Producer Preferences for Contracts on a Risky Bioenergy Crop

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Abstract

This study employs a stated choice experiment survey to identify producer preferences for contracts to produce Giant Miscanthus. Preliminary results indicate that price offered per ton of harvested Miscanthus, yield insurance availability, and biorefinery harvest have significant positive effects on the probability of a producer accepting a contract to produce Giant Miscahthus. The results show that risk-neutral farmers as more willing to accept contracts relative to risk-loving farmers, *ceteris paribus*. Farmers who perceive yield risk of Miscathus to be greater than their current crop are less likely to accept Giant Miscanthus contracts.

Key words: Giant Miscanthus, Contracts Attributes, Choice Experiment

Introduction

Ethanol production in the United States is dominated by the use of corn which has generated debate about the possibility of increased food prices (Runge and Sanauer 2007). As part of addressing this problem, the Energy Independence and Security Act (EISA) of 2007 mandates that by the year 2022, twenty one billion gallons of U.S total annual ethanol production should come from cellulosic ethanol (Gedikoglu 2012).

Cellulosic ethanol is that ethanol obtained from sources such as Giant Miscanthus, switchgrass, wood residues and corn stover. There is evidence that cellulosic ethanol is both more abundant and also more environmentally-friendly than grain-based fuels (Perrin et al. 2008), although there is debate as to whether the use of corn residues would result in increased erosion problems (Petrolia 2008a). Cellulosic fuels, would result in significant reductions in green gas emissions relative to conventional fuels, although SO_x emissions would increase (Petrolia 2006).

In order to achieve the goal of producing twenty one billion gallons of cellulosic ethanol as established by EISA of 2007, Giant Miscanthus has been identified as a promising perennial biofuel crop. Miscanthus is a warm-season perennial energy crop which originated from Asia. The grass is cultivated from rhizomes and can reach a height of 8-12 feet. It takes 2 to 3 years to reach full harvest potential. Once it is established, stands can remain on the field for an average of 15 years without re-establishment or residing, requiring only fertilizer each time the grass is harvested to replace the loss nutrients (Heaton et al. 2010). Miscanthus can be grown on marginal lands which are not suitable for row crops such as corn, although on such lands (i.e. marginal lands), according to Heaton et al. (2010), it does not give maximum yields.

In order to get potential producers to produce this grass, we believe making production contracts available to farmers can serve as one way of enticing them. Furthermore, since production of Miscanthus could be considered as a risky enterprise, potential farmers may be willing to produce only when there exist a risk management tool like contract. However, although contracts can be used to encourage producers to plant Giant Miscanthus, potential producers may not only be interested in contract availability. They will only produce something that provides them with higher net returns (Song, Zhoa, and Swinton 2011). As such, the attributes of the contract would be very crucial for farmers in making decisions to produce Giant Miscanthus.

Contract attributes which could be of interest to farmers may include: price offered per ton of harvested grass, contract length, availability of yield insurance for purchase, biorefinery harvest option, and rhizome or establishment cost - share. Analyzing the effects of contract attributes on farmers' willingness to produce Giant Miscanthus will give biorefineries or prospective biomass processors (buyers) an indication of producers preferred contracts. Also farmers risk perceptions about bioenergy crops in general and their risk preferences can influence their decisions to accept contracts. However, the literature in this area is limited, hence the need to carry out a stated choice experiment to push the frontiers of literature in this emerging area of study.

