"Are Changing Demographics Fostering a New Role for Farmers?"

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Introduction:

Farmers growing traditional crops are by nature at the mercy of the market for input prices as well as the prices received for crops. These farmers participate in a highly competitive market. Such a market creates an atmosphere where businesses which do not do better than the farm industry's average participant, will fail in the long run. Farms must do this while faced with constraints such as limited time and resources.

Resources only make up a portion of what makes a farm successful, as the capability to optimally utilize these resources is just as if not more important. In order to do this a farm must adopt certain skills such as financial management or procurement and selling. Mastering these skills can give a relatively smaller farm an advantage that can allow it to be more successful than a more asset rich farm.

Each of these skills has a different affect on the farm business and some can prove to be more valuable than others. Knowing which skill is the most critical for the individual farm will allow the farm manager to make more informed decisions and allocation of resources to the adoption of more critical skills.

The market, however, is never stagnant and there is a constant change in the definition of the "average" participant in the farm industry. Changes in markets, withdrawal of participants, entry of new participants and new technologies can change the importance of skill sets and resource allocation. Due to these changes what was once a successful farm in the past could quickly becoming less profitable or at risk of withdrawing from the market, without changes being made the farm manager. The modern average farmer has a different set of demographics and skill sets than farmers in the past and in order to continue producing, these skills must be

identified to help traditional farms succeed in allocating time to the right learning opportunities or skill set enhancements.

The most recent era of US farming has seen one of the greatest changes in farming history. Increasing globalization and more liberal trade agreements have drastically increased the number of competitive firms that US farmers must face. Some of these non-US farmers will have competitive advantages such as relaxed environmental laws, cheap labor, and government supports. These competitive advantages cannot be matched by US farmers and force US farmers to adapt in other ways. These recent changes have also increased the volatility of US commodity markets according to Nagler, Hewlett and Weigel. This increase in volatility has made the industry more risky and skills pertaining to risk management play a more critical role in long term survival of the firm (note that in Nagler, Hewlett and Weigel, risk management also pertains to skills involving financial management skills and hedging).

Another change that farmers have had to recently face is decoupled payments. Roberts Kirwan and Hopkins and USDA sources suggest that decoupled payments benefit mostly land owners and land renters see little benefit in increased payments as the majority of the money will be absorbed by increased rent and increased input prices. This makes a large impact on US farmers as, according to USDA, a full 60% of farm land is owned by non-operators. Being squeezed from both suppliers and buyers, relationship and negotiation skills are proving important in profitability of farmers.

On top of these modern changes, there are more traditional changes that farmers have faced in the past but must now be dealt with. Changes in technology will continue to put downward pressure on real commodity prices. Increasing land prices, since the downward spiral of agricultural land prices in the 1980's, are making it more difficult for entry or growth of

farms. Lastly there is an increase in competitor size, allowing these competitor farms to capture economies of scale. If a farm is unable to match the advantages of larger farms through diversification or through other means, the farm may fall victim to being a high cost producer and eventual withdrawal from the market.

Farm managers must also take into consideration what the future might hold when making any decision, especially skill set adoption. Brester and Penn stated that over the next twenty years farmers will face changes that could surpass changes felt over the past fifty years. The drivers of these changes include "bio-technology, trade liberalization, decoupled payments, environmental concerns and consumer demand for safe, nutritious and convenient foods". The sustainable commodity farmers of this future will be large firms that have already and will continue to have strategic positioning skills. This skill will be needed to continue to keep the firm from capsizing in the increasingly turbulent commodity markets. These commodity producers will also have to have relationship skills in place toward their suppliers and buyers. There will also be more pressure on commodity farmers to vertically integrate and value-add to their products in order to better negotiate with buyers. Commodity producers might also gain the ability to value-add to their product through an increased dependency on cooperatives.

All skill sets have a degree of importance in the future of agriculture. These skills will become interdependent on one another and an ideal combination of which skills to develop will have to be chosen by the individual firms. These skill sets will help adopting farms in becoming highly adaptable to change in the markets, increase revenue or decrease the cost of business.

Methodology:

A survey concerning skill adoption, skill importance, crop acres planted, demographics and measures of success was used to do an analysis of skill sets, demographics and resources and their affect on farm success. (The list of specific questions used in this survey is available upon request.) The survey was distributed through the web service Zoomerang using a restricted email list. The email list was constructed through the help of Farm Futures magazine. There were over five hundred responses to the survey, predominantly from Mid-Western farmers. Of the over 500 observations, 290 were used in the econometric analysis. For the purpose of this study we focused on the largest group that was in the data set, commodity crop producers. To obtain this sub-sample we removed observations that had less than 50% of farmer's land in corn, soybean, spring wheat and winter wheat. Removal of this data was necessary as what was produced on this land wasn't available, therefore forbidding us from capturing the effects of other management skills on non-crop farming. This non-crop land could be high value (dairy) or low value (hay) uses, which would adversely affect the model.

