Expansion of Ethanol Demand: Economic Implications for Indiana Corn Producers

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Abstract

The United States significantly depends on petroleum imports. To reduce this reliance on foreign oil, ethanol production is increasing. Ethanol is a renewable fuel that can be derived from corn. In 2007, total corn acres planted in the United States were a record 92.9 million acres, a 19% increase from 2006. This research analyzed farmers' perceptions and crop management adjustments in response to increased ethanol demand. A survey was mailed to 2000 Indiana farmers in August 2007. The objectives of the survey were to analyze farmers' yield experiences from a continuous corn rotation, a corn/soybean rotation, and a corn/corn/soybean rotation plus compare their reported yields to agronomic university research results. Farmer's responses indicate no statistically significant difference in corn yields between the three rotations, while university research indicates otherwise with lower yields for corn following corn as well as continuous corn relative to a traditional corn/soybean rotation. Respondents with higher gross incomes were responsible for most of the increase in corn acres in 2007. It was further found that mid-career farmers were more likely to increase corn acres in response to the increased demand. However, educational attainment did not appear to influence acreage adjustments or yields.

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Expansion of Ethanol Demand: Economic Implications for Indiana Corn Producers

Ethanol production in the United States is generating new challenges: increased investment in a domestic renewable energy source, the need to minimize potential adverse environmental impacts of increased corn production, and farmer's decisions to adopt crop production practices that will be profitable in the context of sharp increases in commodity and input prices, especially fertilizer and fuel.

Ethanol is an alternative fuel source that can be blended with gasoline to generate a cleaner burning fuel. Ford Motor Company is promoting ethanol by increasing the number of cars that can run on E85 (E85 is the combination of 85% ethanol and 15% gasoline). In the 2007 State of the Union Address, President George W. Bush urged Congress to encourage the expansion of ethanol and renewable fuel production to 35 billion gallons by 2017, which is five times the current level of production. The growth in demand for ethanol is resulting in the construction of numerous ethanol plants across the United States. The Renewable Fuels Association reports that there are 139 ethanol bio-refineries currently in operation in the United States and 62 under construction. In Indiana, the four ethanol plants in the towns of Rensselaer, Marion, Clymers, and Linden utilize approximately 160 million bushels of corn. (16% of Indiana's 2007 corn production.) (USDA-NASS)

Corn farmers in the Midwest are re-examining the traditional cropping practice of a corn-soybean rotation. Some farmers are switching to the production practice of planting corn following corn in their rotation. With market corn prices above $5.00/bu., farmers anticipate that growing more corn may be more profitable, even with the associated higher variable costs for fertilizer and fuel. Since corn leaves more residue after harvest than soybeans, farmers may need larger machinery to till the corn residue into the soil for decomposition prior to planting the second year of corn. This will increase labor, fuel, repairs, and depreciation allowance costs. Also, agronomic research suggests there may be as much as a 10% yield penalty for second year corn (Vyn, 2004). However, with higher corn prices, farmers may be able to justify increased variable production costs if this results in a more profitable operation as a consequence of higher corn prices coupled with acceptable corn yields.

The primary goal of this research was to better understand Indiana farmer's decision to adopt a corn following corn rotation.

The research objectives were to:

1. Determine current and expected crop rotation systems in Indiana, including tillage systems.
2. Analyze corn yield impacts of increased corn acreage.
3. Identify the socio-economic characteristics of those Indiana farmers who are successfully making the transition toward increased corn acres.

Methodology

A survey was mailed to a random sample of 2000 Indiana farmers in August 2007. This study was funded by a Mission Oriented Grant from the Indiana Cooperative Extension Service and the Office of Agricultural Research Programs at Purdue University and was developed and coordinated by Drs. Bruce Erickson and Corinne Alexander. The Indiana Agricultural Statistics Service (IASS) assisted with the random selection of farmers, and coordinated the mailing of the survey. Before the survey was mailed to Indiana farmers, it was pre-tested among 46 farmers at the Top Farmer Workshop in July 2007. The Top Farmer Workshop is hosted by the Agricultural Economics Department at Purdue University. The purpose of the Top Farmer Workshop is to assist commercial producers to achieve their management goals.

The purpose of the mailed survey was to acquire information from farmers on a variety of economic and agronomic topics that pertain to their field management practices. Farmers were asked to report their total acres for each crop (corn, soybeans, wheat, etc.), average yield for different cropping rotations, agronomic practices (nitrogen application, disease, etc.), yields, and planting rate for their largest corn after corn field. Farmers were also asked to report several socioeconomic factors (e.g., gross farm income, age, education, etc.). Perceptional data were collected via a Likert scale of 1 (disagree) to 5 (agree).