Past studies regarding cellulosic feedstock production concentrated on the feasibility (both economic and technical) and the potential supply of alternative sources of cellulosic biofuel feedstock in the United States (e.g. Bangsund, DeVuyst, and Leistritz 2008; Bruce et al. 2007; De la Torre Ugarte et al. 2007; Khanna, Dhungana, and Clifton-Brown 2008; Perrin et al. 2008; Petrolia 2008b), with other work focusing on consumer preferences for biofuels (e.g. Li and McCluskey 2014; Petrolia et al. 2010; Skahan 2010; Solomon and Johnson 2009). For instance, Perrin et al. (2008) estimated the cost of producing switchgrass on commercial quantities. Bruce et al. (2007) also carried out a study similar to Perrin et al. (2008) by providing estimates on the costs associated with the conversion of land for traditional crops production to the production of switchgrass. Bergtold, Fewell, and Williams (2014) departs from estimating costs associated with the production of bioenergy crops and employ survey methods to study Kansas farmers' willingness to produce alternative cellulosic biofuel feedstock under alternative contractual, harvesting and market arrangements, a study which is similar to the current study but they focused on corn stover, sweet sorghum and switchgrass. They also did not place a dollar amount on every ton of switchgrass harvested taking into consideration other conventional crops such as corn, soybean, etc. which can compete with switchgrass for land allocation. Also, Bergtold, Fewell, and Williams (2014) did not incorporate farmers risk perceptions and risk preferences in their study. This study focuses on specific biofuel crop, Giant Miscanthus, which to the best of our knowledge is the first of its kind, builds on the previous study by Bergtold, Fewell, and Williams (2014), by incorporating farmers risk preferences and risk perceptions which affects their everyday decisions. The research will yield estimates of the incremental values of contract length, establishment cost share, yield insurance availability and biorefinery harvest on biofuel contracts.

Specific problem

Although the Energy Independence and Security Act of 2007 requires that 21 billion gallons of cellulosic or advanced biofuels be produced per year by the year 2022, however, the necessary mechanisms for biofuel feedstock supply chains have yet not been identified. At the moment farmers are not producing these risky bioenergy crops, specifically, Giant Miscanthus because there are no existing buyers. Again prospective biomass processors or biorefineries also do not know how they would induce farmers to devote part of their farmlands to produce these bioenergy feedstock.

Even though contract availability can assist in enticing farmers to produce Giant Miscanthus, so far little is known about contract attributes which farmers are likely to accept to produce these risky bioenergy feedstock. Issues of risk perceptions and risk preferences are some factors which influence an individual's decision as pointed out by Lusk and Coble (2005) and Petrolia, Landry, and Coble (2013). However, how these factors affect farmers' decisions to accept contracts to produce risky bioenergy crops is yet to be known.

It is against this background that this study seeks to employ a stated choice experiment to fill this gap in literature by identifying the effects of contract attributes on farmers' decisions to produce a risky bioenergy crop such as Giant Miscanthus while incorporating farmers risk perceptions and risk preferences. Modeling the effect of contract features on farmers' willingness to produce the Miscanthus (a newly found bioenergy crop which most southeastern U.S. farmers are not very familiar with), will enable policy makers identify how best the fuel production potential of Giant Miscanthus can be realized. It will also assist biomass and biorefinery processors in designing contracts for farmers to ensure year round supply of feedstock.

Overall Objective

The overall goal of this study is to investigate producer preferences for contracts to produce a risky bioenergy crop, Giant Miscanthus and how their risk perceptions and risk preferences affect their decisions.

Specifically it seeks to estimate the effect of:

i. Price offered per ton of harvested Giant Miscanthus by biorefinery firm or biomass processor on farmers' willingness to grow this bioenergy crop.
ii. Contract duration on farmers' willingness to supply Giant Miscanthus for biofuel production.
iii. Rhizome / establishment cost – share on farmers' willingness to lock in contracts to produce Giant Miscanthus to supply biorefineries or biomass processors.
iv. Availability of yield insurance for farmers to purchase on their willingness to accept contracts to supply Giant Miscanthus.
v. Biorefinery harvesting Miscanthus from farmers' field on farmers' willingness to supply Giant Miscanthus to the biorefinery.
vi. Farmers risk perceptions and risk preferences on their willingness to accept contracts to produce / supply Miscanthus.

