Building a Resilient Economy in the Lower Illinois River Valley –

Considerations for Farm Profitability, the Workforce, and Rural Recovery

Prepared by **THG Advisors** on behalf of **John Wood Community College**
for the **Illinois Green Economy Network**

Sponsor

Illinois Green Economy Network (IGEN) is a consortium of Illinois community colleges working together to share resources, common experiences and best practices to help grow the new green economy. This unique approach leverages the power of a sustainability network while utilizing the deep community connections of individual colleges. IGEN provides a platform to expand the deployment of clean energy technologies, increase employment opportunities, improve environmental and human health, foster community engagement and accelerate market competitiveness.

Contributors

John Wood Community College (JWCC) is the educational link between business and community. JWCC collaboratively creates innovative and relevant academic and training programs with business leaders to educate young people and the workforce for today's needs and tomorrow's opportunities. JWCC has centers in Quincy, Pittsfield, Baylis and Mt. Sterling, Illinois. Programs include a comprehensive baccalaureate transfer curriculum, customized business training, career/technical degrees and certificates and personal enrichment courses.

THG Advisors (THG) is an environmental consulting firm operating at the intersection of policy, science, and communications. Founded in 2008, the firm has established itself as an innovator and trusted, third-party convener. THG and its team of advisors advocate for efficiency, sustainability, and holistic solutions based on cutting-edge science and sound business practice. The firm works alongside federal, state, and local governments, NGOs, and the private sector to achieve measurable results for its clients, partners, and the communities and markets in which they operate.

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Executive Summary

The Lower Illinois River Valley (LIRV) has a long and well-established position in national and global agricultural production. The LIRV holds a central location in Illinois, bordering Illinois' namesake river. Three-quarters of the State's 37 million acres are capable of sustaining agriculture. Illinois currently supports a robust agricultural economy, ranking first in the nation in soybean production, second in corn production, and fourth in hog and pig production. The State also ranks first in the nation in providing processed foods, with over $188 billion in annual sales. On the world market, Illinois ranks third nationally in the export of agricultural commodities. 44 percent of Illinois' grain is exported, and $8.2 billion worth of goods are shipped to other countries. Exports from Illinois account for 6 percent of all U.S. agricultural exports.

The LIRV, which includes all or parts of Brown, Cass, Pike, Calhoun, Morgan, Macoupin, Greene, Jersey, and Scott Counties, is predominantly agricultural, due to the availability of tillable land and an abundant water supply provided by the Mississippi and Illinois Rivers, to which each of the counties border or have access. These river systems define the region. They are fundamental in the provision of quality water and available soil resources, while creating an important transportation artery enabling rapid and economical transport and trade of goods and services to both domestic and international markets. These rivers also supply the stimulus for nature-based experiences and outdoor recreation opportunities, including hunting, fishing, bird watching, and a growing agri- and eco-tourism market.

Today, the LIRV faces a mix of challenges and opportunities. Population numbers from 2010 to 2019 are on the decline across every county within the LIRV, with Cass County experiencing the greatest population decline of 11 percent. With the exception of Brown County, the LIRV's unemployment rate exceeds the State average in every county. The region's population is also aging, with the median age between 39 and 46. Poverty rates are above average, with the childhood poverty rate within the LIRV Counties between 13 and 23 percent. Agricultural producers are also aging with the average age of a farmer at 58, and 33% of farmers aged 65 years or older. Measures of rural success require an expanded focus beyond the traditional agricultural production base, including efforts aimed at facilitating science and new technological investment, increased collaboration, improved resource management, a greater emphasis on workforce development, improved food service delivery networks, targeted succession planning, and supportive public policy.

Regional farm communities have survived through decades of economic fluctuations and uncertainty. There are significant challenges, but a good measure of the answer lies in the forward-leaning application and mastery of technological advances through the deployment of innovative best management practices and new markets. Farmers are increasingly turning to new technologies and adopting additional conservation practices to reduce the financial impact on their farm, helping to increase yields, and improve their bottom line. Farmers are gaining proficiency with new technologies to help enhance profitability and using these technologies to augment their natural resource stewardship and conservation practices. The key to their adoption is confidence, cost, and demonstrating results.

Technological advances have become increasingly accessible. Precision agriculture, Internet-enabled devices, alternative energy sources, and smart tools are increasing efficiencies and

yields. However, this technology comes with a cost, both on an economic level and in terms of an overall learning and acceptance curve. Producers experience a varying capability to take advantage of sophisticated technologies, or to fully utilize the data they provide to influence their decision-making and profitability.

While there is broadband penetration located within many areas of the United States, according to the Congressional Research Service, 21.3 million Americans lack access to a connection that enables acceptable rates of information transfer. Expanding broadband infrastructure can assist the availability of the technology, however there are additional geographic, social, and economic factors that affect broadband adoption implementation strategies, even where it is available and in use. Major examples of such limiting factors include the cost of service, the connecting devices, and the available foundational digital literacy skills of potential users.

Agricultural best management practices also provide practical techniques to conserve natural resources while maintaining or enhancing production. Expressions of these practices include the utilization of reduced tillage, cover crop application, crop rotation, water loss prevention, and advanced nutrient management. These practices can go hand-in-hand with precision ag-based technological advances. All of these practices have differing returns on investment, influenced by such variables as weather, soil, labor, managerial complexity, and land ownership.

Farm policy, both Federal and State, plays an overarching role. Under the current 2018 Federal Farm Act, 76 percent of outlays fund nutrition programs, 9 percent will fund crop insurance programs, 7 percent will fund conservation programs, 7 percent fund commodity programs, and the remaining 1 percent will fund all other programs, including trade, credit, rural development, research and extension, forestry, horticulture, and miscellaneous programs. While Federal farm policy is largely shaped by single pieces of legislation, State farm policy is more decentralized, with dozens of laws carried out and administered by multiple State agencies. Federal funding and federal policy directives play a large role in defining State policy.

There is consensus among the various sources reviewed for this report, and confirmed by the practitioners interviewed, that rural challenges are multi-faceted, and therefore highly unsuitable for a single, one-size-fits-all solution. The current stressors on the farm economy are both longstanding and contemporary. Extreme weather patterns have been a perennial concern, exacerbated by climate change contributing to increased flooding, droughts, and damage to infrastructure, while impacting crop yields. Nationwide, producers face pressure to conserve water and energy. Current tariff policies are further destabilizing the farming industry. Technological advances increase productivity, but come at the expense of both time and deployment costs. Capital is scarce for developing new research, and often is not available at the time it is needed most. Finally, succession planning is crucial to identifying the next generation of farmers and producers, with an emphasis on a trained and willing workforce.

Accordingly, the conclusions in this report are not necessarily directed toward a global resolution. Instead, they provide a summary of the literature reviewed, the most recently available information, and commentary provided by personal discussions with local leaders in the field. The recommendations are intended as the first step in a roadmap for rural recovery. Promotion of energy and water conservation is a central theme, with emphasis on the connections between environmental health, economic success, and jobs. Increasing the availability of renewable and sustainable energy is key, and creating a lasting culture, which emphasizes the approach of “reduce, reuse, and recycle” as a necessity. To remove barriers for the adoption of new technologies, demonstration and pilot projects are required, as well as the conceptualization of an “Ag and Rural Innovation Center” with a proposed “Ag-Geek Squad”

capacity nested within it, to provide responsive assistance to practitioners, and to facilitate the creation of collaborative workspaces to share ideas and ways to develop further public-private partnerships to advance regional goals and aspirations.

Workforce development considerations are central to the retention of talented youth in rural communities. To do so, career pathways need to be identified early on in the educational experience. Classroom training needs to be augmented by hands-on field experience coupled with an emphasis of a broad-based business acumen, including sales, marketing, and basic accounting. Agricultural policy needs to be informed to create real incentives and change-drivers that support emerging markets with research and development.

Finally, rural communities must be livable communities, with reliable communications and access to the Internet, a network of quality health care providers, a range of affordable housing, and accessible educational opportunities. The innovative focus of rural leaders and institutions should be towards an agile collective problem-solving ability, with the goal of greater self-determination, self-reliance, and regional and local resiliency. The LIRV can succeed in arriving at a common shared vision and activation strategy for becoming a corridor of opportunity. The region is ready for targeted investment and transformative change. The implications for the region's rural populations are profound. The need for collaboration and transformational leadership to assess and act on opportunities is immediate.

Background, Goals, and Report Development

BACKGROUND

In early 2020, John Wood Community College (JWCC), with the cooperation and support from the Illinois Green Economy Network (IGEN) identified a need to better understand the challenges facing rural communities in the Lower Illinois River Valley with the goal of identifying strategies for making a greater contribution to positive and measurable regional gains. In order to identify and develop timely and relevant strategies, JWCC requested THG Advisors to prepare a report capturing a rapid assessment or current baseline for the LIRV.

The assessment would include: 1) a characterization of current practices, trends, and resources; 2) a literature review of existing and innovative technologies and practices capable of implementation in rural agricultural zones throughout the LIRV; 3) a review of current and pending national and statewide policies influencing regional agriculture, producers, and the rural workforce; and, 4) provide recommendations regarding future directions that can be taken to support a skilled workforce and a resilient economy. Input from the community and local and regional subject matter experts would be central to the development of recommendations and would include one-on-one interviews with a broad range of stakeholders.

GOAL

The goal of this report is to provide information to assist decision-makers, including program managers, institutional trustees, and leaders across rural sectors. Key decisions regarding the future of rural regions cannot be borne by one economic sector. Agriculture will continue to play a pivotal role in rural Illinois and the Lower Illinois River Valley. Educators, business leaders, local government officials, and other capacity-builders can have a catalytic role in developing strategies to assist farm operators in building a new rural economy and make rural communities more resilient and vibrant.

Report Organization

I: Regional Profile describes the current LIRV agricultural landscape, including economic status, practices, trends, and resource impacts;

II: Agricultural Innovation and Technology explores precision agriculture, provides an overview of emerging technologies and innovation, and describes best management practices;

III: Market, Workforce, and Rural Resiliency examines the current market environment, specifically focusing on LIRV county statistics, current and trending employment conditions, workforce opportunities and economic resiliency strategies;

IV: Rural Policy at the State and Federal Level reviews state and national policies, legislation, and regulations, as well as local opportunities for collaboration; and,

V: Conclusions, Recommendations, and Road Mapping Considerations reveals discoveries from stakeholder interviews and provides informed recommendations regarding workforce readiness, educational opportunities, and creating a sustainable future for the next generation.

I. Regional Profile

Lower Illinois River Valley Setting

For purposes of this report, the Lower Illinois River Valley (LIRV) includes parts or all of Brown, Cass, Pike, Calhoun, Morgan, Macoupin, Greene, Jersey, and Scott Counties. The focus of the Lower Illinois River Valley-Rural Prosperity Initiative (LIRV-RPI) also includes Adams and Madison Counties, as shown in the map below of the LIRV-RPI Service Area. The primary intent of this assessment and reporting was to focus on a rural core of nine counties bordering the lower 80 miles of the Illinois River. With a total population of 158,335, the region is predominantly agricultural, due to the availability of tillable land and water supply provided by the Mississippi and Illinois Rivers to which most of the counties border or have access. These river systems define the region, fundamental in the provision of quality water and soil resources supporting agriculture, while creating an important transportation artery enabling rapid and economical trade of goods and services to urban center markets. These rivers also supply the stimulus for nature-based experiences and outdoor recreation, including hunting, fishing, bird watching, and eco-tourism. [1]

Figure 1: The Lower Illinois River Valley region.

Agriculture

Agricultural production is fundamental to the region. According to the University of Illinois, 77 percent of the State is farmland. Illinois' food and agriculture systems have been the driving force of the state economy since the State's pioneer settlement. From the mid-1800s, when grain milling and meat packing helped establish the sector, to the creation of the Chicago Board of Trade, to private sector leadership in food processing and food service, Illinois sustains a thriving modern agricultural and food delivery system. Soybeans, corn, and livestock are the primary commodities. Regional climate and varied soil types enable farmers to grow a variety of additional agricultural products, including wheat, oats, sorghum, hay, fruits and vegetables, in addition to cattle, hogs, and poultry. Maintenance of the agricultural land base is central to the region's economy. [2] [3]

Manufacturing

While much of the economy in the region relies on its agricultural sector, there are various pockets of legacy manufacturing operations, many of which remain reliant on the agricultural economy. These manufacturing interests were located predominantly adjacent to various transportation nodes like interstates, rail or river accessible locations. Existing facilities are: Applied Engineering, ADM, Cargill, Consolidated Grain, Royster Clark Nitrogen, and an EMI Capitol Records Plant, which was closed in 2004. In Morgan County, Eli Bridge maintains facilities that supports components for bridge construction. Nestle and PACTIV also have operations located there. According to IL DCEO, the following are major agribusiness employers in the region: ADM, Smithfield Foods, Carthage Veterinary Service CVS, Professional Swine Management, LLC & Maschhoffs. [4]

There are a variety of small-scale industrial sites located in several communities within the region. Jerseyville's Economic Development Council (JEDC) has designated the Mid-American International Gateway Business Park in rural Jersey County, which has been selected as one of 16 Illinois' "Super Sites." Stonemont Financial Group, an investment firm based in Atlanta, Georgia, has been working with the JEDC and Kansas City Southern Rail on the 1,600-acre site on U.S. 67 at Crystal Lake Road, just outside of the Jerseyville city limits. Roughly 1,200 acres will be developed in the project. Plans for an intermodal facility are anticipated here with some small-scale manufacturing and transportation warehousing facilities. [5]

Transportation

Much of the region is located in a portion of the State that provides a direct transportation corridor between Chicago and Bloomington, Illinois and St. Louis, Missouri. The region has a transportation network that provides for the movement of goods and people along an internal roadway system, rail, and a river transportation network that feeds into both the Mississippi and Illinois rivers.

Major interstates provide much of the east-west connectivity within the region. I-72, I-172, and I-55 form the major network of interstates bisecting the region, while US-67, IL-100, and US-24 provide supporting north-south connections. Two river ferries support transportation in Calhoun County. While much of the region is within major transportation corridors, there are prevailing constraints on east-west and north-south land-based routes. This has caused some hindrance to development within portions of the LIRV. [6] Efforts are underway to complete major gaps within the north-south US-67, from the Quad Cities to Alton, Illinois. Southern portions were complete when I-255 was constructed, but a major bypass around Jerseyville and

other connections are planned. The existing US-67 Corridor extends nearly 220 miles from Rock Island south to Alton, Illinois. The two- and four-lane corridor improvement costs awarded to date total more than $929 million. $4.6 million is programmed in FY 2013 and $109 million in projects are programmed during FY 2014-2019. The estimated unfunded cost to complete the four-lane sections in the US-67 Corridor from Macomb, Illinois southbound to the Alton, Illinois Bypass exceeds $1.7 billion. [7] Movement of waterborne commerce via the U.S. Inland Waterway System is addressed in the following section.

Inland Commercial Navigation

The proximity of major riverine systems to the nation's corn belt provides excellent and efficient transport of agricultural products from the field to transfer stations to the rivers for export. This commercial navigation system not only transports corn and grain, but hundreds of millions of tons of commodities including coal, chemicals, and petroleum products.

The Illinois River supports navigation, recreation, agriculture, and water supply.

The predominant feature of this inland navigation system is the 9-Foot Channel Project. Constructed by the U.S. Army Corps of Engineers beginning in the 1930s, it transformed the Upper Mississippi and Illinois Rivers into reliable, safe passageways for the transport of goods and commodities. A series of locks and dams were constructed, creating pools upriver of each dam, thereby raising water levels to ensure an adequate depth for the navigation channel. These structures, in essence, form an aquatic staircase some 670 miles long. The Upper Mississippi River – Illinois Waterway (UMR-IWW) Navigation System includes 37 locks and 1,200 miles of nine-foot deep navigable waterway in Illinois, Iowa, Minnesota, Missouri, and Wisconsin providing commercial and recreational traffic from Minneapolis-St. Paul, Minnesota, to St. Louis, Missouri, and from the Great Lakes and Chicago to the Illinois River's confluence with the Mississippi River at Grafton, Illinois. Commercial navigation on the UMR-IWW generates an additional $673 million annually, and also supports the economic activity of agriculture, energy, mining, and manufacturing by providing cost-effective and safe shipping services. [8]

According to the U.S. Army Corps of Engineers, the UMR-IWW carries approximately 60 percent of the nation's corn exports and 45 percent of the nation's soybean exports. There has, however, been a flattening and downward trend of tonnage on the UMR-IWW. This trend has paralleled several other occurrences that may have had some influence – congestion on the system increased with usage; railways becoming more efficient following deregulation in the 1980s and more aggressive competition for freight; agricultural export decreases for some of the period; high ocean shipping rates which made shipping by rail to the West Coast more competitive with river shipping to the Gulf; and numerous floods since 1993 that have caused the locks to close for extended periods of time during the shipping season.

There are indications that traffic on the UMR-IWW will resume upward growth in the future, provided investment in the system makes it a desirable option. At present, there are more than 580 manufacturing facilities, terminals, grain elevators, and docks on the UMR-IWW that ship and receive numerous commodities, including grain, chemicals, petroleum products, coal,

cement, non-metallic minerals, metallic and paper products, and scrap. The UMR-IWW also supplies the LIRV with access to Foreign Trade Zone/Subzone and Inland Intermodal Transport Facilities. The Mid-America Port Commission is also located in the region. [6]

Environmental goods and services are also provided by the UMR-IWW's river-floodplain ecosystem. These include drinking water production, hundreds of thousands of jobs related to recreation and tourism, and billions of dollars of revenues generated by residents and visitors traveling to enjoy the region's natural and aesthetic resources. Many people use the river and its resources for boating, hunting, trapping, fishing, and sightseeing, and recreational and associated uses on the UMR-IWW. The UMR-IWW supports a rich array of ecosystems, species, and biodiversity.

Water

Not only does the riverine system within the LIRV provide support for agriculture and navigation, it is also the primary source of drinking water. The Mississippi River supplies drinking water to numerous cities and towns. Several communities in the region obtain drinking water supplies directly from the surface flow of rivers and tributaries, while others draw from deep wells. Several rural water districts use aquifers as their water source. The Illinois Department of Public Health (IDPH) estimates approximately 400,000 residences of the state are served by private wells. This equates to approximately 30 percent of the statewide population utilizing groundwater as their primary source of drinking water. To map and assess the groundwater resources of the state, the Illinois EPA utilizes three primary aquifer classes that were developed by O'Hearn and Schock (1984). These three principal aquifers are sand and gravel, shallow bedrock, and deep bedrock aquifers. [9]

Most water supply systems within the region have adequate capacity but lack proper supply lines to sufficiently serve some communities and rural customers. Water cooperatives are constantly expanding to serve rural citizens and businesses. According to the Illinois State Water Survey, the region's water supplies are provided through various municipal operations, through groundwater sources or water provided through area rural water districts. These include: Alexander Water Service (Morgan), Henderson Public Water District (Macoupin), Greene County Rural Water Service (Greene), Palmyra Modesto Water District (Macoupin), Murrayville-Woodson Water District (Morgan), South Palmyra Rural Water Service District (Macoupin), Pike County #1 Service District (Pike), Scott County Rural Water Cooperative (Scott), the Clayton Camp Point Water Commission, and the Exeter-Merritt Rural Water Cooperative, serving large swaths of the mid-northern portion of the study area. [10] Other smaller cooperatives serve the area as well.

Agrichemical use poses potential challenges to water utilities and both surface and private well water users. The presence of phosphorus and nitrogen related to agricultural fertilizers in surface waters impact water quality inputs into the Illinois and Mississippi Rivers. The potential for groundwater contamination is also a concern. The use of insecticides, herbicides, and nitrates for agricultural use can have a negative effect on the quality of shallow groundwater in many areas of the state.

In 2015 and 2016, the agriculture sector invested nearly $55 million in nutrient load reduction research, outreach, implementation and monitoring. This number does not include the efforts of farmers outside of state and federal cost-share programs. In 2016 alone, almost 39,000 people were reached through various outreach events targeted to farmers and the agricultural community. The Illinois Farm Bureau partnered with the Nutrient Research and Education

Council and USDA's National Agricultural Statistics Service to survey farmers in Illinois about their use of conservation and best management practices for water quality. Survey results show increased adoption of both in-field and edge-of-field practices since 2011. The Nutrient Load Reduction Science Assessment was updated and found that nitrate-nitrogen loads decreased during that time by 10 percent when compared to baseline 1980–1996 load data. [11]

Energy

Agricultural production in Illinois requires predictable access to both energy and water resources. Forms of direct energy consumption on farms include electricity, and fuels like gasoline, natural gas, propane, and diesel. Agricultural inputs like fertilizers and pesticides account for indirect energy consumption. Another indirect energy use comes from related fields such as commercial trucking and navigation. On the whole, the agricultural network provides numerous opportunities for energy conservation.

Farms and agricultural producers are particularly sensitive to changes in the price of both indirect and direct energy sources. Indirect energy costs from inputs typically represent a farmer's highest share of expenses. For example, fertilizers account for 19 percent of total cash expenses for corn producers. The 2016 report 'Trends in U.S. Agriculture's Consumption and Production of Energy: Renewable Power, Shale Energy, and Cellulosic Biomass' published by the U.S. Department of Agriculture (USDA) Economic Research Service (ERS) found that electricity accounts for between 2 to 4 percent of overall costs on most farms. In Illinois, farm irrigation systems account for most of these electricity costs. [12]

Grid and water costs for irrigation can vary across the state due to seasonal demand and conditions. With agricultural irrigation usage rising across the state, experts from the Illinois State Water Survey predict an overall increase in demand for water from 20 percent to possibly as high as 50 percent. Such increases drive the potential for water conflicts between large population centers and agricultural producers in the future, as the State's aquifers will not endlessly support both needs.

Local energy cooperatives have programs to assist producers with installation of renewables.

Today, agricultural producers increasingly use alternatives to traditional energy and fuels, including renewable energy and sustainable fuel sources like solar, wind, biomass, and plant-based fuels. Alternative energy sources utilize resources that are all available on today's farms and help reduce energy costs, making adoption of the technology practical for producers. Finally, changes in traditional farming practices can reduce the use of both water and energy. Tillage practices also account for differences in energy consumption, where conservation or no-till practices are associated with lower direct, but greater indirect, expenditures for corn and wheat producers.

Producers also have access to support from their local energy providers. One energy corporation in Illinois has been assisting farmers on setting up their renewables and connecting to the grid. Additionally, federally supported programs at the USDA and U.S. Environmental Protection Agency (EPA) promote the use of renewable energy sources combined with the

agricultural production of corn and soybeans to be used for biomass feedstocks. Renewable energy development potential also exists through the development of hydropower. Lock and Dam 22 in Pike County on the Mississippi River has been identified by the U.S. Army Corps of Engineers as having potential for hydropower since 1986. Pike, Adams, and Brown Counties currently have operating wind energy systems with others being explored. A natural gas fired power plant also operates in Scott County. [13] The Illinois Electric Cooperative has developed a solar plant in Scott County consisting of 2,223 solar panels covering about four acres. The plant produces upwards of 840,000 kilowatt-hours per year. At full capacity, the solar plant produces enough electricity to power about 170 homes on the hottest day. [14]

Minerals

Deposits of mineable natural resources exist in various areas of the region. Sand, clay, and gravel deposits are numerous throughout the Illinois River Valley, the Mississippi River Valley, and the multiple watersheds that drain into these areas. Sand and gravel pits dot the region adjacent to the rivers. These quarries produce both crushed stone and ground limestone. Future development of these resources is dependent upon demand and mining economics. In some portions of the region, coal mines exist, particularly several legacy mining operations located in Macoupin County, but coal extraction has largely been discontinued. [6]

Wildlife

Wild game populations, especially deer, wild turkey and waterfowl, provide the basis for a significant fee hunting industry within the region. This in turn is encouraging the development of other related businesses to provide lodging, guide or outfitting services, food services, and hunting and fishing equipment sales. Non-consumptive eco-tourism additionally serves as a business driver. [6]

There has been a dramatic rise in the populations of invasive fish species in the Mississippi and Illinois Rivers. Both bighead and silver Asian carp species were unintentionally introduced into the rivers during flooding events and are now established within the Mississippi River basin. These species of grass carp have been reproducing in the Mississippi River since the 1970s. Their prevalence threatens native fisheries and the associated sport fishing industry.

A plan to prevent the spread of Asian carp into the Great Lakes was approved in 2019 by the U.S. Army Corps of Engineers. The recommended plan was the result of the Great Lakes Mississippi River Interbasin Study. The Chief's Report will soon be provided to Congress for authorization consideration. The study and subsequently recommended plan at Brandon Road Lock and Dam near Joliet, Illinois, were the result of findings from the more encompassing Great Lakes Mississippi River Interbasin Study. [15]

Recreation

Outdoor recreation and tourism associated with the wealth of the area's natural resources is a further economic driver that has been largely underappreciated. Hundreds of thousands of jobs are related to recreation and tourism, and billions of dollars of revenues generated by residents and visitors who travel to enjoy the region's natural and aesthetic resources. [16] In the fall of 2019, the Bureau of Economic Analysis' (BEA) released an update of the outdoor recreation economy's growth compared to the national economy. The updated national analysis, released through the Outdoor Recreation Satellite Account (ORSA), shows that inflation-adjusted (real) GDP for the outdoor recreation economy grew by 3.9 percent in 2017, faster than the 2.4 percent

growth of the overall U.S. economy. [17] BEA's data also reveals that outdoor recreation contributes $887 billion to the U.S. economy annually and confirms the national importance of investments in recreation funding and infrastructure. [17] In Illinois, the outdoor recreation industry drives $28 billion in economic impact. [18]

According to the Upper Mississippi River Basin Association (UMRBA) outdoor recreation opportunities along the UMR corridor produce an estimated annual revenue of $4 billion. While they do not measure direct niche spending in their service area, the Great Rivers & Routes Tourism Bureau estimates 'conservatively' that in their six-county service area (Madison, Macoupin, Montgomery, Jersey, Calhoun, and Greene), most of which includes the southern-most five counties of the Lower Illinois River Valley, that visitors annually spend $175 million on goods and services. [19]

Regional nature-based tourism is being viewed by many as a significant part of the new rural economy in the LIRV. The region boasts a large block of federal refuge lands and project operational lands managed by the U.S. Army Corps of Engineers that provide sustained public recreational opportunities, including a nationally-recognized water trail for paddling on the Mississippi and Illinois Rivers. The region is also host to Pere Marquette State Park, the largest state park in Illinois. There are several state conservation areas and land trust managed preserves. Regionally, the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and State of Illinois hold a combined block of fee simple riparian lands accessible for public recreation exceeding 40,000 acres. The region has a broad portfolio of recreational assets to support active living opportunities for leisure travelers and residents.

LIRV County Communities

The Lower Illinois River Valley located within west-central Illinois is a region of the State that has experienced an economic downturn. Primarily agricultural in nature, the LIRV enjoys some of the richest farmland in the world. Home to productive and reliable corn, wheat and other agricultural interests, the region also boasts significant transportation and economic assets. The region is ready for targeted investment and transformative change. Local and regional advocates envision the LIRV as a corridor of untapped opportunity.

The following table (Figure 2) illustrates prominent features of each of the counties within the LIRV and describes important geographic features of each county, the county seat, major communities, major transportation roadways, river access, and size in square miles.

Lower Illinois River Valley (LIRV) County Communities	
BROWN COUNTY 307 square miles	Illinois river serves as its eastern border. Major highways: US-24, IL-99, IL-107.
Villages & Towns	Mound Station, *Mt. Sterling* (County seat), Ripley, Versailles
CALHOUN COUNTY 284 square miles	Almost completely surrounded by water. Serviced by two ferries. The county produces the major portion of Illinois' peach crop. Major highways: IL-16, IL-96, IL-100, IL-108.
Villages & Towns	Batchtown, Beechville, Belleview, Brussels, Deer, Gilead, Golden Eagle, Hamburg, *Hardin* (County seat), Kampsville, Plain
CASS COUNTY 384 square miles	The Illinois River, Little Sangamon and Sangamon Rivers all flow through the County. Major highways include: US-67, IL-78, IL-100, IL-125
Villages & Towns	Anderson, Arenzville, Ashland, Beardstown, Bluff Springs, Burlingame, Chandlerville, Clear Lake, Hagener, Jules, Kisch, Newmansville, Palmer, *Virginia* (County seat)
GREENE COUNTY 546 square miles	Major highways include: US-67, IL-100, IL-108, IL-267.
Villages & Towns	Belltown, Berdan, Borrow, *Carrollton* (County seat), E Hardin, Eldred, Greenfield, Hillview, Kane, Old Kane, Rockbridge, Roodhouse, Whitehall, Wilmington
JERSEY COUNTY 377 square miles	Bordered by three bodies of water: the Mississippi River to the south, Illinois River on the west and the Macoupin Creek on its northwest border. Major highways include: US-67, IL-3, IL-16, IL-100, IL-109, IL-111, IL-267
Villages & Towns	Brighton, Chautauqua, Dow, Elsah, Fidelity, Fieldon, Grafton, *Jerseyville* (County seat), Lockhaven, New Delhi, Otterville
MACOUPIN COUNTY 868 square miles	Predominant industry is agriculture. Major highways include: I-55, IL-4, IL-16, IL-138, IL-108, IL-111, IL-159, IL-267
Villages & Towns	Atwater, Benld, Brighton, Bunker Hill, *Carlinville* (County seat), Chesterfield, Comer, Dorchester, Eagarville, Enos, E Gillispie, Gillespie, Girard, Hagaman, Hettick, Lake Ka-Ho, McVey, Medora, Miles Station, Modesto, Mt. Clare, Mt. Olive, Palmyra, Piasa, Plainview, Royal Lakes, Sawyerville, Scottville, Standard City, S Standard, Staunton, Virden, White City, Womac, Woodburn, Wummerville
MORGAN COUNTY 572 square miles	Major highways include: I-72, US-36, US-67, Il-123, IL-78, IL-100, IL-104, IL-267
Villages & Towns	Chapin, Franklin, *Jacksonville* (County seat), S Jacksonville, Lynnville, Meredosia, Murrayville, Waverly, Woodson
PIKE COUNTY 849 square miles	The Illinois river forms its eastern border with two Interstates I-72 and I-172. Major highways include: I-72, I-172, US-36, US-54, IL-57, IL-96, IL-106, IL-107, IL-100
Villages & Towns	Barry, Baylis, Detroit, El Dava, Griggsville, Florence, Hull, Milton, New Canton, New Salem, Pearl, Perry, *Pittsfield* (County seat), Pleasant Hill, Time, Valley City
SCOTT COUNTY 253 square miles	The Illinois River forms its western boundary. Major highways include: I-72, US-36, US-67, IL-106, IL-100
Villages & Towns	Alsey, Bluffs, Exeter, Glasgow, Naples, Manchester, Riggston, *Winchester* (County seat)

Figure 2: LIRV County Community Information

LIRV Demographics

The Lower Illinois River Valley consists of nine counties and a total population of nearly 159,000. The LIRV is predominantly rural (71 percent) with nearly 5,700 farms and over 80,000 households. The following table provides condensed information from the Census of Agriculture. Key takeaways are the urban vs. rural comparison, total population of the LIRV, numbers of households, the percent of the county that is rural, and population totals.

LIRV Demographics						
County	**Population**	**Urban**	**Rural**	**%Rural**	**Farms**	**Households**
Brown	**6,556**	4,088	**2,849**	41.07	**419**	2,099
Calhoun	**5,089**	0	**5,089**	100	**474**	2,085
Cass	**12,260**	6,530	**7,112**	52.13	**429**	5,270
Greene	**13,044**	4,048	**9,838**	70.85	**733**	5,570
Jersey	**21,847**	9,063	**13,922**	60.57	**519**	22,985
Macoupin	**45,313**	19,816	**27,949**	58.51	**1,169**	19,381
Morgan	**33,976**	22,669	**12,878**	36.23	**693**	14,104
Pike	**15,611**	4,550	**11,880**	72.31	**956**	6,639
Scott	**5,355**	0	**5,355**	100	**300**	2,214
Total	**158,335**	**70,764**	**87,571**	**71.2**	**5,692**	**80,347**

Figure 3: LIRV Demographics

Agricultural Economics and Production

Illinois has a strong food and agricultural sector, leading not only the nation in many products, but much of the world. Illinois is at the logistical center of the Midwest, one of the world's most productive and fertile regions and home to Chicago, a world trade and global city. According to the Illinois Department of Agriculture, marketing of Illinois' agricultural commodities generates more than $19 billion, annually. Billions more dollars flow into the State's economy from ag-related industries, such as farm machinery manufacturing, agricultural real estate and production, and sale of value-added food products. Rural Illinois benefits principally from agricultural production, while agricultural processing and manufacturing strengthen urban economies.

This section provides an overview of the various sectors of the Illinois agricultural economy, including an overview of the State's overall statistical profile of various farming industries in the state, in addition to an agricultural profile of each county within the LIRV, as provided by the most recent Agricultural Census in 2017.

State of Illinois Agricultural Profile

The Illinois Farm Bureau produces an annual report on a variety of Illinois Farm Facts. The latest edition from 2019 provides a statistical profile of the farming industries in the State, included within Appendix B.1, with base data sourced by the 2017 Census of Agriculture. [20] Profile highlights show the following:

1) 35 percent of farms in Illinois are 1-49 acres in size;

2) 39 percent of farms are valued at $1,000,000 or more;

3) 84 percent of Illinois farms are either individually or family owned;

4) 56 percent of the principal operators of farms work elsewhere; and,

5) The number of farms has generally declined since 1910 (there were 72,651 farms in Illinois in 2017).

2017 Census of Agriculture

Within Appendix B.2, individual County Agricultural Profiles for each county within the LIRV are provided, courtesy of the U.S. Department of Agriculture. Released as part of the 2017 Census of Agriculture, the profiles include data collected through the agency's National Agricultural Statistics Service (NASS), the federal statistical agency responsible for producing official data about U.S. agriculture. USDA's NASS Illinois Field Office is operated in cooperation with the Illinois Department of Agriculture's Bureau of Agricultural Statistics.

Various data points are illustrated for each county, including a number of farms, crops, values of products, per farm averages, average age and sex of farmers, Internet access, land uses, and size. In addition, data is provided on crops in acres and crop ranking comparisons in Illinois and the U.S. There are also numbers on family farms, demographics, and livestock breakdowns. [21]

Agricultural Highlights and Farm Profiles by LIRV County

The following tables of Figure 4 represent selected highlights by LIRV county from the USDA 2017 Census of Agriculture. Individual county ranking of agricultural production is shown comparing the county to the State. In addition, similar data is provided for livestock and their rankings. Data includes the number of farms with Internet reported and how many are family owned in each of the LIRV Counties.

