Potential *Miscanthus* adoption in Illinois: Farmers’ information needs and preferred channels

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Anne Heinze Silvis
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‘Biomass Energy Crops for Power and Heat generation in IL’ is a multidisciplinary research effort lead by Dr. Steve Long, UIUC

- Agronomic trials
- Genetic improvement and engineering
- C sequestration
- Water resource implications and slurry clean-up

- Propagation and eradication methods
- Harvesting technology
- Liquid biofuel
- Economic analysis
- Social acceptability
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**MISCANTHUS AS ENERGY CROP**

![Miscanthus](image1.png) ![Switchgrass](image2.png)

Aug 31 2006   DOY 243  

Thanks to Matt Maughan!
Potential *Miscanthus* adoption in Illinois:
Farmers’ information needs and preferred channels

Field trials and Predictions for Champaign, IL weather conditions

Under optimal conditions it is possible to achieve up to 60 Mg ha\(^{-1}\) in central Illinois.

16 years of weather data

*Miguez et al. (in prep)*
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**MISCANTHUS AS ENERGY CROP**

- For information on miscanthus:
  
  [www.miscanthus.uiuc.edu](http://www.miscanthus.uiuc.edu)

- On the news, last Thursday (02/01/07):

  ‘*bp* announced a $500 million bioenergy research program to create the Energy Biosciences Institute, lead by the University of California at Berkeley, with the coparticipatory effort of the Lawrence Berkeley National Laboratory and the University of Illinois at Urbana-Champaign.’
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**INTRODUCTION**

- Miscanthus presents a radical change from current cropping systems
  - Perennial crop (sterile hybrid) - very low inputs / large amounts of biomass
  - Cropping period >20 yrs:
    - Implantation phase (2-5yrs)
      - Implantation/propagation by rhyzomes
      - Yearly increases in biomass and constant growth of roots and rhizomes
    - Phase of main use (>10yrs?)
      - Economic yields and annual harvesting possible
  - Significant initial investment \ Delayed economic returns
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**INTRODUCTION**

- Adoption decision process is not a direct result of economic costs and benefits
  - Characteristics of the innovation
  - Characteristics of the media of communication
  - Characteristics of the potential user
  - Neighbors’ opinions, business partners, landlords, lenders, and family context

(Rogers, 1995; Salamon et al. 1997; Carolan, 2005)
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**INTRODUCTION**

- ‘The innovation decision process is not passive; it is basically an information-seeking and information-processing activity in which the individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation’
  
  *(Rogers, 1995)*

- Availability of information to producers, level of education and experience of prospective adopters are better determinants of adoption than income.
  
  *(Fisher et al., 1996; Caviglia & Khan, 2001; Upadhyay et al., 2003)*
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**INTRODUCTION**

- Farmers’ perspectives and goals differ from those of researchers or government agencies, therefore the availability of information must target the producers’ needs and concerns regarding the innovation.
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**INTRODUCTION**

- The diffusion strategy must use efficient communication channels appropriate to each stage of the innovation-decision process to transmit the available information on miscanthus production.
  - High variability of preferences of information delivery among farmer audiences.

(Tucker & Napier, 2002; Patrick & Ullerich, 1996; Wilson et al., 2000)
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**OBJECTIVES**

- Identify the information Illinois growers' need as they consider an alternative crop such as miscanthus
- Identify characteristics of potential miscanthus adopters
- Outline best methods of providing information to potential growers
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MATERIALS & METHODS

- Surveys and focus groups targeted farming populations from Northern, Central, and Southern regions of the state to evidence regional differences.


- Factor analysis, multivariate ANOVA, and categorical data analysis in SAS 9.1 and SPSS 14.0.
Grower Perceptions about Miscanthus

The use of bio-energy crops such as the grass Miscanthus holds promise for growers in Illinois, but other factors will help determine the commercial success of such crops. Factors such as market development, economic returns, and growers' perceptions of the crop's contributions to water and soil quality are important considerations. To help us better understand your perceptions of energy crops and the value you place on growing such crops, please take ten minutes to complete and return this survey.

Thank you for your input!