Literature review

Although some studies have been conducted on farmers' decisions or willingness to produce dedicated energy crops particularly in the United States, however, these previous studies on farmers' willingness to produce dedicated energy crops have given little attention to Giant

Miscanthus and have concentrated a bit more on switchgrass. Additionally, none of these studies touched on farmers risk perceptions and risk preferences in relation to their acceptance of contracts to produce these perennial energy grasses.

For instance, Jensen et al. (2007) used survey to analyze Tennessee farmers' willingness to produce switchgrass for energy production. Results from their study showed that most farmers, at the time of the survey had still not heard of growing switchgrass for energy production. Sherrington, Bartley, and Moran (2008) using focus groups discussions examined United Kindom farmers' willingness to produce energy crops. Results from their study found farmers perception of financial returns and uncertainty in financial returns as the main factors affecting adoption of energy crops production. This study gives highlight on the likelihood of farmers producing bioenergy should they see returns from such ventures higher or greater than the returns from their traditional / conventional crops.

Qualls et al. (2012) used a tobit (censured regression model) to analyze factors affecting willingness to produce switchgrass in the Southeastern U.S. Results from their study revealed that about two – thirds of the producers in the region have some interest in growing switchgrass. However their results indicated that producing a commodity under contract does not have a significant marginal effect on producers' interest in producing the commodity. This finding needs to be investigated further.

Paulrud and Laitila (2010) used choice experiment to examine farm and farmer characteristics which may contribute significantly on farmers' willingness to grow bioenergy crops. Findings from their study showed that farmers produce on rented / leased land, share of set aside land for production, and type of farming had no significant effect on farmers' willingness to grow. However, farm size, cultivating on set aside lands, farmer's age, and income, all had negative effects on farmers' willingness to produce energy crops.

Pannell et al. (2006) found that an individual's level of education has less to do with adoption than training courses that related to the technology being adopted. They revealed that crops with long time periods between planting and harvesting have increased production risk and can act as hindrance for farmers to plant perennial bioenergy crops.

Agricultural Contracts

Contracts play a significant role in the production and marketing of agricultural commodities. According to McDonald and Korb (2011), in the year 2008, formal contractual arrangements accounted for about 40% of the total value of agricultural production as compared to 11% which existed in the year 1969. In the U.S., agricultural contracts have usually been in the forms of either production or marketing contracts. Agricultural contracts particularly production contracts can serve as a tool for the provision for a more stable income for the producer by reducing the marketing risks which farmers often time face. Production contract may also provide the farmer with a guaranteed market so long as the commodities are provided in accordance with the contract (University of Minnesota Extension 2009). However, Larson et al. (2007) assert that farmers usually have a limited degree of autonomy with production contracts. This happens because they may not be able to make any changes to the formal agreements should the need arise. In marketing contracts, agreements are made between a grower and a contractor where the grower mostly sets a price before harvest with the grower mostly bearing all the production risks and at times either sharing the price risk with the contractor or pushing all the price risks to the contractor under a fixed price forward sale (Yang, Paulson, and Khanna 2014). Marketing contracts are usually used to address demand and price risks. These kinds of contracts (marketing contracts) are usually common in vegetables, fruits and row crops (USDA 1996). However, despite the availability of agricultural contracts in the U.S., there is none for bioenergy crops production.

Risk Perceptions and Risk Preferences

Risk as a concept has been defined as the probability or the likelihood of occurrence of damage or danger as a result of the use of a substance in the proposed manner or quantity (Amin et al. 2013). In dealing with issues of risk, we normally consider two main concepts namely; risk perception and risk preferences. The occurrence of risk has to be usually perceived by the individual decision maker. On the other hand, according to Charness, Gneezy, and Imas (2013), risk preference may be defined as the extent to which one is willing to take on risk. Several studies have sought to find out how risk altitudes affect individuals decision or acceptance of a product. For instance, Lusk and Coble (2005) investigated the effect of consumers risk perceptions and risk preferences on their preferences for genetically modified (GM) food. Petrolia, Landry, and Coble (2013) using Holt and Laury (2002) instrument for measuring risk aversion in an experimental setting found that their experimental risk aversion measure was positively and significantly correlated with an individual’s decision to purchase a flood policy. Going by this finding, the implication is that issues of risk (both preference and perception) need not be side-lined in analysing an individual’s preference or decision to accept particularly contract to produce a risky bioenergy crop like Giant Miscanthus. However, studies which have analysed producer acceptance to produce bioenergy crop (e.g. Bergtold, Fewell, and Williams

2014, Gedigoklu 2012) did not pay particular attention to these issues, hence the need to address these issues.