A total of 239 farmers responded (a 12% response rate). There were no restrictions or limits imposed on farm size, corn acres, or gross income. The survey data were analyzed with SAS. Data from the 2002 Indiana Census of Agriculture served as a reference as to the representativeness of the mailed survey.

Actual farmer field practices and yields relative to university research plot results were assessed using descriptive statistics. To determine the statistical significance of yields for each rotation, a Student t-test was used.

Cross tabulation analysis was conducted for cropping systems relative to farm size, farmer education, farmer age, and other variables that may be associated with cropping systems. The cross tabulation analysis was based on a one-way ANOVA test.

Statistical Results

The statistical analysis compared the socioeconomic factors from the Indiana farmer survey with the 2002 Indiana Census of Agriculture. Second, the yield results from three rotations: continuous corn, corn/soybean, and 2nd year corn were analyzed. Finally, market prices for corn and soybeans were analyzed. Previous studies serve as a reference in the analysis.

Farmer Age

The average age of the farmers in the survey is comparable to those in the Indiana Census of Agriculture. In the survey, the average age of the 228 farmers who responded was

55.6 years. The average age of Indiana farmers in the Census of Agriculture is 54 years (NASS, 2006).

Farmer Education

In the mailed survey, education was reported in five categories: 1) some high school, 2) high school diploma, 3) some college/vocational technical work, 4) bachelor's degree, and 5) graduate degree. The 226 respondents in the Indiana survey who completed this question reported educational levels comparable to farmers in the Indiana Census of Agriculture. The 2002 Indiana Census of Agriculture reported the following educational percentages: 18% of farmers have less than a high school education; 37% of farmers have a high school diploma only; 26% of farmers have some college; and 19% have completed college.

In the mailed survey, approximately 30% of the respondents have completed a college degree. This is much higher than reported in the Indiana Census of Agriculture of 19%. It is also important to consider the percentage of less than or equal to a high school degree. By adding the two categories of 2.7% and 36.3%, approximately 39% of the survey respondents have achieved a high school diploma or less. On the other hand, the Indiana Census of Agriculture indicates approximately 55% of farmers in Indiana have achieved a high school diploma or less.

Gross Income

The definition of total gross farm income used in the mailed survey and the 2002 Indiana Census of Agriculture is the total value of products sold, farm land rental income, and government program payments. The results of the survey and Indiana Census of Agriculture are quite different. Only 17% of the mailed survey respondents are in the less than $50,000 category while 75% of the farmers in the 2002 Indiana Census of Agriculture are in the less than $50,000 category. The 2002 Indiana Census of Agriculture reflects the many small farmers in Indiana, while in the mailed survey farmers report much higher total gross incomes. The mailed survey respondents reflect larger, commercial crop farmers in Indiana, and not the smaller, part-time producers that are widely found in Indiana.

Area Planted

According to USDA-National Agricultural Statistical Service (NASS), total corn acres planted in 2007 in the United States were 92.9 million acres, a 19% increase from 2006. (SeedQuest, 2007) Total corn acres planted in Indiana in 2007 were 6.6 million acres, a 20% increase from 2006. (NASS, 2007)

According to the Indiana mailed survey, the reported planted acres for 2nd year corn in 2006 averaged 82.58 acres and 111.63 acres in 2007 which represents a 35% increase from 2006 to

2007. The respondents reported for continuous corn an average of 102.79 acres in 2006 and 119.97 acres in 2007 which represents a 16.7% increase from 2006 to 2007.

The survey clearly suggests that corn after corn acres in Indiana increased from 2006 to 2007. Hence, it is important to identify those farmers who diverted more acres to corn. Socioeconomic variables were tested against increased corn acres to determine if there are any statistically significant relationships. The socioeconomic variables examined were gross income, age, and educational attainment. Corn after corn was classified as a combination of two rotations: a continuous corn rotation and a 2nd year corn rotation.

