Technology Adoption, Management Practices, and Financial Performance of New and Beginning Farmers: Evidence from a National Survey

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Abstract

More than 50 percent of current farmers are over age 55, and the number of new farmers replacing them has fallen. This paper examines factors that contribute to the financial performance of new and beginning farmers in the U.S. A weighted regression analysis was used on data from the 2005 Agricultural Resource Management Survey (ARMS) to measure new and beginning farmers' financial performance given farm and operator characteristics, production and marketing, and risk management strategies. Particular attention was given to the impact of technology adoption and management strategy on financial performance. Results indicate the adoption of Genetically Modified (GM) crops, having a written business plan, controlling variable costs, participation in coupled farm program payment, and participation in marketing contracts lead to higher financial performance while education, age, and off-farm work lowered financial performance for new and beginning farmers.

Keywords: financial performance, technology adoption, Genetically Modified (GM) crops, Business plan, new and beginning farmers, contracting, coupled farm program payments

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The population of U.S. Agriculture is poised to make a dramatic change-more than 50 percent of current farmers (over 55 years) are likely to retire in the next five years (Mishra and El-Osta). U.S. farmers over age 55 control more than half the farmland, while the number of new farmers replacing them has fallen. For example, the number of farm operators 35 years or younger has declined by 86 percent since the Farm Crisis period (Census of Agriculture). Absence of a generation of new and beginning farmers can lead to: (1) concentration of land in large farms; (2) loss of rural communities; and (3) squandering the chance to shift to a more sustainable system of agriculture;

The issue of new[1] and beginning farmers is such a concern that the 2002 Farm Bill directed the USDA to initiate special programs for new and beginning farmers. For example under the Credit (Title V), farm ownership loan, the 2002 Farm Bill asked the Farm Service Agency to setup (1) guarantee of loans made under State beginning farmer or rancher program; (2) beginning farmer and rancher contract land sales program; and (3) reservation of funds for direct operating loans for beginning farmers and ranchers. Finally, currently the Farm Credit Administration (FCA) is seeking lending rule changes to aid new and beginning farmers and ranchers. The FCA is investigating if off-farm income can be used to finance farm investment decisions.

New and beginning farmers and ranchers (YBFR) have different needs than established farmers and ranchers. YBFR often lack the capital and the scale of operation to make profits and face high production costs (due to high cost technologies and production systems). A YBFR must rapidly acquire information about how to farm, how to manage a farm business, and how to adhere to regulations. Hence, the objective of this paper is to: (1) assess the uses of technology,

[1] In this study terms young and new are used interchangeably.

in particular the adoption of GM crops; (2) use of input management practices and information systems; (3) labor allocation decisions; and finally (4) investigate the factors (farm, operator, and household characteristics, along with farm type, and regional location of the farm) affecting profitability of new and beginning farmers and ranchers A better understanding of the characteristics that influence returns and/or profits would be useful to YBFR who wish to make changes in their farming operations in order to increase returns, and to policymakers who aim at formulating policies that help YBFR maintain stable incomes.

Defining New and Beginning Operators

New and beginning farm operators can be defined in a variety of ways depending on the reasons for which analysis may be conducted. Sociological studies may define new and beginning by generational differences says by twenty year age bands. Studies related to eductional services may group new and beginning operators by “high school”, “college student” and “post graduate”.

New and beginning farm operators are often defined by eligibility status in some farm programs. Widely used is a definition “*any individual or entity who has been operating a farm or ranch for less than 10 years and materially participates in its operation.”* This is the definition used for participation under the Conservation Security Program (CSP) and the Environmental Quality Incentives Program (EQIP). A second widely used definition is the Farm Service Agency (FSA) definition. For paticipation in farm ownership and operating loan programs, a beginning farmer or rancher must have an operation that is no larger than 30% of the average size farm in the county. A further requirement, for direct operating loan participation, requires that the applicant must have participated in the business operation for at least 3 years.

