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Illinois Department of Agriculture

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ILLINOIS INSTITUTE FOR RURAL AFFAIRS

FARMER DISPARITY STUDY

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The Examination of Economic and Other Disparities Associated with Farm Ownership and Farm Operations in Illinois

A STUDY CONDUCTED BY:

Illinois Department of Agriculture

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Farmer Disparity Study

The Examination of Economic and Other Disparities Associated with Farm Ownership and Farm Operations in Illinois.

What is the Farmer Disparity Study?

The farmer disparity study is a process to explore data about various aspects of farming to assess what, if any, differences exist among farmers by characteristics like race or ethnic group, age, and ability.

What does "disparity" mean?

The word "disparity" refers to differences between groups. Groups could be defined by race, ethnicity, gender, disability status, age, sexual orientation, veteran status, or other characteristics.

How did the Farmer Disparity Study come about?

The farmer disparity study was commissioned through Senate Bill 1792, passed by the Illinois General Assembly in January 2021, to conduct a study to determine economic and other disparities associated with farm ownership and farm operations in the State of Illinois.

How was the study carried out?

The Department of Agriculture facilitated logistics and brought together researchers from the University of Illinois and Illinois Extension, Illinois State University, Western Illinois University, and Southern Illinois University. The researchers were tasked with compiling statistical data from existing sources such as USDA NASS and collecting primary data via surveys and focus groups to ensure a thorough investigation. The study focused on data relating to disparities or differences in farm operations for the following areas:

1. Farm ownership and the size of acreage of the farmland owned compared to the number of farmers who are farm tenants.
2. The distribution of farm-related generated income and wealth.
3. The accessibility and availability of grants, loans, commodity subsidies, and other financial assistance.
4. Access to technical assistance programs and mechanization.
5. Participation in continuing education, outreach, or other agriculturally related services or programs.
6. Interest in farming by young or beginning farmers.

In the United States, we have a deep belief that if people work hard, they will be successful. We also have a deep belief that everyone should have access to the same opportunities. The study aims to assist in determining whether this belief in equal access to opportunities for success is a reality in agriculture, and if not, to identify where and how disparities exist.

Conducting research across the population of Illinois farmers allows us to see whether there are patterns of difference in the six areas being investigated. Such patterns of difference, if found, may indicate areas where policy, funding, or programs could assist in alleviating difficulties due to differences in opportunities for success.

The charge for the research team is as follows:

The Department shall conduct a study and use the data collected to determine economic and other disparities associated with farm ownership and farm operations in this State. The study shall focus primarily on identifying and comparing economic, land ownership, education, and other related differences between African American farmers and white farmers, but may include data collected in regards to farmers from other socially disadvantaged groups. The study shall collect, compare, and analyze data relating to disparities or differences in farm operations for the following areas:

1. *Farm ownership and the size of acreage of the farmland owned compared to the number of farmers who are farm tenants.*
2. *The distribution of farm-related generated income and wealth.*
3. *The accessibility and availability to grants, loans, commodity subsidies, and other financial assistance.*
4. *Access to technical assistance programs and mechanization.*
5. *Participation in continuing education, outreach, or other agriculturally related services or programs.*
6. *Interest in farming by young or beginning farmers.*

Timeline

The research project began on March 23, 2021, by Illinois Governor Pritzker, who signed into law SB 1792, which contains Section 25.

Farm Success Survey

TASKS

Literature Review

- Started on June 1, 2022
- Covering over 30 published documents on disparities across all genders, age groups, classifications, and social statuses that directly correlate to the farming community.
- This literature review was compiled from around the United States using targeted publications within the last ten years.

Survey Design

- Based on the literature review, an online questionnaire (using Qualtrics) was designed.
- The survey was reviewed by the research team members, an Illinois farmer, a farming organization representative, and the Senior Manager for Strategic Engagements and Initiatives from the Office of the Illinois Lt. Governor Juliana Stratton.

Institutional Review Board (IRB) Human Subjects Research Approval

- Started on August 9, 2022
- IRB reviews and serves a vital role in protecting the rights and welfare of our human research subjects.
- The IRB review aims to ensure appropriate steps are put in place to protect the rights and interests of humans participating as subjects in our research.
- Submitted recruitment scripts, questionnaire, consent form, and other forms to the UIUC IRB Office.
- Received IRB approval on September 8, 2022.
- The survey instrument was finalized on October 11, 2022.
- For more details, see Institutional Review Board (IRB) Approval Process.

Gathering a list of contacts

- The research team has compiled a list of contacts to help disseminate the survey with farmers in Illinois.

Data Collection

- We launched the online survey on October 19, 2022, by emailing the contact list and asking them to share the invitation to participate in the project with their farmer contacts. However, by the following day, October 20, 2022, we had over 4,000 responses to the survey and over 6,000 responses to the gift card/focus group survey. When checking the responses, it became clear that we were receiving BOT/fraudulent responses. We immediately paused the study.
- Over the following days, the research team added new questions to the survey to stop the bots. We relaunched the survey, and it kept getting bot responses. We paused the survey again.
- We reached out to our contacts, explained what happened, and asked them not to share the link to the survey.
- At this point, the team reestablished a mechanism to permit actual farmers who had been surveyed to verify their status as real farmers and receive the gift card/sign up for the focus groups. We contacted the IT at ISU and requested them to enable the BOT detection and fraud detection features on Qualtrics.
- On November 11, 2022, the survey (with a separate link) was launched, utilizing our contract with Informa/ Farm Progress Companies. Informa emailed the invitation to participate in the project to 10,063 farmers in Illinois in their email database.
- We reached out to the contact list and shared the link to a survey with a captcha question (added to avoid bot responses.)
- We contacted specialty crop farmers via email.

Data Analysis

- A sample size of 245 complete surveys is suitable for generalizing to a farming population in Illinois at a 95% confidence level with ±5% sampling error, assuming an 80/20 split1.
- We received 84 complete surveys as of December 12, 2022.
- Due to insufficient response rate (low total number of responses and low responses from underrepresented farmers), we will continue to reach out to agricultural community and ask for their assistance in sharing the survey with farmers in Illinois. Such outreach has occurred at the Good Food and Urban Agriculture Summit, Governor's Rural Affairs Commission and Ag Equity and Food Insecurity Council.
- We will continue data collection until the end of March 2023.
- The following is a descriptive summary of the preliminary data.

[1] "80/20 split means that answers are less variable; many people respond one way or have a certain characteristic, whereas a few do not." https://nature.forestry.oregonstate.edu/sites/default/files/2008-3%20Needham%20&%20Vaske%20-%20Chapter%2008%20-%20Survey%20Implementation,%20Sampling%20&%20Weighting%20-%20Second%20Proofs.pdf

PRELIMINARY RESULTS

The average age of the respondents was 57 with 31 years of farming experience. Nearly two thirds of their household comes from farming (63%).

Descriptive Statistics	N	Minimum	Maximum	Sum	Mean	Std. Deviation
What year were you born?	81	1932	2000		1965	16
How long have you been farming? (in years)	84	1	70		31	18
How many people are currently in your household?	84	1	7		3	1
What percentage of your household income comes from farming?	81	0	100		63	32
How many generations has your family been farming?	84	0	10		4	2
Number of family members including you	81	0	6		2	1
Permanent employees	62	0	400	967	16	58
Temporary or seasonal employees.	66	0	100	518	8	19
Foreign migrant employees (H2A)	50	0	50	192	4	10
Own acres farmed	84	0	100		49	38
Rent/lease from others	84	0	100		36	37
Rent/lease to others	84	0	100		5	21
Corn	84	0	3,500	41,772	497	731
Hay	84	0	400	1,413	17	56
Hemp	84	0	15	47	1	2
Fruits	84	0	20	97	1	4
Oats	84	0	150	243	3	17
Soybeans	84	0	3,750	33,635	400	625
Vegetables	84	0	30	135	2	5
Wheat	84	0	900	2,180	26	117
Other crop	84	0	250	957	11	43
Beef cows	21	0	200	1,031	49	63
Milk cows	11	0	540	782	71	158
Other cattle and calves	15	0	360	1,021	68	100
Bees	9	0	16	28	3	6
Broilers	9	0	10,000	16,780	1,864	3,240
Other poultry	11	0	20,000	39,211	3,565	7,882
Turkey	11	0	1,000	2,314	210	393
Hogs	8	0	8,000	8,193	1,024	2,819
Goats	7	0	200	258	37	73
Sheep	9	0	250	456	51	81
Other livestock	1	3	3	3	3	

Table 1: Descriptive Demographics

DEMOGRAPHICS OF RESPONDENTS

90% of respondents to the survey are the primary decision-makers.

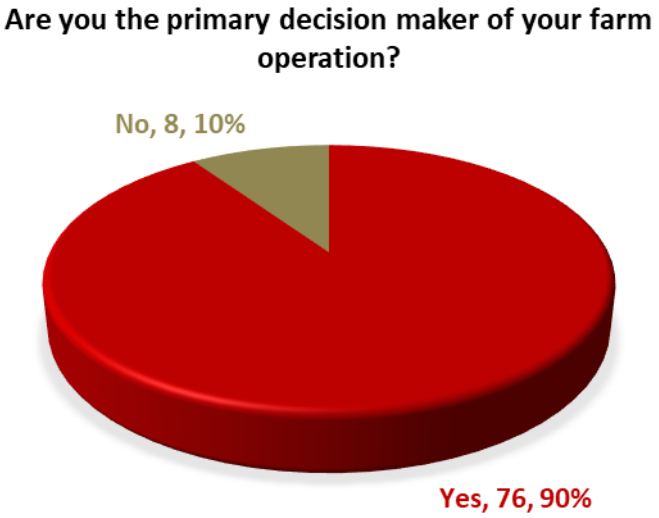

FIGURE 1: ARE YOU THE PRIMARY DECISION MAKER OF YOUR FARM OPERATION?

87% of the respondents to the survey are male.

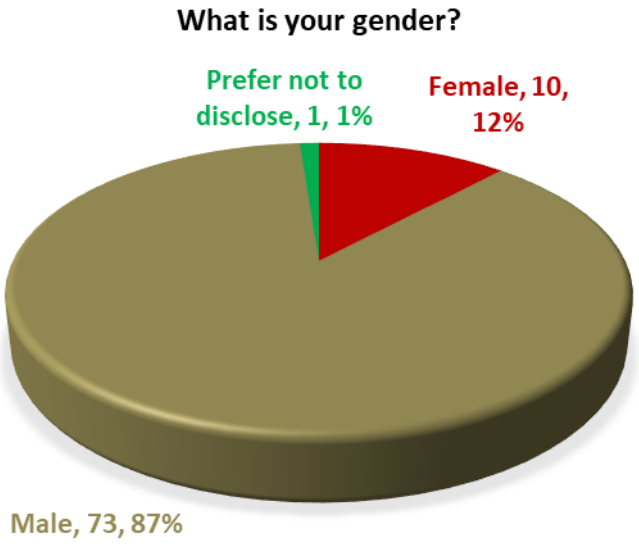

FIGURE 2: WHAT IS YOUR GENDER?

89% of the respondents to the survey describe themselves as white.

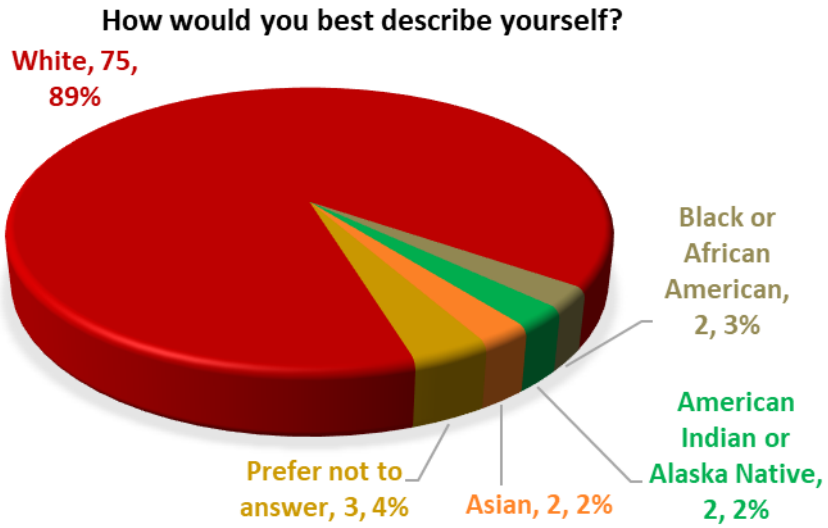

Figure 3: How would you best describe yourself?

93% of the respondents to the survey do not identify as Hispanic or Latino.

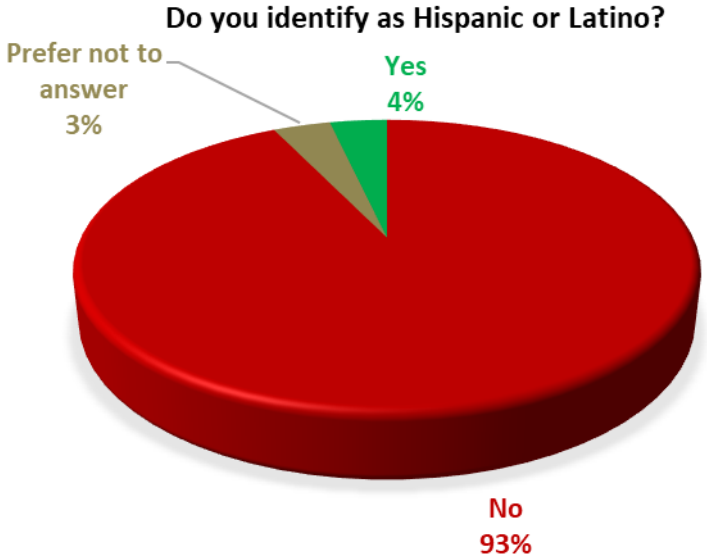

Figure 4: Do you indentify as Hispanic or Latino?

34% of the respondents have completed a four-year degree and 20% have a graduate degree.

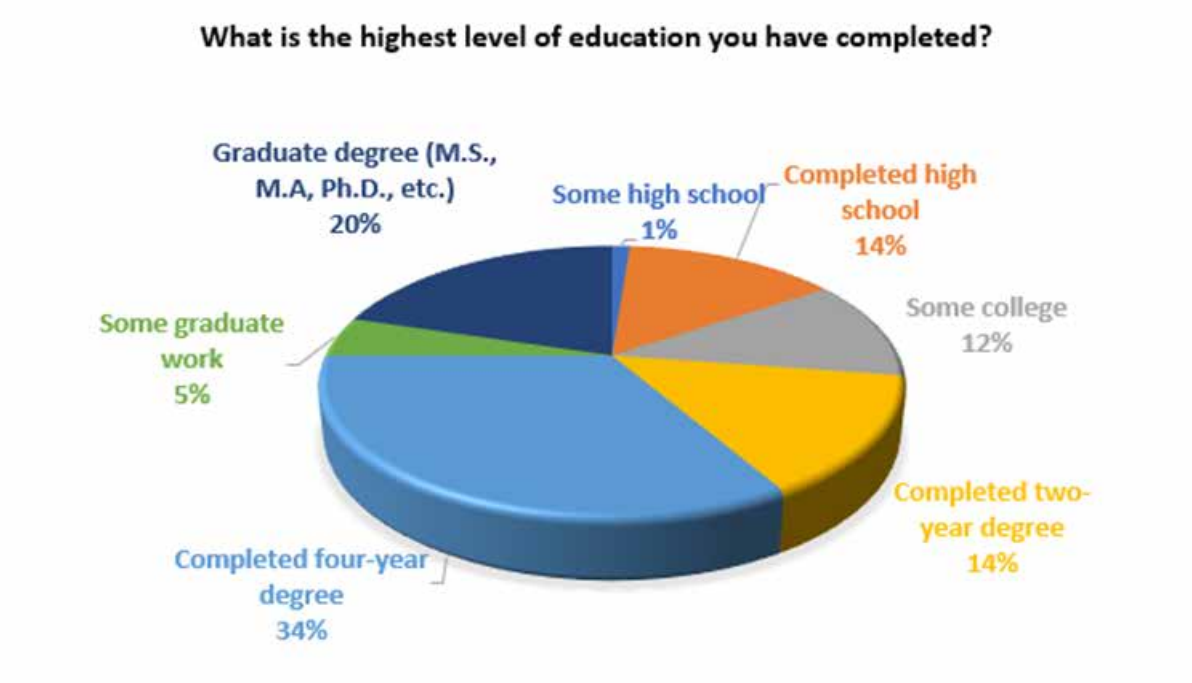

Figure 5: What is the highest level of education you have completed?

73% of the survey respondents currently live on a farm.

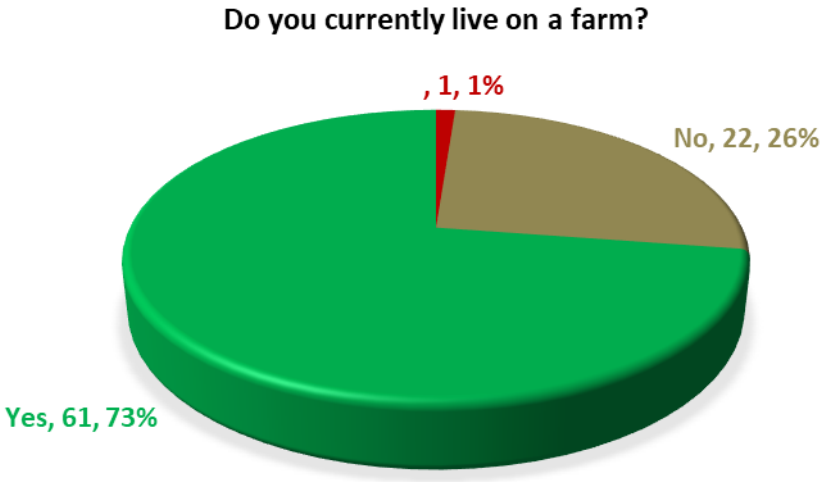

Figure 6: Do you currently live on a farm?

21% of respondents to the survey work full-time outside the farm.

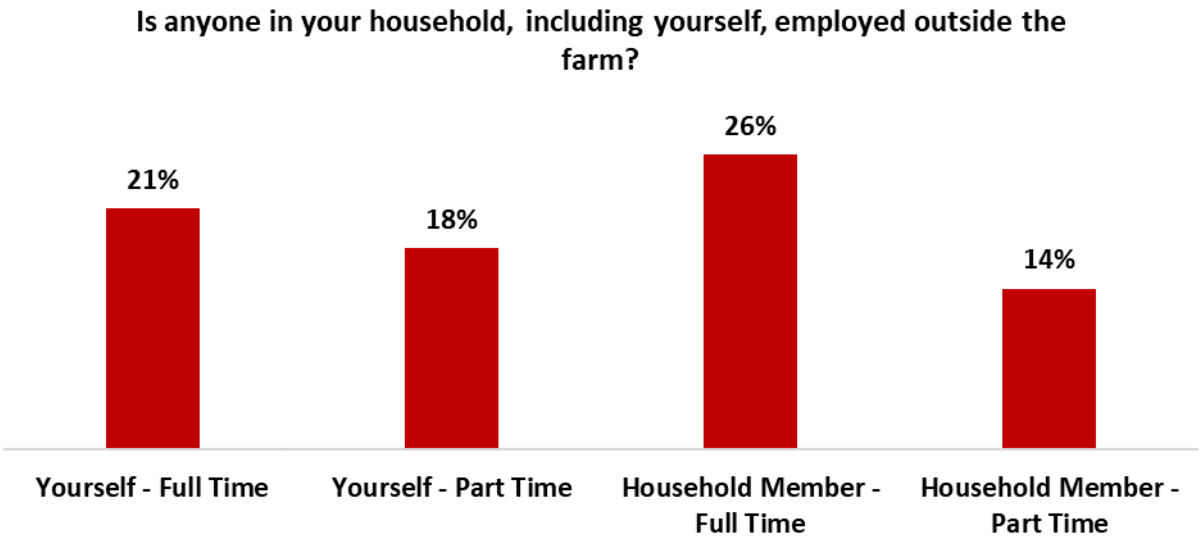

Figure 7: Is anyone in your household, including yourself, employed outside the farm?

73% of the survey respondents grow specialty crops.

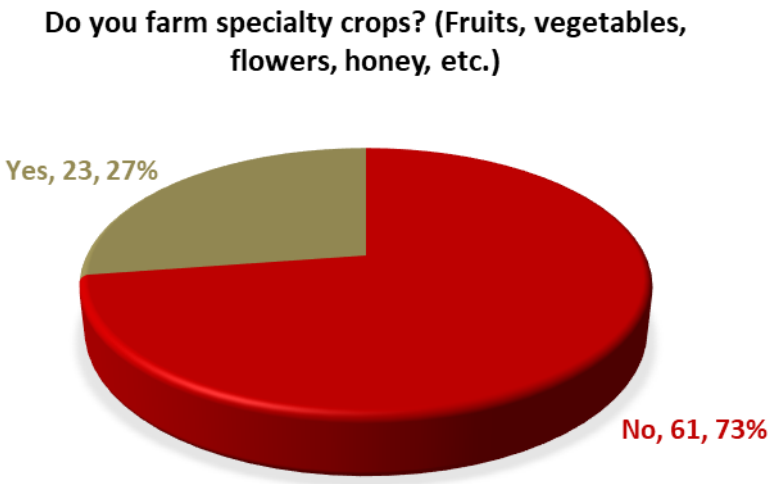

Figure 8: Do you farm specialty crops? (Fruits, vegetables, flowers, honey, etc.)

Fruits (74%) and vegetables (65%) are the top two specialty crops the respondents grow.

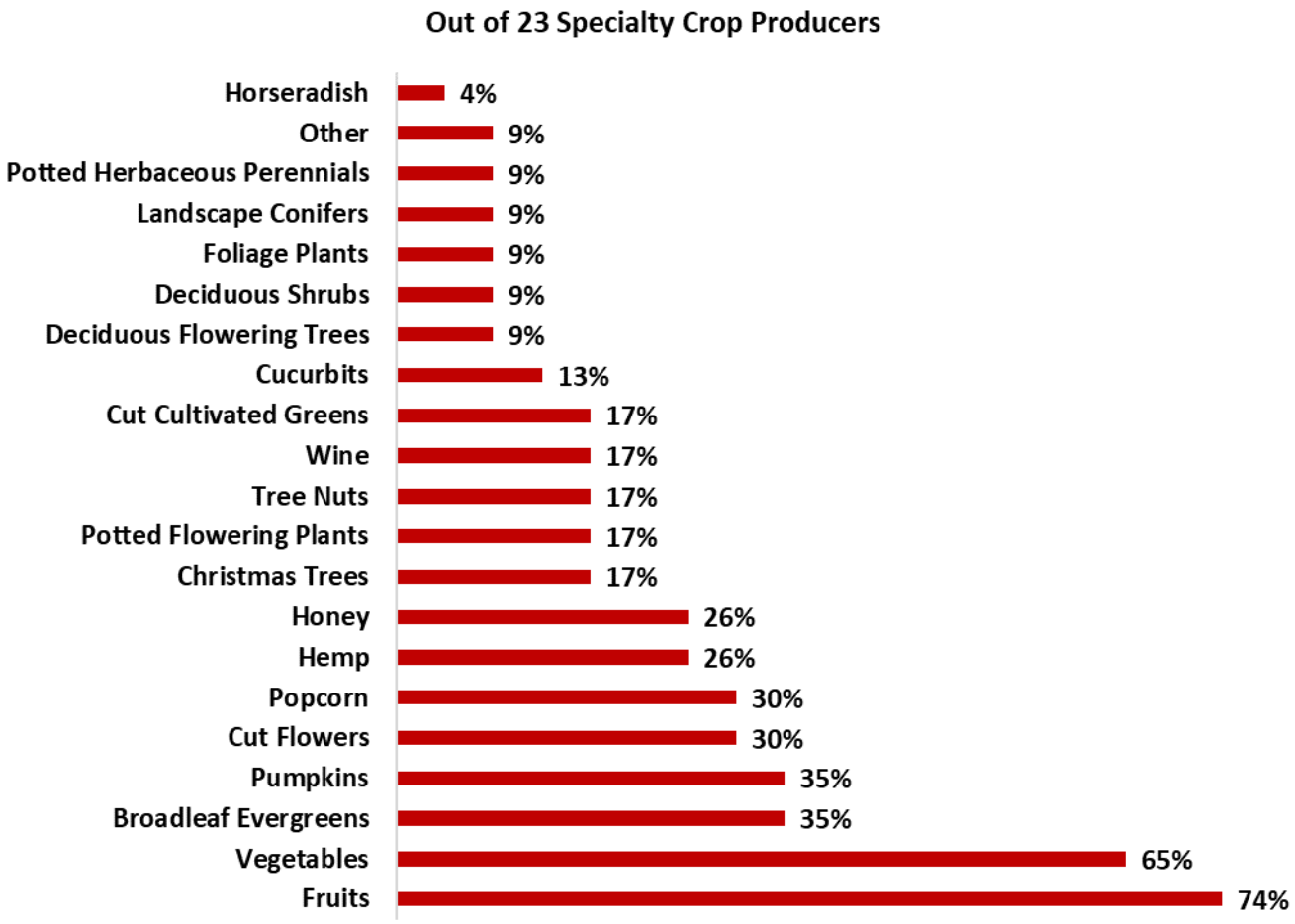

Figure 9: Types of specialty crops produced

45% of the respondents surveyed do not plan on expanding their farming.

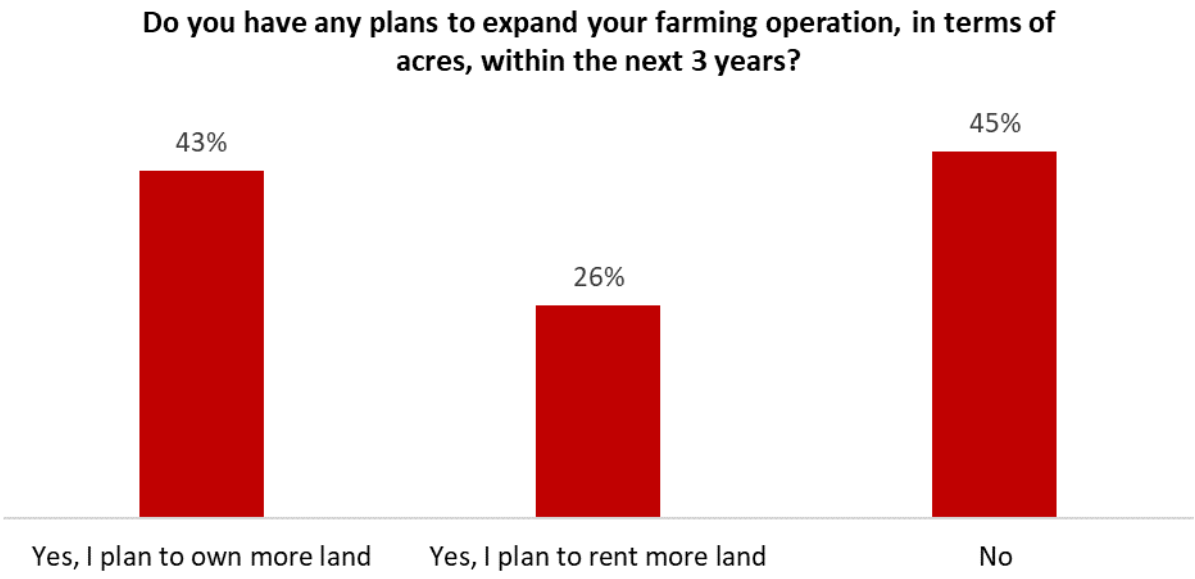

Figure 10: Do you have any plans to expand your farming operation, in terms of acres, within the next 3 years?

47% of respondents without farm expansion plans do not plan to expand their farming operations due to land costs.

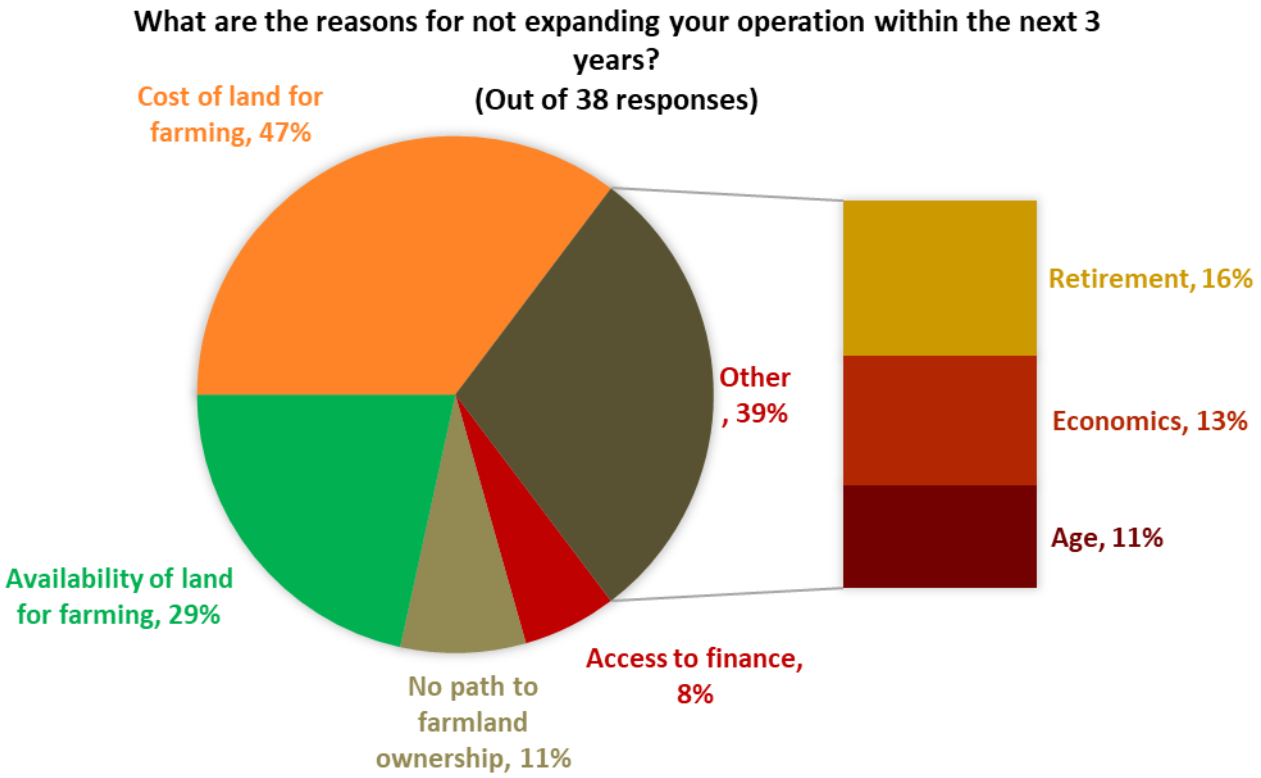

Figure 11: What are the reasons for not expanding your operation within the next 3 years?

FARM OPERATION

33% of respondents on the survey have gross cash income from $150,000 to $349,00.

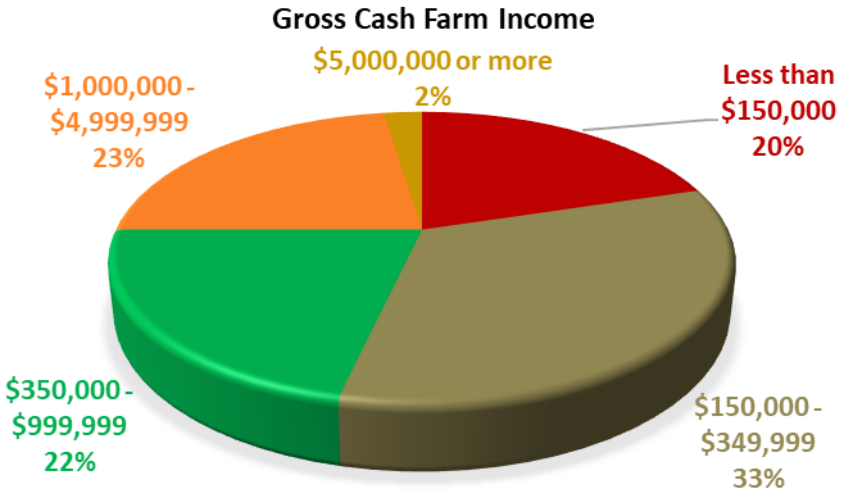

Figure 12: Gross Cash Farm Income

59% of the respondents have a sole or general proprietorship for the management structure of their farm.

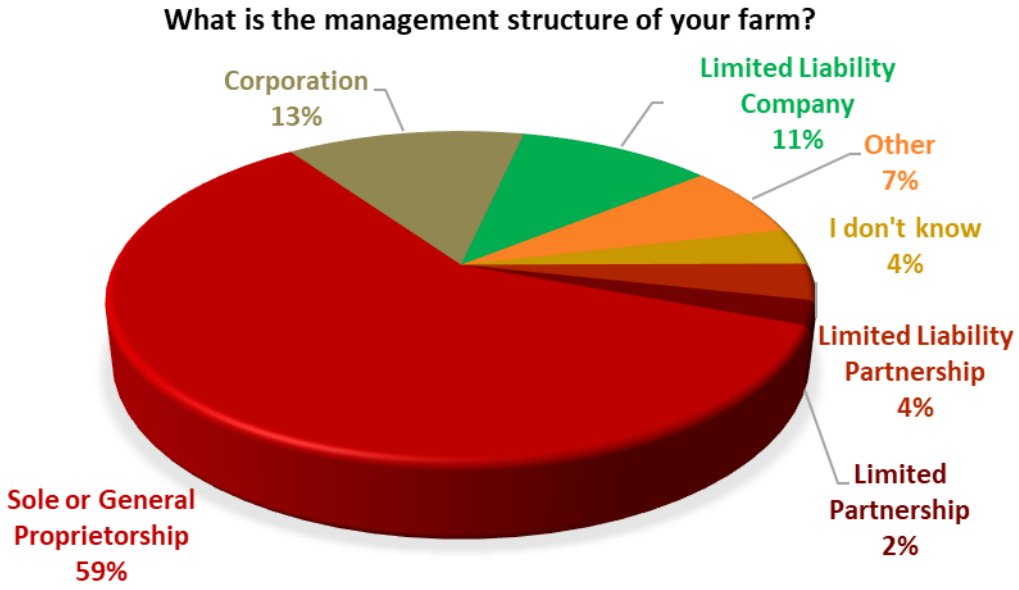

Figure 13: What is the management structure of your farm?

26% of respondents are employed full-time outside of the farm.

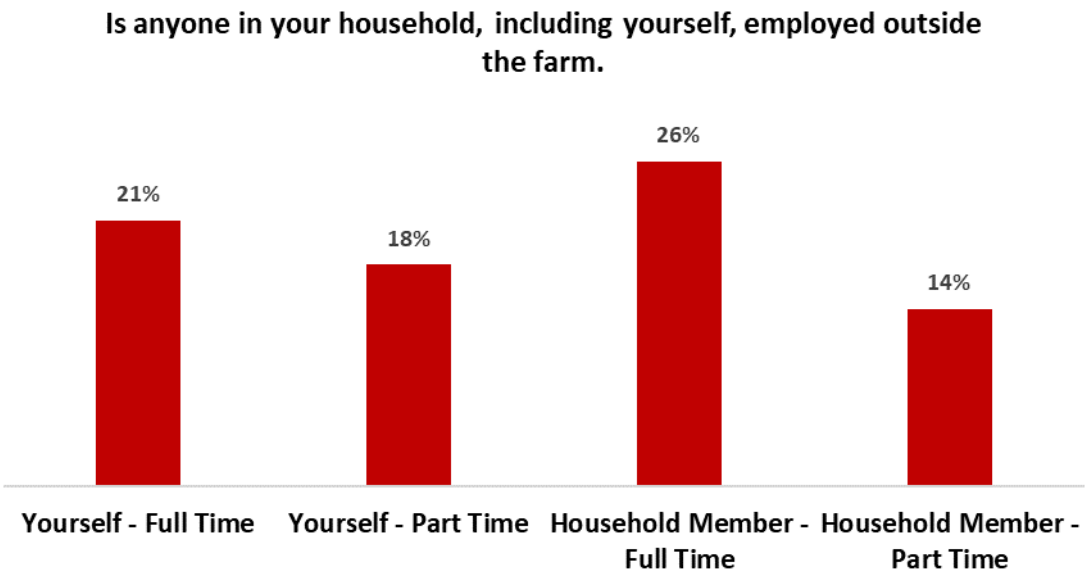

Figure 14: Is anyone in your household, including yourself, employed outside the farm?

32% of respondents have livestock on their farms.

