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Proceedings of Regional Committee NCT-173
"Financing Agriculture and Rural America: Issues of Policy, Structure and Technical Change"
Louisville, Kentucky
October 5-6, 1998

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April 1999

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Abstract

In this paper we investigate factors that affect farm household savings. Particular attention is given to examining the role of farm income uncertainty and identifying regional differences in savings behavior. Using farm-level data, we find that farm income uncertainty plays an important role in farm household savings, suggesting strong precautionary motives. Results also show that marginal propensity to save is higher than the average propensity to save, and that it differs by region.

Key Words: Savings, farm household, disposable income, uncertainty.

Introduction

Agriculture, a predominantly self-employed industry in the U.S. and around the world, faces higher income risk more than any other industry. Riskiness in farming comes from two sources, farm-level commodity prices and weather. Variability in prices and yields lead to variability in farm income. In order to survive the uncertain or unpredictable future, family owned and operated farm businesses must save during good times. Recent published data (*Survey of Consumer Finances,* SCF) show a substantial increase (51.4 percent) in the percentage of self-employed families who saved between 1992 and 1995. In both surveys a higher percentage of professionally employed families saved when compared with the self-employed, however, the percentage change in the saving rates between the two surveys were similar. The propensity to save is reflected in increased financial assets, especially in saving bonds and retirement accounts (Table 1).

These findings are in contrast with results found in the Consumer Expenditure Survey of

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1972-73. The results of the 1972-73 survey indicated that those employed in traditionally riskier occupations, such as sales and self-employed saved more than the average professionals and managers. Klein points out that self-employed save more than other families because of their business savings, a wealth component that dominated all other forms of wealth. Fisher and Liviatan have found similar results in their studies.

The historical record of fluctuating farm prices and incomes have been cited in various studies by Tweeten, Schultz, and Robinson. This instability has been dampened, but not eliminated by government policies (Tweeten). Policies that increase the incomes of farmers may well be different from those that decrease income variability. However, fluctuations in farm incomes will lead to changes in the consumption of farmers only if savings behavior of farm households does not offset income fluctuations. If farmers are able to save and dissave in response to fluctuations in income, then income fluctuations may have no serious consequences for the well-being of the farm family and there would be no need for government policies aimed at decreasing income variability. Further, Newbery and Stiglitz point out that saving is one of the ways by which farmers can mitigate risk and uncertainty associated with farm income. Monke observes that a majority of farmers already keep liquid assets to meet unexpected expenses and use other management techniques to manage risk. On the other hand, with a majority of farmers working off the farm and off-farm income (Table 2) contributing the largest share (more than 91%, Mishra and Goodwin) of households' total income, farmers are becoming more dependent on retirement and other benefit packages offered by their off-farm employers. Figure 1 shows farmers are increasingly dissatisfied by their current retirement incomes. Almost 52 percent of respondents were dissatisfied and concerned that the current retirement income was not enough to maintain living standards, and nearly 42 percent of farmers indicated retirement/old age as a

importance of this issue, it is perhaps surprising that little or no empirical research on precautionary savings in agriculture has been done. In cases where high savings capacity exists, such as self-employed business, it is necessary to empirically investigate the main determinants of savings.

The agricultural sector presents some peculiarities regrading motives of farm household saving behavior. Figure 2 shows that important reasons for the positive propensity to save are retirement/old age and liquidity (Hamaker and Partick; Leon and Rainelli; Spence and Mapp). Irregular and unforeseeable financial needs, such as those arising from natural disasters, force farmers to save more than other households. Other motives for farm households' saving behavior are related to the need to secure a satisfactory and stable income level during the pension period or to cover the education expenses of children and grandchildren, uncertain health expenditures (Kotlikoff, 1986), and to financially assist their children in their career.

The average farm household possesses both liquid and fixed assets, with fixed assets occupying larger share (almost 90%) of the total. We also know that aside from the business the farm dwelling is the prized durable in the farm household. The most important component of the farm business is land. Others include farm machinery (tractor, combine, other implements), land improvements, and buildings and livestock. The total assets of an average household increased from $741,652 in 1992 to $854,945[2] in 1995 (SCF, 1992; 1995, Table 3) in nominal terms. The average debt level (total liability) for an average farm household increased slightly from $50,737 in 1992 to $56,875 in 1995, only a 12 percent increase. However, with rising asset values the debt to asset ratio between the two years has remained approximately unchanged.

