

## Variability in Farm Household Income and Wealth

The various sources of farm household income and wealth and their relative importance explain only part of the “farm income problem.” In addition to the level of income and wealth, the economic well-being of the farm household is influenced by variability in its income, which can hamper its ability to maintain consumption and accumulate wealth.

Both unpredictable weather and the biological risks inherent in agricultural production contribute to price volatility in agricultural commodity markets. The 20<sup>th</sup> century witnessed a range of farm policies aimed at mitigating the adverse effects of price fluctuations and production shortfalls. The recent consolidation of farms and growth in the value of farmland has brought more attention to wealth. Variability in the returns from farming can cause fluctuations in farm household wealth, and especially in the value of farm real estate. Many have argued that government programs have contributed to higher levels of wealth for farmers and that uncertainty about future programs puts this wealth at risk (Schmitz, 1995; Phipps, 1984; Featherstone and Baker, 1988; Just and Miranowski, 1993).

Wealth from the farm business is also unique in that equipment and other forms of capital are not easily transferred to other uses. This “asset fixity” also has implications for the distribution of wealth among farm households and changes in the level of wealth over time (Hathaway, 1963; Johnson and Quance, 1972; Johnson and Pasour, 1981; Pindyck, 1988). Given the importance of wealth to farm households, determining the sources of its variability may improve policies that influence income and underpin farm real estate values. In addition, decomposing (variability of) wealth into components will help relate the vulnerability of farm households to changes in the general economy.

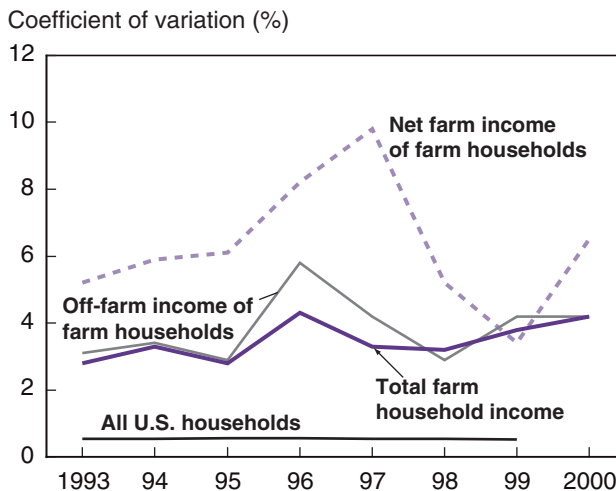
### Income Variability, Year to Year, Due Mostly to Farm Earnings

Variability of farm household income far exceeds that of all U.S. households (fig. 18), mostly due to variability in income from farming. Reasons for the variability in farm income across time include fluctuations in farm output, commodity prices, and business cycles (Firch, 1975; Schultz, 1945; Cochrane, 1979; and Tweeten, 1979). Price trends have not followed a con-

Figure 18

### Income variability in farm and all U.S. households

*Farm household income is more variable, mostly due to income from farming.*



Note: Coefficient of variation is defined as the ratio of standard deviation of income to the mean of income.

Source: USDA, Economic Research Service, 1993-1999 Agricultural Resource Management Survey. U.S. Bureau of the Census, Current Population Survey for all U.S. Households.

sistent pattern. Furthermore, export demand tends to be more unstable than domestic demand (Johnson, 1977). As a principal residual supplier of grain, cotton, and soybeans on the world market, U.S. farmers have become more vulnerable to decisions made in Russia, China, and/or the European Union (EU). Policy actions such as agricultural trade embargoes in the 1970s and 1980s, alterations in set-aside requirements, and the introduction of the Payment-in-Kind (PIK) program in 1983 further contributed to income variability. Macroeconomic policies, as they affect interest rates and exchange rates, also cause income instability in agriculture (Schultz, 1945; Schuh, 1974; and Johnson, 1977). All these factors are beyond the control of any individual producer, and can make predicting annual income of farm households very difficult.