Theoretical Framework

Random Utility

The random utility framework is the driving theoretical model behind our study. The framework is usually applied to consumer settings, however, in this study it is applied to producers. This theory which was formalized by McFadden (1974) and Hanemann (1984) forms the basis for many preference elicitation procedures as well as non-experimental preference elicitation procedures. In this study we assume the producer's utility is a function of profits as well as other factors known to the researcher and other factors which are known to the decision maker but unobservable to the researcher.

We assume that a farmer makes his crop production choices to maximize subjective expectation of utility subject to technology and short-run fixed input constraints (such as land availability), where utility is a function of farm and other income. One crop production alternative may be a risky bioenergy crop such as Giant Miscanthus. If we observe a farmer choosing to produce Giant Miscanthus under a specified contract, then we assume that the subjective expectation of utility from producing Miscanthus under that specified contract exceeds that of producing Miscanthus under an alternatively-specified contract as well as his next-best (existing) crop alternative.

Following Roe, Sporleder, and Belleville (2004), and Bergtold, Fewell, and Williams (2014) we assume producers maximize utility by choosing between energy crop production contracts and their current crop mix. In notational terms, an individual producer, *i*'s utility derived from choosing a contract or his current crop mix could be given by;

$$U_{ij} = \boldsymbol{\beta}^{'}\boldsymbol{X} + \varepsilon_{ij} \tag{1}$$

where; U_{ij} is the utility an individual i associates with contract option j, $\boldsymbol{X}$ is a vector of measured attributes (in this case contract attributes associated with contract option *j* which comprises: price offered per ton, biorefinery harvest option, rhizome / establishment cost share, contract length, yield insurance availability). It also encompasses the interaction variables which are generated by interacting individual - specific variables such as risk perceptions and risk preferences with the choice attributes. $\boldsymbol{\beta}$, is a vector of coefficients associated with each of the $\boldsymbol{X}$ variables which we seek to estimate. ε_{ij}, the elements of utility not observed by the researcher (stochastic component).

Due to the fact that there are some factors that are known to the individual or gives the decision maker some utility but the researcher do not observe, which as a result introduce the stochastic or the random component, we can only make some probabilistic statements about the decision maker's utility. Given that $U_{ij} > U_{ik} \quad \forall \quad j \neq k$, all $j \in J$ where J is the total number of alternatives, producer i will choose alternative $j = 1, \ldots, J$, which maximizes utility. The probability that the i th individual chooses j^{th} alternative over another alternative say k is given by:

$$P_{ij} = \Pr(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}), \text{ all } j \in J \tag{2}$$

$$P_{ij} = \Pr(\varepsilon_{ik} - \varepsilon_{ij} < V_{ij} - V_{ik}) \tag{3}$$

Assuming that the error / stochastic component is identically and independently distributed according to McFadden (1974), the probability could be represented by:

$$P_{ij} = \frac{\exp \boldsymbol{\beta}' \boldsymbol{X}_{ij}}{\sum_{j=1}^{J} \exp \boldsymbol{\beta}' \boldsymbol{X}_{ij}}; \; j = 1, ..., J, \; j \neq k$$ (Hensher et al. 2005).

$$\Pr(Y_i = j) = \frac{\exp \boldsymbol{\beta}' \boldsymbol{X}_{ij}}{\sum_{j=1}^{J} \exp \boldsymbol{\beta}' \boldsymbol{X}_{ij}} \qquad (4)$$

where Y_i is a random variable which indicates the choice the i^{th} individual or respondent made, β represents a vector of coefficients to be estimated and the probability could be estimated using, conditional logistic regression. According to Meyerhoff (2006) the basic conditional logit model is estimated using maximum likelihood estimation (MLE). MLE maximizes the joint probability that the model correctly identifies the actual choices each respondent made given the individual's characteristics and the characteristics of alternatives presented to an individual. The conditional logit relies on two assumptions about individuals' choices. The first assumption is that choices obey the Independence from Irrelevant Alternatives (IIA) property. The second assumption is that conditional logit treats responses to the choice sets shown to every respondent as completely independent observations.