Agricultural Highlights by LIRV County	
Brown County	– **43** farms are producer owned by someone less than 35; **642** are owned by a producer over 35 with **253** producers over 65 – Ranks **90** out of **102** in Ag products sold – Ranked **92nd** for crop production and **68th** for Livestock – **70**% of farms have Internet – **90**% are family owned
Calhoun County	– **33** farms are producer owned by someone less than 35; **774** are owned by a producer over 35 with **331** producers over 65 – Ranks **95** out of **102** in Ag products sold – Ranks **95th** for crop production and **69th** for Livestock – **64**% of farms have Internet – **95**% are family owned
Cass County	– **46** farms are producer owned by someone less than 35; **647** are owned by a producer over 35 with **281** producers over 65 – Ranks **60th** out of **102** in Ag products sold – Ranks **65th** for crop production and **43rd** for Livestock – **74**% of farms have Internet – **93**% are family owned
Greene County	– **124** farms are producer owned by someone less than 35; **1116** are owned by a producer over 35 with **395** producers over 65 – Ranks **39** out of **102** in Ag products sold – Ranks **42nd** for crop production and **32nd** for Livestock – **77**% of farms have Internet – **94**% are family owned
Jersey County	– **76** farms are producer owned by someone less than 35; **781** are owned by producer over 35 with **265** producers over 65 – Ranks **83** out of **102** in Ag products sold – Ranks **76th** for crop production and **89th** for Livestock – **75**% of farms have Internet – **94**% are family owned
Macoupin County	– **158** farms are producer owned by someone less than 35; **1656** are owned by a producer over 35 with **595** over 65 – Ranks **24** out of **102** in Ag products sold – Ranks **22nd** in crop production and **30th** for Livestock – **75**% of farms have Internet – **95**% are family owned
Morgan County	– **93** farms are producer owned by someone less than 35; **1039** are owned by a producer over 35 with **413** over 65 – Ranks **43** out of **102** in Ag products sold – Ranks **38th** for crop production and **51st** for Livestock – **82**% of farms have Internet – **94**% are family owned
Pike County	– **107** farms are producer owned by someone less than 35; **1420** are owned by a producer over 35 with **563** over 65 – Ranks **16** out of **102** in Ag products sold – Ranks **25th** in crop production and **4th** for Livestock – **72**% of farms have Internet – **93**% are family owned
Scott County	– **16** farms are producer owned by someone less than 35; **472** are owned by a producer over 35 with **165** over 65 – Ranks **81** out of **102** in Ag products sold – Ranks **80th** for crop production and **60th** for Livestock – **71**% of farms have Internet – **89**% are family owned

Source: 2017 USDA Census of Agriculture

Figure 4: Agricultural Highlights by LIRV County

Farm Profiles by LIRV County	
Brown County	– **419** farms representing a **1**% increase since 2012 – **141,657** acres of land are farmed, up **3**% since 2012 – Net farm income per farm is down **4**%; Irrigated Acres represent **160** – **79**% of the County is crop land while **21**% are livestock – **28**% of farms follow no-till practice will **8**% are cover crop
Calhoun County	– **474** farms representing a **1**% decrease since 2012 – **114,628** acres of land are farmed, up **31**% since 2012 – Net farm income per farm is up **74**%; Irrigated Acres represent (unavailable) – **73**% of the County is crop land while **27**% are livestock – **29**% of farms follow no-till practice while **5**% are cover crop
Cass County	– **429** farms representing a **4**% decrease since 2012 – **197,561** acres of land are farmed, up **8**% since 2012 – Net farm income per farm is down **10**%; Irrigated Acres represent **30,454** – **79**% of the County is crop land while **21**% are livestock – **35**% of farms follow no-till practice while **14**% are cover crop
Greene County	– **733** farms representing a **6**% increase since 2012 – **328,133** acres of land are farmed, up **13**% since 2012 – Net farm income per farm is down **2**%; Irrigated Acres represent **783** – **79**% of the County is crop land while **21**% are livestock – **32**% of farms follow no-till practice while **8**% are cover crop
Jersey County	– **519** farms representing a **2**% increase since 2012 – **189,749** acres of land are farmed, up **22**% since 2012 – Net farm income per farm is (unavailable); Irrigated Acres represent **7** – **95**% of the County is crop land while **5**% are livestock – **40**% of farms follow no-till practice while **9**% are cover crop
Macoupin County	– **1169** farms representing a **2**% decrease since 2012 – **420,688** acres of land are farmed, down **4**% since 2012 – Net farm income per farm is up **17**%; Irrigated Acres represent **31** – **83**% of the County is crop land while **17**% are livestock – **31**% of farms follow no-till practice will **10**% are cover crop
Morgan County	– **693** farms representing an **8**% decrease since 2012 – **300,265** acres of land are farmed, down **3**% since 2012 – Net farm income per farm is down **22**%; Irrigated Acres represent **7673** – **89**% of the County is crop land while **11**% are livestock – **40**% of farms follow no-till practice while **14**% are cover crop
Pike County	– **956** farms representing a **1**% decrease since 2012 – **447,007** acres of land are farmed, up **9**% since 2012 – Net farm income per farm is up **1**%; Irrigated Acres represent **3149** – **65**% of the County is crop land while **35**% are livestock – **32**% of farms follow no-till practice while **10**% are cover crop
Scott County	– **300** farms representing a **16**% decrease since 2012 – **155,444** acres of land are farmed, up **5**% since 2012 – Net farm income per farm is down **10**%; Irrigated Acres represent **6300** – **82**% of the County is crop land while **18**% are livestock – **45**% of farms follow no-till practice while **7**% are cover crop

Source: 2017 USDA Census of Agriculture

Figure 5: Farm Profiles by LIRV County

Challenges and Opportunities: Change Drivers and Ag-Specific Influencers

The global food and agricultural system is in the midst of change. Worldwide, population trends show significant growth in developing countries, placing stressors on agricultural systems. Globalization and the development of emerging markets has produced a growing middle class in many countries, contributing to increasing demands for food and other products. Added to this situation of insecurity are uncertain national and international trade policies, an uneven federal immigration policy, and a changing climate placing demands on water and energy production.

Issues regarding access to capital and traditional funding measures are also impacting farm startup costs and expansion opportunities. The basic infrastructure that serves the farming community and its supporting networks is also in need of improvement, with roads, bridges and waterways in various stages of disrepair. Inadequate Internet access and broadband system deployment hampers a more efficient delivery of improved technologically-based farm inputs, such as farm sensors, remote systems, and fertilizer and irrigation applications.

Furthermore, these technical advances are hampered by lack of user knowledge and inadequate supportive networks to provide the technical support for farmers and producers alike. The uneven application and use of traditional resource conservation measures, like cover crop and no-till farming, also impact the farmer's bottom line. Farm profitability is also affected by the financial challenges created by uneven trade and agricultural policy, in addition to issues with a declining and available workforce and accessibility of land to be agriculturally developed. The aging agricultural provider and a need to recruit, retain, and advance a new generation of farmers will continue to present challenges.

To realize the potential of its already sizeable and globally connected food and agricultural system, Illinois has challenges to address from both outside and inside its borders. Locally, Illinois' food and agricultural businesses are not integrated with the wider business community, particularly in metropolitan areas. [3] Regionally, Illinois faces other obstacles with respect to a lack of coordinated leadership, poor farm profitability, inadequate efforts to educate a future workforce, best practice adoption, and long-term resource planning. [3] Globally, soaring demands for food, the dangers from climate and food insecurity, financial instability, uneven trade policy and the strain on the overall inputs and outputs on farm profits, require the development of a more sustainable agricultural approach. [22]

The LIRV is well-positioned to capitalize on these global trends, but it will require an expanded focus beyond a traditional agricultural production base that includes efforts aimed at facilitating science and new technological investment, increased collaboration, better resource management, a greater emphasis on workforce development, improved food service delivery networks, and the development of supportive public policy.

Population Trends

According to the Food and Agriculture Organization of the United Nations, demand for food is expected to surge by more than 50 percent as the global population expands to 9 billion people by 2050. [22] [3] This represents population growth of 30 percent, with a resulting 2.3 billion additional people to feed. [22] Even at today's population levels, there are nearly one billion people who do not have access to a safe and adequate food supply. 20 percent of the world's population lives on less than $1.25 a day and many are children who suffer from long-term health concerns. Over the next several decades, agriculture will be challenged to provide food, feed, fiber, and fuel to this growing world population. [22]

Climate

Flood events have increased with a changing climate.

According to the Illinois Department of Commerce and Economic Opportunity's (ILDCEO) Plan to Revitalize the Illinois Economy released in 2019, climate change threatens to undermine the success of Illinois' farmers. [23] The Midwest is already suffering from the impacts of climate change, and the projections are troubling. Extreme weather patterns are contributing to increased flooding, droughts, damage to infrastructure, and lower crop yields across Illinois.

According to the most recent National Climate Assessment, warm-season temperatures are projected to increase more in the Midwest than any other region of the United States. The result could be more highly eroded soils, more pests and pathogens, degraded quality of stored grain, and lower crop yields.

Rain events and associated floods continue to impede the deployment of adequate crop preparation and planting efforts with seasonal delays continuing each crop planting year. [23] The effects of climate change are resulting in varying levels of rain events and intensity or even outright periods of flood and drought. These levels of uncertainty provide a strain on irrigation systems and may lead to an increased level of pumping to provide crop irrigation. Water pumping in turn requires extensive amounts of energy consumption.

Availability of Water and Energy

Managing water resources has become an increasingly important concern for producers.

Nationwide, farmers across the country face pressure to conserve water and energy. Predictions today still point to a future characterized by dwindling water supplies, diminished water quality, vanishing topsoil, loss of farmland to urban development, land degradation, deforestation, declining fish stocks, and other possible outcomes of unsustainable use of natural resources. At the same time, competition for the use of natural resources is expected to also increase.

The relationship between energy and water use is a significant factor in costs for farm operations. High energy and water costs result in tighter margins and a less sustainable food supply. Water and energy access and their associated costs represent supply chain risks. Producers and society as a whole have a stake in ensuring the long-term sustainability of water supplies.

Farms that are considering integrated resource management use both water and energy resources wisely. Both resources are tightly linked, reducing one has the effect of reducing the other, such as employing drip irrigation systems that use less water and less energy. Use of renewable energy sources is also expanding, where traditional fossil fuel power generation requires increased water use, sources like solar and wind use little to no water. A more holistic view of water and energy management can have positive effects on-farm operations.

Trade Policy

Current tariff policies at the federal level are further destabilizing the farming industry. According to the State of Illinois economic plan, Illinois is the number one producer of soybeans in the nation. Over the past year, China purchased almost no soybeans from American farmers during a trade standoff with the United States. While China made some soybean purchases from farmers over the past few months, trade restrictions are crippling the ability of Illinois' farmers to confidently invest for the future. This uncertainty extends beyond disputes with China. Tariffs on trade with Mexico, a major purchaser of Illinois corn, have been proposed, further destabilizing that market. Recent national trade policy has resulted in an agricultural market filled with uncertainty and destabilized costs. State and national policymakers can have a role by developing clearer trade policy initiatives and formulate a better defined overall agricultural policy direction. [23]

Access to Capital

Capital is scarce for developing new research and development for agricultural products with extended development cycles. Preliminary research opportunities are often carried out at universities using public grant funding. However, little private capital exists from private equity and venture capital funds, which often only will invest once a company has a "proof of concept" or has begun selling its product. Between preliminary research and final product, there is a time lag during product development that can be particularly long for agricultural products because of federal regulatory oversight and potential seasonal impacts during testing. During that time, capital is difficult to obtain. These impediments to capital investment provide a significant challenge in deploying new technological advances in the field. [23]

Aging Infrastructure

Adequate infrastructure is also critical for the effective movement of products from the field to local, regional, and global markets. The existing infrastructure network is satisfactory; however, it is aging. Ports, rail facilities, river infrastructure for waterborne commerce, roads and bridges suffer from widespread deferred maintenance and need major repair to sustain reliable serviceability and in many instances need complete modernization. Choke points identified in the trucking, rail, and river navigation networks impede the movement of food and agricultural products. [23]

Infrastructure with respect to broadband deployment is also a significant challenge for farms and farming operations. Many individuals as well as businesses across Illinois still lack reliable high-speed Internet access. USDA reports that while 70 percent of farms have adopted broadband use, of the same proportion of households, just 53 percent of farms use computers. Additional investments in broadband infrastructure could ease delays, congestion, and strengthen the food production supply chain. As the 2017 Census of Agriculture points out, most counties within the study area experience reduced levels of Internet access. [23] [3]

According to a recent report developed by the Congressional Research Service, states have been advancing their own accelerated broadband deployment initiatives. Although many state broadband initiatives focus on building out broadband infrastructure, states have also been considering other factors. These include initiatives that address broadband mapping, assessment and feasibility, financing, planning, telehealth, tele-education, and telework connections. There has been recent movement in Congress and the State of Illinois with respect to further expanding broadband accessibility. Among the options Congress is considering or has

underway are: improved mapping, holding hearings with state officials involved in state broadband initiatives to hear their success stories and lessons learned; developing pilot broadband initiatives to evaluate the feasibility of different approaches; providing additional funding and oversight for state initiatives to help improve sustainability; and finding ways to address duplicative funding while not unintentionally exacerbating the exclusion of unserved and underserved communities.

Technological Advances

New technologies give farmers the ability to compete in an increasingly competitive global market.

Science, technology, and innovation, and the application of this research, primarily through commercialization, will dramatically reshape global agriculture. [3] Taking advantage of new technologies is essential to remaining competitive in the global market. Perceived risk, limited access to technical support, and the lack of high-speed Internet can lead to slow adoption of new technological solutions for producers. [23] For example, precision farming that incorporates data-driven methods and new technology to manage and optimize the production of crops is anticipated to increase crop yields by 70 percent by 2050. [24] However, farmers tend to be cautious about adopting this new technology, where it is perceived to be unproven or costly. This dilemma presents an opportunity for educational institutions and farm consultants to fill the existing gap for building overall producer digital proficiency and confidence regarding new technological advancements. Peer-to-peer communication can also play a critical role.

In order to meet these challenges, there has been a rise in the applicability of new agricultural technologies (Ag Tech) that provides a clear implication and connection to environmental, social, and economic value. Ag Tech describes innovative technologies in the agricultural sector that demonstrably enhance the sustainability of the "practice" by increasing productivity, improving the efficiency of resource usage, and reducing ecological impacts. Ag Tech also yields sustained or enhanced profitability for investors by increasing the long-term value of agricultural production. [25]

Farm Profitability

In the United States, both public policy and private sector investments have been shaped by decades of agricultural abundance and declining real food prices. The challenge today is to adjust to an era in which the agricultural sector must meet competing and growing demands with limited natural and financial resources, as well as challenging agricultural markets. [22] The 2017 Census of Agriculture of the LIRV shows that farms can be profitable and that many farms within the region are successful; however, there are stresses on their operation and profitability. The growth of farming operations within many of these counties point to the viability of farming, however financial challenges remain, as well as those challenges regarding resource management and workforce development. Potential new technologies can be utilized to provide for improved farm profitability. Marketing and financial implications on a new workforce may be deployed to help support new farming operations and to demonstrate the need for improved policy. The creation of collaborative networks may assist in improving the

overall farming environment. Finally, farmers have a role in their own success through the deployment of on-the-ground innovative practices that will improve yields, reduce input costs, and bolster efficiency and management of margins. [21]

Food Insecurity

Across the LIRV, food security and access to healthy foods are localized and vary. According to the latest information from the Robert Wood Johnson Foundation - County Health Rankings of 2019, the following table provides the percentage of the county population that lacks access to food (food deserts), and those identified as low income with limited access to a grocery store. Living close to a grocery store is defined differently in rural and nonrural areas; in rural areas, it means living less than 10 miles from a grocery store; in nonrural areas, less than one mile. [26]

Several counties have gaps with respect to access to food, as well as access to a grocery store, when compared to the State as a whole. Decreasing levels of food insecurity and access to healthy foods are clearly policy issues to address for rural communities.

Food Availability in Illinois

County	Percent of Population Lacking Access to Food	Percent of Population Who are Low Income with Limited Access to a Grocery Store
Brown	11%	13%
Calhoun	11%	4%
Cass	9%	3%
Greene	12%	6%
Jersey	10%	4%
Macoupin	11%	6%
Morgan	12%	13%
Scott	11%	1%
Pike	11%	9%
State		
Illinois	11%	4%

Figure 6: Food Availability in Illinois

Resource Conservation

According to a FARM Illinois report, *An Agricultural Roadmap for Illinois*, Illinois farmers are recognized leaders at efforts to protect resources and the environment. However, conservation practices need to be more widely adopted in Illinois. At present, Illinois has been identified as a high contributor to both nitrogen and phosphorus delivered into the Gulf of Mexico. According to this study, nutrient loss and runoff pose a major threat to water quality throughout the State.

Furthermore, soil is a nonrenewable resource and research indicates that developing one inch of topsoil takes at least 100 years, depending on climate, vegetation and other factors. Deployment of best management practices to reduce the level of soil erosion in Illinois is critical. [3]

The challenges of meeting the diverse needs of a growing world population must be accomplished sustainably, while continuing to develop and adopt technologies, both traditional and cutting-edge, to enhance productivity on the farm. [3]. Farmers will need to become improved managers of existing resources through the use of technological innovation and have access to a trained and qualified workforce. [22]

Succession Planning

Today, family farms comprise 99 percent of farms in the U.S. These farms are increasingly concerned with succession planning as they look to transition from one generation of ownership to the next. The current trends among Illinois farms reflect a level of fewer ownership numbers, with the remaining farms growing larger. According to U.S. Census data, the average age of a farmer is 58, and 33 percent of farmers are at age 65 or older. Existing farmers often do not have a next generation of prepared and local farmers ready to take over or purchase the business and its operations. Even for multigenerational farms with family members ready to take over, experts recommend a 5 to 7-year plan for succession that includes considerations for legal needs, estate taxes and ownership transitions.

The overall costs associated with large-scale farm operations, from land to equipment to new technology, all serve as a barrier for the next generation of farmers, who may have the interest and drive, but lack the capital. Land access is the primary barrier for most young farmers, with costs of farmland seeing inflation rates rise by approximately 150 percent between 2004 and 2018. Meanwhile, existing large-scale producers are constantly surveying the landscape to acquire additional land or capacity to expand farming operations.

Identifying trained and willing farmers in the next generation could also prove difficult. Access to high-quality training and education for young farmers is limited because of the high costs involved. Taking on debt from student loans can significantly impact a young farmer's ability to take out a loan and acquire lands. Support for the next generation of farmers should be a priority for the industry and for the country. The 2018 Farm Act included permanent funding for programs for beginning and disadvantaged farmers.

Education and Outreach

As the agriculture industry's aging workforce pushes the need for the next generation to step forward, there is a renewed urgency for not only succession but for recruitment, education, and skills training. Too often, even when new and inexperienced farmers can overcome the financial and land accessibility barrier, they often encounter setbacks related to a lack of training, business management support and educational programs.

One nonprofit, Rogue Farm Corps in Oregon, serves new farmers with education and outreach offerings, from creating mentorship programs that pair young farmers with experienced mentors, to advising both new farmers on land acquisition opportunities and retiring farmers on their succession planning options. However, such a program can only address a small portion of the 57,900 openings the USDA estimates for food and agriculture-related fields between 2015 and 2020.

Permanent funding in the Agriculture Improvement Act of 2018 also inspires optimism. The 2014 Farm Bill also proposed a response to this issue with a total of $440 million allocated to beginning farmer programs. The 2014 Farm Bill also included additional funding for the Beginning Farmer and Rancher Development Program (BFRDP), including new and revised loan programs for beginning farmers and helped facilitate the creation of land trusts that incentivized retiring producers to sell their land to beginning farmers.

The 2018 Farm Bill reauthorized the BFRDP and provided mandatory funds to support initiatives around education, mentoring, and technical assistance for beginning farmers and ranchers. The funding is $15 million a year for Fiscal Years (FY) 2019 and 2020, $17.5 million for FY 2021, $20 million for FY 2022, and $25 million for FY 2023. A 2017 report by the National Sustainable Agriculture Coalition found the 'BFRDP has been a major force in providing essential training services for new and aspiring farmers and spurring the development of local and regional networks to support beginning farmers as they navigate the complexities of starting a career in U.S. agriculture.' [27][28]

II. Agricultural Innovation and Technology

Rural communities have survived through decades of economic fluctuations and uncertainty. The current stressors on the farm economy are both longstanding and contemporary. These are significant challenges, but the answer lies in the development and application of a combination of technological advances, employment of innovative best management practices, and through the development of emerging markets. Farmers are increasingly turning to new technologies and adopting additional conservation practices to reduce the financial impact on their farm, to help increase yields, and improve their bottom line. Many producers are eyeing new technologies to help increase or maintain profitability. The key is demonstrating results.

Precision Agriculture: Emerging Technologies and Advancements in Science

Today's farmers are utilizing new technologies and digital tools to gather, process and analyze complex data to support management decisions for improved resource-use efficiency, profitability, and sustainability of agricultural production. [29] This is generally referred to as "precision agriculture," and it is radically influencing farm management. [30] Data-driven insights help guide farmers on both immediate and future decisions, such as what seed to plant in what field, how much water irrigation is sufficient, or where a precise amount of fertilizer is needed. [31]

Precision agriculture takes advantage of the availability of data in the digital age, data collected through monitoring and sensors, and then analyzed to inform predictive farming decisions. Producers use data related to the weather, soil, pest or hydration conditions of a specific farm to make exacting and predictive farming decisions. For example, analyzed data can direct innovative guidance systems and variable-rate application technology to precisely maneuver a fleet of equipment (e.g., combines, tractors, sprayers, irrigation systems) while applying the optimal amount of seed, fertilizer, chemicals, and water, resulting in cost savings, environmental performance, and higher yields through more precise management of inputs. [31] The power of data is unlocking speed, accuracy, and accountability for the next generation of farm management.

Precision agriculture practices and techniques have been used in farming since the 1990s, including widely adopted technologies like programmable auto-steer tractors and agricultural vehicles. But, today's farmers are increasingly looking to *big data* and its additional capacity for analysis and analytics. Agricultural producers have long used data to accomplish simple tasks with existing digital mapping technology, but the additional new capacity has paved the way for digital field maps with detailed layers, formed from sources of public and proprietary data. Advanced big data tools and analytics can help producers depict complex interactions across multiple timespans and consider the factors of production, ecology, and environment.

These technologies often come with a disproportionate price tag. Farmers must consider the economic viability of a practice or new technology in the short- and long-term before deciding on whether to implement it. Overall, only those practices that deliver a positive return on investment will be able to achieve widespread adoption, especially during times when prices are low and input costs are high. Utilizing practices that can perform the double benefit of providing resource conservation and maintaining profitability is desirable.

Internet of Things: Artificial Intelligence and Data Driven Farming

Battery powered sensors can be attached to plants and transmit encrypted cellular data.

One of the newest buzzwords to hit precision agriculture over the past few of years is the "Internet of Things" (IoT). Simply defined, IoT is the concept of connecting any device with an on/off switch to the Internet and to other Internet-enabled devices which can then be monitored or controlled from a remote location. [32] This creates a network of appliances, electronics, mobile devices, smart meters, sensors, drones, satellites, and even individuals or animals with wearable devices that can generate, collect, communicate, and exchange data and information. [33] This idea has clear demonstrable success in the consumer market in the "connected or smart home," where appliances, security systems, and the like, communicate with each other and the homeowner. Systems such as Google and Amazon's Alexa smart hubs are examples of these applications. Expansion of these concepts to the farm community is a promising development. [34]

Mobile devices, including cell phones, smartphones, tablets, and laptop computers have enabled farmers to access sources of data and information to better inform their operations, sometimes in real-time. These devices, for example, provide platforms for the management of weather, water application, pesticide and herbicide applications, monitoring crop health, and livestock measurement tools. [34] Devices widely populate farm tractor cabs and pickups, turning equipment into the mobile office space. Apple's iPhone and smartphones using Google's Android operating system are becoming the cellular communication of choice for many farmers, despite the limited number of phone applications specific to agriculture. [35] Sales of tablet computers, like Apple's iPad, are expected to grow dramatically. Sales will be fueled by a raft of new touch-screen tablets that run a customized version of Google's Android operating system. [35] Ag-specific mobile computers generally are based on the Windows operating system. This allows them to run Windows-based software that currently dominates the agriculture market.

Ag Tech companies like Ag Leader, Farm Works, and SST have recently introduced new Windows Mobile rugged handhelds with enhanced features, including powerful processors, GPS, high-resolution cameras, and built-in wireless and cellular communications capabilities. [35] Precision agriculture tools developed through open-source frameworks are enabling researchers and citizen scientists alike to build upon, adapt, and customize free software for their own specific needs. [36]

Most recently, several agricultural start-ups and component suppliers have been using Low Power Wide Area Network (LPWANs) in place of, or to augment, conventional cellular networks in wireless data transmission. Because the devices that communicate with the LPWA networks do so with low power levels, system battery lives are substantially longer than the current cellular offerings. This, coupled with low-cost network usage, provides a compelling total cost of ownership advantage over other options resulting in additional farm savings. [34]

Computer modeling of agricultural systems has also been widely utilized to help make decisions, predictions, and to establish best practices for applications, from crop management, to plant breeding, to water usage. Agricultural systems modeling has contributed to addressing

inefficiencies in production systems across the industry. Computer models can also utilize interdisciplinary data and produce algorithms and comprehensive system models that aggregate agricultural, socioeconomic, and environmental sources. Today's big data agricultural modeling programs utilize supercomputers to process crop, livestock and agricultural data, providing the complete systems picture necessary for developing practices, technologies, and policies.

Utilizing the processing power of artificial intelligence to collect and analyze multiple data sourced from the field, new tools allow farmers to benefit from the insights data analytics are able to generate. These new technologies predict everything from potential rainfall to managing pests and reviewing trend lines of particular commodity prices with specific accuracy. The use of predictive technologies through these applications help transform the field by literally measuring various aspects of a soil's resilience in the face of flood or drought, or the introduction of various inputs like fertilizer. For example, the software provider, "Sunrise Cooperative" suggests that linked components in agriculture could include field sensors for logging real-time weather, soil moisture, and temperature data, and links to aerial/satellite imagery for direct field monitoring. Device communications like these could also be used in farm dispatching programs, sales interaction tools, and other business management applications. [34]

GPS/GNSS

Farmers can use GPS navigation tools to inform field mapping, farm planning and tractor guidance.

Global Positioning Systems (GPS) and Global Navigation Satellite Systems (GNSS) became popular in the 1990s when operators and manufacturers of these systems were able to find ways of using these technologies to make field management decisions easier, less expensive, and more accurate. The use of these applications in the tractor are critical in managing crop development and production. GPS devices on tractors, for instance, allow farmers to plant crops in more efficient patterns and with more precision, saving time and fuel. Fields can be leveled by lasers, which means water can be applied more efficiently and with less farm effluent running off into local streams and rivers. The result can be a boon for farmers and holds great potential for making agriculture more sustainable. [37]

Deployment of Sensors

Wireless sensors have been used in precision agriculture to gather data on soil water availability, soil compaction, soil fertility, leaf temperature, leaf area index, plant water status, local climate data, insect-disease-weed infestation, and more. Perhaps, the most advanced and diverse technologies in use today are found in water management applications. [34]

Plant and soil moisture sensors typically refer to sensors that estimate volumetric water content of soil. These sensors are able to measure the soil's water content indirectly using some other property of the soil as a proxy for the moisture content. These soil moisture sensors provide a percentage or relative content of soil moisture. Researchers are studying experimental plant

specific moisture sensing technologies, showing promising capacity to improve water use efficiency.

Another class of sensors is capable of measuring water potential in soils such as tensiometers, gypsum blocks, and granular matrix sensors. A tensiometer measures the tension or suction a plant's roots require to extract water from the soil, which is useful when a crop requires a lot of water and any water shortage could stress the crop, negatively affecting its potential. Traditionally, gypsum blocks were used as sensors as they are low cost and easy to operate. But, today's advanced granular matrix sensors are capable of a quicker response and greater wet soil range. [34]

Soil moisture sensors are most effective when used in conjunction with scheduled irrigation. The sensors must be correctly installed, strategically placed, and used in conjunction with other irrigation management information/practices, such as an irrigation shift approach that evenly delivers water, evaporation-based scheduling, and additional forms of soil moisture monitoring.

Plant and soil sensors can detect and record water and moisture data from the field.

Research advances and innovations in soil moisture sensors are creating smaller, cheaper sensors. In 2019, a team of engineers at the University of Connecticut developed a soil moisture sensor that costs around 2 dollars apiece; far cheaper than the cost of current comparable commercial devices. [38] Future sensors could also similarly detect nutrients like nitrogen with a similar size and profile.

Across the country, increased regulation of water usage and water scarcity will continue to drive improvements. Producers in drought-stricken areas of California are using moisture sensors extensively to help irrigation scheduling, while on-the-go sensor information has become more valuable as well. On-board applicator options developed over the past few years include GreenSeeker (Trimble), OptRx (Ag Leader), and CropSpec (Topcon), which have the ability to communicate real-time crop health conditions to help immediately tailor water applications. WeedSeeker, Trimble's weed detection sensor, is made for the precise site-specific application of herbicides. This tool is invaluable for precision-guided herbicide application in areas of the country where Roundup based products are regulated. [34]

Sensor technology is available to measure soil features like electrical conductivity, ground elevation, organic matter content, and pH. Another type of sensing system is satellite or aerial imaging called remote sensing. These satellites record images of key agricultural areas every few days to note differences in crop health. Growers then apply nutrients based on a prescription-based approach developed from the satellite images generated. [35]

The use of sensors to provide real-time data for animal producers is also on the rise. For instance, the Hart Dairy Farm in Waynesboro, Georgia is the first U.S. farm to develop and implement a machine learning application using TensorFlow for tracking livestock. Their application, called IDA, continues to improve over time, by regularly collecting and analyzing data from sensors attached to cow udders. [36] By using remote-control sized transmitters, owners know when their Holsteins or Guernsey cows are chewing cud, feeling sick, or ready for

insemination. The volume of data captured and processed by this software is high. Originally trained on the equivalent of 600 years of cow data, this software can replicate that volume every 2.5 months, given that the equivalent of eight years of cow data is created and collected every day.

Another software called HerdDogg, originally developed as a smart herd monitoring tool, measures everything from a cow's ear temperature to their activity levels via a Bluetooth-enabled tag clipped to their ear. Using this data, the tag tells farmers or researchers whether cows are in heat, missing from the herd, or about to become sick. [36]

Robotics

The use of robotics ranges from small "rowbots" that are designed to apply fertilizer precisely between rows of corn to a "lettuce bot" that pulls weeds up in a row, to a fully automated mechanical harvester. [39] Robots and robotic systems are being developed as a more efficient substitute for performing work traditionally done by hand or large machinery. For instance, conventionally inspecting for pest problems in the field is a labor-intensive process. Spensa Technologies, uses robotics to streamline this cumbersome process. Spensa Technologies' Z-Trap and an online tool called MyTraps.com are automated tools that allow farmers to track pests from their cellphones in real-time, reducing the amount of pesticides sprayed on crops and saving the farm money and labor. [37]

Robots are taking on many additional tasks in agriculture with varying levels of success. This includes such tasks as planting greenhouse crops and pruning vineyards. There has been a significant push in the use of robotic and autonomous machines that are remotely controlled using telematics. Task-driven robotic specificity is largely in the early development stages, but several examples are noteworthy.

Farmers are utilizing new technologies and data analytics to enhance their practices and decisions.

Kinze Manufacturing, Inc. has created an autonomous grain cart system designed to plug into any tractor in which the grain cart follows a combine through the field at a safe distance. [34] Launched in 2011, AGCO's Fendt Guide Connect leader-follower technology also connects two machines by means of GNSS signal and radio, so that both are controlled by a single driver. AGCO is continuing to develop the concept based on customer input on their farming needs. [34] In a different approach, the Fendt-produced MARS (Mobile Agricultural Robot Swarms) project utilizes small corn seeding robots that are lightweight, energy-efficient, highly agile, cloud-controlled, and operated from a tablet application. There is no cab, but instead an off-field operator managing a fleet of multiple MARS units, working around the clock with low maintenance needs. [34] These technologies reduce fuel costs, farm labor costs, and require less maintenance.

Drones

One area where technological innovation has become commonplace in agriculture is the use of Unmanned Aerial Systems (UAS), commonly referred to as flying drones. Agricultural drones

are used to analyze soil and fields, assist with planting and spraying, monitoring crops, and managing irrigation. Operation of drones requires a certification from the Federal Aviation Administration (FAA) under Part 107 rules which regulate 'Certificated Remote Pilots including Commercial Operators.' Experts at Global Market Insights estimate the market for agricultural drones will reach $1 billion by 2024. [40]

Today's drones are capable of creating detailed maps of the crop area and collecting data about the current crop life cycle, overall plant and crop health, and land distribution by crop type. The drones, outfitted with different types of cameras (infrared, hyperspectral, multispectral) and sensor systems, are able to fly over fields capturing images which can be analyzed by farmers and managers. This imagery is increasingly used by farmers to inform their management decisions such as evaluating soil types and cover crops, automating plant counts, evaluating crop damage, examining flood risk, and monitoring the performance of fields.

Today's agricultural drones can be customized and equipped with additional cameras and tools.

Drones help farmers accomplish tasks that traditionally were expensive, difficult, dangerous, and time-consuming. In the past, monitoring large-scale crop and livestock conditions required satellites or plane imagery, which were expensive and lacked detail and precision. The surveying and mapping capabilities of drones allow producers to obtain real-time footage to monitor crop progression and informs specific decisions beyond best practices.

Regular surveying with thermal camera systems and near-infrared (NIR) sensors also help farmers monitor their plant health, irrigation issues, and water use and application, identifying areas of concern before they escalate into problems. Multispectral and hyperspectral camera systems can aid farmers with precision application of pesticides and herbicides through advanced identification of weeds and pests, as well as enhancing surveying efforts, performing visual inspections, and determining spacing issues. Drone-based applications like FARMWAVE, PLANT VILLAGE, and PLANTIX use algorithms to diagnose plant disease and pests. Some larger fruit and vegetable farms are experimenting with the use of drones to help pollinate crops as the bee population declines. [37]

Aerial application of fertilizers and pesticides via crop spraying has traditionally been conducted with crop dusting planes, but drones increase the capacity of farmers to perform targeted applications via spot spraying. Requiring FAA approval, crop spraying drones have reservoirs which can be filled with fertilizers, pesticides or herbicides and then deployed to spot treat areas of fields for specific issues before they spread throughout the farm. Drones can be programmed or scheduled to run routes, allowing spot spraying to become an effective technique for farmers by reducing both economic and environmental costs.

Integrated Farming Systems

Innovations in agricultural technology do not need to be constrained to a single step in the value chain; rather, the most disruptive breakthroughs may come from combining innovations in multiple areas. [25] One illustration of this combination is an idea known as "integrated farming systems" that combines genetics, physical inputs, IT sensing, and smart tech applications and

machinery. Through advances in software and environmental testing, farmers will be able to create custom field prescriptions for seeds, fertilizer, and pest controls. Smart machinery will carry out the prescribed treatment, while collecting further data that will provide feedback to the farmer. [25] This concept is currently being advanced by several established companies and entrepreneurs.

Water Conservation and Irrigation Monitoring

While precision agriculture practices are typically associated with input management and water quality, water conservation is also a primary focus for both innovative and trusted best management practices, technologies, and techniques. Irrigating is costly for farmers. Beyond the cost of water, farmers incur additional expenses from energy, labor, and maintenance. Today, farmers use new technologies like drones and sensors to gather data and inform their water management practices.

On the ground level, plant and soil moisture sensors allow farmers to track water content and water potential on their lands. Data from sensors is used in combination with other irrigation management information, as well as other manually collected data sources. Aerial drones are used to survey farms and spot areas that are receiving too little moisture or excessive irrigation. Producers analyze this data to inform how crops are positioned to avoid water pooling, maximize drainage, and adhere to natural land runoff, problems that can damage yields, if mismanaged.

One such product is the Precision Mobile Drip Irrigation system, where the dripline is pulled through a field by a center pivot or linear system. As the driplines are pulled behind the system, emitters deliver a uniform pattern across the full length of the irrigated area, delivering water directly to the soil surface, minimizing evaporation and drift. [34]

Biological Product Applications

Biological pest control and growth enhancements are an expanding market, as farmers look for more environmentally friendly and cost-efficient crop inputs. Advanced technologies, such as high-throughput screening, are also helping companies to quickly multiply beneficial organisms, thus driving development of new biologicals.

Herbicide-Drought Tolerant Hybrids

Development of herbicide tolerant seeds is a recent innovation. Two new traits are appearing in the market. Dicamba- and 2,4-D-tolerant traits are in the final stages of development and will offer producers an alternative to Roundup Ready and Liberty Link. Adoption of these new technologies will be dependent on the spread of glyphosate-resistant weeds. [35]

Wheat's ability to be grown in alternating seasons with soybeans has led to increased R&D of hybrids.

Decades of work to develop drought-resistant plants are now producing results. The first corn hybrids marketed for drought conditions are also being sold. These hybrids use natural gene selection and are targeted to the western Corn

Belt where water is a key limiting factor. Companies promise yields will be more stable with these hybrids. [35]

Because of the potential for increased yields and improvements with consistency and stability under stress, hybrid wheats have been a priority for large-scale agriculture producers across the country and in Illinois. Wheat is a self-pollinating plant, meaning development of hybrid bread wheat has been a greater challenge on the larger commercial level for producers than crops like corn and soybeans.

The process for creating hybrid wheat saw a breakthrough in 2017 when DuPont Pioneer researchers identified a gene in wheat that controlled self-pollination, allowing it to be turned off while maintaining capacity for cross-pollination. Traditionally, creating a hybrid wheat species was possible via chemical emasculation or through backcrossing with a sterility gene from a wild wheat species. Now, researchers have identified a gene necessary for cross-pollination in wheat which can be used in large-scale, low-cost production of parent breeding lines necessary for hybrid wheat seed production. [41]

Variable Rate Application Seeding

Variable rate application (VRA) seeding technology appeals to a grower's natural inclination to maximize yields by accounting for the factors that impact seed growth. VRA seeding is different than variable rate fertilizer because VRA seeding relies on the ability to gather accurate data from the start of the agricultural process with the seed itself. Currently, only 5 to 10 percent of the planted acres today are using VRA seeding, but its use is expected to increase in the future. [34]

Weather Modeling

There is no other input in the agricultural development chain that is as varied and unpredictable as the weather. Over the last several years, weather forecasting and predictability have greatly improved. One of the newer approaches in this field involves the application of quality weather models. Iteris' ClearAg system creates a platform for agriculture that also expands into other modeling areas, such as water use, soil properties, and crop growth. Growers are learning that if they harvest crops at certain temperatures, crop quality and integrity are affected, where they previously had to send workers into the field to manually assess items such as soil temps prior to sending in harvesting equipment. Using this technology allows the producer to accomplish the harvest more efficiently by taking the readings remotely. [34]

Nitrogen Modeling and Management

Although some forms of variable rate fertilizer application have been used for decades, nitrogen modeling has become increasingly utilized. The complexity of the nitrogen cycle and its constant state of flux has made managing nitrogen difficult. [34] SST Software has partnered with Agronomic Technology Corporation (ATC) to introduce Adapt-N. Adapt-N was first introduced in 2014 and is becoming an important tool for properly managing nitrogen use. Increasing awareness of nitrogen levels in farm applications is driving most growers to use simpler methods to address these concerns. These modeling approaches, coupled with conservation resource applications, provide consistency and information. Finally, the extreme price fluctuations of nitrogen fertilizer have not been lost on seed companies, which are currently developing corn hybrids with the ability to better use and manage available nitrogen. [35]

Vertical Farming and High Tunnels

Vertical farming is the practice of growing crops in vertically stacked layers, often in a controlled environment that aims to optimize plant growth, while also using soilless farming techniques such as hydroponics, aquaponics, and aeroponics. Common structures to house vertical farming systems include abandoned warehouses, buildings, shipping containers, tunnels, and repurposed limestone quarry caverns. Beyond providing fresh local produce, vertical agriculture could help increase food production and expand agricultural operations as the world's population expands and becomes increasingly urban. [42] Vertical farm yields have been realized at nearly 10 times the efficiency of traditional agriculture. [43] Vertical farming also holds the potential to provide producers with a 365-day growing season with temperature-controlled environments.