Of the 135 questions in the survey, there were five measures of success (the dependent variable for the ordered probit model), four of which were ordered discrete and one was continuous. The continuous variable was "Compared to five years ago, by what percentage has your farm's net worth increased [excluding increase in value of land] due to earnings?" The ordered discrete variables are shown in the following chart:

Chart 1: Measures of success and discrete responses

Question	Possible Responses						
What were your total farm profits, after expenses in 2006?	Lost Money	< $10,000	$10,000-$24,999	$25,000-$49,999	$50,000-$99,999	$100,000-$199,999	>$200,000
Over the last five years, the annual gross revenue of my business has been growing at a rate of:	Less than 2% per year	2% to 4.9% per year	5% to 9.9% per year	10%-14.9% per year	More than 15% per year		
Over the last five years the annual rate of return on the equity of my business has been:	Less than 2% per year	2% to 4.9% per year	5% to 9.9% per year	10%-14.9% per year	More than 15% per year		
From a financial perspective, I rank my farm enterprise in the last five years as:	Very Disappointing	Somewhat Disappointing	Somewhat Successful	Very Successful			

Of these measures of success, the one pertaining to farm profits would seem to be the one with the least error in reporting by farmers. This is because this measure of success is a number which all farmers should know for at least tax purposes and is the most traditional number used in the success of a business. The measure of success dealing with how farmers felt about their own business was expected to be opinionative, as those farmers who felt that their business was very disappointing would quickly leave the industry or switch to a more rewarding farm enterprise. This would lead to a series of data that would be skewed toward those farmers who

felt there farm was successful. The other measures of success could be less understood and not accurately measured by less successful or smaller farms, creating a series bias on responses.

Questions were asked in the survey along with the measures of success pertaining to individual skills. For analysis purposes each of these skills were categorized into skill sets based on how these skills related to one another. These categories were production management skills, procurement and selling skills, financial management skills, personal management skills, strategic management skills, relation management skills and risk management skills. The respondents were asked two questions about each specific skill. The first question was to state the importance that the farmer thought the specific skill had on the success of a farm. The respondent answered on a scale of one to four, with "one" being very low importance and "four" the highest importance. The next question was the level of adoption that the farmer had of each skill. This was also on a scale of one to four with "one" being no plans to adopt, "two" will do in future, "three" working on adopting and "four" full adoption. For each category one number was created from the average response for each of the individual skills in each category.[1] This average number was then used for each analysis. This average number is a truncated continuous number that is set between one and four.

The first step in analyzing the data was to use descriptive statistics to capture the variable effects on financial success from demographics and behavioral aspects of successful farmers. This was done by taking each variable from the survey and dividing it into sections by either the discrete variables provided in the survey or by quartiles in the case of continuous variables. For each question, within each of the sections, we found the percentage of respondents for each answer given. For continuous answers the average response from each question was compared to

[1] For example: (Risk Management Skill Adoption 1+2+3)/3=Truncated Continuous Response Risk Management Skills Adoption

the average responses from other sections. The comparisons focused on polar responses (example: Those who strongly disagreed and those who strongly agreed.) and responses divided in the middle (example: The responses divided by the median of a continuous data set and responses divided by those who either strongly agreed or agreed compared to those who either disagreed or strongly disagreed to the statement.) Selected data sets were divided by those respondents who were above five percent (the closest discrete response to inflation, so real effects could be measured) and below 5% in their measures of success for growth of gross annual income and return on equity measures of success. The results of this method of analysis allows for multiple traits of a successful farmer to be compared with those of a less successful farmers.

The second analysis focused on the affects of skill adoption and demographics on the success of a farm; determine the influence of each variable on the measures of success, ordered probit was determined to be the best analysis tool. Regular regression was deemed inappropriate for the method of analysis for the models as the ordered discrete variables in the survey make ordered probit the more appropriate choice. By using ordered probit analysis marginal effects of each variable can also be measured. Selected responses were transformed into discrete variables by taking the quartiles of the responses; these including the percentage increase in net worth of the farm (one of the measures of success). The strength of the model was determined by the Veall-Zimmerman test, one of the standard measurements used in ordered probit analysis.