The first socioeconomic variable tested against corn after corn acres was gross farm income. The independent variable, gross income, was categorized into five categories: 1 = Less than \$50,000; 2 = \$50,000-\$99,000; 3 = \$100,000-\$249,000; 4 = \$250,000-\$499,999; and 5 = \$500,000 or more. The ANOVA test generated an F value of 5.10 at $\alpha \geq 0.0006$. This suggests that farmers in the higher gross income categories were responsible for most of the increase in acres planted to corn in 2007 compared to 2006. In fact, as gross income increases the area planted to corn also increases. (Figure 1)

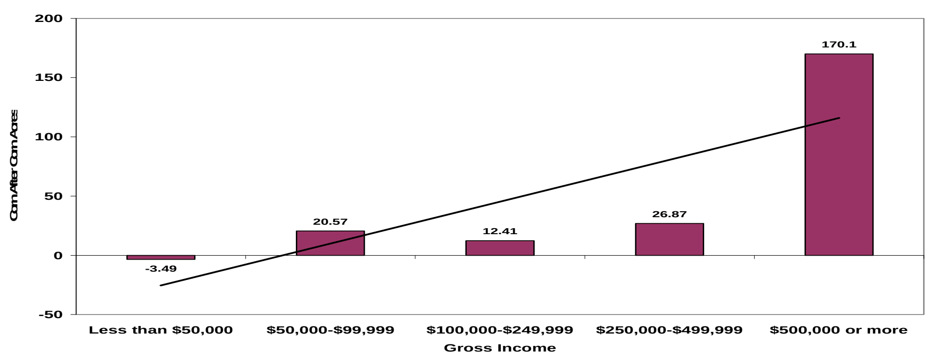

Figure 1: Gross Income vs. Corn after Corn Acres

The second socioeconomic variable tested against corn after corn acres was farmers' age. The independent variable, age, was categorized into six age ranges: 1 = Less than 25 years of age; 2 = 25 to 35; 3 = 36-45; 4 = 46 to 55; 5 = 56 to 65; and 6 = greater than 65. The ANOVA test generated an F value of 3.33 with an $\alpha \geq 0.0063$. This suggests that the relationship between farmers' age and increased planting of corn in 2007 compared to 2006 is statistically significant at an $\alpha \geq 0.01$. It appears that farmers in the early to mid-career ages (i.e., 25 to 45) were more likely to have substantially increased corn acres. (Figure 2)

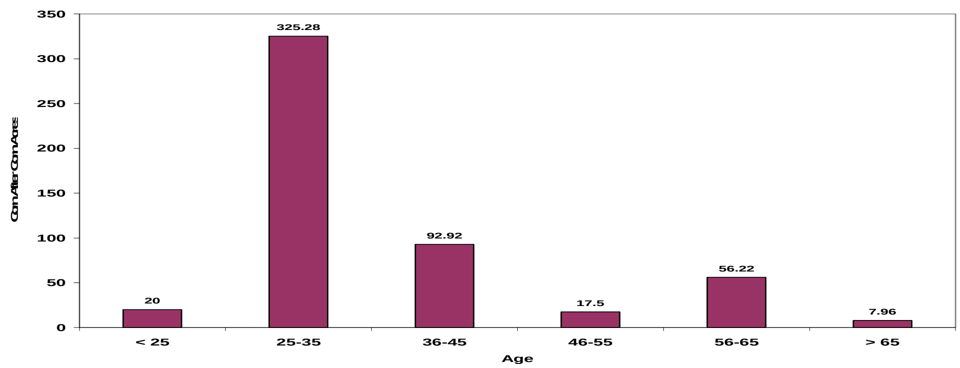

Figure 2: Farmers' Age vs. Corn After Corn Acres

The final socioeconomic variable tested against increased corn acres was the farmers' education level. The independent variable, education, was categorized as: 1 = some high school; 2 = high school diploma; 3 = some college/vocational technical work; 4 = bachelor's degree; and 5 = graduate degree. The ANOVA test generated an F value of 1.82 with an $\alpha \geq 0.1258$. This suggests that there is no statistically significant relationship between years of schooling and increased corn acres in 2007 compared to 2006. This relationship is not statistically significant at even a 10% level. (Figure 3)

