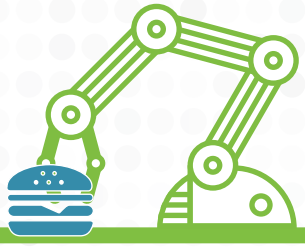
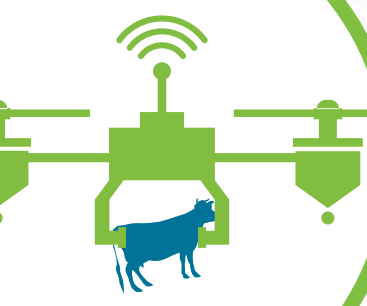
FUTURE OF MIDWEST AGRICULTURE

Scenarios of the Future

June 15-16, 2017





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FUTURE OF MIDWEST AGRICULTURE

SCENARIOS OF THE FUTURE REPORT

June 15-16, 2017

Minneapolis-St. Paul, Minnesota

This report summarizes the two-day Future of Midwest Agriculture Think Tank Workshop conducted in St. Paul, Minnesota in June 2017. Close to 100 stakeholders participated in the workshop and developed the scenarios presented in this report.

REPORT PREPARED BY:

future→iQ

WORKSHOP HOSTED BY:

TABLE OF CONTENTS

1.0 WORKSHOP OBJECTIVES AND DESIGN

The Future of Midwest Agriculture Think Tank provided an opportunity for a key group of stakeholders to undertake a foresight oriented workshop that explored the future of Midwest agriculture. The key features of the June 2017 workshop included:

- Gathering of a selected group of key stakeholders. This 2-day scenario planning think tank gathered the group's collective intelligence, beginning with the Future Game simulation exercise and an examination of emergent trends.
- Building scenarios of the future. During the workshop, participants identified key drivers shaping the future of Midwest Agriculture, and then built a range of plausible scenarios about the future.
- Analyzing of future implications. Participants took a 'deep dive' into the scenarios and examined the implications, likelihood and potential shocks to the system. This process aimed to help understand and assimilate the complex and interrelated forces that are combining to shape the future 'external' environment for Midwest agriculture.

Workshop Day One – 15 June - Creating the Backdrop – Drivers of Change:

- Setting the context – outline of the scenario planning process and the connection to the larger goals of the Future of Midwest Agriculture Project.
- The Future Game – simulation learning tool as an introduction to scenario thinking.
- Examination of Future Trends and Emergent Issues.
- Identification of Key Drivers of the Future – using insight gathered from personal and professional experiences coupled with the examination of future trends and emergent issues.

Workshop Day Two – 16 June - Future Scenario Development:

- Development of Future Scenarios – working in smaller groups to develop range of scenarios.
- Examination of Implications – discussion around what scenarios mean for Midwest Agriculture.
- Assessment of Plausibility – determining which scenarios are most likely to eventuate and why, exploration of scenario's blind spots.
- Introduction to Strategy development process, next steps and timing.

Close to one hundred Midwest Agriculture stakeholders from the private, public and nonprofit sectors across the Midwest attended the workshop. The list of participants includes faculty from various midwest colleges and universities, elected officials, farmers, representatives from various governmental entities, and members of the food and agriculture corporate and non-profit sectors.

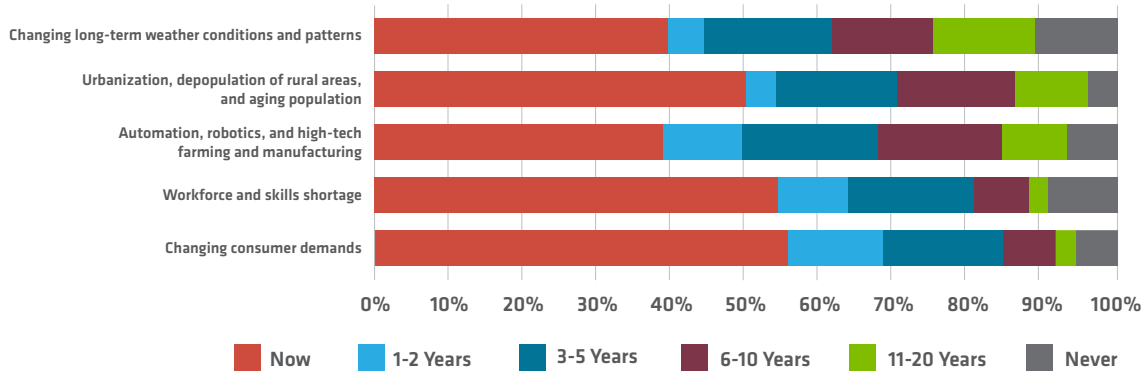
2.0 PRE-THINK TANK AND COMMUNITY SURVEYS

Prior to the planning workshop, surveys were conducted. Participants were sent a participant survey and asked questions relating to future readiness and the future of Midwest Agriculture. Additionally, a Community Survey on the subject was shared on various listservs, social media, and participants were asked to forward it through their networks.

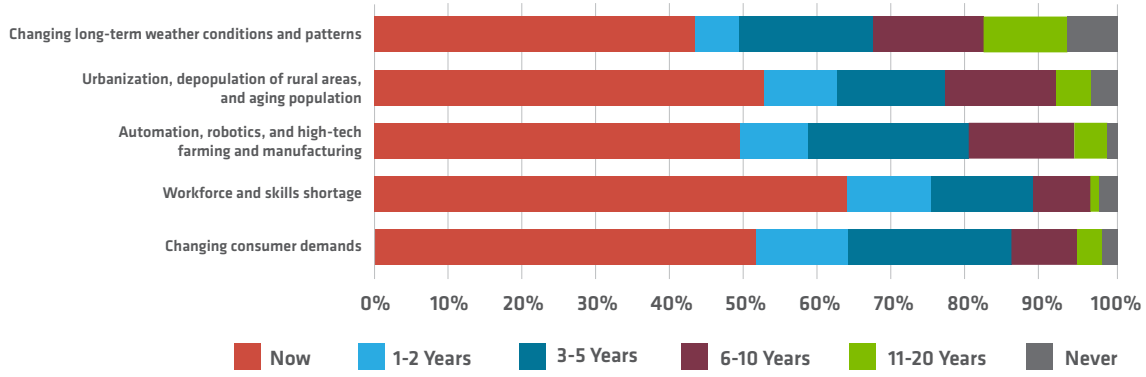
2.1 COMMUNITY SURVEY

The Community Survey was produced prior to the Think Tank and will continue to run until late 2017.

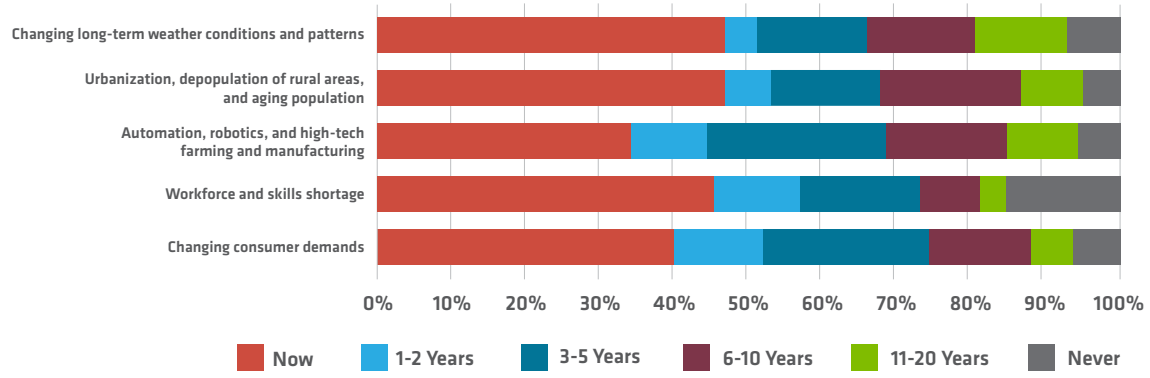
When do you think the following factors will significantly change YOUR life?



