Tennessee Soybean Producers' Views on Biodiesel Marketing

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Tennessee produces about 35.7 million bushels of soybeans each year. A growing potential market for soybeans is as a feedstock for biodiesel. Biodiesel can be made from soybeans, as well as other feedstocks. Biodiesel can be blended with conventional diesel (B20 is 20 percent biodiesel) and used in engines with no modifications. Substituting petroleum diesel with biodiesel could decrease air emissions, reduce reliance on foreign oil, and help expand markets for U.S. farmers.

A recent study evaluated the economic feasibility of biodiesel production in Tennessee (English, Jensen, and Menard, 2002). As part of this study, it was determined that at the current time the most economically efficient sized plant is a 13 million gallon biodiesel plant that would use 9 million bushels of soybeans. While the results from this study were suggestive that a biodiesel facility would be economically feasible in Tennessee given sufficient soybean production, the question of producer interest in selling soybeans to a biodiesel facility was not addressed. This study examines Tennessee soybean growers' views on biodiesel, their interest and capability to supply sufficient production to a biodiesel plant, and their interest in formation of a cooperative to produce biodiesel.

Survey and Analysis Methods

In February of 2003, a mail survey was sent to 2,452 producers in Tennessee. The listing of soybean producers was provided by Tennessee Agricultural Statistics Service (TASS). All soybean producers producing soybeans on at least 100 acres were surveyed. Among those producing on less than 100 acres, 20 percent were randomly selected and surveyed. About 2 weeks after the initial mailing, a follow-up mailing was conducted. In this mailing, a second copy of the survey was sent to all producers who did not respond to the first mailing. Of the 2,452 producer addresses, 40 were undeliverable. A total of 561 usable responses were provided, giving a response rate of 23.3 percent. The results are summarized with means (for continuous responses, such as age) and with frequency counts (for categorical responses, such as "yes" or "no").

The survey was comprised of three sections. The first section contained questions regarding soybean producers' views on biodiesel markets, including their views on growth potential for biodiesel markets and whether they would be willing to sell soybeans to a biodiesel processing facility. The second section focused on cooperative processing of soybeans into biodiesel. This section included questions about purchasing delivery shares in a cooperative and desired rates of return on investment in a cooperative to produce biodiesel. The third section of the survey included questions regarding characteristics of the soybean farm and the soybean producers' characteristics, including size of farm and experience of the farm operator. A copy of the survey is presented in the Appendix.

Summary measures include means for continuous variables (for example, age in years) and frequency tables for discrete variables (such as "Yes/No"). Throughout this document "N" represents the number of responses to the question. In order to evaluate non-response bias, several measures from the survey were evaluated. The statewide average age of the operator was 55.4, while the survey respondents averaged 52.39. The frequency of responses versus non-responses were compared by county. No significant association between county and response was found. However, when small (<100 acres) versus larger farms (100+ acres) were compared, the larger farms had a response rate of 23.8 percent, while the smaller farms had a response rate of 11.2 percent. A breakdown of the responses, sample, and population is shown in Table 1. Due to the lower response rate on the part of smaller firms, care should be taken in extending the results to the full sample or the population.

Table 1. Response Rates Across Farm Size.

	Respondents	Sample	Population	Response Rate	Percent of Population
Large (100+ acres)	471	1977	1977	23.82%	23.82%
Small (<100 acres)	53	475	2375	11.16%	2.23%
Total	524	2452	4352		

Survey Results

Section I. Biodiesel Markets

On average, producers felt optimistic about the growth prospects for biodiesel markets in the next decade (Table 2). On average the producers strongly agreed or agreed that biodiesel production will provide an important national market for soybeans in the next 10 years. The producers agreed, on average, that they would be interested in using biodiesel from soybeans in a 20 percent blend on their farming operation if it were competitively priced with conventional diesel.

Table 2. Producers' Opinions About Biodiesel Markets.

	Average Rating (1= Strongly Agree, 2=Agree, 3= No Opinion, 4=Disagree, 5=Strongly Disagree)	N
The U.S. markets for biodiesel will grow rapidly in the next 10 years.	1.88	548
Biodiesel production will provide an important national market for soybeans in the next 10 years.	1.86	539
If priced competitively with conventional diesel, I would be interested in using biodiesel from soybeans in a 20 percent blend on my farming operation.	1.46	542

As shown in Table 3, nearly 96 percent of producers believed that biodiesel could profitability produced in West Tennessee. About 97 percent indicated they would be willing to sell some or their entire crop to a biodiesel processing plant.