The issue of the financial health and success of new and beginning farm operators is especially pertinent for farmers who are ready to retire within the next five years. Their retirement will have implications for farm wealth, industry structure, and the supply of food and fiber. Using the 2005 ARMS, farm operators have been classified into two categories based on their experience as a primary farm operator. The first category includes farm operators who have ten years or more farming experience (about 80 percent of farm operators). Second are farm operators who have less than ten years experience (about 20 percent of operators). Our study focuses on the latter group of farm operators and their households.

Data Source for New and Beginning Operators

Data for this analysis are from the 2005 Agricultural Resource Management Survey (ARMS). ARMS is conducted annually by the Economic Research Service and the National Agricultural Statistics Service. 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 of the survey is operators associated with farm businesses representing agricultural production in the 48 contiguous 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 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 run by hired managers were excluded.

The 2005 ARMS collected information on farm households in addition to farm economic data. For example, it collected detailed information on off-farm hours worked by spouses and farm

operators, the amount of income received from off-farm work, net cash income from operating another farm/ranch, net cash income from operating another business, and net income from share renting. The heavy emphasis in off-farm employment of operators and spouse by suggests that the farm household has an alternate goal to generating maximum household income for the farm business operation[2]. Furthermore, income received from other sources, such as disability, social security, and unemployment payments, and gross income from interest and dividends was also counted. The 2005 ARMS contains a sample of 983 farm operated by new and beginning farmers and ranchers (YBFR). This sample, when expanded using sampling weights, represents a population of 412,321 farms operated by YBFR.

Having a business plan is very important to new and beginning farmers and ranchers (YBFR) in today's agriculture. A completed business plan expands on opportunities and determines whether a new business venture is feasible. Viable farm business ventures are a by-product of business planning. Developing a business plan is a process that helps farmers focus on factors necessary for future business success. An initial benefit of engaging in the business planning process is assisting farmers in defining realistic goals that will make their proposed venture viable in the future. Organizing thoughts and ideas into a formal plan sets farms on a path of success and also provides a means to measure actual outcomes against business goals. In 2005 farm operators were queried if they had a written business plan. Results show that about 15 percent of YBFR had written business plans.

[2] With a growing rural population, many of whom are defined as "farmers" within the definitions which apply to USDA's agricultural surveys ($1,000 in sales for a "normal" year), we obviously begin to find more "lifestyle" farmers. "Lifestyle" farmers have alternative farming goals: as opposed to farming for profit they may farm for other amenities of a rural lifestyle such as placing high value on clean air, less noise, open spaces, and less congestion. To have these farmers grouped within the same group with farmers who are in business to farm for profit is discordant. While the objective of this paper is not to look at the relationship between farm business goals and profitability it is important to recognize that alternate goals exist within the principal categories selected for analysis.

Income statements comparison by operator experience: Experienced primary farm operators yielded average net farm income about 3.5 times larger than new and beginning operators. Generally, new and beginning operators had lower relative sources of gross cash income, and higher relative costs (both variable and fixed). New and beginning operators realized a larger percentage of income from livestock sources (42 percent vs. 35 percent) and recorded higher feed expenses as a percent of total expenses. An added item contributing to the higher expense percentage for new and beginning operators was interest expense. Experienced operators reported 5.9 percent of cash expenses while new and beginning operators 10.6 percent of cash expenses for interest paid.

Balance sheets comparison by operator experience: On average the farm asset side of the balance sheet of new and beginning farm operators was found to contain about half the asset value that the balance sheet of experienced farm operator balance sheets recorded while the liabilities side of the balance sheet on average were about equal. The resulting farm equity of experienced farm operator operations was on average $755 thousand compared to $376 thousand for new and beginning operator run businesses. Lower level of equity and higher debt to asset ratios are typical business conditions of operators who are in the first ten years of business operations.

Methodology and Model Specification

The appropriate measure of economic performance has been a topic of much interest among both economists and accountants. Some would argue that accrual net farm income (before taxes) is a good measure of overall financial performance while others suggest that return to labor and management is the preferable measure. Yet other researchers have used several financial ratios to measure farms' financial performance (e.g. Plumley and Horbaker; Ellinger *et al.*). Kauffman and Tauer used four different measures of farm performance for their study (labor management

income per operator, labor management income per operator per cow, rate of return on equity capital, and rate of return on equity capital excluding appreciation).