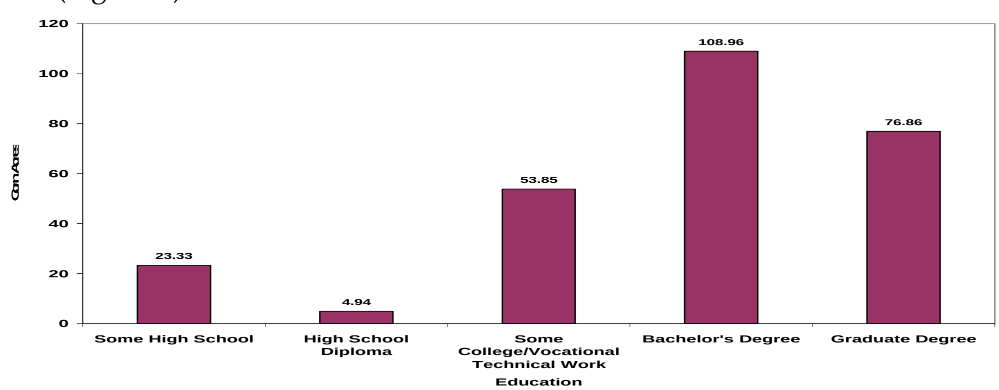

Figure 3: Farmers' Education vs. Corn After Corn Acres

Reported Yields

University research (Vyn et al, 2006 and Vyn et al, 2007) and farmers' perceptions reported in the survey suggest differences in corn yields among rotations. Purdue University agronomic research indicates that there is a lower yield for a continuous corn rotation or second year corn relative to a corn/soybean rotation. Many farmers in the survey reported no differences in corn yields among their rotation systems. To capture farmers' yields, the survey asked farmers to report their five year yield average for corn on their largest field. The average yield reported for the continuous corn rotation was 157 bushels and for the corn/soybean rotation the average yield was 159 bushels. The Student t-value for the two rotations was 0.64. This indicates that these yield averages are not significantly different at $\alpha \geq 0.01$. Hence, farmers' yield perceptions appear to be contrary to Purdue University agronomic test plot research results.

To further elaborate on this, the survey asked farmers to report average, highest, and lowest yields on their farms during the most recent 5-year period. The rotations that were analyzed and tested in this section include a 2nd year corn rotation, a continuous corn rotation, and corn in a corn/soybean rotation. (Table 1)

2nd Year of Corn for 5 Year Basis		
Average Yield (bu/A)	*Highest Yield (bu/A)*	*Lowest Yield (bu/A)*
151	180	124
Continuous Corn for 5 Year Basis		
Average Yield (bu/A)	*Highest Yield (bu/A)*	*Lowest Yield (bu/A)*
152	182	123
Corn After Soybeans for 5 Year Basis		
Average Yield (bu/A)	*Highest Yield (bu/A)*	*Lowest Yield (bu/A)*
156	190	121

Table 1: Survey Average Yield Results for the Period 2003-2007

The survey results are reported separately based on the relationships between the yield class reported (average yield, highest yield, and lowest yield) and the crop rotation. The corn yield results were compared for each rotation and data set: 1) 2nd year corn yield vs. continuous corn yield 2) 2nd year corn yield vs. corn after soybeans yield and 3) continuous corn yield vs. corn after soybeans yield. (Table 2) A Student t-test was used to analyze the mailed survey data.

Average Yields	**t-value**	**Result**
2nd Year Corn vs. Continuous Corn	0.36	
2nd Year Corn vs. Corn/Soybean	1.79	
Continuous Corn vs. Corn/Soybean	1.12	
Highest Yields	**t-value**	**Result**
2nd Year Corn vs. Continuous Corn	0.37	
2nd Year Corn vs. Corn/Soybean	2.56	*
Continuous Corn vs. Corn/Soybean	2.01	*
Lowest Yields	**t-value**	**Result**
2nd Year Corn vs. Continuous Corn	0.09	
2nd Year Corn vs. Corn/Soybean	0.49	
Continuous Corn vs. Corn/Soybean	0.4	
* t-value > 2 is statistically significant		

Table 2: Survey Student t-value Results for Corn Yield Analysis

The Student t-value analysis indicates that none of the yield relationships are statistically significantly different at $\alpha \geq 0.01$, except for two yield relationships. The 2nd year corn high yield vs. corn/soybean high yield and the continuous corn high yield vs. corn/soybean high yield are statistically significantly different at $\alpha \geq 0.01$. These two observations are comparable to university yield data.

Socioeconomic variables were tested against pairs of corn rotation yields to determine if there is a statistically significant relationship. The two rotations tested were a continuous corn rotation and a 2nd year corn rotation. Socioeconomic variables again were gross income, age, and education level. The socioeconomic variables (independent variable) were categorized the same as in the increased corn acre analysis.