Table 3. Views on Tennessee Biodiesel Markets.

	Percent Indicating Yes	N
Do you believe that biodiesel from soybeans could be profitably produced in West Tennessee?	95.7	535
Would you be willing to sell some or all of your soybeans directly to a biodiesel processing plant?	97.0	532

When asked about the type of buyer producers would like to sell to, 6.21 percent indicated they would prefer to sell to a privately owned buyer, 35.73 percent to a cooperatively owned buyer, and 58.06 percent had no preference for type of buyer (Table 4). The respondents were also asked about whether they would rather sell on a contract or spot basis. As shown in Table 5, of those wishing to sell to a privately owned buyer, the

respondents would sell 278,000 bushels through marketing contracts and 90,500 bushels on a spot basis. Among those wishing to sell to a cooperative or with no preference, 4,05,0349 bushels would be sold through contracts and 2,256,889 bushels on a spot basis. From the respondents, a total of 6,675,738 bushels would be available for use in some type of plant. Accounting for farm size differences, a projection of the bushels available across the sample is 28,087,804 and across the population is 30,031,547 bushels.[1] Since the total number of bushels is 35.7 million, this represents about 84 percent of the state's bushels.

Table 4. Preferred Business Structure for Processing Plant.

I would prefer to sell my soybeans to a processing plant that is	Percent (N=515)
Privately owned	6.21
Cooperatively owned	35.73
No preference	58.06

Table 5. Bushels Available for Sale to a Plant.

Number of Bushels Would Sell	To Privately Owned Plant	To Cooperative Plant or No Preference	Total
Through marketing contracts	278,000 (N=18)	4,050,349 (N=322)	4,328,349
On a spot basis	90,500 (N=12)	2,256,889 (N=262)	2,347,389
Total	368,500	6,307,238	6,675,738

Section II. Cooperative Production of Biodiesel

The percent indicating that would be interested in participating in a new generation cooperative to produce biodiesel was 75.66 percent or 314 producers (N=415). The desired average minimum percent per year on any investment made in a biodiesel facility was 9.58 percent (N=269). Among those interested in investing in a new generation cooperative, at this rate of return, 88.51 percent indicated they would be willing to make a minimum

[1] The adjustment was made by multiplying the average bushels for sale by small farmers (<100 acres) and the average bushels for sale by large farmers (100+acres) by the number of farms in the sample in the two categories. These two values were then summed to get a total across small and large farms. The adjustment for the population estimate was calculated in the same way using the number of farms in the population in each size category.

purchase of 2,500 shares ($5,625 at $2.25 per bushel) (N=261). This represents about 577,500 bushels or $ 1,299,375 total investment. In addition, another 13 producers indicated they would buy the minimum amount for a total of 32,500 bushels or $73,125 investment, but did not indicate a desired rate of return. This gives a total of 610,000 bushels or 1,372,500 in investment. If adjustments are made for the farm size differences, then the projections for the sample are 2,622,674 bushels and for the population are 4,688,627. This is an investment of $5,901,016 for the sample and $10,549,412 for the population. Recalling that the shares and investment needed are 9 million bushels and $18.5 million in producer investment, the population estimates represent about 52.1 percent of the bushels needed and 58.6 percent of the producer investment required would be available for operating the cooperative.

Section III. Farming Operation and Producer Characteristics

Of the respondents, 70.52 percent indicated they were members of agricultural cooperatives (N=536). The respondents who produced soybeans in 2001 harvested an average of about 665.14 (N=524) or 348,533.4 acres in total. Distributed across the state, a total of 33 percent or more of the acres planted as reported by NASS are represented by the survey (Figure 1).