While income variability of farm versus nonfarm households is important, so is the variability of farm household income over time. Mishra and Sandretto (2002) measured variability in yearly real net farm income to determine if it had diminished over the period 1933-99. The post-Depression period (1933-38), for example, showed annual variation in aggregate real net farm income of 34 percent. During the farm crisis years of 1979-84, farm income varied 39 percent annually. In contrast, aggregate real net farm income varied

only 12 percent annually during and after World War II, and from 1985 to 1995 (table 4).<sup>5</sup>

Over the years, income instability per farm has differed both in terms of variation in actual dollar amounts and percentage (table 4). By this measure, the years 1964-99 were markedly unstable, compared with 1933-63. The average farm enjoyed relatively stable earnings around World War II, with only a 6-percent yearly fluctuation (table 4). The Vietnam War and post-FAIR Act (1996-99) periods experienced similar variation in real net farm income per farm (21-23 percent), while 1985-95 (post farm crisis) was a relatively stable period for recent times, at 17 percent. In contrast, the farm crisis

era (1979-84) was true to its name, with real net farm income fluctuating \$6,019 per farm, or 47 percent.

In addition, Mishra and Sandretto (2002) examine the role of off-farm income in reducing the variability in total farm household income. They decomposed the variance in total farm household income into farm household income from farming and off-farm income and found that income from farming accounts for a greater absolute (measured by variance) and relative variation in total household income than does off-farm income (table 5). The overall variability in farm household income was lowest during 1960-63, with farm income contributing most to this variability.

A similar result was obtained when the aggregate series for 1960-99 was divided into specific periods, based on data availability, similar to the ones in table 4. Except for the post-FAIR Act period (1996-99), income from farming contributed more to total varia-

<sup>5</sup>During 1985-95, agriculture was moving toward becoming more market oriented, as mandated by the Food Security Act of 1985 and the Food, Agriculture, Conservation, and Trade Act of 1990 (FACT, 1990).

**Table 4—Variation in aggregate real net farm income**

Period	Description <sup>1</sup>	Average yearly variation in real net farm income			
		± \$ Million	± Percent	± Dollars	± Percent
		<i>(Aggregate)</i>		<i>(Per farm)</i>	
1933-1938	Post-depression recovery	8,784	34	1,859	34
1939-1948	World War II	7,812	12	994	6
1949-1959	Post-WWII boom, Korean war and postwar readjustment	8,093	12	1,157	9
1960-1963	Kennedy years	572	3	572	5
1964-1973	Vietnam War	8,457	16	4,183	23
1979-1984	Farm crisis	12,159	39	6,019	47
1985-1995	Post-Farm crisis	5,202	12	3,538	17
1996-1999	Post-FAIR Act <sup>2</sup>	7,034	18	3,648	21

<sup>1</sup>Selection of periods was based on the landmark dates in U.S. history, both in terms of agriculture and the economy as a whole.

<sup>2</sup>Federal Agricultural Improvement and Reform Act of 1996, also called the Farm Bill of 1996.

Source: Mishra and Sandretto (2002).

**Table 5—Components of estimated variance of U.S. farm household income from all sources, 1960-99**

Variance source	1960-99	1960-63	1964-73	1974-78	1979-84	1985-95	1996-99
	\$1,000						
Variance in net income from farming (CV, %)	84.84 (50.51)	2.37 (14.18)	23.86 (38.64)	6.16 (20.69)	2.65 (22.85)	29.99 (67.82)	0.62 (12.97)
Variance in income from off-farm employment (CV, %)	23.92 (35.99)	0.25 (5.61)	10.82 (17.55)	0.75 (3.73)	2.12 (6.43)	7.58 (8.30)	14.22 (8.80)
Covariance in net farm income and off-farm income	-13.49	0.37	11.02	0.18	0.75	-8.83	-1.36
Variance in total farm household income (CV, %)	95.27 (26.96)	2.99 (2.62)	45.70 (29.58)	7.09 (16.56)	5.52 (30.83)	28.74 (7.64)	13.48 (6.84)

Source: Mishra and Sandretto, 2002.

tion in total farm household income than did off-farm income. The relative and absolute variations were lower for nonfarm income than for income from farming. In the post-FAIR Act period, results are different. Table 5 shows that off-farm income accounted for a greater absolute variation in total farm household income than farming income did. However, when relative variation is taken into consideration, income from farming accounts for greater variation in total household income. One possible reason could be that the sustained economic growth and strong demand for workers in the nonfarm economy encouraged households to work more off the farm.