Results:

Descriptive statistics:

Increase in Net Worth:

When comparing the responses from the farmers who were in the highest quartile of increase in net worth to those farmers with the lowest quartile in this category (table 11), there is a large discrepancy in how the farmers responded to the statements "I spend more time in the office compared to time spent doing farm chores" and "I see myself more as a CEO than a traditional farmer". The farmers in the highest quartile were 3.56% more likely to "strongly agree" with the first statement and 9.38% more likely to "agree" compared with those in the lowest quartile who were 2.52% more likely to "disagree" and 10.42% more likely to "strongly disagree". For the second question, the farmers in the highest quartile were 2.71% more likely to "strongly agree" and 12.33% more likely to "agree". When comparing the two highest quartiles to the two lowest quartiles, the discrepancies no longer hold as those in the highest two quartiles are less likely to "strongly agree" to both statements but are more likely "agree" and "disagree". Those in the lowest quartile were 10.96% more likely to "disagree" and 4.08% more likely to "strongly disagree". For the skill sets the farmers in the highest category of increase in net worth placed 16.67% more adoption points[2] for production management skills. These farmers also gave procurement and selling skill adoption 7.00% more points, financial management skill adoption 7.00% more points, personal management skill adoption 5.03% and strategic positioning skill adoption 10.00% more points. For importance, these farmers placed 6.33% more importance points[3] on personal management skills. When comparing those farmers in the two highest categories of increase in net worth with those in the two lowest categories, farmers in the higher two categories assigned 3.67% more adoption points to production management skills, 4.00% more points to procurement and selling skill adoption, 3.33% more points to

[2] This percentage was derived from those farmers in the highest two quartiles assigning 0.50 more points than those farmers in the lower two quartiles. This number was then divided by the range of the possible answer. (In this case 0.50/3= 16.67%).

[3] This percentage was derived in the same method as for adoption.

financial management skill adoption, 4.33% more points to personnel management skill adoption and 5.67% more points to strategic positioning skill adoption.

Growth of Gross annual Income

The next measure of success concerns the average growth of gross annual income and the polar responses were compared (table 12). Farmers with growth above five percent had 11.13% more land in rented acres than those below five percent. These farmers also varied in their farm organization as well as in their debt to asset ratios. The more successful farmers in the survey were 4.60% more likely to farm by themselves but share equipment or labor with a family member, and were 3.20% more likely to farm by themselves but share equipment with neighbors. Farmers below five percent were 6.00% more likely to have an organization which they farmed in a family corporation, LLC or partnership and 3.80% more likely to farm by themselves and not share equipment. Farmers above five percent were more likely to have a higher debt to asset ratio than that of farmers below five percent. These farmers also varied on how important they saw and the level of adoption on procurement and selling skills, financial management skills, strategic positioning skills, and relationship management and leadership skills. These farmers also varied on the level of adoption for production management skills. The farmers above five percent growth placed 7.00% more importance and 10.33% more adoption for procurement and selling skills. These farmers also gave financial management skill importance 4.33% more points and adoption 6.67% more points than the farmers with growth below five percent. For relationship management and leadership skills farmers above five percent assigned 6.33% more importance points and 6.67% more adoption points. Lastly these farmers gave production management skills 4.00% more adoption points.

Return on Equity

The next measure of success concerns the average return on equity; the polar responses were compared (table 13). A comparison of those farmers with a return on equity (ROE) higher than five percent and those lower than five percent, could be done. Farmers with an ROE above five percent had 11.63% more land in rented acres than those farmers with ROE below five percent. The statements "My farm has hired employees to manage specific parts of business", "I spend more time in the office compared to time spent doing farm chores" and "I see myself more as a CEO than a traditional farmer", varied based on farmers with ROE higher and lower than five percent. Farmers with an ROE higher than five percent were 8.79% more likely to "strongly agree" and 1.89% more likely to "agree" with the first statement. These farmers were also 5.68% more likely to "strongly agree" and 3.38% more likely to "agree" with the next statement. For the last statement, these farmers were 7.54% more likely to "strongly agree" and 4.50% more likely to "agree". The farmers also varied in their percentage area rented, farm organization and in their debt to asset ratios. Lastly these farmers varied on how important they saw and the level of adoption on production management, procurement and selling skills, and strategic positioning skills. They also varied on the level of importance of procurement and selling skills. Farmers with a ROE higher than five percent placed 4.33% more importance points and 7.67% more adoption points on procurement and selling skills. These farmers also gave production management skill adoption 6.00% more points and gave strategic positioning skill adoption 4.67% more points.