A High Tunnel System, commonly called a "hoop house," is an increasingly popular conservation practice for farmers, and is available with financial assistance through the Environmental Quality Incentives Program (EQIP). Benefits of a high tunnel systems include an extended growing season, improved plant and soil quality, reduced nutrient and pesticide transportation, and improved air quality through reduced transportation inputs. Farmers can use precise tools like drip irrigation to efficiently deliver water and nutrients to plants. [44]

Use of high tunnel systems, also known as a hoop houses, can extend growing seasons for producers.

Producing fresh greens and vegetables close to urban population centers could help meet growing global food demands in an environmentally responsible and sustainable way by reducing distribution chains, lowering emissions, providing higher-nutrient produce, and drastically reducing water usage and runoff. USDA has recently developed funding mechanisms to encourage the applicability and growth of this program in recent years, including the 2018 Farm Act. [42] Local and regional produce sales also represent another opportunity to diversify revenues for small and mid-sized farms, as well as the development of retirement farms.

Best Management Practices and Conservation Resource Applications

Agricultural Best Management Practices (BMPs) are practical, cost-effective actions that agricultural producers can take to conserve natural resources while maintaining or enhancing production. Conservation and stewardship have been an integral part of agricultural measures for decades. The form of these practices includes the utilization of reduced tillage, cover crop application, crop rotation, water loss prevention, and advanced nutrient management. These practices can go hand-in-hand with precision technological advances. All of these practices have differing returns on investment, influenced by such variables as weather, soil, labor, and land ownership conditions.

More than half of U.S. cropland is leased. Uncertainty over the length of land tenure can also impact a farmer's approach to long-term conservation investment. [45] Many conservation practices require farmers to change their overall management of the farm, which can result in growing pains during crop transition. However, when these practices enhance profitability,

increased management costs are generally more than offset. [45] Returns are realized from reduced monetary and time inputs, higher or more stable yields, and increased resiliency to variable weather conditions.

Adoption of specific BMPs allow farmers to take advantage of the unique nature of individual farms, while following practices that work universally. When managing the surrounding environment, practices may be identified that not only increase profitability, but also benefit the land and water resources. [45]

Soil Health

Soil health, or soil quality, refers to the capacity of soil to support and sustain plants, animals and humans. For many farmers and agricultural producers, the management of soil health is one of the primary concerns for operating a sustainable and profitable operation. The functions of soil, beyond sustaining plant and animal life include regulating water, filtering and buffering pollutants, and cycling nutrients; all concerns that farmers regularly monitor and manage.

USDA identifies four principles to improving soil health: keep the soil covered as much as possible, disturb the soil as little as possible, keep plants growing throughout the year to feed the soil, and diversify as much as possible using crop rotation and cover crops. [46] These principles form the basis for many of the traditional and innovative practices used on farms that employ soil health management systems.

Sustainable soil health management is one of the principles driving support for precision agriculture.

Modern agricultural technologies and data collection systems have been developed and deployed alongside the implementation of both traditional and innovative BMPs to help optimize inputs and maximize yields, while maintaining soil quality and working towards minimizing environmental impacts. Partnerships have formed between producers, conservation groups and food companies to help test technologies, evaluate BMPs, and promote best practices and their adoption. These stakeholders recognize the potential for managing soil quality as an easy and effective way for producers to increase crop productivity and profitability while simultaneously improving the environment.

The soil health management systems on Illinois' farms discussed in greater detail below include techniques and practices such as nutrient and pest management, conservation crop rotation, cover crop usage, no-till practices, mulch tillage, and mulching. Innovative approaches to soil health include the use of biotechnology, soil and plant moisture sensors, remote imaging technologies, and precision agriculture systems. Entities like the University of Illinois Extension programs, Soil and Water Conservation Districts and the Conservation Technology Information Center (CTIC) help promote these practices and innovations, educating farmers across Illinois about systems and technologies that are both ecologically and economically beneficial.

Tillage Practices and Awareness

Tillage refers to the practices of preparing soil for agricultural production. A key component of soil management, much consideration is given to both the amount and type of tillage. In Illinois and the LIRV, the primary form of soil degradation is erosion caused by water. Conservation practices and BMPs for tillage are designed to reduce erosion and soil runoff. [47]

Questions regarding tillage practices were included in the 2017 U.S. Agricultural Census because of its relationship to soil erosion, water quality, yield, and cost of production. Respondents were asked to identify practices for cropland acres as utilizing either no-till, reduced (conservation) tillage excluding no till, or intensive (conventional) tillage. Per the census definitions, conservation tillage leaves 30 percent or more of the soil surface covered by crop residue after planting, whereas conventional tillage has 100 percent of the soil surface mixed or inverted.

No-till and conservation tillage practices help to improve water quality and usage efficiency, increase crop production, and promote water conservation while saving renewable resources. No-till farming is the process of leaving soil and crop residue undisturbed between harvest and planting, other than nutrient injection. No-till farming greatly reduces soil disturbance, which in turn reduces soil erosion, builds soil organic matter, improves soil health, and helps reduce phosphorus entering waterways. [48] No till practices improve the soil's capacity for holding water and increase the organic matter in the soil, while also reducing energy use and decreasing soil compaction.

The advantages of the no-till system include significant improvements in soil health (reduced soil erosion, improved infiltration, etc.) reduced fuel and equipment requirements, and the potential for increased profitability. The disadvantages of this system include the learning curve associated with the transition to no-till, the length of time (several years) required to observe soil health changes, potentially slower early plant growth, and increased seedling diseases in colder and wetter soils. [48]

Conservation tillage practices can contribute to reduced fuel costs and increased profitability.

Conservation tillage can take many forms that run the gamut between conventional tillage and no-till farming. For instance, strip-till farming is a modified form of no-till, where tillage is limited to a narrow zone in which next year's crop will be planted. Soil disturbance is greatly reduced compared to conventional tillage. Like no-till farming, strip-tillage benefits include reduced soil erosion, increased soil organic matter, and reduced phosphorus entering waterways. [48]

Residue-free strips approximately six inches wide are tilled ahead of planting in order to have a warmer and drier zone when row crops such as corn and soybeans are planted. Crop residue is lightly moved to the row middles. Generally, GPS with accuracy to within one inch is used to prepare the strips and later plant in the same zone. A slight mound of soil is typically left after strip-tillage in the fall, limiting soil erosion. Strips can be prepared in the spring, but producers generally prefer to do so in the fall to reduce springtime constraints and improve seedbed conditions. [48]

The advantages of strip-till include optimum placement of fertilizers for plant uptake, improved conditions for seed-to-soil contact at planting, reduced seedling disease problems, and more rapid early season growth as compared to no-till practices. Strip-tillage benefits over conventional tillage include reduced expenses and time requirements, increased soil organic matter and improved soil physical conditions that can improve timeliness of spring field operations. [48]

Case studies show that no-tilled and strip-tilled soybeans and corn can yield more than traditional tillage, making yields more consistent, and reduce costs. [48] However, there are disadvantages, including the cost of special equipment, the cost of the strip-tillage pass, potential for excessive crusting and drying, potential for nitrogen losses, and potential for soil erosion of the tilled strip. [48]

Illinois conducts a biennial statewide Soil Conservation Transect Survey in order to track the status of soil conservation efforts on the state's agriculture lands. The 2018 Soil Conservation Transect Survey for the first-time recorded cover crops, and saw conventional tillage used for 48 percent of corn acreage and 12 percent of soybean acreage. In addition, an annual survey of tillage practices is conducted by local Soil & Water Conservation Districts (SWCDs) and the Natural Resources Conservation Service (NRCS) and coordinated by the CTIC.

Precision Application of Inputs

Large-scale producers and farms of all scales are increasingly embracing data made available by precision agriculture technologies to inform and improve applications of inputs. For crop production, precision agriculture uses site-specific crop management (SSM) techniques that employ multiple technologies to manage different sections of a field separately. Traditionally, mechanized farming relied on averages for measurements of inputs and conditions, and was subject to the natural variability of lands.

A tractor with a trailed sprayer applies fertilizer for young corn in the form of microdroplets.

Unless a site truly had a consistent average, over- and under-applications of herbicides, pesticides, irrigation, and fertilizer became commonplace, causing excesses of chemicals from blanket applications to run off of fields into groundwater, rivers, and streams. Currently, common SSM practices determine variable conditions using precise global positioning, combined with location-specific measurements from both remotely sensed and traditionally collected data sources.

Facing increasing concerns about the ecological impacts of nutrient loss and sediment runoff, including Gulf Hypoxia, farmers are looking to precision application to guide their operations towards more sustainable practices. New technologies have given farmers an abundance of new data to help drive decisions and an understanding of where to apply inputs and what is occurring after application. Water quality metrics are driving innovations in nutrient and sediment tracking at research institutions and universities, involving the agricultural community in the strategizing, development and implementation of BMPs that support reduction goals.

Released in 2015, the Illinois Nutrient Loss Reduction Strategy (IL NLRS) is a framework for using science, technology, and industry expertise to assess and reduce nutrient loss to Illinois waters and the Gulf of Mexico. The IL NLRS lays out a comprehensive suite of BMPs for reducing nutrient loads from agricultural runoff. In northern and central Illinois, nutrient management practices focus on nitrogen runoff, which primarily occurs in tile drains and drainage outlets made up of underground pipes that drain Illinois' agricultural fields. In southern Illinois, BMPs target phosphorus that loads waterways due to surface runoff of eroded soils during periods of snowmelt or heavy rainfall.

Agricultural sector partners reported that in 2017, over $25 million was invested in nutrient-loss-reduction efforts. That figure increased to nearly $34 million in 2018. Agricultural organizations sponsored hundreds of events for farmers, agricultural retailers, and the public about practices that can reduce nutrient loads in Illinois waters. In 2017-2018, nearly 84,500 attended these events. In addition to face-to-face interactions, agricultural organizations sponsored multi-media campaigns to provide information about the strategy and its implementation. Illinois NLRS was featured in newsletters, factsheets, newspaper articles, and on radio programs.

The IL NLRS survey conducted by USDA's National Agricultural Statistics Service (NASS) showed that most farmers have at least some knowledge about BMPs listed in the strategy. Approximately 80 percent said that they were knowledgeable about nutrient management or constructed wetlands and 85 percent knew about cover crops. [49]

Cover Crops

Cover crops can be defined as non-commodity crops planted into standing cash crops or bare fields following a harvest, with the intent of increasing farm profitability through increased yields, reduced fertilizer costs, and reduced weed management. Cover crops help manage soil erosion, improve soil fertility and quality, conserve water, and manage the proliferation of pests and disease, while increasing biodiversity and wildlife. [48]

In southern Illinois, cover crops provide producers with an effective tool for reducing nutrient losses.

Cover crops need to be planted early in the fall to allow for germination and growth before frost and terminated in the spring to prevent interference with the next crop. This can be accomplished through grazing, haying, tilling, spraying, or a combination of these methods. [48] Only a fraction of conventional row crop farmers grow cover crops after harvest, but a new global analysis from the University of Illinois shows that the practice can boost soil microbial abundance by 27 percent. The results add to cover crops' reputation for nitrogen loss reduction, weed suppression, erosion control, and more. Although soil microbial abundance is less easily observed, it is an important metric in estimating soil health. The ecological services performed by the soil microbiome, including nutrient cycling, are enormous. Going forward, understanding these functions and how agriculture can form a healthier soil microbiome will be important. [50]

Stream Buffers and Streambank Stabilization

Conservation buffers are small areas or strips of land left in permanent vegetation, designed to intercept pollutants and manage other environmental concerns. Buffers include riparian buffers, filter strips, grassed waterways, shelterbelts, windbreaks, living snow fences, contour grass strips, crosswind trap strips, shallow water areas for wildlife, field borders, alley cropping, herbaceous wind barriers, and vegetative barriers.

Most buffers are made up of grassy or native vegetation planted adjacent to streams that trap sediment from surface runoff, address areas of concentrated water flow thus preventing soil erosion, reduce phosphorus entering a waterway, filter nitrogen and other agricultural products as they move in surface and groundwater, stabilize stream banks, and provide wildlife habitat. [48] Stream buffer strips are areas surrounding water sources that have been taken out of agricultural production. These areas are then planted with a variety of grasses, shrubs and/or trees that help improve water quality. The primary benefit of stream buffer strips is to trap soil and phosphorus found in surface runoff before it reaches a stream or river. [48]

A stream buffer is visible on the edge of a southern Illinois' farm.

For stream buffers to be effective without excessive maintenance, soil erosion must be well controlled on the land draining toward the stream buffer. A uniform buffer is preferred by many producers, but varying the width of the stream buffer based on the amount of runoff that enters each section is more effective. [48]

Wetland and Drainage Management

The value of wetlands, either constructed or natural, is well-documented. Ecological wetlands function as nutrient cycling and mitigation (filtering) of pollutants, as well as natural buffers for rivers, lakes, and streams. Other benefits include creating or improving waterfowl habitat development of sport fisheries and improving stands of timber. By maintaining these wetlands around production agriculture landscapes, significant improvements in water quality may be achieved. [51]

The term wetlands refers to the transitional areas between open waters and uplands.

Certain agricultural crops thrive in the moist, rich wetland soils, while wetlands near agricultural lands receive the nutrient inputs to maintain an ecosystem balance. More importantly, this relationship shows the intricate balance between viable food and fiber production and preservation of natural resources. [51]

Farmers may develop constructed wetlands as part of an overall BMP for sediment and nutrient controls. These are generally developed as a shallow vegetated pool that filters nutrients, especially nitrates, controlling flooding, and providing wildlife habitat. Nutrient treatment wetlands are another important "edge-of-field practice," and have shown to improve water quality by reducing nitrogen levels by an average of 52 percent. Actual nitrate removal depends on rainfall, with greater removal in drier years and lesser removal in wetter years. [51]

Federal and State Incentives

A major portion of the resources to fund these areas of conservation is the Conservation Reserve Enhancement Program (CREP). This program is part of the Conservation Reserve Program (CRP), the country's largest private-land conservation program. Administered by the Farm Service Agency (FSA), CREP targets specific state- or nationally- significant conservation concerns, and federal funds are supplemented with non-federal funds to address those concerns. In exchange for removing environmentally sensitive land from production and establishing permanent resource conserving plant species, farmers and ranchers are paid an annual rental rate along with other federal and non-federal incentives, as applicable per each CREP agreement. Participation is voluntary, and the contract period is typically 10-15 years. [52] [53]

Application of Conservation Best Management Practices

A study conducted by the Environmental Defense Fund that detailed the practicality of utilizing conservation techniques and the use of technologically innovative management practices found the following [45]:

- Conservation resource management should be part of a comprehensive farm management system. The study found that farmers were able to maximize the benefits of conservation approaches by not implementing them in isolation, but instead focusing on how these practices work in concert with each other. While there may be cost increases in some categories of farm operation, the bottom line often showed a positive return.

- The use of precision agriculture helps target the application of farm inputs like fertilizer and herbicides to help reduce waste while increasing production. Participation in the use and application of these newer technologies involving external stakeholders lead to increased success. The involvement of other partners, especially University or training education-based, were especially found as important.

Producers interviewed in the referenced study used a combination of no-till, nutrient optimization technologies, cover crops, and rotation on some or all of their fields. Each impact realized [45]:

- Lower fuel and labor costs involving the deployment of conservation tillage. This practice involved fewer field visits, reduced compaction, and reduced labor costs. In addition, no-till or minimum-till applications involved even less machinery costs.

- Producers were also able to increase their precision application of nutrient management and herbicide applications using new technological applications. The need for the application of chemical inputs through these technologies also declined with the increased use of natural conservation measures.

Efficiency and Profitability through Technology and BMP Adoption

Farms and large-scale producers, like most businesses, often make decisions driven by their primary concerns over profits, losses, and the bottom line. Because innovative and sustainable technologies and practices can be expensive to obtain and implement, most producers must be incentivized to overcome the costs and adopt them on their farms. The Illinois Department of Agriculture, Farm Bureau, Soil and Water Conservation Districts, University of Illinois Extension, Illinois State Water Survey, and others play a vital role educating producers by making information on practices, technologies, and techniques easily accessible and readily available.

The next wave of best practices expansion will likely involve winter cover crops that provide revenue, carbon sequestering, nitrogen management, water management, food traceability, Internet of Things, food loss/waste, and the age of farmers and succession planning.

While the economic benefits of practices like precision inputs and water-energy conservation are relatively straightforward, other technologies and practices often require early adopters and demonstration projects to help convey their value and ROI to farmers. Modest appropriations in the state budget can make innovation a reality, such as the Illinois Department of Agriculture's 'Fall Covers for Spring Savings: Crop Insurance Reward Pilot Program.' The program is incentivizing and educating farmers to implement cover crop best practices by providing crop insurance rebates.

Technology requires specific upfront investments in hardware, but these technologies serve as tools for producers to reduce costs over time. To some farmers, purchasing a drone may seem like an extravagant expenditure, but when that drone can inexpensively accomplish previously difficult tasks, such an expenditure becomes a simpler value-added proposition. Farmers are increasingly data-driven decision-makers, meaning the barriers to adoption can be overcome if the state and its agencies continue leading and supporting efforts to engage producers and provide them with data, information, education, and especially financial incentives.

Highlighted Agricultural Research: Case Study Summary Sheets

Agricultural research and development (R&D) funding has an estimated return on investment of 20 to 1. While other federal research investments have grown, U.S. agricultural research funding has stagnated. China invests nearly twice as much as the U.S. in agricultural science. USDA's National Institute of Food and Agriculture (NIFA) administers federal funding (competitive, capacity, and extension) to address the agricultural issues impacting our daily lives and our nation's future. [54]

The Foundation for Food and Agriculture Research (FFAR) was established by the Agricultural Act of 2014, known as the Farm Bill. The premise of FFAR's formation was that increased investment in cutting edge research and development, through public-private partnerships, would be critical to nourishing a growing global population. FFAR was created to support food and agriculture research, foster collaboration, and advance and complement the mission of USDA. One of FFAR's key focus areas is soil health. The FFAR Soil Health Challenge Area supports research on the linkages between farm productivity and soil health in addition to highlighting the benefits of sound soil practice. [55]

FFAR is supporting the active collaboration involving the Soil Health Initiative and the Soil Health Partnership to improve soil health and support positive economic and environmental

outcomes for American farmers. One of the research areas addressed is the science of Regenerative Agriculture. Regenerative Agriculture is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services. Regenerative Agriculture aims to capture carbon in soil and aboveground biomass, reversing current global trends of atmospheric accumulation. Regenerative Agriculture has the opportunity to contribute to an expanded effort at making our rural landscapes more resilient. [56]

With the vast array of research efforts and emerging technologies currently being studied in the agricultural field, in areas as diverse as climate resiliency, regional food security, pest resistant chemicals, and specialty processing, changes and discoveries are occurring rapidly. For this report, research areas were selected based on research progress and technology adoption. The selected topics are not meant to be a comprehensive list of all relevant agricultural research and emerging technologies.

The following is a sampling of three key evolving precision agricultural technologies that could find increased application across the LIRV region. Each technology presented below is summarized under the following headings – Remote and Sensor Technology; Data and Informatics; and Cross or Transdisciplinary Research.

Information used to develop these summary statements was obtained from a 2019 collaborative report from FedByScience universities and the Supporters of Agricultural Research (SoAR) Foundation. [57] SoAR is a nonpartisan coalition that educates stakeholders about the importance of agricultural research and a focus on feeding the U.S. and the world. The report, the fourth in a series on agricultural sciences and research initiatives, highlights research projects in several breakthrough areas identified as the most important fields to advance in agriculture by the year 2030. The report shows how scientists funded by USDA's National Institute of Food and Agriculture (NIFA) are leveraging federal resources to advance breakthrough areas. Coupled with traditional Conservation Resource Management practice, expanding utilization of these evolving BMPs could show promise for applications in farming operations within the study area. [57]

Remote and Sensor Technology

The future of agriculture is precise with customized management of production down to each individual plant and animal. This real-time sensing tool and its use require coordinated efforts for deployment in the field and with management from a central location. Farmers are using sensors in conjunction with robotics, drones, and other systems that provide key information for improved and nimble decision-making. [57]

Data and Informatics

More data was created in the last two years than in the entirety of human history. In the food and agriculture arena, there is more data available than ever before. This data is created by sensors in fields, genetic analyses in labs, predictive weather models, and hundreds of other inputs. But, the data collected comes in a variety of forms on a wide range of software platforms that are not coordinated. [57] Megadata overload also creates a substantial concern.

Managing and using this flood of information with optimal utility will be key to solving some of agriculture's most pressing challenges. Informatics is the intersection of data science, software development, and systems modeling that allows scientists to take a lot of data and build

knowledge. Entire growing seasons can now be simulated with computers using a combination of genetic information, climate predictions, and on-farm management practices. Today, the power of computer science and data analytics can be harnessed to save years of testing new crops in the field and to deploy customized solutions for farmers in real-time. [57]

Cross or Transdisciplinary Research

To advance our ability to sustainably feed the world's growing population, producers will need to combine science-based solutions that account for the realities of farming, such as shifting economic markets or limited access to technology. Transdisciplinary or cross disciplinary research will build the foundation for achieving creative solutions for our most pressing agricultural challenges. [57] By using transdisciplinary approaches, researchers can better understand the complex factors impacting our food system without being confined by their individual areas of expertise. Transdisciplinary collaborations will enable diverse teams to pool their knowledge and develop holistic solutions that increase the efficiency, resiliency, profitability, and sustainability of our food system. [57]

Remote and Sensor Technology

The future of agriculture is precise, customized management of production down to each individual plant and animal. This agricultural revolution requires coordinated efforts to advance sensor technologies that can be deployed in the field and managed from a central location. Farmers can use sensors in conjunction with robotics, drones, and other monitoring systems that provide information to inform management decisions.

Advances in nanotechnology prepared the way for a new breed of biosensors that can help farmers and food distributors improve efficiency and safety in agriculture. Improvements in sensors can help farmers use less water, fertilizers, and pesticides by allowing them to determine the precise requirements of their crops and livestock.

Biosensors can act as "cyber canaries" in the field by alerting farmers to a variety of changes in crops, from pest or pathogen infestations to changing water levels. Similarly, improved sensors help distributors detect when food has spoiled or been contaminated by foodborne pathogens.

The information provided by diverse arrays of sensors facilitates a transdisciplinary approach to understanding the outcomes of interactions of different influences on the food system, from weather to human behaviors. Analyzing the gathered data is key to unlocking the power of sensing technology to increase the efficiency and sustainability of agricultural production.

USDA NIFA-funded researchers are utilizing the latest in sensing technology to allow precise control over inputs (e.g., water, fertilizer), better management of pests and pathogens, and quicker breeding selection for improved varieties.

Source: SOAR Foundation: "Retaking the Field Volume 4: Science Breakthroughs for Thriving Farms and a Healthier Nation" (2019)

Data and Informatics

More data was created in the last two years than in the entirety of human history. In the food and agriculture arena, there is more data available than ever before. This data is created by sensors in fields, genetic analyses in labs, predictive weather models, and hundreds of other inputs. But the data collected comes in a variety of forms on a wide range of software platforms that are not coordinated with each other.

Managing and using this flood of information is key to solving some of agriculture's most pressing challenges. Informatics is the intersection of data science, software developments, and systems modeling that allows scientists to take a deluge of data and build a fountain of knowledge.

Diverse research teams are bringing together the best and brightest minds in agriculture, data science, and computer science to equip farmers and ranchers with the right tools to collect, manage, interpret, and utilize data.

Entire growing seasons can now be simulated with computers using a combination of genetic information, climate predictions, and on-farm management practices. Today, we can harness the power of computer science and data analytics to save years of testing new crops in the field and deploy customized solutions for farmers in real-time.

NIFA-funded researchers are using the latest breakthroughs in agri-informatics to help farmers and ranchers accomplish more with data. Complex problems can now have data-driven solutions that make farms more efficient as they strive to grow more with less resources and environmental impacts.

Source: SOAR Foundation: "Retaking the Field Volume 4: Science Breakthroughs for Thriving Farms and a Healthier Nation" (2019)

Cross or Transdisciplinary Research

The food system is a complex web of interactions among biology, technology, human behavior, economics, and policy. Transdisciplinary research requires the coordination of specialists from different fields of expertise, but scientists in one field, such as biology, are rarely trained to translate their findings in a way that can be readily used by researchers in another discipline, such as economics.

The "systems approach" is focused on discovering simplified strategies for integrating different academic fields in a way that will lead to solutions that are more useful for solving complex issues in production agriculture.

To advance our ability to sustainably feed the world's growing population, producers will need to combine science-based solutions that account for the realities of farming, such as shifting economic markets or limited access to technology. Transdisciplinary research will build the foundation for achieving creative solutions for our most pressing agricultural challenges.

NIFA-funded researchers are developing transdisciplinary teams to understand entire production systems that integrate multiple factors from scientific processes to human behaviors. For example, economists are weighing in on how water management practices will impact farm profitability.

By using transdisciplinary approaches, our scientists can better understand the complex factors impacting our food system without being confined by their individual area of expertise. Transdisciplinary collaborations will enable diverse teams to pool their knowledge and develop holistic solutions that increase the efficiency, resiliency, profitability, and sustainability of our food system.

Source: SOAR Foundation: "Retaking the Field Volume 4: Science Breakthroughs for Thriving Farms and a Healthier Nation" (2019)

III. Market, Workforce, and Rural Resiliency

Rural communities occupy 95 percent of the U.S. landscape with a wide variety of small towns, woodlands, farms, fisheries, grasslands and forests. Less than 20 percent of the U.S. population serve the vital role of stewardship of our rural lands and watersheds. [58]

Planning for a resilient future carries with it important considerations for rural markets and a resilience-oriented workforce. Communities that embrace the concept of resilience discover that creative solutions emerge from the willingness to move beyond commonly proposed, sector-specific solutions in favor of new solutions that are generated by appreciating the interconnections between community issues. [59]

Rural communities and rural landscapes today are shaped and impacted by a myriad of complex issues. Most often, community resilience is defined as a community's ability to "bounce back" after a crisis or disaster. This definition, however, is incomplete. A second important, but often overlooked, dimension of community resilience recognizes the proactive efforts required to plan for and build stronger and more cohesive communities. [59]

The agricultural sector is a diverse and critical component in future growth and development of the Illinois economy. Multiple constituents of this sector include agricultural production, large-scale commodities, food manufacturing and distribution, local and organic foods, horticultural products, and a diversity of derivative industries that use agricultural feedstocks to produce biofuels, chemicals, and materials. This sector also encompasses the transportation and commerce functions, including the packaging and distribution of value-added agricultural products to end-use customers on a local, regional, national, and international scale. [60]

Illinois requires a cadre of trained professionals to meet the growing demands of a local, regional, and global market to support the agricultural sector. This goes far beyond technical training for producers necessary to address a growing world population and a diminishing supply of natural resources, and extends to scientists, business marketers, engineers, designers, and innovators. The incorporation of information technology, smart-agriculture equipment, and data analytics into the food and agriculture system should aid in the creation of new career opportunities for educated, qualified workers. [60]

Market Environment

Existing Economic Conditions

The 2019 production season was a challenge for all Illinois farmers, and within the LIRV was no exception. Government policies will continue to be a main driver of incomes with continued tariffs in place, reducing U.S. exports, especially soybeans to China, resulting in lower corn and soybean prices. Lower yields due to less than ideal growing conditions, along with corn prices below $4.00 and soybean prices at or below the $9.00 level, have offset government assistance, keeping incomes at modest levels. [61]

Current projections estimate the Illinois average corn yield at 179 bushels per acre and the average soybean yield at 51 bushels per acre, both slightly below trendline yields. The national average 2019-2020 marketing year price for corn is estimated at $3.85 per bushel and soybeans

at $9.00 per bushel. Current projections for returns on corn in Illinois indicate a slightly positive farmer return of $36 per acre, after an average land rent charge of $274 per acre and a negative $37 per acre for soybeans. [61] [62]

Projections for 2020 using trendline yields forecast a corn price of $3.90 per bushel and a soybean price of $9.00 per bushel. With no Agriculture Risk Coverage and Price Loss Coverage (ARC/PLC) the result would be a negative $17 per acre farmer return for corn and a negative $58 per acre farmer return for soybeans. [61]

Average cash rents have decreased slightly from their peak after the higher income years of 2006 to 2013. In Illinois, land values peaked in 2013 and have dropped about 15 percent from their peak for excellent land, and 13 to 14 percent for good and average land. Like cash rents, land values and overall farm incomes have generally been stable to slightly lower the last few years. [61] [62]

Economic Trendlines in the LIRV

According to a comparison of economic information compiled in the LIRV, several points come across that affect the workforce needs of the region and the overall economic well-being of the area. A table for each county was compiled and included in Appendix B.4, using information from the U.S. Census and American Community Survey and Stats America, a product of Indiana Business Research Center under the auspices of the Economic Development Administration.

LIRV area highlights include:

1) Population growth from 2010 to 2019 is on the decline across every county in the LIRV, with Cass County experiencing the greatest decline of 11 percent;

2) The unemployment rates across each of the counties are generally higher than the State average unemployment rates of 4.0, except for Brown County;

3) The labor force across each county has declined both on the 5 and 10 year percentage change. Unemployment continues to be a concern within the LIRV;

4) Generally, those residents possessing a high school diploma are above 85 percent, with those possessing a bachelor degree hovers around 18 percent;

5) The median age is between 39 and 46 across each county; and,

6) Poverty rates for children in the region are between 13 and 23 percent.

The following graphic from USDA's Economic Research Service (ERS) reports that net cash farm income is forecast to decrease $10.9 billion (9.0 percent) to $109.6 billion in 2020, relative to the 2019 forecast. Net farm income, a broader measure of profits, is forecast to increase $3.1 billion (3.3 percent) from 2019 to $96.7 billion in 2020. In inflation-adjusted 2020 dollars, net cash farm income is forecast to decrease $13.1 billion (10.7 percent) and net farm income is forecast to increase $1.4 billion (1.4 percent). [61]

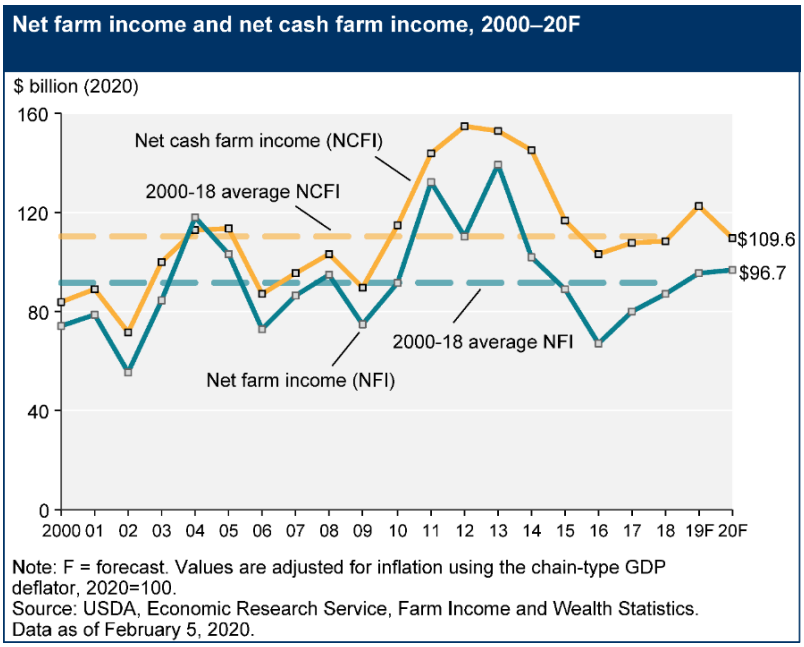


Figure 7: Net Farm Income and Net Cash Farm Income, 2000-20F

The following data show that the struggles in the U.S. agricultural economy will continue as farm bankruptcies rise and producers face ever-mounting farm debt, prolonged low commodity prices, volatile weather patterns, and a fatal pig disease that has decimated China's herd. [63] The bankruptcy rate trended upwards since 2015 while the debt service ratio leveled since 2017.

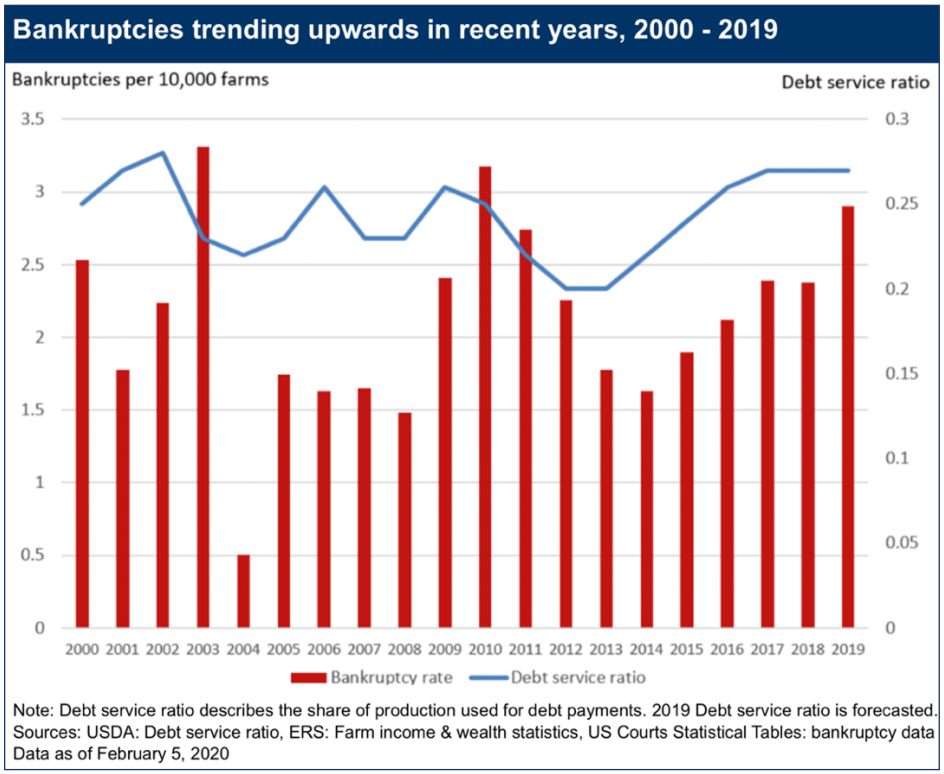


Figure 8: Bankruptcies and Debt service ratio, 2000-2019.

LIRV County Economic Outputs

The County Economic Overview in Appendix B.3 provides a county-by-county analysis of the top three industries within each county of the LIRV. This information, compiled through the National Association of Counties (NACO), provides data on total county economic production, change, and per capita output. In addition, the tables show the county as compared to similar counties and national GDP. [64] The full Economic Output fact sheet for each county is also included within Appendix B.3.

Current and Trending National Agricultural Employment

According to data from the Quarterly Census of Employment and Wages (QCEW), wage and salary employment in agriculture—including those in support industries such as farm labor contracting—stabilized in the 2000s, and has been on a gradual upward trend since 2010, rising from 1.07 million in 2010 to 1.18 million in 2018, a gain of 11 percent. Growth has been fastest in the U.S. livestock sector, which added 39,000 jobs, a 17 percent increase, between 2010 and 2018, and in crop support services, which added 51,000 jobs, or 18 percent.