### Income Variation Among Farm Households Due More to Off-Farm Choices

Unlike the previous section on income variability, this section uses farm-level household data instead of aggregate household data. It also uses a normalized variance decomposition method (see appendix B) to assess the importance of each income component to the variability in total household income. The analysis of variation in farm household income focuses on two time periods (1993 and 1999) to represent circumstances before and after the 1996 FAIR Act.

Variation in farm household income originated primarily from farm income in both 1993 (49.6 percent) and 1999 (46.5 percent) (table 6). Variance sprang much less from off-farm business income and off-farm wages/salaries, though by 1999 off-farm wages and salaries contributed more than double (23.2 percent) their contribution to variance in 1993 (11.0 percent). The amount of variation in household income originating from interest and dividends and from other sources of off-farm income was minimal.

Off-farm income components (especially income from off-farm businesses and wages/salaries) appeared to have a greater variance in the 1990s than one might expect. This may follow from how the farm operator or farm household chooses to allocate time. When the nonfarm economy is doing well, a farmer who typically does not work off the farm may seek nonfarm employment. Additionally, farmers (and their spouses) more accustomed to off-farm work may be expanding hours worked there. This tendency to seek the highest return for their labor is consistent with the finding of Mishra and Goodwin (1997). Several other factors may add to variation in off-farm income components.

**Table 6—Normalized variance decomposition of farm operator households' income and wealth, 1993 and 1999<sup>1</sup>**

Income and wealth sources	1993	1999
	<i>Percent</i>	
<b>Income:</b>		
Farm income	49.6	46.5
Off-farm business income	31.6	19.2
Off-farm wages/salaries	11.0	23.2
Interest and dividends	3.9	6.2
Other off-farm income	3.9	4.9
<b>Wealth:</b>		
Farm equity	92.8	85.8
Nonfarm equity	7.2	14.2

<sup>1</sup>Source: USDA, Economic Research Service, 1993 and 1999 Agricultural Resource Management Study.

First, households tend to differ in their off-farm earnings potential (both from each other and over time) due to disparity in the level of human capital. Second, variation in demographics (i.e., age, marital status of operators, presence of children) is likely to affect the level of participation in (and income from) off-farm employment. Finally, the level of technology greatly determines how households allocate their time, and technology adoption varies widely among farm types.

### Sources of Variation in Farm Household Income

Differences in farm income among households may arise due to variations in climate, productivity of the land base, and type/size of the operation. These factors affect how farmers allocate their time between on- and off-farm work. As the size of the farm increases and farming income grows, so too does the proportion of income variation originating from farming (app. table 5). Farming occupation/high-sales, large farm, and very large farm households have more than half the variation in their income originating from farming. Along the same lines, retirement households show the most variation in their income from interest and dividends (and this variation has increased over time).

Farm households in the Northeast and West (app. table 6) tend to have a larger portion of income variation originating from farming than those in other regions. Farming's contribution to household income variability over time has gone in opposite directions in these regions—rising in the Northeast and falling in the West and North Central. Farm households in the South show much of their income variation originating from off-farm businesses and wages/salaries. Farms in the

South tend to be smaller, and many households report significant off-farm income.

The type of commodities produced can have a significant effect on variation in farm household income. Households specializing in cash grains, other specialty crops (such as tobacco, cotton, fruits and vegetables, and floriculture), and dairy have farming as a major source of income variability (app. table 7). Dairy households had the highest variation in income originating from farming in both 1993 and 1999. Dairy farming is labor intensive, and so its participants have less time for off-farm employment. In the case of cash grain and “other” livestock (such as poultry, beef, hogs, eggs, and sheep/goats) households, the variation in income from farming has fallen.