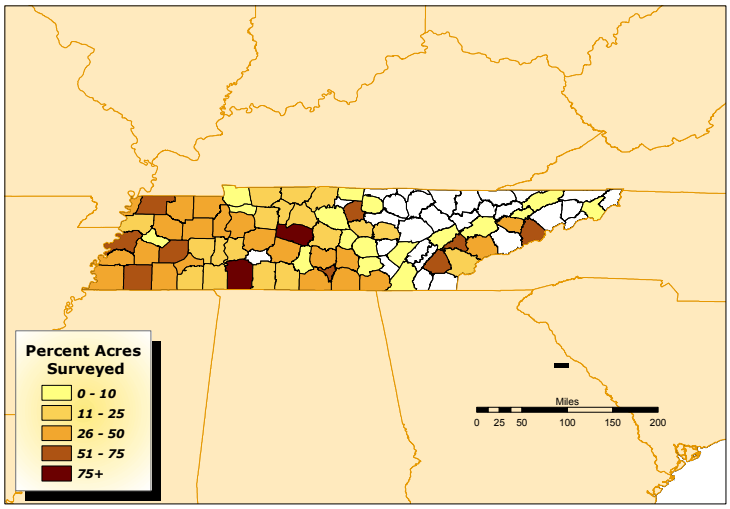

Figure 1. Proportion of Acres Represented by Survey Responders

Using an average of 30 bushels per acre, this would represent about 10,456,002 bushels of soybeans. About 31.54 percent (N=539) had no on-farm storage. Among those with on-farm storage, storage capacity was about 23,819 bushels of soybeans on-farm (N=369). The total amount of storage indicated was 8,789,211 bushels. On average, the respondents stated they typically sold about 33.65 percent through contracts (N=525).

In addition to soybeans, other crops grown included cotton, corn, and wheat. On average, about 210.82 acres of cotton were harvested, 356.31 acres of corn, and 158.76 acres of wheat (Table 6). Other land uses included 100.96 acres, on average, of pasture and 79.54 acres on average of woodlands.

Table 6. Other Acreage Harvested or Used.

Type of Acreage	Average Acres Harvested or Used	N
a. Cotton	210.82	548
b. Corn	356.31	533
c. Wheat	158.76	533
d. Other Crops Harvested (Please describe)	26.18	526
e. Pasture	100.96	535
f. Woodland	79.54	546
g. Other (Please describe)	15.42	545

As shown in Table 7, the respondents had an average of 66.02 beef cows on their farms. The average number of milk cows was 5.70, while the average numbers of sows was 8.27 and broilers was 3029.09. Note that these averages include those farms raising none of the particular type of livestock.

Table 7. Number of Livestock on your Farming Operation.

Type of Livestock	Average Number on Farm	N
a. Beef Cows	66.02	548
b. Milk Cows	5.70	551
c. Yearlings	20.85	550
d. Heifers	8.62	548
e. Broilers	3029.09	550
f. Sows	8.27	550
g. Horses	.60	551
h. Other (Please describe)	48.57	548

On average, the respondents were 52.39 years old and had been farming for 33.99 years (Table 8).

Table 8. Producer's Age and Farming Experience.

	Average Number of Years	N
Producer's Age in Years	52.39	546
Years in Experience in Farming	33.99	529

Shown in Table 9, about 44.71 percent of the farmers were full owners of their farms, while 25.73 percent were partners in the farm. About 9.67 percent were renters. The majority of the rest were owner/renters.

Table 9. Farm Ownership.

Type of Farm Ownership	Percent (N=548)
Full Owner (Sole Proprietorship)	44.71
Part Owner in a Partnership, Family Held Corporation or Other Corporation	25.73
Renter	9.67
Other	19.89

The net farm income from farming most commonly cited was $35,000-$49,999 at 15.45 percent (Table 10). The majority (54.27 percent) of producers had net incomes from farming between $15,000 and $75,000 per year.

Table 10. Net Income From Farming in 2001 (After Taxes).

	Net Farm Income Level	Percent (N=492)
a.	negative (less than $0)	5.69
b.	$0-$9,999	15.65
c.	$10,000-$14,999	8.74
d.	$15,000-$24,999	15.24
e.	$25,000-$34,999	13.21
f.	$35,000-$49,999	15.45
g.	$50,000-$74,999	10.37
h.	$75,000-$99,999	4.07
i.	$100,000-$149,999	4.67
j.	Greater than or equal to $150,000	6.71

As displayed in Table 11, nearly 35 percent had no farm debt. The majority, 53.71 percent, had less than $5 financed with debt per $100 of assets.