However, it should be noted that the QCEW is based on unemployment insurance records, not surveys of farms or households. As a result, it does not cover smaller farm employers in those states that exempt them from participation in the unemployment insurance system. However, survey data sources, such as the American Community Survey and the Current Population Survey, also find some evidence of rising farm employment since the turn of the century. [65]

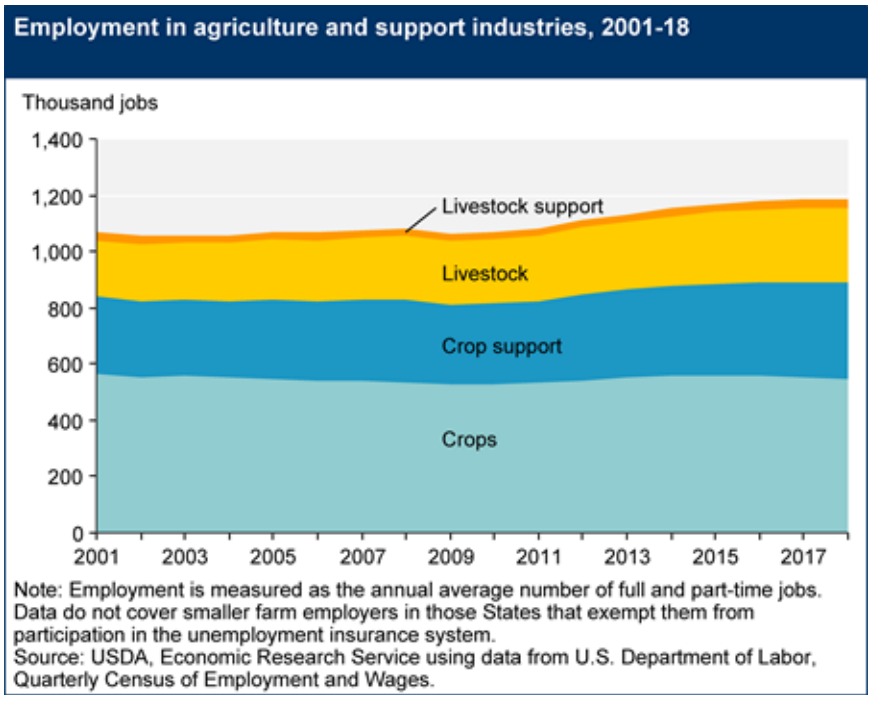


Figure 9: Employment in Agriculture and Support Industries, 2001-18

Current and Trending State Agricultural Employment

Agricultural and farm supporting jobs in Illinois have generally been on the decline with an annual compound negative growth rate, as shown in the following tables provided by the Illinois

Farm Bureau. Farm worker jobs are projected to decrease over 9 percent into the foreseeable future. [2]

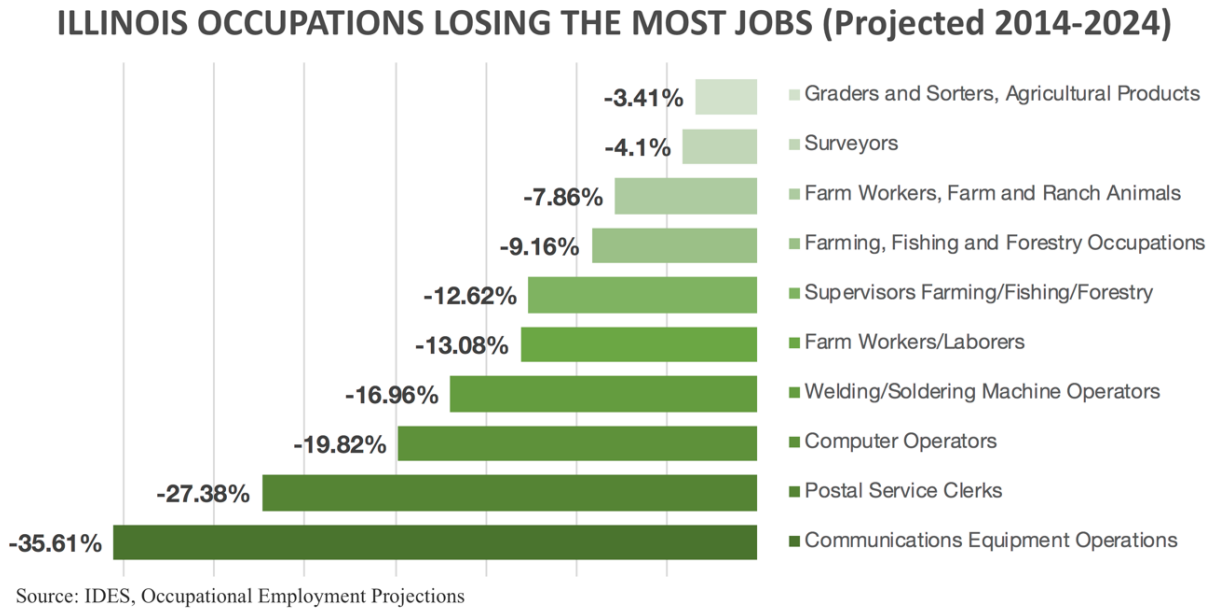


Figure 10: Illinois Occupations Losing the Most Jobs (Projected 2014-2024)

ILLINOIS EMPLOYMENT BY INDUSTRY (Projected 2014-2024)

INDUSTRY	BASE YEAR EMPLOYMENT (2014)	PROJECTED EMPLOYMENT (2024)	ANNUAL COMPOUND GROWTH RATE
Agricultural Production	73,358	70,148	-0.45
Durable Goods Manufacturing	342,887	330,848	-0.36
Non-Durable Goods Manufacturing	236,140	231,433	-0.20
Self-Employed Workers	282,241	283,299	0.04
Information	99,093	99,794	0.07
Financial Activities	369,439	388,402	0.50
Retail Trade	614,463	637,697	0.54
Trade, Transportation & Utilities	1,206,335	1,279,972	0.59
Educational & Health Services	1,330,597	1,430,001	0.72
Leisure & Hospitality	557,645	616,483	1.01
Professional & Business Services	915,447	1,015,567	1.04

Source: IDES, State of Illinois Industry Employment Projections

Figure 11: Illinois Employment by Industry (Projected 2014-2024)

Agricultural Employment in the LIRV

According to data provided by ESRI Business Analyst for 2018, Agricultural employment accounted for the following (refer to Appendix B.4 for full ESRI data report by LIRV county)

Agricultural Employment in 2018			
County	Total Employed	Agricultural Employed	Percentage of Total
Brown	2748	201	13.7%
Calhoun	2399	95	25.3%
Cass	6668	483	13.8%
Greene	6638	444	14.95%
Jersey	11721	287	40.8%
Macoupin	23793	912	26.1%
Morgan	16465	615	26.8%
Pike	7355	675	10.9%
Scott	2531	170	14.9%

Figure 12: Agricultural Employment in 2018

According to an Economic Modeling Analysis (EMSI) conducted in March 2019 of a portion of the LIRV region, Agricultural, Forestry and Fishing jobs are projected to also decline 2 percent from 2018-2023, with an average earnings rate per worker of $32,211. Additionally, this economic sector is also expected to decrease by 2 percent.

Regional trend data shows a projected decline of agricultural workforce projections overall, -2.4 percent in the period of 2018-2023, while the decline overall in the comparative STL SMSA was -1.1 percent, and overall growth in Illinois occupations in this field is projected at 3.0 percent.

Occupational breakdowns included:

- Farmers, Managers, Ranchers: 48.9 percent of total jobs in the industry
- Farmworkers, Laborers: 27.09 percent of total jobs in the industry
- Farmworkers, Farm, Ranch Animal Workers: 2.6 percent of the total workforce
- Agricultural Equipment Operators: 2.5 percent of the total jobs
- First Line Agricultural Supervisors: 1.3 percent of the total jobs
- 84.5 percent were male
- 15.5 percent were female
- 65 plus age breakdown was 20 percent

Integrating Ag-Related Jobs into a Resilient Rural Workforce

For decades, policymakers have tried to ensure that small and medium-sized farms have a chance to not only survive but thrive. Yet, with labor, financial and other challenges, farms have continued to consolidate nationwide. Today, 15 percent of the crop farms control 80 percent of

the output. [66] To realistically examine the scope of the farmer/producer workforce, an objective profile of today's modern farmer is necessary.

The next effort to advance community and regional resilience will require a greater focus on the factors that contribute to building the discipline, and within that, the development of a resilience-oriented workforce. A resilience-oriented workforce is not defined as a single and unique set of professionals trained in resilience, but rather, a goal state whereby all professions involved in protecting and promoting health of places and people possess the capacity (knowledge, skills, and attitudes) necessary to be integrated, and thus resilient in the face of a disaster or other widespread stress. [67]

Farmer/Producer Profiles

Recent research indicates that some of the most important indicators of a farm's financial success may not be the size of the farm, but the personality type, skill set, and ambition of the producer [66]. Additionally, research shows that most farmers and producers are aging, and replacement with younger farmers is not counteracting this attrition. This situation is exacerbated given that new producers are more apt to utilize new technologies and practices.

Aimpoint Research has worked to identify who will be the farmer of the future by analyzing industry trends, conducting in-depth surveys dating back to 2002, convening in-person farmer focus groups with psychographic, attitudinal feedback, and conducting war-gaming exercises. Through extensive psychographic segmentation, Aimpoint Research identified five farmer profiles that exist today, and each of the characteristics that set them apart. [66]

Five Farmer Profile Types and Characteristics [66]

Independent Elites: Representing about 20 percent of the grower universe, this group is growth-oriented and "have largely made it to the top of the mountain." Their growth orientation is high, business IQ is above average, and their financial health is above average. They tend to be more optimistic about agriculture and do not see as much importance in safety nets and farm bill programs. They are the long-term, business-focused planners with over half expanding their operations over the last couple of years. Nearly 51 percent have succession plans in place, while 39 percent have bachelor's degrees. This group tends to be financially sound. They can afford and are earlier adopters of technology. They believe they can profit regardless of commodity prices or government programs. They tend to be independent. They are consistent and reliable and at the top of their game.

Enterprising Business Builders: This group represents about 21 percent of the growers surveyed and have the highest priority on growth out of all five groups. They are the least traditional and the least change resistant. This group is highest in business IQ, are sophisticated marketers, financially healthy, and have a strong willingness to innovate and adopt new technology. 64 percent of these operations grew over the last five years. These operatives are highly collaborative and more willing to conduct business online.

Classic Practitioners: This group, representing 24 percent of the growers surveyed, still want to grow and be successful, but are struggling. They believe success is not fully in their control. They tend to be more traditional, rely more on safety nets and farm bill programs. They tend to save money rather than invest money. They are slower to adopt technology and management practices. They want to grow, but lack some of the fundamentals to adapt in a changing environment. They are the most loyal to their suppliers of any group. They like the practice of

farming more than the business of farming. This group is representative of a real shift in mindset compared to the first two groups who believe they can be successful regardless of commodity prices.

Self-Reliant Traditionalists: This group has been through the ups and downs of the farm economy before and are just trying to hold on. Representing 22 percent of the survey sample, they have saved a sum of money and tend to be cash funded. They tend to be short-term thinkers, not planners. They have seen tough times before and believe they will survive again. These tend to be smaller operations. They often do not place a high value on technology or innovation.

Leveraged Lifestylers: This is the most vulnerable group profiled. Representing about 14 percent of the grower universe, they are trying to survive and think their profitability is completely tied to markets recovering, a reduction in government regulation, and an increase in support. They tend to love the lifestyle of farming, but do not have the degree of business sense to navigate it. They have purchased all the latest and greatest equipment, which adds to financial pressure. They tend to be short-term thinkers, impulsive decisionmakers, and are skeptical of the industry. They recognize that they are likely to fail if they are unable to change, but do not have a grasp on the path forward.

Predictors of Success

The previously described profiles enable predictions regarding producer success. The substantive differentiators are business acumen, adaptability, drive to succeed, collaboration, and a willingness to sacrifice some independence. When reviewing the five profile group traits, the Enterprising Business Builders are most likely to lead the industry, with the Independent Elites continuing to find success. [66]

Farmers of the future will need to build collaborative relationships with the supply chain they want to serve. The concept of a "one size fits all" farm operation is fading. Farms moving forward will require the development of different approaches in management and move faster to add value in new ways.

Targets for Improvement

The Illinois agricultural sector must have a broadly-educated and prepared workforce. This pipeline must include secondary and postsecondary programs in multiple career pathways ranging from agri-business to natural resource management. Without planning and training, the Illinois agricultural economy will suffer delays causing eventual decline or loss of global market share. [60]

Producers and the farm workers who support this portion of the economy must overcome multiple obstacles. Numerous challenges have been identified as barriers and impediments to grow these types of jobs and provide additional support to a firmer producer foundation. These challenges include:

1) *Bolster producer/farmer business knowledge and overall financial acumen* – Farmers have identified knowledge, experience, and skills gaps when it comes to marketing and product sales. There are specific requirements for accounting, invoicing, marketing, sales, data collection, loans, and understanding basic business finance [68].

2) *Bolster labor force in operations, large and small* – Shortages of field labor, especially at the entry level, are a challenge. Entry-level work offers the opportunity for other higher scale work conducted on modern farms. These types of positions are difficult to fill and are often seasonal. The work requires much physical labor and time outdoors. Larger farms have significant difficulty hiring labor with skills to operate advanced machinery. To compound this shortage, the U.S. immigration system is in flux and traditional migrant farm worker programs and pipelines are in disarray. [68]

3) *Lack of physical resources* – Livestock producers often point to the lack of localized processing facilities. This in turn requires longer livestock transportation times, greater expense, and higher incidence of injury, disease, or mortality. Produce farmers often point to a longer reach to transfer facilities and drop centers as a detriment in quality and product freshness. [68]

Additionally, producers point out that they lack specific knowledge in certain areas beyond basic production. Food safety, for example, is becoming an increasing priority from both a regulatory standpoint and a market pressure from buyers and consumers. Regulatory rules are often complex, and many small farmers lack the local training opportunities to learn sound agricultural practices. Farmers are often required to travel long distances to receive such training. With the decline in local Extension Services offices that had been traditionally offered by the University of Illinois, farmers have less of a support network to rely upon. [68]

Producers also express an interest in learning about extended seasons. This information would allow the extended production of certain year-round foods. The use of hoop houses or other protective structures could extend seasonal production of certain crops, in addition to the development of so-called "deep winter greenhouses" that allow for growing crops straight through the winter months using passive solar technology and minimal propane as backup heating. [68]

The list of additional educational needs is long. Many farmers point out a lack of knowledge of certain grant funding opportunities. Another concern expressed is a desire for more technical knowledge and a need for additional digital proficiency. Finally, many farmers simply cite a lack of resources to obtain knowledge. Knowing where to turn for answers is part of the problem.

Many producers, specifically those new to the farming business, express a need to connect with these necessary resources, including customers and other producers. Many producers for example, work in isolation, a problem exacerbated by the long days and difficult physical working conditions on the farm. Increased connectivity and peer-to-peer communication help to provide a better flow of information among farmers/growers, increasing their marketing knowledge and the potential for additional sales or marketing opportunities. [68]

Producers often mention the benefits of improved connectivity in the following ways:

1) Access to new buyers, markets and consumers;

2) Other producers for sharing advice and equipment;

3) Distribution opportunities; and,

4) Purchasing opportunities for supplies and equipment. [68]

According to a recent study by the Illinois Workforce Investment Board, Illinois needs to have a firm understanding of the trends, opportunities, and challenges facing workforce development, education, and awareness, and must identify appropriate ways to engage the next generation of professionals. Policy development is required to ensure that the public and policymakers are knowledgeable allies in food and agriculture system innovation. [60]

Education and Capacity-Building

The agricultural sector is struggling to retain the best and brightest. The agricultural career field has suffered from a lack of visibility and understanding with narrow avenues of degreed training. Other career paths, for example, have a clear trajectory – medical practitioners, educators, legal professionals, firefighters, and electricians are a few of the myriad of careers that offer a straightforward path from novice to professional. Farming has never been quite as linear as many other professions and, in food production farming, this is particularly true. For many, the route to owning or working on a farm is not a direct pathway.

There is no specific instruction manual for becoming a farmer, especially when it is less and less common for farming to be the family business. [68] Current pathways to owning a farm enterprise often look different. But as is true for most professions, providing a solid foundation in the fundamentals, coupled with a strong support network, will go a long way in creating successful practitioners out of curious novices.

A fragmented network of supportive capacity-building programs is available in Illinois that serve producers with some production experience, but only for certain aspects of their farm business. A study from McHenry County Community College points out that: [68]

1) There is little opportunity through these existing programs for new and beginning farmers to gain production experience and entry.

2) The training offered is largely geared toward highly diversified, direct-to-consumer farm production and marketing efforts without a wholesale focus.

3) There is little comprehensive training with a farm wholesale (or beyond direct-to-consumer) emphasis.

4) Existing farmer training curricula tackles a range of useful and necessary concepts and subjects, but may not provide enough of a foundation in either the basics of business, marketing, or sales.

5) The overall picture of farmer training is fragmented, with organizations offering classroom time with no hands-on component, or a hands-on environment with no classroom learning. [68]

There appears to be an emerging need for agricultural degree programs that offer a strong business foundation, including entrepreneurship, sales, and marketing, and a basic science curriculum, alongside hands-on production experience that provides equal emphasis to wholesale and to the direct-to-consumer business models. [68]

Agricultural education at the primary and secondary level teaches students about agriculture, food, and natural resources. Through these subjects, agricultural educators teach students a

wide variety of skills, including science, math, communications, leadership, management, and technology. In many secondary schools across Illinois, agricultural education has been an important component of the curriculum. However, support for funding these programs has waned in some school districts, while in others, it has enjoyed a resurgence. Associated Future Farmers of America (FFA) programs have evolved over time to provide exceptional leadership development programs, as well as experiential learning opportunities, while providing an excellent support network to students interested in agricultural management and occupations.

Many educators lead efforts across the state to include a food and agriculture curriculum in every level of education. However, this programming is usually small-scale and hindered by teacher turnover. [3]

After several years of relatively flat funding, recent Illinois State Board of Education budgets have shown promise of increases.

Senate Bill 255 passed and signed into law in September 1986 created the foundation of Agricultural Education as part of the Illinois educational system. The act recognized the need for the state to promote agriculture as central to the importance of the state's welfare and economic stability. The act set forth a need to develop a comprehensive education program in agriculture to be created and maintained by the public schools. The legislature's intent in creating the act was that a state program be made part of the state's educational curriculum from kindergarten through adult, and made available to all school districts, who could include these programs as part of their curriculum.

An amendment to the act passed in 2006 ensured that at a minimum, secondary students should receive an instructional sequence of courses approved by the State Board of Education and that a state and nationally affiliated FFA chapter is integral to that instruction.

The State's agricultural educational program is based upon literacy, agricultural education, community college education, University education, teacher education, agricultural workforce knowledge, skill and talent development, and consumer education.

The following table provides the foundational and legislative context information, and an overview of Illinois funding for agricultural education programs over time. [69]

FUNDING FOR AGRICULTURAL EDUCATION IN THE ILLINOIS STATE BOARD OF EDUCATION BUDGET

1987	$48,500
1988	$48,500
1989	$1,000,000
1990	$1,040,000
1991	$1,040,000
1992	$1,040,000
1993	$1,040,000
1994	$1,081,600
1995	$1,081,600
1996	$1,181,600
1997	$1,299,000
1998	$1,429,700
1999	$1,500,000
2000	$2,000,000
2001	$2,000,000
2002	$1,950,000
2003	$1,881,200
2004	$1,881,200
2005	$1,881,200
2006	$2,381,200
2007	$2,881,200
2008	$2,881,200
2009	$3,381,200
2010	$3,043,100
2011	$1,947,600
2012	$1,800,000
2013	$1,800,000
2014	$1,800,000
2015	$1,759,900
2016	$1,800,000
2016	$1,800,000
2018	$5,000,000
2019	**$5,000,000**

$1,646,778	Incentive Funding Grant based on quality indicators for high schools and universities with an approved agricultural program, $5,359 per school
$1,406,635	Three Circle FFA & SAE Grant for agricultural teacher extended contract salaries for work beyond the official school day, weekends, and summer months
$454,794	On-site technical assistance and mentoring to students, teachers, administrators, coordinators, and staff of county AITC partnerships, schools, colleges, universities, and agribusinesses
$370,000	Plant, animal, and horticulture teacher lesson plans, PowerPoint presentations, and student E-units correlated to the next generation science standards
$329,148	Improving high school agricultural education program grants to build greenhouses, improve mechanics labs, and update technology through computers, laptops, and tablets
$250,115	Agriculture Experience Tracker (AET) website resources for program, teacher and student workplace record keeping and financial management
$130,000	Agriculture In The Classroom grants for county partnerships to educate K-8 students, teachers, and the public about agriculture
$98,000	Growing Agricultural Science Teachers Grant for universities (4) and colleges(3) to recruit and retain agricultural teachers
$67,782	Agricultural teacher professional development and training on curriculum and classroom technology
$35,755	Agricultural Education.org website improvements and maintenance
$35,500	Student teacher grants for students graduating with a license to teach agricultural education
$5,625	Online 9-12 grade agricultural course grants
$169,868	Administrative costs

Figure 13: Illinois State Board of Education Budget for Agricultural Education

Rural Resiliency

Planned-for resilience is a positive approach to promote greater well-being in rural communities and landscapes, offering the capacity for an individual, business, community, or region to cope with stress and adapt positively to change. Building a resilient community can serve as a protective factor from developing problems. Rural resiliency can also help communities when unforeseen factors occur such as floods, drought, or large company shut downs.

Resilience is a complex construct with many interrelated factors. One issue impacts and overlaps many things. Social, environmental, and economic issues may seem different, but their impact is inter-related. Economic issues impact all facets of a community. Infrastructure represents one economic consideration. Water, transportation, and telecommunications are each important infrastructure components. These economic factors are important to allow people in the community to carry out daily activities. Infrastructure as a part of rural resiliency is necessary to help the community function and provide support service to many different aspects, such as housing and employment. The absence of these services within a community is detrimental to the quality of life of a community and its members. [70]

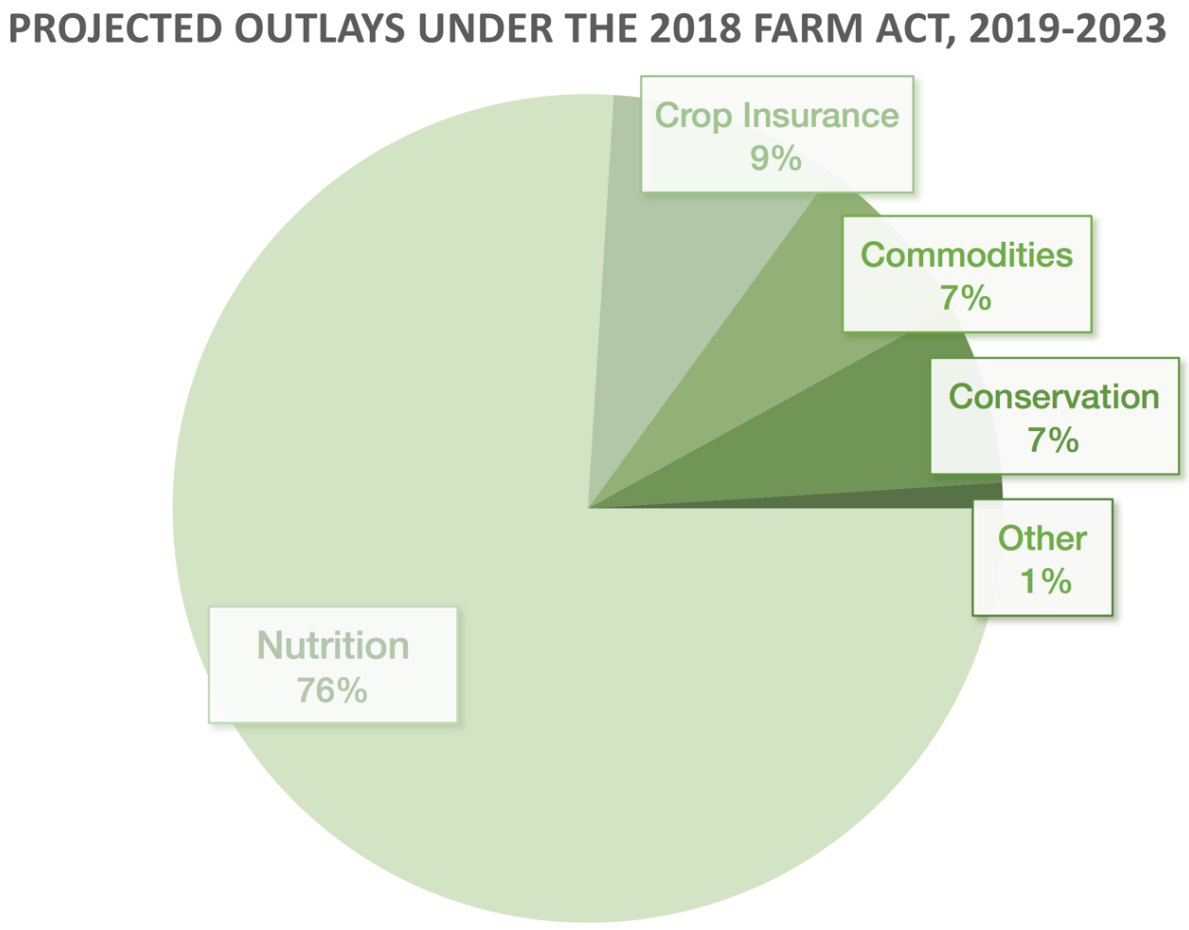
IV. Rural Policy at the State and Federal Level

Federal Farm and Rural Development Policy

Federal farm policy is largely shaped by acts of Congress commonly called "Farm Bills." Enacted on an approximate five-year schedule, each piece of legislation covers policies on topics as far-ranging as commodity programs to soil conservation to nutrition. The most recent is the Agriculture Improvement Act of 2018 ("2018 Farm Act"), signed on December 20, 2018, which will remain in force through 2023, although some provisions extend beyond 2023. [71]

Overview

As the below figure shows, the Congressional Budget Office estimates that 76 percent of outlays under the 2018 Farm Act will fund nutrition programs, 9 percent will fund crop insurance programs, 7 percent will fund conservation programs, 7 percent will fund commodity programs, and the remaining 1 percent will fund all other programs, including trade, credit, rural development, research and extension, forestry, horticulture, and miscellaneous programs. [72]



Source: USDA, Economic Research Service calculations based on Congressional Budget Office estimates.

Figure 14: Projected Outlays Under the 2018 Farm Act, 2019-2023

The majority of programs existing in the prior 2014 Farm Act continue basically unchanged. This includes crop insurance, marketing loans, disaster assistance, and commodity programs. Farm subsidy eligibility was expanded to include a broader range of family members, including nieces, nephews, and first cousins of farmers, even if those relatives do not directly work on the farm. Another significant change was expansion of trade-related price supports, primarily to offset farm losses due to the impact of tariffs imposed by the United States on other countries. One of the most hotly debated provisions of the 2018 Farm Act pertained to the Supplemental Nutrition Assistance Program (SNAP), but ultimately the program remained intact or was modestly strengthened. Provisions also address challenges faced by rural health care systems and rural substance abuse. Finally, one of the more newsworthy provisions was the legalization of hemp production. [73]

Resource Conservation Programs

All major conservation programs are continued, although some are modified. The Conservation Reserve Program is continued through 2023. The Conservation Reserve Enhancement Program (CREP), which carries with it a cost-share requirement, is also continued. The Conservation Stewardship Program, which pays farmers to strengthen conservation efforts, was proposed to be merged into another branch of the USDA. Ultimately, however, the program is continued. The Regional Conservation Partnership Program received increased funding, with 10 percent of allocated funds mandated to protect drinking water sources. This incentivizes agricultural producers to collaborate with water utilities to implement source water protection practices. Under the Environmental Quality Incentive Program, funds are provided to encourage wildlife habitat improvement, water conservation and efficiency, and development of innovative practices for urban, indoor, or other emerging agricultural operations.

Funding for these conservation programs, while only seven percent of the 2018 Farm Act budget, is substantial. The Environmental Quality Incentive Program funding is increased from $1.75 billion in FY2019 to $2.025 billion in FY2023, compared to an average baseline of $1.75 billion over FY2019-FY2023. Funding is also increased for the Agricultural Conservation Easements Program, from $250 million to $450 million annually, and the Regional Conservation Partnership Program, $100 million to $300 million, annually. Only the Conservation Reserve Program funding is projected to decline, a total of -$189 million over FY2019-FY2023.

Emerging Markets

Permanent funding is provided for local/regional food programs in support of the farm-to-table industry. Congress had been providing funding on a temporary basis, only funding these initiatives for a five-year period. Ventures eligible for promotional funding include farmers' markets, research projects to further organic farming, development of specialty crops, and training for the next generation of farmers. Funding to provide loans and to train socially disadvantaged, veteran, minority and beginning farmers and ranchers is also a permanent feature.

The legalization of hemp, which is a form of cannabis with lower THC levels than marijuana, also represents an emerging market. The 2018 Farm Act permits production, sale and transportation of hemp in interstate commerce. Analysts have predicted that hemp could grow into a $20 billion industry by 2022.

Encouragement of Innovative Practices

In addition to the 2018 Farm Act, the Senate's budget for Fiscal Year 2020 included a $10 million increase for the USDA's competitive research program. This would boost the budget for the Agriculture and Food Research Initiative (AFRI) to $425 million, expanding the current program's scope to scientifically examine agricultural challenges, including commodity market instability, food safety, and impact of natural disasters. AFRI, which provides funding through a rigorously peer-reviewed process, is currently authorized at $700 million, but has never received this full amount during the annual appropriations process. With the previously limited annual budget, the program typically could only provide funding to less than a quarter of the science that the program's expert panels deem worthy. The currently increased level will improve research capabilities. Targeted areas of research include beginning farmer and rancher development, food safety outreach, organic transitioning, and sustainable agriculture research and education.

Support for New Technologies and Research

The Rural Electrification Act of 1936 was amended in the 2018 Farm Act to encourage the provision of broadband Internet to rural communities. Grants, loans, and financial guarantee provisions are included. Eligible programs include training and technical assistance to prepare reports and surveys necessary to request grants, loans and loan guarantees for broadband deployment and to improve management, including financial management, relating to the proposed broadband deployment. [74]

In addition to the provisions in the 2018 Farm Act, the Federal Communication Commission (FCC) launched a new task force initiative in July 2019 to "promote rapid, expanded deployment of broadband Internet service on unserved agricultural land, with the goal of achieving reliable capabilities on 95 percent of agricultural land in the U.S. by 2025." The Precision Agriculture Connectivity Act of 2018, which was ultimately incorporated into the 2018 Farm Bill to become law, addressed head-on the broadband infrastructure gap in rural communities.

The 2018 Farm Act also directs the USDA to identify its available datasets regarding the use of conservation practices and the effects of such practices on farm and ranch profitability, including such effects relating to crop yields, soil health, and other risk-related factors. A report to Congress is required within one year to include datasets identified, and necessary steps, safeguards, and privacy protections to enable data access and sharing.

Finally, a "Next Generation Agriculture Technology Challenge" is established. This challenge competition has the express purpose of providing an incentive for the development of innovative mobile technology that removes barriers to entry in the marketplace for beginning farmers and ranchers. The winners of the competition are eligible for up to one million dollars in the aggregate.

Illinois Farm and Rural Policy

Overview

Unlike Federal farm policy, Illinois does not have a single, overarching act of the legislature that defines its agricultural framework. Instead, there are dozens of laws administered by the Illinois Department of Agriculture that establish policy for conservation practices, food safety,

marketing, animal health and welfare, education and research. Federal funding and federal policy directives play a large role in defining State policy.

The annual budget for the Illinois Department of Agriculture for FY 2020 is over $117 million, with approximately $17 million from general funds, $87 million from other state funding sources, and $13 million from federal sources. Another $18 million is allocated for marketing and promotion, and $6 million for county fairs. The Illinois' agricultural budget provides an analogous indication of the current administration's priorities. [75]

Resource Conservation Programs

There is a slight boost in budget allocation for environmental programs in FY 2020, from $9.2 million to over $9.6 million. Expansion of a recent initiative that encourages farmers to grow cover crops, which are planted between cash crop seasons to protect soil and manage erosion, is proposed. Funding is also provided for farmers to work with local soil and water conservation districts to ensure high yields, while minimizing soil loss and water usage. Global and regional climate change research is also viewed as a priority. [76]

Illinois also assists local governments to acquire, protect, and manage public parks and open space through the Open Space Lands Acquisition and Development (OSLAD) program, which is a state-financed grant program. Funding for OSLAD comes from a statutorily dedicated real estate transfer tax on property sold in the state. In addition, the Natural Areas Acquisition Fund (NAAF) provides financing for acquisition, preservation, and stewardship of natural areas, including habitats for endangered and threatened species, high-quality natural communities, wetlands and other areas with unique or unusual natural heritage qualities. [77]

Emerging Markets

Illinois farmers have been seriously affected by federally-imposed tariffs, especially with regard to market share in China. Continued restrictions have caused China to turn to other sources to meet its demand of top Illinois exports like pork and soybeans. Current Illinois policies include strengthening long-term relationships with foreign governments to return trade to its pre-tariff levels and beyond.

New and niche markets require marketing and branding, a skill set that was not necessary for the traditional row cropper. Often, today's market economy requires website development and active use of social media to promote a profitable product. Given that the average age of the farmer is 58 years old, this may not be a common proficiency.

Emerging markets include both macro- and micro-opportunities. These go beyond the traditional farmers' markets to customized local meat processing, locavore restaurant supply, and specialty products such as popcorn, pumpkins, and apple cider.

Legalization of recreational marijuana in Illinois creates one such emerging market. In the first 60 days for 2020 alone, statewide sales exceeded $74 million with about 27 percent of sales to out-of-state residents. The Illinois Department of Agriculture oversees licensing of this high-visibility program. [78]

Hemp is an emerging market with enormous potential. Production of hemp fiber is not labor intensive, can be mechanized, and is similar to current haying operations. Producers who have recently converted to hemp production have pointed out that it can be mastered in former row-

crop applications. Those producers have commented on the importance of fully understanding the economics of conversion, including start-up costs and market conditions. Markets exist for a range of subsidiary products, including fiber, seed, and oil. Biomass and flower are typically used for their CBD oil, stalks for industrial uses, and seed will be planted this year or used for hemp seed oil. The Illinois Department of Agriculture recently released final harvest numbers for 2019, the initial production year. Licenses were issued to 651 hemp growers, with all but 137 licensees planting at least one acre. Over 7,000 acres were planted, 5,233 acres harvested, and yields totaled over 2.27 million pounds. [79]

As an emerging market, hemp is still seen as a high-risk industry. One of the challenges identified has been a knowledge gap between those with an understanding about hemp production, including planting methods, fertility, harvesting storage and extraction, and those with functional knowledge regarding Illinois farming practice. These two knowledge bases need to be combined for successful yields in Illinois. [80] Another challenge is the need for conveniently located processing plants, highlighting the opportunity for specialty processing operations. There is cautious optimism in this emerging market, and hemp will undoubtedly continue to be of interest as farming operations diversify to meet the bottom line.

Field pennycress is a new winter annual cover crop that produces an oilseed feedstock for industrial uses. As a cash cover crop for the Upper Midwest, field pennycress can provide economic return with yields up to 990 pounds per acre (1,109 kilograms per hectare), and a seed oil content ranging from 26 to 36 percent. Similar to traditional cover crops, pennycress has the potential to increase the ecosystem services without negatively influencing crop yields. Pennycress prevents soil erosion and nutrient leaching, suppresses weeds and creates suitable conditions for beneficial insects and pollinators. Despite field pennycress' multiple benefits, it is new, which limits its adoption. Consequently, growing recommendations for the crop's optimum agronomic performance are needed.

One non-traditional market that is rapidly evolving entails the sale of environmental credits to entities that require pollution offsets. A broadening of this concept could provide a reliable, non-federal revenue stream without requiring increases in conventional production. In addition, the concept encourages practices that prevent runoff of nitrogen and phosphorus and sequesters carbon in the soil. A pilot program currently underway enrolled nearly 10,000 acres in Iowa. Under that program, the Soil & Water Outcomes Fund, a partnership between the Iowa Soybean Association and third-party verification company Quantified Ventures, farmers will be paid from $30 to $45 per acre for confirmed results. [81] The credits generated will then be sold to cities and companies needing carbon or other environmental offsets. The program is funded through grants from Cargill, Incorporated and the Walton Family Foundation. The Lower Illinois River Valley could be a prime location for the expansion of such a program.

A second initiative is under consideration by the Ecosystem Services Market Consortium (ESMC). ESMC's stated goal is to launch a fully functioning national scale ecosystem services market designed to sell both carbon and water quality and quantity credits for the agriculture sector by 2022. The consortium notes that traditional management practices have caused a degradation in ecosystem function, threatening the sustainable future of the agricultural industry. Recognizing approximately 70 percent of U.S. land is in private ownership, America's farmers and ranchers are the key to creating solutions which address soil health, natural resource conservation, and ecosystem services challenges. The proposed market would enable farmers and ranchers to voluntarily adjust crop and livestock production in ways that increase soil carbon sequestration and retention, reduce greenhouse gas emissions, improve water quality, conserve water use, and benefit many additional ecosystem service outcomes. The

quantified changes in ecosystem services would then be monetized and sold as credits, with farmers and ranchers realizing a return. [82]

Encouragement of Innovative Practices

Through funding provided by the Illinois Agricultural Extension and the University of Illinois, farmers are guided through a variety of ways that digital solutions can be deployed to resolve longstanding challenges. This includes collaboration within the industry, outsourcing innovation to startups, and partnering to advance technological education. Growers are viewed as being on the front lines of bringing farming from the industrial age into the digital age, at a record pace. From land management to machinery to maximizing inputs, growers are assisted by these educational institutions to navigate labor shortages, climate change and maximizing yields as they adopt new technologies and services making farming viable for generations to come. [83]

Beyond introducing producers to new emerging digital tools, it is important to ensure they can also optimize the use of these tools toward cost containment, efficiency, and profitability. Large operations may be inclined to recruit full-time technicians to trouble shoot digital solutions. Small to mid-sized operations are more likely to seek a technical service that understands agriculture's fast-evolving digital suite of tools, assisting producers in building their digital proficiency. During this study and interaction with stakeholders, a number of producers expressed an interest in seeing community colleges play a larger role in this type of training/coaching. Specific to energy and solar conversion, producers offered that rural electric cooperatives may begin to expand services to include solar installation and servicing.

Local Opportunities through Collaboration

A robust mix of organizations that share a collaborative spirit have positioned Illinois to maximize the opportunities available to its local communities. The State of Illinois has well-established key agencies, academic organizations and trade associations that support the state's population of agricultural producers and operators by coordinating communities and their residents.

Agencies, universities, non-governmental organizations, and community colleges throughout Illinois all play roles in a support network for agriculturally-centered functions across the LIRV region. This network assists stakeholders with education programs, forming collaborative consortiums and hosting conferences.

As the State's premier land grant research institution, the University of Illinois at Urbana-Champaign manages outreach programs and partners with other regional stakeholders on collaborative initiatives. From such venerable programs as the University of Illinois Extension to newer efforts like the Illinois Sustainable Ag Partnership and the University of Illinois AgTech Innovation Summit, successful collaboration and public engagement is at the heart of the University's efforts to support agriculture, technology, and innovation in the state.

University of Illinois Extension

The University of Illinois Extension serves as the primary outreach program for the University of Illinois at Urbana-Champaign, offering educational programs and services to residents throughout the State's 102 counties. Extension is tasked with providing programs that offer practical translations of cutting-edge research in five areas: *energy and environmental*

stewardship; food safety and security; economic development and workforce preparedness; family health, financial security, and wellness; and youth development.