Farmers who own all of the land they farm tend to operate smaller farms and generally comprise a large share of limited-resource, retirement, residential/lifestyle, and lower sales farms. Therefore, variation in their household income originates mainly from earned income sources such as off-farm business income and off-farm wages and salaries. In contrast, significant variation in the household income of tenants (and part-owners) originates from farming. Farm income makes up a substantial portion of the household income for tenants and its contribution to income variation increased from 1993 to 1999 (app. table 8).

When decomposing variability in household income by age of farm operator, a familiar life-cycle pattern emerges. For young farm households (operator age 44 or younger), income from farming is the main source of variation in total income. As the operator ages, other sources of variation emerge. For example, by age 45-54, variation in income originates more from off-farm business income and wages/salaries. Aside from differences in sources of income during different phases of life, the cost of searching for a job also factors in. The present value of the returns to investing in the search for off-farm jobs will likely be greater for young farm operators, since the payoff period for such activities is much longer.

Education plays an important role in how operators allocate their time between farm and nonfarm work. Farmers with the highest level of education are more likely to have off-farm employment and thus a greater proportion of income from off-farm sources. Much of the income variability of households whose operator

has a graduate degree originates from different sources, depending upon the relative strength of the nonfarm economy (app. table 10). For example, in 1999 when the nonfarm economy was enjoying a record performance, many farm operators and members of their household earned higher off-farm wages. At the same time, nonfarm business income rose. Consequently, much of the variability in their income (and more than in 1993) originated from off-farm earnings.

Farming is the largest component of income variability for operators whose education has not advanced beyond high school. However, the contribution of farming toward this variability decreased from 1993 to 1999. This decline not only reflects greater stability in farm earnings from government support, but also suggests that such operators also took advantage of the booming nonfarm economy by reallocating their time between farm and nonfarm work.

### **Variation in Farm Household Wealth, 1993 and 1999**

Farm operator households’ wealth, measured as proprietors’ equity (current market value of assets minus debt), amounted to more than \$1 trillion in 1999. The vast majority of this wealth (87 percent) is controlled by farm households organized as sole proprietorships, which also manage 93 percent of farming units. Sole proprietorships averaged over \$500,000 in wealth in 1999, of which nearly two-thirds came from farm equity. Sole proprietorships are more active than partnerships or family corporations in determining how the farm’s wealth is managed.

The mere reporting of farm operator wealth, on average, masks the significant differences in wealth levels and in factors contributing to wealth accumulation among farm households. For example, the range in wealth between sole proprietorships with below-average equity (low wealth) and those with above-average equity was nearly \$1 million. Farms with low wealth were much smaller (200 acres versus 568 acres) and received significantly less in government payments (\$3,167 per year versus \$10,699). Operators of these less wealthy proprietorships were younger and less educated. There is considerable variation in farm households’ wealth over the period 1993-99.

Government farm programs contribute to the income and wealth of more than 40 percent of U.S. farms. The Federal Agriculture Improvement and Reform Act



(FAIR), which became law on April 4, 1996, gave participating farmers much greater flexibility in terms of crops that could be grown, while guaranteeing decreased payments over a 7-year period. Because the values of fixed production flexibility contract (PFC) payments as provided by FAIR are known over the 7-year program and are tied to land ownership, these outlays are capitalized into land values (Bierlen et al., 2000; Schertz and Johnston, 1997, 1998). To the extent that nearly 75 percent of U.S. farms' total assets are tied to real estate holdings, including land and buildings, variations in payments received by farm households contribute to variation in household wealth.