Financial Performance is a subjective term and depends in part upon the time frame considered and the goals of the farm business and/or farm household. Therefore, the criteria by which farm performance is measured must be clearly defined. Several studies have investigated the use of net farm income (NFI) as a performance measure (Melichar; Haden and Johnson). The benefits of using NFI, as a measure of profitability, have been well-documented in past studies (Lins *et al.*). A positive value of NFI is critical to survival of the farm. Most farmers must balance equity growth with the need to meet short-term cash commitments. The use of NFI as a sole performance measure, however, may present a problem because it is an accounting measure and does not address opportunity costs. Hence, the use of NFI as an economic performance measure does not necessarily accurately reflect use of the resource base. In addition, the measure is a dollar amount and as a result is difficult to compare across farm businesses. Also, the form of business organization (family owned, corporation, etc.) can cause interpretation problems. In light of the above problem, following Mishra et al, 1999 we use modified net farm income (MNFI) per dollar of assets as a measure of financial performance.

Conceptual Framework

Consider a profit maximizing farm operator who in each period selects the combination of inputs and outputs that maximizes profits (total revenue minus total cost) subject to a production constraint. Specifically,

$$\text{Max } \Pi = \left[\sum \mathrm{P_i} Q_i \left(k, \mathrm{P_i}, \gamma\right)\right] - \left[\sum \mathrm{C_j} \left(Q_{j,} w_j, \theta\right)\right] \qquad (1)$$

where Π is net profits (net farm income), $\mathrm{P_i}$ denotes a vector of output prices, and Q_i denotes a vector of output produced. Production depends on the farm operator's level of human capital

(education and experience), price of output, various farm characteristics, and managerial ability. On the cost side, C_j represents the cost of production, which depends on the quantity produced (Q_j), a vector of input prices w_j, and a vector of farm characteristics, and managerial ability, θ. Based on equation 1 one can estimate the following model

$$\mathbf{NFI} = \alpha_o + \Sigma\, \alpha_{ij} \mathbf{X}_{ij} + \varepsilon \qquad (2)$$

where NFI is net farm income and X_{ij} is a vector of farm, operator, and financial characteristics. However, because net farm income does not address opportunity costs as a measure of financial performance we replace the dependent variable (NFI) in equation 2 with modified net farm income (MNFI) per dollar of assets. MNFI is defined as net farm income (NFI) plus interest expense, where NFI is gross farm income minus total farm operating expenses, excludes marketing expenses (Mishra, El-Osta, Johnson, 1999). MNFI_DA is defined as the ratio of MNFI to total assets. MNFI_DA is hypothesized to be a function of operator and farm characteristics and management strategies used to manage the farm. Specifically, we estimate the following equation using a weighted least squares procedure.

$$\mathbf{MNFI\_DA} = \alpha_o + \Sigma\, \alpha_{ij} \mathbf{X}_{ij} + \varepsilon$$

(3)

where,

(i =1.....n),

MNFI_DA is modified net farm income per dollar of assets,

$\mathbf{X}_{ij}$ are a set of farm operators', farm, and financial characteristics,

α_{ij} is a vector of parameters to be estimated, and,

ε is the unexplained random component.

The independent variables hypothesized to affect the farm's financial performance encompasses the three following areas: farm operator characteristics; farm characteristics such as production and marketing efficiency measures; and management strategies. They are presented in Table 1.

The inclusion of farm operator characteristics such as education may give some insights into the influence of training, experience, and demographics on farm business financial performance. These factors affect the production function (Huffman, 1977; Becker). Huffman (1977) and Lin et al. show that higher levels of farm operator education are likely to induce adoption of new technology. Education is hypothesized to have a positive effect on returns to farming, as predicted by human capital theory. Better educated farmers tend to be more successful and to receive the same or better returns from farming as elsewhere. Warren, using cross-classification analysis, found that operators of higher income dairy farms in New York had a higher than average level of education. Cunningham-Dunlop assessed the effect of education on farm profits in Canada. She concluded that the net returns to education in Canadian agriculture were positive. On the other hand, Laband and Lentz and Osburn found a negative effect of education on farm financial performance.