Illinois Extension is based in the College of Agricultural, Consumer and Environmental Sciences (ACES) and works with all colleges and units of the University. Extension staffers serve communities in 27 local offices and units located throughout the state, offering programs including hands-on workshops, field days, online self-paced tutorials, and other formats. Additionally, Extension educators and specialists located on campus at Urbana-Champaign offer in-depth programming locally, in regional venues, and through distance-learning technologies and webinars.

Collaboration is a core value of the Extension program, reflected in the relationship with the nationwide Cooperative Extension System, as well as through Extension's participation in other initiatives like the Illinois Sustainable Ag Partnership and the Illinois Nutrient Loss Reduction Strategy (NLRS). Extension provides its partnering initiatives with expertise in outreach and local community stakeholder engagement, having access to a variety of educational resources designed to help advise Illinois farmers, landowners and communities as they implement BMPs.

As the Illinois NLRS aims to reduce nitrate-nitrogen and total phosphorus losses into rivers and streams across the State, Extension is supporting these efforts through a NLRS podcast launched in 2019. The podcast provides updates on the latest research, lessons learned, and BMPs, offering practical advice that farmers and landowners can apply to their local landscapes.

With new agricultural technologies and innovations arriving all the time, from 5G broadband to increased efficiencies with precision agriculture, the role of Extension will remain crucial for Illinois communities who remain reliant on the State's natural resources for commerce and community.

University of Illinois Ag Tech Innovation Summit

The fifth annual AgTech Innovation Summit was hosted on March 4, 2020 by the University of Illinois Research Park and presented by partners Bayer and The Climate Corporation. The summit brought together corporate and academic stakeholders, students and attendees to explore how existing and emerging technologies are addressing current challenges affecting agriculture.

The summit gathered key stakeholders for a forum that included panels on analytics and data-driven decision-making, food tech and ag tech investments and startups, corporations and collaboration in ag tech, and insights from growers dealing with digitization and preparing for the next generation of agricultural producers. A public networking reception and showcase followed the summit where visitors could learn more about Research Park companies, explore innovative technologies, and network with industry leaders and other summit attendees.

Stakeholder Frameworks and Partnerships

Throughout the State, there are existing networks and partnerships that are actively promoting agricultural innovation through the use of analytics, technology and conservation BMPs. Currently, many of these partnerships focus on helping achieve the goals set by the NLRS through outreach and education for farmers, ag producers, landowners, and communities.

Association of Illinois Soil and Water Conservation Districts

The role of Soil and Water Conservation Districts (SWCDs) is to work in collaboration with agricultural and environmental stakeholders to protect and sustain the State's natural resources. In Illinois, the Association of Illinois Soil and Water Conservation Districts (AISWCD) serves the 97-district SWCD members through strategic conservation programs and providing technical assistance.

The districts educate local farmers, suburban/urban landowners and communities, assisting them with strategies for managing natural resource issues including water quality, nutrient management, soil conservation, sustainable land use, and conservation education. The AISWCD has the existing network infrastructure to help locally promote innovations in agricultural technology for water and energy conservation, while also providing technical assistance for any relevant BMPs.

The AISWCD administers the Illinois Department of Agriculture's Partners for Conservation Program (PFC) and assists the USDA with implementation of federal Farm Bill programs and contracts. Additionally, the conservation practices supported by the AISWCD support the goals of the state's NLRS by minimizing soil loss from farms/landscapes and keeping nutrients like nitrogen and phosphorous from reaching Illinois' lakes, streams, and rivers.

Illinois Sustainable Ag Partnership

The mission of the Illinois Sustainable Ag Partnership (ISAP) is to "create a network to support a systems approach to improve soil health and reduce nutrient loss." The members of ISAP have partnered to increase coordination between programs and efforts related to soil health, cover crops, water quality, nutrient management, and conservation issues. The partnership "envisions Illinois as a sustainable agriculture system that results in improved soil health, water quality, profitable and resilient agriculture systems, and thriving communities."

The partnership aims to coordinate consistent messaging among its members, bringing outreach, training and education to farmers who are "middle adopters," defined as risk-averse producers that want to wait for proof of concept and scale demonstrations of new innovations and technology before adopting or even testing them out. ISAP provides programs and technical assistance aimed at helping these "middle adopters" experiment with new practices by "creating a network of on-farm demonstration sites to bring together and disseminate new information and lessons learned in plain, practical language."

In 2019, ISAP added the University of Illinois Extension program as a contributing partner. Other partners include the AISWCD, Illinois Corn Growers Association, Soil Health Partnership, American Farmland Trust, The Nature Conservancy, and the Wetlands Initiative among others.

Community Education to Advance Adoption of Best Management Practices

In Illinois, beyond the universities and the state NGOs and agencies, the state's public schools and community colleges are uniquely positioned to develop and maintain resiliency in their communities. The Governor, Legislature, and Board of Education oversee the Illinois Committee for Agricultural Education and the Illinois Leadership Council for Agricultural Education (ILCAE), two organizations tasked with the development and implementation of a comprehensive plan for agricultural education in the state's public school system for all school districts.

Illinois Council of Best Management Practices

The Illinois Council on Best Management Practices (CBMP) is a coalition of agricultural organizations and agribusinesses including Illinois Farm Bureau, Illinois Corn Growers Association, Illinois Soybean Association Checkoff Program, Illinois Pork Producers Association, Illinois Fertilizer and Chemical Association, Syngenta, GROWMARK, and Monsanto. CBMP was founded in 1998. The Council's mission is to assist and encourage adoption of best management practices to protect and enhance natural resources and the sustainability of agriculture in Illinois.

K-12 Education

Agriculture remains central to Illinois' welfare and economic stability, requiring trained and qualified individuals for employment in the industry. As a result of the successful establishment of programs and funding by the State government, the State's Agricultural Education program has a strong track record, with greater than 70 percent of the agricultural education system's graduating seniors entering postsecondary education.

In addition to funding that supports local FFA and Supervised Agricultural Experience (SAE) programs with the latest agricultural technology and equipment, the State has also pushed to craft an online curriculum. There is also an opportunity at the middle school level to provide exploratory experiences, to better acquaint youth with the concept of agriculture as a career.

Illinois has set the standard with its online curriculum development, offering more than 1,200 agricultural lesson plans, free of charge, to the state's agricultural teachers. The material is currently being used in 42 other states with 14 states adopting the entire curriculum.

Community Colleges

The potential for Illinois community colleges extends beyond their traditional strengths of educating their district residents and student populations in their locality. The State's community colleges and their supporting consortiums are positioned to play a central role in establishing and maintaining their resilient communities throughout the State.

Community colleges in Illinois are local hubs of expertise for community engagement, workforce training, and sustainable strategies. Embedded in their communities throughout the LIRV region and supported by their network of institutions, community colleges provide the leadership, training, and resources needed for educating, preparing and positioning their constituents for the adoption of BMPs. Community colleges provide high-quality education at the local level, enabling students to remain in the farm workforce while pursuing advanced training.

The Illinois community college system offers education in the fields of agricultural technology, renewable energy, precision agriculture, and sustainable communities, providing opportunities to regional stakeholders to update the workforce and advance deployment of innovative technologies.

Beyond the achievements of individual colleges, consortiums formed between community colleges in Illinois have successfully collaborated to establish strategies for promoting green curricula and researching BMPs.

Illinois Green Economy Network

In 2008, with support from the Illinois Department of Commerce & Economic Opportunity, a small coalition of Illinois community colleges across the state established a platform for collaboration to drive the growth of the green economy in Illinois. Today, the platform has grown and evolved into the Illinois Green Economy Network (IGEN), a consortium of Illinois community colleges aligned to serve all interested schools across the State through sharing resources, common experiences, and curricula.

IGEN leverages the full collaborative potential of community colleges and their connection to their local communities by providing a "platform to expand the deployment of clean energy technologies, increase employment opportunities, improve environmental and human health, foster community engagement and accelerate market competitiveness." IGEN promotes college's efforts to promote sustainability throughout a broad range of categories, including energy, food, natural resources, and water.

The network promotes the potential for community college campuses to serve as living labs, where building and landscape management provide the foundation for introducing, demonstrating, and explaining sustainable green technologies to their communities. IGEN is advancing efforts at Illinois community colleges in establishing new green career pathways and opportunities for students, while also developing new curriculum to meet growing needs in the sector. The network is also committed to connecting the movement for sustainability with the push for resilient communities. Community colleges serve as a gateway to engagement, encouraging local stakeholders to pursue adaptable strategies to withstand today's dynamic changes of climate, population, ecology, and economy.

IGEN operates under the premise that their consortium of community colleges can achieve more through working together, rather than individually. IGEN applies this same perspective to their collaborative partnerships. The network partners with state and federal agencies and NGOs with a common goal to prepare the next generation of students for a new wave of careers, help grow the Illinois' economy, and create resilient communities throughout the state.

V. Conclusions, Recommendations, and Road Mapping Considerations

Conclusions

Overview

Despite the importance of rural communities to the health of the nation overall, arguably many rural communities are being left behind. Though some are thriving, rural areas overall have yet to match the employment levels reached prior to the 2008 recession, and significant poverty persists. Beyond barriers to jobs and economic opportunity, some rural areas also lack access to crucial services, such as healthcare, and many lack reliable hi-speed Internet connectivity. Though policymakers may be eager to tackle these challenges, discussions on the topic tend toward sweeping generalizations about the dynamics at work in these communities, leaving many Americans out of the conversation.

Rural America is far more diverse economically, demographically, and technologically than is frequently reported. This necessitates a shift in the traditional view of rural communities that considers this vibrant diversity. Thus, any discussion on rural America needs to acknowledge this variability in order to successfully inform policy solutions that address the complexity of its challenges. A one-size-fits-all approach to rural development and advocacy will be ineffective and inequitable.

Farming is a major contributor to the fabric of rural society. Agricultural production generally plays an important part in rural development, especially as it relates to land use. The contributions of farming to the rural economy relate to supporting employment, subsidizing ancillary businesses, and contributing to environmental services.

However, in more economically developed regions, farming accounts for a relatively small part of a diversified rural economy. In addition, the significance of agriculture proportionally is in decline in most regions. Today, agriculture represents only 6 percent of the rural economy. Various other industries underpin rural areas, including manufacturing and recreation. Strategies must be developed and paradigms shifted to realize the potential for growth and capitalize on rural opportunities. This does not lessen the role of farming in rural development, but the contribution of alternative economic activities, which may offer durable prospects for employment and economic progress, should not be marginalized. A different model of economic development, including entrepreneurship and local wealth strategies holds great potential. Capacity is a core issue facing distressed communities of all sizes. For small communities, the opportunity to draw in a large project that brings thousands of jobs is no longer a reasonable option. The real opportunity for growth in rural communities is likely through investing in small businesses, entrepreneurs, and niche or specialty markets.

The urban and rural stories of America are woven together. Rather than urban and rural communities competing against one another, the focus instead should be on how they are interdependent and complementary, and how regional approaches can lead to opportunities for innovation and prosperity.

A better understanding of the rural economy is incredibly important to those seeking to change the fate of rural areas. Today, agriculture represents only 6 percent of the rural economy.

Various other industries underpin rural economies, including manufacturing and recreation. Strategies must be developed and paradigms shifted to realize the potential for growth and capitalize on rural opportunity.

There is a general consensus among the various sources reviewed and practitioners interviewed for this report that rural challenges are multi-faceted, and therefore highly unsuitable for a single, one-size-fits-all solution. The conclusions that follow are not necessarily directed toward a global resolution. Instead, they provide a summary of the literature reviewed, the most recently-available information, and commentary provided by personal discussions with regional and local leaders and practitioners. The conclusions and recommendations are intended to guide an actionable dialogue and present a path forward that details opportunities to drive local and regional outputs that can achieve measurable and sustainable outcomes.

Health of the Agricultural Community and its Contribution to Rural Economies

Illinois is a leader in world food production, with 27 million of its total 37 million acres capable of sustaining agriculture. Statistically, Illinois ranks third nationally in the export of agricultural commodities with $8.2 billion worth of goods shipped to other countries. Exports from Illinois account for 6 percent of all U.S. agricultural exports and approximately 44 percent of grain produced in Illinois is sold for export. Illinois is first in nationwide soybean production, second in corn production, second in the export of soybeans and feed grains, fourth in hog and pig production, and eleventh in winter wheat production.

Illinois' central location, both mid-continent and mid-Mississippi River basin, is supported by a broad-reaching transportation network. Fertile land is a major asset, as is access to plentiful water supplies. With 2,640 food manufacturing companies, Illinois is well-equipped to turn the State's crops and livestock into food and industrial products. In fact, the State ranks first in the nation with $180 billion in processed food sales. Most food processing companies are located in the Chicago metropolitan area, which supports one of the largest concentrations of food-related businesses in the world. These factors combine to establish Illinois' continued leadership position in the nation's agricultural economy.

Technological advances have become increasingly accessible and affordable, creating opportunities for greater efficiency. However, this technology comes with a cost, both economic and in terms of a learning and acceptance curve. Producers experience varying capability to take advantage of sophisticated technologies, or to fully utilize the data provided to influence their decision-making and profitability.

There are significant challenges to agricultural sustainability in the days ahead. The producer population is aging. The age of the average farmer is 58, and attrition outpaces recruitment. The need for succession planning is apparent and promotion of agriculture as a career path warrants greater attention. Economic conditions have always been cyclical, but recent farm incomes have declined. On average, that decline stands at 10 percent in the LIRV alone. Likewise, total farm numbers are declining. Farm consolidation is continuing, large-scale operations are becoming more prevalent, and smaller operations are either absorbed or pushed to diversify to produce sustainable revenue streams and profitability.

External forces play a major role. Drought conditions are a perennial concern. Recently the region has experienced an increased frequency of heavy rainfall events and wetter than average conditions. Extreme and frequent rainfall events early in the growing season have contributed to erosion, loss of topsoil, sediment transfer, and delays in tillage and planting. The uncertainty

caused by global climate fluctuations and its influence on weather patterns is a significant change driver and stressor.

On the economic front, global trade policies have created additional uncertainty. Monetary policy has been unpredictable, tariffs have sharply influenced global trade, markets, and supply chains. While production has largely increased, it has not consistently translated to farm profitability, as margins tighten with increased input costs and depressed commodity pricing.

Precision Agricultural Technology and Conservation

Progress toward a green and resilient economy requires recognition that improved technologies, environmental enhancement and economic success are interdependent. Conservation practices, coupled with technological advances that reduce water and energy utilization, work in concert to minimize farm costs and increase production. Supporting farmers and producers who embrace these innovations will prove desirable, requiring the development of technical networking, group collaboration, cooperative NGOs, and an integrated educational system to provide the building blocks for advancing green strategies.

There is a pronounced need for functional technological advancement. Precision agricultural technologies are being deployed at a rapid rate. Irrigation technology is widely used, resulting in increased efficiencies in both energy and water usage. Sensor technology is demonstrating significant growth and expansion potential. GPS mobile applications are widely available. Drones, artificial intelligence tools, and machine learning are providing real-time data.

Integrated modeling increases predictability and efficiency. A growing number of applications for hand-held devices are available. Biologics, such as genomics and microbiomes, can increase production, but at a cost of added uncertainty from public and consumer perspectives. Finally, all technological advances come with an expense in time and dollars, with many producers reporting that costs cannot be justified and technologies are too complicated to learn. This points to the need to educate the agricultural workforce in an integrated farming system approach, combining scientific inputs and physical characteristics through optimized utilization of smart technologies.

Traditional conservation resource practices are widely employed with demonstrable results. Education in these practices is key. No two farms are alike, and workable solutions require on-site development. No-till, minimum-till, and strip-till methods must be adapted to individualized conditions and physical requirements. These and other in-field techniques like cover cropping represent a cost to the farmer, and therefore demand mainstream financial recognition to monetize their value, reward deployment, and accelerate broader adoption. There are also revenue producing strategies that could align with specific conservation practices. For instance, off-season livestock grazing over cover crops such as pennycress can defray expense.

Networking and peer-to-peer interaction is an important factor towards the individual adoption of conservation practices. Implementation of new conservation measures requires both facts and faith. Most producers are naturally tempered in their rush to adopt new conservation measures, until they are satisfied that they have been proven. As margins shrink, the willingness of operators to take on risk diminishes. Education, metric development, and performance measurement are increasingly important.

The farming community is well-acquainted with independent and renewable energy supplies. Farmers are wary of alternative technologies and practices touted with over-promised results. Producers gravitate to practices that are proven. Federal incentives can make an important contribution toward increasing the rate of adoption and a fact-based assessment can address the perception of the financial risk associated with deploying innovative equipment and approaches. USDA energy programs are an excellent example of a conservation strategy that is also moving toward greater use and appreciation of renewables such as solar, methane, and state-of-the-art wind technologies. Unfortunately, there is now a concern that USDA funding allocations are not allowing USDA to keep up with the growing demand for these programs.

Wind- and solar-powered systems are already in widespread use. Wind energy generation appears to be more suited to utilities or large operations, primarily due to higher costs for environmental compliance and maintenance. Regionally, solar energy is proving to be the most attractive and scalable alternative for small and medium farm applications. The installation of a small solar panel to support a well pump or electrify a fence is a small matter, which can then be built out to include larger rooftop panels to support a workshop, and further expanded into an arrayed system to power an entire hog operation.

Conservation in agriculture requires an immediate focus on training and educational support. An educational system with standardized goals should include information on available incentives for conservation practices. This must include a discussion of real property options, including modified land leases, appraisals, restructured insurance arrangement, or other financing means. Providing information on conservation easements and other types of encumbrances to protect farmland will reduce landowner anxiety regarding engaging in these legal safeguards. Reducing waste streams has not always been a priority. Waste reduction also provides proven economic benefits. There are a host of opportunities for resource maximization and cost containment through waste management. Education is key to the understanding and implementation of these processes.

Policy and Collaborative Networks

The most recent Federal Farm Act provides nearly one trillion dollars annually for agricultural programs. Of this funding, 76 percent is for nutrition programs, 9 percent for agricultural insurance, 7 percent for conservation programs like CREP, 7 percent for commodities, and 1 percent for research and development. The last figure highlights the clear and pressing need for additional focus on the development and deployment of applied, solution-oriented research. USDA budget requests reveal an increase in the amount sought to support technological research and development, but it remains for Congress, the administration and appropriators to commit to a funding increase.

Many factors entirely out of the control of the rural producer drive farm profitability. Federal programs have proven to be a double-edged sword, creating an uneven playing field, aiding one sector at the competitive expense of others. This points to the need to provide policymakers with a unified voice to inform decisions that have an immense impact on rural livelihoods.

Federal, state and regional policies and programs require thoughtful reflection, practical input and refinement. Policies that simply prop up failing markets are not a long-term solution. Programs that enable innovation, encourage stewardship, train the future workforce, and assist in research and development are needed to sustain the agricultural economy.

The need for additional focus on research was recognized and acted on through the establishment of the Foundation for Food and Agriculture Research (FFAR). Created through the enactment of the 2014 Farm Bill, the premise of FFAR's formation was that increased investment in cutting edge research and development through public-private partnerships, would be critical to feeding a growing global population. The FFAR's stated goals are to support food and agriculture research, foster collaboration, and advance and complement the mission of the USDA. FFAR establishes consortia that pool resources and knowledge to conduct research. The results are distributed to the consortium participants for use by their individual institutions. Ultimately, the consortium model allows participants to collectively explore multiple areas of research based upon common needs, while minimizing risk and costs.

Another key capacity-building opportunity lies in accelerated broadband deployment, which is recognized as a foundational need for rural prosperity and technological optimization on the farm. For producers in rural communities to utilize emerging and existing technologies, reliable coverage, quality and speed of Internet service must be available. Many rural regions lack either a planned strategy or the capacity to establish e-connectivity, or both. The region and the State are taking steps to address regional connectivity issues. Led by the Partnership for a Connected Illinois, the Illinois Department of Commerce and Economic Opportunity, and other state agencies, rural organizations, and service providers, multiple partnerships are being developed to tap existing programs and advocate for new ones.

With the recent Covid-19 pandemic, remote work and increased access to broadband have become a higher priority at the federal level, with a variety of programs being reviewed to fund and advance universal access. Local governments within the region should also be encouraged to expand Internet investments by including "dig once" policies in municipal and other construction projects, like road improvements and utility extensions and to better enable partnerships with ISPs. Advanced planning, pre-development feasibility analysis, and consideration of next-generation community-wide networks are being discussed by a growing number of economic development and public interest groups.

Likewise, in several regions across the nation, regional prosperity initiatives are taking hold. These show great promise for integrating efforts across regional capacity-building institutions, including community colleges. These initiatives reveal a shared strategy to accomplish key regional activation projects that are building public and private investor confidence in rural recovery. Capacity-building, collective impact, regionalism, resilience, and the need for transformational leadership and placemaking are all indicated as important attributes of efforts to improve the livability of targeted regions.

For perspective, just over ten years ago, the Subcommittee on Rural Development within the U.S. House Agriculture Committee conducted a hearing on March 31, 2009 to review innovative approaches to rural development. One question posed by the Subcommittee explored how regional organizations could help local communities innovate. The witness, William Lambe, at the time serving as Associate Director of the University of North Carolina's Economic and Community Development Program, answered with the following: "I think the key is to provide flexible and strategic resources aimed at building the capacity of rural communities. As I stated in my testimony, in order for these rural communities to innovate, there has to be a certain level of capacity within the local community. Helping to build that local capacity through leadership development, workforce training and assistance, accurate data for community leaders on their particular opportunities and most importantly, through flexible investments in promising ideas will go a long way toward helping local communities innovate."

Another member observed there are more than 88 programs administered by 16 different federal agencies that target rural economic development. This prompted an inquiry as to whether this divided approach presented its own challenges, specifically whether it would be more effective to consolidate the leadership and funding into fewer programs.

The answer came from witness Dr. Deborah Markley, Director for the Center for Rural Entrepreneurship. Dr. Markley stated that Rural America faces a variety of challenges, including lack of trained health care professionals, lack of access to broadband, lower rates of college enrollment, and more limited access to business support services. All of these challenges make rural economic development more difficult. Dr. Markley added that the challenges offered here can be effectively addressed by different agencies of the federal government – Health and Human Service, Agriculture, Commerce, Education. However, to be most effective, these various agencies should be guided by a common vision for rural development. She added that this vision should be guided by the answers to several questions, including: Why do we allocate funds to rural development? What goals are we trying to achieve? How can we move, at the federal level, from a rural development strategy that focuses on spending in rural regions to one that emphasizes investing in rural regions? Dr. Markley concluded by stating that the most critical factor for rural economic development is not consolidation but coordination of federal programs to muster a planned-for coordinated response to rural redevelopment.

In April 2017, the White House released Executive Order 13790, establishing the Interagency Task Force for Agriculture and Rural Prosperity. In January 2018, the Task Force released its recommendations, which have served to bring into alignment a federal vision for rural recovery. Subsequently, USDA Rural Development Grant opportunities have sought to arrive at alignment with the recommendations of the Task Force.

Markets and Workforce

Overall, the agricultural and rural workforce sectors provide opportunities for diversification. In agriculture, there are fewer individuals engaged in the workforce, but overall, better-paying jobs are available. Lack of skilled labor continues to hamper opportunities and productivity in rural areas. Needed skills are more varied than traditional labor force categories; they include such diverse fields as equipment technicians, solar installers, and rural health care workers. Each of these fields requires its own specialized training.

The traditional farm worker and operator are evolving. Farmers' personalities drive innovation and interest. Key traits enabling success include business savvy, digital proficiency, adaptability, drive, collaboration, and greater reliance on community strengths. Business acumen, including marketing, sales and accounting, has been identified as an educational need. Communication and collaborative networks are likewise needed, and peer-to-peer contact is frequently cited as an imperative in promoting adoption of new practices.

Regulatory requirements are an increasingly burdensome market force. Costs associated with regulatory compliance are on the rise. This may prove especially true in the food safety arena. There is real potential for impact on small producers. Specialty operations such as farm stores, roadside produce stands, and food preparation in conjunction with on-the-farm agri-tourism attractions present enforcement challenges for regulatory agencies. Often producer perception can be that rules are confusing, burdensome, and inconsistently and arbitrarily applied and enforced. A better understanding of regulatory requirements and responsibilities is needed, as well as an ability to influence sensible regulation, implementation, and enforcement.

Education

Information and training on emerging technologies for farmers and producers is available, but not altogether conveniently accessible. Too frequently real-time troubleshooting and coaching on emerging technologies is unavailable. Big data and information overload are often cited as 'noise,' obscuring useful information. Educational programs therefore need to focus on deliverable, relevant content. Beyond training, many producers mention digital proficiency as a differentiator. Learning how to access and use emerging digital technologies is not enough, the key is mastering those technologies to optimize results.

Keeping talented youth in rural Illinois is a matter of making rural Illinois an affordable and desirable place to live. Providing opportunities for the next generation workforce require a "Cradle to Career" approach. This requires rural communities to be child-centered communities. Rural children must have access to quality educational opportunities, from early childhood programs, through elementary and secondary schools, to post-high school continuing education. Investment in agricultural education and place-based learning at the earliest opportunity cannot be over-emphasized.

Statewide, there seems to be a strong interest for a more clearly communicated career path in agriculture, beginning with exploratory learning at the middle school level. A focus on classroom and experiential training is suggested to continue through secondary education, with additional focus on business, science, and technology. A broader range of rural choices can be conveyed with career paths revealed both on- and off- the farm. Dual credit opportunities at the secondary school level should support higher education progressions, not simply college prep courses, but also offering to move students into and through career and technical education (CTE) programs at community colleges. Cooperation between high schools and community colleges to advance CTE programming and placement should be more aggressively encouraged to assist with rural workforce readiness. Finally, continuing educational opportunities are needed across the entire rural workforce to enable information transfer without travel or loss of valuable time on the farm.

Ultimately, rural prosperity depends on aspiration. Young people need to see and hear that there is opportunity, and to see models of success. There needs to be marketing of a 'rural brand,' with emphasis on a comfortable and financially-secure lifestyle.

Recommendations: Rural Recovery and a Path Forward

Overview

In arriving at recommendations based on the report's findings, conclusions, and the input of regional practitioners and subject matter experts, key themes emerged to guide the development of actionable objectives. Particular focus was placed on efforts that could advance local and regional outcomes with impact.

Defined metrics and demonstrable performance are crucial in building investor and citizen confidence. Key actionable recommendations should be measurable, impactful, and difference-making. Metrics for community and regional livability should be thoughtfully considered to afford reliability, analysis, and reporting. The impact of implementation should reveal the overall well-being and prosperity of the region. This performance transparency will bolster resident and investor trust and attract the attention and interest of potential relocators.

Key Emerging Themes

The following thematic areas emerged as a result of investigative and outreach efforts:

- Agricultural Innovation, Food Security, and Resource Conservation
- Strengthening the Rural Brand for Talent Retention, Return, and Relocation
- Rural Capacity-Building, Problem-Solving, and a Call for Transformational Leadership

Next Steps – A Call to Action

In April 2017, the White House issued Executive Order 13790, Promoting Agriculture and Rural Prosperity in America, establishing the Interagency Task Force on Agricultural and Rural Prosperity. Six months later the task force released a set of 100 recommendations.

The authors of this report have concluded that American prosperity and well-being are intrinsically tied to rural America's ability to thrive in the new global economy; build and scale local and regional markets to ensure greater rural resiliency and self-reliance; build and attract an educated workforce and expand its population base; and use its diverse and abundant natural resources to provide food, fiber, forest products, energy, recreation, and a unique livability for those embracing a rural lifestyle.

The Task Force declared that realizing the opportunities for prosperity in rural America would require action on multiple fronts, including promoting economic development, advancing innovation and technology, ensuring a well-trained and productive workforce, and improving the quality of life in rural communities. Achieving increased productivity would require innovation and technology, as well as access to capital, infrastructure, and an adequately trained workforce. Attracting and retaining a skilled and motivated workforce would depend on regional and local quality of life attributes.

Local and regional leaders, opinion-shapers, institutional trustees, and practitioners will be central to this effort as capacity-builders, activators, and implementers. Institutional arrangements are fundamental in establishing forward-leaning rural regional partnership councils, local community-building councils, and community development corporations. Each of these institutions should be vested in a shared commitment and planned-for approach, and

may prove to be a key difference-maker in resisting rural trends and placing rural regions on a more sustainable trajectory.

The recommendations of the White House Task Force were ultimately nested across five action areas including:

a. Achieving E-Connectivity for Rural America
b. Improving Rural Quality of Life
c. Supporting the Rural Workforce
d. Harnessing Technological Innovation
e. Developing the Rural Economy

The authors of this report have concluded that considerable alignment exists between the findings of the White House Task Force and this current LIRV report's findings, which incorporates the views of regional producers, program administrators, farmers and other stakeholders with their boots on the ground in the Lower Illinois River Valley. The White House Task Force's recommendations presented an actionable framework for a clustering of objectives to support a LIRV regional action plan.

The following presents a prescribed LIRV response to advance each of the five focus areas that the White House Task Force has called out as national rural priorities. Initiatives begin with a baseline assessment, continue by soliciting practitioner and stakeholder input, and conclude with implementation of programs and projects.

Call to Action #1: E-Connectivity for the Lower Illinois River Valley

In today's economy, e-connectivity is essential. E-connectivity is more than connecting households, schools, and healthcare centers through high-speed Internet; it is a tool that enables increased productivity for farms, factories, small businesses, and financial institutions and is fundamental for economic development, innovation, advancements in technology, workforce readiness, and an improved quality of life.

LIRV Activation Project Ideas:

- Establish a Regional Broadband Council to assess existing conditions, review existing mapping, and engage stakeholders, including anchoring user institutions (hospitals, schools, libraries, and banks), service providers, and State and Federal program managers with a view to advancing a planned-for approach to ensuring that the region has a coordinated and timely path to make e-connectivity a regional strength.

- Develop and advance an accelerated broadband deployment strategy in collaboration with work already begun by the Illinois Electric Cooperative and other private sector providers.

- Develop and implement a regional school-based telehealth pilot for which conceptualization and pre-planning is already underway.

- Purchase telehealth support equipment for area rural hospitals and training for virtual care technicians.

- Assess and develop CTE courseware involving collaboration between regional community colleges, school districts, the State Board of Education, and industry to ensure a skilled workforce is ready for placement in a new regional digital economy. This effort would include bolstering the digital proficiency of farm operators in a rapidly evolving world of precision agriculture, as well as telehealth workers, telework employees, and small business owners via conceptualization and deployment of digital technology 'geek squads.'

Call to Action #2: Improving Our Rural Quality of Life

Ensuring rural Americans can achieve a high-quality of life is the foundation of prosperity. The quality of life is a measure of human well-being that can be identified through economic and social indicators. Modern utilities, affordable housing, dependable child care, adequate health care, efficient transportation, and reliable employment are economic indicators that must be integrated with social benchmarks, including access to medical services, public safety, education, and community resilience. These are the services that empower rural communities to thrive.

LIRV Activation Project Ideas:

- Develop and communicate the case to stimulate reinvestment in regional town centers. Work with local, regional, State, and Federal community development interests to plan and advance efforts to revitalize historic downtown business districts. This could begin with a pilot effort in two or more regional anchoring communities and county seats, such as Pittsfield and Carrollton, Illinois. Each of these communities has historic downtown retail district revitalization initiatives underway on and around their town squares.

- Brainstorm with regional leaders to build pathway and process to affect greater rural and population hub cooperation with the three largest regional population centers: Quincy, Jacksonville, and Alton, Illinois. Cooperation is in evidence today, but synergies that shape and usher in a next level effort could result in unanticipated gains from collective impact.

- Support efforts to transform regional health care and wellness. Regional healthcare providers are currently responding to new market realities, changing demographics, and service needs. Efforts should be undertaken to embrace Illinois' new Health in All Policies Act and to develop policies and programs to create a Center for Wellness and Active Living in the LIRV. The Southern Illinois University Medical School Department of Population Science and Policy and a group of service providers in Illinois have crafted a blueprint for transforming rural health and wellness. This report is complete and due for release and launch in 2020 and can serve to guide this effort.

- Build a framework to better promote outdoor recreation, tourism, and active living economy. The LIRV is within easy driving distance of the St. Louis and Chicago metropolitan areas and provides tremendous opportunities to access the region's abundant natural resources and outdoor amenities, including two of America's great rivers. Local and regional efforts to promote a nature-based tourism platform and a

consolidated destination development, management, and marketing strategy could make the region a desired "outdoor recreation getaway." Outreach is already underway to bring local, state, and federal public land managers across the LIRV region together to discuss shared objectives. This initiative includes a collectively developed effort to build a strong active living brand. This will position communities to realize the potential of providing a "gateway community" for a Great Rivers getaway. Not only will this effort promote tourism, but it could also spur regional in-migration as people seek to live and work in a region that features active living communities and amenities.

- Create programs and events to celebrate local foods and heritage-based festivals. Beyond

  the challenges associated with areas labeled "food deserts," there is an opportunity to bolster local and regional food systems and markets with a "Grown in the Valley" brand identity. Regional and local festivals are authentic and can reveal a taste of the region's unique cultural and natural heritage. These offerings continue to appeal to those seeking authentic Midwestern experiences and weekend getaways.

- Develop platforms to convey compelling relocation strategies. Local Chambers of Commerce, community building organizations, economic development interests, and regional and local tourism bureaus could come together to produce focused "Relocation Guides" that introduce visitors to regional and community assets and serve as a community-driven resident recruitment tool. A variation of these visitor guides could provide displaced workers, young families, retirees, and other talented individuals with information about the community. This would facilitate contact and interaction with local schools, health and child care providers, realty companies, and job prospects, therefore bolstering their interest in relocation.

Call to Action #3: Supporting a Rural Workforce

To grow and prosper, every rural community needs job opportunities for its residents, and employers that require qualified individuals to fill those needs. To function effectively, employment opportunities need to be identified and communicated. Information should be made available to local candidates, as well as to attract available workers from adjacent urban and rural centers. Finally, a pipeline could be established to provide the workforce with awareness, training, and education enabling the capacity to fill available positions.

Rebuilding Illinois' rural population and growing prosperous communities, requires a skilled and ready workforce. For rural areas within the LIRV to thrive and prosper, human capital is the top priority. LIRV workforce challenges have been identified to center on three areas: Population Retention, Talent Attraction, and Workforce Training and Education.

The agricultural career path remains largely dominated by family ascendancy. But new farmers can be derived from a diversity of backgrounds. Key to workforce development is the ability to attract nontraditional farmers – women, minorities, veterans, and disadvantaged communities. Programs should encourage and incentivize participation by these target populations. Community colleges have targeted displaced workers and immigrant communities, particularly in locales where unemployment is low and skilled and unskilled workers are desperately needed.

New farmers need support from developing farming program internships and training programs. Building support from seasoned producers/farmers and creating a farm legacy consortium of older farmers teamed with novices could assist in building networks of farming

communities. With the shared interest in the continuation of the agricultural lifestyle and culture, these networks will provide both a resource and an opportunity to give back to the community as a whole.

There are many opportunities to partner with local businesses and organizations to identify educational and career gaps. All levels of educational institutions, particularly high schools and community colleges, can provide CTE, to grow student and parent awareness of rural career opportunities, build existing workforce training programs to meet emerging needs, and grow apprenticeship opportunities to address workforce readiness.

LIRV Activation Project Ideas:

- Partner with local businesses and organizations to identify gaps and emerging needs to grow LIRV digital opportunities, working with high schools and community colleges to provide expanded Career and Technical Education (CTE), to grow student and parent awareness of rural career opportunities, build upon existing workforce training programs to meet emerging needs, and grow apprenticeship opportunities to address workforce readiness.

- Community Assessment Rapid Engagement (CARE). This concept involves working with area community college administrators, state and county workforce development councils, and workforce practitioners to conceptualize a platform and additional local pilot activities that position community colleges with resources and rapid response capacity to quickly react to small workforce training and placement needs within rural areas. The capacity to quickly train and certify additional welders, truck drivers, or certified nurse assistants in rural counties is significant and helps maintain a stable rural population. This effort requires close coordination and a willingness to look beyond budgets and traditional credit hour frameworks to respond to critical workforce needs. Secondary and higher education practitioners need to be better positioned and supported to track and react to these types of opportunities.

- Develop Small Business Acumen Training Toolkit and assistance platform. Working with the Illinois Department of Employment Security, the regional Workforce Innovation Team and the regional Small Business Development Center (SBDC), a program is required to help build efforts to create an Entrepreneurship Center within the LIRV. This center could provide a solid foundation to grow small and startup businesses as well as providing basic business acumen to new and returning students, fortifying their business knowledge. Building on their existing business program curricula, focused efforts can be developed to encourage small business incubators and startup collaboration through workshops, academies or off-season learning sessions. These initiatives can be performed in conjunction with local secondary and higher education institutions. The SBDC, their supporting network of providers and advisors, and local banking institutions can provide the financial network to support investment opportunities and identify potential new business prospects.

- Grow the LIRV's digital capacity with a skilled and ready workforce. John Wood Community College is currently working with a manufacturing partner to develop an Automation and Robotics Technician training program. The program introduces industrial automation, including the use of CAD SolidWorks software, PLC programming, industrial motors and controls, and the operation and programming of

robotics systems. The program prepares students for immediate employment as an automated process specialist or technician. There is immediate demand for similar skills throughout the LIRV region. Other local manufacturers and warehouse operators are exploring the need to include more automation into their operations. Those employers are being contacted to form an Automatic and Robotics Advisory Committee to help roll out this new program offering. This program could present a pilot, demonstration, and operational model for other regional and statewide community colleges.