Experimental Design

Although orthogonal designs are more prevalent in the literature of Discrete Choice Experiments (DCE), efficient designs have recently emerged as a new alternative to facilitate choice experiment designs. As pointed out by Bliemer and Rose (2010) and Bliemer and Rose

(2011) efficient designs lead to smaller standard errors in model estimation with small sample size. The D-error was used to determine the efficiency of the design. The D-error measures the inefficiency of the design, hence the design with the lowest D- error is said to be D – optimal. Although in practice, it is be very difficult to identify the design which yields the lowest D-error, however, we normally consider the design with sufficiently low D- error as the D- efficient design. The choice sets design was carried out in NGENE Statistical software. In all, 12 choice sets were generated which were put into 2 blocks, with 6 choice sets in each. Each respondent was randomly assigned to a block and given 6 independent choice sets in which the respondent makes independent decisions in each choice scenario. Table 1, indicates attributes and their respective levels used our choice experiment design.

Below shows a sample of a typical choice set scenario:

Suppose a biorefinery is offering you the contracts below to produce Giant Miscanthus as against producing your current crop, which option would you prefer?

<table>
<tr><th>Attribute</th><th>Contract A</th><th>Contract B</th><th>No Contract</th></tr>
<tr><td>Price Paid</td><td>$100/ton ($1200/acre)</td><td>$90/ton ($1080/acre)</td><td rowspan="5">I would not grow Miscanthus under the offered contracts and would maintain my current crop mix</td></tr>
<tr><td>Contract Length</td><td>9 years</td><td>9 years</td></tr>
<tr><td>Biorefinery Harvest</td><td>No</td><td>Yes</td></tr>
<tr><td>Yield Insurance Available</td><td>Yes</td><td>No</td></tr>
<tr><td>Rizhome/Establishment Cost-Share</td><td>25%</td><td>0%</td></tr>
</table>

I would choose...
[Check only one]

Contract A ○ *Contract B* ○ *No Contract* ○

Before respondents were shown the choice scenarios, they were first introduced to a table which explains each of the choice attribute. Table 2, indicates the descriptions of all the contract attributes.

Data Collection Method

Following Dillman (2000), we partitioned our survey into three main sections: The first section contained set of general questions regarding farmers farming operations. The second part presented a brief introduction about Giant Miscanthus followed by explanation of the choice attributes and the choice sets. Lastly, the third part contained risk assessment questions (for instance questions eliciting farmers risk preferences and risk perceptions) and demographic characteristics of the respondents.

The survey was constructed with the use of Qualtrics survey software (Qualtrics Labs, Inc. Provo, UT). Respondents were reached through third parties who sent respondents' e-mails that contained a link to the survey. We sampled crop and/or pasture farmers in Mississippi and North Carolina. Survey respondents are mostly commercial farmers, who cultivate soybean, corn, cotton, grain sorghum, wheat, rice, and pasture or a combination of these crops. Farmers from North Carolina were reached through a professor from North Carolina State University who had contacts of the farmers. After informing the farmers, he e-mailed each farmer with the link to the survey. In order to obtain large sample size we also got in touch with an individual who works with "The 25 x' 25 Alliance" who volunteered to send out the survey to other farmers in the group. Again as a way of increasing response rate we incentivize respondents by offering them $25 VISA gift card upon completion of the survey.