The last measure of success was taken from the response to the question, "From a financial perspective I feel the success of my farm business is: Very Successful, Successful,

Disappointing, Very Disappointing." (Table 14) For this analysis in addition to behavioral and demographic differences, financial analysis is also compared to see which measures of success affect how farmers feel about their own success. Differences in the most successful and least successful farmers included the measures of success farm profits, growth of annual gross revenue and average rate of return on equity. Farmers who felt that their business was successful were more likely to have made over $50,000 in farm profits. These farmers were also more likely to have a growth of annual gross revenue and a rate of return on equity of over five percent. The farmers also varied in their debt to asset ratio, with a general trend of lower debt to asset ratios relating to feeling more successful. Lastly these farmers varied on how important they saw and the level of adoption on production management, financial management skills, procurement and selling skills, strategic positioning skills, relationship management and leadership skills, and risk management skills. For these skill sets the adoption of the skills having more influence than the level of importance assigned to the skill. The farmers who viewed their farm as successful having assigned 7.67% more adoption points to production management skills, 10.67% more points to procurement and selling skills, 7.33% more points to financial management skills, 10.33% more points to strategic management skills, 6.67% more adoption points to relationship management and leadership skills, and 11.00% more points to risk management skills. For importance procurement and selling skill was assigned 6.33% more important points and for personnel management skills 5.00% more importance points by those farmers who saw their farm as successful. These farmers also gave 4.00% more importance points to strategic management skills, 5.00% more importance points to relationship management and leadership skills, and 8.67% more importance points to risk management skills.

Ordered Probit analysis:

The ordered probit model used for the analyses of farm profit in 2006 was:

$Y_i = \beta_0 + \beta_1$Planted Crop Acres$+ \beta_2$Planted Crop Acres$^2 + \beta_3$Production Mgmt. Skill Adoption$+ \beta_4$Procurement and Selling Skill Adoption$+ \beta_5$Financial Mgmt. Skill Adoption$+ \beta_6$Personnel Mgmt. Skill Adoption$+ \beta_7$+Strategic Mgmt. Skill Adoption$+ \beta_8$Relationship and Leadership Skill Adoption$+ \beta_9$Risk Mgmt. Skill Adoption$+ \beta_{10}$ Age$+ \beta_{11}$ Farm Organization $+\varepsilon$

Y_i^* = Unobserved Measure of Success

Y_i = Level of Profitability

$Y_i = 0$ if $Y^* \leq 0$, Lost Money

$Y_i = 1$ if $0 \leq Y^* \leq \mu_1$, Less than \$10,000

$Y_i = 2$ if $\mu_1 \leq Y^* \leq \mu_2$, \$10,000 to \$24,999

$Y_i = 3$ if $\mu_2 \leq Y^* \leq \mu_3$, \$25,000 to \$49,999

$Y_i = 4$ if $\mu_3 \leq Y^* \leq \mu_4$, \$50,000 to \$99,999

$Y_i = 5$ if $\mu_4 \leq Y^* \leq \mu_5$, \$100,000 to \$199,999

$Y_i = 6$ if $\mu_5 \leq Y^*$, \$200,000 or more

ε= error term

The probabilities for the model were:

Prob $(y=0| x) = \Phi(-x'\beta)$, probability that Y_i^* is Lost money

Prob $(y=1| x) = \Phi(\mu_1 - x'\beta) - \Phi(-x'\beta)$, probability that Y_i^* is Less than \$10,000

Prob $(y=2| x) = \Phi(\mu_2 - x'\beta) - \Phi(\mu_1 - x'\beta)$, probability that Y_i^* is \$10,000 to \$24,999

Prob $(y=3| x) = \Phi(\mu_3 - x'\beta) - \Phi(\mu_2 - x'\beta)$, probability that Y_i^* is \$25,000 to \$49,999

Prob $(y=4| x) = \Phi(\mu_4 - x'\beta) - \Phi(\mu_3 - x'\beta)$, probability that Y_i^* is \$50,000 to \$99,999

Prob $(y=5| x) = \Phi(\mu_5 - x'\beta) - \Phi(\mu_4 - x'\beta)$, probability that Y_i^* is \$100,000 to \$199,999

Prob $(y=6| x) = 1 - \Phi(\mu_5 - x'\beta)$, probability that Y_i^* is More than \$200,000

The probit model for the question relating to farm profits in 2006 (see tables 1 and 2), has a Veall-Zimmerman value of 0.2156. For this measure of success, Planted Crop Acres was allowed to have a quadratic shape, showing the decreasing marginal returns for increasing acres. In the model, having a farm organization in which sharing equipment and labor, or being in an organization with non-family members was related with farm success as well as was significant at the 5% level. Of the skill set adoption, financial management was significant at the 5% level. Risk management skills were positive and significant at the 15%.