Several farm production characteristics are hypothesized to contribute to a farm's financial performance: nonfarm income, machinery value per dollar of output, participation in government commodity programs, ratio of cash operating expenses, and diversification. Nonfarm income may affect labor and management. If the source of the nonfarm income is wages and salaries (in this study we use income from all nonfarm sources), then one would expect the effort expended to detract from farm labor and management therefore contributing to lower performance of the farm. Machinery value per dollar of output (C_MEVP) is expected to be negatively related to farm performance. This is because depreciation and interest on debt and returns to owners' capital are higher with relatively more capital. Ali and Johnson used machinery expenses per tillable acre as a variable in explaining returns to labor and management. They found that this variable has a significantly negative influence on the labor earnings.

The variable defined as the ratio of cash operating expense to value of farm production (C_COPEVP) is used to take into account variable costs of production. Cash operating expenses include expenditures on hired labor, purchased feed and livestock, maintenance and repair, and custom hire work. It is hypothesized that more successful farms will have a significantly lower ratio than less successful farms. Plumley and Hornbaker used the ratio of cash operating expenses to value of farm production as a variable to study (using mean analysis) characteristics of successful and less successful Illinois grain farmers. Kauffman and Tauer, Haden and Johnson have used expenditures on hired labor to measure the same effect. Therefore, a negative relationship is hypothesized between C_COPEVP and the probability that a farm will be successful. Warren and Burritt in their studies found that most profitable dairy farmers were controlling their cash expenses. Luckham focused on identifying financial ratios associated with the profitability of Virginia dairy farms. He found that controlling operating expenses (which measures cost control) was positively related to profit. Korth used a variety of statistical techniques to identify factors related to financial success of Nebraska beef-hog, grain, and dairy farms between 1978 and 1982. He found that expense structure had a negative and significant impact on the financial success of the farm.

Farm size is another factor related to financial performance (Boessen *et al*.; Ford and Shonkwiler; Haden and Johnson; Kauffman and Tauer; Sonka *et al*.). While Matulich found economies of scale in dairying, Kauffman and Tauer's findings indicated no strong relationship between number of cows and the probability of higher returns. Haden and Johnson found a positive relationship between farm size and financial performance. Finally, a recent study by El-Osta and Johnson found a positive correlation between farm size and net farm income. In this study we use value of farm production (F_VALPROD) as a measure of farm size. Farm size is expected to be positively associated with returns to labor and management. This is in line with Barlett's notion that larger and more resource endowed farms are better able to take advantage of

sophisticated, productivity-enhancing technology and ultimately more likely to generate higher incomes.

Managerial ability has been included in a number of studies of producers. Managerial ability has been represented in regression models by a set of demographic variables or production practices (Sumner and Leiby; Mykrantz *et al.*). Managerial practices in general have been found to be important to the success of farming operations (Sonka *et al*.). However, there is no clear consensus arising from previous studies on what variables represent management or accurately assess managerial ability. Ford and Shonkwiler used latent variables such as crop, financial, and dairy management practices as proxies that reflect financial success of dairy farms in Pennsylvania. Their findings show that management measures such as milk sold per cow, milk sold per man, veterinary expenses per cow, and heifers and calves per cow are more important determinants of farm financial success than financial management (e.g., equity-to-asset ratio, operating margin, and debt per cow) or crop performance (e.g., crop acres per cow, crop acres per man, and crop expenses per acre). Hoffman indicated that well managed farms, based on farm records, are better able to compete in per-unit profitability with farms many times larger. In our study, we use a variable based on keeping books and records (B_PLAN) as one proxy for managerial ability.

Kauffman and Tauer use hay ratio (haylage as a proportion of all hay) as a measure of technology adoption. They point out that farmers who adopted haylage production technology over dry hay significantly improved their farm's probability of success. Based upon the information of technology adoption by farmers (first in the county, second, wait and see), Mishra, El-Osta, and Johnson, found that farmers who adopt a proven technology (operators willing to try a new technology even though it has been tried by only few operators in the county) are more likely to be successful in farming.