Call to Action #4: Harnessing Technological Innovation

The impact of technology has been remarkable in terms of production, safety, efficiency, and cost containment. The modern farm is mechanized in every aspect from combines to grain handling to sensing devices. Most producers are self-selecting for technological advantages, and therefore require individualized education regarding the myriad of choices at their disposal.

A key to accelerated deployment of these techniques is the development of demonstration programs. This could be accomplished by a collaboration between educational institutions in partnership with manufacturers and providers. Pilot projects permit farm decision-makers the opportunity to see results in the field, a positive return on investment, and ease of use. Demonstration programs do not have to be large scale. This is an opportunity for small business start-ups to assist producers with specific technological problems. Farmer-to-farmer influence is an important factor, so contact through social media networking platforms is an effective tool. Advantages can be achieved simply by facilitating effective peer-to-peer communication.

LIRV Activation Project Ideas:

- Foster collaboration between the private sector and community colleges to increase awareness and interest in the digital economy and emerging technologies. Efforts can be immediately undertaken to advance opportunities for training and placement in drone technology, robotics, and working with regional power providers, solar site assessment and installation programs.

- Develop a Farm Worker/Operator Digital Proficiency Training Program and create a platform to assist small and mid-sized farm operators to troubleshoot digital issues and build their digital proficiency.

- Work closely with area community colleges, University Extension, local FFA and 4H organizations and private farm advisors to develop additional peer-to-peer producer networking opportunities, demonstration projects, farm tours, and instructional workshops.

- Develop a concept for a Regional Agricultural and Rural Innovation Center. The region boasts impressive new technological accomplishments and approaches towards driving technology-based agricultural innovations. Specialty processing for hemp, pennycress, and light hogs are three areas that could provide custom processing centers and jobs. This effort could reveal a clustered environment for agricultural innovation at a time when food security is a looming priority for everyone.

LIRV Regional Agricultural and Rural Innovation Center

Workforce efforts throughout the region could be coordinated and successfully led through the creation of a regional agricultural network or consortium (i.e., LIRV Agricultural and Rural Innovation Center). The focused goal of this network would be to build awareness of career paths in agriculture. This statewide or regional effort must be centrally led, and is an ideal niche for community colleges and the Illinois Green Economy Network (IGEN).

The LIRV Agricultural and Rural Innovation Center (Center), potentially located on the campus of JWCC or one of its satellite campuses, could serve as a convener and connector of agricultural related events, meeting space, trade shows, and a learning center for the region. The Center could be a direct connection between the college and the farming communities, providing space for collaboration, education, and idea generation.

The Center could serve as an anchor for college agricultural-based coursework and ongoing education efforts and initiatives focused on the development of regional food systems. The Center could house partnerships with allied organizations serving agricultural interests in the region and provide direct farmer training through these cooperative relationships. This could become a place where experienced farmers and producers could participate and train, but also facilitate new connections to novices. Additional learning opportunities and direct corporate and ag business connections would similarly be facilitated. Corporate sponsorships and practical field technology applications could be part of the Center's role as well as supporting efforts of local Farm Bureaus, Future Farmer affiliates, and other student-based efforts.

Likewise, and perhaps of greater strategic importance, the Center's mission could focus on the larger effort to develop, promote, and implement sound regional economic and community-building strategies overall, to measurably improve the quality of life across the Lower Illinois River Valley Corridor and lift the region altogether.

The Center could be a platform to address each of the activation projects described within this section across all five White House Task Force focus areas.

This Center could be the single "big idea" with transformative energy sufficient to create a direct pathway to regional resiliency, greater self-reliance, long-term economic prosperity, and regional livability.

Call to Action #5: Developing Our Rural Economy

In looking at the cause for action, infusing rural areas with stronger businesses and agricultural economies empowers the nation. Expanding funding options to increase the productivity of farmers will lead to the enhanced viability and competitiveness of rural America. By promoting innovative farm technologies, energy security, recreation, agri-tourism and sustainable forest

management, communities will be further empowered to leverage the already significant assets of rural America.

Additional federal, state and local efforts are required to invest in existing rural transportation infrastructure. Improvements to these networks through road, river and rail will further expand the movement of "Made in America" goods and products to existing and new domestic and international markets boosting our country's global competitiveness.

LIRV Activation Project Ideas:

- The LIRV needs to seek and secure leveraged public and private investment in regionally significant transportation modernization projects. Expansion of the north/south Illinois Highway 67 corridor has been a key regional goal to increase transportation mobility. Efforts are underway to pursue new opportunities for development along the east-west I-72 corridor. Efforts are needed to increase recognition, management, and investment along the region's river-themed and federally recognized scenic byway corridors. Federal and State support for the modernization of the Upper Mississippi River and Lower Illinois River Inland Waterway should also be sought and secured to aid in modernizing locks and dams to return them to full serviceability and reliability, and related efforts should continue to maintain the navigability of the channel reaches between each of the locks on the river for commercial and recreational traffic. In order to maintain a reliable transportation corridor for regional agriculture and other products, regional leaders and beneficiaries should continue to work collectively to address long-standing back logs of deferred maintenance on these systems.

- The LIRV should consider supporting the development and creation of a Regional Rural Economic Development Hub and Clearinghouse. The entire region could benefit from growing functional capabilities and capacities to foster sensible growth by standing up a rural innovation center modeled after the North Carolina Rural Center. This center could also offer grant-writing support to local communities and organizations as well as descriptive and predictive analytic data access and analysis support.

- The emerging ecosystem services market is primed for development. The region has multiple unique landscapes and expertise in the disciplines of source water protection, nutrient management, soil health, carbon sequestration, mitigation banking, and open space stewardship, which could create economies to realize returns on investment for interested impact investment groups. Development would also aid producers and local economies to protect important natural capital.

Concluding Observations

When considering the activation project ideas offered within each of the Five Call to Action areas, one looms as an organizing theme and activator for all the rest, the conceptualization of a Lower Illinois River Valley Rural Innovation and Career Center. This Center could provide a platform to address each of the activation projects described across all five White House Task Force focus areas.

This Center could be the single "big idea" inspirational and scalable enough to energize interest and advance regionalism. This place-based innovation and incubation hub could create a pathway to regional capacity-building and problem-solving, resiliency, greater long-term economic stability, and regional livability. A clustered hub for agricultural innovation is part of

this concept, but not all of it. The other complementary function of this Center would be to consider "all things rural" and advance a regional approach to rural revitalization. Successful development and implementation of this Center could reveal a replicable and exportable platform for other regions of the State and beyond.

Today's challenges in rural communities require local transformative leadership and regional platforms to leverage a larger shared and common effort. A number of regional rural efforts elsewhere in the nation are finding traction and attracting long-term impact investors. These place-based funders are establishing long-term relationships with rural communities and regions, building diverse and grassroots leadership and organizations, and catalyzing significant change. This long-term thoughtful and planned-for commitment will prove to be game-changing, and preferable to sporadic spending from well-intentioned parties.

The author's aspiration for this report would be that it contributes actionably to the timely discussion regarding how this region positions itself to take key next steps to revitalize and build the prosperity of the Lower Illinois River Valley, and thus making its own contribution to restoring rural America.

Appendices and Endnotes

Appendix A: Synthesis of Subject Matter Expert/Stakeholder Interviews

Section I. Overview of Interview Process

As part of an overall effort to assemble and analyze information pertinent to understanding agriculture in the United States, THG Advisors, in cooperation with John Wood Community College and the Illinois Green Economy Network, conducted 22 one-on-one phone interviews of subject matter experts and various rural stakeholders. Interviews were undertaken to gain tangible insights from those most familiar with the workings of rural communities and agricultural systems. Questions were designed with a focus on Illinois farm profitability and the rural economy, including trending innovation, best practices, and implications and opportunities to build a resilient rural workforce. The ultimate goal was to shed additional light on a variety of strategies for cost containment, risk management, and best management practices to better frame opportunities for further innovation in rural landscapes, both on and beyond the farm.

Interviewees were thoughtfully selected based on direct and lengthy experience with agricultural production in Illinois, an appreciation and knowledge of rural Illinois, and an understanding of today's challenges across rural landscapes and communities. Further, many interviewed had particular knowledge of the Lower Illinois River Valley.

A single set of 12 questions was utilized for all interviews. The interviews were conducted confidentially. No individual attribution is revealed in the reporting. Instead, common themes, compelling observations, reflections on existing assumptions, and recommendations revealed during the interviews formed the basis for the Interview Summary.

Section II. Interview Participants

- Julie Armstrong, Executive Director, Illinois Nutrient Research and Education Council
- Bill Bodine, Director of Business and Regulatory Affairs, Illinois Farm Bureau
- Kevin Burrus, Owner, Burris Seed Company
- Phil Bradshaw, Owner/Operator, Bradshaw Family Farms
- Eliot Clay, Policy Director, Illinois Environmental Council
- Ron Coultas, President, Scott County Illinois Rural Water Cooperative
- Shelby Crow, County Director, University of Illinois Extension
- Bruce Giffin, Retired General Manager, Illinois Electric Cooperative
- Eric Hobbe, CEO, Prairie Power
- Liz Hobart, Government Relations Manager, GROWMARK, Inc
- Regan Joehl, Owner/Operator, Greene Fields Farm
- Nate Keener, Director of Sustainability, Lewis and Clark Community College
- Russ Koeller, Owner/Operator, Koeller Family Farms
- Lauren Lurkins, Director of Environmental Policy, Illinois Farm Bureau
- Pat Pinkston, Retired Executive, John Deere
- Dwight Reynolds, Area Director, U.S. Department of Agriculture
- Blake Roderick, Executive Director, Pike-Scott Farm Bureau
- Chad Schutz, Owner/Operator, Schutz Farms
- Lucas Strom, Illinois Producer and VP, Farmers Business Network
- Sarah Schmidt, Director, Carrollton IL Schools Early Childhood Program
- Sameer Vohra, Chair, Department of Population Science, Southern Illinois University, School of Medicine
- Erica Thieman, Agricultural Education Advisor, Illinois State Board of Education

Section III. Subject Matter Expert Interview Questions

Informal interviews were conducted telephonically to gather local and regional impressions regarding challenges and opportunities for Illinois' rural economy and rural workforce.

The questions focused on three thematic areas: (1) Illinois' Agricultural Economy and Farm Profitability; (2) Energy and Water Conservation Best Practices; and, (3) Rural Workforce Challenges and Opportunities.

Illinois' Agricultural Economy

Framing: General impressions regarding Illinois' current agricultural economy and influences of farm profitability.

Question 1: What do you see as the greater immediate challenges or threats to farm profitability and Illinois' agricultural economy?

Question 2: Are there specific programs or practices that you feel are particularly beneficial and working for producers? For example, do you see cooperative practices like equipment sharing and group purchasing becoming more common place?

Question 3: What impact is the expanded role of technology having on the farm? What's your experience or perspective?

Question 4: When considering potential new markets, specialty crops and processing, and other opportunities to enhance and/or diversify farm income and the rural economy, where do you see us headed for large and small farms?

Illinois' Natural Resources: Conservation, Use and Re-Use, On-the-Farm Best Management Practices

Question 5: When you look at energy usage and investing in conservation practices, (i.e. renewable power generation, solar conversion, battery storage, methane production, staying on the grid vs. moving off the grid), what do you see trending and what do you think is most viable for adoption and why?

Question 6: Specific to source water protection and retention, and practices like cover no-till, cropping, buffers, terracing, ponds, and end-of-field solutions, which practices do you think are proving most viable for producers and land managers?

Question 7: What do you see as key barriers to expanded adoption of best management practices?

Question 8: What should we be doing to accelerate and expand the use of best practices and new technologies? Would an increased investment in education and extension make a difference? Please explain?

Illinois' Rural Workforce, Challenges and Opportunities

Question 9: Are we doing enough to recruit and train the next generation of producers and agricultural workforce overall? What more is needed? What are we missing? Do we need to provide greater support to programs like FFA and 4-H?

Question 10: Regarding jobs in rural Illinois and what is being called Illinois' green economy, what rural jobs and start-ups could have potential in your view?

Question 11: How do you think we need to approach workforce opportunity and retaining talent in rural Illinois overall?

Wrap Up

Question 12: As we wrap up, across our three key topical areas of the agricultural economy, best practices, and the rural workforce, are there innovative demonstration projects or ideas that you would like to see advanced that you believe could be 'difference makers?'

Is there anything else you would like to offer/add? Are there areas that we did not cover that you would like to address?

Section IV. Interview Summary – Observations of Subject Matter Expert/Stakeholder Interviews in the Rural Economy

Illinois' Rural Economy and Farm Profitability

What do you see as the greater immediate challenges or threats to farm profitability and Illinois' agricultural economy?

- One major disruptor to our Ag Economy is globalism and our dependence on trade. Recent trade wars are having an immediate and significant impact on farm income. Production is up, but margins are shrinking. Input costs are up. Market prices are down. All the other factors that are affecting the rest of us also impact farm income and profitability.

- Whether it's the current recession or the Covid-19 outbreak, agriculture is not immune to stressors in other parts of society. Trade, consumer demand, and monetary policy all have a ripple effect that challenges agriculture and rural economies. How will events like Covid-19 impact food processing? If a single worker is infected, will whole plants be closed down? How do we monitor and make sure that 'essential' facilities are not forced to close? If we have to reduce processing shifts, it will impact our ability to process a large number of hogs.

- The continuing challenges of weather, climate, market conditions, and their impact on regional grain production.

- Profit and loss in grain farming are more connected to marketing strategies, protecting existing markets, and keeping supply chains open. Agriculture is resilient, but trade issues have a huge influence. Changes happen quickly. You have the recent dust up with trade, markets, labor, and weather. All of these factors have become very unpredictable.

- Cost of living is a big issue, with one of the biggest being health insurance. Things we do on the farm to diversify and add income get eaten up by healthcare costs. We try to be smart, creative, and work hard, but we feel like we are treading water. Being bigger helps. If you aren't big, you have to diversify and get into some kind of specialty crops.

- Similar to the 1980s, producers are feeling really stressed and vulnerable. Mental and business health are being tested. Farm income in 2020 is projected to be 8% lower than in 2019. Meanwhile, the complexity of farming is ramping up and you have to remain focused. Farmers are being pressed on all sides by farm consolidation, automation, electric drives, ag data management, bio tech, gene sequencing, commodity prices, global trade policy, and emission standards.

Are there specific programs or practices that you feel are particularly beneficial and working for producers?

- Farmers are farmers. Production will always be very important. Producers want to produce the best and the most. With precision ag, it's now about fine tuning your operation and managing your margins. There is greater pressure to use technology and other advancements to balance cost containment and production.

- More and more, small farms will turn to specialty crops, higher margin crops, and even branding their farm to create an agro-tourism experience. Alternative crops and niche market development – hemp, pennycress, other high value crops – are becoming attractive. The big challenge will be creating demand and regional processing capacity. Farm consolidation is going to continue and more small farms are going to be pushed out, unless they diversify.

- On smaller operations, equipment sharing might make a difference, buying and selling in bulk (i.e., three ranchers coming together to sell their feeder calves to a feed lot may present an advantage). Cooperative selling of specialty foods (organic) in smaller niche markets will likely find a more receptive audience. Organic operations are not vulnerable to trade issues.

- Big farms are like battleships, they are slow to turn. Production-wise, all farmers are willing innovators.

- The average age of farmers today is probably 55-65. As farm management transitions to the next generation, there will be greater acceptance and use of new programs and innovative practices. Entry-level farmers are likely and initially to follow what their parents did or are doing.

- Subsidies and conservation incentives have an upside and downside. They work for some and not so much for others, and some may contribute to an uneven playing field. Producers take what works and further integrate it. Profitability is still priority one. Innovation is pervasive throughout agriculture. But, adoption is largely triggered by demonstrating an ability to drive down various forms of risk and drive out costs.

- The impact of technology has been tremendous for production and for efficiency and cost containment. Most producers are self-selecting for technological advantages. Precision agriculture is making a difference on several fronts. But, it's not just technology advancements, it's also advancements in science (i.e., drought resistant seed varieties). Reliable high-speed e-connectivity is another form of technology and supporting infrastructure that is critical. Accelerated broadband deployment into rural areas is a game changer.

- Useful practices and programs have given us terracing, farm ponds, and practices that are building long-term soil improvement and stewardship.

- Federal programs have proven to be a two-edge sword helping some at the competitive expense of others.

Could you comment on the expanded role of technology on the farm and across rural landscapes?

- Development of non-manned equipment is moving ahead. Efforts to make farming better and safer are receiving a lot of attention. Improved sensing devices. Combines are fairly automatic today (grain handling, trucking, auto-steer). Technology on sensors that began in the 70s and 80s is now second nature to most producers. Every day, technology is being more broadly embraced. Precision robotic weed control is here, with a remote machine moving down bean rows zapping weeds. Innovations like this will have a huge impact.

- The utilization of data is and will continue to be significant. Using it effectively is the challenge. A big X-factor is integrating all of the data into a whole farm framework that can be mastered to optimize management decisions and in real-time. The technology and farm consolidation downside may be fewer farmers and farm workers. However, farm workers with the right skill set can find a career on the farm or in agriculture off the farm. Social media is another form of technology that is making a difference. People want the connection to their food, how it's grown, where it comes from, and knowing the people that grew it. This is good for everybody, good for growers wanting to brand their operation, good for rural areas, and good for consumers.

- Technology and precision agriculture continue to be a looming difference-maker. Ag may actually be outpacing other industries with the current pace of innovation. Broadband has become an imperative, for remote monitoring of crop health, the need for better connectivity to advance data transmission networks. The Covid-19 event and social distancing will likely ramp-up social media and stretch the system.

- Technology adoption happens over a long timeframe, and moves from success to success. With business operations, enterprise-wide suites improve productivity and profitability, but different employees are better than others at adopting technology, not dissimilar to other businesses.

- With our farm operations, we moved to a cloud-based management and fleet system which has been successful. We started with high resolution imagery eight years ago which has taken us to using significantly less herbicides in certain instances. Drones may play a larger role with imagery and they're more interesting than a few years ago, much more so than five years ago.

- Closing the knowledge gap between what's available, what's being used, and what's being used effectively will make producers more competitive. Some quickly master data analytics and it separates them from the rest of the pack. We need a platform of technicians and a rapid response helpdesk or Ag Geek Squad. There is real need and opportunity to better master data and how to use it to make decisions that will impact the bottom line.

- Mechanization, automation, and monitoring have to all be there to ensure settings are correct and operation is functioning at an optimal level, consistently. Using ag data in real-time to track inputs and outputs and having more granular info is huge. We have been collecting data for 20 years, but we still struggle to handle it effectively and efficiently to guide real-time management decisions.

- We have been using technology on our family farm for over 20 years, beginning with GPS and employing additional applications for soil, then field operations, planting rates, anhydrous application, and so on. We have come to depend on reliable Internet access and the increasing sophistication of available software.

- The challenge in all of this for farmers is the disparate programs and in-cab monitors and receivers that don't communicate seamlessly with each other and can't overlay data in a productive way. There's the additional frustration, experienced by all businesses, of older apps and hardware no longer supported by the manufacturer.

- The drone business is definitely establishing a foothold and growing on several fronts, sweeping the farm to support precision agricultural monitoring and for solar site assessment.

- We need to explore building a rural economy sector, but it requires reliable high-speed broadband, a competitive cost of living, vibrant downtowns, outdoor active living amenities, nearby higher education institutions, and strong welcoming communities.

When considering potential new markets, niche markets, specialty crops and processing, and other opportunities to enhance and/or diversify farm income and the rural economy, where do you see that headed?

- Specialty crops represent forms of diversification to bolster farm income and explore niche markets. It's also a matter of not putting all your eggs in one basket. Growing or depending solely on one crop makes the farm vulnerable. If weather or a pest strikes a particular crop, you risk losing everything. In Illinois, adding a pumpkin crop or popcorn crop can provide an important second income stream that could be the difference-maker for smaller operations, helping to cover healthcare costs, loan payments, and other fixed costs.

- Corn-soy-wheat-swine are all 'mature' markets. All are susceptible to trade issues. The trade gains achieved via check-off program investments has been set back significantly with recent erosion of trade relationship with China and the 'trade war.'

- New markets and niche markets require marketing and branding that traditional row croppers didn't contend with. Social media skills are needed. For example, if you have a pumpkin patch, you need a web page to promote it, and to let people know about it. This is something that an older farmer may not be proficient.

- Consumer demand and government policy will be drivers on what happens regarding new market development and niche markets. Consumers want specific foods and companies and producers are trying to respond. GHG challenges will shape expectations and responses and this will also be a driver.

- Specialty crops and specialty processing are opportunities for producers and rural areas overall. This type of innovation needs to be encouraged. Some of these opportunities tend to conflate agricultural economics with what really should be considered rural small business opportunities, and small business practice acumen will be necessary.

- Specialty crops and on-the-farm experiences for consumers are going to be necessary to support niche markets, fully utilizing your land and creating a brand.

- Covid-19 is calling new attention to our need for national food security and reducing our reliance on supply chains outside the U.S. Direct markets and regional and local food systems need more sophisticated attention. We need food 'systems,' not food opportunities.

- Diversification is more practical for the small- to mid-sized operator. We need to identify long-term consumer demand.

- Diversifying existing operations (i.e., local foods and individual farm branding) is needed. Niche markets including custom beef, industrial hemp, pennycress as cover crop and also for seed oil could prove timely and helpful for diversifying small operations. Given the Lower Illinois River Valley's abundant water resources, there should be real interest in potential new markets. Other parts of the country without water are going to have problems with high value crops with high water appetites. This may present an opportunity for the region.

- Corn and soy are mature markets and will continue to dominate the discussion, but niche market opportunities are real and represent a significantly untapped opportunity particularly for small and mid-sized farms.

Energy and Water Conservation Best Practices

When you look at energy usage and investing in conservation practices, (i.e., solar conversion, staying on the grid vs. moving off the grid), what do you see trending and what do you think is most viable for adoption and why?

- USDA Energy programs have been a great example of a conservation strategy that is also moving us toward greater use and appreciation of renewables (solar, wind, methane). Regionally, solar is proving to be most attractive for farm-to-farm applications. Wind seems to be more suited to utilities or large operations. Very simply, there is less space required for solar and it's scalable. You might begin with using solar to support a well pump, and then to support a workshop, or expand to have it powering an entire hog operation.

- All energy choices present localized opportunities and issues. Farmers will gravitate toward what is proven. Farmers are wary of vendors that over promise. Energy presents real input efficiency and cost containment possibilities and federal and state incentives help with the rate of adoption. Alternative energy choices and use requires greater awareness and confidence. Methane production is another opportunity, but the capitalization costs are considerable.

- There is a natural interest by producers to sell power back to the grid. One issue in selling power back to the grid is the interconnection agreements with utilities. With some utilities, it's 1:1 with sell price matching buyback price. With others, the buyback price by the utility is much less than the utility's sale price.

- There is a need to make sure producers know about and feel confident in their decisions regarding the advantages of energy efficiency programs. There are awareness issues and an ongoing need to ensure that operators/owners are educated about program opportunities and requirements. USDA's REAP program has proven popular for grants supporting solar. Unfortunately, Congressional funding of USDA and specifically REAP is not keeping up with the demand. Many are arguing that funding of this program needs to be increased.

- Another opportunity for landowners is lease payments for placement of solar and wind structures on private land.

- To achieve a true green economy and a reduction in greenhouse gases, there needs to be

active consideration of a carbon tax and a roll back to the recent weakening of relevant federal environmental regulations. Any form of taxation is unpopular. In order to even raise the issue of taxing carbon, you have to say where the money would go. Experts say proceeds should go to technology investigation and deployment and funding for the decommission of significant greenhouse gas emitters.

- Relative to technology deployment, there could be a robust network of electric vehicle Rapid Charging Stations along with facilities and trained technicians to care for electric vehicles. Deploying batteries and integrating them into electric systems to achieve the best results for their consumers is yet another challenge.

- Assistance to low income consumers is also a consideration and could be cash and/or real improvements to their dwellings.

- Regarding the case for Energy Source Conversion and the pluses and minuses. Solar cuts down the dependency on the grid. Early adaptors take on risk of being first. Today, the solar benefit-cost ratio is looking much better to producers.

- Solar is becoming bigger for individual farms. Wind is more a regional utility venture. Methane is capital expenditure intensive. Solar distribution centers are popping up, such as the Growmark distribution facility at Alfa, IL.

- Rural electric co-ops need to develop a new business model to better position them to work in the solar space and have a bigger role, like they have done with broadband. Solar is very scalable on the farm.

- Regarding energy solutions, the pricing structure of rural electric, metering, and 'net metering' are issues. Rural electric co-ops have an opportunity to adjust their business model to put themselves into selling-installing-servicing energy equipment, similar to how they got into broadband. From a producer's standpoint, being able to market power back to the grid needs to become less problematic.

- More and more, stories are circulating about operators/owners considering moving off the grid. With better storage batteries and better solar technology, more producers will move to solar. It's happening now. Whole operations are being converted. Fuel cells never caught on. Back up generation is an important consideration. Solar avoids line maintenance! Rural co-ops need to move into this space. There will be new roles for co-ops. Need to probe barriers and challenges to co-ops that could hinder farmers selling power to the co-op. Solar has several advantages to the producer, including low maintenance costs!

- Rounding out the discussion of alternative energy on the farm, large operations and utilities are taking wind power to the grid. Confined Animal Feeding Operations (CAFOs) are utilizing on-site manure digesters to capture methane. A good deal of liquid manure is being spread in lieu of commercial fertilizer. Solar is finding a scalable foothold on smaller operations.

- There is interest by electric co-ops in looking at "time of use" rates for irrigation, which flows the benefits of being 'off peak' to the consumer adopting the practice.

- More and more information is coming out regarding the value of 'micro grid' technology. Solar users need to consider their needs for batteries. Batteries can nearly double the cost of your system.

- Bigger solar facilities coming online may require utilities to make infrastructure upgrades and those costs will be passed to the project.

- There are billions of dollars of assets in coal plants; even those fully depreciated have some value to their owners. Those owned by public utilities, municipal systems and cooperatives will be likely fully financially supported by their consumers until their debt is extinguished. So, if you want to get coal plants out of operation, especially those with the worst emission characteristics, buy them out.

Specific to source water protection and retention, and in-the-field practices like cover cropping and end-of-field solutions, what practices do you think are proving most viable for producers and land managers?

- Regarding source water protection practices, in some places, there is still a love affair with the plow. But no-till and minimum-till translates to fewer passes through the field and that produces a time savings and cost savings reducing fuel and equipment hours. Every farm is different by soil type, slope, and drainage, so there isn't one practice that fits all. Something that works on slopped fields may not be practical on a flat field. It's all about the bottom line.

- A number of water conservation and source water protection practices have been identified and are being promoted, but it all gets down to finding those practices that work for your farm and a good part of that is driven by considerations like profitability and management intensity. Government investment is also crucial.

- Decisions on family farms are often made by committee. Trade-offs and the bottom line influence decisions. It is beneficial to have lots of tools and a big menu to pick from. Local conditions factor in. Landform is a driver. There needs to be a comprehensive 'whole farm' approach, as not one approach fits all fields. Additional economic data is always helpful. A past bad experience inhibits confidence in practices and sustained adoption.

- Producers need flexible opportunities, so decisions can be made farm to farm and acre to acre. A suite of practices is needed toward a whole farm approach, including infield and end of field measures such as 4R, cover cropping, and edge of field. Education and demonstration will be important to advance a whole farm cropping system approach.

- Prevalent accepted conservation practices include no-till, minimum-till, strip-till, and changing rotations, but it depends on the ground being considered. CRP and buffers along waterways have been successful. Cover cropping is really taking off. These practices represent operating costs, not revenue streams. Rotational grazing onto cover crops is helpful with margins. All these practices can prove themselves in stewarding soil health. Incentives that help with the economics will accelerate broader adoption.

- Across the span of conservation practices, cover cropping seems to be enjoying greater interest right now. Cover cropping enjoys a lower cost of entry and agronomically and

economically is perceived as providing a better return.

- Cover cropping needs to be more effectively incentivized. The economics in too many cases isn't there; it just doesn't pay for itself. There is still work to do in this area. No-till struggled to gain acceptance, but better equipment has proven it pays for itself. Many longer standing practices like buffer strips, grass waterways, terracing, retention ponds need to be reinvested in. Many retention ponds have silted in after years of use. We need to reinvest in our farm ponds and create additional storage capacity. Soil and Water Conservation Districts were de-funded and some went away. We need to reinvest in them. Erosion is still a significant issue and increased frequency of heavy rain events isn't helping.

- Another practice that we need to refocus on is source water retention. Source water protection is important, but so is source water retention and storm water management. We need to capture and hold water longer. We need to increase pond storage, reclaim old silted in retention ponds, and work with our friends in urban areas to improve storm water management. The frequency and intensity of rainfall over the last few years are testing the resiliency of our communities and farms.

- You have to be mindful of the bottom line when doing any conservation practices with the current shrinking margins. There are unresolved policy issues regarding stewardship objectives. For example, from a regulatory standpoint, you cannot get too close to the stream bank if you are applying manure fertilizer, but if you are applying granular commercial fertilizer you can, which doesn't make sense.

- There is little stakeholder concern regarding the adequacy of the water resource in the Illinois River Valley or the Mississippi River Valley. Supply, of course, has to be balanced with conservation, water quality interests, and best practices.

- Unlike the situation which existed only a few years ago, the rural water systems in this region generally have more than one supply source from the municipal water systems. Most/all of the water comes from wells in the two river valleys. The regulatory regimen for the water systems is not particularly severe or burdensome.

- Generally speaking, the municipal water systems have emergency backup electric generators because there is always the chance that electric supply to the wells is interrupted by events like tornadoes. There are, however, pockets where interruption of electric service would disrupt water flowing to a community, and the water supply could be in jeopardy for residential and commercial use and also for firefighting. All in all, the rural water systems in this region are a genuine success story of consumers working with the support of the federal government, and water service is generally available throughout the area.

- Water resources quality and availability should be seen as a compelling regional strength and opportunity asset in comparison with other water-stressed parts of the U.S. Good management practices overall and sound water management are important. It's not just irrigation; it's also drainage.

What do you see as key barriers to expanded adoption of best management practices? Risk, cost, lack of confidence, lack of information?

- One key barrier to adoption of best management practices is the bottom line. Some practices are demonstrating they are a good business practices and those will be the ones that are embraced. Particularly, when margins are shrinking, it is harder to support practices that don't generate a long-term or short-term value add to the operation. Every dollar counts!

- Culturally, many farmers were taught to produce. For some, it's why they are drawn to production. So, they are not driven by supply and demand equations. Farmers generally want to produce a better and bigger crop than they did last year.

- Profit is the incentive that impacts adoption of best management practices. Producers have financial obligations that have to be met first or they are out of business. Land payments, payroll, etc. have to be met.

- Trade-offs and unintended consequences have to be considered. For example, say you want to graze cattle on cover crops. Grazing causes a degree of compaction and compaction could reduce future crop yield 25-30 percent.

- During periods of squeezed margins, producers have to be acutely mindful of cost containment. Practices that can't stand up to economic or business practice scrutiny are not going to be embraced.

- Another obstacle to expanded adoption of best practices is the percentage of rental ground. It takes several years to get a return, which isn't attractive to tenant growers.

- For soil and water conservation practices, profitability and management intensity influence adoption. Another barrier could be lack of broadband, on the farm and in the field. Average age of current producers, closer to the end of their career than the beginning, could also present a barrier to aggressive adoption of new approaches. Another barrier is the inability to measure and validate outputs. We need more research on long-term economic and environmental benefits.

- The next wave of best practices expansion will likely involve winter cover crops that provide revenue, carbon sequestering, nitrogen management, water management, food traceability, Internet of Things, food loss/waste, and the age of farmers and succession planning. Rental ground and remote owners can also get in the way of adoption of best practices.

- Most producers are naturally tempered in their rush to adopt new technologies until they are satisfied that they have been proven. Networking and peer-to-peer interaction are important. We listen to those we trust and respect. Adoption requires facts and a leap of faith. New practices will be adopted as new practices were adopted in the past. There needs to be tested and proven benefits and organizational readiness to accept new practices.

- Influencers that affect the Ag Economy in turn affect farm profitability that in turn influence the adoption of best practices. As margins shrink, the willingness of operators to take on risk diminishes. Everything has to prove itself. Metrics and performance

measurement become more and more important.

What should we be doing to accelerate and expand the use of best practices and new technologies? Would an increased investment in education and extension make a difference? Do we need more research and demonstration to validate that practices work? Could Community Colleges have an expanded role?

- An incremental investment in producer education could stimulate earlier adoption of technology and best practices, but the effort has to be focused on practices that have proven themselves and are working.

- Trust is a big part of it. Do you trust what you are being told? Can you trust the practical knowledge of the government, the land grant extension, the farm advisors? The revenue or cost containment case for best practices has to be there and be compelling and believable.

- Measurement and validation are very important. Peer-to-peer interaction is very important. Sharing lessons learned coming from an unbiased, trusted source matters.

- Expanded awareness is always needed. We don't need to just educate producers either. We need to educate seed dealers, equipment manufacturers, everyone involved in agri-business. Best management practices and conservation practices are not profit centers, so they don't get the attention of other things.

- Extension seems to primarily focus their messaging on farmers. We need to test some old assumptions and retrofit a lot of programs. We need to reinvest in Illinois' Soil and Water Conservation Districts.

- It's not a matter of selling or simply teaching the technology, it's showing producers how to master the technology or practice and optimize its value on their farm.

- Community colleges (CCs) have a bigger role to play in rural areas, but they have to be nimble and committed to saying yes to new opportunities to add value.

- CCs could have a more impactful role in building and sustaining a better-equipped rural workforce. CCs could also have impact on furthering the adoption of best practices. Early adopters get it, but it will be a long on-ramp for the rest of us to get on board. CCs could be an effective local outreach mechanism to reach a larger bandwidth of producers.

- Adult education programming in CCs could be a difference-maker, but it has to be flexible, responsive, directed at rural issues, and strategic. Today, it seems like a lot of CCs attention is focused on students moving on to four-year institutions, perhaps at the expense of other audiences. CCs need to adopt a flexible 'hybrid approach.' Dual credit seems too focused on college prep at the expense of the career and technical education (CTE) platform. CTE jobs allow rural kids to stay at home and not leave the community. An estimated 40 percent of Perkins Funds for CTE programming goes to CCs already. The relationship and collaboration between CCs and high schools should be better than it is. CCs may be perceived as too strident in how they approach dual credit offerings.

- There is an acute need to reach young people at an earlier age. Frankly, trying to grab their attention in high school is too late for some kids.

- There are specific opportunities for education and training in the area of CCs to meet the needs of the electric industry, in addition to ongoing linemen training. There will also be an increasing need for technicians for the installation of solar systems and, in the coming years, with batteries interconnected with electric systems. Perhaps, those same technicians could install residential and commercial EV charging stations, and work with consumers to lower energy use and, thereby, lower carbon emissions. You can also anticipate a growing need for electrical engineers as grid complexity increases, and CCs could provide the first two years of a four-year engineering program.

Rural Workforce Challenges and Opportunities

Are we doing enough to recruit and train the next generation of producers and the ag workforce overall? What more is needed? What are we missing? Do we need to provide greater support to programs like FFA and 4-H? Are there other things our high schools and our community colleges could be doing?

- We need to pay greater attention to programs like FFA and 4-H. These programs need greater support and expanded participation in rural areas. We have a need for a skilled, trained rural workforce. There are jobs on and off the farm that could be filled, if we had qualified people ready and interested in moving into those jobs.

- We also need to be nimbler and more responsive to evolving training needs in rural areas. This area is ripe for better integration of effort and collaboration between high schools and CCs to promote and address technical skill sets.

- FFA and 4H need to fully account for the challenges in a modern rural society. Expansion of where and how these organizations can plug in is important on the mentorship front. Intern programs are also needed. High school freshmen need early experiences and parent support. We need to start earlier in middle school; exploratory courses should be mandated.

- We are not effectively reaching the next generation with a strong compelling rural message. We need to reveal new careers in agriculture and promote rural areas as great places to relocate. But, rural communities must possess what young people are looking for. Talent is looking for a vibrant community to live in and raise a family with affordable housing, affordable child care, good schools, and access to quality, affordable health care.

- A big hurdle for entry-level young farmers is the prohibitive capitalization needed to break in. Family farmers and next generation heirs are more likely to 'stay in.' 'Getting in' is the really tough part.

- There seems to be a growing trend in high school to point students toward college prep. For rural regions, this points out a big disconnect. We need more technicians on our farms. We need to make sure that high school students are more aware of CTE training opportunities. We need high schools and CCs to get this right. STEM has contributed to a further focus on four-year degrees. Next generation offerings in STEM need to create a bigger, more inclusive tent. It now comes at the expense of technical training, the skill trades, and CTE careers requiring only two-year degrees.

- A good number of CTE kids may need a push. CC reps need to be routinely in our high schools and that doesn't happen locally. High school is too late. Job readiness begins with kindergarten readiness. It all begins with child development and a child's well-being. We need to become child-centered communities.

- Regarding a new rural economy, rural jobs, and start-ups, it all could be framed as an effort to address rural population loss in Illinois by creating reason and opportunity for talent to stay and talent to relocate here. Incubating home business, promoting telework opportunities, and the new digital economy could be game changers for rural communities. Global markets are opening up to the small home business entrepreneur.

- Young people need to know there is more to agriculture than being a producer. We need to raise awareness of off-the-farm agriculture careers, as well as rural careers, overall. We have to look beyond current thinking. We need to embrace the opportunity for a new rural economy, supported by a skilled rural workforce.