[2] It should be pointed out that farm business, in the category of non-financial asset had the largest share. Farm business is defined as net equity if business were sold today plus value of personal assets used as collateral for business loan.

The data in Table 3 shows that, on average, farm household liquid assets primarily is comprised of checking and saving deposits. Average total financial assets of an average farm household increased from $104, 272 to $157,755, a 51% increase between 1992 and 1995. The data also indicates that more money in 1995 was saved in the form of stocks, bonds, and individual retirements accounts (IRAs) than in 1992. There is also a significant increase in the amount saved in the form of CD's and mutual funds. Average non-financial assets of farm household increased by on 9% (form $637,380 in 1992 to $697,191 in 1995) during the period of 1992and 1995.

Determinants of Savings and Model Specification

Since the early 1960s a number of studies have shown the importance of particular variables in the savings function. These studies have focused generally on three sets of variables; (1) socio-economic characteristics; (2) financial characteristics; and (3) attitudes and expectations. It has been long recognized that age, education, family size, other demographic characteristics affect household saving behavior (Leon and Rainelli). Watts (1958) found that those with more education expected higher incomes and spent more. Kennickell, Starr-McCluer, and Sunden have provided strong evidence that college educated individuals saved less than individuals with less education. Accordingly, it is hypothesized here that farmers who have gone to college or graduated from college (COLL) save less. Farmers with education level of high school or less than high school are considered as the base group in our study. Another factor that affects household savings is age (AGE). Using the life-cycle hypothesis (Ando and Modigiliani; Modigiliani and Brumberg; Kennickell; Snyder) it is hypothesized that households save more in the early stages of their formation and later dissave as they age. Size of the household (HH_SIZE)

coefficient on this variable will indicate that with increasing uncertainty, farm households consume less and save more. This would also represent precautionary savings in agriculture.

Finally, regional factors such as soil type and climate may affect production agriculture and the choice of crop, livestock and other forms of enterprise, and ultimately farm household income. Accordingly, we have introduced regional effect into our model. We have used four regional variables in our model, based on the Census of regions (Northeast, West, Midwest, and South). The variables are used as a dummy variable. The base group is farms located in the Midwest region. Also, to facilitate comparison of propensities to save among different regions, interaction terms between the regional dummy and total household disposable income were used.

Empirical Model

In our attempt to investigate the main determinant of savings, we will estimate a linear model for individual units (farms) according to criteria such as income level, wealth, age and the degree of uncertainty in agricultural production. The linear multivariate model used has the following functional form:

$$S_i = f(Y_i, W_i, X_i) + U_i \qquad (1)$$

where:

S_i = Savings of the ith household,

Y_i = Total farm household income includes both farming[6] (after self-employment taxes) and off-farm incomes,

W_i = Total farm household assets. This includes both farm and non-farm assets,

X_i = Various exogenous, quantitative and qualitative variables such as age, level of education, household size, debt, present value of future income streams, standard deviation of the

[6]Households farming income= net farm income (NFI), NFI= net cash income-depreciation.

value of agricultural production from its normal level,

U_i = Random disturbances normally distributed with mean zero and constant variance.

Data Description

Data for the analysis are from the 1996 Agricultural Resource Management Study (ARMS, formerly known as Farm Costs and Return Survey (FCRS). ARMS, conducted annually by the Economic Research Service and the National Agricultural Statistics Service (USDA), is a multi-frame stratified survey with the sample being drawn from both a list and area frame. 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 during the year. Farms can be organized as proprietorship, 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 decision. For the purpose of this study, some operator households were excluded from the analysis-those where the farms are organized as nonfamily corporations or cooperatives because they do not represent any farm household but corporations. The final sample count was 6,284 farm families, which statistically represents 1,945,286 farm operator households in the 48 contiguous States.

There are several ways to measure savings, however, given limitations to our data we employ the traditional measure of savings (Friedman, Paxson, Bhalla)-SAVE as the difference

between income and expenditures of the farm household. In this study we consider disposable income. Since tax rate for each individual was not available we have assumed that households earning less that $30,000 do not pay any federal, state and local taxes; households with gross income between $30,000 and $60,000 pay 15% in taxes; households earning between $60,000 and $200,000 pay 25% in taxes; and household earing $200,000 or more pay 40% in taxes. Income of the household includes income from farming, off-farm work (in the form of wages and salaries, income from off-farm businesses), interest and dividends, social security and public assistance, and other off-farm sources of income[7] minus taxes. To be consistent with money income definition used in the Current Population Survey (CPS) farming income is net cash income minus depreciation[8] (Hoppe). Total expenditures, on the other hand includes-household expenditures on food and household supplies, household rent/mortgage, nonfarm transportation, medical expenses, insurance, retirement, and other household expenditures, such as clothing, education, hobbies, recreation, and charitable contributions.