The marginal effects for each of the variables on the measure of success for the first model are seen in table 3. The marginal effects suggest that an increase in crop acres negatively affects the probability that the farmer will be in the first four profit categories which are less than $50,000, and increases the probability a farm will be in the categories above $50,000. Financial management skill adoption, strategic planning skill adoption and being in an organization that shares equipment or farms with non-family members decreases the probability a farm will be in the profitability categories of less than $50,000 and increases the probability a farm will be in the categories of greater than $50,000. Increased age increases the probability that the farm will be in the profit categories of less than $50,000 and decreases the probability that the farm will be in the categories above $50,000.

Looking at how well the model predicted actual results (see table 4), for $25,000 to $49,999 the model predicts the correct result 34% of the time. For the category $50,000 to $99,999 the model predicts the actual result 28% of the time and for the category $100,000 to $199,999 the model correctly predicts the result 33% of the time. For the categories less than $10,000, $10,000 to $24,999 and $200,000 or more there are no accurate predictions.

The robustness of the model was tested against the other models (tables 5, 6, 8, 9). These models were allowed to have different variables based on fit but they all shared the same skill sets. While the model with profit as the dependent variable resulted in the best fit, the other models provided some level of consistency. For the measures of financial success relating to return on equity and increase in net worth show that farmers in an organization which involves sharing equipment or farming with non-family members, has a higher percentage chance of being successful. Tables 7 and 10 show the accuracy of the two models.

Conclusions:

While no hard conclusions can be made from the survey data some patterns are consistent with recent research and other trends. Several speculations can also be made from the survey data.

While no individual skill can be singled out as “the most important”, there is collaboration that skill set adoption is important for farm success. Each of these skill sets would have varying levels of importance on each farm. It would be logical to assume that personnel management skills would play a more critical role on a large farm compared to that of a small family farm, as the hiring of non-family members would be necessary for the large farm. This hiring of non-family members would require the larger farm to find ways of hiring qualified labor for an increasingly complicating industry. Other examples would be that relatively small farms would need better procurement and selling skills and relationship skills as they would be less inclined to receive discounts on inputs that larger farms would have an easier time acquiring.

Further research in this area would need to include a way to capture non-crop farm land usage. Necessary skill sets for non-crop use land could be different especially if the land use

includes high value production usage such as dairy or fruit and nut production. Another factor that needs to be researched would be value adding or diversification activities which are becoming more important to smaller farmers and, if research is correct, will become more important to large farms as well.

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Variables	Coefficient	Std Error	t-value	p>test
Intercept	-1.085354	1.207167	-0.9	0.3686
Planted Crop acres (corn, wheat, soybean)***	0.000505	0	.	.
Planted Crop Acres Squared***	-4.89E-08	0	.	.
Production Management Skill Adoption	-0.198896	0.213815	-0.93	0.3523
Procurement and Selling Skill Adoption	0.040254	0.169583	0.24	0.8124
Financial Management Skill Adoption**	0.331215	0.146954	2.25	0.0242
Personal Management Skill Adoption	0.072345	0.106828	0.68	0.4983
Strategic Planning Skill Adoption	0.142916	0.148662	0.96	0.3364
Relationship Management Skill Adoption	0.157293	0.173937	0.9	0.3658
Risk management Skill adoption*	0.338927	0.207646	1.63	0.1026
Age	0.004391	0.006373	0.69	0.4909
Organization Which Shares Equipment or Farm with Non-family Members**	0.310722	0.155354	2	0.0455
_limit 2	0.378287	0.101292	3.73	0.0002
_limit 3	0.794174	0.1277	6.22	<.0001
_limit 4	1.528283	0.148673	10.28	<.0001
_limit 5	2.277385	0.165824	13.73	<.0001
_limit 6	3.178227	0.199579	15.92	<.0001

Table1: Model profit in 2006 (*** significant at 1%, ** significant at 5%, * significant at 15%)