- We support programs like the CEO programs, and students in that program receive community college credits for their participation. It's working and we need that. Call it workforce readiness if you like. People need to show up on time, have critical thinking skills, be able to work with others, be ready to work hard, and so on. We may be teaching young people to perform in school, rather than teaching them how to make a living.

- Today, you need trained people on the farm. The days of the minimally educated and skilled farmhand are over. We need fewer hands, but a smarter workforce. There are real career opportunities for skilled people. Fewer people have much greater responsibility and are commanding higher wages, particularly in areas like computer skills, reading and interpreting data, field monitoring, livestock monitoring and management.

Regarding jobs in rural Illinois and what is being called Illinois' green economy, what rural jobs and start-ups could have potential in your view?

- Regarding future jobs and a new rural economy for Illinois, it seems that agronomy-related and technology-related areas will produce opportunities for clustered gains and perhaps innovation.

- All jobs will be driven by outcomes they can effect/produce. On the farm monitoring, data management, and analytics is ramping up in its importance to profitability/cost containment. Training and recruitment are needed to produce an agile skilled workforce. Need to attract good people for technical support.

- There is a growing need for technicians to help users run and maintain all the systems they have on the farm. Larger businesses will have staff for this, but the farm's needs don't justify this, but a service or contractor would be very useful.

- Regarding rural job prospects in Illinois, it seems like there could be a number of opportunities that need pre-development assessment and business planning. It may be that many possibilities are not being addressed with a sense of urgency. Telework, data mining, drones, new ventures like hemp and pennycress, specialty processing, farm brand marketing, communications, robotics, and agro-tourism are a few examples.

- A number of opportunities exist, if we have a skilled work force. There is a need for mechanics/technicians to work on increasingly complex combines and trucks, particularly their electrical systems. 'Geek Squad' to provide tech support to farm operators is needed, including drone start-ups, GPS technicians, solar installers, and service start-ups.

- Unfortunately, the path to getting and using a Commercial Drivers Licenses is not valued, but agri-seed businesses need them. Additionally, there's the need for mechanics and for technicians to take care of all the systems in use in the business and on the seed farms.

- Start-ups and more innovation present niche opportunities and they are important. But, the technology we already have today should be producing more jobs. It's a matter of capacity. Manufacturers like Deere and Case could probably weigh in more, as part of the rural strategy, overall. Producers are getting older and succession planning offers a bridge to the future.

- The focus needs to be on existing businesses first. Software companies are a big opportunity area for new business development. But, initial focus should be on what is here first! How do we help existing rural business? How do we market and sell 'rural?'

- More innovation may be needed, but the first priority should be filling vacancies for skilled trades and workforce readiness to attract or build-out existing businesses and capacity. Rural areas need framers, plumbers, and electricians. There are legitimate telework opportunities in rural areas, particularly near airports for air travel to key meetings and engagements. Rural workforce could support and benefit from small manufacturing operations. The labor is here. A small operation of 10-15 employees could make a big difference in a small rural community.

- Here's an idea. Let's look at all of our institutions and how they are performing, our rural anchor businesses, the livability of our rural communities, and their marketing as relocation options, and look at performance, overall. On every front, in every sector, you hear stories that suggest we could be doing better. How do we measure performance on several fronts to make sure that our communities, our businesses, how we train our workforce, and how we attract talent are working to optimize success? Maybe innovation needs to start there.

- Farmers have a lot of skills. They make decisions daily based on the information they have. They are problem-solvers. How do we tap into that problem-solving DNA and utilize their thought leadership in an immediate and applied way to strengthen our rural communities?

How do you think we need to approach workforce opportunity and retaining talent in rural Illinois overall? How do we get young people to choose rural?

- Transformational leadership is needed to put rural areas on a new trajectory. A good deal of attention needs to be devoted to rural capacity-building to address problem-solving and to recognize current and future opportunities available to rural business and rural communities.

- The Rural Jobs Forecast is gloomy. Population trend forecasts are not favorable. Farms are consolidating, companies are consolidating, some public institutions are calling for a consolidation of services. When taken together, it can be perceived as a big wind down for the people that live there and for those that might otherwise be encouraged to invest there. In spite of this, a handful of rural regions and rural communities seem to be bucking the trend, pushing back and finding new ways to rebuild their economy and communities.

- We need to be doing a lot more to smartly promote the rural brand. We need to give young people a reason to stay or come back. We need to consider what they want and make our communities more attractive to relocators. We need aggressive ambitious plans and metrics to make sure that what we are doing to build better communities is actually working.

- You want rural kids to stick around. They need to see those ahead of them moving into good jobs, driving nice cars, and affording decent homes. We need to do a much better job of convincingly promoting the 'rural brand.' Working on the farm has to be viewed as a professional career. Skilled farm employees cannot be seen as unskilled hired hands.

- Keeping talent in rural Illinois is a matter of making rural Illinois a great, affordable place to live. We need to make infrastructure investments in rural Illinois and staff capacity to assist communities with assessment and guiding informed development of key activation projects, business start-up support and mentoring, and regional alignment. Every kid coming out of high school should have an opportunity. A "Cradle to Career" approach is indicated, where kindergarten readiness is just as important as workforce readiness. Every rural kid should have access to early childhood and access to quality experiences and instruction throughout their student careers that broaden their appreciation of opportunities to stay rural.

- Winning the next Toyota plant has trade-offs with incentives. On the other hand, helping five existing businesses explore new services or new markets that add another 12-15 well-paying jobs in a rural area could have broad immediate and lasting impact. Likewise, encouraging/incubating five new small locally-owned businesses, each employing 2-5 employees will have a long-term impact that shouldn't be underestimated when trolling for the next big deal.

- Choosing rural has to consider available and affordable housing, affordable health care, affordable child care, and affordable higher education costs. Talent and their spouses have to both be able to find work. We also need to return the vibrancy to our town centers and have amenities attractive to young families and services that enable our seniors to age in place.

- How do we rebuild/revitalize rural areas? Rural prosperity depends on aspiration. Young people need to see and hear that there is real and legitimate opportunity. They need to see models of success around them. We need to reach more young people and equip them with skills and self-confidence about the future. A big disconnect is a lack of capacity and resources in rural areas.

- Self-reliance can also work against you, if it keeps you from seeking and accepting help. Kids must have opportunities. Meritocracy is maybe creating separation. Educational

and economic aspirations shouldn't close off living in a rural community. We need attractive, welcoming rural communities, and we need to begin branding rural to a wider bandwidth. We also need to recognize what often brings people back to rural communities are their rural roots…family!

- Today, rural students need greater exposure to a wider array of opportunities and CCs need courseware to steer students to exciting possibilities that wouldn't occur to them. Opportunities exist in areas like ecosystem service markets, local and regional food systems, rural healthcare, telework, robotics, and the digital economy. There are also immediate opportunities due to truck driver shortage, welder shortage, EMTs, registered nurses, virtual care technicians, medical and nursing assistants, and the emerging need for robotics technicians.

- Smart investing in expanded CTE is warranted. Missouri offered an instructive model approach with their CTE regional career centers. In Illinois, the Effingham area is bringing forward a proposed Regional Career Academy. We need to examine how to more effectively use Federal Perkins CTE Act funding to promote CTE awareness, opportunities, and placement.

- AmeriCorps-YouthBuild is a federal, community-based, pre-apprenticeship program that provides job training and educational opportunities for at-risk youth ages 16-24, who have previously dropped out of high school, administered by the U.S. Department of Labor. Each year, more than 6,000 youth participate in approximately 21 YouthBuild programs in more than 40 states. YouthBuild is a career pathway program designed to prepare young adults to take the GED/High School Equivalency exam or complete their high school diploma, while gaining skills in areas like construction, information and technology.

- The AmeriCorps component of YouthBuild provides students with leadership opportunities, while earning money for education and developing an appreciation for citizenship through service-learning activities within the community. A student may begin their job transition with placement as a warehouse worker in the solar industry, continued training toward becoming a solar site assessor, and onto certification as a solar installer, and possibly continue on to earn a four-year engineering degree.

As we wrap up, across our three key topical areas of the agricultural economy, best practices, and the rural workforce, are there innovative demonstration projects or ideas that you would like to see advanced that you believe could be 'difference makers?'

- Problem-solving mechanisms for rural areas are a considerable part of the rural capacity building challenge. Transformational leadership is called for. Some areas will change and thrive, others may unfortunately whither and empty out.

- When considering building capacity for shaping rural solutions, agricultural innovation should flourish. Some areas will establish themselves as 'hubs' of agricultural-driven technology clusters. Rural communities need to be able to brand themselves around employment satisfaction and lifestyle satisfaction. Jobs aren't enough. Talent is looking for a great place to live.
- Innovation and problem-solving capacity are vital to the promotion of rural development. While scientific and technological changes in agriculture can contribute to the increase in productivity and cost containment efficiencies, their contributions are

incomplete without a directly proportional change in the larger rural systems they belong to and contribute.

- Regarding innovative projects, specialty processing comes to mind. Industrial hemp and light hogs, to name a couple. Agro-tourism is another opportunity sector. I also think we sorely under-optimize our relation with the river as an attraction and recreational asset. Asian Carp may have caused a safety issue for boaters, but there seems to be less recreational use of the river by recreational boaters.

- Telehealth and improving rural health are areas that could improve rural living.

- Given the urgent need to connect rural America, we need to consider establishing Rural Broadband Advisory Councils to ensure that rural communities have the correct information and capacity to evaluate various options in front of them, so that the best decisions can be made to keep rural areas competitive.

- We need to place well-being at the forefront of rural policy objectives across its multiple dimensions (social, environmental, and economic). We also need to take a place-based view of rural development that considers the different conditions and needs of communities, depending on their geographies and their local assets.

- Greater attention needs to be focused on marketing rural support to young families. The concept for birth to third-grade programs, combined with daycare center, could find traction. Parents' first impression of community institutions depends on early childhood/preschool.

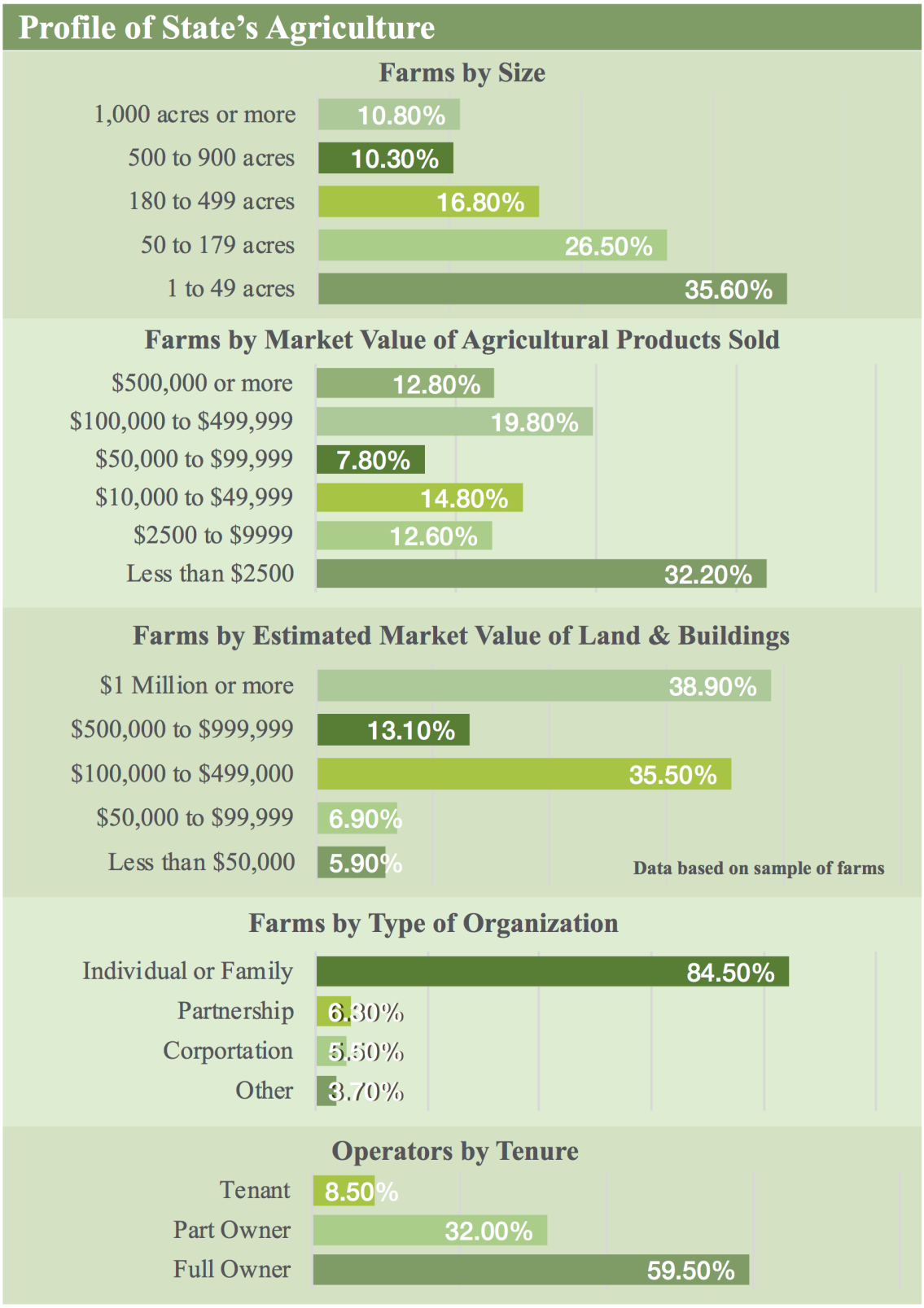
- Regarding innovation and demonstration, a number of agricultural and ag-related small business projects come to mind, including pennycress, industrial hemp, solar conversion projects, telehealth, farm operation tech support, water/soil management, precision ag training sessions, and help desk. Direct producer access to the river. University Extension 2.0 is needed.

- The community college system needs to quickly deploy and demonstrate the capacity to develop community assessment rapid engagement protocols to assess, analyze, and respond nimbly to local and regional workforce needs, with training and placement to meet the needs of small employers and shifting job openings and skill set requirement. For example, being able to flexibly come in and train 10 truck drivers this year, 10 welders next year, and 10 certified nurse's assistants the year after is important.

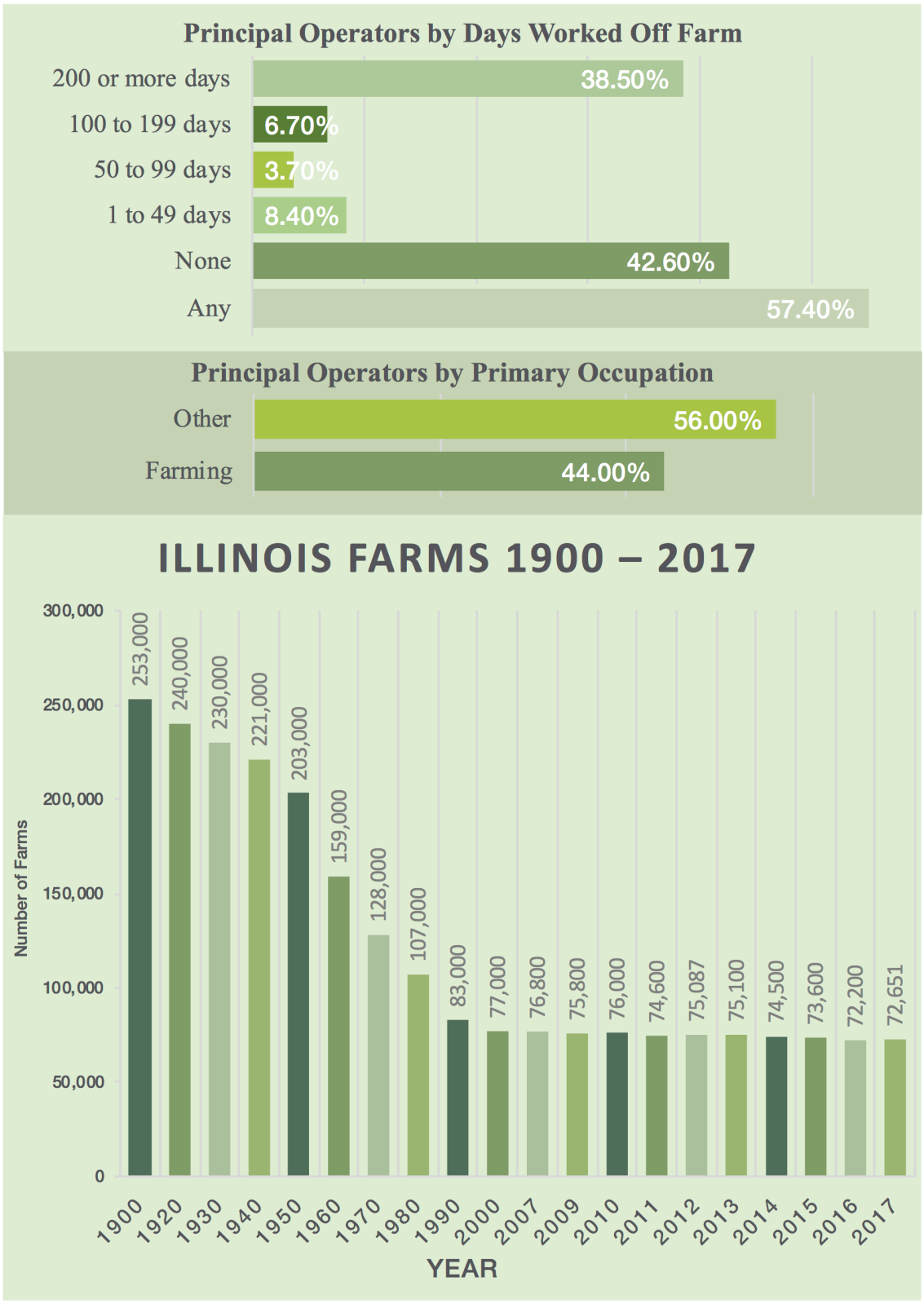
- Housing shortages are a key barrier to rural retention and recruitment. You may create an employment opportunity in a small town, but the employees may select to live in a larger community 30 miles away and commute in, to have greater access to services and amenities that the small community currently lacks. This is an issue regionally.

- Performance in the context of the innovation revolution in agriculture presents opportunities and perhaps barriers in its implications for rural redevelopment. Rural policies should mobilize assets and empower communities in order to enhance the social, economic, and environmental well-being of rural areas.

Appendix B.1: 2019 Illinois Farm Bureau State Agricultural Profile



Appendix B.1: 2019 Illinois Farm Bureau State Agricultural Profile (cont'd)

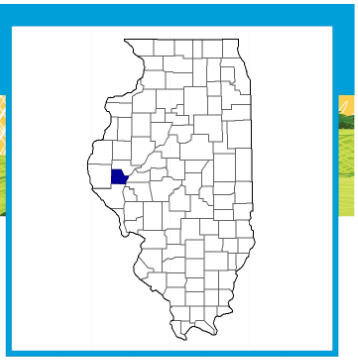


Source: US Census of Agriculture, 2017

Appendix B.2: 2017 USDA Census of Agriculture County Profiles

The following tables provide agricultural and economic data specific to each county located with the LIRV. Data provided is the most recent available from USDA Census of Agriculture conducted in 2017. Following the tables are some highlighted points from each of the Counties within the LIRV. Comparison data is provided from the 2012 Census of Agriculture.

2017 CENSUS OF AGRICULTURE *County Profile*



Brown County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	419	+1
Land in farms (acres)	141,657	+3
Average size of farm (acres)	338	+2
Total	($)	
Market value of products sold	49,839,000	+19
Government payments	3,224,000	+4
Farm-related income	3,794,000	-49
Total farm production expenses	46,226,000	+11
Net cash farm income	10,631,000	-3
Per farm average	($)	
Market value of products sold	118,947	+17
Government payments (average per farm receiving)	9,264	+8
Farm-related income	16,147	-49
Total farm production expenses	110,324	+9
Net cash farm income	25,373	-4

(Z) Percent of state agriculture sales

Share of Sales by Type (%)

Crops	79
Livestock, poultry, and products	21

Land in Farms by Use (%) [a]

Cropland	62
Pastureland	7
Woodland	25
Other	6

Acres irrigated: 160
(Z)% of land in farms

Land Use Practices (% of farms)

No till	28
Reduced till	26
Intensive till	12
Cover crop	8

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	179	43
$2,500 to $4,999	16	4
$5,000 to $9,999	39	9
$10,000 to $24,999	31	7
$25,000 to $49,999	37	9
$50,000 to $99,999	30	7
$100,000 or more	87	21

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	3	1
10 to 49 acres	103	25
50 to 179 acres	141	34
180 to 499 acres	94	22
500 to 999 acres	48	11
1,000 + acres	30	7

USDA United States Department of Agriculture
National Agricultural Statistics Service
www.nass.usda.gov/AgCensus

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Brown County
Illinois, 2017
Page 2

2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**49,839**	**90**	**102**	**1,753**	**3,077**
Crops	**39,153**	**92**	**102**	**1,250**	**3,073**
Grains, oilseeds, dry beans, dry peas	38,381	90	102	882	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	84	99	(D)	2,821
Fruits, tree nuts, berries	-	-	98	-	2,748
Nursery, greenhouse, floriculture, sod	-	-	93	-	2,601
Cultivated Christmas trees, short rotation woody crops	-	-	52	-	1,384
Other crops and hay	(D)	33	102	(D)	3,040
Livestock, poultry, and products	**10,686**	**68**	**102**	**2,067**	**3,073**
Poultry and eggs	(D)	86	101	(D)	3,007
Cattle and calves	2,612	69	102	2,038	3,055
Milk from cows	668	42	74	991	1,892
Hogs and pigs	7,322	57	99	424	2,856
Sheep, goats, wool, mohair, milk	(D)	81	102	2,296	2,984
Horses, ponies, mules, burros, donkeys	69	41	100	1,643	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	-	-	96	-	2,878

Total Producers [c]	685
Sex	
Male	487
Female	198
Age	
<35	43
35 – 64	389
65 and older	253
Race	
American Indian/Alaska Native	6
Asian	2
Black or African American	-
Native Hawaiian/Pacific Islander	-
White	671
More than one race	6
Other characteristics	
Hispanic, Latino, Spanish origin	4
With military service	76
New and beginning farmers	146

Percent of farms that:

Have internet access	**70**
Farm organically	**1**
Sell directly to consumers	**(Z)**
Hire farm labor	**18**
Are family farms	**90**

Top Crops in Acres [d]

Corn for grain	32,742
Soybeans for beans	32,347
Forage (hay/haylage), all	3,777
Wheat for grain, all	593
Corn for silage or greenchop	278

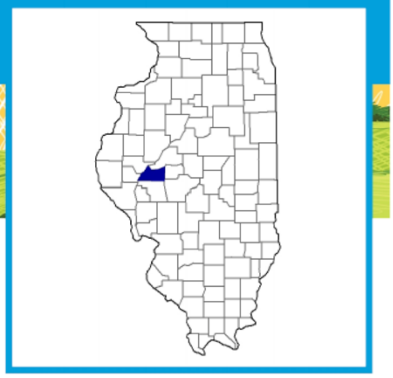
Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	36
Cattle and calves	6,123
Goats	(D)
Hogs and pigs	29,984
Horses and ponies	255
Layers	111
Pullets	-
Sheep and lambs	120
Turkeys	-

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm. [d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank. (D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*



Cass County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	429	-4
Land in farms (acres)	197,561	+8
Average size of farm (acres)	461	+12
Total	($)	
Market value of products sold	121,877,000	-1
Government payments	5,151,000	+33
Farm-related income	6,876,000	-21
Total farm production expenses	90,864,000	+5
Net cash farm income	43,040,000	-13
Per farm average	($)	
Market value of products sold	284,095	+2
Government payments (average per farm receiving)	14,230	+32
Farm-related income	31,541	-17
Total farm production expenses	211,804	+9
Net cash farm income	100,327	-10

1 Percent of state agriculture sales

Share of Sales by Type (%)

Crops	79
Livestock, poultry, and products	21

Land in Farms by Use (%) [a]

Cropland	86
Pastureland	3
Woodland	7
Other	4

Acres irrigated: 30,454
15% of land in farms

Land Use Practices (% of farms)

No till	35
Reduced till	26
Intensive till	19
Cover crop	14

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	154	36
$2,500 to $4,999	14	3
$5,000 to $9,999	31	7
$10,000 to $24,999	39	9
$25,000 to $49,999	26	6
$50,000 to $99,999	25	6
$100,000 or more	140	33

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	14	3
10 to 49 acres	111	26
50 to 179 acres	125	29
180 to 499 acres	71	17
500 to 999 acres	46	11
1,000 + acres	62	14

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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Cass County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**121,877**	**60**	**102**	**957**	**3,077**
Crops	**96,520**	**65**	**102**	**587**	**3,073**
Grains, oilseeds, dry beans, dry peas	95,746	62	102	408	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	191	47	99	1,291	2,821
Fruits, tree nuts, berries	(D)	89	98	(D)	2,748
Nursery, greenhouse, floriculture, sod	(D)	55	93	(D)	2,601
Cultivated Christmas trees, short rotation woody crops	120	7	52	244	1,384
Other crops and hay	(D)	(D)	102	(D)	3,040
Livestock, poultry, and products	**25,357**	**43**	**102**	**1,455**	**3,073**
Poultry and eggs	4	77	101	1,955	3,007
Cattle and calves	3,241	63	102	1,941	3,055
Milk from cows	-	-	74	-	1,892
Hogs and pigs	22,094	32	99	249	2,856
Sheep, goats, wool, mohair, milk	13	82	102	2,312	2,984
Horses, ponies, mules, burros, donkeys	(D)	87	100	(D)	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	(D)	72	96	(D)	2,878

Total Producers [c]	**693**
Sex	
Male	497
Female	196
Age	
<35	46
35 – 64	366
65 and older	281
Race	
American Indian/Alaska Native	-
Asian	-
Black or African American	-
Native Hawaiian/Pacific Islander	-
White	692
More than one race	1
Other characteristics	
Hispanic, Latino, Spanish origin	6
With military service	76
New and beginning farmers	163

Percent of farms that:

Have internet access	**74**
Farm organically	**(Z)**
Sell directly to consumers	**2**
Hire farm labor	**25**
Are family farms	**93**

Top Crops in Acres [d]

Corn for grain	86,133
Soybeans for beans	65,038
Forage (hay/haylage), all	2,953
Wheat for grain, all	1,500
Cultivated Christmas trees	307

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	(D)
Cattle and calves	4,641
Goats	193
Hogs and pigs	92,391
Horses and ponies	120
Layers	271
Pullets	54
Sheep and lambs	232
Turkeys	-

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm. [d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank. (D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*

Calhoun County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	474	-1
Land in farms (acres)	114,628	+31
Average size of farm (acres)	242	+32
Total	($)	
Market value of products sold	38,671,000	+63
Government payments	2,393,000	+17
Farm-related income	2,014,000	-64
Total farm production expenses	31,017,000	+28
Net cash farm income	12,061,000	+72
Per farm average	($)	
Market value of products sold	81,584	+65
Government payments (average per farm receiving)	7,362	+31
Farm-related income	9,547	-60
Total farm production expenses	65,437	+29
Net cash farm income	25,444	+74

(Z) Percent of state agriculture sales

Share of Sales by Type (%)

Crops	73
Livestock, poultry, and products	27

Land in Farms by Use (%) [a]

Cropland	60
Pastureland	9
Woodland	26
Other	5

Acres irrigated: (D)

(D)% of land in farms

Land Use Practices (% of farms)

No till	29
Reduced till	18
Intensive till	16
Cover crop	5

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	211	45
$2,500 to $4,999	37	8
$5,000 to $9,999	38	8
$10,000 to $24,999	57	12
$25,000 to $49,999	41	9
$50,000 to $99,999	25	5
$100,000 or more	65	14

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	35	7
10 to 49 acres	87	18
50 to 179 acres	208	44
180 to 499 acres	84	18
500 to 999 acres	35	7
1,000 + acres	25	5

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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Calhoun County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**38,671**	**95**	**102**	**1,982**	**3,077**
Crops	**28,146**	**95**	**102**	**1,455**	**3,073**
Grains, oilseeds, dry beans, dry peas	25,817	94	102	1,036	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	(D)	99	(D)	2,821
Fruits, tree nuts, berries	1,801	2	98	343	2,748
Nursery, greenhouse, floriculture, sod	(D)	53	93	(D)	2,601
Cultivated Christmas trees, short rotation woody crops	-	-	52	-	1,384
Other crops and hay	265	71	102	2,547	3,040
Livestock, poultry, and products	**10,525**	**69**	**102**	**2,076**	**3,073**
Poultry and eggs	7	68	101	1,845	3,007
Cattle and calves	1,873	72	102	2,193	3,055
Milk from cows	(D)	(D)	74	(D)	1,892
Hogs and pigs	8,532	53	99	404	2,856
Sheep, goats, wool, mohair, milk	(D)	89	102	(D)	2,984
Horses, ponies, mules, burros, donkeys	(D)	(D)	100	(D)	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	-	-	96	-	2,878

Total Producers [c]	**807**
Sex	
Male	553
Female	254
Age	
<35	33
35 – 64	443
65 and older	331
Race	
American Indian/Alaska Native	2
Asian	-
Black or African American	-
Native Hawaiian/Pacific Islander	-
White	805
More than one race	-
Other characteristics	
Hispanic, Latino, Spanish origin	1
With military service	117
New and beginning farmers	172

Percent of farms that:

Have internet access	64
Farm organically	-
Sell directly to consumers	4
Hire farm labor	20
Are family farms	95

Top Crops in Acres [d]

Soybeans for beans	27,490
Corn for grain	21,639
Forage (hay/haylage), all	3,355
Wheat for grain, all	1,514
Peaches, all	391

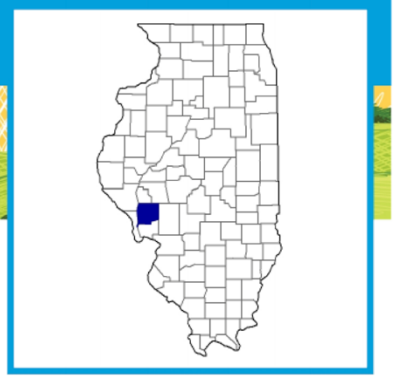
Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	-
Cattle and calves	4,523
Goats	(D)
Hogs and pigs	13,838
Horses and ponies	120
Layers	508
Pullets	-
Sheep and lambs	120
Turkeys	(D)

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm.
[d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank.
(D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*



Greene County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	733	+6
Land in farms (acres)	328,133	+13
Average size of farm (acres)	448	+6
Total	($)	
Market value of products sold	183,352,000	-2
Government payments	4,745,000	-21
Farm-related income	9,203,000	-25
Total farm production expenses	141,004,000	-6
Net cash farm income	56,296,000	+5
Per farm average	($)	
Market value of products sold	250,140	-7
Government payments (average per farm receiving)	8,902	-24
Farm-related income	21,809	-35
Total farm production expenses	192,366	-12
Net cash farm income	76,803	-2

1 Percent of state agriculture sales

Share of Sales by Type (%)

Crops	79
Livestock, poultry, and products	21

Land in Farms by Use (%) [a]

Cropland	79
Pastureland	6
Woodland	12
Other	4

Acres irrigated: 783
(Z)% of land in farms

Land Use Practices (% of farms)

No till	32
Reduced till	35
Intensive till	25
Cover crop	8

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	207	28
$2,500 to $4,999	37	5
$5,000 to $9,999	52	7
$10,000 to $24,999	81	11
$25,000 to $49,999	47	6
$50,000 to $99,999	55	8
$100,000 or more	254	35

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	62	8
10 to 49 acres	128	17
50 to 179 acres	211	29
180 to 499 acres	146	20
500 to 999 acres	82	11
1,000 + acres	104	14

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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Greene County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**183,352**	**39**	**102**	**596**	**3,077**
Crops	**144,226**	**42**	**102**	**322**	**3,073**
Grains, oilseeds, dry beans, dry peas	143,190	39	102	200	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	72	99	(D)	2,821
Fruits, tree nuts, berries	270	21	98	887	2,748
Nursery, greenhouse, floriculture, sod	(D)	(D)	93	(D)	2,601
Cultivated Christmas trees, short rotation woody crops	-	-	52	-	1,384
Other crops and hay	677	41	102	2,177	3,040
Livestock, poultry, and products	**39,126**	**32**	**102**	**1,129**	**3,073**
Poultry and eggs	6	70	101	1,863	3,007
Cattle and calves	(D)	(D)	102	(D)	3,055
Milk from cows	(D)	59	74	(D)	1,892
Hogs and pigs	(D)	19	99	(D)	2,856
Sheep, goats, wool, mohair, milk	24	71	102	2,126	2,984
Horses, ponies, mules, burros, donkeys	(D)	91	100	(D)	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	(Z)	77	96	1,776	2,878

Total Producers [c]	**1,240**
Sex	
Male	939
Female	301
Age	
<35	124
35 – 64	721
65 and older	395
Race	
American Indian/Alaska Native	1
Asian	1
Black or African American	6
Native Hawaiian/Pacific Islander	-
White	1,227
More than one race	5
Other characteristics	
Hispanic, Latino, Spanish origin	7
With military service	110
New and beginning farmers	350

Percent of farms that:

Have internet access	**77**
Farm organically	**1**
Sell directly to consumers	**1**
Hire farm labor	**26**
Are family farms	**94**

Top Crops in Acres [d]

Corn for grain	118,379
Soybeans for beans	110,905
Forage (hay/haylage), all	6,799
Wheat for grain, all	2,113
Corn for silage or greenchop	937

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	-
Cattle and calves	15,946
Goats	205
Hogs and pigs	(D)
Horses and ponies	166
Layers	530
Pullets	(D)
Sheep and lambs	(D)
Turkeys	-

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm.
[d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank.
(D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*

Jersey County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	519	+2
Land in farms (acres)	189,749	+22
Average size of farm (acres)	366	+20
Total	($)	
Market value of products sold	82,076,000	+19
Government payments	4,326,000	+67
Farm-related income	5,951,000	-39
Total farm production expenses	75,591,000	+16
Net cash farm income	16,761,000	+2
Per farm average	($)	
Market value of products sold	158,143	+16
Government payments (average per farm receiving)	12,912	+87
Farm-related income	20,663	-43
Total farm production expenses	145,648	+14
Net cash farm income	32,296	(Z)

(Z) Percent of state agriculture sales

Share of Sales by Type (%)

Crops	95
Livestock, poultry, and products	5

Land in Farms by Use (%) [a]

Cropland	80
Pastureland	4
Woodland	13
Other	3

Acres irrigated: 7
(Z)% of land in farms

Land Use Practices (% of farms)

No till	40
Reduced till	27
Intensive till	15
Cover crop	9

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	170	33
$2,500 to $4,999	34	7
$5,000 to $9,999	43	8
$10,000 to $24,999	57	11
$25,000 to $49,999	34	7
$50,000 to $99,999	28	5
$100,000 or more	153	29

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	53	10
10 to 49 acres	131	25
50 to 179 acres	130	25
180 to 499 acres	96	18
500 to 999 acres	61	12
1,000 + acres	48	9

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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Jersey County
Illinois, 2017
Page 2

2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**82,076**	**83**	**102**	**1,335**	**3,077**
Crops	**78,196**	**76**	**102**	**746**	**3,073**
Grains, oilseeds, dry beans, dry peas	76,417	73	102	524	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	(D)	99	(D)	2,821
Fruits, tree nuts, berries	(D)	13	98	(D)	2,748
Nursery, greenhouse, floriculture, sod	501	39	93	1,039	2,601
Cultivated Christmas trees, short rotation woody crops	7	20	52	557	1,384
Other crops and hay	587	48	102	2,247	3,040
Livestock, poultry, and products	**3,880**	**89**	**102**	**2,548**	**3,073**
Poultry and eggs	125	32	101	990	3,007
Cattle and calves	3,465	61	102	1,907	3,055
Milk from cows	(D)	52	74	(D)	1,892
Hogs and pigs	42	84	99	1,165	2,856
Sheep, goats, wool, mohair, milk	(D)	(D)	102	(D)	2,984
Horses, ponies, mules, burros, donkeys	39	55	100	1,915	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	12	53	96	1,458	2,878

Total Producers [c]	**857**
Sex	
Male	631
Female	226
Age	
<35	76
35 – 64	516
65 and older	265
Race	
American Indian/Alaska Native	-
Asian	1
Black or African American	-
Native Hawaiian/Pacific Islander	-
White	855
More than one race	1
Other characteristics	
Hispanic, Latino, Spanish origin	12
With military service	94
New and beginning farmers	222

Percent of farms that:

Have internet access	**75**
Farm organically	**-**
Sell directly to consumers	**4**
Hire farm labor	**23**
Are family farms	**94**

Top Crops in Acres [d]

Corn for grain	75,359
Soybeans for beans	62,131
Forage (hay/haylage), all	4,010
Wheat for grain, all	639
Corn for silage or greenchop	183

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	(D)
Cattle and calves	7,099
Goats	108
Hogs and pigs	286
Horses and ponies	499
Layers	1,815
Pullets	248
Sheep and lambs	502
Turkeys	29

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm.
[d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank.
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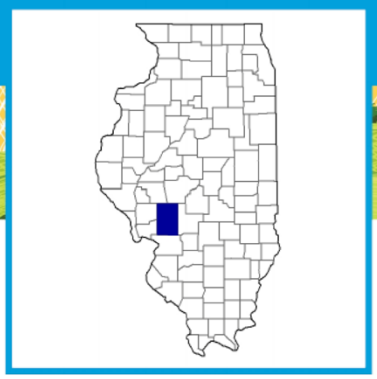
Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*