Table 11. Farm Debt.

	Dollars Financed with Debt per $100 of Assets	Percent (N=484)
a.	$0	35.74
b.	$1-$2.99	13.22
c.	$3-$4.99	4.75
d.	$5-$9.99	7.85
e.	$10-$14.99	4.75
f.	$15-$19.99	7.85
g.	$20-$39.99	14.67
h.	$40-$69.99	8.47
i.	$70 or Greater	2.69

On average, about 35.95 percent of the respondents' household income came from off farm sources in 2001 (N=507). Shown in Table 12, most of the producers were either high school graduates, had attended some college, or held a college degree.

Table 12. Education Level.

Education Level		Percent (N=544)
a.	Some high school or less	7.90
b.	High school graduate	39.15
c.	Some college	22.61
d.	College graduate	23.71
e.	Post graduate	6.62

Soybean Draw Area

A biodiesel facility located in Northwest Tennessee could be served by local soybeans trucked from the surrounding area or by soybeans delivered by barge from upriver. Counties in Tennessee lying within a 50-mile radius of Cates Landing Tennessee include Dyer, Obion, Gibson, Weakley, and Lake. Responses from these counties indicate that a total of 2,634,155 bushels would be available for sale from the responding farmers in this area. Projecting this amount to the five county area, then the total bushels available would be about 10,631,831 bushels. This suggests that a facility in Northwest Tennessee could adequately be supplied by area farmers.

Summary and Conclusions

The results from this survey suggest considerable interest on the part of soybean farmers in selling their soybeans to a biodiesel production plant. Producers were less certain about formation of a new generation cooperative to produce biodiesel. If 9 million bushels are required to provide sufficient feedstock for a biodiesel production plant, there does appear to be sufficient interest and ability to supply soybeans on the part of producers.

As part of the economic feasibility study conducted during 2002, financial viability of a 13 million gallon (9 million bushel) facility at an investment of $18.5 million from

producers and $18.5 million from outside investors was examined. From the survey responses, it appears that producers would be willing to purchase shares in a new generation cooperative in the amount to supply and finance about half the needs of a biodiesel plant.

References

English, B., K. Jensen, and J. Menard. Economic Feasibility of Producing Biodiesel in Tennessee. Department of Agricultural Economics, The University of Tennessee, November 2002.

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United States Department of Agriculture, NASS. 1997 Census of Agriculture. Tennessee State and County Data. Vol. 1, Geographic Area Series, Part 42. March, 1999.

APPENDIX-Survey Instrument

Growers' Views on Biodiesel Production & Marketing

The purpose of this study is to measure soybean producers' attitudes about biodiesel markets and formation of a cooperative to produce biodiesel from soybean oil in the West Tennessee area. Your response is important for obtaining an accurate measure of producers' views. Your participation is ***completely voluntary*** but will help us to serve you and other soybean growers. Only summaries of responses from the survey will be reported. Only researchers conducting the study will have direct access to the data. This questionnaire will take about 15 minutes to complete. You will be provided with an opportunity to request a copy of the study summary at the end of this questionnaire. We appreciate your participation.

Section I. Biodiesel Markets

Biodiesel is an alternative fuel that can be made from soybean oil. Blends of up to 20% biodiesel mixed with petroleum diesel fuels (B20) can be used in nearly all diesel equipment and are compatible with most storage and distribution equipment.

1. Please circle the rating that most closely matches your opinions on the following statements.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
a. The U.S. markets for biodiesel will grow rapidly in the next 10 years	1	2	3	4	5
b. Biodiesel production will provide an important national market for soybeans in the next 10 years	1	2	3	4	5
c. If priced competitively with conventional diesel, I would be interested in using biodiesel from soybeans in a 20 percent blend on my farming operation.	1	2	3	4	5

2. Do you believe that biodiesel from soybeans could be profitably produced in West Tennessee? (Circle the answer.)
   a. YES (Continue on to question 3.)
   b. NO Please indicate reasons why _____(Go to question 11)

3. Would you be willing to sell some or all of your soybeans directly to a biodiesel processing plant?
   a. YES (Continue on to question 4)
   b. NO (Go to question 11)