Results

The Agricultural Resource Management Study (ARMS) is a probability weighted random survey and in order for the estimated parameters to be reflective of the farming population a weighted least squares method of estimation was used. Weighted least squares estimates of factors hypothesized (equation 3) to affect the financial performance of new and beginning farm operators, as measured by MNFI per dollar of asset is presented in Table 2. The R^2 (adjusted) of 0.30 in Table 3 indicates that the explanatory variables used in the weighted least squares equation explained 30 percent of the variation in returns to operators' labor and management. These levels of explained variation in Table 2 are fairly typical when the analyses are based on cross-sectional data (El-Osta and Johnson; Hensher and Johnson). The F-statistic, which tests the joint significance of the independent variables included in the model, is significant at the 1 percent level of significance (Table 2).

The coefficient on technology adoption (T_GMSEED) is positive and statistically significant at lower than the 10 percent level of significance. Results show that new and beginning farmers and ranchers (YBFR) who adopt Genetically Modified (GM) corn and soybean seeds have higher financial performance, as measured by MNFI_DA. Our results are consistent with the finding of McBride and El-Osta. One possible explanation is by planting GM seeds operators are reducing the operating costs. Further, Fernandez-Cornejo, Hendricks, and Mishra point out that adoption of GM seeds decreases farm work hours and increases off-farm labor supply of farm operators. This is certainly true for YBFR, whose returns from off-farm work are greater than farm work. Higher education and financial performance is negatively related for YBFR. The coefficient on COLL_EDU, farm operators with college degree and beyond is negative and statistically significant at the 5 percent level of significance. This is not surprising since many YBFR tend to have higher education, operate smaller farms, and tend work more off the farm. This result may

imply that better educated YBFR are likely to get higher returns to human capital from off-farm work are likely to work off the farm, and in the process have a negative impact on farm's financial performance.

Agriculture is a dynamic industry and there are numerous opportunities for YBFR to capitalize on consumer trends. New agriculture related business ventures can be complex and require substantial planning to guide farmers through a start up, diversification, or expansion. Many farmers are entrepreneurial and have numerous options to consider when changing the way they do business. The coefficient on B_PLAN is positive and statistically significant at the 5 percent level of significance. Results indicate that YBFR who have written business plans have higher financial performance (MNFI_DA) compared to YBFR with no written business plan. One possible explanation is that having a written business plan may help YBFR obtain loans and grants from banks, state, and regional agricultural development agencies. Many states in the U.S. have separate funds dedicated to assist YBFR. However, in all of the cases the authorities require that the farm operator have a business plan, income statement, and financial balance sheet.

The age of the farm operator (OP_AGE) has a negative and statistically siginficant influence on the financial performance, as measured by MNFI_DA, of the farm operated by YBFR. The results support the notion that farmers have fewer assets and often lower profits when they are new. Another interpretation of this finding is that older farmers have more experience and can better allocate resources where they are needed and keep them fully utilized. These results are consistent with the findings of Haden and Johnson; Mishra, El-Osta, and Johnson and Mishra, Tegegne, and Sandretto. The coefficient on ratio of farm debt to farm assets (FARM_DA) is negative and statistically significant at the 1 percent level of significance. Findings here suggest some kind of liquidity constraint and financial performance of YBFR is indirectly related to the debt-to-asset level (farming operation). On the other hand, nonfarm debt-to-asset level

(OFARM_DA) has no impact on the financial performance. Although, many YBFR have a significant amount of nonfarm wealth, they do not use that wealth for borrowing money for the farming operation. Further, farm assets are mainly used to acquire additional debt (short or long term debt) for farming. A possible interpretation of this finding is that if the debts are high greater amount of the income will be used to service the debt and hence lower financial performance of the farm.