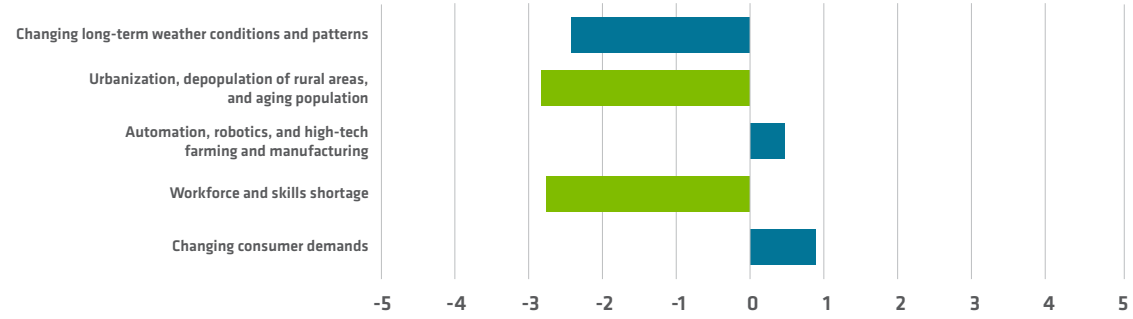
When do you think the following factors will significantly change the agricultural industry in the Midwest?



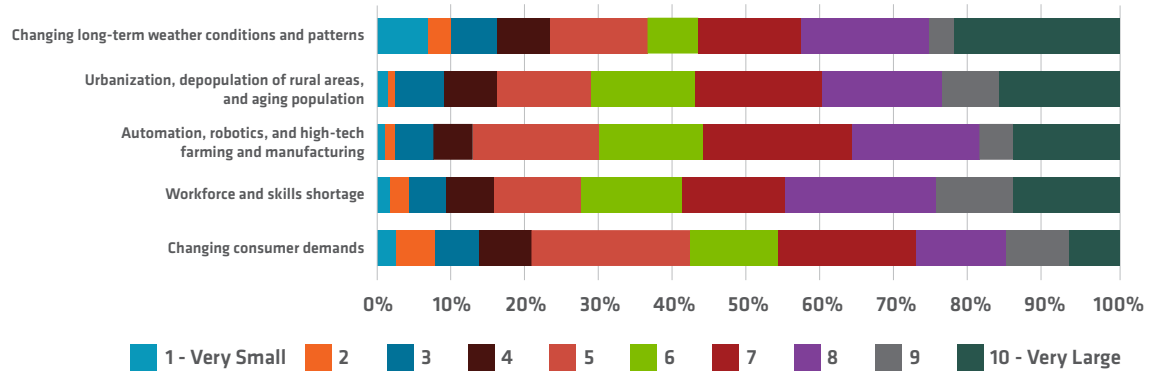
When do you think the following factors will significantly change the environment in the Midwest?



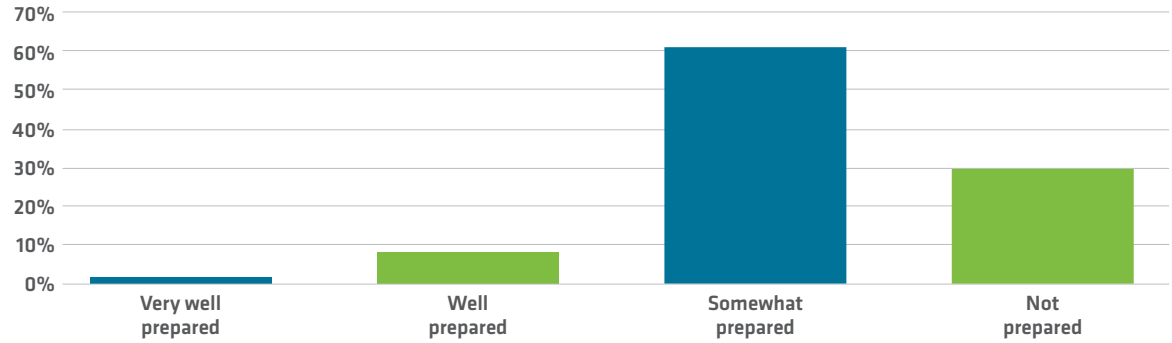
Considering your answers to the above questions, how positive or negative do you think the changes will be within each topic area?



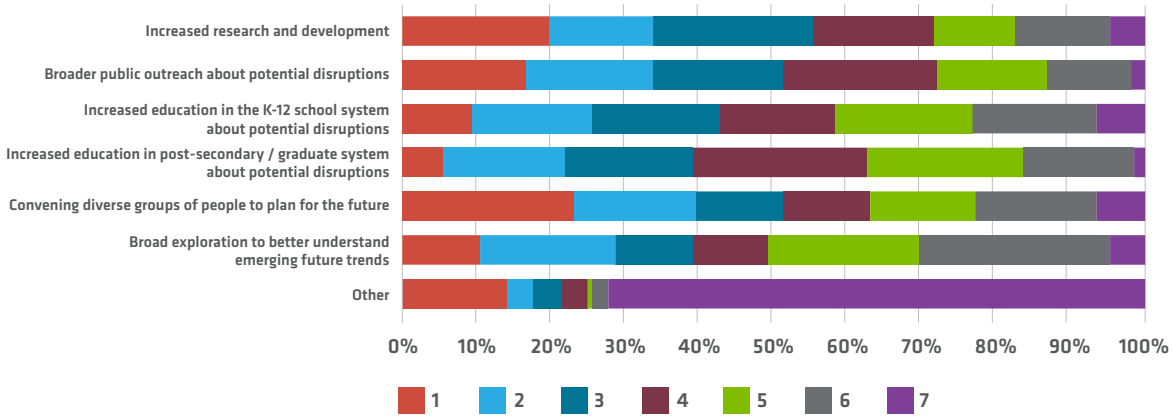
Considering your answers to the above questions, what do you think will be the overall magnitude of the changes within each topic area?



How well prepared is the Midwest to adapt to these changes?



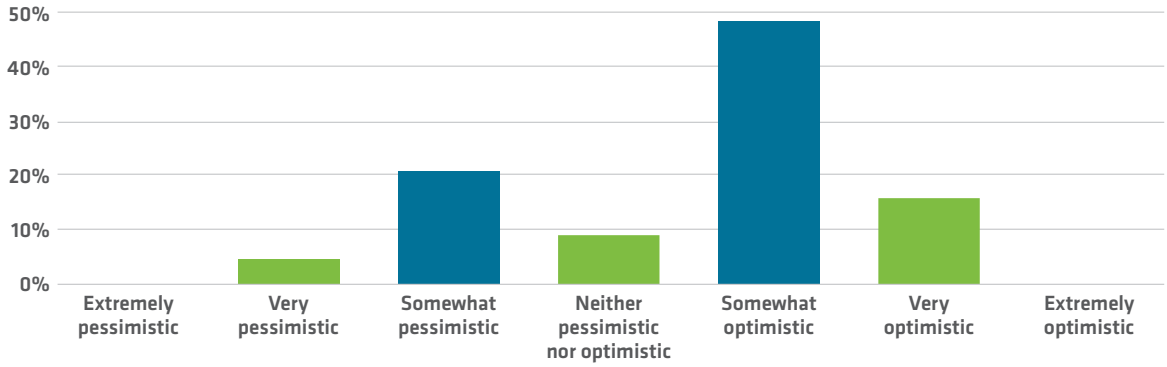
Please rank the following approaches according to what you believe are the best strategies to help the Midwest adapt to these changes, with 1 being what you believe is the best strategy.