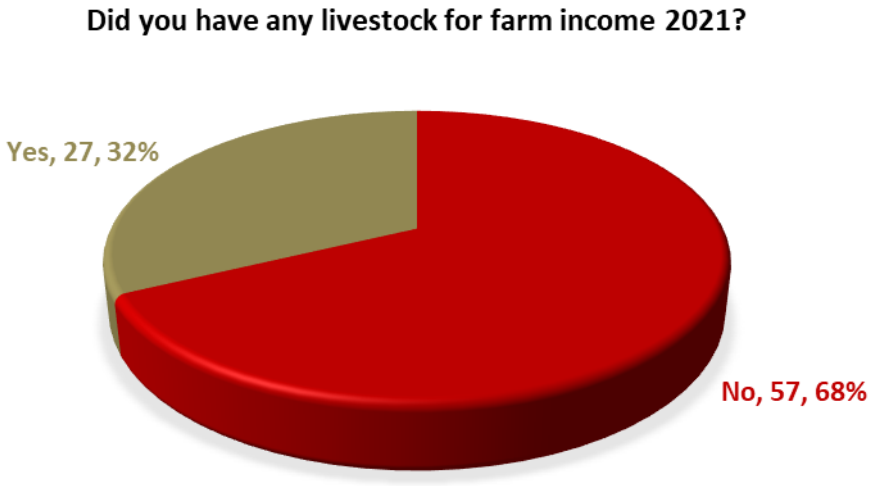

Figure 15: Did you have any livestock for farm income 2021?

60 % of the 84 respondents sell their products to a grain handling facility.

Figure 16: To whom do you sell your products?

RESOURCES

Respondents ar a members of several organizations. Illinois Farm Bureau is the most popular organization among the respondents.

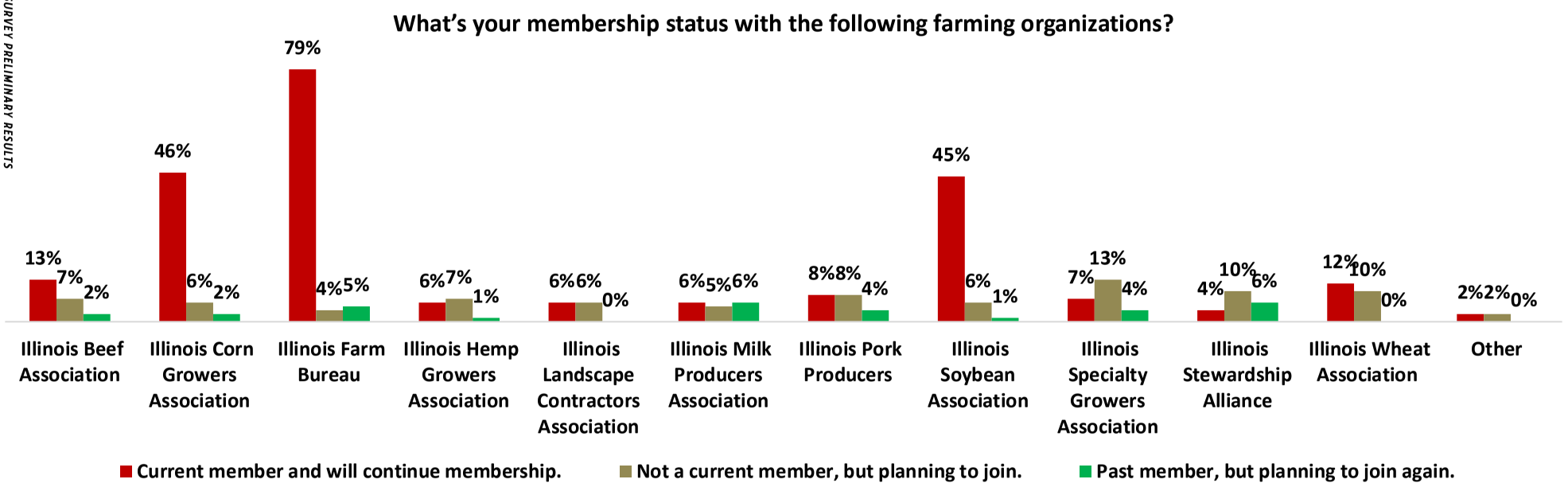

FIGURE 17: WHAT'S YOUR MEMBERSHIP STATUS WITH THE FOLLOWING FARMING ORGANIZATIONS?

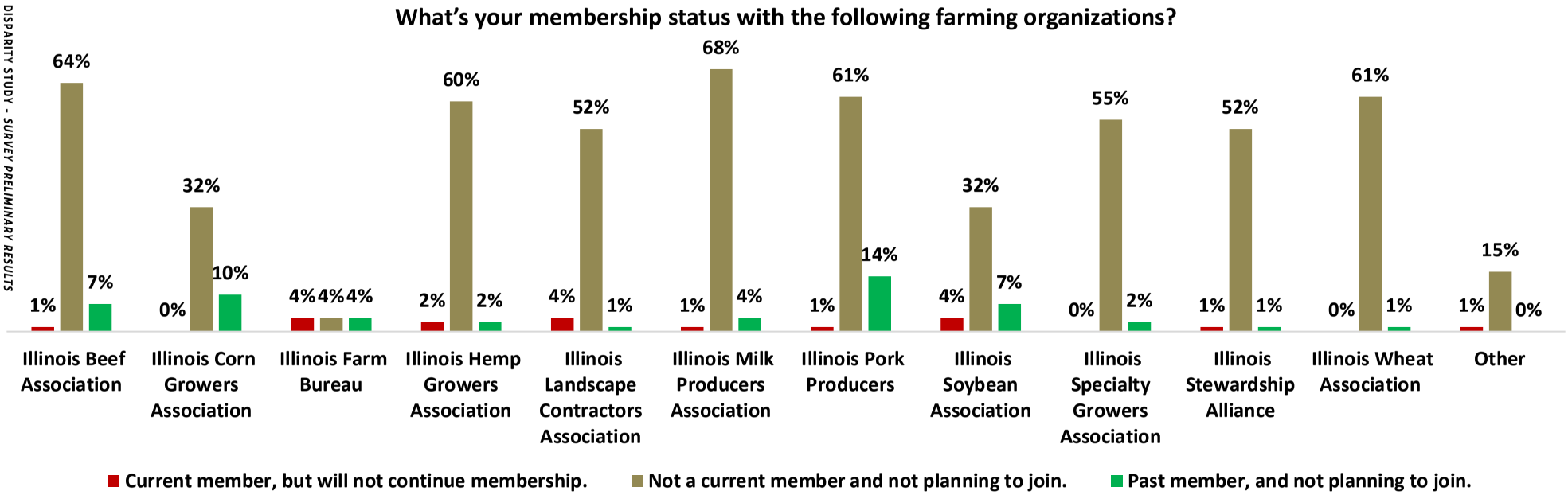

Figure 18: What's your membership status with the following farming organizations?

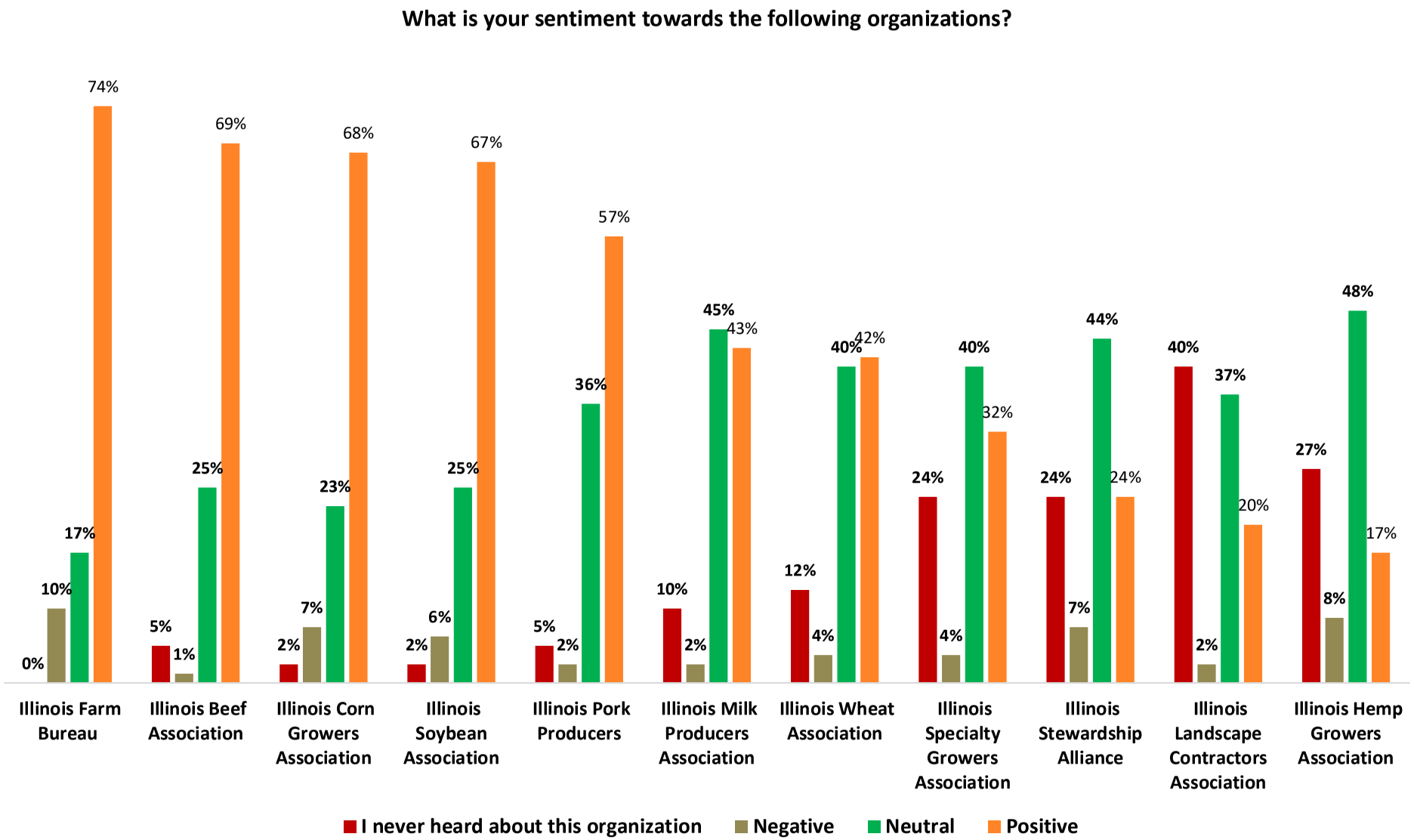

FIGURE 19: WHAT IS YOUR SENTIMENT TOWARDS THE FOLLOWING ORGANIZATIONS?

100% of the respondents are aware of the USDA Farm Service Agency programs.

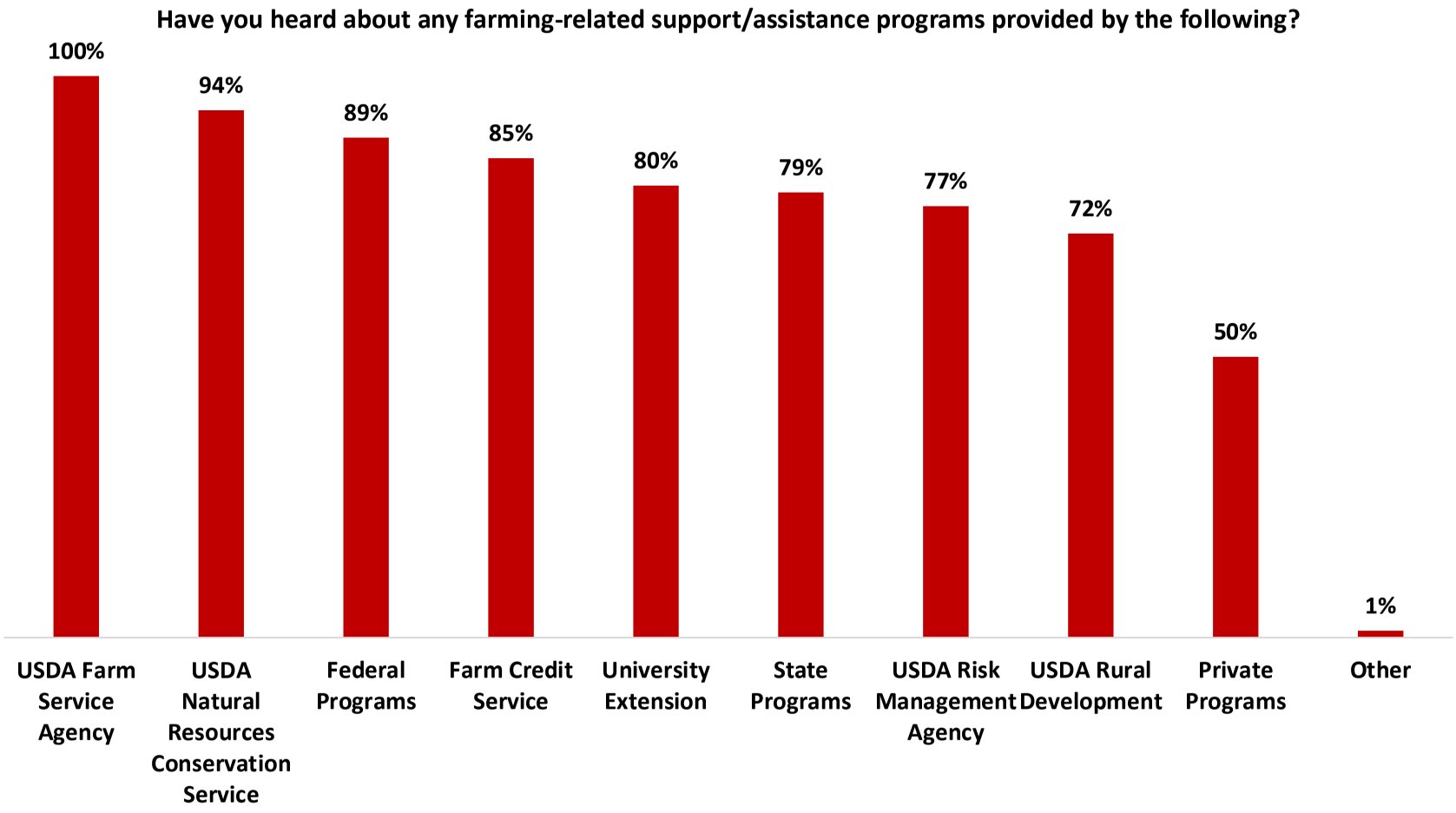

FIGURE 20: HAVE YOU HEARD ABOUT ANY FARMING-RELATED SUPPORT/ASSISTANCE PROGRAMS?

Participation in farming-related programs vary while some of the respondents reported that they were not successful in participating in some of the programs.

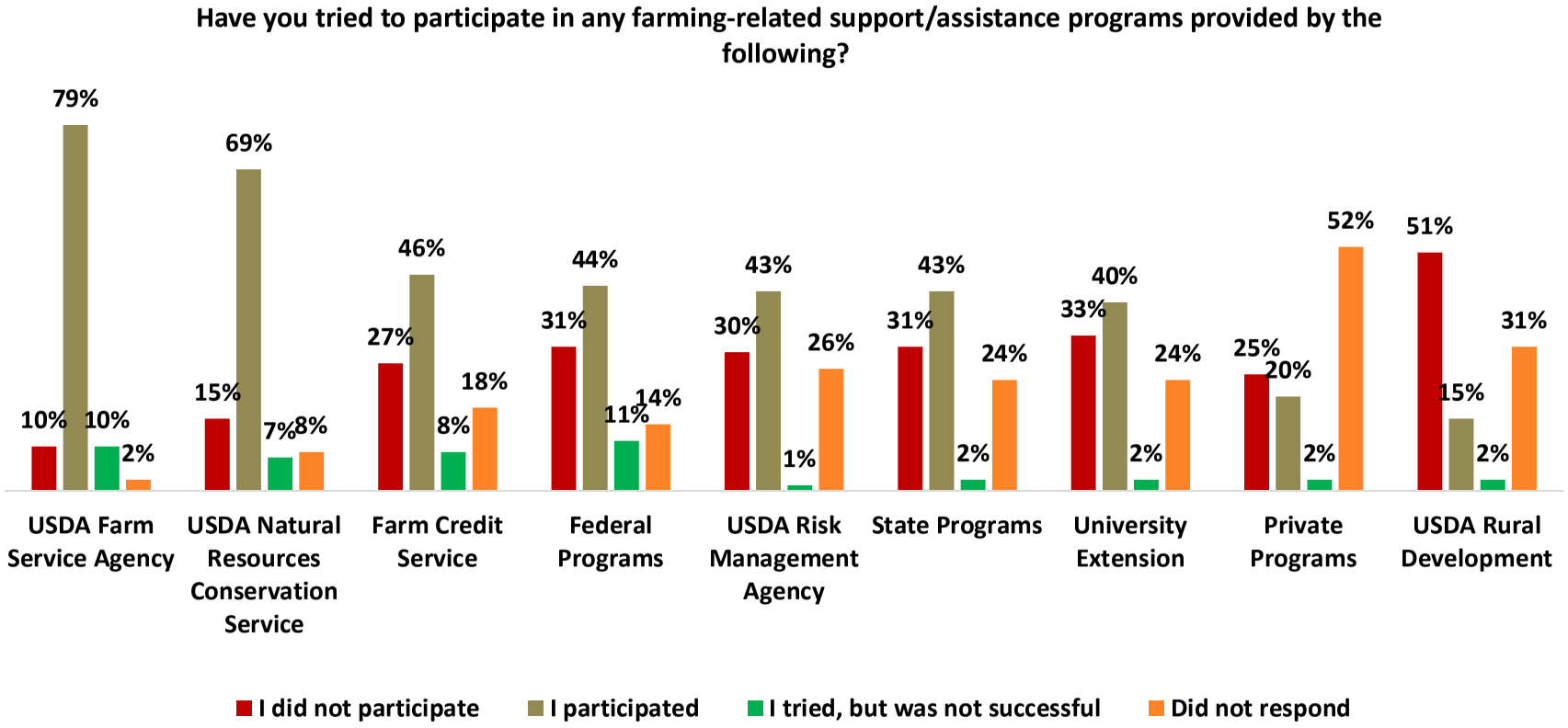

FIGURE 21: HAVE YOU TRIED TO PARTICIPATE IN ANY FARMING-RELATED SUPPORT/ASSISTANCE PROGRAMS?

SOURCES OF INFORMATION

Business partners, other farmers and family & friends are the top three choices as sources of information.

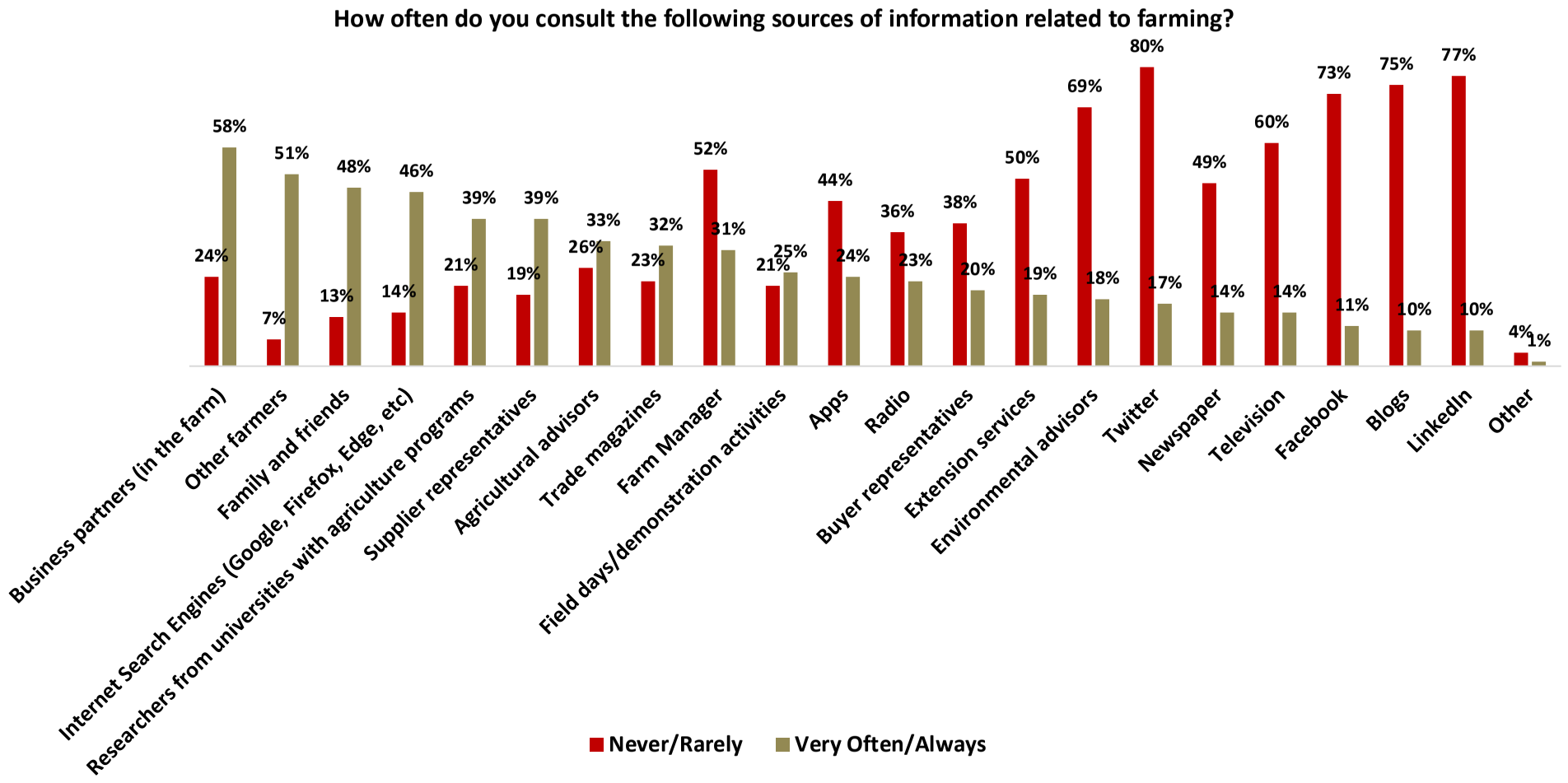

FIGURE 22: HOW OFTEN DO YOU CONSULT THE FOLLOWING SOURCES OF INFORMATION RELATED TO FARMING?

CONCERNS & FUTURE PLANS

Respondents have several concerns. Cost of land, equipment, health insurance, and labor are top of mind concerns.

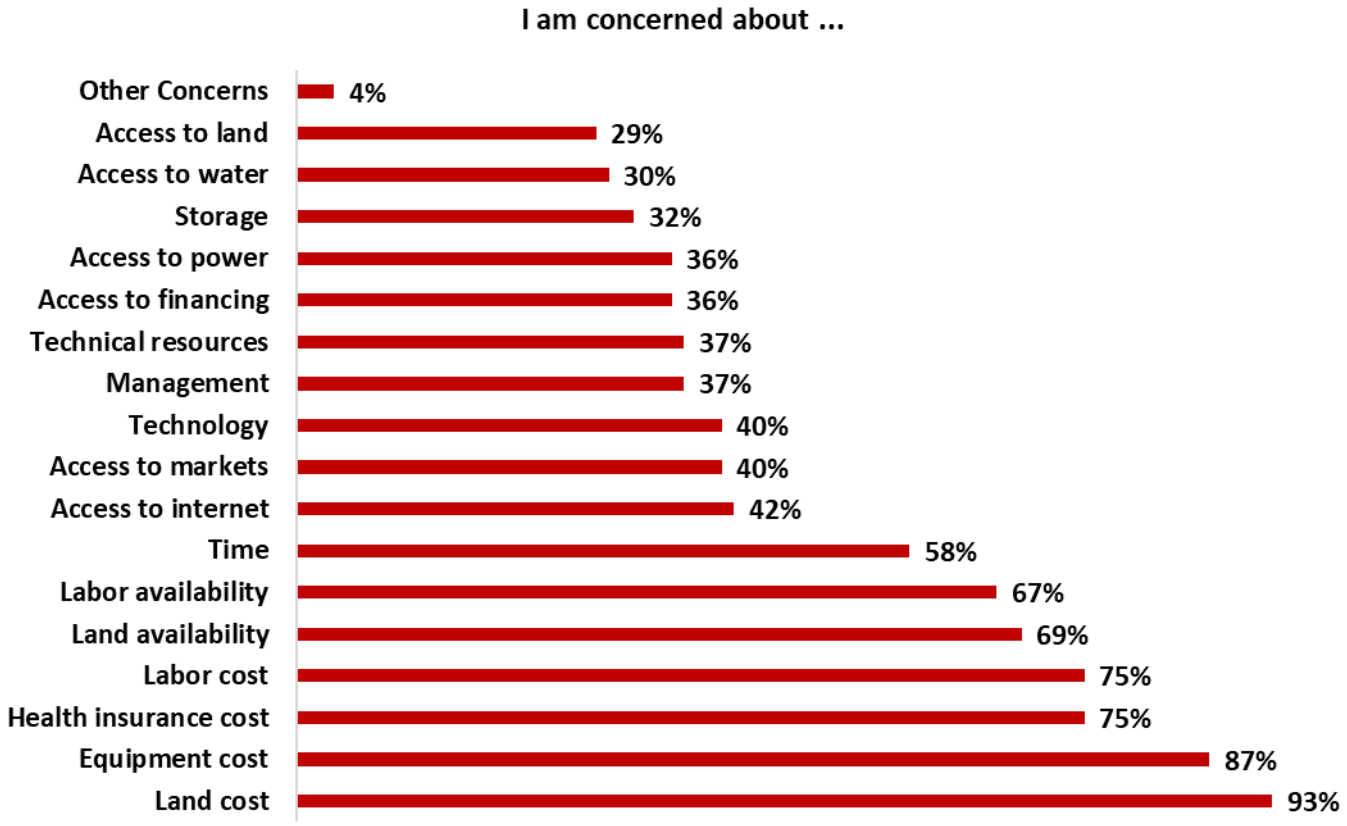

FIGURE 23: I AM CONCERNED ABOUT ...

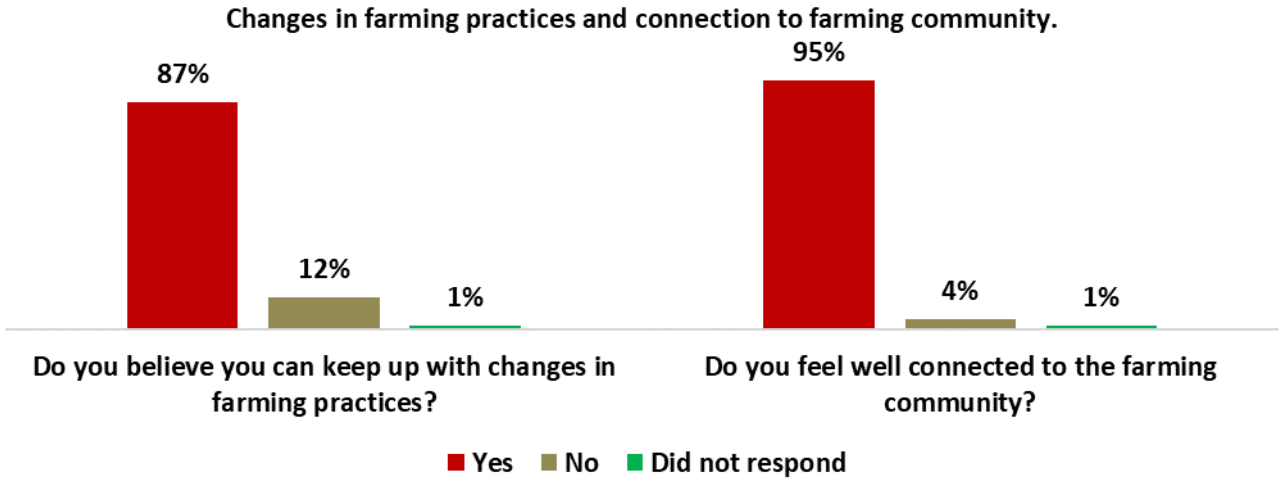

FIGURE 24: CHANGES IN FARMING PRACTICES AND CONNECTION TO FARMING COMMUNITY.

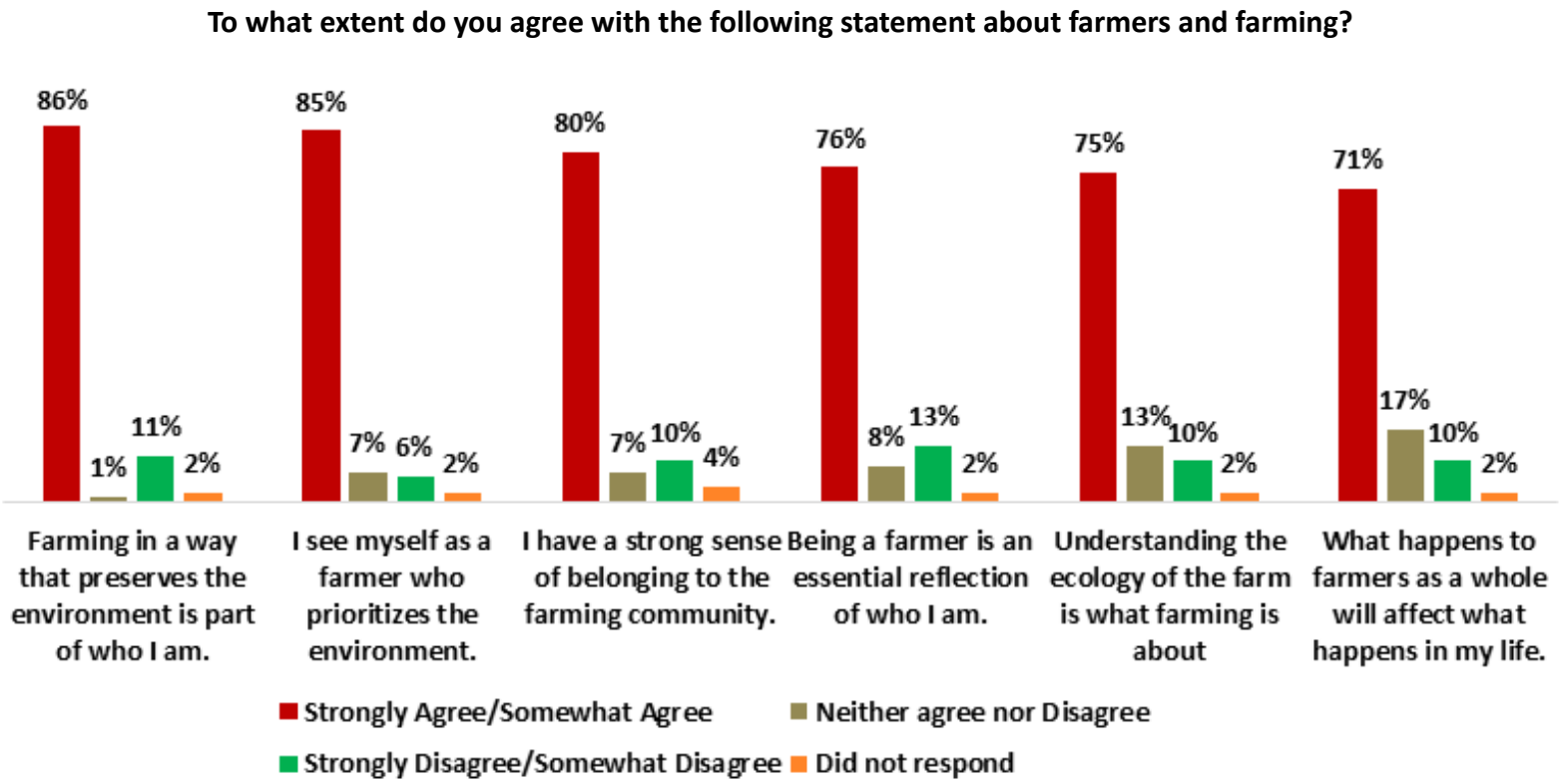

Figure 25: To what extent do you agree with the following statement about farmers and farming?

The majority of the respondents are planning to continue farming, some with expansion and diversification of crops and livestock plans.

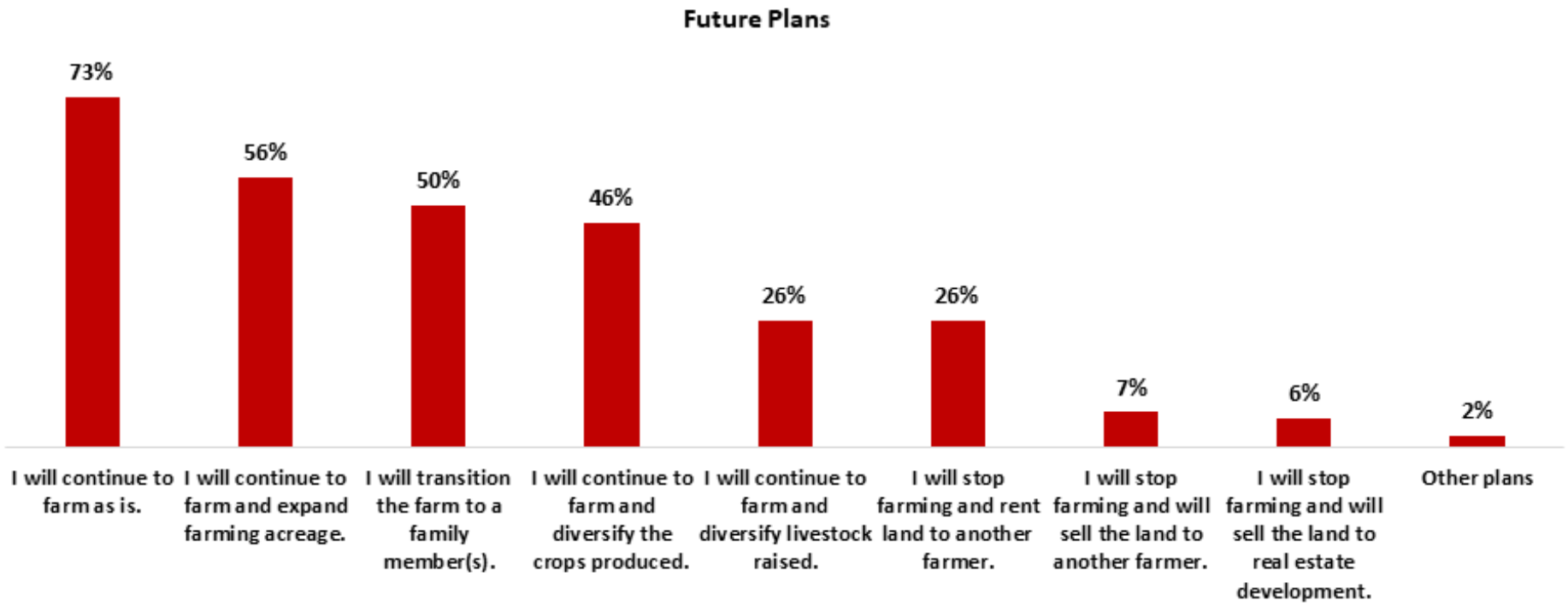

FIGURE 26: FUTURE PLANS

Institutional Review Board (IRB) Approval Process

Research that draws on data from living people through instruments like surveys and focus groups is called "human subject research." Researchers must gain approval from their IRB before engaging in any such research to be sure that the benefits of the research outweigh any risks to participants. The IRB approval process allows a university IRB to ensure that features of the research plan like data collection, data storage, and focus group protocols meet best standards for ensuring respondent data confidentiality and minimizing any risk of harm to respondents.

Once the funding agreement with participating universities was completed (that was 6/9/2022 at UIUC), Professor Amy Ando at the University of Illinois Urbana-Champaign (UIUC) led the four-university research team through the IRB approval process. There were two important preliminary steps. First, they consulted with IRB officers at UIUC to identify how to secure IRB approval for research carried out by a group of researchers at four different universities. Second, all faculty and graduate research assistants involved with the survey or focus groups made sure they were up to date on IRB-approved training in policies and practices to protect human subjects involved in research.

Next, Dr. Ando led the researchers involved in the survey and focus groups in the extensive effort needed to prepare the materials for submission for IRB approval. They collaborated to write the complete texts of the actual survey, focus group script, research consent forms, and recruiting materials that are used in the research. They developed the comprehensive research plan and documented that in the "Human Subjects Research Exempt Form." The Exempt Form describes details of the research project including: the benefits of the research to society and the subjects themselves; risks (if any) posed to the subjects of participating in the research; how subjects will be recruited for the research; how the survey and focus groups will be administered; how informed consent will be obtained from all subjects; what compensation will be provided and how; whether identifying information will be gathered; and how respondent privacy and confidentiality would be protected. Finally, they collected information about all research personnel for the" Research Team" form.