The first socioeconomic variable tested against the continuous corn rotation yield was gross income. The ANOVA test generated an F value of 6.94 with an $\alpha \leq 0.0001$. This suggests that there is a statistically significant relationship between gross income and continuous corn yields at an $\alpha \geq 0.01$. There is a tendency for yields in a continuous corn rotation to increase as gross farm income increases. (Figure 5)

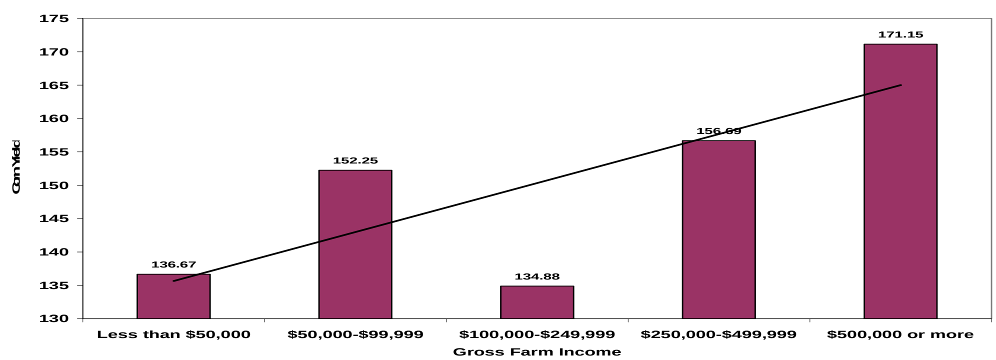

Figure 5: Gross Farm Income vs. Continuous Corn Yield

The second socioeconomic variable tested against yields from a continuous corn rotation was farmers' age. The ANOVA test generated an F value of 4.12 with an $\alpha \geq 0.0022$. This suggests that the relationship between farmers' age and corn yield for a continuous corn rotation is statistically significant at an $\alpha \geq 0.01$. It appears that farmers in the early to mid-career ages (i.e., 25 to 45) are more likely to have higher corn yields in a continuous corn rotation. (Figure 6)

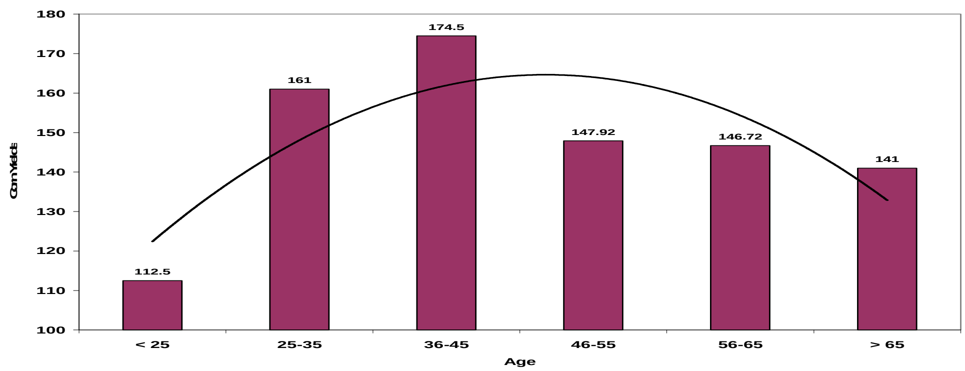

Figure 6: Farmers' Age vs. Continuous Corn Yields

The final socioeconomic variable tested against yield from a continuous corn rotation was the farmer's education level. The ANOVA test generated an F value of 0.24 with an $\alpha \geq$ 0.9146. This suggests that there is no statistically significant relationship between years of schooling and yield for a continuous corn rotation. This relationship is not statistically significant at even a 10% level. (Figure 7)

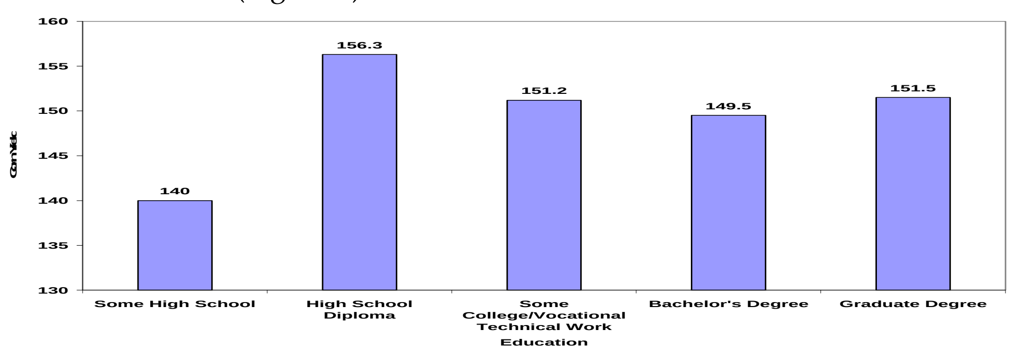

Figure 7: Farmers' Educational Attainment vs. Continuous Corn Yields

The first socioeconomic variable tested against the 2nd year rotation yield was gross farm income. The ANOVA test generated an F Value of 6.45 with an $\alpha \geq 0.0001$. This suggests that there is a statistically significant relationship between gross farm income and 2nd year corn rotation yields at an $\alpha \geq 0.01$. (Figure 8) There is a tendency for yields in a 2nd year corn rotation to increase as gross farm income increases.