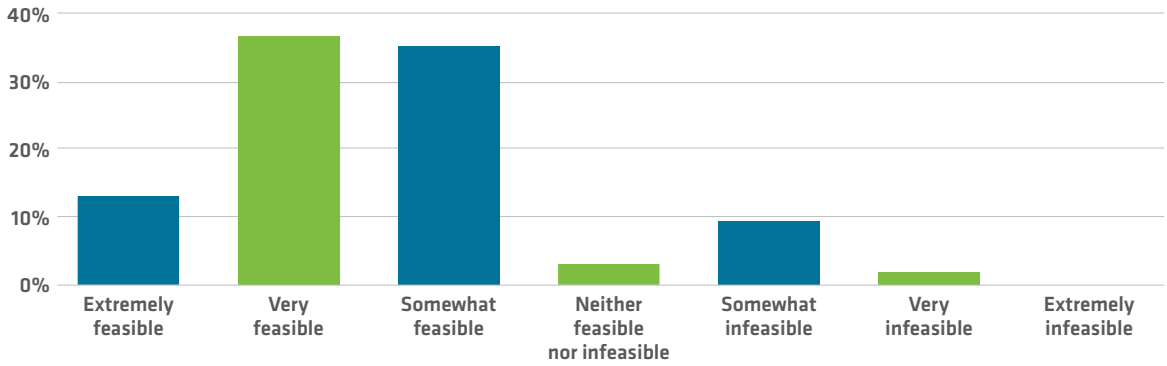
2.2 PRE-WORKSHOP PARTICIPANT SURVEY

Prior to the scenario planning workshop, a survey was distributed to the participants. Relevant survey results are below.

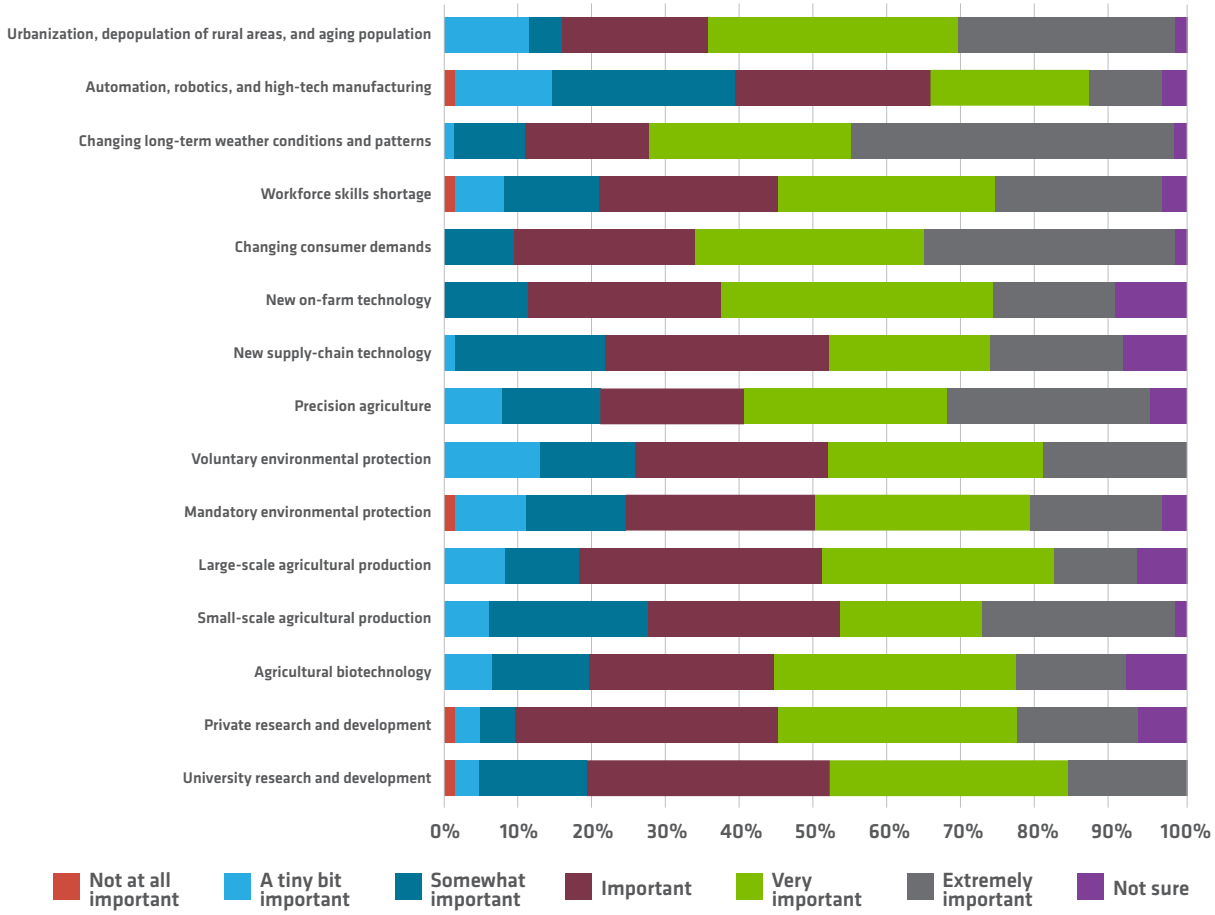
How pessimistic or optimistic do you feel about the prospects for agriculture in the Midwest in the next five years?



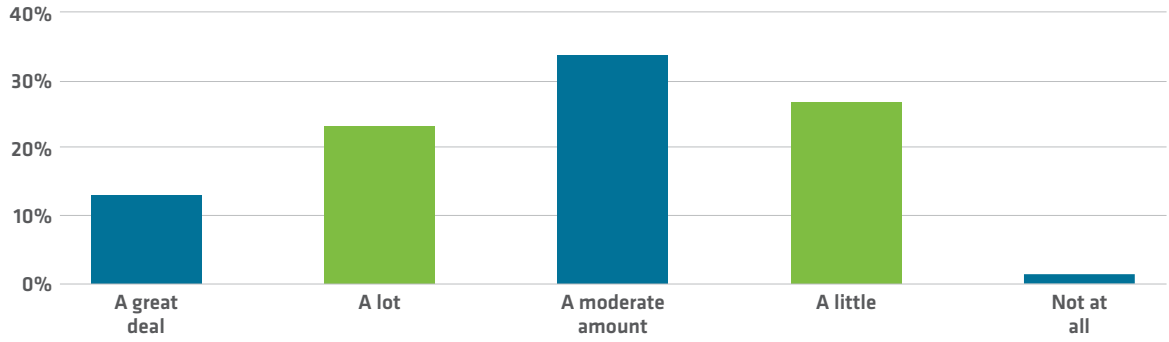
How feasible do you think it is for multiple organizations to have a shared vision for agriculture in the Midwest?



How important do you expect the following things to be in the next five years for the future of Midwest Agriculture?



How much can people like you affect the future of agricultre in the Midwest?