Many of the perceived impacts of government payments on the distribution of farm wealth are related to the life cycle of farmers. Lins et al. (1982) assert that while capitalization of program payments into land values tends to benefit existing landowners, it may also make it harder for young people to enter farming. Gale (1994) has shown that young and new entrants, due to financial constraints, tend to have smaller farms, and are less likely to own farmland than are older, more experienced farmers. Schultze (1971) suggested capitalization may provide incentives for retirement and exits from farming as owners "cash out" capital gains. Examining variation in farm households' wealth in light of the operator's life cycle is practical since farmers, in addition to saving for retirement, tend to take on less labor- and capital-intensive production activities as they grow older. Consequently, older farmers have different asset portfolios than younger farmers. Similarly, because older farmers have a shorter planning horizon and are more averse to risk than young farmers, they tend to be less inclined to adopt new technology or to purchase newer equipment (Haden and Johnson, 1989; Batte et al., 1984; Gale, 1994). As a result, they hold fewer physical capital stocks than do younger farmers.

Variation in farm household wealth has not received much attention in the literature. Weldon et al. (1993) examined changes in U.S. farm wealth over 1960-91 and cited farm income, government payments, and increased off-farm income as generating a more uniform wealth distribution. Skees et al. (1995) used simulation to illustrate how relative price changes in land, returns, and interest rates affect wealth for differently structured (i.e., size) corn-soybean farms in Illinois. Larger farms were found to be more sensitive to changes in land

inflation, especially when the land was owned, interest rates were lower, and the farm had less debt.

Average wealth of the U.S. farm household grew by 54.2 percent from 1993 (\$365,465) to 1999 (\$563,563). Meanwhile, variability of wealth declined (table 7, column 2). To the extent that size largely determines the composition of wealth, it is not surprising to see that the allocation of wealth into its farm and nonfarm components has also changed over time. With the growth in average wealth (and farm size), farm operator households have broadened their investments to include more nonfarm wealth (e.g., cash, money market accounts, corporate stocks, mutual funds, IRA, 401k accounts), with its share in 1999 rising to more than twice its 1993 level (Mishra and Morehart, 2001). Despite this growth, nonfarm wealth's contribution to the variability in total wealth remained relatively minor at 14.2 percent.

### Sources of Variation in Farm Household Wealth

Using Mishra and El-Osta's (2001) methodology we decompose variation in household wealth into its components (farm and nonfarm). Variation in farm household wealth is attributed primarily to variation in farm equity (wealth); this component, compared with the nonfarm (wealth) component, commands the bigger share of wealth and dictates more of its variability. We have also intimated that life-cycle differences and level of physical assets may explain part of the variation in household wealth. The purpose of this section is to quantify these effects.

Also contributing to variation in farm household wealth are size of farm, type and location of farm, and operator's level of educational attainment. For example, the capital requirements of a dairy farmer (cows,

**Table 7—Variability in farm operator households' income, wealth, and expenditures, 1993-99**

Year	Household income	Household equity	Household expenditures
<i>Coefficient of variation (percent)</i>			
1993	2.8	2.4	2.9
1994	3.3	5.2	1.7
1995	2.8	2.1	1.7
1996	4.3	5.3	4.0
1997	3.3	NA	NA
1998	3.2	4.1	2.8
1999	3.8	1.7	7.3

NA = data are not available.

milking machines, etc.) far exceed those of a cash grain producer. Farm location also determines wealth in that land values vary greatly across geographic areas. The average value of farm real estate in 1999 ranged from \$219 per acre (New Mexico) to \$7,000 (New Jersey) (USDA, 1999). The high cost of real estate in New Jersey, as in other Northeast States, reflects greater competition for land from nonfarm uses. Finally, those farmers with more education, consistent with human capital theory (Mincer, 1974), are expected to earn more than less educated farmers when working off-farm, thereby gaining access to additional funds to use toward either onfarm or off-farm investment.

Appendix tables 11-16 report wealth decomposition results based on data disaggregated by operator characteristics (e.g., age and education), size of farm, farm location, and type and tenure arrangement of farm. Regardless of the classification used, the pattern that persistently emerges (with one exception: full tenants) is that farm wealth is strongly and positively associated with total household wealth. It appears that the higher the households' commitment to farming and the higher the proportion of farm wealth to total wealth, the higher is the contribution of the farming component of wealth to the overall variation of total household wealth.