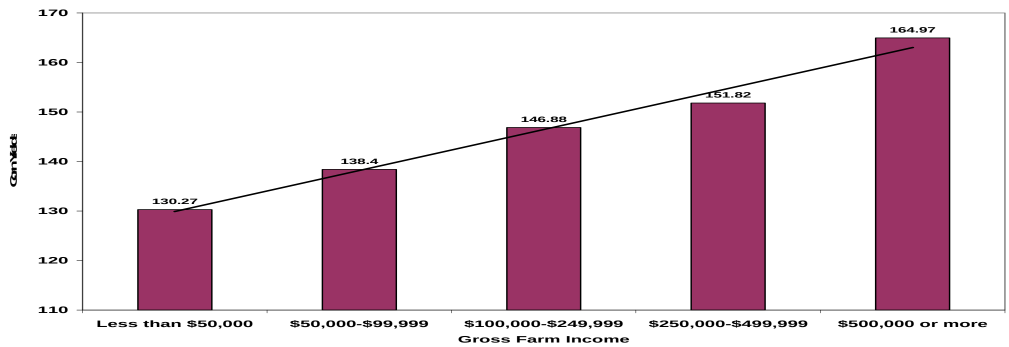

Figure 8: Gross Farm Income vs. 2nd Year Corn Rotation Yield

The second socioeconomic variable tested against yields from a 2nd year corn rotation was farmers' age. The ANOVA test generated an F value of 1.22 with an $\alpha \geq 0.3075$. This suggests that the relationship between farmers' age and yield from a 2nd year corn rotation is not statistically significant at an $\alpha \geq 0.01$. This relationship is not statistically significant at even a 10% level. (Figure 9)

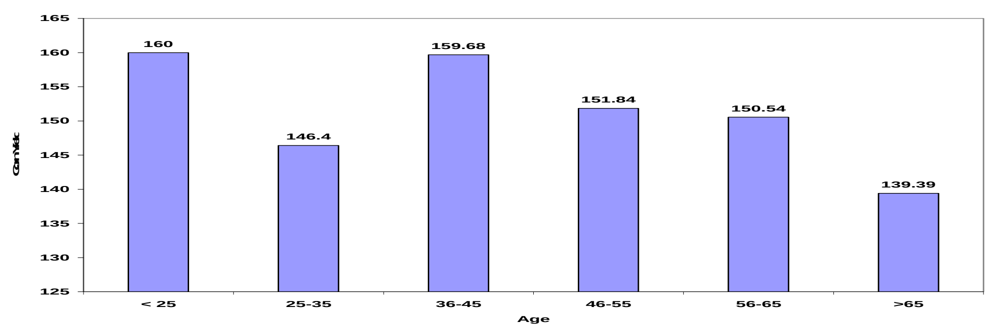

Figure 9: Farmers' Age vs. 2nd Year Corn Yield

The final socioeconomic variable tested against yields from a 2nd year corn rotation was the farmers' education level. The ANOVA test generated an F value of 1.17 with an $\alpha \geq 0.3310$. This suggests that there is no statistically significant relationship between years of schooling and yield from a 2nd year corn rotation. This relationship is not statistically significant at even a 10% level. (Figure 10)