Dr. Ando submitted the Exempt Form, Research Team form, research materials (survey, focus group script, consent forms, recruiting materials), and funding agreement to the UIUC IRB for review on August 9, 2022. IRB personnel provided two rounds of feedback and requested changes to the materials (this is common for IRB approval processes). Dr. Ando received notice of IRB exempt for what is now known as protocol IRB #23303 on September 8, 2022. The exempt determination means that team successfully documented that the project poses minimal risk to respondents and meaningful potential benefits to society such that more extensive IRB is not warranted. Only at that point in time was the research team able to begin carrying out the research itself.

Focus Group

There are three data collection methods to achieve the study objectives as set forth by the IL Legislature and the Governor's office. The first being the use of secondary data available with NASS and ERS. Second is survey data, which is primary data collected through surveys. Third is the primary data collected via focus group sessions. Focus group interviews with Illinois farmers are conducted to explore and bring to light their lived experiences that would complement information collected through surveys.

A focus group format was selected because it draws upon respondents' beliefs, feelings, attitudes, and experiences in ways that a questionnaire survey cannot. A focus group can help to reveal attitudes, beliefs, and feelings via the observation of interactions of participants in a social setting. Focus groups are different from interviews in that the richness of the data revealed stems from the interaction of members with each other within the group when responding to topics supplied by the researcher (Morgan, 1997). Focus groups provide an informal setting yet a familiar environment with fellow farmers with similar farming backgrounds and similar characteristics that enables participants to intimately share their farm and personal experience. Focus group interviews make use of the dynamics of the concerned group to generate qualitative data which provides a richer understanding about the subject matter (Morgan et al., 1998).

In these small groups, a variety of views may emerge from the participants' discussions, as focus groups are suited for obtaining multiple perspectives of a topic. We hope to gain insight into the participants' shared understanding of Illinois farming and their voices to emerge in the narrative.
It is important to remember that focus groups are limited in terms of their ability to generalize findings to a whole population. This is due to the small numbers of participants and the likelihood that the participants may not be a representative sample (Gibbs, 1997).

CONDUCTING FOCUS GROUP

The steps in conducting focus groups of farmers are:

i. **Choose participants:** There are two ways we'll recruit focus group participants. Each participant receives $100 to compensate them for their time, which is 1½ to 2 hours, and for the expenses incurred to come to the location.
   a. The survey itself will give respondents the option to be contacted for inclusion in a follow-up focus group to discuss the topics of the survey in a more open-ended way. They can click a button that will take them to a signup form that gathers contact information; this way their identity is kept separate from their survey responses.
   b. Research team members will email farm associations and/or farmer groups to ask them to circulate approved recruitment messages via email to invite the group's members to participate in focus groups. Research team members will call farm operators who are in the networks of the researchers' departments and use another recruitment message designed for phone calls to invite them to participate in a focus group. Calls will be made during work hours at their place of business.

ii. **Prepare the questions:** The script was designed by the entire team of researchers with input also from stakeholders, including the IL Department of Agriculture and other members of the study group. The questions are consistent with the other data collection methods. The focus group question and session notes are attached below.

iii. **Conduct focus groups:**
   a. After identifying suitable locality for our meetings based on where the participants live, we plan to host several focus groups consisting of 4-8 participants, which is generally considered to be an ideal number (Krueger & Casey, 2000).
   b. Participants will convene as a small group in a conference room. The researcher will talk through the consent process and gather a signed consent form from each participant. The researcher will then lead them in a discussion of issues that were raised in the survey by asking a series of prompts. The focus

groups will be audio-recorded, and later transcribed while maintaining anonymity and then analyzed. Each focus group session will be recorded for later transcription and to maintain data accuracy.

iv. **Coding, Analysis, and Reporting:** anonymous transcriptions are analyzed for common themes and conclusions drawn. After we complete a focus group the session will be transcribed, anonymized, and would be analyzed by trained focus group analysts undergo. We would look for emerging ideas and draw relationships between ideas and keywords used by participants. This facilitates the generation of themes and patterns. Once these patterns and themes are identified we report our findings to the group for further discussions. The final results and conclusions are put on a report to be submitted to IL Legislature.

RESEARCH PROGRESS

Thus far we have carried out two preliminary mock focus groups to train our moderators and researchers. As noted above, we have been identifying potential participants and hope to conduct our first focus group interviews over the next few weeks.

DATA COLLECTION AND SCRIPT

The questions we will ask participants can be divided into three major themes. The first asks about participants' farming history, how they came into farming, and the scale and scope of their farming operation. Two example questions are "How did you get into farming? Did you have family connections?" "How many acres do you currently farm? Of those, how many are owned vs. leased?"

The second theme of our questions inquires as to farmers' knowledge of, and participation in, agricultural supports and resources. "Are you aware of support and assistance resources and programs designed to help farmers? Have you made use of them? If so, what has been your experience?" "Are you using modern technology? GPS, precision ag, etc.? Why or why not?" "Are you taking advantage of CRP, extension service, etc.? Resources?"

The third theme of questions revolves around the topic of challenges and difficulties faced by Illinois farmers. We anticipate the responses will be wide-ranging and diverse. Some questions we will ask include, "Do you know other people, such as friends/family/other who were farmers, but are not currently farming? If they are not, why do you think they are not?" "Have you ever attempted to borrow money for farm operations, such as to improve your crop land or purchase machinery? If so, what was your experience?" "What are you most concerned about regarding the future of your farming operation?"

Steps Taken to Obtain NASS Data for the Farmer Disparity Study

The research is designed to address the following questions: (i) how does farm income / wealth differ among different types of farms (for example, producer demographics, farm characteristics such as NAICS, etc.); (ii) do grants, loans, commodity subsidies, etc. differ among different types of farm segments; (iii) are technical assistance and mechanization uniformly distributed within farm segments, and (iv) does participation in learning programs differ among various producer segments.

The theoretical focus is on producer's behavioral choices. The study of producer behavior is complex - producers have different values, influence structures, etc. For example, the decision to adopt a practice such as "no-till" farming is influenced by external factors such as culture and internal factors such as the operator's motives and confidence. A model of producer behavior would indicate the relevant parameters influencing operating practices, aiding the design of a 'policy' information system.

A conceptual model of the form given in Figure 1 will be developed and empirically validated using individual Illinoisans' responses to ARMS and TOTAL surveys. The domain of the conceptual model includes three distinct facets of producer behavior; *inputs* from the environment are *processed* by the producer which result in farming *behavior*.

The inputs consist of significative stimuli such as the attributes of the farming land, information from institutions such as farm management services, and family and friends. These inputs are processed and acted upon by the producer which result in the performance of farming operations.

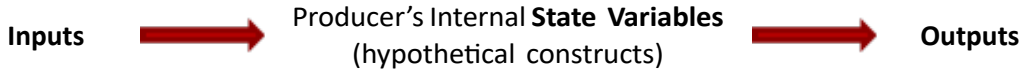

Figure 27: A Conceptual Model of Producer Behavior: Examples of Stimuli, Intervening, and Response Variables

Significative, for example,

a. **Farm assets:**

(i) Acres operated
(ii) Acres irrigated
(iii) Livestock inventory

b. **Farm management practices**

c. **Social**

(v) Family
(vi) Reference groups

Motives (variables such as "years of farming" will be used to tap into motives)

Confidence (Confidence (variables such as age and education will be used as formative indicators to measure the construct)

Economic Performace

Table below shows the ARMS survey variables that would be used as indicators of both reflective or latent constructs and formative constructs - the input, state, and output constructs in Figure 1.

Table 2: Rules of Correspondence

Study Variable	Corresponding Theoretical Construct	Source
Land and operations	Input	ARMS, C&R, 2021; Sections A – D, all questions.
Operational expenses and sales	Output	ARMS, C&R, 2021; Sections E- J, all questions
Personal characteristics	State indicators	ARMS, C&R, 2021; Sections K – M, all variables

We are making this request on the assumption that Illinois respondents account for a sizeable portion of the total respondents, for example, around 1,000. ARMS micro data for any year during the 2018-2021 time period is acceptable.

STATE OF QUEST TO SECURE PERMISSION FROM NASS TO USE ARMS DATA

On July 21, 2022, a team of researchers from WIU, SIU, USDA, and NASS discussed the process involved in obtaining ARMS microdata for the farmer disparity study (Exhibit 1).

Exhibit 1: Pre-proposal meeting


Re: ARMS and TOTAL Access

Adee Athiyaman <a-athiyaman@wiu.edu>
to Carrie, Lisa, Mark

Mon, Jul 25, 9:50 AM

Hello Carrie,

I have attached a short proposal requesting ARMS data for your perusal. I look forward to your reply.
Again, thanks for all the help.

Best,
Adee

The outcome of this meeting was the submission of a preliminary research proposal to ERS on July 25, 2022 to obtain ARMS microdata (Exhibit 2).

Exhibit 2: Application to ERS for Microdata


Re: ARMS and TOTAL Access

Adee Athiyaman <a-athiyaman@wiu.edu>
to Carrie, Lisa, Mark

Mon, Jul 25, 9:50 AM

Hello Carrie,

I have attached a short proposal requesting ARMS data for your perusal. I look forward to your reply.
Again, thanks for all the help.

Best,
Adee

On August 17, 2022, ERS responded to the proposal by requesting that the methodology be expanded to include variables to be employed in data analysis (Exhibit 3); our response to the request on August 19, 2022 is shown in Exhibit 4.

Exhibit 3: ERS' Response to the Short Proposal

From: **Jones, Carrie - REE-ERS, Washington, DC** <Carrie.Jones3@usda.gov>
Date: Wed, Aug 17, 2022 at 10:46 AM
Subject: RE: ARMS and TOTAL Access
To: Adee Athiyaman <a-athiyaman@wiu.edu>

Good morning,

Your short write-up has been reviewed by myself and two of our researchers. We are all in agreement that your methodology needs more details. Typically this is something we would ask for in the next steps of the access process. However, it appears that we need this now so that we can make a feasibility assessment for your project. Also, there are some other issues that you should address:

- Please be more specific with the variables you plan to use; there is concern that you are looking for variables that are not found in the ARMS data (WE WANT TO MINE ALL THE VARIABLES; WE DON'T HAVE SPECIFIC VARIABLES IN MIND)

Exhibit 4: Response to ERS' Feedback on the Short Proposal

ARMS Data for Illinois

Adee Athiyaman <a-athiyaman@wiu.edu> Fri, Aug 19, 3:31 PM
to Carrie, bcc: Mark, bcc: Lisa, bcc: Christopher

Hello Carrie,

Thanks for the feedback. I have attached a revised pre-MOU proposal. This time I am certain that I have addressed all your requirements; by the way, please note that I am not planning to combine any other data sets with the ARMS data.

Best,
Adee

--
Adee Athiyaman, Ph.D
Professor, Illinois Institute for Rural Affairs
509, Stipes Hall,Western Illinois University
Macomb, IL 61455

Voice: +1 309-298-2272
Fax: +1 309-298-2142
http://www.iira.org
http://www.instituteintelligence.com

On September 21, 2022, ERS approved the application for access to microdata, but requested that WIU enter into a formal agreement with the USDA to gain access to the data. The 'formal' application was submitted by WIU on October 24, 2022. We are waiting for USDA to upload the requested ARMS data on the Data Enclave.

REQUEST FOR ACCESS TO ARMS MICRODATA

Background

Researchers at various universities in Illinois[1] have been contracted by the Illinois Department of Agriculture (IDOA) to gather information on disparities in farm operations and to present their findings to IDOA by end 2022[2]. To this end, the researchers have produced five papers, *Research Brief*, on the topic using data from various sources (Appendices 1 to 5 contain the publications).

Some of the salient findings from our research include:

[2] These include Adee Athiyaman and Chris Merrett from Western Illinois University and Jeb Asirvatham from Southern Illinois University.

[3] This fact-gathering exercise is to analyze the existing situation for policy purposes.

ILLINOIS FARM OWNERSHIP BY RACE AND FARM PRODUCTIVITY

Lack of data on minority farmers is a major constraint to learn about the impact of producer's race on farm productivity. We know that farm size and agricultural income are lower for African Americans, Asians, and other minorities. We also know that human capital is a determinant of productivity and that the level of education is lower among minorities. Other than these correlates, nothing could be said about systemic barriers such as racial bias that could nullify the impact of, for example, knowledge, skills, and assets of racial minorities on business success.

AN EMPIRICAL ANALYSIS OF FARM TENANCY IN ILLINOIS AND TWEETS ABOUT FARM TENANCY

Results of data analysis suggest that in 2020 eight percent of Illinois farms had tenant farmers; sixty two percent of the tenant farmers were male and a majority of tenants rented less than 100 acres of land. Revenue growth for tenant farms is positively correlated with the size of the land; larger the leased land, larger is the revenue growth.

YOUNG ILLINOISANS' INTERESTS IN FARMING

The head of the farming household provides positive reinforcement for young persons in the household to engage in farming; the strength of the reinforcement is the largest for biological son or daughter and least for adopted children. In spite of this parental influence, 92% of young persons from farming families look for employment elsewhere. The consequence is reflected in the median growth rate of young producers in Illinois, -2.7%.

AN EMPIRICAL ANALYSIS OF THE ATTRIBUTES OF NEW AND BEGINNING FARMERS IN ILLINOIS

Results of data analysis reveal that 99% of all beginning producers are White. Of the very few minority beginning producers, N = 202, 44% are African Americans, 34% Asians, and 22% other minorities. A higher proportion of beginning farmers grow vegetables and engage in cattle, sheep, and goat farming, whereas experienced producers focus on oilseed and grain farming and dairy cattle.

While these papers have facilitated building up an empirically based set of observations and findings about disparities in farm operations, most of the arguments were constructed using grouped data. More than six decades ago Johnston[3] alerted us to pitfalls in inference from grouped data, that different conclusions can emerge from the same data depending on the classification adapted. The best procedure is to analyze the original survey data, or micro data. Hence the request for microdata, the details of which are given below.

[4] Johnston, J. (1960). *Statistical Cost Analysis.* New York: McGraw-Hill Book Company.

NASS RESEARCH QUESTIONS

Question 1

How does farm income / wealth differ among different types of farms (for example, producer demographics, farm characteristics such as NAICS, etc.)?

Data from the 2017 US Census of Agriculture and Bureau of Economic Analysis were employed to gain insights into farm income and productivity at the macro level, for all races. For insights into productivity differences among races, a proxy measure of farm productivity, human capital, was calibrated using data from the ACS Public Use Microdata Sample.

We believe that ARMS data can provide greater insights into the research question. For instance, C&R, 2021, Section K, provides direct measures of race and education for the principal producer and three other decision makers. In addition, the moderating role of race, for example, on farm management practices and business success could be explored using Section K, questions 16 to 20. Table 1 lists the indicators that could aid in addressing the research question including replicating and validating the research shown in the appendices.

Table 3: ARMS Data Needed to Explore Differences in Farm Productivity in Illinois Data

Data Required	Planned Usage	Final Data Products
C&R, 2021, Responses All variables related to farm earnings and production expenses; these would be, for example, variable values for Section B, Q2, cell numbers 1 & 5; Section C, Q2, cell numbers 1 & 5; Section D, for all "Yes" responses, cell numbers 1, 3-7; Section E, for all "Yes" responses, cell numbers 1, 3-7; data on direct sales, Q4 and incentives, Q5; Section G, questions 1-5; and all of the remaining sections with income and expense variables. In addition, we also need individual responses to sections A, K and L. A less desired option would be access to microdata for sections A, G, K-M.	Estimate farm productivity by race, farm tenure, and other demographics such as age (young producer versus others) and beginning producer.	Discussions will center around crosstabulations of producer demographics by farm earnings and production expenses; the output will be similar to the papers in the appendices; see Appendix 1, Tables 2 and 3, for examples of presentations of farm productivity metrics.

Question 2

Do grants, loans, commodity subsidies, etc. differ among different types of farm segments?

Our research addressed this question using data from the 2017 Census of Agriculture, but details about specific types of Federal, State, or local farm program payments such as those listed in C&R, 2021, Section G, couldn't be obtained from the census. Gaining such information would indicate producers' needs, awareness, and usage of various farm program payments.

In summary, access to survey responses for C&R, 2021, Section G would help explore needs, awareness, and usage of different farm program payments by producer race and other demographics. The outputs will be similar to the paper given in the Appendix.

Question 3

Are technical assistance and mechanization uniformly distributed within farm segments, for example, producer demographics and farm characteristics?

This question was addressed only minimally in our research given in the appendices; lack of published data on the topic was a major constraint. ARMS C&R, 2021, survey responses for Section H would help us address this question. The final product would be a descriptive analysis of the use of technical assistance among clusters of farms and producers.

NASS SUMMARY AND CONCLUSION

The request for ARMS data is motivated by the need to fulfil a contractual obligation between the author and his colleagues and the IDOA. The final report will address many more questions, but ARMS data will inform the three research questions discussed above.

The audiences of the research would be elected officials and practitioners in the agricultural industry in Illinois.

Exploratory data analysis methods such as five-number summaries and crosstabulations of variables will be the primary method of data analysis; regression analysis may be employed to obtain conditional estimates. To profile producer segments, for example, new and beginning farmers, discriminant analysis will be used.

APPENDIX 1

SHORT PROPOSAL

The research is designed to address the following questions: (i) how does farm income / wealth differ among different types of farms (for example, producer demographics, farm characteristics such as NAICS, etc.); (ii) do grants, loans, commodity subsidies, etc. differ among different types of farm segments; (iii) are technical assistance and mechanization uniformly distributed within farm segments, and (iv) does participation in learning programs differ among various producer segments.

The theoretical focus is on producer's behavioral choices. The study of producer behavior is complex - producers have different values, influence structures, etc. For example, the decision to adopt a practice such as "no-till" farming is influenced by external factors such as culture and internal factors such as the operator's motives and confidence. A model of producer behavior would indicate the relevant parameters influencing operating practices, aiding the design of a 'policy' information system.

A conceptual model of the form given in Figure 1 will be developed and empirically validated using individual Illinoisans' responses to ARMS and TOTAL surveys. The domain of the conceptual model includes three distinct facets of producer behavior; *inputs* from the environment are *processed* by the producer which result in farming *behavior*.

The inputs consist of significative stimuli such as the attributes of the farming land, information from institutions such as farm management services, and family and friends. These inputs are processed and acted upon by the producer which result in the performance of farming operations.

Figure 1: A Conceptual Model of Producer Behavior: Examples of Stimuli, Intervening, and Response Variables

Inputs →	Producer's Internal **State Variables** (hypothetical constructs)	→ **Outputs**
Significative, for example, a. Farm assets: (i) Acres operated (ii) Acres irrigated (iii) Livestock inventory b. Farm management practices c. Social (i) Family (ii) Reference groups	Motives (variables such as "years of farming" will be used to tap into motives) Confidence (variables such as age and education will be used as formative indicators to measure the construct)	Economic Performance

Table 1 shows the ARMS survey variables that would be used as indicators of both reflective or latent constructs and formative constructs - the input, state, and output constructs in Figure 1.

Table 1: Rules of Correspondence

Study Variable	Corresponding Theoretical Construct, Figure 1	Source
Land and operations	Input	ARMS, C&R, 2021; Sections A – D, all questions.
Operational expenses and sales	Output	ARMS, C&R, 2021; Sections E- J, all questions.
Personal characteristics	State indicators	ARMS, C&R, 2021; Sections K – M, all variables.

Conclusion

I am making this request on the assumption that Illinois respondents account for a sizeable portion of the total respondents, for example, around 1000. ARMS micro data for any year during the 2018-2021 time period is acceptable.

APPENDIX 2

FULL PROPOSAL

Request for Access to ARMS Microdata

Background

Researchers at various universities in Illinois[1] have been contracted by the Illinois Department of Agriculture (IDOA) to gather information on disparities in farm operations and to present their findings to IDOA by end 2022[2]. To this end, the researchers have produced five papers, *Research Brief*, on the topic using data from various sources (Appendices 1 to 5 contain the publications).

Some of the salient findings from our research include:

Appendix 1; *Illinois Farm Ownership by Race and Farm Productivity*

> Lack of data on minority farmers is a major constraint to learn about the impact of producer's race on farm productivity. We know that farm size and agricultural income are lower for African Americans, Asians, and other minorities. We also know that human capital is a determinant of productivity and that the level of education is lower among minorities. Other than these correlates, nothing could be said about systemic barriers such as racial bias that could nullify the impact of, for example, knowledge, skills, and assets of racial minorities on business success.

Appendix 3; *An Empirical Analysis of Farm Tenancy in Illinois and Tweets about Farm Tenancy*

> Results of data analysis suggest that in 2020 eight percent of Illinois farms had tenant farmers; sixty two percent of the tenant farmers were male and a majority of tenants rented less than 100 acres of land. Revenue growth for tenant farms is positively correlated with the size of the land; larger the leased land, larger is the revenue growth.

Appendix 4; *Young Illinoisans' Interests in Farming*

> The head of the farming household provides positive reinforcement for young persons in the household to engage in farming; the strength of the reinforcement is the largest for biological son or daughter and least for adopted children. In spite of this parental influence, 92% of young persons from farming families look

[1] These include Adee Athiyaman and Chris Merrett from Western Illinois University and Jeb Asirvatham from Southern Illinois University.
[2] This fact-gathering exercise is to analyze the existing situation for policy purposes.

for employment elsewhere. The consequence is reflected in the median growth rate of young producers in Illinois, -2.7%.

Appendix 5; *An Empirical Analysis of the Attributes of New and Beginning Farmers in Illinois*

> Results of data analysis reveal that 99% of all beginning producers are White. Of the very few minority beginning producers, N = 202, 44% are African Americans, 34% Asians, and 22% other minorities. A higher proportion of beginning farmers grow vegetables and engage in cattle, sheep, and goat farming, whereas experienced producers focus on oilseed and grain farming and dairy cattle.

While these papers have facilitated building up an empirically based set of observations and findings about disparities in farm operations, most of the arguments were constructed using grouped data. More than six decades ago Johnston[3] alerted us to pitfalls in inference from grouped data, that different conclusions can emerge from the same data depending on the classification adapted. The best procedure is to analyze the original survey data, or micro data. Hence the request for microdata, the details of which are given below.

Research Questions

Question 1

The papers in Appendices 1, 3-5 were constructed to address the question:

> how does farm income / wealth differ among different types of farms (for example, producer demographics, farm characteristics such as NAICS, etc.).

Data from the 2017 US Census of Agriculture and Bureau of Economic Analysis were employed to gain insights into farm income and productivity at the macro level, for all races. For insights into productivity differences among races, a proxy measure of farm productivity, human capital, was calibrated using data from the ACS Public Use Microdata Sample.

We believe that ARMS data can provide greater insights into the research question. For instance, C&R, 2021, Section K, provides direct measures of race and education for the principal producer and three other decision makers. In addition, the moderating role of race, for example, on farm management practices and business success could be explored using Section K, questions 16 to 20. Table 1 lists the indicators that could aid

[3] Johnston, J. (1960). *Statistical Cost Analysis*. New York: McGraw-Hill Book Company.

in addressing the research question including replicating and validating the research shown in the appendices.

Table 1: ARMS Data Needed to Explore Differences in Farm Productivity in Illinois

Data Required	Planned Usage	Final Data Products
C&R, 2021, Responses All variables related to farm earnings and production expenses; these would be, for example, variable values for Section B, Q2, cell numbers 1 & 5; Section C, Q2, cell numbers 1 & 5; Section D, for all "Yes" responses, cell numbers 1, 3-7; Section E, for all "Yes" responses, cell numbers 1, 3-7; data on direct sales, Q4 and incentives, Q5; Section G, questions 1-5; and all of the remaining sections with income and expense variables. In addition, we also need individual responses to sections A, K and L. A less desired option would be access to microdata for sections A, G, K-M.	Estimate farm productivity by race, farm tenure, and other demographics such as age (young producer versus others) and beginning producer.	Discussions will center around crosstabulations of producer demographics by farm earnings and production expenses; the output will be similar to the papers in the appendices; see Appendix 1, Tables 2 and 3, for examples of presentations of farm productivity metrics.

Question 2

Do grants, loans, commodity subsidies, etc. differ among different types of farm segments?

Our research in Appendix 1 addressed this question using data from the 2017 Census of Agriculture, but details about specific types of Federal, State, or local farm program payments such as those listed in C&R, 2021, Section G, couldn't be obtained from the census. Gaining such information would indicate producers' needs, awareness, and usage of various farm program payments.

In summary, access to survey responses for C&R, 2021, Section G would help explore needs, awareness, and usage of different farm program payments by producer race and other demographics. The outputs will be similar to the paper given in Appendix 1, Tables 4 and 5.

Question 3

Are technical assistance and mechanization uniformly distributed within farm segments, for example, producer demographics and farm characteristics?

This question was addressed only minimally in our research given in the appendices; lack of published data on the topic was a major constraint. ARMS C&R, 2021, survey responses for Section H would help us address this question. The final product would be a descriptive analysis of the use of technical assistance among clusters of farms and producers.

Summary and Conclusion

The request for ARMS data is motivated by the need to fulfil a contractual obligation between the author and his colleagues and the IDOA. The final report will address many more questions, but ARMS data will inform the three research questions discussed above.

The audiences of the research would be elected officials and practitioners in the agricultural industry in Illinois.

Exploratory data analysis methods such as five-number summaries and crosstabulations of variables will be the primary method of data analysis; regression analysis may be employed to obtain conditional estimates. To profile producer segments, for example, new and beginning farmers, discriminant analysis will be used.

APPENDIX 3

ILLINOIS FARM OWNERSHIP BY RACE AND FARM PRODUCTIVITY

Research Brief,

Short Paper

Vol. 4, No. 10

(2022, May 25)

The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.

Western Illinois University

Illinois Farm Ownership by Race and Farm Productivity

ISSN 2687-8844

Adee Athiyaman[1]

Abstract

This paper explores the impact of producer's race on farm productivity. Data analysis suggests that: (i) minority farmers own farms that are less than 50 acres in size; the opposite is true for the White producers, 64% own more than 50 acres of farm land; and (ii) on average, farms operated by the Whites receive more conservation-programs payments and other federal program payments.

Introduction

> *In 2021, President Joe Biden promised to erase $4 billion worth of debt to socially disadvantaged farmers who have been impacted by the USDA's discriminatory lending practices. However, a swarm of lawsuits from banks and white farmers alleging discrimination against them has stagnated the debt relief in court.* Dana Cronin, KCUR News, May 18, 2022[2].

In the neoclassical theory of the firm[3], the firm is represented by a production function – the technology that employs labor and capital for production. In agriculture, 'technology' has propelled firm productivity[4] to grow at an average rate of 1.42% per annum, from

[1] Professor, Illinois Institute for Rural Affairs, Western Illinois University.
[2] https://www.hppr.org/hppr-news/2022-05-18/black-farmers-have-lost-326-billion-worth-of-farmland-study-says. It should be noted that white women are excluded from the definition of socially disadvantaged.
[3] Penrose, E. (1959). *The Theory of the Growth of the Firm*. New York: Sharpe.
[4] Multifactor productivity (MFP) is the measure; it measures aggregate output relative to aggregate inputs; see Athiyaman, A. (2019). Determinants of Economic Growth in Illinois: An Empirical Analysis. *Research Brief*, 1(2), 1-4. Available online: http://www.instituteintelligence.com/wp-content/uploads/2019/08/IL-Growth_2019_v1_2.pdf.

1910-2007[5]. The question is whether this growth was shared by producers of all backgrounds, for example, White, Black, and Asian. The news story suggests that the answer is likely to be a "no". In the following pages we examine published data on Illinois agriculture to gain insights into the issue. If there is evidence that the race of the farmer impacts farm productivity, then we can theorize about race impacts on productivity and test propositions using a variety of data, including textual information.

Illinois Agriculture

Table 1 highlights some of the attributes of Illinois farms. For example, of the 72,651 farms in the state, a majority are crop farms (73%) and each farm harvests around 427 acres of crops. The producers are predominantly White (98%) and male (71%). The modal age group of the producer is 55-64 and a majority have lived in the farm for 10 years or more.

[5] Alston, J. M. (2010). *Persistence Pays: U.S. Agricultural Productivity Growth and the Benefits from Public R&D Spending.* New York: Springer.

Table 1: Illinois Farms: Salient Attributes

Attribute	Value
Total number of farms	72,651
- Total acres	27,006,288
Number of crop farms	53,188
- Cropland acres	22,701,382
Total number of producers	118,141
- Male	84,134
- Female	34,007
Place of residence – on farm	74,788 (63% of all producers)
Primary Occupation - Farming	51,281 (43% of all producers)
10 years or more in present farm	88,287 (75% of total producers)
Producer Age	
- Under 25 years	1,406
- 25 - 34	8,452
- 35-44	12,764
- 45-54	19,959
- 55-64	32,986 (Modal value)
- 65-74	26,087
- 75 and Over	14,763
Producer Race	
- White	115,605 (98% of all producers)
- Hispanic	934
- African American	229
- Asian	160

Note: Data are from 2017 Census of Agriculture.

To explore farm productivity by race, we integrate data from the BEA, US Census of Agriculture and ACS Public Use Microdata Sample. Data are presented at two levels: macro analysis for all races, and meso or mid-tier analysis of productivity for each of the major racial divisions: White, African American, and Asian.

Macro Analysis

Table 2 shows farm earnings for 2017 and 2020. In 2020, product sales posted a 0.4% increase over the 2017 figures[6]; during the same period, government payments to farms increased by 371% - from $540.5mil in 2017 to $2.54bil in 2020[7]. Corporate

[6] Product sales growth for the nation's farms registered a 2% growth from 2017 to 2020.

[7] For all US farms, government payments increased by 343%; from $10.235bil in 2017 to $45.29bil in 2020.

farms gained the most; their net income increased by 440%, from 2017 to 2020[8].

Table 2: Farm Earnings: 2017 and 2020 (See Appendix 1 for Variable Definitions)

Description	2017	2020
Cash from Product Sales +	$16,184,696,000	$16,250,654,000
Other income	$1,476,348,000	$3,887,102,000
Government payments	$540,517,000	$2,545,624,000
Cash receipts and other income	$17,661,044,000	$20,137,756,000
Realized net income	$1,588,364,000	$4,989,091,000
Plus: Value of inventory change	$387,341,000	$715,849,000
Equals: Net income including corporate farms	$1,975,705,000	$5,704,940,000
Less: Net income of corporate farms	$135,210,000	$730,413,000
Plus: Statistical adjustment	$1,000	$9,000
Equals: Farm proprietors' income	$1,840,496,000	$4,974,536,000
Plus: Farm wages and salaries	$411,259,000	$431,411,000
Plus: Farm supplements to wages and salaries	$96,832,000	$126,742,000
Equals: Farm earnings	$2,348,587,000	$5,532,689,000

Source: BEA, Table SAINC45.
Note: +: Consist of the gross revenue received by farmers from the sale of crops, livestock, and livestock products and of the value of defaulted loans made by Commodity Credit Corporation (CCC) and secured by crops.

Table 3 highlights production costs for the 2017 and 2020 time periods; the ACGRs were computed using data for the 1969-2020 time period (Appendix 2). Overall, production expenses grew at a compound rate of 4% per annum; product sales grew at a rate of 3% and other income at 5%. If farm productivity is conceptualized as total output over total inputs, that is,

$$\frac{Y}{(\mathrm{I}+\mathrm{L}+\mathrm{K})}$$

where, Y = gross output, I = intermediate input, L = labor, and K = capital input, then productivity increased from 1.16 in 2017 to 1.29 in 2020[9].

Partial productivity indices for labor and intermediate inputs are:

$$PP_{\text{Labor},2017} = \frac{Y}{L} = 13.68 \text{ and}$$
$$PP_{\text{Labor},2020} = \frac{Y}{L} = 16.13 ;$$
$$PP_{I,2017} = \frac{Y}{I} = 1.32 \text{ and}$$
$$PP_{I,2020} = \frac{Y}{I} = 1.49.$$

[8] US corporate farms gained 240% in income from 2017 to 2020.

[9] This is a proxy for TFP or total factor productivity; not all metrics for K are included in the analysis.

Table 3: Production Expenses, 2017 and 2020; ACGRs are for 1969-2020

Description	2017	2020	ACGR
Production expenses	$16,072,680	$15,148,665	4%
Feed purchased	$1,000,000	$788,720	2%
Livestock purchased	$490,418	$600,663	1%
Seed purchased	$2,020,000	$1,824,506	6%
Fertilizer and lime	$2,850,000	$3,056,120	5%
Petroleum products purchased	$543,802	$501,163	3%
Hired farm labor expenses	$695,715	$741,848	3%
All other production expenses	$8,472,745	$7,635,645	4%

Source: BEA, Table SAINC45.

In summary, government financial assistance played a major role in boosting overall farm productivity in 2020.

Meso Analysis

Majority of non-whites own farms that are less than 50 acres in size; for example, 63% of African Americans, 60% of Asians, and 90% of Pacific Islanders own less than 50 acres. The opposite is true for the Whites, 64% own more than 50 acres (Table 4). This disparity in farm size among races is reflected in farm outputs; a typical, minority farm gross less than $10,000 in sales, including government assistance (Tables 4 and 5).

Table 4: White versus Minority Producers: Farm Characteristics

Attribute	American Indian	Asian	African American	Pacific Islander	White
Number of farms	105	128	156	21	72,299
Size (acres):					
➢ 1-9	22(21%)	20(16%)	52(33%)	3(14%)	7,913(11%)
➢ 10-49	40(38%)	57(44%)	47(30%)	16(76%)	17,800(25%)
➢ 50-179	30(29%)	29(23%)	28(18%)	2(10%)	19,114(26%)
➢ 180-499	3(3%)	8(6%)	17(11%)	0	12,223(17%)
➢ 500 +	10(9%)	14(11%)	12(8%)	0	15,249(21%)
Ownership:					
➢ Owned	101	124	142	15	66,294
Economic Class:					
➢ <$1,000	26(25%)	29(23%)	38(24%)	8(38%)	6,861(9%)
➢ $1000-2499	12(11%)	8(6%)	25(16%)	1(5%)	7,023(10%)
➢ $2500-4999	16(15%)	28(22%)	11(7%)	0	7,156(10%)
➢ $5000-9999	22(21%)	11(8%)	20(13%)	7(33%)	7,718(11%)
➢ $10000-24999	8(8%)	14(11%)	15(10%)	1(5%)	7,954(11%)
➢ $25000-49999	4(4%)	6(5%)	17(11%)	4(19%)	5,580(8%)
➢ $50000+	17(16%)	32(25%)	30(19%)	0	30,007(41%)
Commodity Credit Corp. Loans	0	4	0	0	959
Cons. Reserve[1]	30	31	21	3	25,288
Other Fed Payments	28	36	32	2	39,623
Legal Type:					
- Household	105	120	144	21	68,218
- Ltd. Co.	9	11	15	0	2,473
# of Households[2]					
- one	98	98	129	20	54,754
- More than one	7	30	27	1	17,545

Note: 1 = Conservation reserve, Wetland reserve, Farmable wetlands, or Conservation reserve enhancement programs payments;
2 = Farms by number of households sharing in net income of operations.
Source: 2017 Census of Agriculture.

Table 5 shows the average “other income” receipts for farms owned and/or operated by different races. On average, farms operated by the Whites received more conservation-programs payments and other types of federal program payments. Farms run by

Asians had the highest average Commodity Credit Corp. loans. Overall, African Americans had the least amount of conservation program payments and 44% less than the Whites in other federal farm program payments.

Table 5: Other Farm Income Classified by Producers' Race: Average Values

	American Indian	Asian	African Americans	Pacific Islanders	White
CCC loan assistance	0	$8,578	0	0	$1,576
Conservation Reserve, Wetlands Reserve, Farmable Wetlands, or Conservation Reserve Enhancement Programs payments	$1,305	$1,156	$1,058	NA	$1,984
Other Federal farm program payments	$610	$3,133	$2,929	NA	$5,201

Note: NA = Not Available.

Although farm productivity data for races are unavailable[10], it is possible to gain some insights into farm productivity using concepts from the strategy literature[11]. Think of each farm as receiving a cost function on entry and there is causal ambiguity as to what factors of production drive farm success. I contend that a college educated producer should have the necessary skills to gain access to information on costs of inputs and selling prices of outputs, and thus would overcome any causal ambiguity related to productivity[12]. Now the question becomes, how is human capital distributed across the races.

Data from the ACS Public Use Microdata Sample, 2020, were used to address the question[13]. Self-employed persons in agriculture were the unit of analysis. Only two racial groups were represented: Asian and White. As shown in Table 6, a majority of self-employed, Asian producers had less than high school education. In contrast, 60% of White farmers, both male and female, had at least some college education and 34% of the college-educated had agriculture degrees. This suggests that minority producers lag behind White producers on productivity.

[10] 2017 Census of Agriculture doesn't provide information to estimate farm productivity by producer's race. In fact, as far as I am aware, there is little or no published data on the subject.