Macoupin County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	1,169	-2
Land in farms (acres)	420,688	-4
Average size of farm (acres)	360	-2
Total	($)	
Market value of products sold	236,494,000	+7
Government payments	4,907,000	-42
Farm-related income	12,517,000	-65
Total farm production expenses	193,251,000	-9
Net cash farm income	60,668,000	+15
Per farm average	($)	
Market value of products sold	202,305	+9
Government payments (average per farm receiving)	6,614	-26
Farm-related income	19,467	-61
Total farm production expenses	165,313	-8
Net cash farm income	51,897	+17

1 Percent of state agriculture sales

Share of Sales by Type (%)

Crops	83
Livestock, poultry, and products	17

Land in Farms by Use (%) [a]

Cropland	84
Pastureland	4
Woodland	8
Other	3

Acres irrigated: 31
(Z)% of land in farms

Land Use Practices (% of farms)

No till	31
Reduced till	26
Intensive till	32
Cover crop	10

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	362	31
$2,500 to $4,999	80	7
$5,000 to $9,999	87	7
$10,000 to $24,999	100	9
$25,000 to $49,999	72	6
$50,000 to $99,999	94	8
$100,000 or more	374	32

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	110	9
10 to 49 acres	261	22
50 to 179 acres	334	29
180 to 499 acres	217	19
500 to 999 acres	131	11
1,000 + acres	116	10

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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Macoupin County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**236,494**	**24**	**102**	**392**	**3,077**
Crops	**195,398**	**22**	**102**	**139**	**3,073**
Grains, oilseeds, dry beans, dry peas	193,658	19	102	57	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	63	99	1,715	2,821
Fruits, tree nuts, berries	429	14	98	708	2,748
Nursery, greenhouse, floriculture, sod	383	44	93	1,120	2,601
Cultivated Christmas trees, short rotation woody crops	(D)	24	52	(D)	1,384
Other crops and hay	862	27	102	2,001	3,040
Livestock, poultry, and products	**41,096**	**30**	**102**	**1,091**	**3,073**
Poultry and eggs	68	37	101	1,145	3,007
Cattle and calves	13,449	19	102	1,055	3,055
Milk from cows	5,961	16	74	561	1,892
Hogs and pigs	21,456	33	99	255	2,856
Sheep, goats, wool, mohair, milk	68	45	102	1,528	2,984
Horses, ponies, mules, burros, donkeys	(D)	44	100	(D)	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	(D)	41	96	1,170	2,878

Total Producers [c]	**1,814**
Sex	
Male	1,322
Female	492
Age	
<35	158
35 – 64	1,061
65 and older	595
Race	
American Indian/Alaska Native	1
Asian	6
Black or African American	3
Native Hawaiian/Pacific Islander	-
White	1,796
More than one race	8
Other characteristics	
Hispanic, Latino, Spanish origin	15
With military service	195
New and beginning farmers	396

Percent of farms that:

Have internet access	75
Farm organically	(Z)
Sell directly to consumers	3
Hire farm labor	21
Are family farms	95

Top Crops in Acres [d]

Corn for grain	164,851
Soybeans for beans	152,808
Forage (hay/haylage), all	8,090
Wheat for grain, all	5,868
Corn for silage or greenchop	2,866

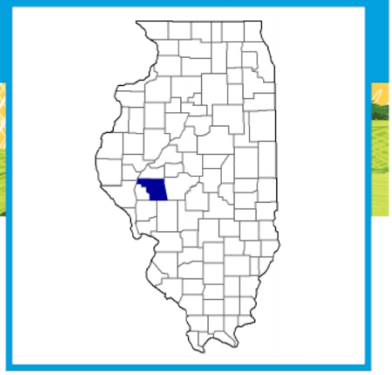
Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	101
Cattle and calves	20,321
Goats	376
Hogs and pigs	40,756
Horses and ponies	298
Layers	2,185
Pullets	164
Sheep and lambs	514
Turkeys	(D)

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm. [d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank. (D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*



Morgan County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	693	-8
Land in farms (acres)	300,265	-3
Average size of farm (acres)	433	+6
Total	($)	
Market value of products sold	172,017,000	-15
Government payments	4,846,000	-17
Farm-related income	8,169,000	-57
Total farm production expenses	128,135,000	-13
Net cash farm income	56,897,000	-29
Per farm average	($)	
Market value of products sold	248,220	-7
Government payments (average per farm receiving)	9,231	-7
Farm-related income	22,139	-52
Total farm production expenses	184,899	-5
Net cash farm income	82,103	-22

1 Percent of state agriculture sales

Share of Sales by Type (%)

Crops	89
Livestock, poultry, and products	11

Land in Farms by Use (%) [a]

Cropland	88
Pastureland	4
Woodland	5
Other	3

Acres irrigated: 7,673
3% of land in farms

Land Use Practices (% of farms)

No till	40
Reduced till	33
Intensive till	22
Cover crop	14

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	171	25
$2,500 to $4,999	34	5
$5,000 to $9,999	53	8
$10,000 to $24,999	68	10
$25,000 to $49,999	49	7
$50,000 to $99,999	57	8
$100,000 or more	261	38

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	35	5
10 to 49 acres	166	24
50 to 179 acres	186	27
180 to 499 acres	128	18
500 to 999 acres	86	12
1,000 + acres	92	13

USDA United States Department of Agriculture
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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Morgan County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**172,017**	**43**	**102**	**645**	**3,077**
Crops	**152,303**	**38**	**102**	**289**	**3,073**
Grains, oilseeds, dry beans, dry peas	151,642	35	102	170	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	62	99	(D)	2,821
Fruits, tree nuts, berries	83	41	98	1,359	2,748
Nursery, greenhouse, floriculture, sod	(D)	64	93	(D)	2,601
Cultivated Christmas trees, short rotation woody crops	-	-	52	-	1,384
Other crops and hay	492	56	102	2,333	3,040
Livestock, poultry, and products	**19,714**	**51**	**102**	**1,651**	**3,073**
Poultry and eggs	85	35	101	1,094	3,007
Cattle and calves	7,274	33	102	1,449	3,055
Milk from cows	584	45	74	1,004	1,892
Hogs and pigs	11,682	46	99	347	2,856
Sheep, goats, wool, mohair, milk	16	77	102	2,267	2,984
Horses, ponies, mules, burros, donkeys	64	42	100	1,674	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	10	56	96	1,502	2,878

Total Producers [c]	**1,132**
Sex	
Male	837
Female	295
Age	
<35	93
35 – 64	626
65 and older	413
Race	
American Indian/Alaska Native	-
Asian	2
Black or African American	-
Native Hawaiian/Pacific Islander	3
White	1,118
More than one race	9
Other characteristics	
Hispanic, Latino, Spanish origin	4
With military service	154
New and beginning farmers	282

Percent of farms that:

Have internet access	**82**
Farm organically	**2**
Sell directly to consumers	**3**
Hire farm labor	**25**
Are family farms	**94**

Top Crops in Acres [d]

Corn for grain	131,605
Soybeans for beans	113,428
Forage (hay/haylage), all	5,109
Wheat for grain, all	740
Corn for silage or greenchop	260

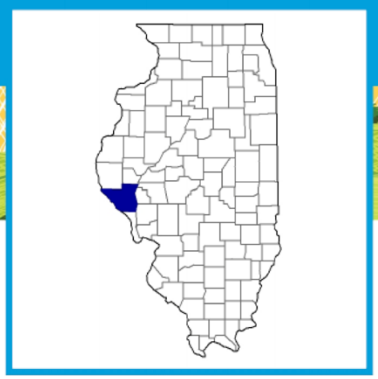
Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	168
Cattle and calves	10,300
Goats	342
Hogs and pigs	28,214
Horses and ponies	382
Layers	774
Pullets	114
Sheep and lambs	140
Turkeys	(D)

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm. [d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank. (D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*



Pike County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	956	-1
Land in farms (acres)	447,007	+9
Average size of farm (acres)	468	+10
Total	($)	
Market value of products sold	278,870,000	+20
Government payments	5,868,000	-35
Farm-related income	11,978,000	-42
Total farm production expenses	224,063,000	+19
Net cash farm income	72,653,000	-1
Per farm average	($)	
Market value of products sold	291,705	+22
Government payments (average per farm receiving)	8,253	-30
Farm-related income	22,388	-41
Total farm production expenses	234,375	+21
Net cash farm income	75,997	+1

2 Percent of state agriculture sales

Share of Sales by Type (%)

Crops	65
Livestock, poultry, and products	35

Land in Farms by Use (%) [a]

Cropland	77
Pastureland	5
Woodland	14
Other	5

Acres irrigated: 3,149
1% of land in farms

Land Use Practices (% of farms)

No till	32
Reduced till	33
Intensive till	19
Cover crop	10

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	300	31
$2,500 to $4,999	53	6
$5,000 to $9,999	73	8
$10,000 to $24,999	67	7
$25,000 to $49,999	87	9
$50,000 to $99,999	68	7
$100,000 or more	308	32

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	58	6
10 to 49 acres	178	19
50 to 179 acres	281	29
180 to 499 acres	190	20
500 to 999 acres	104	11
1,000 + acres	145	15

USDA **United States Department of Agriculture**
National Agricultural Statistics Service
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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Pike County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**278,870**	**16**	**102**	**296**	**3,077**
Crops	**180,572**	**25**	**102**	**189**	**3,073**
Grains, oilseeds, dry beans, dry peas	170,210	27	102	116	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	(D)	99	(D)	2,821
Fruits, tree nuts, berries	(D)	(D)	98	(D)	2,748
Nursery, greenhouse, floriculture, sod	(D)	13	93	(D)	2,601
Cultivated Christmas trees, short rotation woody crops	-	-	52	-	1,384
Other crops and hay	1,322	12	102	1,618	3,040
Livestock, poultry, and products	**98,298**	**4**	**102**	**523**	**3,073**
Poultry and eggs	(D)	(D)	101	(D)	3,007
Cattle and calves	7,057	36	102	1,473	3,055
Milk from cows	(D)	(D)	74	(D)	1,892
Hogs and pigs	90,903	2	99	68	2,856
Sheep, goats, wool, mohair, milk	115	32	102	1,169	2,984
Horses, ponies, mules, burros, donkeys	57	47	100	1,736	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	(D)	(D)	96	(D)	2,878

Total Producers [c]	**1,527**
Sex	
Male	1,088
Female	439
Age	
<35	107
35 – 64	857
65 and older	563
Race	
American Indian/Alaska Native	6
Asian	6
Black or African American	-
Native Hawaiian/Pacific Islander	-
White	1,508
More than one race	7
Other characteristics	
Hispanic, Latino, Spanish origin	10
With military service	144
New and beginning farmers	314

Percent of farms that:

Have internet access	72
Farm organically	-
Sell directly to consumers	2
Hire farm labor	31
Are family farms	93

Top Crops in Acres [d]

Corn for grain	160,812
Soybeans for beans	128,713
Forage (hay/haylage), all	10,340
Wheat for grain, all	3,108
Corn for silage or greenchop	485

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	112
Cattle and calves	17,584
Goats	448
Hogs and pigs	296,213
Horses and ponies	323
Layers	795
Pullets	-
Sheep and lambs	181
Turkeys	(D)

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
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[d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank.
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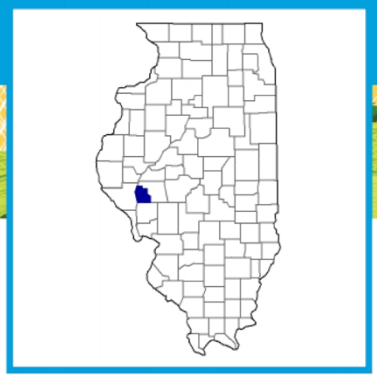
Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

2017 CENSUS OF AGRICULTURE *County Profile*



Scott County
Illinois

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	300	-16
Land in farms (acres)	155,444	+5
Average size of farm (acres)	518	+25
Total	($)	
Market value of products sold	84,659,000	-5
Government payments	1,621,000	-44
Farm-related income	2,457,000	-50
Total farm production expenses	57,226,000	+4
Net cash farm income	31,512,000	-25
Per farm average	($)	
Market value of products sold	282,197	+13
Government payments (average per farm receiving)	8,273	-19
Farm-related income	14,983	-45
Total farm production expenses	190,752	+23
Net cash farm income	105,041	-10

(Z) Percent of state agriculture sales

Share of Sales by Type (%)

Crops	82
Livestock, poultry, and products	18

Land in Farms by Use (%) [a]

Cropland	85
Pastureland	5
Woodland	6
Other	4

Acres irrigated: 6,300
4% of land in farms

Land Use Practices (% of farms)

No till	45
Reduced till	25
Intensive till	24
Cover crop	7

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	84	28
$2,500 to $4,999	13	4
$5,000 to $9,999	19	6
$10,000 to $24,999	34	11
$25,000 to $49,999	22	7
$50,000 to $99,999	23	8
$100,000 or more	105	35

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	14	5
10 to 49 acres	61	20
50 to 179 acres	91	30
180 to 499 acres	55	18
500 to 999 acres	34	11
1,000 + acres	45	15

USDA United States Department of Agriculture
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Appendix B.2: 2017 USDA Census of Agriculture County Profiles (cont'd)

Scott County
Illinois, 2017
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2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**84,659**	**81**	**102**	**1,310**	**3,077**
Crops	**69,411**	**80**	**102**	**847**	**3,073**
Grains, oilseeds, dry beans, dry peas	69,253	79	102	586	2,916
Tobacco	-	-	2	-	323
Cotton and cottonseed	-	-	-	-	647
Vegetables, melons, potatoes, sweet potatoes	(D)	85	99	(D)	2,821
Fruits, tree nuts, berries	(Z)	92	98	1,901	2,748
Nursery, greenhouse, floriculture, sod	(D)	69	93	(D)	2,601
Cultivated Christmas trees, short rotation woody crops	-	-	52	-	1,384
Other crops and hay	(D)	81	102	(D)	3,040
Livestock, poultry, and products	**15,248**	**60**	**102**	**1,845**	**3,073**
Poultry and eggs	(D)	(D)	101	(D)	3,007
Cattle and calves	3,555	60	102	1,895	3,055
Milk from cows	(D)	(D)	74	(D)	1,892
Hogs and pigs	(D)	48	99	(D)	2,856
Sheep, goats, wool, mohair, milk	18	75	102	2,223	2,984
Horses, ponies, mules, burros, donkeys	(D)	(D)	100	(D)	2,970
Aquaculture	-	-	18	-	1,251
Other animals and animal products	-	-	96	-	2,878

Total Producers [c]	**488**
Sex	
Male	362
Female	126
Age	
<35	16
35 – 64	307
65 and older	165
Race	
American Indian/Alaska Native	-
Asian	-
Black or African American	-
Native Hawaiian/Pacific Islander	-
White	487
More than one race	1
Other characteristics	
Hispanic, Latino, Spanish origin	6
With military service	49
New and beginning farmers	127

Percent of farms that:

Have internet access	**71**
Farm organically	**-**
Sell directly to consumers	**1**
Hire farm labor	**25**
Are family farms	**89**

Top Crops in Acres [d]

Corn for grain	60,497
Soybeans for beans	58,228
Forage (hay/haylage), all	2,259
Wheat for grain, all	372
Corn for silage or greenchop	246

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	(D)
Cattle and calves	6,959
Goats	22
Hogs and pigs	13,170
Horses and ponies	50
Layers	248
Pullets	(D)
Sheep and lambs	131
Turkeys	-

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[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm. [d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank.
(D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

Appendix B.3: 2019 National Association of Counties Economic Profiles

LIRV County Economic Output Overview				
County	**County Economic Production**	**Short-Term Production Change**	**Long-Term Production Change**	**Per-Capita Economic Output**
Brown County	**$403.3 Million**	0.00%	**59.00%**	$61,521
Top Three Industries:	1. Real Estate & Rental and Leasing: **$253.6 Million** 2. Government & Government Enterprises: **$146.0 Million** 3. Wholesale Trade: **$127.9 Million**			
Calhoun County	**$109.3 Million**	8.30%	**4.50%**	$22,755
Top Three Industries:	1. Real Estate & Rental and Leasing: **$28.4 Million** 2. Professional & Business Services: **$23.1 Million** 3. Government & Government Enterprises: **$14.9 Million**			
Cass County	**$638.4 Million**	2.60%	**20.80%**	$52,071
Top Three Industries:	1. Real Estate & Rental and Leasing: **$68.3 Million** 2. Government & Government Enterprises: **$47.2 Million** 3. Professional & Business Services: **$41.6 Million**			
Greene County	**$377.1 Million**	8.30%	**19.70%**	$28,909
Top Three Industries:	1. Agriculture, Forestry, Fishing & Hunting: **$146.1 Million** 2. Government & Government Enterprises: **$41.5 Million** 3. Wholesale Trade: **$29.4 Million**			
Jersey County	**$502.1 Million**	1.80%	**22.10%**	$22,983
Top Three Industries:	1. Real Estate & Rental and Leasing: **$103.5 Million** 2. Government & Government Enterprises: **$82.6 Million** 3. Educational Services, Health Care & Social Assistance: **$50.9 Million**			
Morgan County	**$1.4 Billion**	5.90%	**9.20%**	$42,556
Top Three Industries:	1. Manufacturing: **$300.3 Million** 2. Real Estate & Rental and Leasing: **$203.1 Million** 3. Agriculture, Forestry, Fishing & Hunting: **$163.7 Million**			
Macoupin County	**$1.2 Billion**	6.10%	**-1.50%**	$25,668
Top Three Industries:	1. Real Estate & Rental and Leasing: **$253.6 Million** 2. Government & Government Enterprises: **$146.0 Million** 3. Wholesale Trade: **$127.9 Million**			
Pike County	**$623.8 Million**	1.70%	**48.60%**	$39,957
Top Three Industries:	1. Agriculture, Forestry, Fishing & Hunting: **$218.3 Million** 2. Real Estate & Rental and Leasing: **$114.6 Million** 3. Government & Government Enterprises: **$58.0 Million**			
Scott County	**$190.0 Million**	14.20%	**23.50%**	$38,561
Top Three Industries:	1. Professional & Business Services: **$23.6 Million** 2. Government & Government Enterprises: **$17.0 Million** 3. Utilities: **$6.7 Million**			

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

BROWN COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
6,578	-5.20%	2,896	2.7%	$35,166
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
2,087	39	4,220	$45,909	$55,327
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
14.8	14.8	-0.50%	18.60%	28.20%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
0	10	5	56	56

Educational Attainment in 2018	High School Diploma or More; Percent of Adults 25+ (2018): **84.30%** Bachelor's Degree or More; Percent of Adults 25+ (2018): **13.70%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
4,994	163	623	1,838	1,195	490	506	179

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	275	771	635	2,256	1,789	949

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	6	37	1,364	66	6,389	286

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	4,933	39	286	205	0	42

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	2,896	10.80%	-18.10%	2,818	14.90%	-17.20%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
78	-51.60%	-41.40%	2.7	-56.50%	-28.90%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

CALHOUN COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
4,739	-6.90%	2,340	5.3	$42,511
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
1,805	46.7	779	$26,038	$56,099
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
11	15.3	0.00%	1.50%	-9.60%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
-17	-74	1	39	56

Educational Attainment in 2018	
	High School Diploma or More; Percent of Adults 25+ (2018): **90.60%** Bachelor's Degree or More; Percent of Adults 25+ (2018): **13.60%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
3,499	140	188	1,527	797	370	266	211

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	254	765	340	964	1,422	1,113

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	1	41	17	56	4,801	57

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	4,711	0	57	51	0	6

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	2,340	-3.10%	-9.20%	2,215	1,70%	-7.40%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
125	-47.30%	-32.80%	5.3	-45.90%	-26.40%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

CASS COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
12,147	-11.00%	6,162	4.5	$42,649
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
5,024	39.7	5,512	$35,907	$52,486
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
12	15.8	0.00%	1.50%	-9.60%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
37	-247	44	167	130

Educational Attainment in 2018	
	High School Diploma or More; Percent of Adults 25+ (2018): **84.00%** Bachelor's Degree or More; Percent of Adults 25+ (2018): **14.60%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
8,617	443	936	3,722	1,724	530	888	374

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	820	2,234	994	3,132	3,366	2,119

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	17	37	590	150	10,291	2,374

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	9,622	196	2,374	1,932	74	172

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	6,162	-4.50%	-19.00%	5,885	0.30%	-18.40%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
277	-52.80%	-30.80%	4.5	-50.50%	-15.10%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

GREENE COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
12,969	-6.60%	6,015	5.3	$36,912
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
5,005	42.9	2,341	$31,326	$47,314
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
13.9	19.9	-5.90%	-9.50%	-16.70%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
-22	-76	1	131	153

Educational Attainment in 2018	High School Diploma or More; Percent of Adults 25+ (2018): **87.90%** Bachelor's Degree or More; Percent of Adults 25+ (2018): **12.40%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
9,399	338	801	4,170	2,109	812	824	345

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	660	2,121	1,038	3,103	3,812	2,484

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	40	25	194	139	13,132	86

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	12,746	26	86	57	3	0

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	6,015	-4.80%	-13.40%	5,720	-0.90%	-12.40%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
125	-46.00%	-28.90%	4.9	-43.00%	-18.30%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

JERSEY COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
21,773	-5.30%	11,007	4.9	$41,522
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
8,665	42.7	5,095	$33,664	$59,117
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
8.9	13.6	6.40%	11.90%	11.90%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
-23	-18	20	211	234

Educational Attainment in 2018	
	High School Diploma or More; Percent of Adults 25+ (2018): **91.70%**
	Bachelor's Degree or More; Percent of Adults 25+ (2018): **20.50%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
15,259	429	835	5,719	3,266	1,889	2,001	1,120

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	1,032	3,599	2,179	4,839	6,311	4,109

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	23	47	105	513	21,767	302

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	21,162	103	302	156	0	43

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	11,007	-1.30%	-6.60%	10,473	3.20%	-5.20%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
534	-46.50%	-28.30%	4.9	-45.60%	-22.20%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

MACOUPIN COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
44,926	-5.90%	18,772	4.9	$41,607

Households (2018)	Median Age (2019)	Covered Employment (2018)	Average Wage per Job (2018)	Median Household Income (2018)
18,772	43.6	10,467	$35,978	$53,409

Poverty Rate (2018)	Poverty Rate for Children under 18 (2018)	Population Change (2000 to 2010)	Population Change (1990 to 2000)	Population Change (1980 to 1990)
12.9	19.3	-2.40%	0.20%	-3.30%

Natural Increase (births minus deaths)	Net Domestic Migration	Net International Migration	Births	Deaths
-114	-282	3	447	561

Educational Attainment in 2018	
	High School Diploma or More; Percent of Adults 25+ (2018): **91.00%** Bachelor's Degree or More; Percent of Adults 25+ (2018): **19.40%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
32,343	782	2,120	12,488	7,856	2,835	4,257	2,005

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	2,272	7,521	3,583	10,438	13,149	8,756

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	82	213	422	608	45,183	536

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	43,966	145	536	320	0	71

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	23,066	-1.70%	-6.10%	21,934	3.20%	-3.60%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
1,132	-49.00%	-37.60%	4.9	-48.40%	-33.80%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

MORGAN COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
33,658	-5.30%	16,309	4.4	$41,359
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
13,864	41.5	13,924	$40,692	$48,876
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
15.2	23.1	-3.00%	-2.40%	-5.20%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
-36	-377	44	355	391

Educational Attainment in 2018	
	High School Diploma or More; Percent of Adults 25+ (2018): **91.70%**
	Bachelor's Degree or More; Percent of Adults 25+ (2018): **19.90%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
24,001	500	1,491	9,760	5,676	1,792	3,309	1,473

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	1,775	4,795	3,855	8,281	9,068	6,652

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	73	261	2,369	603	33,610	816

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	30,467	166	816	535	22	93

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	16,309	-6.30%	-9.10%	15,590	-2.80%	-7.50%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
719	-47.30%	-33.70%	4.4	-43.60%	-26.70%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

PIKE COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
15,561	-5.30%	7,256	4.8	$42,768
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
6,527	42.3	4,047	$34,357	$47,815
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
14.1	19.6	-4.90%	-6.40%	-13.10%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
18	-50	-1	194	176

Educational Attainment in 2018	High School Diploma or More; Percent of Adults 25+ (2018): **88.70%** Bachelor's Degree or More; Percent of Adults 25+ (2018): **15.10%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
11,006	360	885	4,537	2,644	914	1,186	480

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	961	2,583	1,204	3,524	4,288	3,194

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	43	43	243	140	15,559	195

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	15,097	15	195	150	0	30

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	7,256	-5.70%	-15.00%	6,907	-2.90%	-14.20%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
349	-39.60%	-29.10%	4.8	-36.00%	-17.20%

Appendix B.3: 2019 National Association of Counties Economic Profiles (Cont'd)

SCOTT COUNTY

Population (2019)	Population Growth or Decline (2010 – 2019)	Labor Force (persons) (2018)	Unemployment Rate (2018)	Per Capita Personal Income (2018)
4,951	-7.50%	2,481	5.4	$42,720
Households (2018)	**Median Age (2019)**	**Covered Employment (2018)**	**Average Wage per Job (2018)**	**Median Household Income (2018)**
1,959	44.1	973	$36,535	$55,198
Poverty Rate (2018)	**Poverty Rate for Children under 18 (2018)**	**Population Change (2000 to 2010)**	**Population Change (1990 to 2000)**	**Population Change (1980 to 1990)**
10.3	15	-3.40%	-5.00%	-12.80%
Natural Increase (births minus deaths)	**Net Domestic Migration**	**Net International Migration**	**Births**	**Deaths**
-4	21	6	43	47

Educational Attainment in 2018

High School Diploma or More; Percent of Adults 25+ (2018): **92.60%**
Bachelor's Degree or More; Percent of Adults 25+ (2018): **15.00%**

Total Population (25 and Older)	Less than 9th Grade	9th to 12th (No Diploma)	High School Graduate (includes equivalency)	Some College (No Degree)	Associate Degree	Bachelor's Degree	Graduate, Professional or Doctorate Degree
3,559	91	171	1,732	721	310	371	163

Population Estimates by Age in 2019	Preschool (0 to 4)	School Age (5 to 17)	College Age (18 to 24)	Young Adult (25 to 44)	Older Adult (45 to 64)	Senior (65 plus)
	245	885	358	1,092	1,490	977

Population Estimates By Race and Hispanic Origin in 2019	American Indian or Alaskan Native (Alone)	Asian (Alone)	Black (Alone)	Two or More Race Groups	Non-Hispanic or Latino	Hispanic or Latino
	15	9	8	44	4,985	62

Hispanic or Latino Population in 2019	White, Not Hispanic*	Puerto Rican	Hispanic	Mexican	Cuban	Other
	4,899	0	62	60	0	2

Labor Force Annual Averages in 2018	Total Labor Force	Labor Force 5-Year % Change	Labor Force 10-Year % Change	Employed	Employed 5-Year % Change	Employed 10-Year % Change
	2,481	-4.80%	-9.40%	2,348	-1.10%	-8.90%

Unemployed	Unemployed 5-Year % Change	Unemployed 10-Year % Change	Unemployment Rate	Unemployment Rate 5-Year % Change	Unemployment Rate 10-Year % Change
133	-42.40%	-17.40%	5.4	-39.30%	-8.50%

Appendix B.4: 2018 ESRI Business and Industry Profiles
Brown County

Labor Force by Industry and Occupation Profile

Brown County

Prepared By Business Analyst Desktop
Latitude: 39.961822
Longitude: -90.750366

Population Summary	
2010 Total Population	6,937
2018 Total Population	6,745
2023 Total Population	6,608
2018 Employed Population 16+ by Industry	
Total	2,748
Agriculture	201
Mining	4
Construction	175
Manufacturing	130
Wholesale Trade	402
Retail Trade	292
Transportation	220
Utilities	6
Information	74
Finance/Insurance	43
Real Estate	22
Professional/Tech Services	9
Management	0
Admin/Waste	182
Educational Services	139
Health Care	281
Arts/Entertainment	16
Accommodation/Food Services	138
Other Services	79
Public Administration	264
2018 Employed Population 16+ by Occupation	
Total	
White Collar	1,299
Management/Business/Financial	377
Professional	336
Sales	271
Administrative Support	315
Services	490
Blue Collar	888
Farming/Forestry/Fishing	77
Construction/Extraction	213
Maintenance/Repair	133
Production	64
Transportation/Moving	401

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Calhoun County

Labor Force by Industry and Occupation Profile

Calhoun County

Prepared By Business Analyst Desktop
Latitude: 39.169246
Longitude: -90.667503

Population Summary	
2010 Total Population	5,089
2018 Total Population	4,871
2023 Total Population	4,729
2018 Employed Population 16+ by Industry	
Total	2,399
Agriculture	95
Mining	6
Construction	313
Manufacturing	264
Wholesale Trade	85
Retail Trade	182
Transportation	94
Utilities	32
Information	19
Finance/Insurance	139
Real Estate	43
Professional/Tech Services	37
Management	0
Admin/Waste	80
Educational Services	167
Health Care	268
Arts/Entertainment	45
Accommodation/Food Services	235
Other Services	106
Public Administration	129
2018 Employed Population 16+ by Occupation	
Total	
White Collar	1,067
Management/Business/Financial	339
Professional	314
Sales	174
Administrative Support	240
Services	512
Blue Collar	760
Farming/Forestry/Fishing	27
Construction/Extraction	232
Maintenance/Repair	94
Production	152
Transportation/Moving	255

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Cass County

Labor Force by Industry and Occupation Profile

Cass County

Prepared By Business Analyst Desktop
Latitude: 39.973757
Longitude: -90.247134

Population Summary	
2010 Total Population	13,642
2018 Total Population	13,525
2023 Total Population	13,171
2018 Employed Population 16+ by Industry	
Total	6,668
Agriculture	483
Mining	7
Construction	417
Manufacturing	1,360
Wholesale Trade	281
Retail Trade	589
Transportation	266
Utilities	120
Information	72
Finance/Insurance	198
Real Estate	10
Professional/Tech Services	82
Management	0
Admin/Waste	118
Educational Services	450
Health Care	833
Arts/Entertainment	98
Accommodation/Food Services	311
Other Services	247
Public Administration	373
2018 Employed Population 16+ by Occupation	
Total	
White Collar	2,728
Management/Business/Financial	1,003
Professional	517
Sales	370
Administrative Support	838
Services	1,052
Blue Collar	2,535
Farming/Forestry/Fishing	276
Construction/Extraction	267
Maintenance/Repair	251
Production	1,188
Transportation/Moving	553

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Greene County

Labor Force by Industry and Occupation Profile

Greene County

Prepared By Business Analyst Desktop
Latitude: 39.356253
Longitude: -90.390366

Population Summary	
2010 Total Population	13,886
2018 Total Population	13,380
2023 Total Population	12,905
2018 Employed Population 16+ by Industry	
Total	6,638
Agriculture	444
Mining	38
Construction	428
Manufacturing	858
Wholesale Trade	241
Retail Trade	823
Transportation	328
Utilities	84
Information	87
Finance/Insurance	224
Real Estate	66
Professional/Tech Services	137
Management	0
Admin/Waste	193
Educational Services	446
Health Care	1,047
Arts/Entertainment	64
Accommodation/Food Services	341
Other Services	254
Public Administration	262
2018 Employed Population 16+ by Occupation	
Total	
White Collar	2,878
Management/Business/Financial	946
Professional	820
Sales	464
Administrative Support	648
Services	1,245
Blue Collar	2,242
Farming/Forestry/Fishing	199
Construction/Extraction	313
Maintenance/Repair	345
Production	739
Transportation/Moving	646

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Jersey County

Labor Force by Industry and Occupation Profile

Jersey County

Prepared By Business Analyst Desktop
Latitude: 39.085547
Longitude: -90.356278

Population Summary	
2010 Total Population	23,007
2018 Total Population	22,410
2023 Total Population	21,594
2018 Employed Population 16+ by Industry	
Total	11,721
Agriculture	287
Mining	5
Construction	839
Manufacturing	1,330
Wholesale Trade	176
Retail Trade	1,397
Transportation	668
Utilities	155
Information	64
Finance/Insurance	535
Real Estate	137
Professional/Tech Services	514
Management	0
Admin/Waste	269
Educational Services	1,236
Health Care	2,139
Arts/Entertainment	158
Accommodation/Food Services	689
Other Services	450
Public Administration	288
2018 Employed Population 16+ by Occupation	
Total	
White Collar	6,370
Management/Business/Financial	2,063
Professional	1,610
Sales	1,046
Administrative Support	1,651
Services	2,014
Blue Collar	2,955
Farming/Forestry/Fishing	124
Construction/Extraction	659
Maintenance/Repair	510
Production	815
Transportation/Moving	847

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Macoupin County

Labor Force by Industry and Occupation Profile

Macoupin County

Prepared By Business Analyst Desktop
Latitude: 39.261058
Longitude: -89.92431

Population Summary	
2010 Total Population	47,765
2018 Total Population	46,842
2023 Total Population	45,977
2018 Employed Population 16+ by Industry	
Total	23,793
Agriculture	912
Mining	115
Construction	1,735
Manufacturing	2,465
Wholesale Trade	734
Retail Trade	2,845
Transportation	1,460
Utilities	188
Information	290
Finance/Insurance	1,043
Real Estate	207
Professional/Tech Services	798
Management	0
Admin/Waste	755
Educational Services	2,097
Health Care	3,481
Arts/Entertainment	342
Accommodation/Food Services	1,353
Other Services	1,135
Public Administration	1,099
2018 Employed Population 16+ by Occupation	
Total	
White Collar	12,355
Management/Business/Financial	3,854
Professional	2,666
Sales	2,210
Administrative Support	3,625
Services	3,798
Blue Collar	6,901
Farming/Forestry/Fishing	255
Construction/Extraction	1,231
Maintenance/Repair	1,363
Production	1,781
Transportation/Moving	2,271

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Morgan County

Labor Force by Industry and Occupation Profile

Morgan County

Prepared By Business Analyst Desktop
Latitude: 39.7157
Longitude: -90.201338

Population Summary	
2010 Total Population	35,547
2018 Total Population	34,791
2023 Total Population	34,340
2018 Employed Population 16+ by Industry	
Total	16,465
Agriculture	615
Mining	3
Construction	961
Manufacturing	1,741
Wholesale Trade	434
Retail Trade	1,664
Transportation	594
Utilities	74
Information	139
Finance/Insurance	744
Real Estate	73
Professional/Tech Services	451
Management	1
Admin/Waste	248
Educational Services	2,085
Health Care	2,790
Arts/Entertainment	289
Accommodation/Food Services	992
Other Services	829
Public Administration	1,040
2018 Employed Population 16+ by Occupation	
Total	
White Collar	8,478
Management/Business/Financial	2,673
Professional	2,432
Sales	1,451
Administrative Support	1,922
Services	3,223
Blue Collar	4,066
Farming/Forestry/Fishing	237
Construction/Extraction	699
Maintenance/Repair	489
Production	1,358
Transportation/Moving	1,283

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Pike County

Labor Force by Industry and Occupation Profile

Pike County

Prepared By Business Analyst Desktop
Latitude: 39.622789
Longitude: -90.885764

Population Summary	
2010 Total Population	16,430
2018 Total Population	16,052
2023 Total Population	15,819
2018 Employed Population 16+ by Industry	
Total	7,355
Agriculture	675
Mining	34
Construction	559
Manufacturing	746
Wholesale Trade	205
Retail Trade	768
Transportation	455
Utilities	92
Information	60
Finance/Insurance	285
Real Estate	57
Professional/Tech Services	42
Management	8
Admin/Waste	170
Educational Services	594
Health Care	1,064
Arts/Entertainment	109
Accommodation/Food Services	395
Other Services	274
Public Administration	552
2018 Employed Population 16+ by Occupation	
Total	
White Collar	3,135
Management/Business/Financial	987
Professional	749
Sales	468
Administrative Support	931
Services	1,512
Blue Collar	2,497
Farming/Forestry/Fishing	536
Construction/Extraction	344
Maintenance/Repair	303
Production	609
Transportation/Moving	705

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

Appendix B.4: 2018 ESRI Business and Industry Profiles (Cont'd)

Scott County

Labor Force by Industry and Occupation Profile

Scott County

Prepared By Business Analyst Desktop
Latitude: 39.644249
Longitude: -90.474678

Population Summary	
2010 Total Population	5,355
2018 Total Population	5,091
2023 Total Population	4,893
2018 Employed Population 16+ by Industry	
Total	2,531
Agriculture	170
Mining	2
Construction	171
Manufacturing	336
Wholesale Trade	147
Retail Trade	253
Transportation	109
Utilities	64
Information	21
Finance/Insurance	136
Real Estate	8
Professional/Tech Services	70
Management	0
Admin/Waste	56
Educational Services	177
Health Care	362
Arts/Entertainment	33
Accommodation/Food Services	51
Other Services	121
Public Administration	184
2018 Employed Population 16+ by Occupation	
Total	
White Collar	1,287
Management/Business/Financial	362
Professional	323
Sales	212
Administrative Support	390
Services	379
Blue Collar	805
Farming/Forestry/Fishing	42
Construction/Extraction	112
Maintenance/Repair	147
Production	257
Transportation/Moving	247

Source: U.S. Census Bureau, Census 2010 Data. Esri forecasts for 2018 and 2023

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Contact Information:
David Hetzler
Interim Dean of Career and Technical Education
John Wood Community College
Email: dhetzler@jwcc.edu
Tel: 217.641.4956

Brendan McGinnis
Principal
THG Advisors
Email: bmcginnis@thgadvisors.org
Tel: 618.806.6864

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