Variable definition and mean values are reported in Table 4. Savings in 1996 for the 6,975 farm households averaged approximately $ 16,630 while the mean household disposable income and assets were $45,120 and $405,450, respectively. The average age of the operator was fifty-six years, and the average household size was 2.8. Thirty-six percent of farm operators had some kind of college education (Table 4). On examining the degree of savings by size (as measured in terms of gross value of agricultural production) of the average propensity to save (APS) and level of income, we found that low-income households (small farm households,

[7] This also includes value of home consumption. Value of home consumption includes market value of all meat, poultry, livestock and poultry products and all other items produced and used on the farm for home consumption.

[8] This is economic depreciation not tax depreciation, therefore tax estimation may be overstated.

<$100,000) have an APS of 0.42 (Table 5). On the other hand, high income households(large farm households, $500,000 or more) have an APS of 0.74. Average propensity to save by farm households located in Northeast and Southern regions are almost equal. Significant saving (APS of 0.57) occurs in farm households located in the Midwestern part of the country.

In analyzing the data, the complex design of the ARMS imposes significant restrictions to the econometrics techniques that can be employed. As Kott notes, standard regression packages are not designed to accommodate stratified samples yield biased standard errors, although parameter estimates are unbiased. Efron (1982) has proposed Jackknife estimation procedure to circumvent this problem (See Gray and Schucany for details). The agricultural savings model as described in equation 1 was estimated using Ordinary least Squares procedure and Jackknife method.

Results

Parameter estimates of the model are presented in Table 6. The farm household saving model showed a good fit based on adjusted R^2 (0.91). Further, the model was significant at the 1 percent level based on the F-statistics value. Variables age and level of education had the expected sign and were statistically significant at the 1-percent level of significance. Results indicate that as age of the operator increases savings tend to be higher. This result confirms the life-cycle hypothesis of saving: a household saves more in the early stage of its formation. A positive relationship between age and savings might also imply some bequest motives. On the other hand, farm operators who had some college or graduated from college saved less when compared to farm operators who had high school or less than high school education. These results are consistent with the findings of Watts and Snyder.

The coefficient of the size of household (HH_SIZE) was negative and statistically significant at 1-percent level of significance. Results suggest that an increase in the size of the farm household leads to lower household savings. Economic theory predicts that as the household size increases so does the expenditure outlays and hence less money is left for savings. Our findings are consistent with the findings of Kelly and Williamson (1968), Leon and Rainelli (1976), Noda (1970), and Snyder (1976). The disposable income variable, TOTDHI, was statistically significant at the1-percent level. Results indicate that total household income is an important determinant of the household savings function. The marginal propensity to save (MPS) for the farming household is 0.80. Langemeier and Patrick, when studying consumption behavior, found that the short-run marginal propensity to consume (MPC) of Illinois farm families ranged from 0.007 to 0.020. Using the identity (MPS+MPC=1) we can deduce that our MPS are lower than those obtained by Langemeier and Patrick. Similarly, Girao *et al.* from their study concluded that the short-run MPC for Minnesota farm households ranged from -0.047 to 0.243. Using the identity, the marginal propensity to save (MPS) obtained in our model falls well within this range. Studying the saving behavior of Swiss and French farmers, Leon and Rainelli found that the marginal propensity to save (MPS) for these farm families was 0.78 and 0.88, respectively. Our results are comparable to the results obtained by Leon and Rainelli. A possible explanation for a high MPS could be a low income elasticity of consumption (Friedman) of farm households, and rural way of life.

