

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



María B. Villamil
Anne Heinze Silvis
Germán A. Bollero

'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



Aug 31 2006 DOY 243

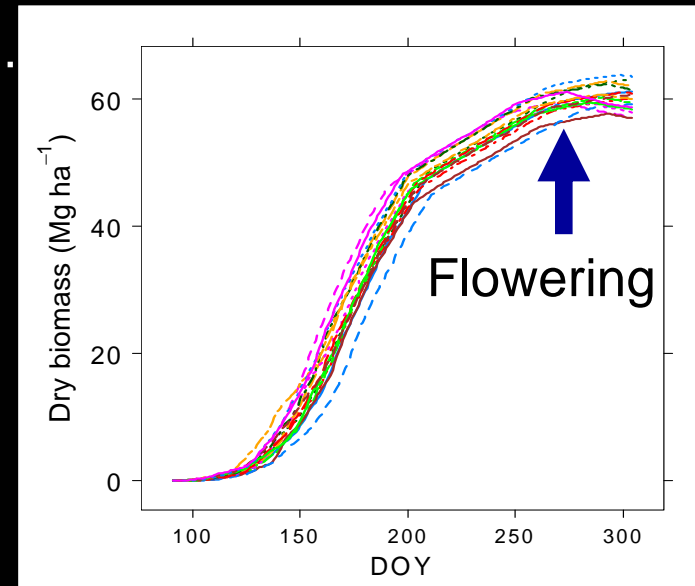
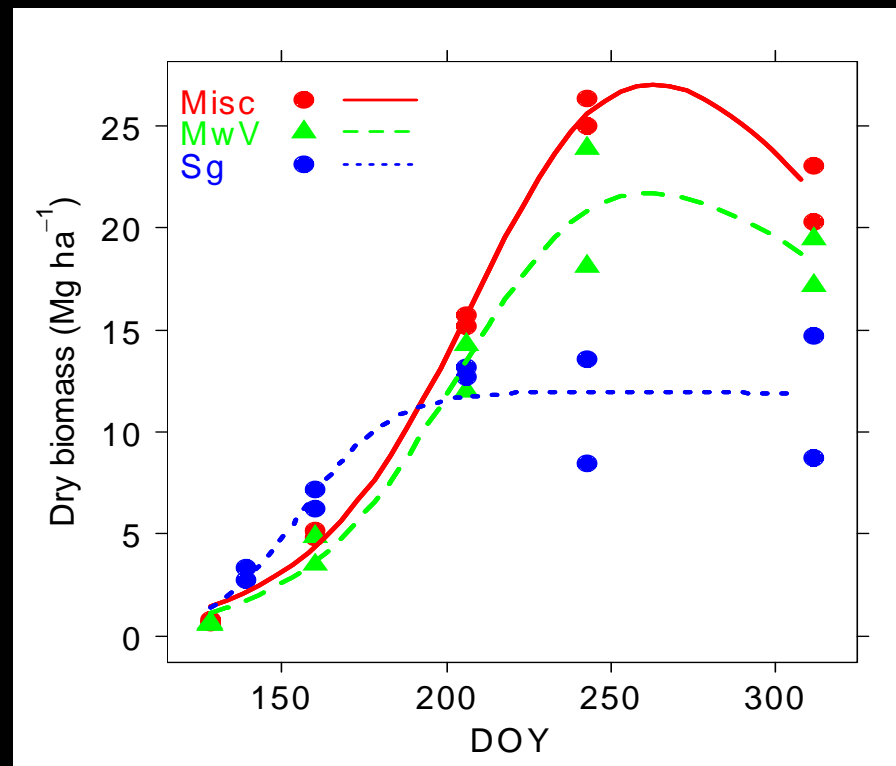
Thanks to Matt Maughan!

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Field trials and Predictions for Champaign, IL weather conditions

2nd yr of growth

3rd yr on...



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

- 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 rhizomes
 - 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.
- Northwest Illinois Ag Coalition (NIAC), Illinois Field Office of the National Agricultural Statistics Service, University of Illinois Extension, and Illinois Farm Bureau.
- 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?

	Very Important	Somewhat Important	Not at all Important	I'm not sure		
a. The opportunity to reduce inputs of fertilizer, pesticides and fuel in producing a crop.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
b. The opportunity to reduce labor to produce a crop.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
c. Reducing wear and tear on equipment.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
d. Market potential for the crop.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
e. Delayed economic returns (investments in year one, break even likely in year three).	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
f. Improved national energy security.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
g. Reducing carbon dioxide emissions.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
h. Reducing nitrogen runoff.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
i. Improving soil quality, including building organic matter.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
j. Producing a crop that is visually attractive during its growing season.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
k. Producing a saleable crop on CRP land.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
l. Need for specialized equipment	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀

I N F O R M A T I O N N E E D S

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:			I'm not sure
	Very Important	Somewhat Important	Not at all Important	
a. Market Prices	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
b. Production practices	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
c. Soil fertility requirements	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
d. Market demand data	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
e. Information about harvesting and storage	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
f. Equipment needs	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
g. Effects on water quality	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
h. Information about potential pests and diseases	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
i. Government policy incentive programs	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
j. Other (describe) _____	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀

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

	Very Important	Somewhat Important	Not at all Important	I'm not sure
	a. Existing markets	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
b. Availability of <i>Miscanthus</i> material to plant (rhizomes)	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
c. Experience growing <i>Miscanthus</i> in Illinois or this region	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
d. Equipment to grow or harvest it	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
e. Changing my operation's current rotation	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
f. Unfamiliar with growing a perennial crop	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
g. Concern about <i>Miscanthus</i> becoming a weed	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
h. Long-term contract to grow <i>Miscanthus</i>	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
i. Existence of crop insurance	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
j. Other (describe) _____	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀

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 6 5 4 3 2 1 8
- No, I would not be able to do that 8
 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?
- 1 Yes 0 No

Year	Estimated total costs (\$/acre)	Gross Revenue (\$/acre)	Net Profit (\$/acre)
1	371	0	-371
2	268	280	12
3-10	246	528	282
10 years total	1873	2925	1052

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?
- 1 Yes 0 No 8 I have no idea.