A case in point is the group of farm operator households identified as very large farms (annual farm sales over \$500,000). While these households represent less than 3 percent of farms, they account for half of all farm output. As a share of household wealth (between farm and nonfarm sources), their farming component was highest of all groups at 86 percent. In comparison, limited-resource farms represent about 6 percent of U.S. farms, produce less than 1 percent of output, and devote just 58 percent of household wealth to farming assets. This demonstrates why the farming component contributed nearly 99 percent to variation in wealth in very large farms (app. table 5) and just 16 percent in households operating limited-resource farms.

### **Farm Household Consumption Less Variable Than Income and Wealth**

The most common indicators of household economic well-being are income and wealth. Because of the stochastic nature of income caused by weather conditions and commodity markets, many farm families rely on savings and/or on borrowing to maintain their con-

sumption in the face of large income shocks. Table 7 shows the extent of variability in household expenditures relative to the variability in total household income and total household wealth over the 1993-99 period. Expenditures exhibited, with 1999 the exception, less variability (based on coefficients of variation) than total household income and total household wealth (equity). This finding is important to this report's goal of determining farm households' true well-being and how best to ensure it.

As noted by Mishra and Morehart (1999) in their examination of the life-cycle/permanent income hypothesis, expenditures tend to provide a more stable accounting of households' long-term welfare since they reflect a household's own assessment of its permanent income. As such, expenditures provide a better proxy for households' long-term welfare. The fact that table 7 (column 3) shows a sizeable rise in the variability of total household expenditures between 1998 and 1999, coupled with a modest rise in the variability of total household income, suggests a lesser degree of consumption smoothing in 1999 than in 1998. This proposition is consistent with the fact that average farm operator household income and wealth in 1999 (\$64,347 and \$563,563) were also higher than in 1998 (\$59,562 and \$492,195).

### **Sources of Variation in Household Consumption**

Expenditures on household rent/mortgage, utilities, and appliances and furnishings accounted for nearly 39 percent of the variation in total household expenditures in 1998 (table 8). Next in importance were medical expenses, insurance, and contributions to retirement plans, which contributed nearly 36 percent of the variation in total household expenditures.

Results of decomposing variation in total household expenditures based on selected farm characteristics (e.g., farm typology, location, specialization, and tenure) and operator characteristics (e.g., age and education) are presented in appendix tables 17-22. Most notable is how individual expenditure components contribute so differently, by characteristic, to overall variation in total household expenditures. For example, while nearly 85 percent of the variation in expenditures by limited-resource farms in 1998 originated from medical expenses, insurance, and retirement, this component contributed only one-fifth of the expenditure variation by the farming groups identified as

**Table 8—Normalized variance decomposition of farm operator households' expenditures, 1998**

Expenditure sources	Percent
Food and household supplies, excluding utilities	6.8
Household rent/mortgage, utilities, appliances, and furnishings	38.5
Nonfarm transportation	11.9
Medical expenses, insurance, and contributions to retirement plans	36.3
All other family living expenses such as clothing, education, hobbies, recreation, gifts, magazines, charitable contributions, etc.	6.4

Source: USDA, Economic Research Service, 1998 Agricultural Resource Management Study

“farming occupation-lower sales” and “farming occupation-higher sales” households (app. table 17). By region and by farm type, the contribution of medical expenses toward variation in overall expenditures remained most important only for farm households in the Northeast (77.3 percent) and those specializing in “other crops” (47.6 percent).

Another component contributing greatly to variation in expenditures is household rent/mortgage, utilities, and furnishings. So, for “part-owners,” this component amounted to 63 percent of variation (app. table 20). When the 1998 sample was categorized based on farm operator’s age and level of educational attainment, the two components that appeared to contribute most to the variation in total expenditures—across all cohorts—were “medical expenses, etc.” and “household rent/mortgage, etc.”