The average propensity to save (APS) for our sample of farm households was 0.38. Leon and Rainelli found an APS of 0.42 for Swiss farmers and 0.56 for French farmers. However, Ong *et. al.* in their study of farmers in Taiwan obtained an APS of 0.22. Furthermore, it should be noted that the APS for our sample of farm households differs with region and size of farm

operations. A review of the average propensities to save by farm size groups (Table 4) shows that APS increases with farm size. The coefficient of the total household assets (TOTALA), which represents wealth in the household was negative and statistically significant, indicating that savings of the farm household decrease as the value of assets increase. These results are consistent with the findings of Snyder (1976), Ramanathan (1969), and Choudhury (1968). Furthermore, Stone has shown that, families owning more capital tend to save less. It is well known that much of the savings of farm households is tied up in the farm business in the form of land, machine, and other real estate. This indicates that farm households seem to be target savers.

As economic theory predicts there is a negative correlation between savings and present value of future income. The coefficient of the present value of future income (PVFI) is negative and statistically significant at a 1 percent level of significance. Results indicate that as PVFI increases, the intensity of the need to accumulate savings become weaker. This result is consistent with the findings of Sandmo (1970), Flavin (1981), Campbell (1987), and Campbell and Deaton (1981). The uncertainty in farming income as measured by DGVAP has a positive affect on the level of savings of farm households. Results indicate that as the deviation in farm income increases, the savings of farm households increase because farm operators are hedging for future falls in income. One can regard this as a precautionary savings of farm households. These results are consistent with the findings of Carroll and Skinner.

There are regional differences in savings by farm households. This is because of differences in climate, soil types, crops grown, livestock concentration, and cultural differences. Three region variables (NEAST, WEST, SOUTH) were used in the regression to test regional differences in savings among farm households. Results show that farm households in the WEST and SOUTH regions saved significantly less than that of benchmark farm households in the

Midwestern (MIDWEST) region. The interaction terms between household disposable income and region indicate that marginal propensity to save for farm households in the southern (SOUTH), and northeastern (NEAST) regions are lower, on average, than marginal propensity to save in Midwest (MWEST) region by 0.040 and 0.035, respectively.

Conclusions and Implications

Diminishing farm subsidies and a move toward market oriented agriculture sends a clear message to farm households regarding the importance of savings. Savings can be used to finance immediate needs in agriculture, retirement income, or an unexpected health expenditure among other items. This paper investigates the factors affecting farm household savings. The estimated marginal propensities to save (MPS), being higher than the average propensities to save, ensure a high degree of responsiveness of farm household savings to disposable income changes. The relatively high MPS found in this study can be attributed to production uncertainties coupled with strong precautionary motives.

Households' disposable income continues to play an important role in the saving function. Age, education, and household size also affect farm household savings. It should also be noted that negative wealth effects on household savings support the hypothesis of the 'target saver'. Results from this study show that as uncertainty in farm income increases, the intensity to save becomes stronger. Also, future income has a negative effect on savings. Finally, uncertainty in agricultural income plays an important role in household saving behavior.

While this study makes a strong contribution towards a general understanding of the savings behavior of farm households, many questions are left unanswered. Without specific information about both the farm business and household investment portfolios, there remains a

complex and misunderstood interrelationship between the financial goals of the farm family and farm business. Since farm households have both financial and non-financial wealth it is important to collect specific information for various types of investments to investigate how financial wealth is distributed, and to identify the various factors that help to explain differences in individual household portfolios. Information on investments will also distinguish between retirement plans and other types of investments.

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Table 1: Family Characteristics of Self-Employed Workers in the United States, 1989, 1992, and 1995 [a].

Family Characteristics	1989	1992	1995
1. Before-tax Family Income (Thousands of 1995 dollars)	111.0	59.2	62.3
2. Family net-worth (Thousands of 1995 dollars)	765.4	644.3	731.5
3. Family holding of financial assets (% of families holding assets)			
-Transactions accounts	96.0	95.8	91.3
-Savings binds	23.9	23.0	26.0
-Stocks	22.9	25.6	18.8
-Retirement accounts	43.7	48.0	47.8
4. Family holding of nonfinancial assets (% of families holding assets)			
-Vehicles	94.7	95.4	85.7
-Primary residence	74.1	76.2	73.9
-Businesses	69.7	62.8	58.0
-Any other financial assets [b]	98.6	98.2	96.1
5. Family holding of debt (% of families holding debt)			
-Mortgage and home equity	53.4	58.6	51.3
-Installments	56.3	48.2	45.6
-Credit cards	34.6	47.5	44.9
-Any debt [c]	82.7	85.8	81.9

Source: Constructed from "Changes in Family Finances from 1989 to 1992." *Federal Reserve Bulletin, vol 80 (October 1994)* and Family Finances in the U.S.: Recent Evidences from the Survey of Consumer Finances." *Federal Reserve Bulletin, vol 83 (January, 1997).*

[a] Definition of self-employed here includes farmers.
[b] Includes artwork, jewelry, antiques, and precious metals.
[c] Includes loans on insurance policies, loans against pension accounts, borrowing on a margin accounts, and other unclassified loans.