4. I would prefer to sell my soybeans to a processing plant that is (Please circle the answer):
   a. Privately owned (Continue on to question 5)
   b. Cooperatively owned (Go to question 6)
   c. No preference (Go to question 6)

5. Please indicate the number of bushels you (on an average year) would be willing to sell to a plant, then go to question 11.
   a. Through marketing contracts _____bushels
   b. On a spot basis (no contract) _____bushels

6. Please indicate the number of bushels you (on an average year) would be willing to sell to a plant (Continue on to question 7)

   a. Through marketing contracts _____bushels
   b. On a spot basis (no contract) _____bushels

Section II. Cooperative Production of Biodiesel

7. Would you be interested in participating in a new generation cooperative to produce biodiesel?
   a. YES (Continue on to question 8)
   b. NO Please indicate reasons why _____ _____(Go to question 11)

8. What is the minimum percent per year you would find acceptable on any investment you made in a biodiesel production facility? _____% (for example, an 8% return would mean for every $100 invested, you would receive $8 per year). (Continue on to question 9)

9. At the rate you of return indicated above, and assuming a share price of $2.25 per bushel with minimum purchase of 2,500 shares or rights to deliver 2,500 bushels ($5,625 investment), would you be willing/able to purchase the minimum number of shares?
   a. YES (If Yes, continue on to question 10)
   b. NO (If No, go to question 11)

New Generation Cooperatives (NGC)
- Major focus is on "value-added" products, rather than commodities.
- Members sell raw products grown to their cooperatively-owned processing plant. Cooperative profits are then distributed back to members in proportion to raw product delivered.
- Shares allocate delivery rights so each share entitles & obligates a member to deliver soybeans to the cooperative
- Restricted or closed membership limits soybean deliveries to the amount the plant can absorb
- Investment may or may not include non-members. Investment by non-members is less than majority.

10. At the rate of return you stated in question 9, please indicate the number of additional shares you would be willing and able to purchase above the minimum of 2,500 (if none, indicate by answering '0')._____ additional shares (Continue on to question 11)

Section III. Farming Operation and Producer Characteristics

11. Are you currently a member of an agricultural cooperative?
    a. YES b. NO

12. Acres of soybeans harvested in 2001 _____.

13. Please indicate the number of soybean bushels you can store on-farm. _____ bushels.

14. What percent of your soybeans do you typically sell through contracts? _____%.

15. Other acreage harvested or used on the farm(s) you operate in 2001

a. Cotton	_____	e. Pasture	_____
b. Corn	_____	f. Woodland	_____
c. Wheat	_____	g. Other (Please describe)	_____
d. Other Crops Harvested (Please describe)	_____		_____

16. Number of livestock on your farming operation

a. Beef Cows	_____	e. Broilers	_____
b. Milk Cows	_____	f. Sows	_____
c. Yearlings	_____	g. Horses	_____
d. Heifers	_____	h. Other (Please describe)	_____

17. Your age in years _____.
Years experience farming _____.

18. For the farm(s) I operate, I am (Please circle the best answer)
a. A full owner (sole proprietorship)
b. A part owner in a partnership, family held corporation, or other corporation
c. A renter
d. Other (please describe): _____.

19. Net income from farming in 2001 (after taxes). (Please circle the best answer).
a. negative (less than $0)
b. $0-$9,999
c. $10,000-$14,999
d. $15,000-$24,999
e. $25,000-$34,999
f. $35,000-$49,999
g. $50,000-$74,999
h. $75,000-$99,999
i. $100,000-$149,999
j. Greater than or equal to $150,000

20. For every $100 of farm assets you have, how many dollars are financed with debt? (Please circle the answer).
a. $0
b. $1-$2.99
c. $3-$4.99
d. $5-$9.99
e. $10-$14.99
f. $15-$19.99
g. $20-$39.99
h. $40-$69.99
i. greater than $70

21. What percent of your household's income came from off farm sources in 2001 _____%

22. What is the highest education level you attained? (Please circle the answer).
a. Some high school or less
b. High school graduate
c. Some college
d. College graduate
e. Post graduate

End of Questionnaire. Thank you for your time and effort.

_____Yes, I would like to receive a copy of the summarized results