McFadden's LRI	0.0565
Veall-Zimmermann	0.2156
McKelvey-Zavoina	0.1869

Table 2: Model fit profit in 2006

Parameter	Lost Money	Less than $10,000	$10,000 to $24,999	$25,000 to $49,999	$50,000 to $99,999	$100,000 to $199,999	$200,000 or more
Planted Crop Acres	-5.75E-5	-3.34E-5	-4.07E-5	-4.81E-5	2.19E-5	8.40E-5	7.37E-5
Planted Crop Acres Sqr.	5.57E-9	3.23E-9	3.94E-9	4.66E-9	-2.12E-9	-8.14E-9	-7.14E-9
Production Management Skill Adoption	2.26E-2	1.3E-2	1.60E-2	1.89E-2	-8.63E-3	-3.31E-2	-2.90E-2
Procurement and Selling Skill Adoption	-4.58E-3	-2.66E-3	-3.24E-3	-3.83E-3	1.75E-3	6.69E-3	5.87E-3
Financial Management Skill Adoption	-3.77E-2	-2.19E-2	-2.66E-2	-3.16E-2	1.44E-2	5.51E-2	4.83E-2
Personal Management Skill Adoption	-8.23E-3	-4.78E-3	-5.82E-3	-6.89E-3	3.14E-3	1.20E-2	1.06E-2
Strategic Planning Skill Adoption	-1.63E-2	-9.44E-3	-1.15E-2	-1.36E-2	6.20E-3	2.38E-2	2.08E-2
Relationship Management Skill Adoption	-1.79E-02	-1.04E-2	-1.27E-2	-1.50E-2	6.83E-3	2.61E-2	2.29E-2
Risk management Skill adoption	-3.85E-2	-2.24E-2	-2.73E-2	-3.23E-2	1.47E-2	5.63E-2	4.94E-2
Age	-4.99E-4	-2.90E-4	-3.53E-4	-4.18E-4	1.91E-4	7.30E-4	6.40E-4
Organization Which Shares Equipment or Farm with Non-family Members	-0.04	-2.05E-2	-2.50E-2	-2.96E-2	1.35E-2	5.17E-2	4.53E-2

Table 3: Marginal effects on profitability

Actual	1	2	3	4	5	6	7
Predicted							
Lost Money (1)	0	1	1	4	7	1	0
Less than $10,000 (2)	0	0	0	9	4	0	0
$10,000 to $24,999 (3)	0	0	0	10	12	0	0
$25,000 to $49,999 (4)	0	0	4	29	20	1	0
$50,000 to $99,999 (5)	0	0	1	20	31	5	0
$100,000 to $199,999 (6)	0	0	0	7	29	10	0
$200,000 or more (7)	0	0	0	3	8	10	0
Accuracy	N/A	0	0	0.353658537	0.279279279	0.37037037	N/A

Table 4: Accuracy of profitability mode

Variables	Coefficient	Std Error	t-value	p>test
Intercept	1.79279	0.654571	2.74	0.0062
Planted Crop acres (corn, wheat, soybean)**	0.000359	0.000146	2.47	0.0135
Planted Crop Acres Squared***	-3.45E-08	0	.	.
Production Management Skill Adoption	0.025888	0.195487	0.13	0.8946
Procurement and Selling Skill Adoption	-0.10467	0.151131	-0.69	0.4886
Financial Management Skill Adoption	-0.16194	0.161796	-1	0.3169
Personal Management Skill Adoption*	0.205244	0.110488	1.86	0.0632
Strategic Planning Skill Adoption	-0.08516	0.157763	-0.54	0.5893
Relationship Management Skill Adoption	-0.0424	0.159282	-0.27	0.7901
Risk management Skill adoption	-0.07401	0.184344	-0.4	0.6881
Age*	-0.00999	0.006698	-1.49	0.1359
Organization Which Shares Equipment or Farm with Non-family Members**	0.380503	0.163109	2.33	0.0197
_Limit2	0.952123	0.114475	8.32	<.0001
_Limit3	1.954466	0.131473	14.87	<.0001
_Limit4	2.601874	0.144596	17.99	<.0001

Table 5: Model Growth of Gross Annual Income (*** significant at 1%, ** significant at 5%, * significant at 15%)

McFadden's LRI	0.0292
Veall-Zimmermann	0.107
McKelvey-Zavoina	0.0913

Table 6: Model Fit growth of gross annual income

Actual	1	2	3	4	5
Predicted					
Less than 2% (1)	0	1	16	0	0
2% to 4.9% (2)	0	1	48	4	0
5% to 9.9% (3)	0	2	85	7	0
10% to 14.9% (4)	0	2	37	11	0
15% or greater (5)	0	0	31	11	0
Accuracy	N/A	0.17	0.39	0.33	N/A