Preliminary Results

Table 3 presents the summary statistics of all variables used in estimating the regression model. It also describes how the variables are coded. The model estimation was carried out in NLOGIT statistical software. Table 4 shows the preliminary results from the conditional logit model. The Log likelihood and the number of observations used for the preliminary analysis are also reported. Parameter estimates for all the choice attribute variables, namely; price, biorefinery harvest, yield insurance availability, contract length, and cost- share, all have the expected signs. The parameter estimates for price, and biorefinery harvest are both positive and significant at the 1 percent level of significance. The estimate for yield insurance availability is also positive and significant at the 5 percent level of significance. This suggests that in designing contracts to get producers to produce Miscanthus, price, biorefinery harvest, and yield insurance are key attributes that has to be considered. Preliminary results also indicate that a contract that will last for 9 years are less likely to be accepted by producers relative to contracts that will be 5 years long, *ceteris paribus*, since the parameter estimate for this variable was negative and significant at the 10 percent level of significance. Furthermore, the model results show that contracts that are 13 years long are less likely to be accepted by farmers since the coefficient for this variable is negative and significant at the 5 percent level of significance. This is expected because locking up in a contract for 13 years puts the producer at a disadvantage because the returns from the farmers' next best alternative would have increased, although longer contracts can guarantee the biorefinery firm a steady supply of feedstock. The two variables for cost –share are both not statistically significant although their parameter estimates have the expected signs.

Issues of risk perceptions and risk preference cannot be left out when finding out factors that affect ones decision to accepting for instance, a contract to produce Giant Miscanthus. In view of this we include these variables in our model. Preliminary results show that the parameter estimate for risk-neutral variable is positive and statistically significant at the 5 percent level of significance. The yield risk variable which is used to identify the influence of producers' risk perceptions on their willingness to accept contract is negative and statistically significant at the 10 percent level of significance. However, respondents' perception of price risk of Miscanthus relative to their current crop has insignificant effect on their decisions of accepting contracts.

Summary and Conclusion

Although data collection process is still ongoing, results from the preliminary analysis indicates that price, biorefinery harvest, and yield insurance availability, all have positive and significant effects on farmers willingness to accept contract to produce Giant Miscanthus. This implies that an increase in the price per ton of harvested Giant Miscanthus will increase the probability or the likelihood of a producer accepting a contract to produce Miscanthus *ceteris paribus.* Again producers are more likely to accept contracts with biorefinery harvest, and yield insurance availability options relative to contracts without them holding all other factors constant. Contract length has negative and significant effect on ones willingness to produce Miscanthus under contracts. Thus holding all other factors constant, the longer a contract, the less likely farmers will accept. The preliminary results also find initial establishment cost share as insignificant even though it has the sign as expected. As pointed earlier by Lusk and Coble (2005) and Petrolia, Landry, and Coble (2013), an individual's decision is influenced by his risk preference and perceptions. In line with this we incorporate risk preference and risk perception variables in our model to identify how these factors influence farmers' decisions in accepting contracts to produce Giant Miscanthus. Preliminary results revealed that relative to risk lovers, risk neutral individuals are more likely to accept Miscanthus production contracts holding all other factors constant. Although not significant, relative to risk loving farmers, risk averse farmers are less likely to accept contracts holding all other factors constant. In finding out how farmers risk perceptions influence their decisions to accept contracts, we asked respondents to share with us how they perceive both price and yield risk of Miscanthus to their alternative crop they are likely to substitute with Giant Miscanthus. When these variables were included in our model, we find that the parameter estimates for both variables were negative. This suggest that farmers who perceive price and /or yield risks of Miscanthus as greater than that of their alternative crop are less likely to be willing to accept contracts to produce Giant Miscanthus. Although both risk perception variables had negative signs, only the yield risk variable that is statistically significant. We conclude that findings from this will go a long way to guide prospective biorefineries to identify producers preferred contracts.