Table 2: Sources of Income by Farmers, 1992 and 1995

Source of Income	1992		1995	
	Percentage	Average	Percentage	Average
	%	*(1992 Dollars)*	%	*(1995 Dollars)*
Wages and Salaries	73.2	42,968	70.4	40,099
Income from Business	72.5	21,664	74.5	28,842
Non-taxable investment	3.4	29,643	3.2	44,017
Other interest income	38.0	5,054	64.0	3,649
Dividends	19.4	7,142	24.0	8,734
Net gain or loss from the sales of stocks, bonds, or real estate	8.0	22,672	11.0	8,628
Net rent, trust income or royalties	13.8	14,233	12.2	31,039
Income from social security or other pensions, annuities, or retirement programs	32.1	12,278	22.0	10,113

Source: Calculated from the *Survey of Consumer Finances*, 1992 and 1995. The data in these surveys are generally collected for the preceding year.

Table 3: Financial Characteristics of Farm Families in the U.S., 1992 and 1995

Item	1992	1995
Average farm acres	275	265
Av. Hours worked per week on the farm	44	46
Av. Gross farm sales	68,097	74,453
Av. Net farm income	23,022	17,015
Av. Total assets	741,652	854,945
Av. Total financial assets	104,272	157,755
Checking and savings account	27,063	18,531
CDs	3,271	9,937
Mutual funds	6,820	12,612
Stocks	16,918	34,159
Bonds	15,035	32,485
IRAs	10,954	21,880
Saving bonds	514	2,013
Cash value of life insurance	8,303	9,195
Other financial assets	15,392	16,941
Av. Non-financial assets	637,380	697,191
Vehicles	18,273	17,316
Dwelling	98,522	58,348
Farm Business	441,888	512,035
Other	4,834	4,092
Av. Total liabilities	50,737	56,875
Housing debt	35,150	25,644
Other lines of credit	34	2,719
Other real estate debt	9,153	21,253
Credit card	1,347	556
Installment loans	3,669	6,057
Other debt	1,385	645
Av. Net-worth	690,915	798,070
Debt/Asset ratio	0.068	0.066
Number of farm households	368	423

Source: Calculated from the *Survey of Consumer Finances*, 1992 and 1995. The data in these surveys are generally collected for the preceding year.

Table 4: Definition of Variables and Summary Statistics

Variable	Definition	Means	Standard Deviation
AGE	Age of the farm operator	56.53	0.82
COLLEGE	Education level of the farm operators(=1 if college or more, 0 otherwise)	0.36	0.03
HH_SIZE	Size of the farm household	2.78	0.07
TOTDHI	Total household disposable income (*000 dollars*)	45.12	1.38
BORROW	Total amount of interest & service fee payments on loans (*000 dollars*)	4.38	0.29
TOTALA	Total amont of assets (*000 dollars*)	405.45	18.80
NEAST	Location of farm (=1 if located in Northeast, 0 otherwise)	0.05	0.01
MWEST	Location of farm (=1 if located in Mid-West, 0 otherwise)	0.38	0.02
WEST	Location of farm (=1 if located in West, otherwise)	0.11	0.01
SOUTH	Location of farm (=1 if located in South, 0 otherwise)	0.46	0.02
DGVAP	Deviation of agricultural production (gross value) from it's normal level (*000 dollars*)	78.01	4.26
PVFI	Present value of future income (*000 dollars*)	21.90	0.96
SAVE	Total farm household savings (*000 dollars*)	16.63	1.37
Sample		6284	
Population		1,945,286	

Table 5: Socioeconomic and Financial Characteristics of Farm Households by Farm Size and Region (1996)