Table 7: Accuracy of model on growth of gross annual income

Variables	Coefficient	Std Error	t-value	p>test
Intercept	1.158891	1.186674	0.98	0.3288
Planted Crop acres (corn, wheat, soybean)**	6.53E-05	0	.	.
Production Management Skill Adoption	0.160046	0.17781	0.9	0.3681
Procurement and Selling Skill Adoption*	-0.27573	0.180814	-1.52	0.1273
Financial Management Skill Adoption	-0.08651	0.181087	-0.48	0.6328
Personal Management Skill Adoption**	-0.23266	0.118024	-1.97	0.0487
Strategic Planning Skill Adoption	-0.13162	0.163319	-0.81	0.4203
Relationship Management Skill Adoption	0.185285	0.184375	1	0.3149
Risk management Skill adoption*	0.32091	0.217816	1.47	0.1407
Organization Which Shares Equipment or Farm with Non-family Members	0.164554	0.172144	0.96	0.3391
Region (Midwest area=1) *	0.322271	0.179209	1.8	0.0721
_Limit2	1.211828	0.137365	8.82	<.0001
_Limit3	2.291654	0.154947	14.79	<.0001
_Limit4	3.006979	0.174083	17.27	<.0001

Table 8: Model Return on Equity (*** significant at 1%, ** significant at 5%, * significant at 15%)

McFadden's LRI	0.026
Veall-Zimmermann	0.0929
McKelvey-Zavoina	0.0796

Table 9: Model fit return on equity

Actual	1	2	3	4	5
Predicted					
Less than 2% (1)	0	0	0	0	0
2% to 4.9% (2)	5	5	2	1	1
5% to 9.9% (3)	7	51	80	38	20
10% to 14.9% (4)	0	0	3	0	0
15% or greater (5)	0	0	0	0	0
Accuracy	0	0.09	0.94	0	0

Table 10: Accuracy of model return on equity

Question	Category	Highest Increase in net worth- lowest	Two highest increase in net worth – two lowest
Question 7:Spend time in office more than field	Strongly Agree	3.56%	-2.71%
	Agree	9.38%	5.18%
	Disagree	-2.52%	0.24%
	Strongly Disagree	-10.42%	-2.71%
Question 8: See themselves as CEOs	Strongly Agree	2.71%	-1.48%
	Agree	12.33%	5.06%
	Disagree	-10.96%	0.74%
	Strongly Disagree	-4.08%	-4.33%
Production Management	Adoption	0.14	0.11
Procurement and Selling	Adoption	0.21	0.12
Financial Management	Adoption	0.21	0.10
Personnel Management	Importance	0.19	0.09
	Adoption	0.16	0.13
Strategic Positioning	Adoption	0.30	0.17

Table 11: Average increase in net worth descriptive statistics

Question	Category	Highest Growth- lowest Growth	Above five percent- below five percent
Percentage area Rented		Not enough Observations	11.13%
Farm Organization	I farm in a family corporation, LLC or partnership	Not enough Observations	-6.00%
	I farm by myself		-3.80%
	I farm by myself but share equipment or labor with family members		4.60%
	I farm by myself but share equipment or labor with neighbors		3.20%
	I farm in a partnership, LLC or corporation with non-family members		-2.00%
Debt to asset	Zero -- no debt	Not enough Observations	-2.21%
	1% to 10%		-2.39%
	11% to 40%		3.33%
	41% to 60%		0.8five percent
	More than 60%		0.41%
Production Management Skills	Adoption	Not enough Observations	0.12
Procurement and selling skills	Importance	Not enough Observations	0.21
	Adoption		0.31
Financial Management Skills	Importance	Not enough Observations	0.13
	Adoption		0.20
Strategic Positioning Skills	Importance	Not enough Observations	0.18
	Adoption		0.17
Relationship Management and Leadership Skill	Importance	Not enough Observations	0.19
	Adoption		0.20

Table 12: Growth of gross annual income descriptive statistics

Question	Category	Highest ROE- lowest ROE	ROE above five percent- ROE below
Percentage area rented		Not enough Observations	11.63%
Question 4: Farm has hired employees to manage specific parts of business	Strongly Agree	Not enough Observations	8.79%
	Agree		1.89%
	Disagree		-4.09%
	Strongly Disagree		-7.99%
Question 7:Spend time in office more than field	Strongly Agree		5.68%
	Agree	Not enough Observations	3.38%
	Disagree		-10.52%
	Strongly Disagree		-0.0five percent
Question 8: See themselves as CEOs	Strongly Agree	Not enough Observations	7.54%
	Agree		4.50%
	Disagree		-7.52%
	Strongly Disagree		-4.09%
Production Skills	Adoption	Not enough Observations	0.18
Procurement and selling skills	Importance	Not enough Observations	0.13
	Adoption		0.23
Strategic Positioning Skills	Adoption	Not enough Observations	0.14

