	2.55[b]	2.04[b]
NONMETROF	-15.42	-1.24	-5.34	-1.34	-0.75
METRO	5.70	0.82	8.84	2.29[b]	-0.38
R^2 (adjusted)	0.1283 (0.1036)		0.1414 (0.1371)		
Sample	836		4,603		5,439
Population	230,485		1,862,287		2,092,772

[a,b,c] denote two-tailed statistical significance at 0.10, 0.05, and 0.01 levels, respectively.

[1] Except for *OPAGESQ*, variables are defined in table 1. *OPAGESQ* is the squared terms for *OPAGE*.

[2] Each *t*-statistic in this column tests the hypothesis that a specific estimated parameter in the farm household wealth model of 'Only farm wealth' is equal to its corresponding counterpart in the farm household wealth model of 'Both farm and non-farm wealth'. A negative superscripted *t*-statistic indicates that the corresponding α_O is statistically smaller than its α_B counterpart. A positive superscripted *t*-statistic indicates the opposite (i.e., $\alpha_O > \alpha_B$).