Controlling variable costs of production is another important variable that contributes to the success of farm firms. Our results indicate that the ratio of cash operating expense to value of production (C_COPEVP) is negatively correlated with the financial performance of farm firm, operated by new and beginning farmers and ranchers (YBFR). Results indicate that reducing variable costs increases net farm income and MNFI per dollar of assets (MNFI_DA). These results are consistent with the findings of the past studies (Mishra, El-Osta, and Johnson; Kaufman and Tauer; Haden and Johnson; Korth; Luckham; Sonka, Hornbaker, and Hudson; and Warren and Burritt). Farmland pricing literature often cites land prices as a factor that dominates the entry of new and beginning farmers into farming. Due to high land prices many YBFR are constrained by the amount of land that they own, hence renting/leasing is very prevalent in order to achieve economies of size. The coefficient on the share of land rented/leased to total acres operated (SHARE_RNLS) is negative and statistically significant at the 1 percent level of significance. This suggests that financial performance, as measured by MNFI per dollar of assets (MNFI_DA), decreases with an increasing share of rented/leased land to total operated acres. On the other hand, compared to YBFR who are tenants (a form of farm tenure) full and part owners have lower financial performance. Our finding is consistent with Garcia, Sonka, and Yoo, who found a negative relationship between the degree of land ownership and profits.

The coefficient of farm size (F_VALPORD) variable has the expected sign and is significant at the 1% level of significance. These results are consistent with the findings of Ford and Shonkwiler; Haden and Johnson; El-Osta and Johnson, and Mishra, El-Osta, and Johnson. These results suggest overall economies of scale. For an additional $1,000 in sales of farm products, returns to operators' labor and management increased by approximately $104. A farm operator may generate a higher total net income by combining on and off-farm work, but when investigating the financial performance of farm firms operated by YBFR, what matters the most is farm income. Results show that working off the farm (OPF_WAGE) decreases the returns to farming of YBFR. Results suggest that a dollar increase in off-farm income decreases MNFI_DA by approximately 6 cents. A possible explanation is that YBFR farm operators who work off the farm have less time to manage, at the farm level, the farm resulting in mismanagement of resources in the production process. These results are consistent with the finding Mishra, El-Osta, and Johnson

Government farm programs are intended to decrease agricultural producers' risks (Goodwin and Schroeder), i.e., price support programs help reduce producers' price risk by assuring a guaranteed return. In this study, we include three variables that represent three different types of government program payments. The first is direct payments (GP_DIRECT), which are also called "decoupled payments". The second is conservation reserve program payments (GP_CRP), and finally payments are tied to production, also known as "coupled payments" (GP_PAYMENT). The coefficient on GP_PAYMENT is positive and statistically significant. Results suggest that YBFR participation in coupled payments increases net farm income and MNFI per dollar of assets (MNFI_DA). As reported in the literature, government commodity programs have often been identified as the primary risk-reducing mechanism for many farmers, especially those producing cash grains (Calvin; Kramer and Pope; Musser and Stamoulis). Another way to reduce risk in agriculture is through use of market oriented tools such as futures,

options, marketing and production contract. In recent years, especially after the 1996 Farm Bill, farmers have increased the use of such tool (Barry). The coefficient on participation in marketing contracts is positive and significant at the 5 percent level of significance. Results indicate that YBFR who participate in marketing contracts are likely to have higher returns to farming.

Conclusions

The purpose of this study was to identify factors that contribute to the financial performance of new and beginning farmers in the U.S. A weighted regression analysis was used on data from the 2005 Agricultural Resource Management Survey (ARMS) to measure the financial performance of new and beginning farmers given farm and operator characteristics, production and marketing, and risk management strategies. Particular attention was given to the role the technology adoption and management strategy have on financial performance.

Results from this study indicate that YBFR who adopt Genetically Modified (GM) corn and soybean seeds have higher financial performance. Planting GM seeds may reduce operating costs and decrease farm work hours and increases off-farm labor supply of farm operators. Results from this study show that management strategies such as having a business plan, especially a written business plan, can lead to higher financial performance. Written business plan may help YBFR obtain loans and grants from banks, state, and regional agricultural development agencies.

Empirical results from a weighted least squares model of factors affecting financial performance of new and beginning farmers and ranchers (YBFR) identified education, size of operation, controlling variable costs of production, and farm tenure. Our analysis shows that older and more educated YBFR farm operators have lower financial performance. Risk management strategies like marketing contracts and participation in government farm programs, especially coupled

programs, also contributed toward financial performance, as measured by modified net farm income per dollar of assets (MNFI_DA). Finally, off-farm work by the YBFR farm operators reduced returns to farming. Highly leveraged farms have lower financial performance and YBFR who are tenants are likely to have higher financial performance.