Social constraints

Demographics

Comments

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

₇ ₆ ₅ ₄ ₃ ₂ ₁ ₈

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

₇ ₆ ₅ ₄ ₃ ₂ ₁ ₈

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

12. Your age: _____
13. Gender: ₁ Male ₂ 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? ₁ Yes ₀ No
↳ If yes, (Check as many as apply.)
₁ spouse ₁ son or daughter, son-in-law or daughter-in-law
₁ Other relative ₁ Other non-relative
18. What are your major crops? (Check as many as apply.)
₁ corn ₁ soybeans ₁ forage crops ₁ fruits ₁ vegetables ₁ oats
₁ barley ₁ wheat ₁ other _____
₁ 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 Anne Heinze Silvis at asilvis@uiuc.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

Region	Surveys					
	#Sent	#Returned	Refusals	Refusal Rate (%)	#Used	Response Rate (%)
North	480	73	13	3	60	13
Central	500	186	32	6	154	31
South	500	120	21	5	99	20
Total	1480	379	66	4	313	21

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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)

North	Central	South
>65	55-64	<54

Potential *Miscanthus* adoption in Illinois: Farmers' information needs and preferences

RESULTS

■ Information needs and preferences

■ Agronomy & Markets

- Particularly important for farmers

■ Environmental Services

- Central Illinois significantly more interested than northern Illinois

■ Concerns & Potential Problems

- Should be addressed

■ Inputs Reduction

- Central and Southern Illinois significantly more emphasis than Northern farmers

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.

Effects on water quality and soil quality (including soil organic matter), improve national energy security, reducing carbon dioxide (CO₂) 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

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

ing a perennial crop, t to grow miscanthus

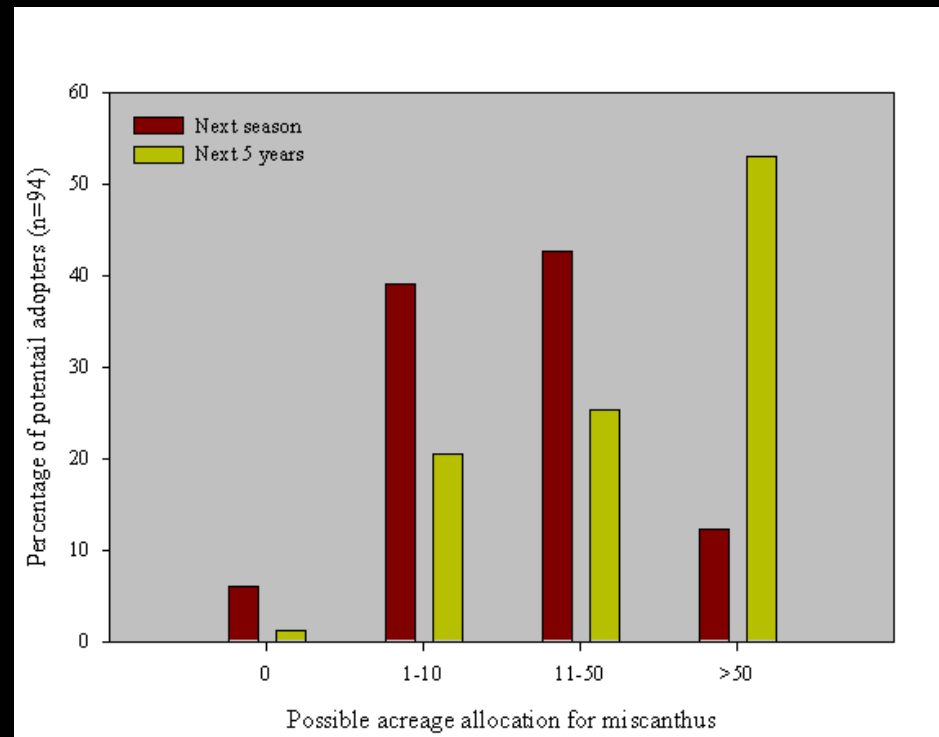
Potential *Miscanthus* adoption
Farmers' information needs a

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
3. Are able to afford delayed economic returns.



Potential *Miscanthus* adoption in Illinois:
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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

Potential *Miscanthus* adoption in Illinois:
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RESULTS

■ Information Channels

Rank	North	Central	South
1	Farm/Ag organizations	Farm/Ag organizations Ag newsletters Other farmers and neighbors	Farm/Ag organizations Other farmers and neighbors
2	Ag newsletters Other farmers and neighbors Internet	Internet Newspapers	Ag newsletters Internet Newspapers
3	Newspapers Trade shows TV	Radio	Trade shows Community meetings

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■ Acknowledgements:

- Illinois Council on Food and Agricultural Research (C-FAR)
- Northwest Illinois Ag Coalition (NIAC), Illinois Field Office of the National Agricultural Statistics Service, University of Illinois Extension, and Illinois Farm Bureau.
- Project partners

■ Thank you,

Questions?