[11] See Andres, K. R. (1971). *The Concept of Corporate Strategy*. Homewood, IL: Dow Jones Irwin.

[12] Athiyaman, A. (2019). Determinants of Sustainability and Human Capital. Research Brief, 1(6), 1-20. Available online: http://www.instituteintelligence.com/wp-content/uploads/2019/08/HumanCapital_IL_v16.pdf.

[13] The analysis was limited to Illinois; a total of 420 records representing 27,636 cases were used in the analysis.

Table 6: Human Capital: Asian and White Self-Employed in Agriculture

Race	Level of Education	%
Asian, Male (N=240)	Less than high school	59
	High school diploma	41
White, Male (N=23,006)	Less than high school	5%
	High school diploma	34%
	Some college	17%
	Associate degree	18%
	Bachelor's degree and higher	25%
White, Female (N=3,027)	Less than high school	5%
	High school diploma	36%
	Some college	29%
	Associate degree	15%
	Bachelor's degree and higher	15%

Summary and Conclusion

This paper explores variations in agricultural productivity among Illinois farmers of different races. Data from the 2017 Census of Agriculture, BEA, and ACS PUMS were used to gain insights into the topic. Results of data analysis suggest that:

1. Of the 72,651 farms in the state, a majority are crop farms (73%); the producers are predominantly White (98%) and male (71%);
2. Majority of minority, non-white farmers own farms that are less than 50 acres in size; the opposite is true for the Whites, 64% own more than 50 acres of farm land;
3. On average, farms operated by Whites receive more conservation-programs payments and other federal program payments;
4. African Americans receive the least amount of conservation program payments and 44% less payments than Whites of all other federal farm program payments, and

5. Human capital is low among minority farmers; a majority of self-employed, Asian farmers (producers) has less than a high school education; in contrast, 60% of White farmers, both male and female, has at least some college education.

Lack of data on minority farmers is a major constraint to learn about the impact of producer's race on farm productivity, econometrically. We know that farm size and agricultural income are lower for African Americans, Asians, and other minorities. We also know that human capital is a determinant of productivity and that the level of education is lower among minorities. Other than these correlates, nothing could be said about systemic barriers such as racial bias that could nullify the impact of, for example, knowledge, skills, and assets of racial minorities on business success. Research is needed to fill this gap in knowledge.

Appendix 1: Income and Production Expenses: Key Variables and their Definitions

Variable	Definition
Cash receipts from marketing	Consist of the gross revenue received by farmers from the sale of crops, livestock, and livestock products and of the value of defaulted loans made by Commodity Credit Corporation (CCC) and secured by crops.
Government payments	Federal government payments to farm operators consist of deficiency payments under price support programs for specific commodities, disaster payments, conservation payments, and direct payments to farmers under federal appropriations legislation. The estimates of government payments are based on USDA national and state estimates of direct government payments.
Production expenses	Farm production expenses consist of purchases of feed, livestock and poultry, seed, fertilizer, agricultural chemicals and lime, and petroleum products; labor expenses; machinery rental and custom work; animal health costs; and all other expenses including depreciation. BEA adjusts the USDA state estimates of production expenses to account for methodological differences in the treatment of depreciation and to conform to BEA definitions and classifications.
Value of inventory change	The value of inventory change is the estimated value of the net change in the farm inventories of livestock and crops that are held for sale during a given calendar year. This estimate is added to the estimate of realized net income so that the estimate of farm proprietors' income for a given year will include only the farm income from production during that year, or from "current" production.

Appendix 2: Annual Compound Growth Rates: Income and Production Expenses

Description	ACGR (1969-2020)
Cash receipts from marketing	3%
Cash receipts: Livestock and products	1%
Meat animals and other livestock	1%
Cattle and calves	1%
Hogs and pigs	2%
Sheep and other livestock	1%
Dairy products	1%
Poultry and poultry products	2%
Cash receipts: Crops	4%
Total grains	4%
Corn	4%
Oats	-2%
Sorghum	4%
Wheat	3%
Soybeans	4%
Other grains	3%
Hay, silage, etc.	4%
Fruits and nuts	2%
Forest and maple products	NA
Tobacco	NA
Cotton	NA
Other crops	4%
Other income	5%
Government payments	5%
Imputed and miscellaneous income received	6%
Production expenses	4%
Feed purchased	2%
Livestock purchased	1%
Seed purchased	6%
Fertilizer and lime (incl. ag. chemicals 1978-fwd.)	5%
Petroleum products purchased	3%
Hired farm labor expenses	3%
All other production expenses	4%
Value of inventory change	NA
Value of inventory change: livestock	1%
Value of inventory change: crops	NA
Value of inventory change: materials and supplies	NA
Derivation of farm proprietors' income and earnings	NA
Cash receipts and other income	4%
Less: Production expenses	4%
Equals: Realized net income	3%
Plus: Value of inventory change	NA
Equals: Net income including corporate farms	4%

Appendix 2: Annual Compound Growth Rates: Income and Production Expenses

Description	ACGR (1969-2020)
Less: Net income of corporate farms	8%
Plus: Statistical adjustment	-2%
Equals: Farm proprietors' income	4%
Plus: Farm wages and salaries	3%
Plus: Farm supplements to wages and salaries	6%
Equals: Farm earnings	4%

Note: ACGR computations are based on exponential growth rates.

APPENDIX 4

FOREIGN BUSINESSES IN THE AGRICULTURAL SECTOR IN ILLINOIS

Research Brief,

Short Paper

Vol. 4, No. 12

(2022, June 28)

The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.

Western Illinois University

Foreign Businesses in the Agricultural Sector In Illinois

ISSN 2687-8844

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Abstract

Fourteen overseas companies operate 27 subsidiaries in the state. The typical parent company has been in business since 1954, employs 23,500 people, and has an annual revenue of $10.03bil. The 27 subsidiaries function in 50 different industries; slightly more than 40% of the firms function in the livestock industry. The question is whether foreign business investments will displace the "local" farmer. Using risk computations from modern finance theory, *I conclude that foreign business takeover of Illinois agricultural land is unlikely to happen.*

Introduction

The Agricultural Foreign Investment Disclosure Act (FIDA) of 1978 requires foreign persons: individuals, firms, or other legal entities such as a 'trust', to provide information about acreages acquired or transferred in the US[2]. Data on these filings are available to the public in the aggregate; for example, 'total acres purchased by foreigners' in a county can be obtained from the USDA, longitudinally, starting 2004[3]. While these "reports" can be used to assess changes in foreign ownership of land at the county level, information about the type of owner, for example, subsidiary of a foreign company, size of the parent company, etc. are not available.

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[1] Professor, Illinois Institute for Rural Affairs, Western Illinois University.
[2] Data are collected using the form FSA-153; See, https://forms.sc.egov.usda.gov/efcommon/eFileServices/eForms/FSA153.PDF.
[3] See, http://www.fsa.usda.gov/programs-and-services/economic-and-policy-analysis/afida/index.

This paper fills this gap in knowledge. Specifically, it highlights the characteristics of foreign firms investing in the agriculture sector in Illinois. Also, using data on private holdings of agricultural land, the paper highlights the 'risk' of increases in foreign ownership of agricultural land in Illinois.

Conceptual Framework

The question of interest is "why firms invest abroad". The theory of the firm suggests that firms exist to maximize shareholder value[4]. Shareholder value is maximized by minimizing, if not eliminating, two risks: systematic or market risk and unsystematic or unique risk[5]. Thus, either a market turbulence or the occurrence of a firm-specific event can impact firm performance. One solution to managing risk is diversification; a diversified firm is susceptible only to market risk; unique risk is diversified away[6].

The market risk for investment in Illinois agriculture can be gleaned from data on farm real estate. As shown in Table 1, the average farmland value per acre in Illinois is the highest in the tri-states region, 2021 estimates. Also, Illinois boasts the highest annual compound growth rate (ACGR) in land value (Table 1).

Table 1: Farm Real Estate, Average Value ($) Per Acre: Illinois, Indiana, and Iowa, 2017-2021[7]

State	2017	2018	2019	2020	2021	ACGR
Illinois	7,160	7,280	7,280	7,400	7,900	2.46%
Indiana	6,580	6,580	6,580	6,600	7,100	1.90%
Iowa	7,350	7,270	7,190	7,070	7,740	1.29%

The metrics in Table 1 suggest that Illinois could be a prime target for foreign investments in agricultural land; a recent news report claims that foreign "investors are driving up farmland prices so the next generation of farmers cannot buy the land they need"[8].

[4] See, for example, Weitzman, M. (2003). *Income, Wealth, and the Maximum Principle*. Cambridge, MA: Harvard University Press.
[5] Van Horne, J. C. (1980). *Financial Management and Policy*. 5th ed. Englewood Cliffs, NJ: Prentice Hall.
[6] Bowman, R.G. (1979). The theoretical relationship between systematic risk and financial variables. *Journal of Finance*, 34, 617-630.
[7] Land Values 2021 Summary (August 2021) 21 USDA, National Agricultural Statistics Service.
[8] Foreign farmland ownership rising, *The Telegraph*, June 12, 2022. Available: https://www.thetelegraph.com/news/article/Foreign-farmland-ownership-rising-17236479.php.

Methodology

Data on foreign agricultural firms with subsidiaries in Illinois were obtained from Uniworld Business Publications[9]; the search for foreign subsidiaries operating in Illinois was conducted using the two-digit, NAICS code for agriculture, NAICS 11. Timeseries data on foreign landholdings at the county level were obtained from the USDA's Farm Service Agency reports[10]. Longitudinal data on county GDP and ACGRs were extracted from an earlier *Research Brief*[11].

Data analysis involved computation of descriptive statistics for all relevant variables, five-number summary, crosstabulations, and content analysis of company descriptions.

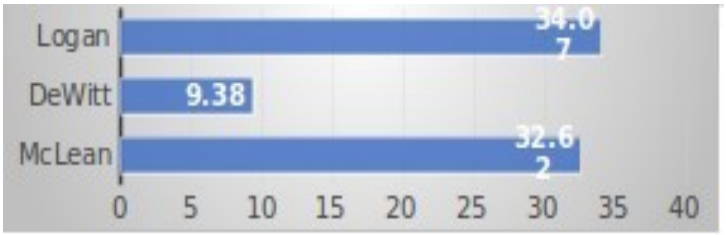
Findings

In 2017, foreign ownership of agricultural land in Illinois counties averaged 1151 acres. It increased to 1673 acres in 2020; a 12.47% annual compound growth rate. Counties with the most growth in foreign acquisition of agricultural land include Clay and Cumberland. McLean County had the most acres under foreign ownership, both in 2017 and 2020; Schuyler County had the least, 7 acres in 2020 (Table 2). Appendix 1 lists foreign acreage and ACGR data for all the counties.

Table 2: Foreign Ownership of Ag Land

(i) Counties with the Most Foreign Ag Ownership in 2020 and ACGRs, %, 2017-2020

	Acres	
County	**2017**	**2020**
McLean	98,448	261,923
DeWitt	40,885	54,169
Logan	13,820	38,401



[9] https://uniworldonline.com/.
[10] Same reference as footnote 3.
[11] Athiyaman, A. (2022). Rural Illinois in numbers: Content-valid indicators for governance. *Research Brief*, 4(11), June 16, 1-59. Available: http://www.iira.org/wp-content/uploads/2022/06/Rural-Illinois-in-Numbers-Content-Valid-Indicators-for-governance_RB4_11_2.pdf.

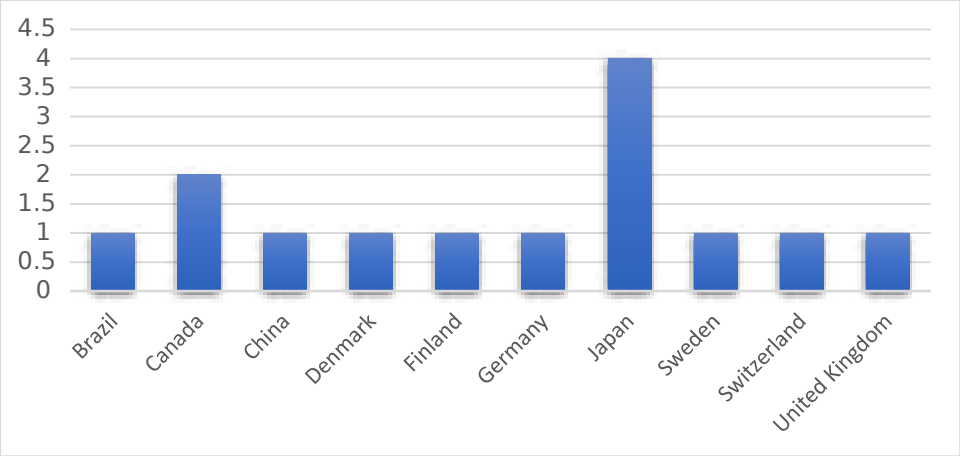
(ii) Counties with the Largest ACGRs, 2017-2020

County	ACGR	2017 Foreign Acreage	2020 Foreign Acreage
Clay	160%	50	6,137
Cumberland	160%	17	2,083
Woodford	88%	1,833	25,341
Cass	79%	267	2,841
Warren	50%	2,394	10,690

Parent Companies:

Fourteen overseas companies operate 27 subsidiaries in the state. Japan is the leading operator with four parent companies. Geographically, it is the European nations that operate the most subsidiaries in the agricultural sector in Illinois, 57% (Figure 1 and Appendix 2).

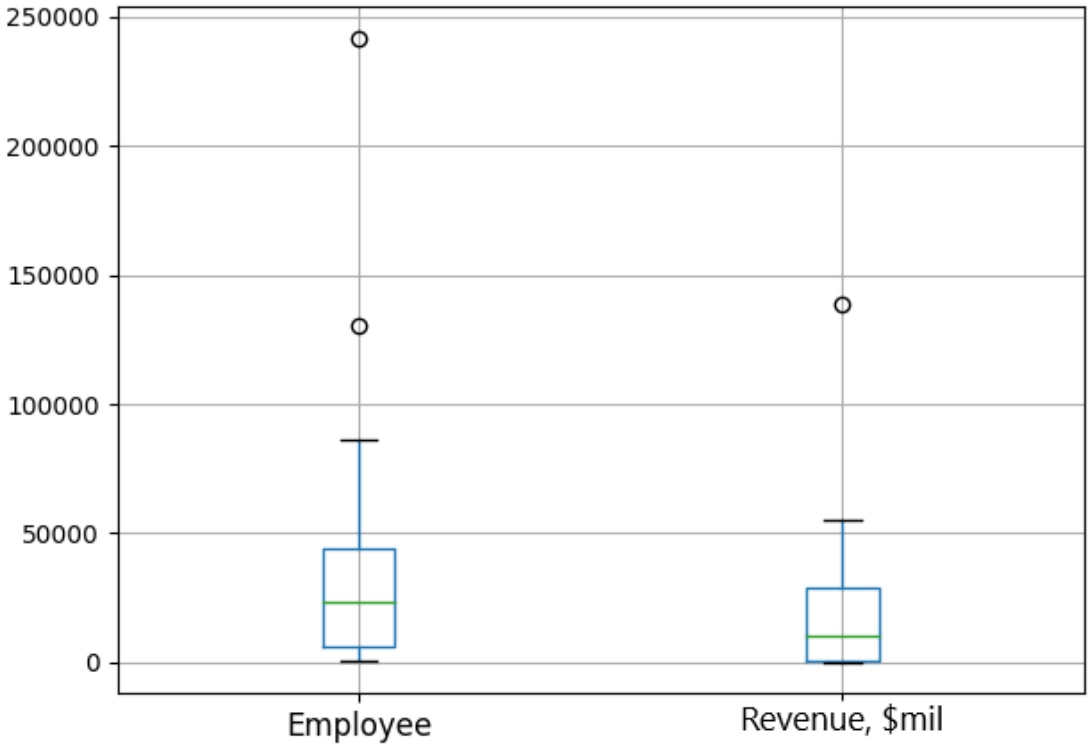
Figure 1: Geographical Locations of Parent Companies of Ag Firms in Illinois



The typical parent company has been in business since 1954, employs 23,500 people, and has an annual revenue of $10.03bil (Figure 2). The Brazilian firm, JBS SA, has the most employees, 242,000. The Mitsubishi Corporation of Japan boasts the most revenue, $139bil[12]. The oldest firm is John Swire & Sons Ltd; it has been in business for more than two centuries (Appendix 2)

[12] The correlation between the two firm size indicators is positive (r=0.41) and statistically significant, t = 1.85, p<0.05.

Figure 2: Size of the Parent Firms: Box Plots of Employee Numbers and Revenue



Note: Descriptive statistics, 5-number summary:
Employee Numbers: Minimum value = 650; Quartile 1 = 6072; Median = 23500; Quartile 3: 44102; Maximum value: 242,000.
Revenues ($mil): Minimum value = 193; Quartile 1 = 664; Median = 10,029; Quartile 3: 29,000; Maximum value: 139,000.

Foreign Subsidiaries

The 27 subsidiaries function in 50 different industries. Slightly more than 40% of the firms function in the livestock sector, for example, beef cattle ranching, goat farming, hog and pig farming, and chicken egg production. Crops including nursery and greenhouse crops account for 30% of the activities, and farm management services are the focus for 16% of the foreign subsidiaries (Table 3).

Table 3: Business Activities of the Foreign Subsidiaries

Industry	Percentage of Firms
NAICS 115210: Support activities for animal farming	14%
NAICS 112111: Beef cattle ranching and farming	10%
NAICS 113210: Forest nursery and gathering forest products	8%
NAICS 111191: Oilseed and grain combination farming	8%
NAICS 112420: Goat farming	6%
NAICS 111930: Sugarcane farming	6%
NAICS 112519: Aquaculture	6%
NAICS 111140: Wheat farming	6%
NAICS 111920: Cotton farming	6%
NAICS 113110: Timber tract operations	6%
NAICS 112410: Chicken egg production	6%
NAICS 115112: Soil preparation, planting, and cultivating	6%
NAICS 111998: All other miscellaneous crop	2%
NAICS 112112: Cattle feedlots	2%
NAICS 115116: Farm management services	2%
NAICS 112210: Hog and pig farming	2%
NAICS 111160: Rice farming	2%
NAICS 113310: Logging	2%
Total	100% (N = 50)

Summary and Conclusion

In 2017, foreign ownership of agricultural land in Illinois counties averaged 1151 acres. It increased to 1673 acres in 2020; a 12.47% annual compound growth rate. Fourteen overseas companies operate 27 subsidiaries in the state. The typical parent company has been in business since 1954, employs 23,500 people, and has an annual revenue of $10.03bil. The 27 subsidiaries function in 50 different industries. Slightly more than 40% of the firms function in the livestock industry.

The descriptive analysis shows that large overseas firms are more likely to invest in Illinois agriculture. The question is whether these types of investments will displace the “local” farmer. Modern finance theory helps us to address this question, albeit at a macro level, using the risk indicator, *Ai*:

$A_i = \frac{\sigma_{i,m}}{\sigma_m^2}$., where, *i* is the ACGR of foreign land ownership in Illinois counties and *m* is the growth rate of county GDP.

For Illinois agriculture, I estimate A_i at 2.22, using data from Appendix 3. An index greater than 1 indicates a riskier investment.

In conclusion, foreign business takeover of Illinois ag land is unlikely to happen.

Appendix 1: Foreign Ownership of Ag Land in Illinois Counties and ACGRS: 2017 and 2020

County	Acres_2017	Acres_2020	ACGR
Adams	899	899	0.00%
Alexander	2462	2403	-0.81%
Bond	224	224	0.00%
Boone	493	493	0.00%
Brown	466	466	0.00%
Bureau	17105	17106	0.00%
Carroll	1108	1108	0.00%
Cass	267	2841	78.82%
Champaign	10701	12021	3.88%
Christian	11270	37564	40.13%
Clark	0	160	NA
Clay	50	6137	160.34%
Clinton	160	160	0.00%
Coles	599	2270	44.41%
Cook	293	322	3.15%
Crawford	60	60	0.00%
Cumberland	17	2083	160.28%
DeKalb	8481	10104	5.84%
De Witt	40885	54169	9.38%
Douglas	4289	13011	36.99%
DuPage	273	273	0.00%
Edgar	565	1974	41.70%
Edwards	30	30	0.00%
Fayette	235	399	17.65%
Ford	29252	29580	0.37%
Franklin	5918	5918	0.00%
Fulton	760	800	1.71%
Greene	6984	7477	2.27%
Grundy	14961	14998	0.08%
Hamilton	5370	5370	0.00%
Hancock	2817	3151	3.73%
Hardin	650	650	0.00%
Henderson	1711	1711	0.00%
Henry	5608	5632	0.14%
Iroquois	29754	30047	0.33%
Jackson	1151	1151	0.00%
Jefferson	118	118	0.00%
Jersey	1420	1500	1.83%
Jo Daviess	487	532	2.95%

County	Acres_2017	Acres_2020	ACGR
Johnson	280	280	0.00%
Kane	931	1025	3.21%
Kankakee	3771	4085	2.67%
Kendall	2554	2554	0.00%
Knox	259	300	4.90%
Lake	440	440	0.00%
LaSalle	14135	14556	0.98%
Lawrence	13	13	0.00%
Lee	5518	10142	20.29%
Livingston	19047	19387	0.59%
Logan	13820	38401	34.07%
McDonough	16625	17064	0.87%
McHenry	3346	3455	1.07%
McLean	98448	261923	32.62%
Macon	28504	28566	0.07%
Macoupin	1611	2107	8.95%
Madison	711	711	0.00%
Marion	363	363	0.00%
Marshall	696	696	0.00%
Mason	3242	3242	0.00%
Massac	2345	2345	0.00%
Menard	374	374	0.00%
Mercer	1319	2882	26.05%
Monroe	680	680	0.00%
Montgomery	1302	1302	0.00%
Morgan	641	641	0.00%
Moultrie	2839	2839	0.00%
Ogle	6957	6992	0.17%
Peoria	120	120	0.00%
Perry	793	793	0.00%
Piatt	11619	16202	11.08%
Pike	97	219	27.15%
Pope	976	976	0.00%
Pulaski	2274	2274	0.00%
Putnam	78	78	0.00%
Randolph	1673	1673	0.00%
Richland	39	39	0.00%
Rock Island	385	539	11.22%
St. Clair	202	894	49.58%
Sangamon	1059	1239	5.23%
Schuyler	7	7	0.00%
Scott	1252	1252	0.00%

County	Acres_2017	Acres_2020	ACGR
Shelby	553	756	10.42%
Stark	827	1047	7.86%
Stephenson	9524	9524	0.00%
Tazewell	2644	2644	0.00%
Union	1497	1497	0.00%
Vermilion	10754	10792	0.12%
Warren	2394	10690	49.88%
Wayne	11516	12587	2.96%
White	0	4562	NA
Whiteside	414	696	17.32%
Will	1093	1097	0.12%
Williamson	1283	1283	0.00%
Winnebago	2203	2712	6.93%
Woodford	1833	25341	87.55%

Appendix 2: List of Parent Companies of Ag Firms, Subsidiaries, Operating in Illinois

Company	City	Country	Founded	Employee	Annual Revenue (mil)	Company Type
AJINOMOTO CO., INC.	Tokyo	Japan	1908	32509	10100	Public
CANOPY GROWTH CORPORATION	Smiths Falls	Canada	2013	4430	483	Public
COFCO INTERNATIONAL	Chene-Bougeries	Switzerland	1993	11000	31000	Private
DANISH CROWN FOODS	Randers	Denmark	1887	23000	9958	Private
DELAVAL INTERNATIONAL AB	Tumba	Sweden	1878	2500	1206	Private
FIRSTSERVICE CORPORATION	Toronto	Canada	1989	24000	2407	Public
GEA FARM TECHNOLOGIES GMBH	Bonen	Germany	1881	650	193	Private
JBS SA	Sao Paulo	Brazil	1953	242000	36785	Public
JOHN SWIRE & SONS LIMITED	London	United Kingdom	1816	130716		Private
MARUBENI CORPORATION	Tokyo	Japan	1858	45470	55306	Public
MITSUBISHI CORPORATION	Tokyo	Japan	1954	86098	139000	Public
TOMOEGAWA PAPER CO., LTD.	Tokyo	Japan	2006	1460	310	Public
UPM KYMMENE CORPORATION (UPM)	Helsinki	Finland	1996	18700	11993	Public
WANXIANG GROUP CORPORATION	Hangzhou	China	1969	40000	23000	Private

Appendix 3: Data for Systematic Risk Analysis

County	Acres_2017	Acres_2020	ACGR	Gdp_2017	Gdp_2020	ACGR_GDP
Adams	899	899	0.00%	3135910	3004617	-0.0143
Alexander	2462	2403	-0.81%	151111	147920	-0.0071
Bond	224	224	0.00%	500923	505790	0.0032
Boone	493	493	0.00%	1567478	1608551	0.0086
Brown	466	466	0.00%	422319	455980	0.0256
Bureau	17105	17106	0.00%	1203867	1139625	-0.0183
Carroll	1108	1108	0.00%	553035	563373	0.0062
Cass	267	2841	78.82%	584011	593363	0.0053
Champaign	10701	12021	3.88%	10135840	9763130	-0.0125
Christian	11270	37564	40.13%	1523876	1265823	-0.0618
Clark	0	160	0.00%	527166	525463	-0.0011
Clay	50	6137	160.34%	526895	526389	-0.0003
Clinton	160	160	0.00%	999175	954844	-0.0151
Coles	599	2270	44.41%	2227308	2159678	-0.0103
Cook	293	322	3.15%	353801813	344457109	-0.0089
Crawford	60	60	0.00%	2151895	1822658	-0.0554
Cumberland	17	2083	160.28%	962765	924839	-0.0134
DeKalb	8481	10104	5.84%	3688459	3802486	0.0101
De Witt	40885	54169	9.38%	1094477	1187292	0.0271
Douglas	4289	13011	36.99%	1023955	986847	-0.0123
DuPage	273	273	0.00%	83841990	81986150	-0.0075
Edgar	565	1974	41.70%	759380	728315	-0.0139
Edwards	30	30	0.00%	280106	255189	-0.0311
Fayette	235	399	17.65%	533581	497287	-0.0235
Ford	29252	29580	0.37%	581718	663646	0.0439
Franklin	5918	5918	0.00%	1034331	876961	-0.055
Fulton	760	800	1.71%	854009	773353	-0.0331
Greene	6984	7477	2.27%	294211	284648	-0.011
Grundy	14961	14998	0.08%	3569733	4059818	0.0429
Hamilton	5370	5370	0.00%	392665	291875	-0.0989
Hancock	2817	3151	3.73%	538605	515392	-0.0147
Hardin	650	650	0.00%	78733	70567	-0.0365
Henderson	1711	1711	0.00%	169167	167726	-0.0029
Henry	5608	5632	0.14%	1340740	1382530	0.0102
Iroquois	29754	30047	0.33%	1065782	1051553	-0.0045
Jackson	1151	1151	0.00%	2248751	2164357	-0.0128
Jefferson	118	118	0.00%	1795705	1657999	-0.0266
Jersey	1420	1500	1.83%	467011	463177	-0.0027
Jo Daviess	487	532	2.95%	752904	711418	-0.0189
Johnson	280	280	0.00%	201367	213340	0.0193

Kane	931	1025	3.21%	24151876	23946745	-0.0028
Kankakee	3771	4085	2.67%	5432958	5658125	0.0135
Kendall	2554	2554	0.00%	3241171	3375378	0.0135
Knox	259	300	4.90%	1643344	1583351	-0.0124
Lake	440	440	0.00%	55318009	54706679	-0.0037
LaSalle	14135	14556	0.98%	5347355	5225406	-0.0077
Lawrence	13	13	0.00%	521480	537410	0.01
Lee	5518	10142	20.29%	1433989	1464440	0.007
Livingston	19047	19387	0.59%	1683287	1786360	0.0198
Logan	13820	38401	34.07%	938916	948474	0.0034
McDonough	16625	17064	0.87%	1086669	985645	-0.0325
McHenry	3346	3455	1.07%	10965496	10170115	-0.0251
McLean	98448	261923	32.62%	13138760	12822459	-0.0081
Macon	28504	28566	0.07%	6161686	5589315	-0.0325
Macoupin	1611	2107	8.95%	1123377	1054833	-0.021
Madison	711	711	0.00%	12181624	12986578	0.0213
Marion	363	363	0.00%	1226948	1152914	-0.0207
Marshall	696	696	0.00%	351628	365992	0.0133
Mason	3242	3242	0.00%	515810	373756	-0.1074
Massac	2345	2345	0.00%	547010	542130	-0.003
Menard	374	374	0.00%	217891	223795	0.0089
Mercer	1319	2882	26.05%	391238	388188	-0.0026
Monroe	680	680	0.00%	864854	818856	-0.0182
Montgomery	1302	1302	0.00%	1204467	907371	-0.0944
Morgan	641	641	0.00%	1392734	1444379	0.0121
Moultrie	2839	2839	0.00%	660849	816150	0.0704
Ogle	6957	6992	0.17%	2528865	2619663	0.0118
Peoria	120	120	0.00%	11419973	11181923	-0.007
Perry	793	793	0.00%	565480	579709	0.0083
Piatt	11619	16202	11.08%	471374	499961	0.0196
Pike	97	219	27.15%	496626	508290	0.0077
Pope	976	976	0.00%	60049	55919	-0.0238
Pulaski	2274	2274	0.00%	210206	149905	-0.1127
Putnam	78	78	0.00%	319178	315308	-0.0041
Randolph	1673	1673	0.00%	1424631	1254990	-0.0423
Richland	39	39	0.00%	576012	544301	-0.0189
Rock Island	385	539	11.22%	9253888	9105484	-0.0054
St. Clair	202	894	49.58%	10764103	10421418	-0.0108
Sangamon	1059	1239	5.23%	10076814	9734977	-0.0115
Schuyler	7	7	0.00%	237707	232053	-0.008
Scott	1252	1252	0.00%	143507	144811	0.003
Shelby	553	756	10.42%	695309	784017	0.04
Stark	827	1047	7.86%	197426	209655	0.02

Stephenson	9524	9524	0.00%	1727785	1697006	-0.006
Tazewell	2644	2644	0.00%	5993560	4818375	-0.0727
Union	1497	1497	0.00%	369211	377182	0.0071
Vermilion	10754	10792	0.12%	3019062	2920343	-0.0111
Warren	2394	10690	49.88%	751131	738545	-0.0056
Wayne	11516	12587	2.96%	410674	401315	-0.0077
White	0	4562	0.00%	534577	485263	-0.0323
Whiteside	414	696	17.32%	1959959	1920402	-0.0068
Will	1093	1097	0.12%	30659654	30663731	0
Williamson	1283	1283	0.00%	2693221	2587496	-0.0133
Winnebago	2203	2712	6.93%	12689835	11654778	-0.0284
Woodford	1833	25341	87.55%	1067386	1067716	0.0001

APPENDIX 5

AN EMPIRICAL ANALYSIS OF FARM TENANCY IN ILLINOIS AND TWEETS ABOUT FARM TENANCY

Research Brief,

Short Paper

Vol. 4, No. 13

(2022, July 5)

The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.

Western Illinois University

An Empirical Analysis of Farm Tenancy in Illinois and Tweets about Farm Tenancy

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Abstract

This paper explores Illinois farm tenancy using both published quantitative data and qualitative Tweets. Results of data analysis suggest that in 2020 eight percent of Illinois farms had tenant farmers; sixty two percent of the tenant farmers were male and a majority of tenants rented less than 100 acres of land. Revenue growth for tenant farms is positively correlated with the size of the land; larger the leased land, larger is the revenue growth. Twitterati harbor positive sentiments about farm tenancy. The paper concludes with a call for micro data analysis of farm tenancy data.

Introduction

The phrase “landlord and tenant” implies differences in affluence and power between the two positions. These concepts may not be relevant for the farming sector in Illinois. For example, in 2020, 63% of Illinois’ farms were farmed by full owners and 29% by part owners who also rented farmland from others; the tenant farmer as a category of “tenure” is disappearing fast; from 31% in 1964 to a low 8% in 2020 (Table 1).

Table 1: Farms by Tenure: Data Comparisons for Illinois Farms

	1964	1974	…	2012	2017	2020
Full owners	41%	50%		59%	61%	63%
Part owners	28%	30%		32%	31%	29%
Tenants	31%	20%	…	10%	8%	8%
No. of Farms	1342,352	115,059		75,087	72,651	71,100
Total Acreage	30mil	28.75mil		26.94mil	27mil	27.22mil

Source: Agricultural Resource Management Survey; Data as of 12/16/2021.

[1] Professor, Illinois Institute for Rural Affairs, Western Illinois University.

The literature on farm tenancy is sparse. A search for the title "farm tenancy in the United States" on Google Scholar resulted in 151 listings[2]. Most of these are 70 to 100-year old publications. Nine publications were recent - published during 2017-2022, but they had little or no relevance for this research[3].

How do we conceptualize farm tenancy? What kind of published data are available on the topic, Illinois farm tenancy? Does the topic "farm tenancy" appear in Tweets? If "yes", what are the Tweets about? This paper addresses these and other similar questions.

Conceptual Model

The term 'farm tenancy' refers to farmers who own capital and lease farmland by paying cash rent or a share of the crop[4]. In a cash-rent contract, the farmer pays a fixed amount per acre, per time period, and owns the entire crop. Crop-share contracts vary widely in dividing the agricultural output between the farmer and the landowner, from 50-50 agreements to more than half for the farmer[5].

Classical economists conceptualized agricultural 'rent' as a reward or net income which land returns to its owners. Their arguments focused not on farm tenancy per se, but on the impacts of unrestrained population growth on inelastic agricultural production[6]. Farm tenancy first appeared in the writings of Adam Smith who argued that the sharecropper has little or no incentive to improve the land, because the cost of improvement has to be borne by the farmer and not the landowner; Adam Smith advocated for cash-rent contracts[7].

John Stuart Mill agreed with Adam Smith; he posited that sharecropping is productively inefficient and attributed its failure to tenure insecurity. Put simply, improvements to the land made by the tenant could be used as an excuse for the landlord to increase rents[8].

In contemporary microeconomics, it is the technique of marginal analysis that could aid in conceptualizing farm tenancy[9]. Consider the production function:

[2] The search input was: title: "farm tenancy in the United States".
[3] Two papers explored property taxes; one was about slavery in Brazil; two highlighted African American history, and the remaining were about geography of Wyoming, rural electrification, and list of Civil Law references.
[4] Cheung, S. (1969). *The Theory of Share Tenancy*. Chicago, IL: The University of Chicago Press.
[5] Allen, D., and Lueck, D. (1992). Contract choice in modern agriculture: Cash rent versus crop-share. *Journal of Law and Economics*, 35(October), 397-426.
[6] See the writings of Ricardo and Malthus, specifically Ricardo's law of rent and Malthus' law of population; see Ekirch, Jr. A. (1963). *Man and Nature in America*. New York: Columbia University Press.
[7] Smith, A. (1937). *Wealth of Nations*. New York: Modern Library.
[8] Same reference as Footnote 4.
[9] Adapted from Barnes et al (1981). Farm tenancy literature review and theoretical foundation. College of Agriculture, University of Kentucky: Staff Paper 116, July.

$Q = f(x_1, x_2, L)$ where x_i are inputs and L is land, a fixed quantity.

Assume that the agricultural output is sold at price P and the tenant pays p_1 and p_2 for the inputs.

The profit function is:

$$\pi = PQ - p_1 x_1 - p_2 x_2$$

Differentiating with respect to the variable inputs result in:

$$P\frac{\partial Q}{\partial x_1} = p_1 \text{ and}$$

$$P\frac{\partial Q}{\partial x_2} = p_2$$

Note that $P\frac{\partial Q}{\partial x_i} = Value\ of\ Marginal\ Product\ i$ (VMP).

A proposition that could be empirically assessed in an exploratory study like this is the equality of VMP for different types of land tenure; for example, production efficiency could be lacking under tenancy (cf. Adam Smith), so VMP could be lower under tenancy agreements.

Psychological theory supports this assertion. For example, psychoanalysis states that 'envy' is the wish to have the good things or attributes of the envied person, but when that is not possible, envy also contains the desire to destroy the envied person or to spoil the good things they have[10]. Thus, assuming that tenant envies the landlord who owns the farmland, it is probable that VMP is lower for tenancy.