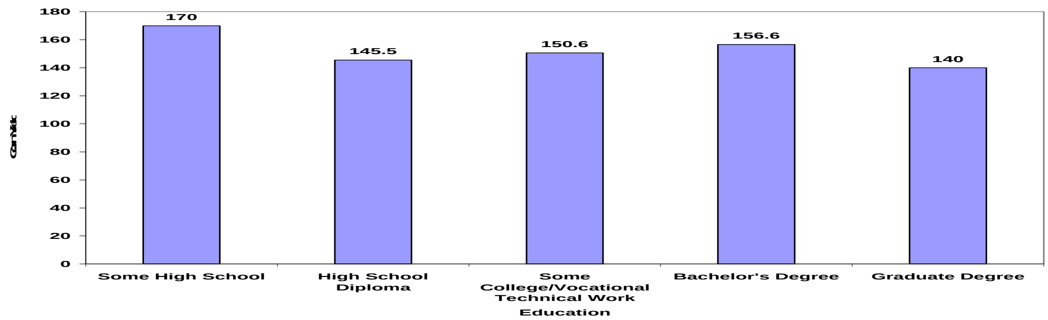

Figure 10: Farmer's Education vs. 2nd Year Corn Yield

Soybean Yields

Many university researchers report that soybean yields are greater following 2nd year corn than in a corn/soybean rotation (Nafziger, 2004). They believe that yields are greater due to a reduction in soybean disease pressure and possibly fewer nematodes However, farmers' reported yields indicate a somewhat different result. The survey asked farmers to respond to the following: "Soybean yield is higher after 2nd year corn than 1st year corn." A Likert scale response of 1 indicates that they strongly disagree and 5 indicates that they strongly agreed with the statement. The results from each category from 1 to 5 are as follows: 14.6%, 25.9%, 32.2%, 18.1%, and 9.3%. In essence, 40.5% of the respondents disagree with the survey statement while 27.3% of the respondents agree with the statement. This suggests that there is a slight bias towards farmer's disagreeing with the statement. Hence, a slight majority of farmers think soybean yields are lower following two or more years of corn.

Tillage Systems

The survey asked the respondents to indicate the primary tillage system in their largest field for a corn after corn rotation. The choices were: no-till, strip-till, chisel-disk, deep ripper, moldboard plow, or other. Of the 149 observations, the majority (59%) of the respondents used a chisel/disk tillage system. The other reported tillage methods were: 12% no-till, 1% strip-till, 10% deep ripper, 11% moldboard plow, and 6% reported another tillage system not listed on the survey.

To further analyze tillage impacts on yield, university test plot research was compared to the survey results. Indiana farmers were asked to report their average corn yield for five years for three different corn rotations: corn/soybean, continuous corn, and 2nd year corn. Four types of tillage systems were analyzed in response to corn yields: moldboard plow, chisel/disk, no-till, and deep ripper. Table 3 contains corn yield results from the survey in relation to tillage practices. Table 4 serves as a reference from a study by Vyn et.al, 2006.

Crop Rotation Yields (2003-2007)				Yield Gain For Rotation (%)	
Tillage Method:	**Corn After Soybeans**	**2nd Year of Corn**	**Continuous Corn**	**CS/ CC**	**CS/2nd C**
Moldboard Plow	161	163	166	-3%	-1%
Chisel/Disk	155	149	149	4%	4%
No-till	147	136	139	6%	8%
Deep Ripper	175	166	172	2%	5%

Table 3: Average Corn Yield In Last Five Years vs. Tillage Method

	Crop Rotation Yields (1976-2006)		Crop Rotation Yields (1997-2006)		Yield Gain For Rotation (%)	
Tillage Method:	**Corn After Soybeans**	**Continuous Corn**	**Corn After Soybeans**	**Continuous Corn**	**CS/CC (1976-2006)**	**CS/CC (1997-2006)**
Moldboard Plow	179.8	172.4	190	184.3	4%	3%
Chisel Plow	180.1	167.7	189.7	180.6	7%	5%
No-till	175.2	148.8	186.6	158.7	18%	18%

Table 4: Tillage Systems and Potential Yield Drag with Continuous Corn in West Lafayette, Indiana, for the years 1975 through 2006. (Vyn et.al, 2006)

To determine yield gain for a corn/soybean rotation, the continuous corn and 2nd year corn rotations serve as the base rotation. For instance, a moldboard plow tillage system in the survey indicated that there is a 3% yield decrease for corn in a corn/soybean rotation relative to a continuous corn rotation. The 3% yield decrease for moldboard plow between these two rotations slightly contradicts the Purdue University agronomic data. As for chisel plow and no-till, the survey results are consistent with Purdue University agronomic data. However, it is important to recognize the magnitude of the yield gains between both of the no-till cases. Purdue University agronomic data indicate a much greater yield gain for a corn/soybean rotation in relation to a continuous corn rotation. The survey indicates a 6% yield gain for corn in a corn/soybean rotation relative to a continuous corn rotation, whereas university agronomic data reported an 18% yield gain. In addition to the yield gain between a corn/soybean rotation and a continuous corn rotation, 2nd year corn was compared with a corn/soybean rotation. (Table 3)

Price Analysis

The survey did not ask farmers to report input and commodity prices for their operation. However, it is important to analyze the impact of commodity prices and input costs on rotation selection and corn yields. Farmers often use a soybean/corn price ratio as a guide to adjust their rotation acres. Historically, the "break-even" price ratio for a 50/50 corn/soybean rotation has been around 2.5:1, indicating that the soybean price averages 2.5 times the corn price.