1. If you were thinking about growing Miscanthus in the next season or the near future, how important would be the following characteristics in your decision?

<table>
<thead>
<tr>
<th>Very Important</th>
<th>Somewhat Important</th>
<th>Not at all Important</th>
<th>I'm not sure</th>
</tr>
</thead>
</table>
   a. The opportunity to reduce inputs of fertilizer, pesticides and fuel in producing a crop. | ☐ | ☐ | ☐ | ☐ |
   b. The opportunity to reduce labor to produce a crop. | ☐ | ☐ | ☐ | ☐ |
   c. Reducing wear and tear on equipment. | ☐ | ☐ | ☐ | ☐ |
   d. Market potential for the crop. | ☐ | ☐ | ☐ | ☐ |
   e. Delayed economic returns (Investments in year one, break even likely in year three). | ☐ | ☐ | ☐ | ☐ |
   f. Improved national energy security. | ☐ | ☐ | ☐ | ☐ |
   g. Reducing carbon dioxide emissions. | ☐ | ☐ | ☐ | ☐ |
   h. Reducing nitrogen runoff. | ☐ | ☐ | ☐ | ☐ |
   i. Improving soil quality, including building organic matter. | ☐ | ☐ | ☐ | ☐ |
   j. Producing a crop that is visually attractive during its growing season. | ☐ | ☐ | ☐ | ☐ |
   k. Producing a saleable crop on CRP land. | ☐ | ☐ | ☐ | ☐ |
   l. Need for specialized equipment. | ☐ | ☐ | ☐ | ☐ |

2. If you were to begin production of Miscanthus next season, how important is it for you to understand the following:

   Information about this topic is:

<table>
<thead>
<tr>
<th>Very Important</th>
<th>Somewhat Important</th>
<th>Not at all Important</th>
<th>I'm not sure</th>
</tr>
</thead>
</table>
   a. Market Prices | ☐ | ☐ | ☐ | ☐ |
   b. Production practices | ☐ | ☐ | ☐ | ☐ |
   c. Soil fertility requirements | ☐ | ☐ | ☐ | ☐ |
   d. Market demand data | ☐ | ☐ | ☐ | ☐ |
   e. Information about harvesting and storage | ☐ | ☐ | ☐ | ☐ |
   f. Equipment needs | ☐ | ☐ | ☐ | ☐ |
   g. Effects on water quality | ☐ | ☐ | ☐ | ☐ |
   h. Information about potential pests and diseases | ☐ | ☐ | ☐ | ☐ |
   i. Government policy incentive programs | ☐ | ☐ | ☐ | ☐ |
   j. Other (describe) ____________________________ | ☐ | ☐ | ☐ | ☐ |

3. How important are the following considerations in making the decision to grow Miscanthus, starting next year?

<table>
<thead>
<tr>
<th>Very Important</th>
<th>Somewhat Important</th>
<th>Not at all Important</th>
<th>I'm not sure</th>
</tr>
</thead>
</table>
   a. Existing markets | ☐ | ☐ | ☐ | ☐ |
   b. Availability of Miscanthus material to plant (mismones) | ☐ | ☐ | ☐ | ☐ |
   c. Experience growing Miscanthus in Illinois or this region | ☐ | ☐ | ☐ | ☐ |
   d. Equipment to grow or harvest it | ☐ | ☐ | ☐ | ☐ |
   e. Changing my operation's current rotation | ☐ | ☐ | ☐ | ☐ |
   f. Unfamiliar with growing a perennial crop | ☐ | ☐ | ☐ | ☐ |
   g. Concern about Miscanthus becoming a weed | ☐ | ☐ | ☐ | ☐ |
   h. Long-term contract to grow Miscanthus | ☐ | ☐ | ☐ | ☐ |
   i. Existence of crop insurance | ☐ | ☐ | ☐ | ☐ |
   j. Other (describe) ____________________________ | ☐ | ☐ | ☐ | ☐ |
Potential adopters

1. Are willing to allocate some acreage to miscanthus within the next five production years
2. Are able to leave the crop in the field for at least 10 years, and
3. Are able to afford delayed economic returns.