Methodology

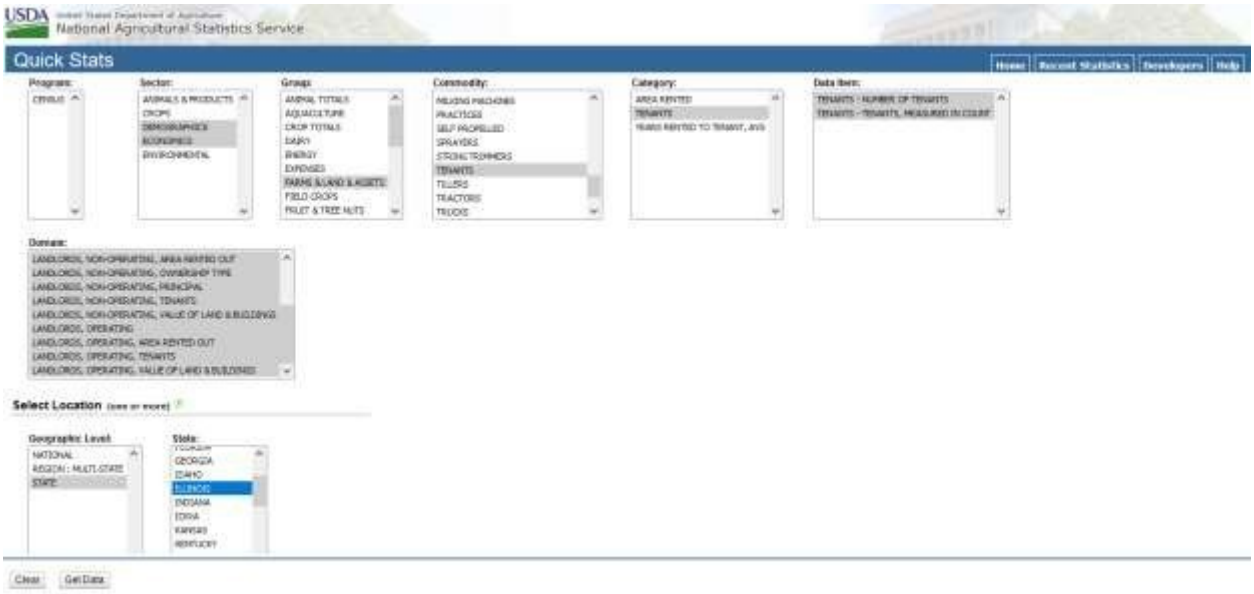
I started my search for published, quantitative, farm tenancy data on USDA's "Tenure, Ownership, and Transition of Agricultural Land" (TOTAL) survey portal[11]. The option "Get the Data" was not functioning, so I accessed the data through QuickStats[12]. Figure 1 shows the query combinations that were used to extract the data at the aggregate level.

[10] Klein, M. (1957). *Envy and gratitude*. New York: Basic Books.

[11] https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/TOTAL/index.php

[12] http://quickstats.nass.usda.gov/

Figure 1: Data on Farm Tenancy: Query Combinations



In all, 132 records were downloaded; all from the most recent TOTAL survey[13]. I also extracted data on farm income, using ERS' data portal[14]. Variables extracted include information about number of tenants, number of acres rented, etc. (Table 2 lists the salient variables).

Table 2: Operational Definitions of Salient, Quantitative Variables

Variable	Operational Definition
Tenants	Number of tenants
Area rented	Six levels: 1-49 acres; 50-99; 100-199;200-499; 500-999; 1000-9,999 Acres.
Landlord	Two groups: 1. Non-operating landlord; 2. Operating landlord.
Tenancy type	1. Acres fully paid for; 2. Acres not fully paid for.

[13] The last TOTAL survey was conducted during 2014; see Footnote 11.

[14] The search for "Farm Business Income Statement" had the following form / filters: Subject: All Farms, Filter 1: Farm Typology (2011 to present), Region: Illinois; see https://my.data.ers.usda.gov/arms/tailored-reports.

Numerical variables were processed using exploratory data analysis (EDA) tools such as five-order statistics. Categorical variables were cross-tabulated and variable independence assessed using Chi-square statistics.

Twitter Data

The Tweepy[15] library was used to extract Tweets related to the keywords: Illinois farm tenancy; the Tweets appeared during the time period January 2021 to July 1, 2022. The unit of analysis was the entire Tweet. Data analysis included: words emitted by the Twitterati, word counts; the energy level of the tweet measured by the "pitch" of the Tweet: that is, Tweets that were entirely or partially constructed using uppercase letters.[16] Emojis associated with the Tweets were also analyzed. Table 3 lists the variables constructed using Twitter data and their operational definitions.

Table 3: Twitter Variables and Definitions

Variable	Operational Definition
Verbal behavior (the entire Tweet)	Maximum of 280 characters; the maximum permitted by Twitter. The entire Tweet was subjected to linguistic analysis such as word counts.
Energy level of the Tweet (binary variable)	Whether the Tweet had words in capital letters, value = 1; else = 0.
Audience Location (binary variable)	Illinois = 1; rest of the geography = 0.
Followers	Number of followers listed in the Twitter account.
Friends	Number of friends listed in the Twitter account.
Emoji	Symbols used in Tweets.

[15] Used to access Twitter API.

[16] More about the NLP analysis, including files associated with the data analysis, can be obtained by writing to the author.

Findings

Quantitative, Published Data

A majority of the tenants rented less than 100 acres of agricultural land; fewer than one in ten leased more than 500 acres (Table 4). A majority of the landlords, 88%, were non-operators, they did not farm; also, 90% of these non-operators rented out their land for cash, pre-paid in advance by the tenant.

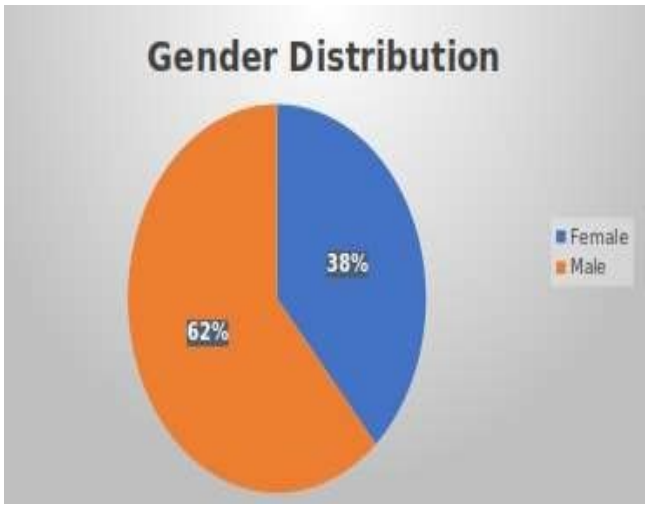
Table 4: Tenants and Acres

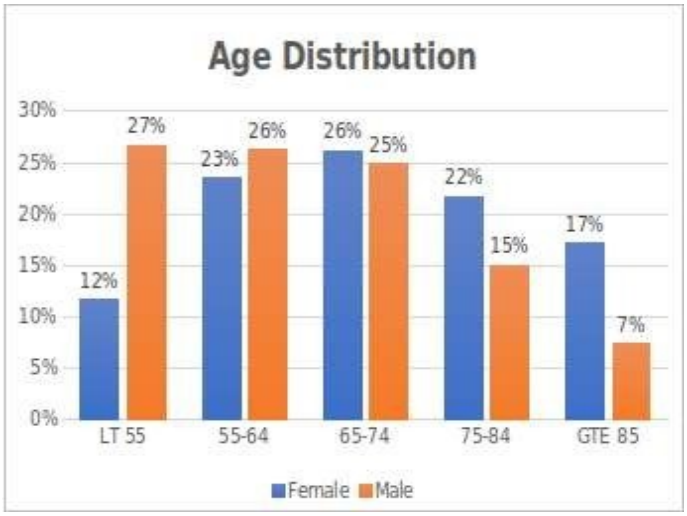
Variable	% of Tenants (N = 154,719)
Acreage Rented:	
➢ 1-49 acres	37%
➢ 50-99 acres	19%
➢ 100-199 acres	19%
➢ 200-499 acres	17%
➢ 500-999 acres	4%
➢ 1000-9999 acres	4%
Landlord Type:	
➢ Non-operating landlord	88%
➢ Operating	12%

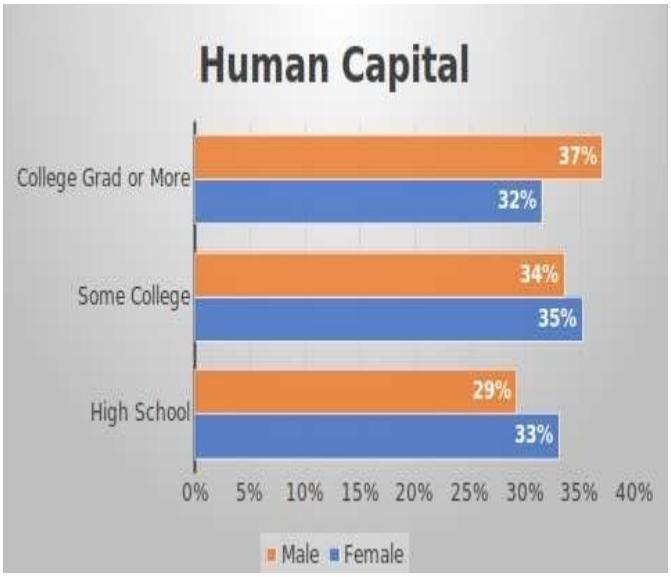
Source: TOTAL survey; see Footnote 11.

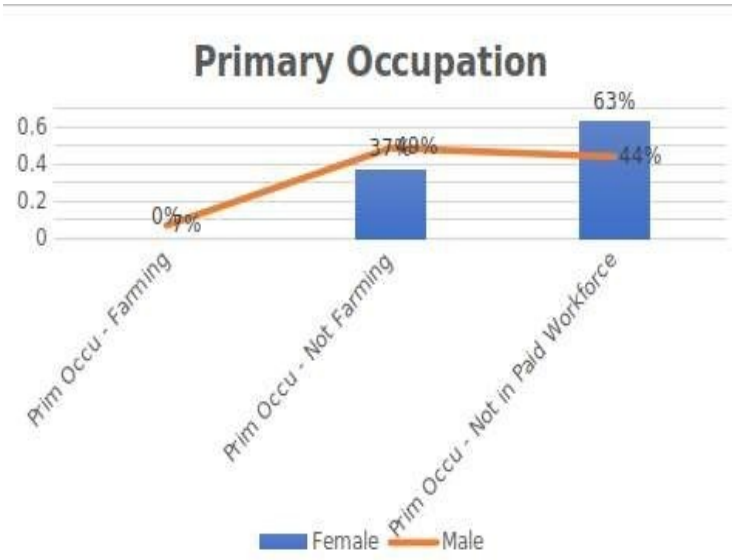
To explore the characteristics of the majority, non-operator landlords, demographics such as age and education were cross-tabulated with gender. As shown in Figure 2, approximately two of the three landlords were male with some college education or more. There were more female landlords in the 65+ age group and majority of them did not report a primary occupation.

Figure 2: Demographics of Non-Operator Landlords









Source: TOTAL survey

A county-wise analysis shows trends in farmland ownership and tenancy. For example, Logan County had the most growth in acreage under "full ownership", 3% ACGR during 1997-2017, and Cook County had the least, -9.1% ACGR.

On tenancy, Massac County experienced a positive ACGR of 2.4% in acreage during 1997-2017; during the same time period, DuPage County posted the largest decline in acreage under farm tenancy, -23% ACGR (Table 5). Appendix 1 lists county-wise ACGRs for all three types of farm tenure: full ownership, part ownership, and tenant.

Table 5: Extreme Observations in Acreage ACGR by Farm Tenure: County Data, 1997-2017

Full Owner	Part Owner	Tenant
Logan: 3%	Grundy: 2.3%	Massac: 2.4%
Cook: -9.1%	DuPage: -10.2%	DuPage: -22.9%
Five Number Stats:		
• Min: -9.1%	Min: -10.24%	Min: -22.95%
• Q1: -1.3%	Q1: -0.2%	Q1: -4.2%
• Median: -0.45%	Median: 0.3%	Median: -3%
• Q3: 0.4%	Q3: 0.9%	Q3: -1.1%
• Max: 3%	Max: 2.3%	Max: 2.3%

Source: NASS; see footnote 12.

Table 6 shows the attributes of the leased agricultural land. A typical landlord has been renting out his or her agricultural land for 12.1 years. The land lease is a written document (58%) for a one-year lease (69%); it requires fixed, cash payment for the leased land (68%). Only 22% of the lease agreements allow payment adjustments for unusual conditions.

Table 6: Attributes of Leased Land, Central Tendencies

Attribute	Landlord, Nonoperating	Landlord, Operating
Years rented to tenant	12.5%	8.8%
Written lease	56%	54%
Lease - cash payment	68%	59%
Lease- crop-share	32%	28%
Lease renewal term - annual	69%	72%
Years rented to tenant, 5-9 years	23%	22%
Acres rented out	11.6mil	2.25mil

Source: TOTAL survey.

Does it pay to farm leased land? It depends; if it is a small acreage operation, less than 500 acres, then, on average, revenue growth is negative. One exception is farms operated by households; they tend to perform well even though they average only 103 acres in size. In general, the larger the leased land, larger is the revenue growth (Table 7).

Table 7: Growth in Production Value and Acreage by Type of Farm: Tenant Acreage, 2011-2020

Farm Type	Total Tenant Acreage, Median 2011-2020	Average Tenant Acreage	Production Value Per Acre, Median 2011-2020	ACGR, Production Value	ACGR, Acreage
Low-sales farms: operator's primary occupation is farming and gross cash farm income < $150,000	87,446	143	$380	-2.7%	-4.7%
Moderate sales farms: operator's primary occupation is farming and gross cash farm income is $150,000-$349,000	301,754	467	$606	-1.0%	-11.6%
Midsize farms: operator's primary occupation is farming and gross cash farm income is $350,000-$999,000	1,135,203	919	$645	0.3%	1.3%
Large farms: operator's primary occupation is farming and gross cash farm income is $1mil -$4.999mil	1,249,621	2,156	$761	0.0%	-1.2%
Very large farms: operator's primary occupation is farming and gross cash farm income is >$5mil	53,597	5,215	$1,058	3.0%	14.0%
Non-family farms: Majority not owned by the operator or her relations.	193,572	682	$756	-0.8%	-16.2%
Farm businesses: Gross cash income >$350,000 or smaller operation where farming is the operator's primary occupation.	2,761,206	637	$687	0.1%	-5.1%
Farm operator, households	2,177,357	362	$629	0.1%	1.2%
Retirement farms: Retired operator; gross cash from farming <$350,000	9,036	103	$212	2.6%	-17.5%

Source: ERS; see Footnote 12.

In summary, secondary analysis of data from TOTAL and ARMS[17] suggests that tenancy pays for larger land holdings, and households benefit from leasing and operating farmland. This is an indirect test of the VMP hypothesis; lack of financial data on tenant landholdings prevents us from assessing the value of marginal productivity of tenant holdings, directly.

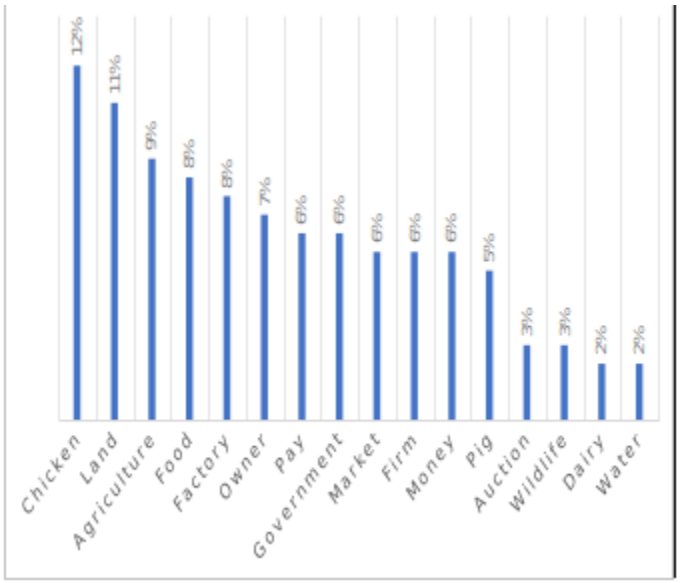
Qualitative Tweets

Five hundred Tweets were extracted using Twitter API. The Twitterati had, on average, 881 followers and 483 friends. Figure 3 shows the noun phrases and adjectives that are associated with the Tweets, for keywords "Illinois farm" and "farm tenancy"[18]. Business terms such as factory, firm, owner, and auction constituted 30% of the Tweets. Farm products such as chicken, dairy, and pig were mentioned in 19% of the Tweets.

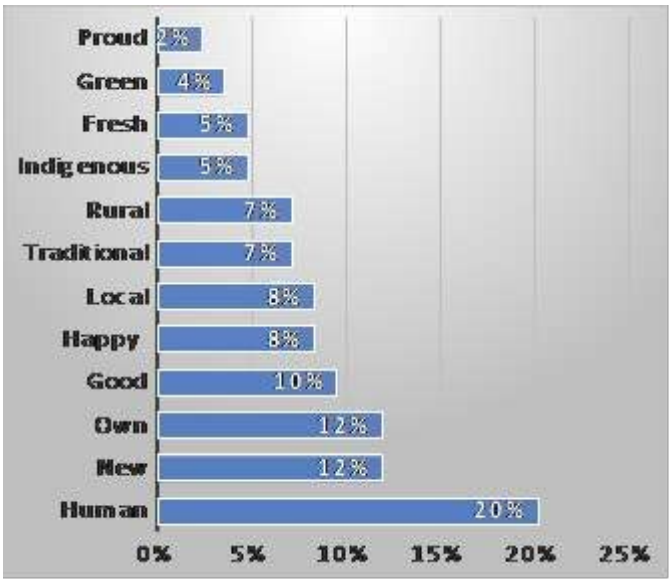
Adjectives associated with the keywords include attributes of farm products such as green and local. In general, the Tweets expressed the saliency of "human" factors, including proudness and the joys of owning a farm.

Figure 3: Tweets on Illinois Farms: Most Common Nouns and Adjectives

(i) Noun Phrases



(ii) Adjectives



[17] the ERS reports stated in Footnote 14 contained the ARMS data, *Agricultural Resource Management Survey* responses.

[18] A majority of the Tweets, 54%, were from the US; 45% were from the UK.

Emojis highlight contextual information in messages and are understood across linguistic barriers[19]. The emojis provided with the Tweets are shown in Table 8.

Table 8: Emojis Associated with the Tweets

Emoji	Meaning	Use Context in Tweets
	Farm Animals	Farm cuisine
	Raised fit, used to express solidarity with oppressed groups.	Tweets about farm laborers and their working conditions.
	Thinking, deep in thought.	Query about "Farm Aid" concerts to help farmers keep their land.
	Cereal grains.	Vegan food and vegetable farming.
	Sun and Spring	References to farming and farm life.
	Hope	Praying for farming (business) success.
	Oil drums	Impacts of rising gas prices on farming.

In summary, other than the inference that Tweets are generally positive about farming and farm life (Appendix 2), nothing could be said about Illinois farm

[19] Steinbergh, A. (2014). Smile, you are speaking Emoji: The rapid evolution of wordless tongue. *New York Magazine*, November 16.

tenancy. The number of Tweets on farm tenancy correlates positively with my Google Scholar search on publications about farm tenancy (see the "Introduction" section); very little is being said on Twitter about Illinois farm tenancy.

Summary and Conclusion

The term 'farm tenancy' refers to farmers who own capital and lease farmland by paying cash rent or a share of the crop. In 2020, 63% of Illinois' farms were farmed by full owners, 29% by part owners who also rented farmland from others, and 8% by tenants. A majority of the landlords, 88%, were non-operators, they do not farm; approximately 3 of the 5 landlords were male with a college education.

A typical landlord has been renting out his agricultural land for 12.1 years. The land lease is a written document (58%) for a one-year lease (69%); landlords require fixed, cash payment for the leased land (68%).

Does it pay to farm a leased land? It depends; in general, the larger the leased land, larger is the revenue and revenue growth. Small-acreage operation, that is, leased land less than 500 acres in size, has negative revenue growth, on average. One exception is farm operated by households; they tend to perform well, grow their revenue, even though they average only 103 acres in size.

All these inferences were gleaned from aggregate data, mostly grouped data. More than six decades ago Johnston[20] alerted us to pitfalls in inference from grouped data, that different conclusions can emerge from the same data depending on the classification adapted. The best procedure is to analyze the original survey data on farm tenancy; to that end, the author and his colleagues are working to gain access to micro data on farm tenancy.

[20] Johnston, J. (1960). *Statistical Cost Analysis*. New York: McGraw-Hill Book Company.

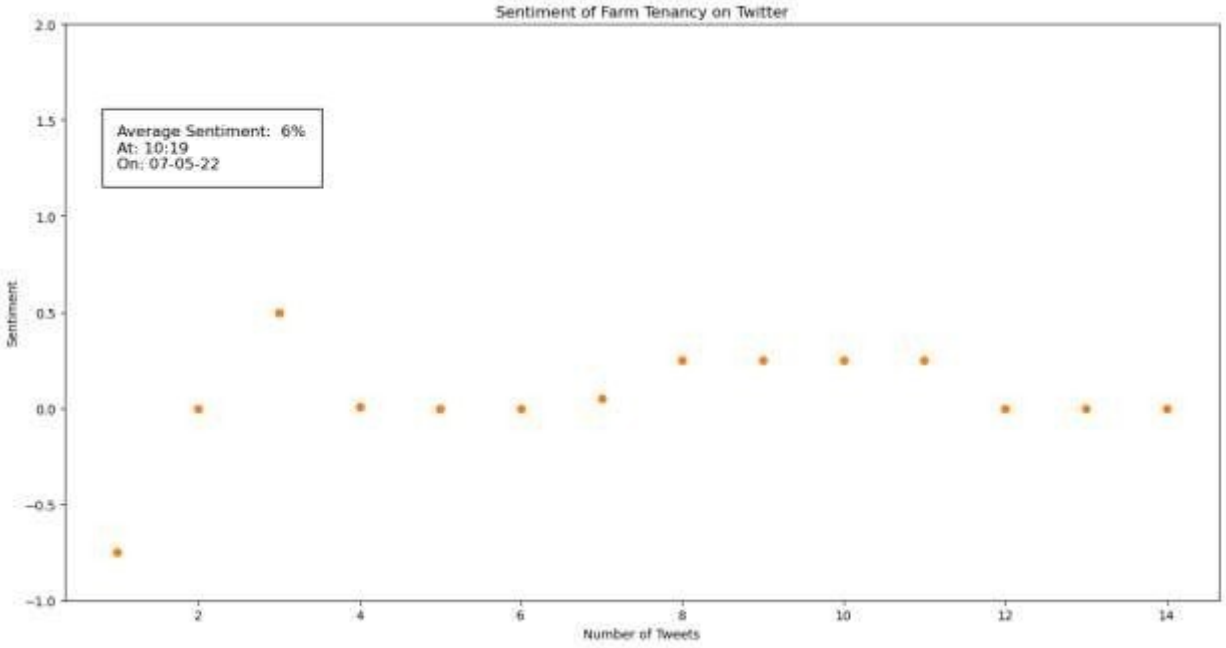
Appendix 1: Annual Compound Growth Rates by Farm Tenure by County

County	Variable	TENURE: (FULL OWNER)					TENURE: (PART OWNER)					TENURE: (TENANT)					Full Owner ACGR	Part Owner ACGR	Tenant ACGR
		1997	2002	2007	2012	2017	1997	2002	2007	2012	2017	1997	2002	2007	2012	2017			
ADAMS	FARM OPERATIONS - ACRES OPERATED	139759	138392	88037	104341	130348	266845	274580	255486	263354	335065	38212	31115	30610	21052	12270	-0.3%	1.1%	-5.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	912	830	785	799	803	460	423	395	413	447	146	94	115	86	58	-0.6%	-0.1%	-4.6%
ALEXANDER	FARM OPERATIONS - ACRES OPERATED	15897	20435	12930	17467	14347	46438	47167	31760	0	34485	11304	10816	2936	0	1652	-0.5%	-1.5%	-9.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	105	74	89	97	83	64	59	41	45	34	15	16	13	2	9	-1.2%	-3.2%	-2.6%
BOND	FARM OPERATIONS - ACRES OPERATED	40838	43709	32967	36503	31772	130514	138611	180647	154419	135316	12239	10298	11146	7417	5752	-1.3%	0.2%	-3.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	387	422	396	415	417	242	215	234	203	187	51	31	43	43	33	0.4%	-1.3%	-2.2%
BOONE	FARM OPERATIONS - ACRES OPERATED	26308	30770	32972	23497	16768	78545	92520	76061	90345	81582	39272	23650	28129	20917	15150	-2.3%	0.2%	-4.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	288	267	340	269	282	160	154	137	136	125	97	55	63	74	50	-0.1%	-1.2%	-3.3%
BROWN	FARM OPERATIONS - ACRES OPERATED	58456	53786	54937	44634	58892	86569	79328	87145	84582	79037	12309	11115	8976	8307	3728	0.0%	-0.5%	-6.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	259	295	295	286	311	116	102	107	111	88	36	20	20	16	20	0.9%	-1.4%	-2.9%
BUREAU	FARM OPERATIONS - ACRES OPERATED	93892	84910	69605	71271	71673	275742	318283	313908	307398	308242	125253	87987	94876	71463	57140	-1.4%	0.6%	-3.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	474	457	604	530	537	414	430	374	367	371	329	204	211	159	130	0.6%	-0.5%	-4.6%
CALHOUN	FARM OPERATIONS - ACRES OPERATED	42415	45285	42707	45463	56868	54612	41419	40796	38724	52705	3797	3651	4435	3563	5055	1.5%	-0.2%	1.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	322	355	347	366	363	125	98	83	89	96	27	27	34	23	15	0.6%	-1.3%	-2.9%
CARROLL	FARM OPERATIONS - ACRES OPERATED	59407	68520	61681	50748	54984	142842	145797	168836	178168	168368	51383	33219	34636	27216	22369	-0.4%	0.8%	-4.2%
	FARM OPERATIONS - NUMBER OF OPERATIONS	325	365	390	368	394	204	190	200	216	173	148	101	86	59	60	1.0%	-0.8%	-4.5%
CASS	FARM OPERATIONS - ACRES OPERATED	36702	49485	35458	30799	41743	130142	128360	118850	123096	130636	25297	20714	19235	28793	25182	0.6%	0.0%	0.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	227	254	271	272	286	154	135	116	141	105	66	38	46	33	38	1.2%	-1.9%	-2.8%
CHAMPAIGN	FARM OPERATIONS - ACRES OPERATED	81929	109731	86882	90125	91603	353796	354654	360580	437239	428343	135920	112681	103019	89129	62743	0.6%	1.0%	-3.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	483	529	673	601	601	580	501	470	523	448	362	255	246	188	165	1.1%	-1.3%	-3.9%
CHRISTIAN	FARM OPERATIONS - ACRES OPERATED	50747	71519	65836	43569	54986	290835	294956	329268	290024	281887	52834	44074	54408	40038	65830	0.4%	-0.2%	1.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	383	368	465	428	459	375	339	343	304	254	119	89	102	84	81	0.9%	-1.9%	-1.9%
CLARK	FARM OPERATIONS - ACRES OPERATED	45595	65728	25584	59473	47200	207706	194108	192846	185046	189578	16137	15482	20276	22285	24302	0.2%	-0.5%	2.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	328	334	344	436	488	285	214	193	202	200	41	33	51	39	45	2.0%	-1.8%	0.5%
CLAY	FARM OPERATIONS - ACRES OPERATED	42436	62623	39508	48426	49096	186241	175889	163375	216462	237975	13207	4642	6951	5431	7240	0.7%	1.2%	-3.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	358	433	478	523	480	271	246	195	221	220	57	24	34	30	32	1.5%	-1.0%	-2.9%
CLINTON	FARM OPERATIONS - ACRES OPERATED	44502	53288	47018	49373	49287	170256	184794	205884	221589	173648	21918	16547	15539	14527	12809	0.5%	0.1%	-2.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	419	461	549	453	463	385	384	378	382	298	111	70	104	80	70	0.5%	-1.3%	-2.3%
COLES	FARM OPERATIONS - ACRES OPERATED	31202	62455	37613	33412	40469	188170	170916	188389	206013	161631	40063	27767	28867	27348	34764	1.3%	-0.8%	-0.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	354	378	468	399	464	285	235	203	230	177	105	71	58	75	60	1.4%	-2.4%	-2.8%
COOK	FARM OPERATIONS - ACRES OPERATED	18911	11755	2875	1859	3070	17557	7833	4719	5095	7268	5706	4248	604	1545	1565	-9.1%	-4.4%	-6.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	205	156	127	84	126	35	34	23	15	20	36	21	34	28	36	-2.4%	-2.8%	0.0%
CRAWFORD	FARM OPERATIONS - ACRES OPERATED	27465	51225	26906	32802	35955	164039	145432	155523	159106	154786	18756	17004	22927	23087	28908	1.3%	-0.3%	2.2%
	FARM OPERATIONS - NUMBER OF OPERATIONS	240	346	422	387	374	218	190	169	187	159	51	31	24	25	33	2.2%	-1.6%	-2.2%
CUMBERLAND	FARM OPERATIONS - ACRES OPERATED	28740	27214	30367	36895	47343	122642	135946	103380	122552	114197	19275	10203	11234	10702	10220	2.5%	-0.4%	-3.2%
	FARM OPERATIONS - NUMBER OF OPERATIONS	290	308	450	499	508	245	245	169	209	182	55	30	35	25	34	2.8%	-1.5%	-2.4%
DE KALB	FARM OPERATIONS - ACRES OPERATED	54511	43306	39611	45711	35283	222338	243404	233628	285561	240526	98483	72642	97533	66499	95968	-2.2%	0.4%	-0.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	328	306	418	399	358	336	344	332	343	293	216	166	180	138	128	0.4%	-0.7%	-2.6%
DE WITT	FARM OPERATIONS - ACRES OPERATED	28609	28933	36257	33027	26073	112813	119975	116215	130225	122509	64746	53791	46208	32260	37354	-0.5%	0.4%	-2.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	211	210	287	302	313	167	156	134	141	133	113	93	87	68	58	2.0%	-1.1%	-3.3%
DOUGLAS	FARM OPERATIONS - ACRES OPERATED	27225	45225	31255	29586	29633	173764	146369	189502	184402	173034	51574	41096	40756	48851	42165	0.4%	0.0%	-1.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	288	280	359	398	377	258	208	207	236	159	138	88	91	101	64	1.3%	-2.4%	-3.8%
DU PAGE	FARM OPERATIONS - ACRES OPERATED	7361	2623	1947	0	1246	6358	3811	0	0	0	3935	1249	0	0	0	-8.9%	-10.2%	-23.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	80	60	55	60	63	9	10	4	8	6	16	9	14	6	8	-1.2%	-2.0%	-3.5%
EDGAR	FARM OPERATIONS - ACRES OPERATED	50590	57618	48995	44800	38034	229405	249514	257507	277847	255104	75111	47903	46033	29037	25026	-1.4%	0.5%	-5.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	367	296	328	328	331	292	277	249	269	242	156	94	93	76	64	-0.5%	-0.9%	-4.5%
EDWARDS	FARM OPERATIONS - ACRES OPERATED	20618	28451	25117	18760	18282	80377	88640	71998	69366	82807	12426	5935	19575	18611	10659	-0.6%	0.1%	-0.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	189	243	257	250	182	135	124	87	93	95	34	12	21	22	14	-0.2%	-1.8%	-4.4%
EFFINGHAM	FARM OPERATIONS - ACRES OPERATED	55361	61762	55974	69328	64453	172153	193150	162935	206365	219879	34630	23287	23100	11330	15057	0.8%	1.2%	-4.2%
	FARM OPERATIONS - NUMBER OF OPERATIONS	518	579	659	750	738	459	456	373	483	404	156	99	118	69	51	1.8%	-0.6%	-5.6%
FAYETTE	FARM OPERATIONS - ACRES OPERATED	76150	85463	80110	81736	68444	225675	266690	212101	209882	231363	35041	13527	11047	11522	49248	-0.5%	0.1%	1.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	734	774	783	865	796	418	413	317	337	361	96	61	32	38	82	0.4%	-0.7%	-0.8%
FORD	FARM OPERATIONS - ACRES OPERATED	36052	38340	34432	30302	27609	193904	177512	179756	217863	210696	83395	70217	56532	60016	31935	-1.3%	0.4%	-4.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	183	204	237	246	286	245	211	186	205	212	137	115	101	95	66	2.2%	-0.7%	-3.7%
FRANKLIN	FARM OPERATIONS - ACRES OPERATED	59845	64445	45368	47515	45753	119150	108707	129966	122188	115045	8490	6542	32543	11646	12978	-1.3%	-0.2%	2.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	550	550	591	556	435	197	153	153	128	141	27	24	41	27	20	-1.2%	-1.7%	-1.5%
FULTON	FARM OPERATIONS - ACRES OPERATED	139170	131180	102588	90140	97727	233871	245218	252143	238518	278718	59088	37017	30571	26352	25980	-1.8%	0.9%	-4.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	663	626	629	596	606	357	322	298	288	295	162	107	78	86	72	-0.4%	-1.0%	-4.1%
GALLATIN	FARM OPERATIONS - ACRES OPERATED	30824	36389	12373	23088	12958	147986	112725	148382	151712	147212	13674	5332	24998	11450	17639	-4.3%	0.0%	1.3%
	FARM OPERATIONS - NUMBER OF OPERATIONS	110	113	120	98	82	117	66	81	86	70	27	8	9	19	13	-1.5%	-2.6%	-3.7%
GREENE	FARM OPERATIONS - ACRES OPERATED	81293	83463	70089	74121	80251	201948	191899	171196	186156	218231	47686	39410	31803	29847	29651	-0.1%	0.4%	-2.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	407	390	357	432	431	249	222	186	200	231	115	66	57	57	71	0.3%	-0.4%	-2.4%
GRUNDY	FARM OPERATIONS - ACRES OPERATED	31551	27196	23980	21338	27905	113784	140548	147392	162545	178902	58812	45723	44102	33133	26347	-0.6%	2.3%	-4.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	174	138	197	172	195	167	170	151	183	162	146	99	102	76	55	0.6%	-0.2%	-4.9%
HAMILTON	FARM OPERATIONS - ACRES OPERATED	79687	87432	57289	73392	48247	130559	141824	152352	135668	138178	11644	5058	10232	14259	14178	-2.5%	0.3%	1.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	418	497	485	535	398	207	177	167	140	138	19	20	33	20	16	-0.2%	-2.0%	-0.9%
HANCOCK	FARM OPERATIONS - ACRES OPERATED	100015	111680	88413	76384	108080	293010	280078	269815	275285	316949	50399	40065	34670	34593	30262	0.4%	0.4%	-2.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	598	594	612	634	645	469	383	339	356	356	143	118	112	100	108	0.4%	-1.4%	-1.4%
HARDIN	FARM OPERATIONS - ACRES OPERATED	0	22642	18878	18240	19601	17344	16814	0	14665	0	0	296	0	300	0	-1.0%	-1.1%	0.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	141	133	118	120	133	52	42	25	26	25	3	4	2	4	3	-0.3%	-3.7%	0.0%
HENDERSON	FARM OPERATIONS - ACRES OPERATED	35771	44182	34256	33142	38775	137217	142659	120708	124354	131828	36490	14359	15479	14078	22311	0.4%	-0.2%	-2.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	173	186	211	193	223	182	164	150	156	176	86	42	39	47	39	1.3%	-0.2%	-4.0%
HENRY	FARM OPERATIONS - ACRES OPERATED	87748	92698	88645	81477	86456	275929	312434	340257	336216	347623	104085	76179	61001	61601	50206	-0.1%	1.2%	-3.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	664	625	822	770	788	490	465	476	469	444	291	194	175	134	121	0.9%	-0.5%	-4.4%
IROQUOIS	FARM OPERATIONS - ACRES OPERATED	66198	113195	90185	91124	101768	463397	478319	499705	498178	506004	136539	87404	87913	79978	73517	2.2%	0.4%	-3.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	443	552	679	675	778	672	601	577	575	555	328	233	215	220	183	2.8%	-1.0%	-2.9%
JACKSON	FARM OPERATIONS - ACRES OPERATED	61192	59421	56502	48348	59749	134148	124325	134074	154463	152624	16605	15937	33838	11386	9248	-0.1%	0.6%	-2.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	483	499	578	562	553	210	186	166	183	177	77	55	66	38	42	0.7%	-0.9%	-3.0%
JASPER	FARM OPERATIONS - ACRES OPERATED	51828	52015	48588	44319	42573	186837	200546	184860	190231	200242	17595	18768	10003	16216	6802	-1.0%	0.3%	-4.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	346	376	530	550	577	365	358	311	312	295	72	57	41	48	41	2.6%	-1.1%	-2.8%
JEFFERSON	FARM OPERATIONS - ACRES OPERATED	77984	81180	81097	73404	80670	151774	173033	142294	126629	184830	7849	5081	9140	13868	3892	0.2%	1.0%	-3.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	746	846	854	814	818	317	303	258	220	257	37	19	44	29	24	0.5%	-1.0%	-2.2%
JERSEY	FARM OPERATIONS - ACRES OPERATED	39830	47822	43484	32417	45931	103541	111973	124006	109366	117990	21000	13349	21972	13700	25828	0.7%	0.7%	1.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	297	313	317	322	316	169	160	162	155	162	57	47	40	32	41	0.3%	-0.2%	-1.6%
JO DAVIESS	FARM OPERATIONS - ACRES OPERATED	103102	103777	79042	79015	82749	152814	140631	168668	179692	189884	37990	20085	33747	13086	16842	-1.1%	1.1%	-4.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	612	670	662	598	606	272	240	252	268	280	146	79	102	69	61	0.0%	0.1%	-4.4%
JOHNSON	FARM OPERATIONS - ACRES OPERATED	72701	65220	55435	52025	60402	33236	53324	43916	35925	43132	6201	2378	1148	1765	1943	-0.9%	1.3%	-5.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	474	501	444	460	534	98	112	111	82	102	27	23	13	16	17	0.6%	0.2%	-2.3%
KANE	FARM OPERATIONS - ACRES OPERATED	34588	32071	26747	16332	18837	123864	109657	132155	117473	123991	56694	56499	33470	34736	27426	-3.0%	0.0%	-3.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	342	302	438	295	322	217	188	192	179	193	148	129	129	116	90	-0.3%	-0.6%	-2.5%
KANKAKEE	FARM OPERATIONS - ACRES OPERATED	53099	52462	85600	53382	53231	225451	245885	248608	236565	212373	75936	48814	51600	52690	47300	0.0%	-0.3%	-2.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	340	285	393	377	418	332	313	311	317	246	203	124	131	124	92	1.0%	-1.5%	-4.0%
KENDALL	FARM OPERATIONS - ACRES OPERATED	26652	23294	20199	11742	10519	102277	101680	107302	75145	93553	40980	43108	39371	42854	33827	-4.6%	-0.4%	-1.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	183	159	224	161	154	185	159	118	130	112	105	94	82	73	47	-0.9%	-2.5%	-4.0%
KNOX	FARM OPERATIONS - ACRES OPERATED	82834	80039	58667	61880	80408	248090	259683	250439	230274	294474	64826	54254	53845	55443	39241	-0.1%	0.9%	-2.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	488	511	539	531	503	363	306	282	252	290	141	104	83	73	60	0.2%	-1.1%	-4.3%
LA SALLE	FARM OPERATIONS - ACRES OPERATED	96904	88555	66436	69409	92240	366983	386428	465590	431876	406994	134906	104158	111265	100994	73807	-0.2%	0.5%	-3.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	640	570	713	698	789	628	596	632	620	532	407	312	277	265	175	1.0%	-0.8%	-4.2%
LAKE	FARM OPERATIONS - ACRES OPERATED	18905	13903	13989	10339	11172	24782	17559	10849	12227	15645	8841	7398	9687	7473	3777	-2.6%	-2.3%	-4.3%
	FARM OPERATIONS - NUMBER OF OPERATIONS	264	243	287	239	234	72	52	49	61	34	49	42	60	49	34	-0.6%	-3.8%	-1.8%
LAWRENCE	FARM OPERATIONS - ACRES OPERATED	33235	32187	25979	23705	26766	136867	153930	148913	146182	184793	14324	5931	19143	14224	13390	-1.1%	1.5%	-0.3%
	FARM OPERATIONS - NUMBER OF OPERATIONS	215	188	257	214	273	167	158	143	139	131	31	9	21	26	22	1.2%	-1.2%	-1.7%
LEE	FARM OPERATIONS - ACRES OPERATED	58786	78889	44134	43783	54192	239486	234148	257364	262127	292091	105756	76000	94126	63137	45819	-0.4%	1.0%	-4.2%
	FARM OPERATIONS - NUMBER OF OPERATIONS	330	339	414	375	427	374	330	324	301	300	257	173	160	159	105	1.3%	-1.1%	-4.5%
LIVINGSTON	FARM OPERATIONS - ACRES OPERATED	68236	80598	65792	62846	72898	412549	435528	461597	507165	467315	135857	120280	101113	86264	60320	0.3%	0.6%	-4.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	463	488	570	565	634	638	591	556	600	521	332	251	193	184	158	1.6%	-1.0%	-3.7%
LOGAN	FARM OPERATIONS - ACRES OPERATED	36614	58449	47052	52015	66829	225818	214484	200952	238649	220054	120060	85834	72352	72608	67147	3.0%	-0.1%	-2.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	226	287	351	406	365	305	264	239	250	211	236	141	120	123	107	2.4%	-1.8%	-4.0%
MACON	FARM OPERATIONS - ACRES OPERATED	43465	45304	32514	39563	30163	209424	221005	196831	239439	203918	73643	54337	61258	57574	43348	-1.8%	-0.1%	-2.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	309	303	387	353	346	267	252	218	228	184	134	91	103	93	59	0.6%	-1.9%	-4.1%
MACOUPIN	FARM OPERATIONS - ACRES OPERATED	74608	96445	62800	75609	82427	272939	282918	268244	272238	306172	58583	47810	63184	90745	32089	0.5%	0.6%	-3.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	659	660	708	683	680	498	437	352	387	387	151	117	127	120	102	0.2%	-1.3%	-2.0%
MADISON	FARM OPERATIONS - ACRES OPERATED	64648	59813	44702	50968	42160	188616	200579	221880	213450	239635	36961	35285	46354	42717	36975	-2.1%	1.2%	0.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	787	669	720	662	685	405	386	401	350	313	135	97	108	98	81	-0.7%	-1.3%	-2.6%
MARION	FARM OPERATIONS - ACRES OPERATED	64293	76585	65766	76335	59202	168747	176026	148047	161420	174788	21322	9288	46866	29073	14758	-0.4%	0.2%	-1.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	606	781	803	868	734	315	282	217	240	243	74	32	57	44	27	1.0%	-1.3%	-5.0%
MARSHALL	FARM OPERATIONS - ACRES OPERATED	32909	32240	26878	27807	31125	150422	130566	153157	160319	140387	48091	28517	24549	20968	27037	-0.3%	-0.3%	-2.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	195	209	242	200	221	212	171	170	183	176	113	74	88	57	75	0.6%	-0.9%	-2.0%
MASON	FARM OPERATIONS - ACRES OPERATED	40654	53235	31284	40395	60007	187364	195773	206835	222798	228291	62601	36089	35243	26648	23631	1.9%	1.0%	-4.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	193	195	216	242	331	219	187	186	195	172	103	61	45	53	45	2.7%	-1.2%	-4.1%
MASSAC	FARM OPERATIONS - ACRES OPERATED	43593	39220	40566	33818	41006	55846	81050	40135	51848	62146	9698	4327	8992	16583	15408	-0.3%	0.5%	2.3%
	FARM OPERATIONS - NUMBER OF OPERATIONS	313	303	304	318	311	107	112	75	76	88	28	19	21	18	18	0.0%	-1.0%	-2.2%
MCDONOUGH	FARM OPERATIONS - ACRES OPERATED	65717	68558	40138	44400	52836	233587	211585	226695	219102	222666	48043	44581	40892	28542	39240	-1.1%	-0.2%	-1.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	429	390	400	421	432	317	263	241	237	255	136	99	120	82	73	0.0%	-1.1%	-3.1%
MCHENRY	FARM OPERATIONS - ACRES OPERATED	42588	33133	36634	29566	34042	153681	144857	133673	159033	156315	54772	55468	45277	45612	17982	-1.1%	0.1%	-5.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	579	498	699	544	571	292	261	204	248	216	160	111	132	119	94	-0.1%	-1.5%	-2.7%
MCLEAN	FARM OPERATIONS - ACRES OPERATED	79377	94853	81152	99997	86804	431088	430555	434626	448426	423056	193674	162655	160206	143868	110196	0.4%	-0.1%	-2.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	604	597	752	738	773	609	575	516	511	469	350	270	245	240	174	1.2%	-1.3%	-3.5%
MENARD	FARM OPERATIONS - ACRES OPERATED	27103	21358	19739	21616	29402	113121	100167	107765	102184	102887	31512	33499	41090	33955	35770	0.4%	-0.5%	0.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	168	163	255	209	246	147	111	100	114	104	57	55	56	46	36	1.9%	-1.7%	-2.3%
MERCER	FARM OPERATIONS - ACRES OPERATED	81743	85211	60467	54060	72260	187009	171682	209078	174067	190812	46630	35826	36761	23871	19158	-0.6%	0.1%	-4.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	418	443	456	430	486	278	225	239	209	210	127	78	90	76	52	0.8%	-1.4%	-4.5%
MONROE	FARM OPERATIONS - ACRES OPERATED	41514	39163	31826	27046	28603	131173	126938	124164	143455	127554	17555	11329	22144	22700	20048	-1.9%	-0.1%	0.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	321	310	416	317	366	222	185	215	200	159	68	36	47	46	43	0.7%	-1.7%	-2.3%
MONTGOMERY	FARM OPERATIONS - ACRES OPERATED	56292	72629	53556	53859	65888	250889	245128	254355	275817	335811	56211	44543	39854	52712	37135	0.8%	1.5%	-2.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	485	533	602	575	624	420	362	361	372	351	138	106	66	74	92	1.3%	-0.9%	-2.0%
MORGAN	FARM OPERATIONS - ACRES OPERATED	58906	63899	57267	54109	50819	197430	196175	213465	220535	221232	54307	32666	49780	34514	28214	-0.7%	0.6%	-3.3%
	FARM OPERATIONS - NUMBER OF OPERATIONS	417	372	416	436	416	295	251	240	259	225	117	59	84	62	52	0.0%	-1.4%	-4.1%
MOULTRIE	FARM OPERATIONS - ACRES OPERATED	23359	29834	20095	49741	20475	122487	128433	130028	124795	163542	30033	28211	17668	30451	17736	-0.7%	1.4%	-2.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	232	212	290	323	355	192	170	187	173	143	82	59	43	57	28	2.1%	-1.5%	-5.4%