3.0 SCENARIO PLANNING

Through a facilitated process; data was presented on key future trends and emergent issues. The data was discussed at small group level and then telescoped to whole group level. The discussions examined the trend information, and explored 'what does this mean for the future of Midwest Agriculture?', implications and likely consequences across sectors and markets. Presentation material was drawn from various studies and included topics such as:

- Demographics, population and urbanization
- Macro-economics and shifting power
- Energy, food, water & extreme weather patterns
- Food security and human health
- Technology driving change
- Consumers of the future

3.1 DRIVERS SHAPING THE FUTURE

With the background of external trends, participants identified drivers that they considered most likely to shape the future of Midwest Agriculture. The drivers were then discussed at group and workshop levels. The scope of each driver was clarified, and any similar drivers were grouped and new drivers added, until a list of twenty unique key drivers were identified.

Key drivers shaping the future of Midwest Agriculture, as identified by participants:

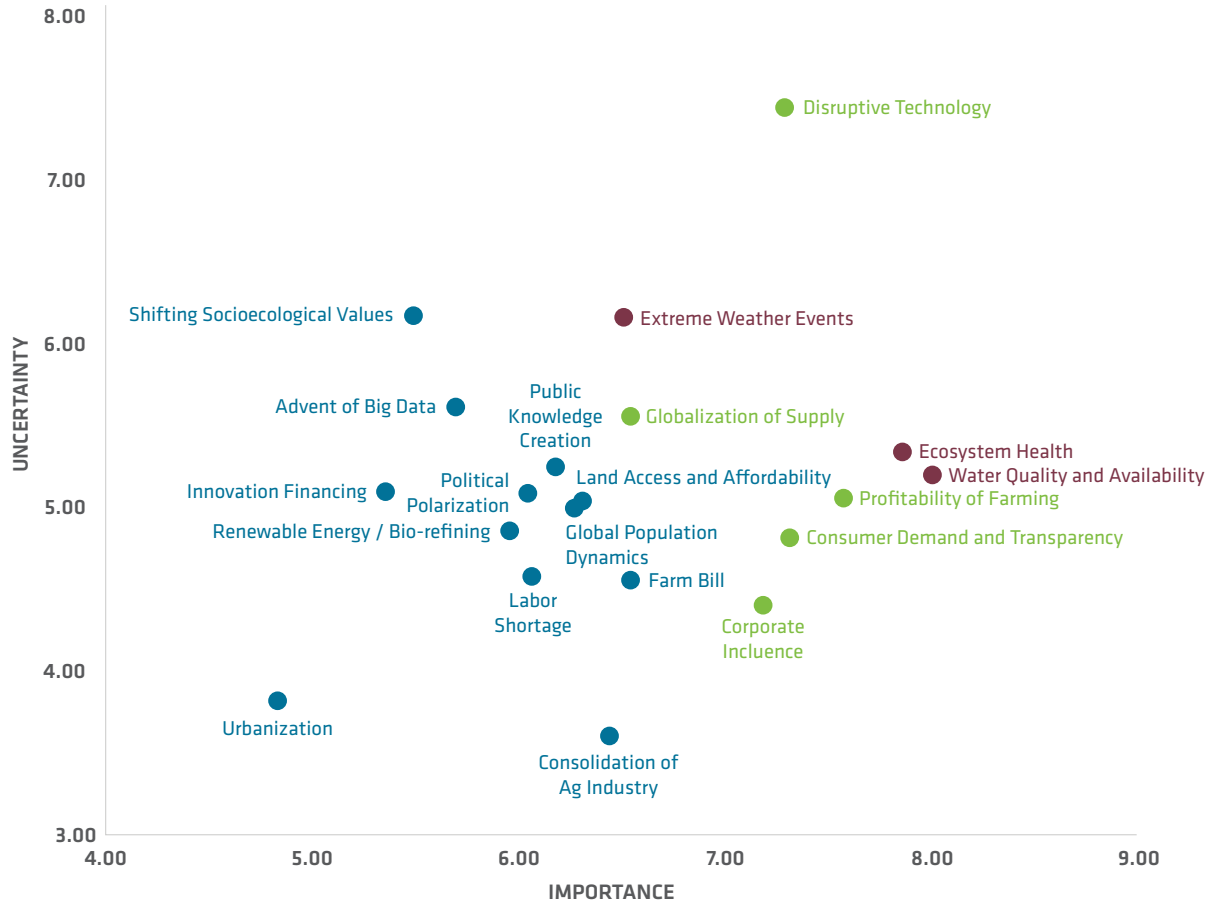
1. Urbanization
2. Consolidation of the Agricultural Industry
3. Farm Bill
4. Globalization of Supply
5. Advent of Big Data
6. Political Polarization
7. Consumer Demand
8. Global Population Dynamics
9. Labor Shortage
10. Corporate Influence
11. Shifting Socioecological Values
12. Ecosystem Health
13. Extreme Weather
14. Farm Profitability
15. Water Quality and Availability
16. Innovation Financing
17. Renewable Energy / Biorefining
18. Disruptive Technology
19. Public Knowledge Creation
20. Land Access

3.2 IDENTIFYING SCENARIO SHAPING CLUSTERS OF DRIVERS

The participants rated each of the twenty key drivers for its 'Importance' and 'Uncertainty'. The scale used was 1 – 10 (1 = low 10 = high). Importance refers to how important the participant considers the driver will be in shaping the future of Midwest Agriculture. Uncertainty refers to the degree of uncertainty associated with the driver in terms of its future level of uncertainty, impact, or both.

The individual ratings by each participant were pooled and averaged, providing an overall rating for each driver by the entire group of stakeholders. Then, a scatter diagram of the drivers, based on importance and uncertainty, was developed. The scatter diagram allows the identification of clusters which are relatively high in Importance and Uncertainty. This process illustrates the clusters of drivers that were seen as critical in shaping the future – these clusters are termed 'Scenario Shaping Clusters of Drivers.'

Scenario Shaping Clusters of Drivers



3.3 CREATING SCENARIO SPACES – FOUR PLAUSIBLE SCENARIOS FOR THE FUTURE

Grouping similar drivers into two categories, clusters of drivers were identified by adding a thematic name linking the drivers in the clusters. These themes became the basis for two axes on the scenario matrix that define four scenario 'spaces', with quadrants either towards or away for each driver cluster. These quadrants were used to formulate four plausible scenarios. The two axes were defined as 'Resource Control and Access' and 'Ecosystem Health and Resilience.'

CLUSTER THEMES

Resource Control and Access

- Disruptive technologies
- Globalization of supply
- Profitability of farming
- Consumer demand and transparency
- Corporate influence

Ecosystem Health and Resilience

- Ecosystem health
- Water quality and availability
- Extreme weather events

The four quadrants (scenario spaces) were reviewed and discussed with the Think Tank participants. This discussion explored the drivers included in each scenario-shaping cluster, the scope of each cluster, and how they formed the axes that defined the four scenario spaces. Participants were asked to consider the main attributes of each of the quadrants and to begin to speculate about how Midwest agriculture would look in a future based on each of the quadrants.

3.4 CREATING NARRATIVES FOR EACH SCENARIO QUADRANT

Workshop participants were assigned to one of four groups and asked to formulate the scenario for their respective quadrant. They were asked to describe the midpoint on the overall scenario space they were allocated, providing detail on the scenario's characteristics, predicted size and nature of impact and providing headline news for several categories at various points in time. The groups were also asked to produce a name for the scenario.