Carbon credits awareness

4. If you were to begin production, how many acres would you allocate to Miscanthus? 
   _______ acres next growing season. _______ acres within the next five years or so.
5. Assuming that markets exist for Miscanthus or other energy crops, would you consider growing such energy crops as a supplement to your current income and farming operation, or as a replacement on most of your acreage?
   As a supplement to my current income..............□ 1
   As a replacement of most of my acreage...........□ 2
   As a partial replacement of my current acreage....□ 3
   I'm not sure........................................... □ 4
6. You could leave this crop in place for ten years. Would you be able to do that?
   Yes, I could do that □ 7
   Probably □ 8
   I would not be able to do that □ 1
   I'm not sure □ 8
7. Most producers would break even in the third year of production, using costs and revenues as presented in the table below. Would that be an adequate payback timetable for your operation?
   □ Yes □ No

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated total costs ($/acre)</th>
<th>Gross Revenue ($/acre)</th>
<th>Net Profit ($/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>371</td>
<td>0</td>
<td>-371</td>
</tr>
<tr>
<td>2</td>
<td>266</td>
<td>280</td>
<td>12</td>
</tr>
<tr>
<td>3-10</td>
<td>246</td>
<td>528</td>
<td>282</td>
</tr>
<tr>
<td>10 years total</td>
<td>1873</td>
<td>2925</td>
<td>1052</td>
</tr>
</tbody>
</table>

From Heaton et al. 2003. Gross revenue assumes a conservative price of $40/ton. Sales prices could be substantially higher.

8. If so, what percentage of your total production acres would you devote to Miscanthus each year?
   2006 growing season _______ %
   2007 growing season _______ %
   2008 growing season _______ %
   2009 growing season _______ %
   2010 growing season _______ %

9. Do you expect to receive either state or federal “carbon credits” (a “green payment” related to offsetting greenhouse gas emissions) for carbon sequestration of Miscanthus?
   □ Yes □ No □ I have no idea.
10. During the growing season, a field of Miscanthus will look quite different from orderly rows of corn or soybeans. How important is it for your crops to be planted in orderly rows?

- Very Important
- Somewhat Important
- Not at all Important
- I'm not sure

11. How important is it to your neighbors that your crops be planted in orderly rows?

- Very Important
- Somewhat Important
- Not at all Important
- I'm not sure

Please provide some background information about you and your farming operation.

12. Your age: ______________

13. Gender: [ ] Male [ ] Female

14. Years you have been farming full time: _______ part time: ________________

15. I (we) farm _______ acres.

16. I (we) own _______ % of the acres we farm.

17. Are you farming in partnership with someone? [ ] Yes [ ] No

- If yes, (Check as many as apply.)
  - [ ] Spouse
  - [ ] Son or daughter, son-in-law or daughter-in-law
  - [ ] Other relative
  - [ ] Other non-relative

18. What are your major crops? (Check as many as apply.)

- [ ] Corn
- [ ] Soybeans
- [ ] Forage crops
- [ ] Fruits
- [ ] Vegetables
- [ ] Oats
- [ ] Barley
- [ ] Wheat
- [ ] Other __________________________

- [ ] Any livestock? (List) __________________________

Please share any additional thoughts in the space provided below.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Thank you for sharing your viewpoints and perceptions.
For more information about the results of this survey, contact Ane Henze Silva at ahilvis@uic.edu or 217.333.5126.
We will compile and share information from many questionnaires, but will not link your name to any of the information.

This research is funded by the State of Illinois through the Illinois Council on Food and Agricultural Research (C-FAR).
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**RESULTS**

<table>
<thead>
<tr>
<th>Region</th>
<th>#Sent</th>
<th>#Returned</th>
<th>Refusals</th>
<th>Refusal Rate (%)</th>
<th>#Used</th>
<th>Response Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>480</td>
<td>73</td>
<td>13</td>
<td>3</td>
<td>60</td>
<td>13</td>
</tr>
<tr>
<td>Central</td>
<td>500</td>
<td>186</td>
<td>32</td>
<td>6</td>
<td>154</td>
<td>31</td>
</tr>
<tr>
<td>South</td>
<td>500</td>
<td>120</td>
<td>21</td>
<td>5</td>
<td>99</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>1480</td>
<td>379</td>
<td>66</td>
<td>4</td>
<td>313</td>
<td>21</td>
</tr>
</tbody>
</table>
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**RESULTS**