Appendix 1: Annual Compound Growth Rates by Farm Tenure by County (Cont'd)

OGLE	FARM OPERATIONS - ACRES OPERATED	77782	79251	50976	59604	56738	244585	235267	236942	281209	266667	66828	57767	78552	35609	31182	-1.6%	0.4%	-3.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	597	586	737	619	593	404	378	356	396	326	191	165	181	133	92	0.0%	-1.1%	-3.7%
PEORIA	FARM OPERATIONS - ACRES OPERATED	57009	55750	46246	54273	47954	174153	173463	168229	167026	167634	41584	37067	44729	28964	34482	-0.9%	-0.2%	-0.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	570	506	493	560	546	320	295	267	271	263	117	91	117	86	75	-0.2%	-1.0%	-2.2%
PERRY	FARM OPERATIONS - ACRES OPERATED	40527	37512	37314	42960	32656	123439	147996	141580	127503	147062	14454	8481	21460	10172	4447	-1.1%	0.9%	-5.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	316	294	334	341	343	244	222	203	178	200	50	33	52	41	29	0.4%	-1.0%	-2.7%
PIATT	FARM OPERATIONS - ACRES OPERATED	28254	29268	29744	21521	23765	164837	158042	180930	176680	194356	62822	70559	56591	60847	37891	-0.9%	0.8%	-2.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	164	166	238	208	227	193	174	159	144	142	108	102	83	74	53	1.6%	-1.5%	-3.6%
PIKE	FARM OPERATIONS - ACRES OPERATED	155320	156574	114583	139496	141672	273408	246010	243166	245061	270642	40442	23233	32059	26889	34693	-0.5%	-0.1%	-0.8%
	FARM OPERATIONS - NUMBER OF OPERATIONS	698	694	662	657	620	316	279	237	246	252	102	68	68	67	84	-0.6%	-1.1%	-1.0%
POPE	FARM OPERATIONS - ACRES OPERATED	0	39728	37472	41625	42758	35367	34854	23005	0	22967	0	2353	332	0	310	0.5%	-2.2%	-13.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	240	268	290	286	259	68	64	47	62	55	15	9	9	1	8	0.4%	-1.1%	-3.1%
PULASKI	FARM OPERATIONS - ACRES OPERATED	25768	26333	26756	23364	23741	51352	51192	68510	51710	71015	8929	8764	5923	7084	6510	-0.4%	1.6%	-1.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	178	175	190	162	144	69	62	71	58	72	23	16	15	10	6	-1.1%	0.2%	-6.7%
PUTNAM	FARM OPERATIONS - ACRES OPERATED	10738	14586	18066	14935	10561	53408	45832	33591	35557	34543	12574	10847	11048	9643	4656	-0.1%	-2.2%	-5.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	77	75	99	97	77	83	73	48	47	56	39	27	20	39	14	0.0%	-2.0%	-5.1%
RANDOLPH	FARM OPERATIONS - ACRES OPERATED	65205	61120	59628	63127	56862	174720	176668	169518	195823	189424	28011	16075	23780	19646	15562	-0.7%	0.4%	-2.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	498	476	514	458	519	320	284	261	271	238	99	63	58	64	51	0.2%	-1.5%	-3.3%
RICHLAND	FARM OPERATIONS - ACRES OPERATED	21357	32216	22172	26868	23266	168657	164667	160732	155407	144984	10007	12390	19956	6608	10231	0.4%	-0.8%	0.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	267	271	324	352	391	235	210	216	185	160	41	25	39	17	45	1.9%	-1.9%	0.5%
ROCK ISLAND	FARM OPERATIONS - ACRES OPERATED	42805	50309	42713	42213	45619	116594	104645	125023	98259	107217	14859	14658	10887	8714	6747	0.3%	-0.4%	-3.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	403	417	457	440	434	212	201	195	186	178	70	41	48	40	37	0.4%	-0.9%	-3.2%
SALINE	FARM OPERATIONS - ACRES OPERATED	34965	29446	35859	31125	30546	93504	96823	78557	99407	111082	7110	3674	2817	9322	3250	-0.7%	0.9%	-3.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	339	304	375	347	301	142	125	106	123	130	24	17	16	13	21	-0.6%	-0.4%	-0.7%
SANGAMON	FARM OPERATIONS - ACRES OPERATED	90488	61963	54883	59465	85215	303512	325484	357827	377701	390878	78063	80867	105443	76877	55197	-0.3%	1.3%	-1.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	515	507	652	660	695	364	336	355	304	296	194	127	146	128	92	1.5%	-1.0%	-3.7%
SCHUYLER	FARM OPERATIONS - ACRES OPERATED	53271	62940	50882	48596	68113	136420	126712	140505	118117	139983	19665	17794	16070	15380	3767	1.2%	0.1%	-8.3%
	FARM OPERATIONS - NUMBER OF OPERATIONS	277	348	366	391	394	176	150	127	119	123	54	40	41	32	27	1.8%	-1.8%	-3.5%
SCOTT	FARM OPERATIONS - ACRES OPERATED	24654	31087	30993	32816	27939	88334	74933	88140	102039	124448	33275	9903	16598	12677	3057	0.6%	1.7%	-11.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	172	157	209	211	194	116	103	99	106	93	66	31	42	39	13	0.6%	-1.1%	-8.1%
SHELBY	FARM OPERATIONS - ACRES OPERATED	79284	78841	62105	81856	70000	289799	292642	287754	281444	264210	56192	48331	37429	42483	28190	-0.6%	-0.5%	-3.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	694	634	703	750	748	511	467	390	433	380	156	127	92	99	69	0.4%	-1.5%	-4.1%
ST CLAIR	FARM OPERATIONS - ACRES OPERATED	50256	55819	35057	30120	29077	184070	187902	249585	203801	191309	33451	26099	21891	18010	16820	-2.7%	0.2%	-3.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	457	379	473	370	454	348	346	325	288	276	113	86	97	74	63	0.0%	-1.2%	-2.9%
STARK	FARM OPERATIONS - ACRES OPERATED	29268	26529	19710	16825	20522	113503	117291	120717	122645	136445	39520	30491	29348	28657	21690	-1.8%	0.9%	-3.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	123	133	163	149	177	154	143	148	150	144	97	59	61	49	41	1.8%	-0.3%	-4.3%
STEPHENSON	FARM OPERATIONS - ACRES OPERATED	73267	82708	55173	59742	50917	190321	203081	249548	254254	234857	52978	38329	33211	38485	19172	-1.8%	1.1%	-5.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	585	601	737	617	598	397	340	323	350	300	187	134	118	120	67	0.1%	-1.4%	-5.1%
TAZEWELL	FARM OPERATIONS - ACRES OPERATED	47512	59714	43890	49786	45319	214058	216200	246821	259119	228632	71128	51322	38557	28471	30524	-0.2%	0.3%	-4.2%
	FARM OPERATIONS - NUMBER OF OPERATIONS	418	465	534	505	466	357	336	358	342	305	194	117	106	95	86	0.5%	-0.8%	-4.1%
UNION	FARM OPERATIONS - ACRES OPERATED	84445	73705	68468	53001	60809	59666	68185	48180	66621	87858	6309	10398	5714	1551	1957	-1.6%	1.9%	-5.9%
	FARM OPERATIONS - NUMBER OF OPERATIONS	524	523	510	528	478	138	113	84	90	105	29	30	26	5	7	-0.5%	-1.4%	-7.1%
VERMILION	FARM OPERATIONS - ACRES OPERATED	60329	63021	58461	53361	75049	329696	322827	335189	329194	338817	96611	64116	63725	51851	57602	1.1%	0.1%	-2.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	427	398	518	503	631	437	382	367	347	298	181	129	129	106	120	2.0%	-1.9%	-2.1%
WABASH	FARM OPERATIONS - ACRES OPERATED	12227	12348	11014	0	12459	98505	88607	96409	89018	94912	12225	9605	6938	0	8063	0.1%	-0.2%	-2.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	99	94	119	114	126	107	90	98	83	71	20	15	8	16	11	1.2%	-2.1%	-3.0%
WARREN	FARM OPERATIONS - ACRES OPERATED	66398	69356	45326	44250	44751	192905	215015	213222	263589	256840	59994	42541	36359	30572	39394	-2.0%	1.4%	-2.1%
	FARM OPERATIONS - NUMBER OF OPERATIONS	333	267	310	270	354	275	277	234	248	275	142	89	100	87	82	0.3%	0.0%	-2.7%
WASHINGTON	FARM OPERATIONS - ACRES OPERATED	50211	53871	32659	38740	35586	223054	255515	308442	294463	297626	39185	22900	12802	21696	15812	-1.7%	1.4%	-4.5%
	FARM OPERATIONS - NUMBER OF OPERATIONS	359	307	346	364	339	356	378	372	346	322	112	71	61	67	54	-0.3%	-0.5%	-3.6%
WAYNE	FARM OPERATIONS - ACRES OPERATED	91017	116828	91572	118457	83697	203706	224281	218747	234623	275533	33537	15159	22936	15438	8787	-0.4%	1.5%	-6.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	650	782	931	883	705	341	275	253	252	268	91	35	49	52	52	0.4%	-1.2%	-2.8%
WHITE	FARM OPERATIONS - ACRES OPERATED	52455	62114	23439	68997	40975	190680	195570	228076	224465	235602	17064	23143	45474	17428	12880	-1.2%	1.1%	-1.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	270	300	287	413	354	170	158	151	152	128	34	24	43	17	14	1.4%	-1.4%	-4.4%
WHITESIDE	FARM OPERATIONS - ACRES OPERATED	72758	82196	76160	73379	69520	243726	244920	285592	272998	271850	75643	52250	43581	56865	29393	-0.2%	0.5%	-4.7%
	FARM OPERATIONS - NUMBER OF OPERATIONS	501	530	607	623	573	393	343	364	362	300	216	128	161	125	86	0.7%	-1.4%	-4.6%
WILL	FARM OPERATIONS - ACRES OPERATED	43956	38121	27751	26022	19950	174434	175094	156060	164560	162907	81700	52275	37040	43667	33736	-3.9%	-0.3%	-4.4%
	FARM OPERATIONS - NUMBER OF OPERATIONS	476	389	466	516	485	334	307	279	256	240	186	134	132	110	76	0.1%	-1.7%	-4.5%
WILLIAMSON	FARM OPERATIONS - ACRES OPERATED	45849	50470	40448	42152	39067	50782	50567	47309	56371	60179	4591	4288	6367	4898	4619	-0.8%	0.8%	0.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	500	478	487	559	461	168	138	119	125	128	25	15	10	18	21	-0.4%	-1.4%	-0.9%
WINNEBAGO	FARM OPERATIONS - ACRES OPERATED	46233	43451	38533	42698	34458	112964	122139	116626	116022	120766	39352	25865	28456	24185	23409	-1.5%	0.3%	-2.6%
	FARM OPERATIONS - NUMBER OF OPERATIONS	433	417	591	542	488	219	211	192	189	184	107	67	77	76	64	0.6%	-0.9%	-2.6%
WOODFORD	FARM OPERATIONS - ACRES OPERATED	47943	52767	41365	47069	53166	186110	203209	214688	241016	192657	68317	53615	32347	34898	37317	0.5%	0.2%	-3.0%
	FARM OPERATIONS - NUMBER OF OPERATIONS	410	421	480	485	507	386	370	358	373	324	182	128	94	100	89	1.1%	-0.9%	-3.6%

Appendix 2: Twitterati Sentiment about Farm Tenancy



APPENDIX 6

YOUNG ILLINOISANS' INTERESTS IN FARMING

Research Brief,

Short Paper

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The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.

Western Illinois University

Young Illinoisans' Interests in Farming

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Abstract

This paper explores young persons' interests in farming using published data from the Census of Agriculture and related sources. One of the salient findings of the research is that the head of the farming household provides positive reinforcement for young persons in the household to engage in farming; the strength of the reinforcement is the largest for biological sons or daughters and least for adopted children. In spite of this parental influence, 92% of young persons from farming families look for employment elsewhere. The consequence is reflected in the median growth rate of young producers in Illinois, -2.7%.

Introduction

The 2017 US Census of Agriculture defines a young agricultural producer as 35 years of age or younger[2]. Illinoisans in this age group are predominantly White (73%), female (50.19%), and have been to college (64%). Professionally, slightly more than one-in-five holds a job in the information sector and a mere one-in-one-hundred is engaged in the agricultural sector (Table 1).

[1] Professor, Illinois Institute for Rural Affairs, Western Illinois University.
[2] 2017 US Census of Agriculture, Appendix B: *General Explanation and Census of Agriculture Report Form*.

Table 1: Profile of Illinoisans ≤ 35 Years of Age, as at January 2022

Characteristic	%		%	Characteristic	%
Gender		**Race**		**Main Job, by Industry**	
(N=3,370,215)		(N=3,370,215)		(N = 1,439,084)	
Female	50.19	White	73	Information	22
Male	49.81	Black	15	Public Admin.	16
				Leisure	11
Education				Agriculture	1
High School	23				
Some College +	64				

Source: CPS, 2022

Conceptually, one's interest in a vocation is one's perceptions of the 'value' of the vocation[3]. Table 1 suggests that only a miniscule portion of young Illinoisans believe that work in agriculture is of value.

How could we explain young Illinoisans' interests in farming? This paper addresses this and other related questions using the framework of the stimulus sampling theory[4].

Theoretical Model, Stimulus Sampling Theory (SST)

The basic idea of SST is that one learns or acquires interest in an act by associating three elements in a sequence: a stimulus (S), a response (R), and a reinforcing outcome (O). Specifically, one experiencing an S-R-O sequence will learn associations for three pairs of elements: S-R, R-O, and S-O[5]. The S-O connection provides "good" or "bad" feedback that either facilitates or inhibits a S-R connection. For example, for S = agricultural land, R = farming the land, and O = income including government assistance for farming, the perception of O as good will strengthen the S-R link.

Model Workings

The stimulus situation includes all variable components of the environment; both environmental (for example, weather) and individual stimuli (for example, knowledge about agricultural science) are studied. Each stimulus is related to one response; for example, one's knowledge about agricultural science may be conditioned to farming. Thus, it is possible to characterize one's disposition to farming by listing stimulus elements and their responses. Such a listing is the theoretical state of the system, an indicator of which at the macro level would be the proportion of the people with primary jobs in the farming sector.

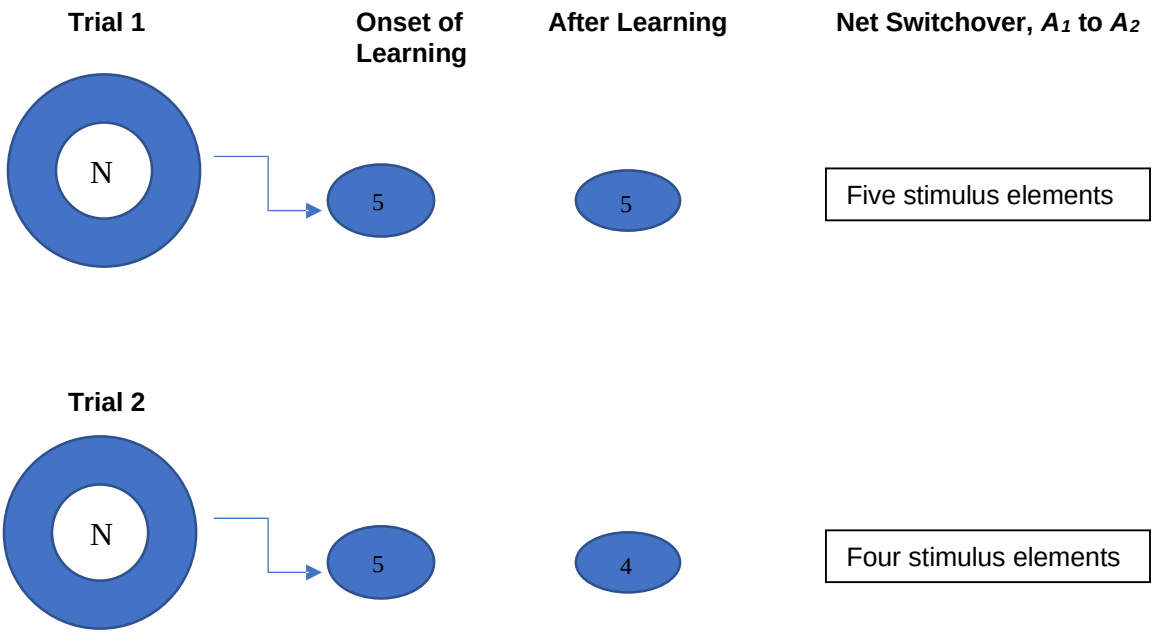
[3] Value is utility, defined as benefits less costs; see Athiyaman, A. (2022). Labor mobility in Illinois: Industry by Occupation Analysis. *Research Brief*, 4(8), April 18, 1-16. See, http://www.iira.org/wp-content/uploads/2022/04/RB48_local-mobility-in-illinois-industry-by-occupation.pdf.

[4] Thibaut, J. W., & Kelley, H. H. (2017). *The social psychology of groups*. Routledge.

[5] Technically, $nPr = \left(\frac{3!}{2!}\right) = S-R; R-O; S-O$.

The reinforcing outcome "O" could be economic (for example, money income) and / or noneconomic (for example, respect). For example, consider a young person (subject) from an intergenerational family farm[6] who has been farming with her family for some years; symbolically, A_1 = engage in farming, and A_2 = engage in some other alternative, a free operant. The population of potential stimulus elements, N, corresponding to A_1 and A_2 is represented in Figure 1. In the beginning year, trial 1, a sample of five stimulus elements occur and no response is made by the subject; then, the family receives income from the sale of agricultural products (farm income), a portion of which is allocated to the subject stimulating subject's interests in farming and connecting the five stimuli to the response A_1. On the second trial, the probability of response A_1 is fixed at 0.2 since only one of the 5 conditioned stimuli is present. Again, if farming is economically successful, then the subject is reinforced with a portion of the income, and now a total of 9 stimuli is connected to A_1.

Figure 1: Conditioning of the Stimulus Elements to the Act of Farming



[6] Farm owned by family or individual, a sole proprietorship.

Figure 1 can be summarized using probabilities. Let p and $1-p$ denote the proportion of stimuli connected to responses A_1 and A_2. Since the proportions change over trials, p_i will denote the proportion of A_1-linked stimuli at the i^{th} trial. Predictions of p_{i+1} are made with the formulation:

$$p_{i+1} = (1 - \theta)p_i + \theta$$

where, θ is the probability that a stimulus element is sampled on any given trial.

In words, $1 - \theta$ is the probability that the element is not sampled; its probability of connected to response A_1 remains the same as before at time i, p_i. The other possibility is the stimulus element gets chosen and reinforced in trial $i+1$, with probability θ.

This simplified SST offers many propositions about S-R, R-O, and S-O connections in the domain of young persons' interests in farming (Table 2)[7]. For example, the 2017 US Census of Agriculture provides a listing of farms by economic class, that is, classification of farms by the sum of market value of agricultural products sold and Federal farm program payments. This economic, reinforcing, outcome indicator takes on seven values: less than $1,000, $1,000-$2,499, $2,500-$4,999, $5,000-$9,999, $10,000-$24,999, $25,000-$49,999, $50,000 or more. An R-O proposition that could be assessed empirically is:

> **R-O$_i$**: The number of young Illinoisans working in the agricultural sector will covary positively with the economic class of the farms; the higher the economic outcome for agriculture, the larger would be the workforce in agriculture.

[7] SST framework offers opportunities for research into each of the S, R, and O concepts; for example, exploration of salient stimuli or deterministic attribute (N) for young versus mature farmers, class of responses for uncontrollable stimuli such as weather, and non-economic outcome variables such as family bonding, teamwork, etc.

Table 2: Testable Propositions: Deduced from the Application of SST to Young Persons' Interests in Farming

Conceptual Links		Proposition
S-R	S-R_1:	Young persons' farming behavior is correlated positively with family connections in farming.
	S-R_2:	Young persons' farming behavior is negatively associated with level of education.
R-O	R-O_1:	The number of young farmers in Illinois will covary positively with the economic class of the farms.
	R-O_2:	The lower the family distance between the head of family who is engaged in farming and the young person in the family, the higher will be the probability of the young person engaging in the target behavior, farming.
S-O	S-O_1:	Family farms will attract a larger number of young persons to farming than any other type of farming business.
	S-O_2:	Full-owner farms will attract young farmers in larger proportion than part-owner and tenant farms.

Methodology

Data from the 2017 US Census of Agriculture[8], Current Population Survey (CPS)[9], and American Community Survey (ACS)[10] were used to profile young Illinoisans with interest and occupation in farming and to test the hypotheses given in Table 2.

The Agricultural census data are aggregate, frequency data. They can be used to highlight the proportion of family farms and corporate farms, but they cannot be combined with a variable such as young farmers; cross-classification of variables is difficult, mostly impossible at the state level. In this paper, the census data are mostly used to describe young persons' interests in farming at the macro level.

In contrast, the ACS and CPS data are micro, individual-level data; they can be used to test hypotheses. For example, the ACS, 2015-2019, PUMS, persons file for Illinois contained 630,922 records. The records were screened for the presence of the following class of workers: self-employed incorporated,

8 https://www.nass.usda.gov/Publications/AgCensus/2017/index.php.

9 https://www.census.gov/programs-surveys/cps.html.

10 https://www.census.gov/programs-surveys/acs/data.html.

self-employed unincorporated, and without pay; the focus was on the agricultural sector. The screening resulted in 2,592 records. These were matched with the PUMS housing file to address the hypotheses given in Table 2.

Table 3 shows the variables extracted from ACS and CPS, operational definitions of the variables, and associated hypotheses. Measures of central tendency and dispersion, tests of independence in contingency tables, and rank-correlation coefficients were the statistical models employed to summarize data and test hypotheses.

Table 3: Operational Definitions

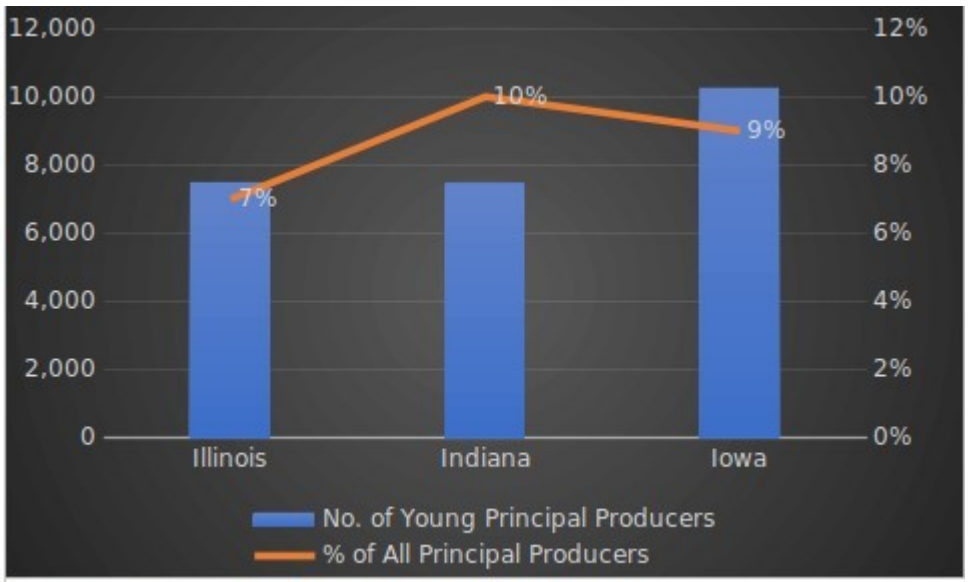
Hypothesis (see Table 2)	Variable Definitions	Data Source
S-R_1	Main occupation of person 1, the householder: farming = 1; Other = 0; Main occupation of young persons, persons 2-5: farming = 1; Other = 0.	ACS, 2019 Questionnaire; Q4 and Q.42, e.
S-R_2	PRTAGE: Persons age; 0-79 (ratio scale), 80 = 80-84, 85 = ≥85. PRMJIND1: Major industry; Agriculture = 1; else = 0. PEEDUCA: Highest level of school completed; Value labels: 31 = <1st grade … 46 = Doctorate.	CPS; 2022 January data.
R-O_1	HEFAMINC: Family income; value labels: 1 = <$5,000 … 16 = ≥$150,000. Sum of PRMJIND1.	CPS; 2022 January data.
R-O_2	Persons 2 to 5; relations to person 1 (householder). Distance = 1 for biological / adopted son or daughter; 2 = grandchild; else = 3. Main occupation of young persons, persons 2-5: farming = 1; Other = 0.	ACS, 2019 Questionnaire; Q2 and Q.42, e.
S-O_1	PEIO1COW: Class of worker; value label 7 = Self-employed, unincorporated business; Else = 0. PRMJIND1: Major industry; Agriculture = 1; else = 0.	CPS; 2022 January data.
S-O_2	Person 1: self-employment income from own farm business. Main occupation of young persons, persons 2-5: farming = 1; Other = 0.	ACS, 2019 Questionnaire; Q.42e and Q43b.

Findings

Profile Analysis

Seven percent of agricultural producers in Illinois, that is, persons involved in making decisions about the farm operation, are young, 35 years of age or younger. The neighboring states, Indiana and Iowa, have greater proportion of young producers, 10% and 9%, respectively (Figure 2). However, in terms of acres farmed, young producers in Illinois farm the most: 334 acres on average, compared to 170 acres for Indiana residents and 241 acres for Iowans.

Figure 2: Young Principal Producers: Illinois, Indiana, and Iowa



Source: 2017 Census of Agriculture – State Data.

A typical young producer's household is a four-person household. A majority of the young producers, 51%, operate less than 100 acres and have been the principal operators of the farm for less than six years[11]. Most of them are single operators (64%) of their family farm (81%) and grow oilseed and/or grain crops in their primary farming business (64%). Slightly more than one-in-four operators earn between $1,000 to $9,999; a similar proportion (25%) earn between $100,000 to $499,999. One in ten reports earning more than $500,000 in agricultural product sales and Federal farm program payments (Table 4).

[11] The profile is based on both 2012 and 2017 census data; 2012 census had more variable levels.

Table 4: Profile of Young Principal Producers

Profile Variable	Definition	Frequency; Central Tendency is in Bold	
Area Operated	Land area of the farm.	**Less than 100 acres**	**52%**
		100 to 499 acres	33%
		500 + acres	15%
		N	5,067
Business Organization	Operations ownership.	**Family and individual business**	**83%**
		Partnership	5%
		Other	12%
		N	5,505
Tenure	Farms classified by tenure of producers.	**Full owner**	**35%**
		Part owner	33%
		Tenant	31%
		N	5,067
Principal on Present Operation	Primary producer.	**< 6 years**	**45%**
		6 – 10 years	31%
		11+ years	24%
		N	5,067
Number of Operators	Producers, operators of the farm	**One**	**65%**
		Two or more	35%
		N	5,067
Economic Class	Sum of farm's market value of agricultural products sold and Federal farm program payments.	Less than $1,000	7%
		$1,000 - $9,999	**27%**
		$10,000 - $49,999	20%
		$50,000 - $99,999	12%
		$100,000 - $249,999	15%
		$250,000 - $499,999	10%
		≥$500,000	10%
		N	5,067
NAICS	Industry	**Oilseed and Grain Production**	**64%**
		Beef Cattle Ranching & Farming	12%
		Other	24%
		N	5,067

Source: 2012 and 2017 Census of Agriculture.