3.4.1 CHARACTERISTICS

Participants were requested to develop a scenario narrative for their quadrant to include multi-dimensional analysis of the following points and sub points:

- Food Production Systems
  - Food Production
  - Food Processing
  - Consumers
- Environmental and Landscape
  - Local and Farm Scale
  - Catchment Scale
  - Regional / Midwest Scale
- Community and Societal
  - Small Rural Communities
  - Regional Centers
  - Metropoles

3.4.2 PREDICTED SIZE AND NATURE OF THE IMPACT

Each group was then requested to demonstrate the scenario unfolding by highlighting what would be expected to be occurring in Midwest Agriculture in 2020, 2030, and 2040. Groups were asked to outline the predicted size and nature of the impact their assigned scenario would have on the three previously outlined categories of Food Production Systems, Environmental and Landscape, and Community and Societal characteristics for each point in time.

3.4.3 HEADLINE NEWS

To conclude the creation of the scenario narratives, participants were then asked to summarize the characteristics and the size and nature of impact into Headline News for each category (Food Production Systems, Environmental and Landscape, and Community and Societal) in 2020, 2030, and 2040.

3.5 DEVELOPING FOUR PLAUSIBLE SCENARIOS FOR THE FUTURE

These four scenarios paint very different plausible futures for Midwest Agriculture. The workshop participants considered them all as largely plausible futures, as in, they could actually happen. Narratives and descriptions of each scenario, as developed by the workshop participants, are included in the following section. Each scenario has its subsequent consequences and impacts on the future of Midwest Agriculture. No one future is the 'perfect' future, as each comes with its attendant challenges and implications. The process, however, does provide a way to tease out the future scenarios and examine them from a speculative standpoint. They represent different possibilities for the future, and are not predictions.

4.0 DETAILED DESCRIPTIONS OF THE SCENARIOS

The resultant scenario matrix was defined by the two major axes. These were further defined by descriptions of the potential implications and outcomes at the ends of the scenario axis. In this way, each axis represents continuums of possible futures. The scenarios, as described by the workshop participants define an approximate mid-point in their allocated scenario space.

A

B

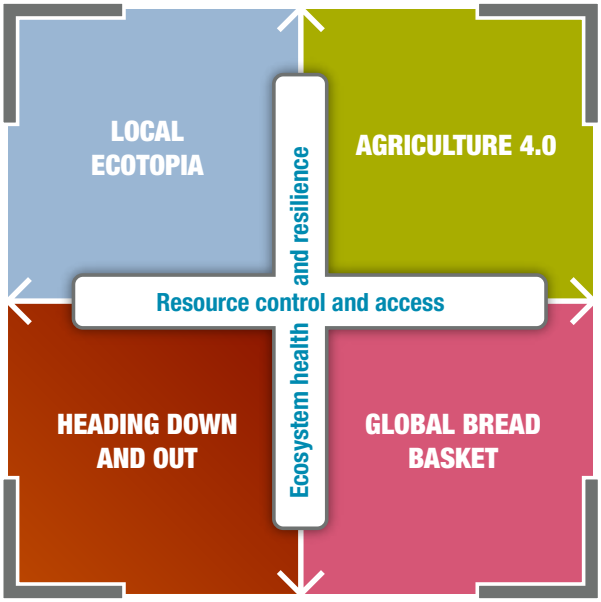
There is a focus on sustainable production systems, connecting through to consumer benefits. Science and technology deliver the capacity to produce healthy ecosystem outcomes at local and regional scale. Public policy and regulations reinforce rapid change in sustainable practices driven in part by more conscious communities and stakeholders. Extreme weather events are able to be absorbed.

Regional ecosystem health and resilience is paramount

A

Food production capacity and resource control is largely guided by local investment and influence. Investments are made to continue to create cutting edge technology that drives production innovation and new diverse food products. Farm profitability is driven by producing unique and differentiated products targeting key consumer groups .

Local focus and influence



Global connection

B

The global food industry has strong connections and exposure to Midwest Agriculture. Significant corporate agriculture influence is driven by investment in new technology and scale, increasing food production capacity, and new alternate food chains are developed. Increasing intensification and automation improves the efficiency of the food production, processing and distribution systems.

C

D

Ecosystem health is a secondary priority to production

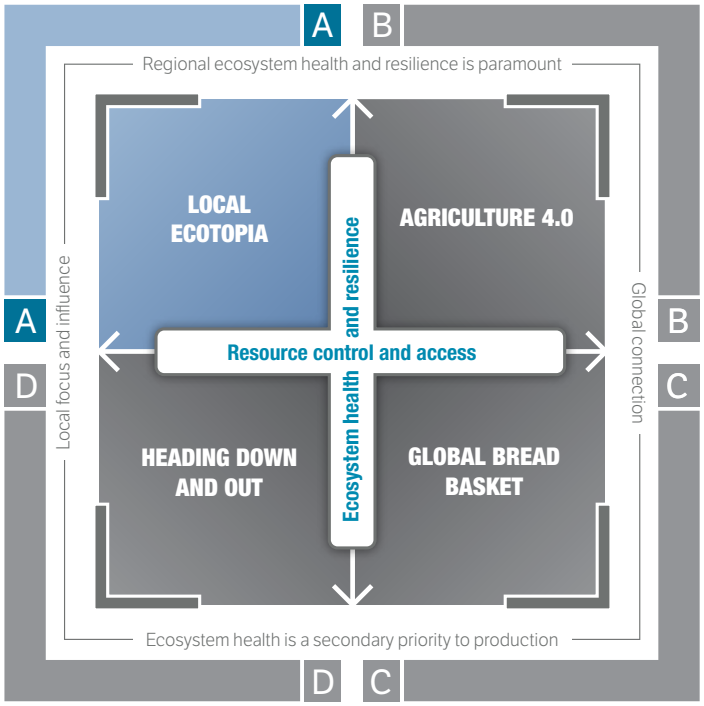
Regional focus is on large scale food production, to feed the growing global demand for food. This production demand drives farming systems that maximize output. On a broad scale, the 'commodification' of food continues, and undesirable environmental impacts expand, placing additional burden on public services to mitigate weather impacts and declining water quality. This is partly offset by environmentally conscious options pursued by segments of the farming community.

D

C

4.1 SCENARIO A – LOCAL ECOTOPIA - 2040

The scenario presented in this quadrant is defined by resilient regional ecosystem health and a strong focus on local resource control and influence. This future scenario is characterized by diverse crops, healthy soil, and integration of livestock. Food is not only grown regionally, but it is also processed regionally in closed loop systems with zero environmental impact. Consumers lead this trend by demanding full transparency from seed to final product destination – powered by precision technology. Public private partnerships will be structured in ways that encourage and allow co-op models to thrive in all sectors of the agricultural landscape. Farm transfers will increase and farmer average ages will decline. More money will be spent on education and research and a strong focus will be placed on equity and civic engagement.



SCENARIO CHARACTERISTICS:

Food Production Systems

- Diverse crops
- Vertical integration – regionally owned
- Closed loop / zero environmental impact processing
- Consumer driven transparency in the system

Environmental and Landscape

- Increased soil health
- Increased cover
- Reduced tillage

Community and Societal

- Co-op model / shared local ownership
- Increased rural identity
- Equitable and fair system as a whole

4.1.1 SCENARIO A - CHARACTERISTICS

Food Production Systems Characteristics	Environmental and Landscape Characteristics	Community and Societal Characteristics
FOOD PRODUCTION • Nutrient cycling • Advanced planning • Market driven • More diverse crop and livestock	**LOCAL AND FARM SCALE** • Minimum till • 100% Soil coverage • Strategic land use plan (ecosystem services) with financial sustainability • Ecologically focused and optimized	**SMALL RURAL COMMUNITIES** • Education
FOOD PROCESSING • Local /Regional centers • Timely • Transparent • Closed loop with zero environmental impact • Drives food production	**CATCHMENT SCALE** • Public/Private partnerships • Climate resilience • Water quality	**REGIONAL CENTERS** • Co-op model
CONSUMERS • Transparency • Certification • Sustainability • Specialized foods • Convenience • Willing to pay more • High quality protein	**REGIONAL / MIDWEST SCALE** • Exceed Environmental Protection Agency water standards • Ecosystem services trading	**METROPOLIS** • Sustainable urban farming • Walkable nodes

LINKAGES

Increased civic engagement, education

LINKAGES

Good food programs, environment protection, immigration reform, tax equity, ecosystem service transactions, institutional investment in local food and infrastructure, land transfer incentives, crop insurance reform, progress state environmental policy, greater research investments.