With a continuous corn rotation, variable costs will increase along with machinery costs to manage the crop. However, if the demand for corn drives the market price high enough, a continuous corn rotation could be a profitable option for the farmer. A model created by Iowa State University illustrates that the most profitable rotation is determined by the corn price and nitrogen rate (Duffy, 2006).

To explain this model in relation to the time of the Indiana survey, corn and soybean prices for 2005, 2006, and 2007 were selected. In particular, December 2005, 2006, and 2007 corn futures prices as reported in February and October are used along with November soybean futures prices for 2005, 2006, and 2007. Table 5 illustrates the corn price, soybean price, nitrogen rate, price ratio, and analyzes the most profitable rotation based on the Iowa State University study method. Nitrogen rates were taken from 2005, 2006, and 2007 Crop Cost Guide developed annually by Purdue University (Dobbins, 2007).

	December Corn Futures (Feb.)	December Corn Futures (Oct.)	November Soybean	Nitrogen Rate	Price Ratio (S/Dec Corn Feb.)	Price Ratio (S/Dec. Corn Oct.)	Best Rotation and N Level
2005	$ 2.31	$ 2.02	$ 5.80	$ 0.26	2.51	2.87	CS @ 160
2006	$ 2.59	$ 3.03	$ 6.52	$ 0.34	2.52	2.15	CS @ 240 lbs
2007	$ 4.05	$ 3.58	$ 10.26	$ 0.28	2.53	2.86	CCS @ 160 lbs

Table 5: Price Ratio for Soybeans and Corn for 2005, 2006, and 2007

According to the Iowa State model, and using the 2000-2005 average yield data, the rotation that would have been most profitable for 2006 was a corn/soybean rotation at an N level of 240 pounds. For the second scenario, for 2007, a corn price of $4.05 per bushel with N rates approximately $0.28 per pound, the most profitable rotation would have been a 2nd year corn rotation at an N level of 160 pounds. The price ratio between November soybeans and December corn futures reported in February, from 2005 to 2007, remained constant at about 2.5. However, the price ratio between November soybeans and December corn futures reported in October, from 2005 to 2007, fluctuated. From 2005 to 2006 the price ratio favored corn by decreasing from 2.87 to 2.15. The increase in corn futures prices gave farmers an incentive to grow more corn and less soybeans. However, from 2006 to 2007, the price ratio increased favoring soybeans.

Conclusions and Implications

A mailed survey was developed to analyze Indiana farmers' perceptions and experiences relative to the increased demand for corn due to ethanol production. Socioeconomic, agronomic, and economic variables were evaluated to determine which farmers in Indiana are increasing corn acres and yields. The survey reported that Indiana farmers who have higher gross farm incomes and in the early to mid career age range (25-45) increased their corn acres planted from 2006 to 2007. However, educational attainment and changes in corn acres planted from 2006 to 2007 were not statistically significant. As for corn yields, the survey reported that farmers with higher gross incomes and in the early to mid career age range (25-45) tend to produce higher yields with a continuous corn rotation. However, the relationship between educational attainment and continuous corn yield was not statistically significant. The survey indicated that Indiana farmers with higher gross farm incomes tend to report higher corn yields for a 2nd year corn rotation. On the other hand, farmer's age and educational attainment were not statistically significant.

The survey analyzed and reported tillage systems in relation to corn yields for a continuous corn rotation, 2nd year corn rotation, and a corn/soybean rotation. Survey results are somewhat contrary to Purdue University agronomic test plot results. It was found from the survey that there was a yield loss between a corn/soybean rotation relative to a continuous corn rotation under a moldboard plow tillage system. Chisel/disk and no-till systems reported fairly consistent results in comparison with Purdue University agronomic test plot data. However, the yield gain for the no-till system for the corn/soybean rotation and the continuous corn rotation indicated a lower magnitude in comparison with Purdue University agronomic test plot data.

This research offers information on farmers rotational adjustments in response to the recent increase in demand for corn for ethanol. From the farmers' standpoint, it is important to analyze both university agronomic research data as well as farmers' perceptions and experiences.

With technologies, hybrids, machinery, and market prices constantly changing, Extension educators and crop consultants need to offer farmers up-to-date data that can help them with their managerial decisions. Comparing similarities and differences among farmers' cropping system decisions will allow for a free-flow of new ideas and techniques.

Continuous corn is becoming a more popular rotation among some farmers due to the increase in the price of corn. However, not all farmers will profit from a continuous corn rotation. A spreadsheet economic analysis under alternative input and commodity prices as well as tillage and rotational systems is necessary to analyze different agronomic and economic scenarios.

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