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Table 1: Contract Attributes and Levels

Attribute	Levels
Price offered per ton of the harvested grass	\$50, \$60, \$70, \$80, \$90, \$100
Contract Length	5, 9, and 13 years
Rhizome / Establishment Cost - Share	0%, 25% and 50%
Yield Insurance Availability	Yes / No
Biorefinery Harvest	Yes / No

Table 2: Description of Attributes

Contract Attribute	**Description**
Price paid	Represents the price biorefinery would offer for every ton of Giant Miscanthus harvested at farm gate. Price per acre is reported in parentheses, assuming that the yield of Giant Miscanthus is on average 12 tons per acre.
Contract Length	Represents the time commitment in consecutive years of the contractual agreement.
Biorefinery Harvest	Option “**Yes**” indicates that the bio-refinery will harvest and transport the biomass at their expense. Option “**No**” means that under the contractual agreement, the farmer is responsible for harvest at his own cost, but the biorefinery is responsible for transporting to plant.
Yield Insurance	At the present time there is no insurance policies for biofuel production. However, as part of this research we want to study how important this option will be for future policy. Assuming that Miscanthus insurance is put in place similar to other major crops. “Yes” indicates **65% Coverage Federal Crop Insurance** is available against crop failure. “No” indicates **65%** Coverage **Federal Crop Insurance** is **not** available to the farmer to purchase.
Rhizome/Establishment Cost-Share	*Biomass Crop Assistance Program* (BCAP) provides financial assistance with **establishment**, including a one-time payment of up to 50% of the cost of establishment and annual payments of up to 5 years for Giant Miscanthus. It is administered by the U.S. Department of Agriculture's (USDA's) Farm Service Agency (FSA) and extended by the Farm Bill 2014.

Table 3: Summary Statistics

Variable	Description	Mean	Std. Dev.	Min.	Max.
Choice	(dependent variable) = 1 if alternative chosen, = 0 otherwise.	0.33	0.47	0	1
Price	Continuous	75.0	17.52	50	100
BH	= 1 if biorefiney harvest is available, = 0 otherwise	0.33	0.47	0	1
YIN	= 1 if yield insurance is available for purchase, = 0 otherwise	0.33	0.47	0	1
CLength5	= 1 if contract length is 5 years, = 0 otherwise	0.22	0.42	0	1
CLength9	= 1 if contract length is 9 years, = 0 otherwise	0.22	0.42	0	1
CLength13	= 1 if contract length is 13 years, = 0 otherwise	0.22	0.42	0	1
CostShare0	= 1 if no cost- share = 0 otherwise	0.54	0.50	0	1
CostShare25	= 1 if cost- share = 25%, = 0 otherwise	0.23	0.42	0	1
CostShare50	= 1 if cost- share = 50%, = 0 otherwise	0.22	0.42	0	1
RAVERS	= 1 if respondent is risk averse, = 0 otherwise	0.13	0.34	0	1
RNTRA	= 1 if respondent is risk neutral, = 0 otherwise	0.13	0.34	0	1
RTAKER	= 1 if respondent is risk taker, = 0 otherwise	0.74	0.44	0	1
YRISKM	Yield risk of Miscanthus relative to yield risk of alternative crop (= -1 if less than, = 0 if equal, and = 1 if greater than)	-0.09	0.88	-1	1
PRISKM	Price risk of Miscanthus relative to yield risk of alternative crop (= -1 if less than, = 0 if equal, and = 1 if greater than)	-0.13	0.74	-1	1

Table 4: Preliminary Results of the Conditional Logit Model

Dependent Variable : Choice	Coefficient	Standard Error
Constant	-3.834***	0.936
Price	0.036***	0.009
BH	1.421***	0.230
YIN	0.556**	0.274
CLength9	-0.585*	0.335
CLength13	-0.794**	0.358
Costshare25	0.192	0.329
CostShare50	0.444	0.352
RAVERS	-0.912	0.594
RNTRA	1.405**	0.702
YRISKM	-0.603*	0.340
PRISKM	-0.244	0.274
Log likelihood = -125.510		
Number of obs.= 138		

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.