4.1.2 SCENARIO A - PREDICTED SIZE AND NATURE OF THE IMPACT

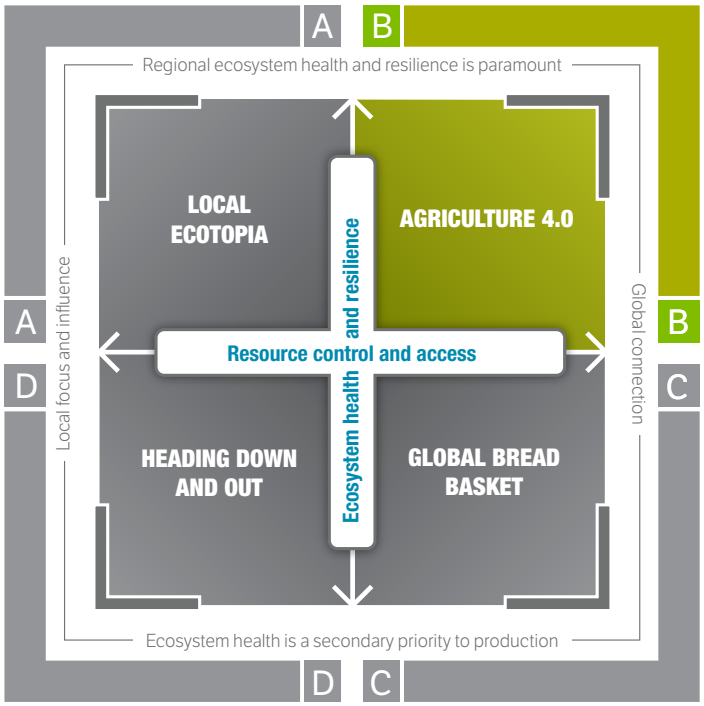
	2020	2030	2040
Food Production Systems	• Beginning of vertical integration	• Continued vertical integration, ability, better soil quality. 50% coverage and diversified crops	• High use of precision technology, ability to trace crops and 100% coverage. • Climate adapted
Environmental and Landscape	• Nutrient cycling	• Watershed partnerships established and showing results • Improved water capture conservation (tile systems) • More agro-forestry • More premiere habitat	• Water quality unimpaired • Soil carbon health (negative emissions)
Community and Societal	• Policies for local control • Expand co-op model • Expand education • Expand research	• Diversification of farm owners	• Revitalized small communities • Fully developed urban agriculture • Socio-economic disparities are reduced • Social and racial equity

4.1.3 SCENARIO A - HEADLINE NEWS

	2020	2030	2040
Food Production Systems	*"Farm Bill Supports Diverse Crops"*	*"Cover Crops Reach 50% for First Time Ever"*	*"John Deere Sells Last Tillage Tool"*
Environmental and Landscape	*"Farmers Embrace Healthy Soil Policies"*	*"Amazon Delivers Cover Crop Seed by Drone"*	*"Midwestern Agriculture is Carbon Negative"*
Community and Societal	*"More Money for Education and Research"*	*"Average Age of Farmer Declines"*	*"Child Hunger at All Time Low"*

4.2 SCENARIO B – AGRICULTURE 4.0 – 2040

The scenario presented in this quadrant is defined by global focus, connectivity and resilient ecosystem health. Corporate responsibility is a foundational block of this scenario which envisions a dual tracked system: local products for regional consumption and global structure for the global marketplace. Consumers locally will demand natural designer foods with a high level of customization, while global markets will provide to local farmers and food producers a stable and established demand. Precision farming will allow for a more intelligent and sustainable production system which will be led by medium and large sized corporations. Corporations – by consumer demand and changes in the farm bill and other regulations – will be incentivized to be environmentally conscious and reduce food and water waste. Ecosystem health will be a strong focus, with cover crops eventually defining the landscape. Healthier consumers will drive down the demand for meat down and growth of protein rich alternative crops will increase. Rural communities will count on vigorous watersheds and will be on the receiving end of strong workforce development efforts by public-private partnerships. Healthy and employed communities will result.



SCENARIO CHARACTERISTICS:

Food Production Systems

- Efficient and consumer driven
- More protein rich foods
- Reduced food waste

Environmental and Landscape

- Uniform environmental standards
- Cover cropping
- Vigorous watersheds
- Renewable energy focus

Community and Societal

- Workforce development
- Corporate Social Responsibility driven by consumer demand
- Market development of alternative crops

4.2.1 SCENARIO B - CHARACTERISTICS

Food Production Systems Characteristics

FOOD PRODUCTION

- Pasture-based food production
- Precision Farming / Intelligent
- More organics
- Sustainable Farming
- Medium sized companies and large (Export free market / global)
- Energy efficient production

FOOD PROCESSING

- Designer / Customized food processing
- Protein rich foods (plant + meat)
- Localized production / close to farm

CONSUMERS

- Demand driven, organic, natural, designer foods
- Customization drives health and virtuous cycle of production systems
- Value added
- Reduction of food waste

Environmental and Landscape Characteristics

LOCAL AND FARM SCALE

- Payment to farmers for ecosystem services
- Corporate Social Responsibility
- Green landscape/perennials

CATCHMENT SCALE

- Vigorous watershed orgs w/ diverse, knowledgeable staff
- Market for ecosystem services
- Better water quality / usage

REGIONAL / MIDWEST SCALE

- Continuous green cover
- Uniform environmental standards
- Electricity will be largely used for fleet/transportation
- Bioenergy and bio products common

Community and Societal Characteristics

SMALL RURAL COMMUNITIES

- Health/livelihood appreciation
- Declining population
- Rich environment with high quality of life is very attractive
- Farm level processing/job creation
- More diverse communities
- Technology allow access to medical and education in every community
- Add immigrant population

REGIONAL CENTERS

- Infrastructure development (water storage, preparedness for extreme events)
- More diverse communities

METROPOLIS

- Clearer and more rigorous sustainability standards
- Policy (trade, environmental)
- Reduction of food waste
- Corporate food comes together to make policy decision

LINKAGES

Broadband power, More people want to live in small rural communities, education and medical access