Table13: ROE descriptive statistics

Question	Category	Successful-Disappointing
Increase in Net Worth		10.96%
Farm Profits	Lost money	-8.0five percent
	less than $10,000	-2.78%
	$10,000 to $24,999	-6.86%
	$25,000 to $49,999	-9.97%
	$50,000 to $99,999	16.79%
	$100,000 to $199,999	8.61%
	$200,000 or more	2.26%
Debt to asset	Zero -- no debt	4.17%
	1% to 10%	6.21%
	11% to 40%	6.03%
	41% to 60%	-5.90%
	More than 60%	-9.39%
Q 59: Growth of annual gross revenue	Less than 2% per year.	-18.68%
	2% to 4.9% per year.	-6.41%
	five percent to 9.9% per year.	7.54%
	10% to 14.9% per year.	9.26%
	1five percent per year or more.	8.28%
Q 60: Rate of Return on Equity	Less than 2% per year.	-16.40%
	2% to 4.9% per year.	-5.11%
	five percent to 9.9% per year.	-2.97%
	10% to 14.9% per year.	13.89%
	1five percent per year or more.	10.59%
Production Skills	Adoption	0.20
Procurement and selling skills	Importance	0.19
	Adoption	0.32
Financial Management Skills	Adoption	0.22
Personnel Management Skills	Importance	0.15
	Adoption	0.14
Strategic Positioning Skills	Importance	0.12
	Adoption	0.31
Relationship Management and Leadership Skills	Importance	0.15
	Adoption	0.20
Risk Management Skills	Importance	0.26
	Adoption	0.33

Table 14: How farmers view their farm venture success, from a financial perspective descriptive statistics

Appendix

Questions Asked to Determine Skill Sets

Production Management Skills:

1. Use technology that provides the most efficient use of inputs such as GPS guidance, variable rate technology, ultrasound for cattle grades, ect.

2. Achieve lower cost of production per bushel/ cwt than comparable farms.

3. Improve production skills through purposely interacting with high-performing colleagues, attending technology/production workshops at least yearly, or at least one hour of self study per week.

4. Employee consultants to assist with difficult or complex production problems.

5. Use control systems that enable real-time adjustment or production such as on-the-go nitrogen sensing or automatic adjusting of livestock rations according to performance.

6. Field records for production inputs are complete and accessible.

7. Written production plans (step by step actions on development stages) are developed ahead of production period.

Production & Selling Skills:

1. At least once a year meet with major input suppliers to define needs, various options and the major lines of a plan.

2. Input suppliers are kept informed enough about my operation that they contact me when opportunities arise.

3. At least once a year allocate time to evaluate alternative methods of input purchasing, such as group buying, contracting, and purchasing alliances.

4. At least once a year allocate time to evaluate alternative methods of farm product pricing, such as group selling, marketing networks, and qualified supplier programs.

5. At least once a year allocate time to evaluate alternative methods of marketing farm products such as group selling, marketing networks, ad qualified supplier programs.

Financial Management Skills:

1. Know the cost per dollar of revenue and cost per unit of production on the farm.

2. To grow business, regularly analyze level of debt and how it benefits the operation.

3. Calculate financial indicators to decide on major purchases such as land, buildings, equipment and their financing.

4. At least once each year provide a written status report of the operation to lenders and other stakeholders contributing capital to the farm.

5. Negotiate competitive terms for farm loans, including interest rates, repayment term and collateral requirements vs. taking what is offered.

6. Use a financial accounting system to record all income and expenses, generate reports, and assist with management decisions.

Personnel Management Skills:

1. Utilize written job descriptions for each employee.

2. Provide organization training to employees to develop their skills and abilities.

3. Offer a compensation package based on job responsibilities and performance.

4. Use formal interview and search procedures when hiring employees.

5. Conduct formal performance appraisals based on previously determined criteria.

Strategic Positioning Skills:

1. Articulate a vision of the farm business.

2. Identify factors critical to the long-term success if the business.

3. Capitalize on new and emerging markets.

4. Regularly asses your farm's advantages and disadvantages compared to competing farms.

5. Written Strategies and actions are updated annually.

6. Written equipment and facility replacement plans are updated annually.

Relationship Management and Leadership Skills

1. Negotiation (vs what is given) mutually beneficial business agreements with landowners, lenders and suppliers.

2. Hold an annual meeting with stakeholders to address strategic planning issues.

3. Practice active listening to ensure a clear understanding of the other person's point of view.

4. Seek the opinions of others when finding a solution to problems.

5. Focus feedback from others on problems and solutions, not on personal characteristics.

Risk Management Skills:

1. Manage production, financial, human, legal and relationship risks.

2. Develop written contingency plans to deal with future uncertain events, such as inability of the main farm manager to perform regular duties.

3. Maintain proper levels of life, health, property and liability insurance.

4. A written estate/succession plans in place.