- **Regional Demographics**
  - Age of farm operator: 55.6 years (ns)
  - Years farming
    - Total: ~33 years (ns)
    - full-time: North & Central (28-29) > South (17)
    - part-time: North & Central (5) < South (8)
  - Acres
    - farmed: ~900 acres on average (ns)
    - owned: ~350 (ns)
    - % owned: North & South (50-60%) > Central (40%)
  - More diversification and partnership in North & South
  - Importance of neighbors' opinions and orderly rows: ns (74% and 69% not important)
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**RESULTS**

- **Information needs and Regional Differences:**
  - Agronomy & Markets
    - Particularly important for Northern and Central Illinois farmers
  - Environmental Services
    - Central Illinois significantly more interested than Northern Illinois
- **Concerns & Potential Problems:**
  - Should be addressed throughout the State.
  - Concern about miscanthus becoming a weed, experience growing miscanthus in Illinois or the Midwest region, changing operation's current rotation, unfamiliar with growing a perennial crop, existence of long-term contract to grow miscanthus and crop insurance.
- **Inputs Reduction**
  - Central and Southern Illinois significantly more emphasis than Northern farmers

Effects on water quality and soil quality (including soil organic matter), improve national energy security, reducing carbon dioxide (CO$_2$) emissions and nitrogen (N) runoff, producing a visually attractive crop.

Concern about miscanthus becoming a weed, experience growing miscanthus in Illinois or the Midwest region, changing operation's current rotation, unfamiliar with growing a perennial crop, existence of long-term contract to grow miscanthus and crop insurance.

The opportunity to reduce inputs of fertilizer, pesticides and fuel in producing a crop, and to reduce labor and wear and tear on equipment.

Information about harvesting and storage, existing markets, market demand data, market prices, specific production practices, equipment needs to grow and harvest, soil fertility requirements, availability of material to plant (rhizomes), and information about potential pests and diseases.
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**RESULTS**

**Potential Adopters**

- About 30% of the respondents were identified as potential adopters with the highest proportion in the Northern region.
- Will use miscanthus or other energy crop to supplement current income or as a partial replacement of their current acreage.
- Will allocate 30 acres for the first season, and 120 acres during the first five years.

1. Are willing to allocate some acreage to miscanthus within the next five production years
2. Are able to leave the crop in the field for at least 10 years, and
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**Possible acreage allocation for miscanthus**
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**RESULTS**

- **Potential Adopters vs Non-adopters**
  - Non-adopters are less aware of the possibility of receiving carbon credits
  - Regarding information needs, non-adopters emphasize Concerns & Potential Problems of introducing miscanthus in their operations
  - No demographic differences
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### RESULTS

#### Information Channels

<table>
<thead>
<tr>
<th>Rank</th>
<th>North</th>
<th>Central</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Farm/Ag organizations</td>
<td>Farm/Ag organizations</td>
<td>Farm/Ag organizations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ag newsletters</td>
<td>Other farmers and neighbors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other farmers and neighbors</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ag newsletters</td>
<td>Internet</td>
<td>Ag newsletters</td>
</tr>
<tr>
<td></td>
<td>Other farmers and neighbors</td>
<td>Newspapers</td>
<td>Internet</td>
</tr>
<tr>
<td></td>
<td>Internet</td>
<td></td>
<td>Newspapers</td>
</tr>
<tr>
<td>3</td>
<td>Newspapers</td>
<td>Radio</td>
<td>Trade shows</td>
</tr>
<tr>
<td></td>
<td>Trade shows</td>
<td></td>
<td>Community meetings</td>
</tr>
<tr>
<td></td>
<td>TV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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**Acknowledgements:**

- Illinois Council on Food and Agricultural Research (C-FAR)
- Project partners

**Thank you,**

*Questions?*