LINKAGES

Electric fleet

4.2.2 SCENARIO B - PREDICTED SIZE AND NATURE OF THE IMPACT

	2020	2030	2040

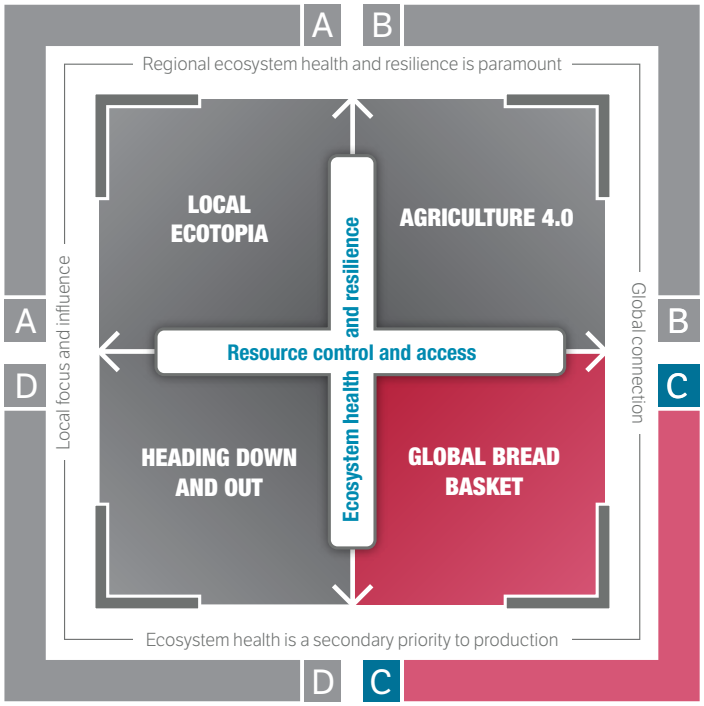
Food Production Systems	• Emergence of two types of production systems "Split Market"
	  • customized demand from U.S. consumer
	  • global consumer
	• Farm bill change
	• Increase in foreign direct investment and corporations
		• Split market is 50% complete
		• Animals integrated into row crops
		• Agriculture giant figures out how to make foods out of crickets and breadfruit (locally available, cheap)
		• Increase in foreign direct investment and corporations
			• Split market 100% complete
			• Microbial protein sources
			• Demand driven healthful high-value

Environmental and Landscape	• Change in environmental regulations • Development of compensation for environmental compliance from the market place • Investment in infrastructure • Customization and influence	• Preparedness for extreme weather events • Less rural / urban split and integrated water management regulations • More investment in infrastructure • Monetize environmental services (true value of water) • Systems that support soil health (True value of water)	• 100% continuous living cover (that pays for itself)
Community and Societal	• Farm bill changes • Tension between haves and have-nots • Workforce training and education • Consumers demand Increased Corporate Social Responsibility	• Policies to support risk management at the farm • Rigorous market development • Healthy diets/ living style • Workforce training and education • Policies on Foreign direct investment • Great rural communities • Diverse and integrated	• Lower meat consumption • Meeting global food needs by supplying plant based production • Promotion of local production in global level • Educational programs to solve food security

4.2.3 SCENARIO B - HEADLINE NEWS

	2020	2030	2040
Food Production Systems	*"Emergence of two major food supply systems"* *"McDonald's rolls out cricket burgers"*	*"Technology allows for more diversified agriculture and forestry"* *"Veggie burger sales surpass Big Macs"*	*"Healthy affordable food delivered to your door across the United States"* *"Price of carbonated beverages include cost of environment water quality"* *"Diversified crop production system"*
Environmental and Landscape	*"Pollinators population resurgences due to increased cover crops"*	*"Perennial cover reaches 50% in Minnesota"* *"MN achieves 50% renewable energy target"*	*"Satellite image shoes perennial cover reaches 100%"*
Community and Societal	*"Charles City welcomes a new wave of Somali farmers"* *"New high tech jobs for rural Minnesota"* *"Rural workforce retraining programs developed across the Midwest"*	*"Robotic agriculture displaces farm labor"* *"Redistricting shifts political power back to rural areas - attractive lifestyle and ease of living"*	*"Mayo biotec lab cures cancer"* *"Majority of US population is made up of people of color"*

4.3 SCENARIO C – GLOBAL BREAD BASKET – 2040



The scenario presented in this quadrant is defined by a focus on global demand coupled with a strong focus on production. Industry will see a shift toward calorie and protein rich foods and away from fresh foods. Global base consumer demand will translate into highly processed and automated production and distribution. Corporate ownership of farms will lead to large operations being controlled by corporations and disappearance of food industry family farms. Farm corporate ownership will also lead to investment in soil health to sustain production, but there will be a notable divergent split in terms of farm sizes – very small farms coupled with very large ones. Global prosperity will mean demand in animal agriculture. There will be a notable increase in private sponsorship of research as well as private ownership of information. Corporations will eventually feel pressure in the environmental landscape area which will lead to increased transparency in the system. Regional centers will thrive with available jobs and education opportunities. Small rural communities will become obsolete and will start to disappear.

SCENARIO CHARACTERISTICS:

Food Production Systems

- Shift toward calorie and protein rich foods
- Highly processed and automated production and distribution
- Farm corporate ownership

Environmental and Landscape

- Degraded water quality
- Small focus on soil health as lever for production
- Greater extremes in flooding and drought

Community and Societal

- Increase in private sponsorship of research
- Small rural communities become obsolete
- Transition out of farming – people leaving the system

4.3.1 SCENARIO C - CHARACTERISTICS

Food Production Systems Characteristics

FOOD PRODUCTION

- Maximize per unit production
- Land ownership shift to industry owned
- Commodities seen in terms of calorie and protein
- Shift in use of food and fiber for energy
- Technologies for other than row crop – algae
- Phosphorus and other inputs costs increase
- Robotic and remote sensors manage production
- Midwest is world supplier of pork – CAFO
- Organic demand chains

FOOD PROCESSING

- Bio-refining deconstructs crops into components
- More meat processing facilities
- Cost of energy is constraint – what is the most use of energy (transport vs processing)
- Efficiency of logistics
- Companies begin nutrient recovery plans
- Innovation in food processing - more automated
- More multi-national companies – vertical integration

CONSUMERS

- Global consumer base
- More calories provided efficiently, fewer fresh foods in the system

Environmental and Landscape Characteristics

LOCAL AND FARM SCALE

- Very small farms provide fresh food for local consumption
- Vertical / Indoor production of food (year-round production)
- Vegetable food production concentrated in urban / suburban areas
- Growth in urban/suburban/peri-urban small farms
- Aquaponics increase
- Greater disparity - large farms
- Disruptive technologies are expensive, drive automation on large farm
- Co-location of local production and waste heat sources, vertical
- Split – more large and more small farms

CATCHMENT SCALE

- Water quality will degrade at catchment and basin scale
- Greater extremes in flooding and drought, what engineering solutions
- No-till and cover crop systems improve soil health.
- Soil health recognized as a lever for production and for water quality
- Corporate land ownership drives investment in soil health to sustain production

REGIONAL / MIDWEST SCALE

- State and local regulatory agencies adopt strict regulations
- Corporations have political influence
- Midwest will see increase in farms over 1000 acres

Community and Societal Characteristics

SMALL RURAL COMMUNITIES

- Health impacts
- More automation
- Mid-level supply chains disappear
- Farmer is contractor
- Loss of place-based identity - Company town
- Small towns are bedroom community to regional center

REGIONAL CENTERS

- Regional Centers grow to provides services, manage automated systems
- Service jobs
- University and tech schools
- Focus on nature-based recreation
- Processing and facilities jobs
- Technical repair, engineering

METROPOLIS

- One fork – are corporations headquartered in the region?
- Metropolitan areas grow and thrive