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Table 1: Variable definition and Summary Statistics

Variable name	Description	Mean (Std. Dev)
OP_AGE	Age of the farm operator (years)	47.86 (12.62)
SCOLL_EDU	=1 if the operator has some college education, 0 otherwise	0.59 (10.07)
COLL_EDUC	=1 if the operator has college degree or more , 0 otherwise	0.31 (9.46)
OPF_WAGE	=1 if operator reports off-farm income through wages and salaries, 0 otherwise	0.65 (9.38)
SPF_WAGE	=1 if spouse reports off-farm income through wages and salaries, 0 otherwise	0.53 (10.23)
SHARE_RNLS	Share of rented and leased acres to total operated acres	0.23 (0.38)
F_POWNER	=1 if farm partly owned, 0 otherwise	0.25 (0.49)
F_FOWNER	=1 if farm fully owned, 0 otherwise	0.64 (0.49)
F_OCCUP	=1 if the operator's occupation is farming, 0 otherwise	0.27 (0.49)
F_VALPROD	Value of agricultural commodities sold by the farm *($0,000)*	45.75 (1584.84)
P_CONTRACT	=1 if the farm had production contract, 0 otherwise	0.12 (0.33)
M_CONTRACT	=1 if the farm had marketing contract, 0 otherwise.	0.20 (0.40)
C_MEVP	Ratio of value of machinery to value of production	6.51 (42.11)
C_COPEVP	Ratio of cash operating expenses to value of production	3.23 (20.06)
GP_DIRECT	=1 if the farm received direct farm program payments, 0 otherwise	0.26 (0.44)
GP_CRP	=1 if the farm received conservation reserve program payments, 0 otherwise	0.12 (0.30)
GP_PAYMENT	=1 if the farm received price support farm program payments, 0 otherwise	0.13 (0.33)
T_GMSEED	=1 if the farm is using genetically modified seeds for corn and soybean, 0 otherwise	0.15 (0.35)
B_PLAN	=1 if the operation has a business plan, 0 otherwise	0.15 (0.36)
FARM_DA	Ratio of farm debt to farm assets	0.18 (1.57)
OFARM_DA	Ratio of nonfarm debt to nonfarm assets	0.58 (27.42)
MNFI_DA	Modified net farm income per dollar of asset	0.18 (2.75)
	Sample	983
	Number of farms	412,321

Table 2: Parameter Estimates of Factors Affecting Financial Performance of New and Beginning Farmers (2005)

Variable	MNFI_DA[1]
Intercept	0.509***
	(0.089)
OP_AGE	-0.003***
	(0.001)
SCOLL_EDU	-0.056
	(0.042)
COLL_EDU	-0.074**
	(0.036)
OPF_WAGE	-0.059*
	(0.030)
SPF_WAGE	0.004
	(0.027)
SHARE_RNLS	-0.214***
	(0.051)
F_POWNER	-0.172***
	(0.049)
F_FOWNER	-0.203***
	(0.057)
F_OCCUP	-0.058*
	(0.032)
F_VALPROD	0.0002***
	(0.0000)
P_CONTRACT	-0.040
	(0.109)
M_CONTRACT	0.076**
	(0.032)
C_MEVP	0.000
	(0.0003)
C_COPEVP	-0.0003*
	(0.000)
T_GMSEED	0.072*
	(0.030)
B_PLAN	0.079**
	(0.039)
FARM_DA	-0.412***
	(0.023)
OFARM_DA	-0.0002
	(0.002)
GP_DIRECT	0.056
	(0.043)
GP_CRP	0.010
	(0.040)
GP_PAYMENT	0.213***
	(0.065)
R^2	0.31
Adjusted R^2	0.30
F-test	20.23***

Numbers in parentheses are standard errors. Single, double, and triple asterisks indicate statistical significance at 10%, 5%, and 1% levels respectively. [1] MNFI is defined as modified net farm income per dollar of assets.