Farm Size/Region	Age of the Operator	Household Size	Total Household Disposable Income [a] (Dollars)	Total Expenditures [b] (Dollars)	Value of Home Consumption [c] (Dollars)	Savings [d] (Dollars)	Average Propensity to Save (APS)
(A) Size							
Less than $100,000	58	2.70	39,441	22,722	162	16,881	0.42
$100,000-$250,000	52	3.15	56,589	26,194	310	30,705	0.54
$250,000-$500,000	50	3.25	62,589	27,238	385	35,909	0.57
$500,000 or more	51	3.02	143,936	37,281	311	106,966	0.74
(B) Region							
North East	55	3.17	44,725	24,844	416	20,297	0.45
West	55	2.91	42,284	22,031	233	20,486	0.48
Mid West	56	2.76	60,131	26,057	245	34,319	0.57
South	58	2.65	43,911	24,319	127	19,719	0.44

Source: Agricultural Resource Management Study (ARMS) for farm operator household data, 1996.

[a] Includes farming income, off-farm business income, wages and salaries from off-farm work, interest and dividends, social security and public assistance, and other off-farm sources of income minus taxes.

[b] Includes household expenditures on food and household supplies, household rent/mortgage, nonfarm transportation, medical expenses, insurance, retirement, and other household expenditures, such as clothing, education, hobbies, recreation, and charitable contributions.

[c] Market value of all meat, poultry, livestock and poultry products and all other items produced and used on the farm for home consumption.

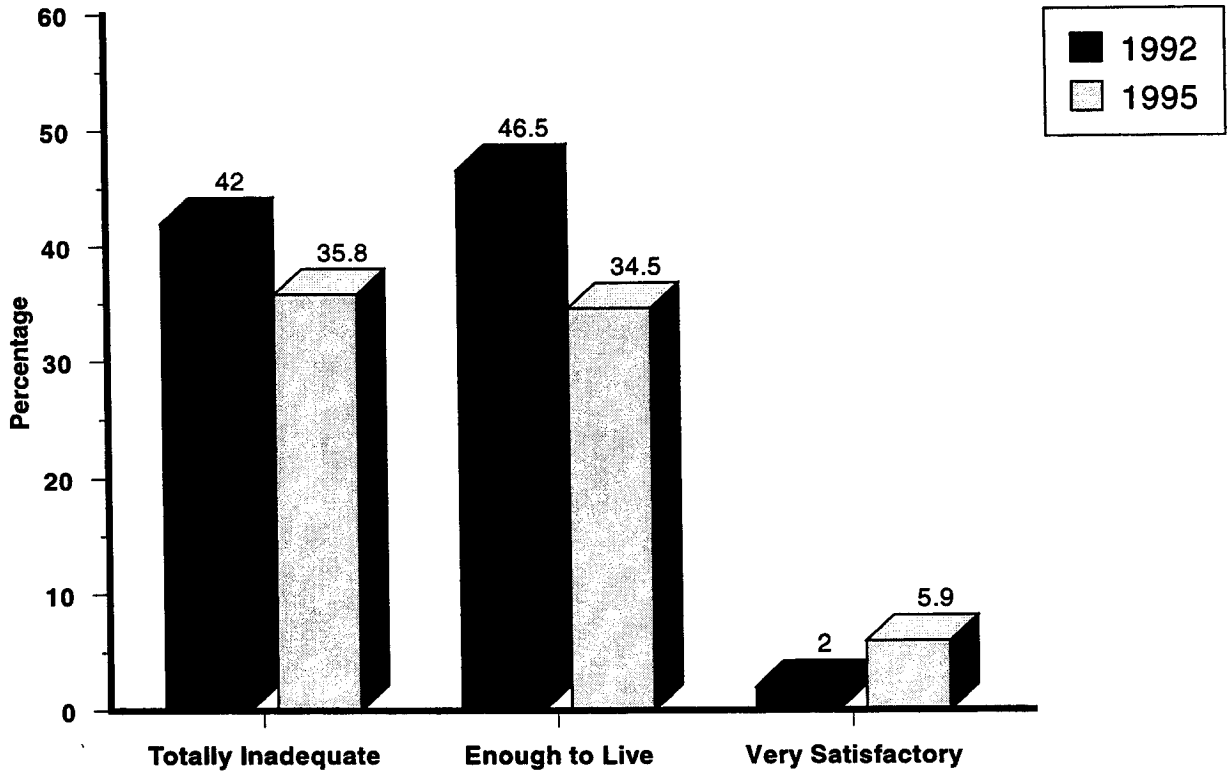
[d] Defined as total household income plus value of home consumption minus total expenditures.