Results of Hypothesis Testing

Hypothesis S-R_1 is predicated on the notion that family connections in farming will influence young persons in the family to take up farming. Table 5 provides evidence in this direction; of the 13,923 head of households who reported farming as their primary self-employment, 8% of the young members of their household had farming as their primary occupation. This number reduces to 1% for young persons in households with non-farming interests.

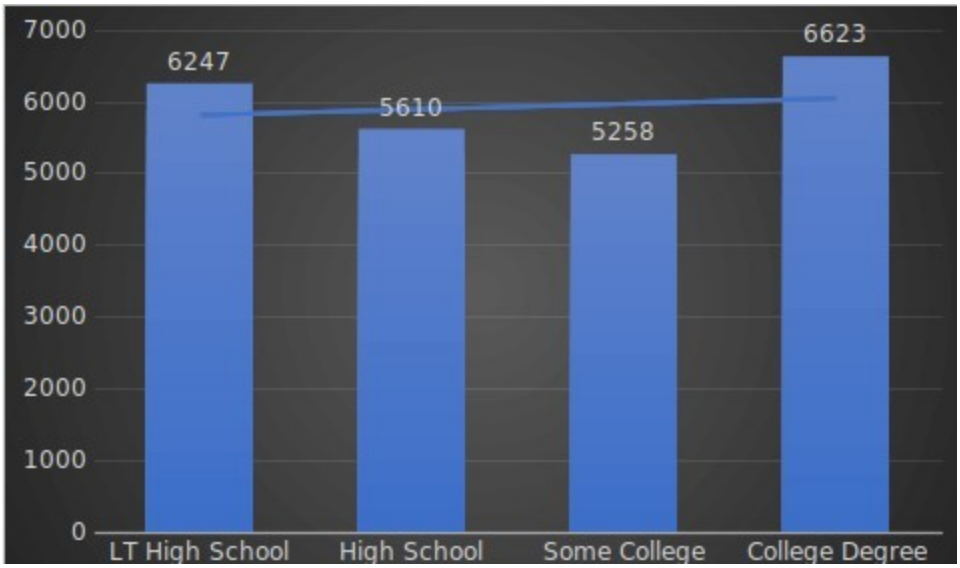
Table 5: Young Persons' Interests in Farming: Intergenerational Influences

Occupation of Head of Household	Occupation of Young Person in the Household	
	Farming	Other Occupation
Farming (N = 13,923)	8%	92%
Other Occupation (N = 29,780)	1%	99%

Note: χ^2 = 1602.95; p <0.05. *Phi* = 0.192, t = 44.54, p < 0.05.

Hypothesis 2, S-R_2, predicts a negative relationship between young persons' farming behavior and level of education. This was disconfirmed; as shown in Figure 3, the correlation between the variables is 0.16, p <0.05.

Figure 3: Level of Education by Number of Young Farmers



The expectation that "higher the farm revenue the more will be the number of young persons engaged in farming", R-O_1, was confirmed (Table 6); almost 50% of the young farmers are associated with farms that earn $100,000 or more. A simple, power model of the form: $y = 3216.9x^{0.6592}$ best explains the relationship between number of young farmers and the impact of farm income; $r^2 = 0.49$.

Table 6: Number of Young Farmers by Economic Class; Mode is Highlighted

Economic Class of Farm	No. of Young Farmers
$30,000 - $34,999	8%
$35,000 - $39,999	8%
$50,000 - $59,999	26%
$60,000 - $74,999	9%
$100,000 - $149,999	18%
$150,000 and more	**31%**
All	100% (N = 46,699)

Note: $r = 0.7$; $t = 210.42$, $p < 0.05$.

The head of the farming household provides positive reinforcement for young persons in the household to engage in farming; the strength of the reinforcement is the largest for biological son or daughter (Table 7). The statistical validity of the statement, hypothesis R-O_2, was tested using the expected frequency of young farmers given in Table 5, 8%. The resultant test statistic, $\chi^2 = 107.93$, was significant at the $p < 0.01$ level.

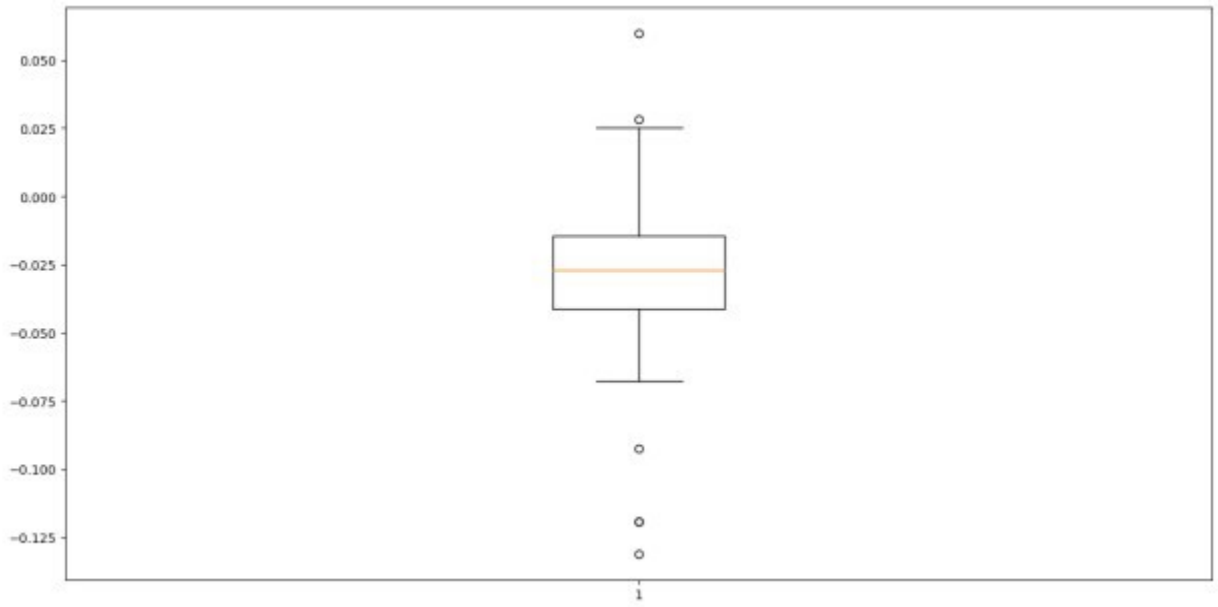
Table 7: Probability of Farming

Relationship to the Head of Household, Farmer	Percent in Farming	N
Biological son/daughter	10%	10124
Adopted son/daughter	4%	263
Step son/daughter	8%	567
Spouse	7%	1505
Other relatives	0%	830

The hypothesis about family farms attracting a large number of young farmers ($S\text{-}O_1$) was tested by correlating two change scores: county-level growth in young farmers and increases in farming-family businesses in the counties.

Figure 4 is the five-number summary of the annual compound growth rates (ACGRs) of young farmers in Illinois counties. The median annual growth rate is -0.027 per year. The interquartile range is 0.026; the 95% confidence interval for the median is -0.054 to 0.0135 which suggests that most of the observations lie between -0.054 to 0.0135 ACGRs. Marshall County is an outlier with a -13% annual decline in young farmer population. Lawrence, Moultrie, and Champaign are examples of counties that have positive growth rates in the segment (Appendix 1).

Figure 4: Box Plot of Young Farmer Growth Rates in Illinois Counties



Note: ACGR data shown in Appendix 1 were used to construct the figure. Summary statistics are: Min = -0.13; Q1 = -0.04; Median = -0.027; Q3 = -0.014, and Max = 0.059.

The ACGRs for family farming businesses in the counties range from -6% to 5% (Appendix 1). The correlation between the change scores, ACGRS for young farmers and family businesses, was negative: r = -.22, t = -2.13, p < 0.05, thus disconfirming the hypothesis that family businesses attract a large number of young farmers.

Figure 5 highlights CPS data on young farmers in full-owner farms. Of the 13,830 young, agricultural workers, 36% work for local governments and 33% are employed by private firms in the industry. The remaining 31% are self-employed and work in farms.

In general, majority of young, self-employed function in the service sectors. Production and manufacturing sectors do not attract young entrepreneurs in large numbers, for example, the agriculture sector has 7% of young entrepreneurs and manufacturing, 6% (Table 7).

Figure 5: Young Agricultural Industry Workers

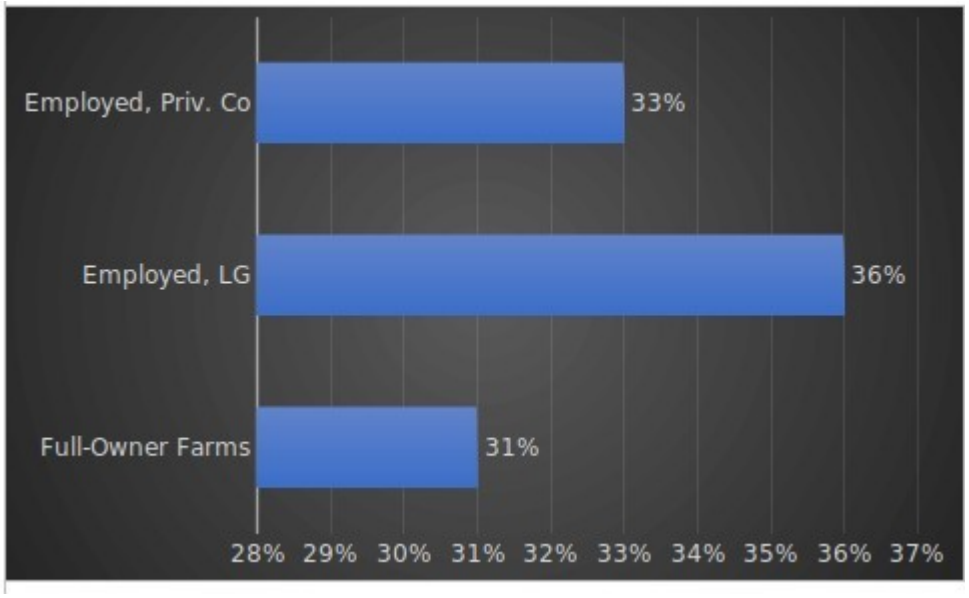


Table 7: Young Persons by Class of Worker by Industry

Industry	No. of Young Persons; Self-Employed, Un-Inc. Business
Agriculture	7%
Manufacturing	6%
Information	9%
Professional Services	28%
Education	27%
Arts& Entertainment	8%
Other Services	15%
All	100% (N = 66,411)

Summary and Conclusion

This paper explores young Illinoisans interests in farming using the conceptual framework of stimulus sampling theory. Multiple data sources are used to gain insights into the topic, for example, Census of Agriculture, ACS, and CPS.

Results of data analysis suggest:

1. Young producers in Illinois constitute 7% of the farm-operator population; neighboring states, Indiana and Iowa, have greater proportion of young producers, 10% and 9%, respectively.
2. A large number of young producers (50%) earn more than $100,000 a year from farming.
3. Family connections in farming influence young persons in the family to take up farming; for example, of the 13,923 head of households who reported farming as their primary self-employment, 8% had young members of their household engaged in farming as their primary occupation. This number reduces to 1% for young persons in household with non-farming interests.
4. The head of the farming household provides positive reinforcement for young persons in the household to engage in farming; the strength of the reinforcement is the largest for biological sons or daughters.
5. The median growth rate of young producers in Illinois counties is -2.7%.

Point 5 above, the negative ACGR of young farmers, could be a concern if family farms are being replaced by corporations, but they are not[12]. The truth is that most young persons from farming families are looking elsewhere for jobs. Their motivation in doing so would be the topic for a future *Research Brief*.

[12] See, Athiyaman, A. (2022). Foreign Businesses in the Agricultural Sector in Illinois. *Research Brief*, 4(12), June 28, 1-14. Available: http://www.iira.org/wp-content/uploads/2022/06/Foreign-Businesses-in-the-Agricultural-Sector-In-Illinois_RB4_12.pdf.

Appendix 1: Annual Compound Growth Rates (ACGRs)

County	Family Farms, ACGR	Young Farmers, ACGR
Adams	0.00%	-2.23%
Alexander	-3.00%	-9.24%
Bond	-1.00%	-1.57%
Boone	-1.00%	-6.06%
Brown	-1.00%	-5.23%
Bureau	-1.00%	-4.20%
Calhoun	0.00%	-6.48%
Carroll	-2.00%	-3.01%
Cass	-1.00%	-3.48%
Champaign	-2.00%	2.40%
Christian	-1.00%	-2.54%
Clark	1.00%	0.81%
Clay	-1.00%	-1.47%
Clinton	-3.00%	-2.97%
Coles	-1.00%	-4.21%
Cook	5.00%	-11.95%
Crawford	-2.00%	-1.42%
Cumberland	-1.00%	0.39%
De Kalb	-4.00%	-4.83%
De Witt	-1.00%	-1.61%
Douglas	-4.00%	-1.17%
Edgar	-2.00%	-2.39%
Edwards	-5.00%	0.20%
Effingham	-2.00%	-2.48%
Fayette	0.00%	-3.49%
Ford	1.00%	-3.01%
Franklin	-3.00%	-2.46%
Fulton	0.00%	-2.80%
Gallatin	-2.00%	-5.77%
Greene	1.00%	-1.51%
Grundy	-1.00%	-4.52%
Hamilton	-6.00%	-6.77%
Hancock	-1.00%	-0.55%
Hardin	0.00%	-4.62%
Henderson	2.00%	-0.85%
Henry	-1.00%	-3.08%
Iroquois	0.00%	-1.50%
Jackson	-1.00%	-4.40%
Jasper	0.00%	-1.30%
Jefferson	1.00%	-5.07%
Jersey	0.00%	-0.93%
Jo Daviess	0.00%	-5.73%
Johnson	3.00%	-3.11%
Kane	-1.00%	-4.62%

Appendix 1: Annual Compound Growth Rates (ACGRs), Cont'd

County	Family Farms, ACGR	Young Farmers, ACGR
Kankakee	-2.00%	-1.71%
Kendall	-4.00%	-1.99%
Knox	-1.00%	-3.85%
La Salle	-2.00%	-2.68%
Lake	-3.00%	5.96%
Lawrence	3.00%	2.81%
Lee	-1.00%	-3.79%
Livingston	-1.00%	-0.79%
Logan	-4.00%	1.03%
Macon	-2.00%	-0.77%
Macoupin	-1.00%	-2.91%
Madison	-1.00%	-6.03%
Marion	-3.00%	-1.81%
Marshall	2.00%	-13.11%
Mason	2.00%	-1.83%
Massac	0.00%	-5.03%
Mcdonough	-1.00%	-2.13%
Mchenry	0.00%	-3.11%
Mclean	-1.00%	-2.03%
Menard	-1.00%	-3.47%
Mercer	1.00%	-1.89%
Monroe	0.00%	-3.00%
Montgomery	0.00%	-2.23%
Morgan	-3.00%	-1.92%
Moultrie	-2.00%	2.52%
Ogle	-3.00%	-1.50%
Peoria	-1.00%	-4.15%
Perry	0.00%	-4.01%
Piatt	-2.00%	-1.43%
Pike	-1.00%	-1.00%
Pope	0.00%	-11.95%
Pulaski	-2.00%	-3.41%
Putnam	-3.00%	1.68%
Randolph	1.00%	-5.88%
Richland	1.00%	-5.19%
Rock Island	-2.00%	-1.28%
Saline	-1.00%	-3.32%
Sangamon	-1.00%	-2.83%
Schuyler	-1.00%	-2.70%
Scott	-5.00%	-4.22%
Shelby	-2.00%	-1.23%
St Clair	1.00%	-3.49%
Stark	1.00%	-0.15%
Stephenson	-3.00%	-3.51%

Appendix 1: Annual Compound Growth Rates (ACGRs), Cont'd

County	Family Farms, ACGR	Young Farmers, ACGR
Tazewell	-2.00%	-2.85%
Union	-2.00%	-1.86%
Vermilion	2.00%	-4.11%
Wabash	-4.00%	-0.74%
Warren	3.00%	-0.57%
Washington	-2.00%	-4.62%
Wayne	-4.00%	0.27%
White	-4.00%	-2.16%
Whiteside	-3.00%	-2.20%
Will	-3.00%	-2.86%
Williamson	-3.00%	-5.15%
Winnebago	-3.00%	-3.55%
Woodford	-1.00%	-1.82%

APPENDIX 7

AN EMPIRICAL ANALYSIS OF THE ATTRIBUTES OF NEW AND BEGINNING FARMERS IN ILLINOIS

Research Brief,

Short Paper

Vol. 4, No. 15

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The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.

Western Illinois University

An Empirical Analysis of the Attributes of New and Beginning Farmers in Illinois

ISSN 2687-8844

Adee Athiyaman[1]

Abstract

This paper compares the characteristics of beginning operators and their farming operations with those of experienced producers using data from the census of agriculture. Results of data analysis reveal that 99% of all beginning producers are White. Of the very few minority beginning producers, N = 202, 44% are African Americans, 34% Asians, and 22% other minorities. A higher proportion of beginning farmers grow vegetables and engage in cattle, sheep, and goat farming, whereas experienced producers focus on oilseed and grain farming and dairy cattle. This research is a first step towards building up an empirically based set of observations and findings about beginning farmers.

Introduction

The concept of clustering arises from the recognition that the elements of a population could differ, but sub-groups which are homogeneous in one or more attributes of interest can be identified and enumerated. The sub-group which is of interest in this paper is new and beginning farmers, that is, farm operators with less than 11 years of farming experience[2]. In the following pages, I compare

[1] Professor, Illinois Institute for Rural Affairs, Western Illinois University.

[2] 2017 US Census of Agriculture. Appendix B: General Explanation and Census of Agriculture Report Form. In 2012, the definition for a new and beginning farmer was an operator with LT 10 years of farming experience; see https://agcensus.library.cornell.edu/wp-content/uploads/2012-United-States-usappxb-1.pdf.

the characteristics of beginning operators and their farming operations with those of experienced producers[3]. Also, changes in the attributes of the beginning farmers are explored using data from both the 2012 Census of Agriculture and the 2017 Census of Agriculture.

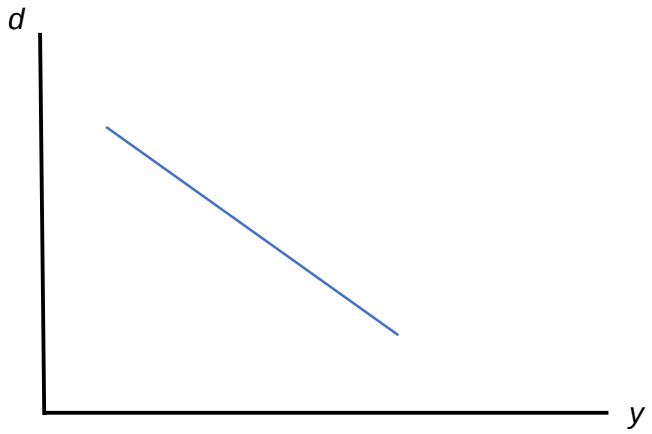
Conceptual Model

The study of business strategy makes use of the experience-curve concept to prescribe product and pricing strategies[4]. Experience curve is based on learning, or acquisition of knowledge[5]; for example, people learn and hence do a given task in less time.

This 'learning' can be expressed as an equation, $d = ay^{(-b)}$, where *d* is the total time to complete a specific task, *y* is the total cumulative years of experience in the job, and *a* and *b* are parameters[6].

The relationship between *d* and y is linear in logs, $ln(d) = a - b*ln(y)$, as shown in Figure 1; it suggests that completion times decline by a constant proportion each time experience increases.

Figure 1: Plot of the Linear Learning Curve



This simple conceptualization suggests that a higher proportion of experienced farmers will be economically successful than new and beginning farmers. The primary reason for this expectation is 'labor efficiency', experienced farmers would have learned improvements and shortcuts in farming practices; work-method improvement – redesign of work methods - could also be a contributing factor.

[3] The terms producer and operator are used interchangeably.
[4] Lancaster, G., & Massingham, L. (2017). Strategic marketing planning tools. In *Essentials of Marketing Management* (pp. 402-425). Routledge.
[5] Baddeley, A. D. (1997). *Human memory: Theory and practice*. Psychology press.
[6] Abernathy, W. J. (1979). Limits of the learning curve. *Harvard Business Review*, 52(Sep-Oct), 109-119.

Methodology

Data are from the 2017 and 2012 Census of Agriculture[7]. Table 1 shows the variables used in the research; data analyses were conducted using the framework, *Data = fit + residuals*. Both, graphical and numerical analyses were performed.

Table 1: Variables and their Definitions

Variable	Operational Definition
Farms	
Operations	Number of farms.
Area	Area operated; five levels; 1= LT 10 acres; 2 = 10 to 49 acres; 3 = 50 to 179 acres; 4 = 180 to 499 acres, and 5 = GT 500 acres.
Tenure	Three levels: 1 = full owner; 2 = part owner, and 3 = tenant.
NAICS	Industry classifications; 13 levels, from NAICS 1111 to NAICS 1129.
Economic class	Sum of value of agricultural products sold and Federal farm program payments; seven levels: 1 = less than $1,000, …, 7 = GTE $50,000.
Producers	
Gender	1 = Male; 2 = Female.
Race	1 = White; 2 = Black; 3 = Asian; 4 = American Indian or Alaska Native; 5 = Native Hawaiian or Pacific Islander.
Age	Age of the operator; six levels; 1 = LE 35; 2 = 35-44; 3 = 45-54; 4 = 55-64; 5 = 65 to 74; 7 = 75+.

[7] https://www.nass.usda.gov/AgCensus/.

Findings

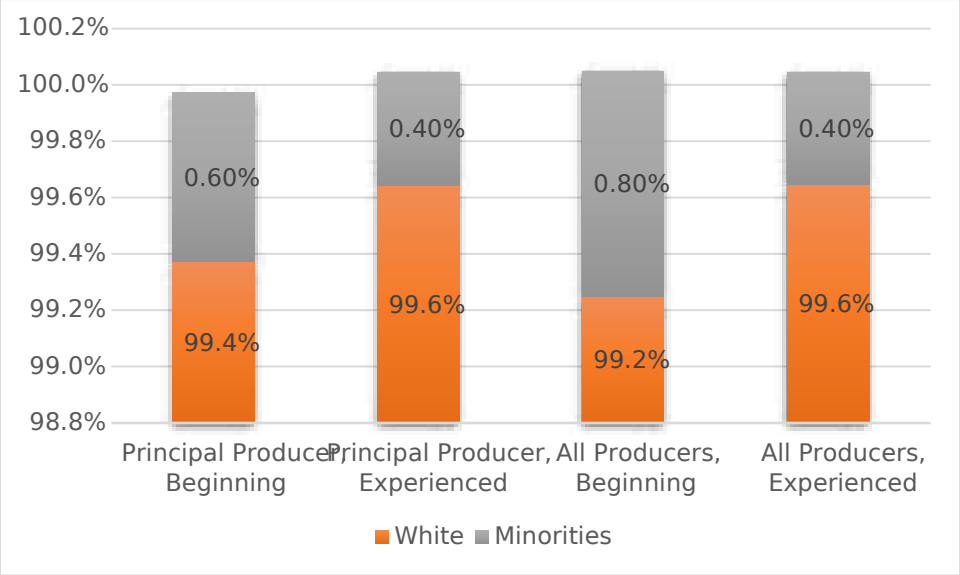
Majority of the beginning producers are male (67%). The proportions of beginning female producers are more than the proportions of experienced female producers; the opposite is true for males (Table 2).

Table 2: Gender Distribution of Beginning and Experienced Farmers

Gender	Principal Producer		All Categories	
	Beginning	Experienced	Beginning	Experienced
Male	74%	81%	67%	73%
Female	26%	19%	33%	27%
N	19,803	74,134	26,995	89,422

Ninety-nine percent of all beginning producers are White. Of the very few minority beginning producers, N = 202, 44% are African Americans, 34% Asians, and 22% other minorities, for example, native Americans (Figure 2). Unlike the females in Table 2, minorities are minimally represented in the "beginning producer" category.

Figure 2: Producers' Race



The beginning producers tend to be young, the modal age is less than or equal to 35. A majority are less than 45 years of age (51%) and slightly more than one-in-ten are older than 65.

While most beginning producers operate farms that are less than 50 acres in size, most experienced producers operate 50-179 acres. However, the relationship between producer status and area operated is nonlinear; a larger proportion of beginning producers operate farms that are 500 acres or more in size (Table 3).

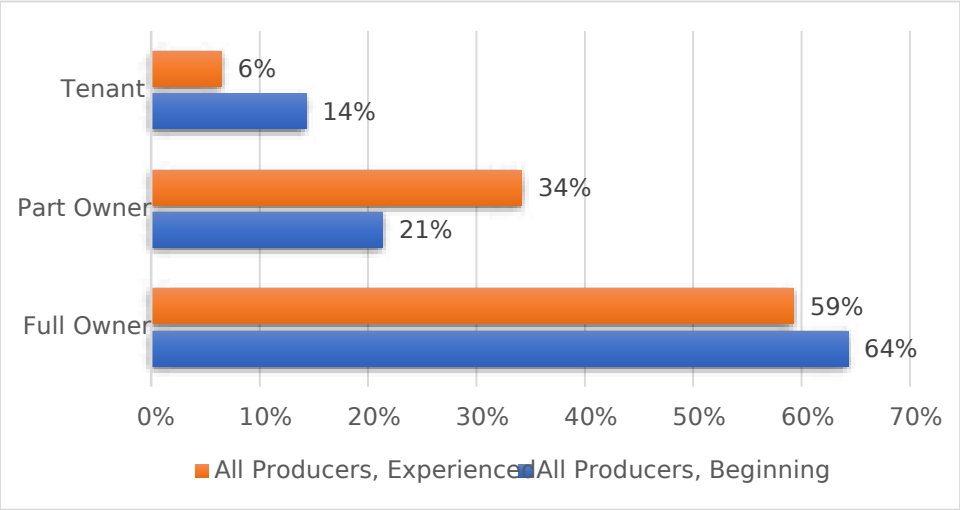
Table 3: Acreage Operated: Beginning versus Experienced Producers

Land Area	Beginning Producers	Experienced Producers
1 to 9.9 Acres	17%	11%
10 to 49.9 Acres	**29%**	27%
50 to 179 Acres	27%	**31%**
180 to 499 Acres	14%	21%
≥ 500 Acres	13%	10%
ℕ	18,796	74,432

Note: Modal values are in bold.

A majority of beginning and experienced producers are full owners of their farms. However, a higher proportion of beginning producers tend to farm leased land (Figure 3). Appendix 1 compares data on beginning producers for the 2012 and 2017 census years.

Figure 3: Farm Tenure: Beginning and Experienced Producers



Note: N = 89,422 for experienced producers and 18,796 for beginning producers.

Learning Curve Effects

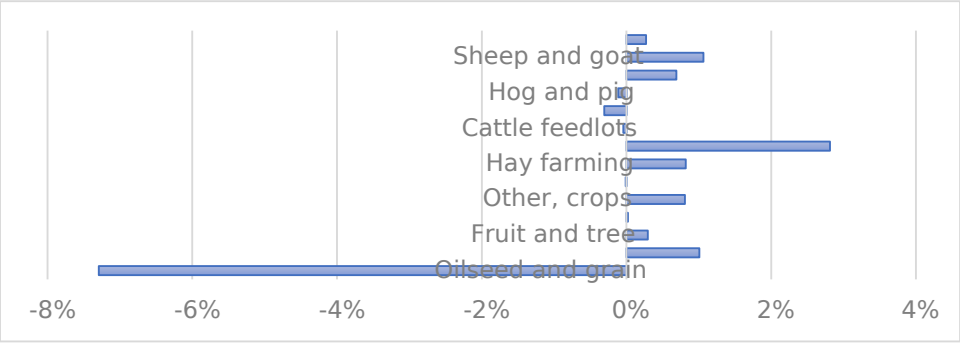
Table 4 lists the production choices of both beginning and experienced producers. The numbers seem similar; for both types of producers, oilseed and grain farming is the most preferred business and dairy cattle and milk production is one of the least preferred choices. However, a Chi-square test rejected the null hypothesis of independence between the variables. In other words, business choice is dependent on the type of operator, beginning or experienced. A higher proportion of beginning farmers grow vegetables and engage in cattle, sheep, and goat farming, whereas experienced producers focus on oilseed and grain farming and dairy cattle (Figure 4).

Table 4: Percentage of Farms by NAICS and Operator Types

NAICS	Beginning Producer	Experienced Producer
1111: Oilseed and grain farming	39%	46%
1112: Vegetable and melon farming	2%	1%
1113: Fruit and tree nut farming	1%	1%
1114: Greenhouse, nursery	1%	1%
1119: Other, crop farming	19%	18%
11191: Tobacco farming	0%	0.02%
11193, 11194, 11199: Hay, etc.	19%	18%
112111: Beef cattle ranching	10%	7%
112112: Cattle feedlots	1%	1%
11212: Dairy cattle and milk production	1%	1%
1122: Hog and pig farming	1%	1%
1123: Poultry and egg production	1%	0%
1124: Sheep and goat farming	2%	1%
1125, 1129: Other, animal farming	5%	5%
N	23,074	108,699

Note: ^{2}: 1030; critical = 22.36; $p < 0.05$.

Figure 4: Plot of Difference Scores from Table 4: Beginning *versus* Experienced Producers



Note: Positive values show the type of businesses that are favored by the beginning producers; see Table 4 for numerical values and NAICS codes for industry descriptions.

To further explore the data given in Table 4, a “fit + residual” analysis was performed; each value of the table was modelled as the sum of ‘producer type’ and ‘industry affiliation. Table 5 displays fits for each producer type; the median values are provided at the bottom of the table with residuals in the center. Each fit plus residual equals the original cell data.

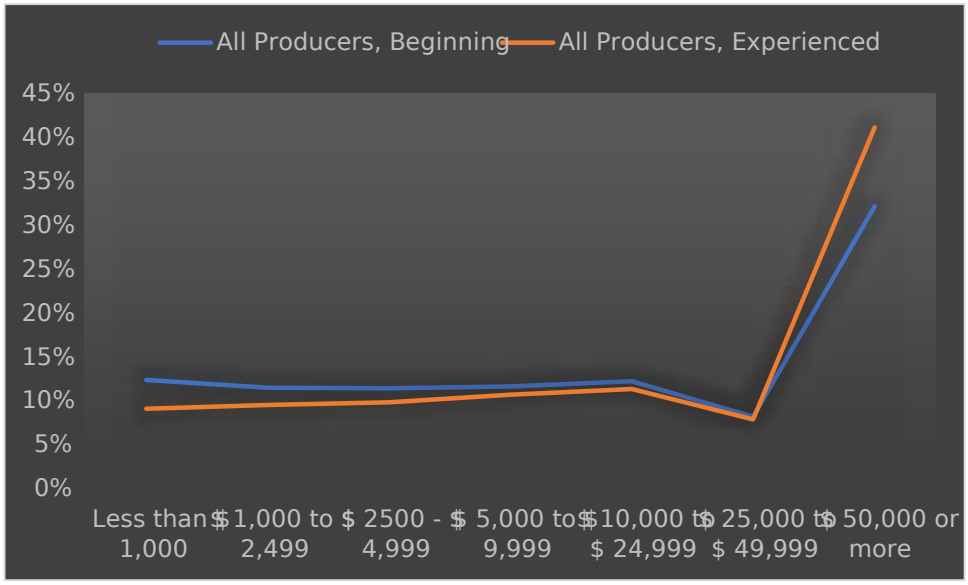
Table 5: Residual Percentage of Producers in Various Agricultural Businesses After a First Pass at Removing the ‘Type of Producer’ Fit.

NAICS	Beginning Producer	Experienced Producer
1111: Oilseed and grain farming	37.36%	44.89%
1112: Vegetable and melon farming	0.26%	-0.50%
1113: Fruit and tree nut farming	-0.41%	-0.45%
1114: Greenhouse, nursery	-0.26%	-0.03%
1119: Other, crop farming	17.11%	16.55%
11191: Tobacco farming	-1.42%	-1.17%
11193, 11194, 11199: Hay, etc.	17.11%	16.54%
112111: Beef cattle	8.15%	5.59%
112112: Cattle feedlots	-0.89%	-0.60%
11212: Dairy cattle and milk production	-0.83%	-0.28%
1122: Hog and pig farming	-0.26%	0.10%
1123: Poultry and egg production	-0.28%	-0.73%
1124: Sheep and goat farming	0.85%	0.03%
1125, 1129: Other, animal farming	3.52%	3.50%
Fit, Median	1.43%	1.18%

In Table 5, negative residuals indicate low-option farming businesses and positive residuals highlight high-option businesses or choices. For beginning producers, beef- cattle ranching is a high-option business and poultry and egg production is a low-option business. Experienced producers value oilseed and grain farming. Appendix 2 models the values associated with industry effects.

Figure 5 shows the impact of farming experience (learning) on income, economic class. A larger proportion of beginning producers is represented at the lower end of the economic-class scale; the reverse is true for experienced producers.

Figure 5: Impact of Farming Experience on Farm Income



Note: ^{2} statistic = 603.43; critical value of ^{2} = 14.067; $p < 0.05$.

Summary and Conclusion

This research profiles beginning farmers in Illinois using the 2017 agricultural census data. Data analysis shows that the economic class of farms vary positively with the work experience of the operator, as predicted by the experience-curve effects

A typical beginning farm operator is a White male, less than 35 years of age, who farms about 10 to less than 50 acres of oilseed and grain in his fully-owned land. In contrast, an experienced producer typically farms 50 to less than 180 acres.

A first step has been made at building up an empirically based set of observations and findings about beginning farmers. We plan to build on this by exploring micro data on the topic from the USDA's Agricultural Resource Management Survey.

Appendix 1: Beginning Farmers: Profiles from the 2012 and 2017 Census of Agriculture

Variable	2012		2017	
	Beginning Operator (N=19,658)	Experienced Operator (N=87,626)	Beginning Operator (N=26,995)	Experienced Operator (N=89,422)
Gender				
- Male	71%	79%	67%	73%
- Female	29%	21%	33%	27%
Race				
- White	99.02%	99.38%	98.92%	99.42%
- Black	0.34%	0.12%	0.33%	0.16%
- Native American	0.16%	0.12%	0.26%	0.10%
- Pacific Islander	0.03%	0.02%	0.11%	0.09%

Appendix 2: Industry Affiliation: Residual Assessment

Table A2.1: Additive 'Producer Type' and 'Agricultural Businesses' with Residuals and Overall Fit from Median Smoothing of Table 5

NAICS	Beginning Producer	Experienced Producer
1111: Oilseed and grain farming	-5.08%	-2.47%
1112: Vegetable and melon farming	-0.92%	1.68%
1113: Fruit and tree nut farming	-1.29%	1.33%
1114: Greenhouse, nursery	-1.42%	1.19%
1119: Other, crop farming	-1.03%	1.59%
11191: Tobacco farming	-1.44%	1.17%
11193, 11194, 11199: Hay, etc.	-1.02%	1.59%
112111: Beef cattle	-0.03%	2.59%
112112: Cattle feedlots	-1.45%	1.16%
11212: Dairy cattle and milk production	-1.58%	1.02%
1122: Hog and pig farming	-1.49%	1.13%
1123: Poultry and egg production	-1.09%	1.52%
1124: Sheep and goat farming	-0.89%	1.71%
1125, 1129: Other, animal farming	-1.30%	1.32%

Table A2.2: Fit Values for Agricultural Businesses, NAICS

NAICS	Fit Statistic
1111: Oilseed and grain farming	42.43%
1112: Vegetable and melon farming	1.18%
1113: Fruit and tree nut farming	0.88%
1114: Greenhouse, nursery	1.16%
1119: Other, crop farming	18.14%
11191: Tobacco farming	0.01%
11193, 11194, 11199: Hay, etc.	18.13%
112111: Beef cattle	8.18%
112112: Cattle feedlots	0.56%
11212: Dairy cattle and milk production	0.75%
1122: Hog and pig farming	1.23%
1123: Poultry and egg production	0.80%
1124: Sheep and goat farming	1.74%
1125, 1129: Other, animal farming	4.82%

Note: The original data from Table 4 can be recreated by adding producer fit from Table 5 and business fit from Table A2.2.