Table 6: Parameter Estimates of Factors Affecting Farm Households Savings
Dependent variable = total savings

Variable	Parameter Estimates
Intercept	-20.157 (1.541)***
AGE	0.174 (0.020)***
COLLEGE	-8.437 (0.487)***
HH_SIZE	-2.046 (0.191)***
TOTDHI	0.801 (0.006)***
TOTALA	-0.001 (0.0002)***
BORROW	-0.053 (0.016)***
NEAST	1.395 (1.299)
WEST	-2.469 (0.859)**
SOUTH	-1.872 (0.599)***
DGVAP	0.001 (0.0003)**
PVFI	-0.048 (0.009)***
TOTDHI x NEAST	-0.040 (0.019)***
TOTDHI x WEST	0.010 (0.010)
TOTDHI x SOUTH	-0.035 (0.009)***
Sample Size	6,284
R^2	0.92
Adj. R^2	0.91

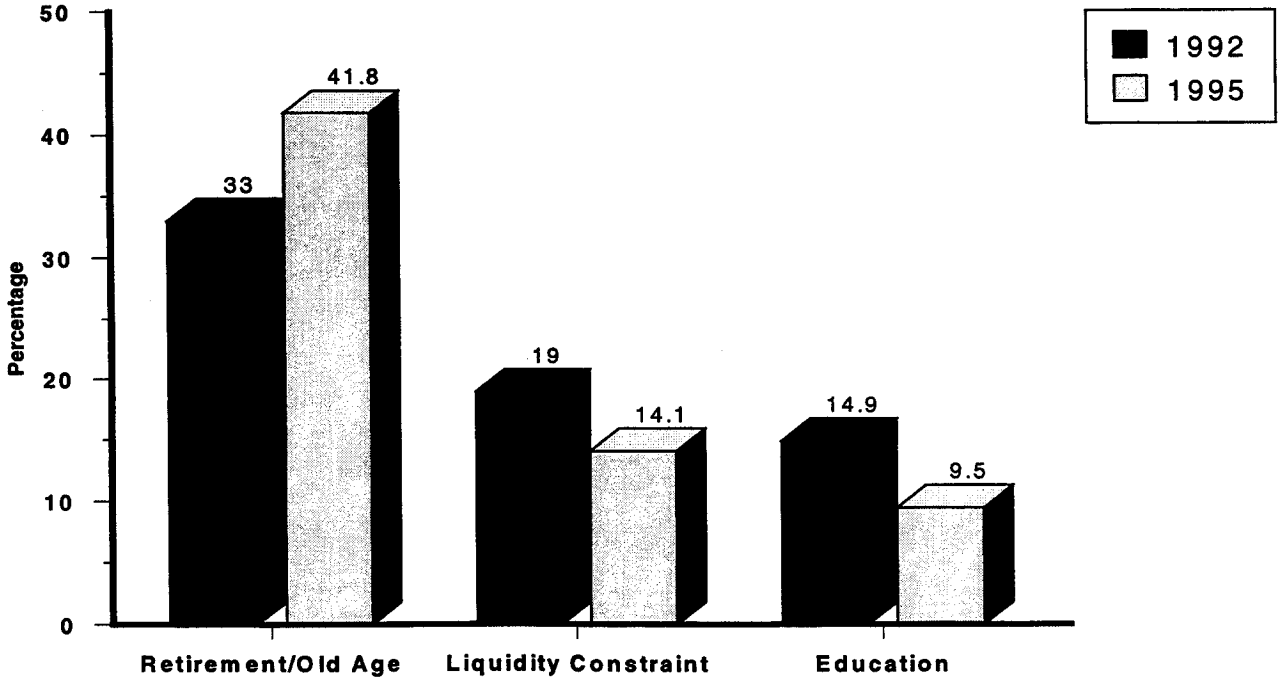
Numbers in parenthesis indicate standard errors. Double and Triple asterisks indicate statistical significance at 5 and 1 percent level

Figure 1: Rating of Retirement Income for Farmers, 1992 and 1995



Source: Calculated from the Survey of Consumer Finances, 1992 and 1995. The data in these surveys are generally collected for the preceding year.

Figure 2: Selected Reasons for Savings Cited by Farmers, 1992 and 1995



Source: Calculated from the Survey of Consumer Finances, 1992 and 1995. The data in these surveys are generally collected for the preceding year.