APPENDIX 8

WIU - USDA AGREEMENT

ARMS AND/OR TOTAL PROJECT AGREEMENT

between

THE UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE (ERS),
NATIONAL AGRICULTURAL STATISTICS SERVICE (NASS),
and the

The Board of Trustees of Western Illinois University *(name of university, institution, or agency)*

(hereinafter referred to as the Organization)

SUBJECT: Access by specified Organization staff to ERS/NASS Agricultural Resource Management Survey (ARMS) and Tenure, Ownership and Transition of Agricultural Land (TOTAL) data that have been collected and acquired for exclusively statistical purposes under a pledge of confidentiality.

NAME OF THE PROPOSED PROJECT: Disparities in Illinois Farming Operations

PROJECT LEADER (Cannot be a student for university-based research):

Name: Adee Athiyaman
Title: Professor of Marketing & Community Economic Development
Address: 509 Stipes Hall, Western Illinois University
Phone number: 309-298-2272
Email address: a-athiyaman@wiu.edu

LOCATION OF DATA ACCESS:

Access to ARMS and/or TOTAL data is via the Internet using the ERS Data Enclave (fees based on number of users)

WHAT SPECIFIC ARMS and/or TOTAL DATA WILL BE USED? List the years, Phase II or Phase III, and if required, which specific versions. (http://www.ers.usda.gov/Data/ARMS and/or TOTAL/GlobalDocumentation.htm).

Enter type of data here:
ARMS, 2021, C&R - Version 1 (10/18/2021)

DURATION: ☐ Student research, one year limit
☒ Faculty research, two year limit

The project starts upon ERS and NASS approval of this agreement.

PROJECT SUMMARY:

Present an overview of the project in a minimum of one page including the objectives, methodology, how ARMS and/or TOTAL data will benefit this project, and how this project will contribute to a further understanding of the agriculture sector. Best statistical practices are expected for all research.

Background

The Illinois Department of Agriculture (IDOA) has requested researchers from various universities in Illinois to study disparities in farm operations in the state. The applicant, a faculty member at Western Illinois University, has been tasked to perform a secondary analysis of published data on the topic.

As at date, the applicant has produced five research papers on the topic (Table 1), but most of the arguments were constructed using grouped data. Since inferences from grouped data have questionable validity, different conclusions can emerge from the same data depending on the classification adapted, the applicant is requesting access to ARMS (micro)data, the details of which are given below.

Table 1: Applicant's Research on Disparities in Farm Operations Using Grouped Data

Citation	Available Online
Illinois Farm Ownership by Race and Farm Productivity.	http://www.iira.org/wp-content/uploads/2022/05/RB410-Illinois-Farm-Ownership-by-race-and-farm-productivity.pdf
An Empirical Analysis of Farm Tenancy in Illinois and Tweets about Farm Tenancy	http://www.iira.org/wp-content/uploads/2022/07/Empirical-analysis-of-Illinois-farm-tenancy-RB4_13_3.pdf.
Young Illinoisans' Interests in Farming	http://www.iira.org/wp-content/uploads/2022/07/Young-Illinoisans-Interests-in-Farming_RB4_14_.pdf.
An Empirical Analysis of the Attributes of New and Beginning Farmers in Illinois	http://www.iira.org/wp-content/uploads/2022/07/New-and-beginning-farmers-in-Illinois-RB4_15.pdf.
Foreign Businesses in the Agricultural Sector in Illinois	http://www.iira.org/wp-content/uploads/2022/06/Foreign-Businesses-in-the-Agricultural-Sector-In-Illinois_RB4_12.pdf.

Research Objective and Goals

The objective is to explore disparity in farm operations in Illinois. The goals, which are stated as research questions, include:

i. How does farm income / wealth differ among different types of farms;
ii. Do grants, loans, commodity subsidies, etc. differ among different types of farm segments; and

PROJECT SUMMARY: (Continued)

iii. Are technical assistance and mechanization uniformly distributed within farm segments such as producer demographics.

Methodology

The purpose of requesting ARMS data is to replicate the findings of grouped data analyses reported in the five papers (Table 1). Exploratory data analysis techniques, specifically five-number summary, and cross-classification of variables would be the primary tools for data analysis.

To address the question about farm income differences among different types of farms, crosstabulations such as the one given below will be constructed using ARMS 2021, C&R - Version 1 (10/18/2021) data. The table was originally constructed using grouped data; see Table 1, Citation 1, Table 4 in the report. Note that due to space limitations only a few, salient crosstabulations are listed; however, the intention is to replicate all tables given in publications 1-4 in Table 1.

Table __: White versus Minority Producers: Farm Characteristics

Attribute	American Indian	Asian	African American	Pacific Islander	White
			ARMS 2021; C&R - Version 1 (10/18/2021)		
Number of farms			Section A, Q4 by Section K, items e and f.		
Size (acres):					
➢ 1-9					
➢ 10-49					
➢ 50-179			Section A, Q4		
➢ 180-499					
➢ 500 +					
Ownership:					
➢ Owned			Section A, Q1		
Economic Class:					
➢ <$1,000					
➢ $1000-2499					
➢ $2500-4999			Sections B, C, D, and E		
➢ $5000-9999					
➢ $10000-24999					
➢ $25000-49999					
➢ $50000+					
Commodity Credit Corp. Loans			Section G		
Cons. Reserve[1]			Section G		
Other Fed Payments					
Legal Type:					
- Household			Section L		
- Ltd. Co.					
# of Households[2]					
- one			Section L		
- More than one					

PROJECT SUMMARY: (Continued)

To assess disparities in farming operations among operators of leased agricultural land, tables such as the ones shown in citation 2 in Table 1 will be developed; again, two tables are listed for illustration purposes.

Table x: Tenants and Acres

Variable	% of Tenants
Acreage Rented: ➢ 1-49 acres ➢ 50-99 acres ➢ 100-199 acres ➢ 200-499 acres ➢ 500-999 acres ➢ 1000-9999 acres	ARMS 2021; C&R - Version 1 (10/18/2021) Section A, Q2.
Landlord Type: ➢ Non-operating landlord ➢ Operating	Section A, Q 10-12

Table x: Production Value by Tenant Acreage

Farm Type	Total Tenant Acreage	Average Tenant Acreage	Production Value Per Acre
Low-sales farms: operator's primary occupation is farming and gross cash farm income < $150,000			
Moderate sales farms: operator's primary occupation is farming and gross cash farm income is $150,000-$349,000			
Midsize farms: operator's primary occupation is farming and gross cash farm income is $350,000-$999,000			
Large farms: operator's primary occupation is farming and gross cash farm income is $1mil -$4.999mil	ARMS 2021; C&R - Version 1 (10/18/2021) Section K, q. 2h; Section M, q. 6; Section A, q.2 a-d; Section B, q 2, all columns; Section L, q1, q5a; Section K, q.2i.		
Very large farms: operator's primary occupation is farming and gross cash farm income is >$5mil			
Non-family farms: Majority not owned by the operator or her relations.			
Farm businesses: Gross cash income >$350,000 or smaller operation where farming is the operator's primary occupation.			
Farm operator, households			
Retirement farms: Retired operator; gross cash from farming <$350,000			

PROJECT SUMMARY: (Continued)

Summary and Conclusion

The request for ARMS data is motivated by the need to fulfill a request for (research) information from the Illinois Department of Agriculture. The ARMS data will inform the three research questions discussed above. The geographical unit of analysis will be Illinois; data tabulations will be at the state level.

The audiences of the research would be elected officials and practitioners in the agricultural industry in Illinois. Exploratory data analysis methods such as five-number summaries and crosstabulations of variables will be used to describe disparities, if any, in farming operations. Publications from the secondary analysis of ARMS data will be in the form of Research Briefs, published by the Illinois Institute for Rural Affairs, Western Illinois University.

PROJECT PARTICIPANT INFORMATION (list each person):

Name: Adee Athiyaman — Signature:
Title: Professor of Marketing and Community Economic Development
Phone number: 309-298-2272
Email address: a-athiyaman@wiu.edu
U.S. Citizen: ☒ Yes ☐ No
Will this person access the ARMS and/or TOTAL database

via the Data Enclave? X
at ERS headquarters? ☐
at NASS headquarters? ☐

Name: ______ Signature:
Title: ______
Phone number: ______
Email address: ______
U.S. Citizen: ☐ Yes ☐ No
Will this person access the ARMS and/or TOTAL database

via the Data Enclave? ☐
at ERS headquarters? ☐
at NASS headquarters? ☐

Name: ______ Signature:
Title: ______
Phone number: ______
Email address: ______
U.S. Citizen: ☐ Yes ☐ No
Will this person access the ARMS and/or TOTAL database

via the Data Enclave? ☐
at ERS headquarters? ☐
at NASS headquarters? ☐

Name: ______ Signature:
Title: ______
Phone number: ______
Email address: ______
U.S. Citizen: ☐ Yes ☐ No
Will this person access the ARMS and/or TOTAL database

via the Data Enclave? ☐
at ERS headquarters? ☐
at NASS headquarters? ☐

MEMORANDUM OF UNDERSTANDING:

The Memorandum of Understanding associated with this Agreement serves as the foundation for the cooperation between the Organization, ERS, and NASS regarding the use of ARMS and/or TOTAL data for strictly statistical purposes. All projects that access the ARMS and/or TOTAL must adhere to and abide by the provisions laid out in the Memorandum of Understanding.

DATA SHARING:

The Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA), Title V of the E-Government Act of 2002 (Public Law 107-347), Subtitle A, establishes standards and requirements that provide the legal authority for any party entering into the Memorandum of Understanding. CIPSEA allows Federal agencies that collect data under the pledge of confidentiality to share individually identifiable data for statistical purposes only, to deny use of the data for non-statistical purposes, such as enforcing regulations or release under the Freedom of Information Act (FOIA), and to punish those who disclose identifiable information about individual respondents.

CIPSEA defines statistical purposes to include the description, estimation, or analysis of the characteristics of groups without identifying individuals. ARMS and/or TOTAL data cannot be used for non-statistical purposes including administrative, regulatory, law enforcement, adjudicatory, or other purposes that affect the rights, privileges, or benefits of a particular respondent.

PENALTIES:

INITIALS:

The protection of data collected under this law is supported by a penalty of a Class E Felony for a knowing and willful disclosure of confidential data. This includes imprisonment for up to five (5) years and fines up to $250,000. Any violation of this Memorandum of Understanding may also be a violation of Federal criminal law under the Privacy Act of 1974, 5 U.S.C. 552a. In addition to the imposition of civil/criminal fines and penalties, any violation of data confidentiality will result in the termination of this Agreement and the Memorandum of Understanding.

DISSEMINATION AND DISCLOSURE REVIEW OF INFORMATION:

INITIALS:

The Organization is accountable for protecting ARMS and/or TOTAL confidentiality and will submit a copy of all drafts reporting data summaries or analytical findings from the ARMS and/or TOTAL to ERS and NASS for disclosure review and approval prior to internal or public dissemination. The Organization will also provide final copies of any research output from the project intended for release or publication. The scope of this review will be solely to determine compliance with CIPSEA and the Privacy Act, and to ensure adherence to the confidentiality and security provisions established under this agreement. The disclosure review and approval covers all statistics, analytical findings, or details based on ARMS and/or TOTAL data made available under this Memorandum of Understanding. Information that might be identified with a particular farm operator or farm operation cannot be published. Research outputs

include articles, posters, presentations, or other statistical summaries. Statistical methods, hypothesis testing, and conclusions are the Organization's responsibility and not part of the disclosure review. Publications that include data from this agreement must clearly state that the conclusions presented do not confer USDA, ERS, or NASS, support and are solely the responsibility of the Organization.

After the Organization has completed all items in the Appendix ERS/NASS will complete their review of outputs, including manuscripts, and notify the Organization as soon as possible. Agents may not disseminate research outputs until ERS/NASS have completed their review and an authorization has been provided to the Recipient Project Coordinator. The Organization will be bound by the determinations of ERS and NASS. Given that the Organization has completed all the items in the Appendix, the review is usually completed with a week. However, review of more complex research analysis may take longer. ERS/NASS will expend sufficient efforts to complete the review within sixty (60) days of receipt. If the review process will exceed sixty (60) days, ERS/NASS will inform the Organization of the anticipated completion date.

INITIALS:

SECURITY:

1) Each member of the project who is not a U.S. citizen will not access or view data until receiving a successful background clearance.
2) Each member of the project, including the Project Leader, must participate in NASS confidentiality training and sign an ADM-043 NASS Certification and Restrictions on the Use of Unpublished Data in the presence of a NASS official;
2) Each member will attend annual confidentiality training and re-certify the ADM-043;
3) Each member will ensure that his/her computing environment does not expose confidential data to unauthorized individuals;
4) No data or any media containing information derived from ARMS and/or TOTAL data, including portable storage, electronic transmissions, photos/image, printouts, diskettes, compact disks, hard drives or DVDs, will be removed without the approval of the ERS or NASS Data Lab Agent/Manager;
5) Each member will respect the confidentiality of the data at all times including past the termination date of this access Agreement; and
6) Until cleared by NASS or ERS, members shall not disclose data or other information containing or derived from the data to anyone other than individuals for whom access is authorized under this Project Agreement and associated MOU and who have executed a Certification and Restrictions on Use of Unpublished Data (USDA-NASS ADM-043).

INITIALS:

SIGNATURES:

The Organization's Project Leader shall sign this Project Agreement below. The Project Leader certifies, by his/her signature, that all provisions of this Project Agreement and Memorandum of Understanding referenced in this document will be adhered to and enforced by all participants of this project.

Signature of Project Leader: A. Athiyaman
Type or Print Name: Adee Athiyaman
Date: 9/29/2022

The Organization's designated Senior Official shall sign this Project Agreement below. The Senior Official certifies, by his/her signature, that:

1) The Organization has the authority to undertake the commitments of this Project Agreement;
2) The designated Senior Official has the authority to bind the Organization to the provisions of this Project Agreement;
3) The designated Senior Official has the authority to enforce the provisions of this Project Agreement; and
4) This Project has been reviewed and approved for access and use of ARMS and/or TOTAL data.

Signature of Senior Official: Elizabeth L Duvall
Type or Print Name: Elizabeth L Duvall
Title: General Counsel
Date: 10-21-22

The Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS) concur in this Project Agreement and authorize access by the Organization to the ARMS and/or TOTAL data. This agreement is effective as of the date of the ERS and NASS Officials' signatures below.

Signature of ERS Official: _____
Name: Thomas Worth
Title: Division Director, Resource and Rural Economics Division
Telephone: (816) 926-3843
Date Approved: _____

Signature of NASS Official: _____
Name: Joseph L. Parsons
Title: Chairperson, Agricultural Statistics Board
Telephone: (202) 690-8141
Date Approved: _____

Appendix: Disclosure Review Requirements

Requirements necessary from the Organization for ERS/NASS to complete the review:

1) A copy of any statistical programs used, the statistics, and sample/counts for each statistic.
2) No statistic should be submitted for review that has less than 5 records used in the calculation.
3) In general maximums, minimums, and medians are a disclosure risk and will not be approved through the disclosure review. The Organization should contact ERS/NASS early to discuss if these items are needed for their statistical models.
4) The Organization will remove or suppress any items identified by ERS/NASS as disclosure of individual data even if individual respondent identifiers have been removed.

MEMORANDUM OF UNDERSTANDING

between
THE UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE (ERS),
NATIONAL AGRICULTURAL STATISTICS SERVICE (NASS),
and the
The Board of Trustees of
Western Illinois University *(name of university, institution, or agency)*
(hereinafter referred to as the Organization)

SUBJECT:

Access by specified Organization staff to the ERS/NASS Agricultural Resource Management Survey (ARMS) and Tenure, Ownership and Transition of Agricultural Land (TOTAL) data which have been collected and acquired for exclusively statistical purposes under a pledge of confidentiality.

DURATION:

All conditions and provisions of this Memorandum of Understanding shall become effective upon the date of final signature and shall continue in force for a period of two (2) years. This memorandum may be amended or extended at any time by mutual agreement of all parties in writing, or terminated immediately by any party upon written notice to the other parties.

LOCATION OF DATA ACCESS:

ARMS and/or TOTAL data may be accessed only via the Internet through the Data Enclave website. The Data Enclave service charges user and project fees.

DATA ACCESS:

Access will be supervised in a manner consistent with Agency regulations governing data confidentiality and survey data research.

ERS/NASS responsibilities for researchers on-site visits to ERS or NASS:

1) Provide necessary office space, equipment, and supplies;
2) Inform each person allowed access to the data of the USDA, ERS, and NASS policy on confidentiality pertaining to the use of ARMS and/or TOTAL data; and
3) Review completed data summaries to avoid disclosure of confidentiality.

Organization and their staff responsibilities for on-site or remote access visits:

1) Will not allow access to data by researchers that are not U.S. citizens until they receiving a successful background clearance.
2) Will not remove data or any media containing information derived from ARMS and/or TOTAL data, including portable storage, electronic transmissions, photos/images, printouts, diskettes, compact disks, hard-drives, or DVDs, portable storage, without the approval of the ERS or NASS Data Lab Agent/Manager; and
3) Will respect the confidentiality of ARMS and/or TOTAL data at all times including past the termination date of this Memorandum of Understanding;

DATA COLLECTION:

ARMS and TOTAL are a series of interviews with farm operators and landlords about their farm businesses and households. ARMS is conducted annually in three phases and TOTAL is a periodic survey conducted by USDA's National Agricultural Statistics Service (NASS). Confidentiality of these data is protected by the USDA/NASS Confidentiality of Information Act (7 U.S.C. 2276) and the Privacy Act of 1974 (5 U.S.C. 552a). Disclosure of confidential information is covered in 18 U.S.C. sections 1902 and 1905.

DATA SHARING:

The Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA), Title V of the E-Government Act of 2002 (Public Law 107-347), Subtitle A, establishes standards and requirements that provide the legal authority for any party entering into this Memorandum of Understanding. CIPSEA allows Federal agencies that collect data under the pledge of confidentiality to share individually identifiable data for statistical purposes only, to deny use of the data for non-statistical purposes, such as enforcing regulations or release under the Freedom of Information Act (FOIA), and to punish those who disclose identifiable information about individual respondents.

CIPSEA defines statistical purposes to include the description, estimation, or analysis of the characteristics of groups without identifying individuals. ARMS and/or TOTAL data cannot be used for non-statistical purposes including administrative, regulatory, law enforcement, adjudicatory, or other purposes that affect the rights, privileges, or benefits of a particular respondent.

PENALTIES:

The protection of data collected under this law is supported by a penalty of a Class E Felony for a knowing and willful disclosure of confidential data. This includes imprisonment for up to five (5) years and fines up to $250,000. Any violation of this Memorandum of Understanding may also be a violation of Federal criminal law under the Privacy Act of 1974, 5 U.S.C. 552a. In addition to the imposition of civil/criminal fines and penalties, any violation of data confidentiality will result in the termination of this Memorandum of Understanding.

REASON FOR REQUESTING ACCESS TO THE ARMS AND/OR TOTAL DATA:

GENERAL:
The Organization has a current and ongoing need to conduct agricultural statistical research that will not only benefit the Organization but also the USDA and the American public, by increasing the understanding of economic and environmental issues of farms and farm households. ARMS and/or TOTAL data provide a source of agricultural production, financial, household, and management data that will support many research efforts in these areas.

SPECIFIC:
A separately signed Project Agreement is needed for each research project.

DISSEMINATION AND DISCLOSURE REVIEW OF INFORMATION:

The Organization is accountable for protecting ARMS and/or TOTAL confidentiality and will submit a copy of all drafts reporting data summaries or analytical findings from the ARMS and/or TOTAL to ERS and NASS for disclosure review prior to internal or public dissemination. The Organization will also provide final copies of any research output from the project intended for release or publication. The scope of this review will be solely to determine compliance with CIPSEA and the Privacy Act, and to ensure adherence to the confidentiality and security provisions established under this agreement. The disclosure review and approval covers all statistics, analytical findings, or details based on ARMS and/or TOTAL data made available under this Memorandum of Understanding. Information that might be identified with a particular farmer or farm operation cannot be published. Research output includes articles, posters, presentations, or other statistical summaries. Statistical methods, hypothesis testing, and conclusions are the Organization's responsibility and not part of the disclosure review. Publications that include data from this agreement must clearly state that the conclusions presented do not confer USDA, ERS, or NASS, support and are solely the responsibility of the Organization.

After the Organization has completed all items in the Appendix ERS/NASS will complete their review of outputs and notify the Organization as soon as possible. Agents may not disseminate research outputs until ERS/NASS have completed their review and an authorization has been provided to the Recipient Project Coordinator. The Organization will be bound by the determinations of ERS and NASS. Given that the Organization has completed all the items in the Appendix, the review is usually completed within a week. However, review of more complex research analysis may take longer. ERS/NASS will expend sufficient efforts to complete the review within sixty (60) days of receipt. If the review process will exceed sixty (60) days, ERS/NASS will inform the Organization of the anticipated completion date.

DESIGNATION OF AUTHORITY:

The Organization will designate an individual, hereafter referred to as the Senior Official, who has authority to represent the Organization in accepting the responsibilities imposed by this Memorandum of Understanding, signing this Memorandum of Understanding, and enforcing the conditions of this Memorandum of Understanding. Additional responsibilities are detailed below.

PROJECT-SPECIFIC REQUEST AND AGREEMENT:

The Organization will submit to ERS/NASS, for review and approval, a Project Agreement signed by the Senior Official, for each individual research project that will access ARMS and/or TOTAL. The Project Agreement must have the following components:

1) A description of the research project, including objectives, methodology, how ARMS and/or TOTAL data will benefit this project, and how this project will contribute to a further understanding of the agriculture sector.
2) Details on what specific ARMS and/or TOTAL data are needed;
3) An ending date;
4) A Project Leader whose signature will be required on the Project Agreement;
5) A list of all parties that will be accessing ARMS and/or TOTAL; and
6) The approval and signatures of the Organization's Senior Official, ERS Resource and Rural Economics Division Director, and NASS Agricultural Statistics Board Chairperson.

RESPONSIBILITIES OF THE SENIOR OFFICIAL:

The Organization's Senior Official will:

1) Ensure that ARMS and/or TOTAL data are being used for statistical purposes only, as defined in the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA);
2) Notify ERS when the project no longer needs access to ARMS and/or TOTAL data;
3) Notify ERS/NASS when the project purpose changes;
4) Have each member of the project, including the Project Leader, participate in NASS confidentiality training;
5) Immediately notify ERS/NASS when job status changes for any project member; and
6) Affix his/her signature to this Memorandum of Understanding and all Project Agreements.

SECURITY:

The Organization agrees to:

1) Make all ARMS and TOTAL users aware of the penalties for misuse and improper disclosure of data and the Organization's legal responsibility for answering to allegations of misuse and improper disclosure;
2) Immediately notify ERS/NASS of termination of an individual's participation in an ARMS or TOTAL project;
3) Ensure all ARMS or TOTAL project team participants annually sign a

Certifications and Restrictions on Use of Unpublished Data (USDA-NASS ADM-043);

4) Deter accidental exposure of ARMS and/or TOTAL data to noncertified users by providing proper IT security training regarding the use of confidential data, including the proper protection of IDs and passwords, prohibition of sharing IDs, and the provision of private computing areas;
5) Provide shredders for proper disposal of all paper forms of ARMS and/or TOTAL data used during the course of the project's life; and
6) If the research is in the Data Enclave, to allow NASS and/or ERS officials to carry out unannounced physical and IT security inspections of the Organization's workplace.

LOCATION OF ALL PARTIES:

1) Research Entity Name: Illinois Institute for Rural Affairs
College or Department: Western Illinois University
City: Macomb State: Illinois ZIP code: 61455

2) Economic Research Service
United States Department of Agriculture
805 Pennsylvania Ave
Kansas City, MO 64105

3) National Agricultural Statistics Service
United States Department of Agriculture
1400 Independence Avenue, SW
Washington, DC 20250-2001

SIGNATURES:

The Organization's designated Senior Official shall sign this Memorandum of Understanding below. The designated Senior Official certifies, by his/her signature, that:

1) The Organization has the authority to undertake the commitments of this Memorandum of Understanding;
2) The designated Senior Official has the authority to bind the Organization to the provisions of this Memorandum of Understanding; and
3) The designated Senior Official has the authority to enforce the provisions of this Memorandum of Understanding.

Signature of Senior Official: Elizabeth L Duvall
Type or Print Name of Official Above: Elizabeth L Duvall
Organizational Title of Senior Official: General Counsel
Date: 9/29/2022 Telephone: (309) 298-3070

The Economic Research Service and the National Agricultural Statistics Service concur with the Memorandum of Understanding and authorize access by the Organization to the ARMS and/or TOTAL data. This is effective as of the date of the ERS and NASS representatives' signatures below.

Signature of ERS Official: _____
Name: Thomas Worth
Title: Division Director, Resource and Rural Economics Division
Telephone: (816) 926-3843
Date Approved: _____

Signature of NASS Official: _____
Name: Joseph L. Parsons
Title: Chairperson, Agricultural Statistics Board
Telephone: (202) 690-8141
Date Approved: _____

Appendix: Disclosure Review Requirements

Requirements necessary from the Organization for ERS/ NASS to complete the review:

1) A copy of any statistical programs used, the statistics, and sample/counts for each statistic.
2) No statistic should be submitted for review that has less than 5 records used in the calculation.
3) In general maximums, minimums, and medians are a disclosure risk and will not be approved through the disclosure review. The Organization should contact ERS/NASS early to discuss if these items are needed for their statistical models.
4) The Organization will remove or suppress any items identified by ERS/NASS as disclosure of individual data even if individual respondent identifiers have been removed.

APPENDIX 9

FARMER DISPARITY STUDY SURVEY

Farmer Success Survey

PERSONAL DEMOGRAPHICS

1. Are you the primary decision maker of your farm operation?

0 Yes 0 No

2. If you are not the primary decision maker, who makes the day-to-day decisions for your farm operation?

0 Family Member 0 Other

3. What year were you born? _____

4. How long have you been farming? (in years) _____

5. What is your gender?

0 Male 0 Female 0 Other 0 Prefer not to disclose

6. How would you best describe yourself?

O American Indian or Alaska Native 0 Asian 0 Black or African American

0 Native Hawaiian or Pacific Islander 0 White 0 Other 0 Prefer not to answer

7. Do you identify as Hispanic or Latino?

0 Yes 0 No 0 Prefer not to answer

8. What is the highest level of education you have completed?

0 No formal education 0 Some grade school 0 Completed grade school

0 Some high school 0 Completed high school 0 Some college

0 Completed two-year degree 0 Completed four-year degree 0 Some graduate work

0 Graduate degree (M.S., M.A, Ph.D., etc.)

0 Other _____

9. Do you currently live on a farm?

0 Yes 0 No

10. How many people are currently in your household? _____

11. Is anyone in your household, including yourself, employed outside the farm?

Yourself:	0 Yes, Full Time	0 No, Part-time	0 No
Household Member:	0 Yes, Full Time	0 No, Part-time	0 No

12. What <u>percentage (%)</u> of your household income comes from farming?

13. How many <u>generation</u>s has your family been farming? _____

14. Do you farm specialty crops? (Fruits, vegetables, flowers, honey, etc.)

O Yes O No

15. If you are a specialty farmer, which of the following do you produce for farm income?

0 Broadleaf Evergreens	0 Christmas Trees	0 Cucurbits
0 Cut Cultivated Greens	0 Cut Flowers	0 Deciduous Flowering Trees
0 Deciduous Shrubs	0 Foliage Plants	0 Fruits
0 Hemp	0 Honey	0 Horseradish
0 Landscape Conifers	0 Popcorn	0 Potted Flowering Plants
0 Potted Herbaceous Perennials	0 Pumpkins	0 Tree Nuts
0 Vegetables	0 Wine	

0 Other, please specify_____

16. Do you have any plans to expand your farming operation, in terms of acres, within the <u>next 3 years</u>?

0 Yes, I plan to own more land 0 Yes, I plan to rent more land 0 No

17. What are the reasons for not expanding your operation within the <u>next 3 years</u>?

0 Availability of land for farming 0 Cost of land for farming 0 Access to finance

0 No path to farmland ownerships 0 Other, please specify_____

18. Please elaborate on your reasons for not expanding if you wish.

Availability of land for farming: _____
Cost of land for farming: _____
Access to finance: _____
No path to farmland ownerships _____
Other, please specify _____

FARM OPERATION

19. What is the 5-digit zip code for your primary farm operation?

_____

20. Please indicate the level of Gross Cash Farm Income (including crop and livestock sales, government payments, and other farm-related income such as receipts from custom work, machine hire, livestock grazing fees, timber sales, outdoor recreation, production contract fees, etc.) generated by your farm operation in 2021?

0 Less than $150,000 0 $150,000 - $349,999 0 $350,000 - $999,999

0 $1,000,000 - $4,999,999 0 $5,000,000 or more

21. What is the management structure of your farm?

0 Sole or General Proprietorship 0 Limited Liability Partnership

0 Limited Liability Company 0 Limited Partnership

0 Corporation 0 I don't know

0 Other, please specify:_____

22. How many employees did you employ in 2021 at your farm operation directly hired by your farm operation. Including: paid family members, hired managers, employees regardless of method of payment. (hourly, salaried, etc.)

Family Members including yourself = Number _____

Permanent employees = Number _____

Temporary or Seasonal employees = Number _____

Foreign migrant employees (H2A) = Number _____

23. What percentage (%) of acres you farmed in 2021 are owned and lease/rent?

Own acres farmed _____

Rent/lease from others _____

Rent/lease to others _____

Total _____

24. How many acres of your farmland are planted with the following crops for farm income?

Corn _____ Soybeans _____

Hay _____ Vegetables _____

Hemp _____ Wheat _____

Fruits _____ Other, please specify _____

Oats _____ Total _____

25. Did you have any livestock for farm income 2021?

O Yes O No

26. How many of the following did you have for farm income in 2021?

	How many regardless of ownership on hand (NUMBER)?
Beef Cows	_____
Milk Cows	_____
Other cattle and calves (Include fed cattle, beef and dairy cull animals, stockers and feeders, veal calves, etc.)	_____
Bees	_____
Broilers	_____
Other poultry	_____
Turkey	_____
Hogs	_____
Goats	_____
Sheep	_____
Other, please specify	_____

27. To whom do you sell your products? [check as many as apply]

0 Agriculture Cooperatives

0 Direct to consumer - CSA (Community Supported Agriculture)

0 Direct to consumer - Farmer Markets

0 Direct to consumer - On-farm store

0 Direct to consumer - Online Marketplace

0 Grain Handling Facility

0 Institutions (schools, hospitals, etc.)

0 Processor

0 Restaurants

0 Retailer (grocery stores)

0 Wholesaler

0 Other (please specify) _____

RESOURCES

28. Are you aware of the following farming organizations? What's your membership status?

	I never heard about it.	Current member and will continue membership.	Past member, but planning to join again.	Not a current member, but planning to join.	Current member, but will not continue membership.	Past member and not planning to join.	Not a current member and not planning to join.
Illinois Beef Association	0	0	0	0	0	0	0
Illinois Corn Growers Association	0	0	0	0	0	0	0
Illinois Farm Bureau	0	0	0	0	0	0	0
Illinois Hemp Growers Association	0	0	0	0	0	0	0
Illinois Landscape Contractors Association	0	0	0	0	0	0	0
Illinois Milk Producers Association	0	0	0	0	0	0	0
Illinois Pork Producers	0	0	0	0	0	0	0
Illinois Soybean Association	0	0	0	0	0	0	0
Illinois Specialty Growers Association	0	0	0	0	0	0	0
Illinois Stewardship Alliance	0	0	0	0	0	0	0
Illinois Wheat Association	0	0	0	0	0	0	0
Other (please specify)							

29. What is your sentiment towards the following organizations?

	Positive	Neutral	Negative	I never heard about this organization.
Illinois Beef Association	0	0	0	0
Illinois Corn Growers Association	0	0	0	0
Illinois Farm Bureau	0	0	0	0
Illinois Hemp Growers Association	0	0	0	0
Illinois Landscape Contractors Association	0	0	0	0
Illinois Milk Producers Association	0	0	0	0
Illinois Pork Producers	0	0	0	0
Illinois Soybean Association	0	0	0	0
Illinois Specialty Crop Growers Association	0	0	0	0
Illinois Stewardship Alliance	0	0	0	0
Illinois Wheat Association	0	0	0	0
Other Organization	0	0	0	0

30. What farming-related organizations do you recommend other farmers like you to join? Please explain why?

_____

31. Have you heard about any farming-related support/assistance programs provided by the following?

USDA Farm Service Agency	O Yes	O No
USDA Natural Resources Conservation Service	O Yes	O No
USDA Risk Management Agency	O Yes	O No
USDA Rural Development	O Yes	O No
Farm Credit Service	O Yes	O No
Federal Programs	O Yes	O No
State Programs	O Yes	O No
Private Programs	O Yes	O No
University Extension	O Yes	O No

Other (please specify) _____

32. Have you tried to participate in any farming-related support/assistance programs provided by the following?

	I tried, but was not successful	**I participated**	**I did not participate**
USDA Farm Service Agency	O	O	O
USDA Natural Resources Conservation Service	O	O	O
USDA Risk Management Agency	O	O	O
USDA Rural Development	O	O	O
Farm Credit Service	O	O	O
Federal Programs	O	O	O
State Programs	O	O	O
Private Programs	O	O	O
University Extension	O	O	O
Other	O	O	O

33. Please elaborate on your experiences with the support/assistance programs, if you wish.

_____

SOURCES OF INFORMATION

34. How often do you consult the following sources of information related to farming?

	Never	Rarely	Sometimes	Very Often	Always
Agriculture advisors	O	O	O	O	O
Apps	O	O	O	O	O
Blogs	O	O	O	O	O
Buyer representatives	O	O	O	O	O
Business partners (in the farm)	O	O	O	O	O
Environmental advisors	O	O	O	O	O
Extension services	O	O	O	O	O
Facebook	O	O	O	O	O
Family and friends	O	O	O	O	O
Farm Manager	O	O	O	O	O
Field days/demonstration activities	O	O	O	O	O
Internet Search Engines (Google, Firefox, Edge, etc.)	O	O	O	O	O
LinkedIn	O	O	O	O	O
Newspaper	O	O	O	O	O
Other farmers	O	O	O	O	O
Radio	O	O	O	O	O
Researchers from universities with agriculture programs	O	O	O	O	O
Suppliers representatives	O	O	O	O	O
Television	O	O	O	O	O
Trade magazines	O	O	O	O	O
Twitter	O	O	O	O	O
Other	O	O	O	O	O

CONCERNS & FUTURE PLANS

35. Do you have any concerns related to the following?

Access to financing	O Yes	O No
Access to internet	O Yes	O No
Access to land	O Yes	O No
Access to markets	O Yes	O No
Access to power	O Yes	O No
Access to water	O Yes	O No
Equipment cost	O Yes	O No
Health insurance cost	O Yes	O No
Labor availability	O Yes	O No
Land cost	O Yes	O No
Management	O Yes	O No
Storage	O Yes	O No
Technical resources	O Yes	O No
Technology	O Yes	O No
Time	O Yes	O No

Other (please specify): _____

36. Please elaborate on your concerns related to the following, if you wish.

Access to financing _____

Access to internet _____

Access to land _____

Access to markets _____

Access to power _____

Access to water _____

Equipment cost _____

Health insurance cost _____

Labor availability _____

Labor cost _____

Management _____

Storage _____

Technical resources _____

Technology _____

Time _____

Other _____

37. Do you believe you can keep up with changes in farming practices?

0 Yes 0 No

38. Do you feel well connected to the farming community?

0 Yes 0 No

39. To what extent do you agree with the following statement about farmers and farming?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Being a farmer is an essential reflection of who I am.	O	O	O	O	O
Farming in a way that preserves the environment is part of who I am.	O	O	O	O	O
I have a strong sense of belonging to the farming community.	O	O	O	O	O
I see myself as a farmer who prioritizes the environment.	O	O	O	O	O
Understanding the ecology of the farm is what farming is about	O	O	O	O	O
What happens to farmers as a whole will affect what happens in my life.	O	O	O	O	O

40. What are your future plans concerning your farming operation in the <u>next 10 years</u>?

	Yes	No
I will continue to farm as is.	O	O
I will continue to farm and expand farming acreage.	O	O
I will continue to farm and diversify the crops produced.	O	O
I will continue to farm and diversify livestock raised.	O	O
I will stop farming and rent land to another farmer.	O	O
I will stop farming and will sell the land to another farmer.	O	O
I will stop farming and will sell the land to real estate development.	O	O
I will transition the farm to a family member(s).	O	O
Other (please specify)	O	O

41. Please elaborate why you are planning to stop farming and rent your land to another farmer.

_____

42. Please elaborate why you are planning to stop farming and sell your land to another farmer.

_____

43. Please elaborate why you are planning to stop farming and sell your land to real estate development.

_____

44. Do you have any additional comments?

_____

45. How did you hear about this study?

_____