LINKAGES

Greater income disparities

LINKAGES

4.3.2 SCENARIO C - PREDICTED SIZE AND NATURE OF THE IMPACT

	2020	2030	2040
Food Production Systems	• Baby-boomer farmers retire - who owns the land? • Transition out of farming – who invests?	• Prosperity globally drives meat demand, growth in animal agriculture • Private investment in processing – public/private • More private funding of research • More private ownership of information • Farmers lose ability to fix	• Large operations, controlled by corporate food industry • Aggressive use of soil (supported by huge soil endowment) • Increased productivity because of climate change create comparative advantage
Environmental and Landscape	• Farm structure – very small farms and very large farms • Current administration reduces environmental regulations	• Simplification of the ecological landscape • Water quality costs are borne by downstream communities • Environmental costs	• Corporations might feel pushback
Community and Societal	• Small communities strive to hold on to basic amenities like a grocery store • Small communities age out • Regional centers grow • Urban communities thrive • Federal immigration policy drives employment vs automation	• Loss of ownership of land and equipment, data • Communities • Broadband access increases to all rural areas to operate the production and monitoring system • Low cost housing in small communities draws populations • Loss of small community identity • Changing population dynamics	• Public investment in public health impacts • Public pressure for transparency in data standards • Depopulation (automation)

4.3.3 SCENARIO C - HEADLINE NEWS

	2020	2030	2040
Food Production Systems	*"Legislature approves corporate farm ownership"*	*"Farm size grows by 100% this decade"*	*"Midwest farmers set production record"*
Environmental and Landscape	*"Gulf hypoxia zone grows"*	*"State falls short of nutrient reduction goals"*	*"Des Moines expands water treatment facility"*
Community and Societal	*"Rural voice lost in Congress"*	*"Midwest broadband coverage complete!!"*	*"Food Inc. blocks housing development"*

4.4 SCENARIO D – HEADING DOWN AND OUT - 2040

The scenario presented in this quadrant is defined by a focus on local control and influence coupled with a strong focus on production. This scenario increases the relevance and size of regional food processing centers, which will grow and eventually become the sole hub of jobs in rural communities. Smaller rural towns will disappear or become bedroom communities for nearby regional centers. Regional centers will face labor, housing, and infrastructure shortages. The relevance of these centers will serve as a push for better infrastructure surrounding them and universities will retool their programs to meet the labor shortages. Corporations will feel pressure from local consumers that demand a more transparent process and environmental protection. Environmental protection response will be a "one step forward, two steps backward" as corporations work to meet the production needs of this scenario. Global demand will be mass driven and many producers will choose to bypass local demands by targeting global markets. Water quality, quantity, and soil quality will decrease. Dead zones downstream will increase with a decrease in aquatic ecosystems. Use of technology will exponentially increase and food grade will also be increased. Small niche urban farms will grow to meet specialized local consumer demand. Self-regulatory bodies will become more prevalent, and farm certification programs will grow.

SCENARIO CHARACTERISTICS:

Food Production Systems

- Increase in technology use in production
- Regional centers as bedrock of food processing
- Local consumer demands vs. global mass production needs

Environmental and Landscape

- Small focus on environmental protection
- New drive for non-animal protein
- Decrease in water quality, quantity and soil quality

Community and Societal

- Disappearance of small rural communities
- Exponential growth of regional centers
- Immigrants move to regional centers
- Urban niche farms

4.4.1 SCENARIO D - CHARACTERISTICS

Food Production Systems Characteristics	Environmental and Landscape Characteristics	Community and Societal Characteristics
FOOD PRODUCTION • Entrepreneurial but large, e.g. potatoes for McDonalds, high protein animal feed • Still a lot of corn and beans • Increase in Non-animal protein • Some specialized, niche markets (e.g. microbrews, distilleries) • Consumer pulls trumps producer push	**LOCAL AND FARM SCALE** • Increase in confinement and large-scale operations • Increased farm size • A few small specialty farms	**SMALL RURAL COMMUNITIES** • Almost gone • Infrastructure, water treatment and wastewater treatment costs too high to support on small tax base • Access to capital also depopulates • Some communities may limp along (downshifters) with internet • Bedroom communities • Tourist destinations
FOOD PROCESSING • Regional centers, e.g. Hormel, Schwans, Swift, Green Giant • Labor shortage • Housing shortage • Increased infrastructure, water and energy needs • Need to get products to market	**CATCHMENT SCALE** • Decrease in water quality • Decrease in water quantity • Degradation of soils	**REGIONAL CENTERS** • Population increases • Labor needed for skilled jobs, still blue color • Immigrant and young people come to region
CONSUMERS • Aware • Health conscious • Transparency in production • Tracking of products • Connection to farmer	**REGIONAL / MIDWEST SCALE** • Increase in dead zones • Flooding or flashy rivers–problems with when and where the water flows • Decrease in the aquatic ecosystem	**METROPOLIS** • Bigger • Universities to retool • Distribution Center Market • Increased disparities • Increased desire for convenience • Home delivery

LINKAGES

New partnerships for finance and products

LINKAGES

Co-ops will help farmers grow and innovate with less risk

4.4.2 SCENARIO D - PREDICTED SIZE AND NATURE OF THE IMPACT

	2020	2030	2040
Food Production Systems	• Increase in food grade • Increase in technology and production • Consumer-demand driven	• Drive to efficient production • Non-animal protein • Contract production for co-ops • Co-ops may provide machinery	• Large scale • Increase in acres consolidated • Fewer operators • Urban farms and entrepreneurs • Local corporate processors and packaging plants
Environmental and Landscape	• Conflict over regulation	• Food processors and retailers may voluntarily increase • Environmentally-responsible practices to meet consumer and share-holder demand	• Self-regulated industry through certified farmer program • Some choose to avoid regulation and seek global market • Increased environmental degradation • Public and consumers demand environmental efforts • Pockets of environmental quality
Community and Societal	• Increased immigration • Societal discomfort • Lacking community services	• Decline of rural communities • School consolidation • Community tension at its highest • Diversification of rural communities to meet labor demands • Increase in need for social services	• Increase in city populations

4.4.3 SCENARIO D - HEADLINE NEWS

	2020	2030	2040
Food Production Systems	*"Millennial Women Drive Consumer Trends in Food Production"*	*"Cargill Buys Hertz for Farm Management"* *"Uber Invests in Automated Farm Equipment"*	*"Midwest Corporate Farms reach 30,000 acres average size"*
Environmental and Landscape	*"Increased Pressure for Water Quality"*	*"Amazon Charged by the Nature Conservancy for Ignoring Water Quality"*	*"One step forward, two steps back on Soil Health"*
Community and Societal	*"U of M Study Shows Communities Continue to Diversify"*	*"Rural Schools Close, Minnesota Students Forced to Enroll in Kahn Academy"*	*"Rural Towns on Endangered Species List"*

5.0 EXPLORING THE UNEXPECTED – POTENTIAL SHOCKS

Workshop participants were given the opportunity to consider the unexpected by exploring potential and plausible shocks to the scenarios. The following were identified by participants as plausible shocks that could impact the future of Midwest Agriculture:

- Market Collapse Globally Commodity and At Large
- Global Financial Crisis
- Global Water Crisis
- Trade Restrictions / Limitations
- Closed Borders / Tight Immigration Policy
- Cargill Gets Sold to Chinese Investors
- Extended Drought
- Major Renewable Energy Leap – Storage and Production
- Farm Bill Programs get Defunded
- Farm Bill Elimination
- General Disease
- Major Global Conflict
- New Technologies Getting in the Hands of Bad Actors
- Major Water System Vulnerability
- Unprecedented Extreme Weather Event
- Technology Breakdown – Air Traffic

6.0 PREFERRED AND EXPECTED FUTURES

Participants individually assessed the plausibility of the scenarios across a 100-cell matrix. This information was collated to produce 'plausibility heat map', providing insight into what was considered the most likely scenario version to eventuate, if nothing changes, and which scenario is preferred.

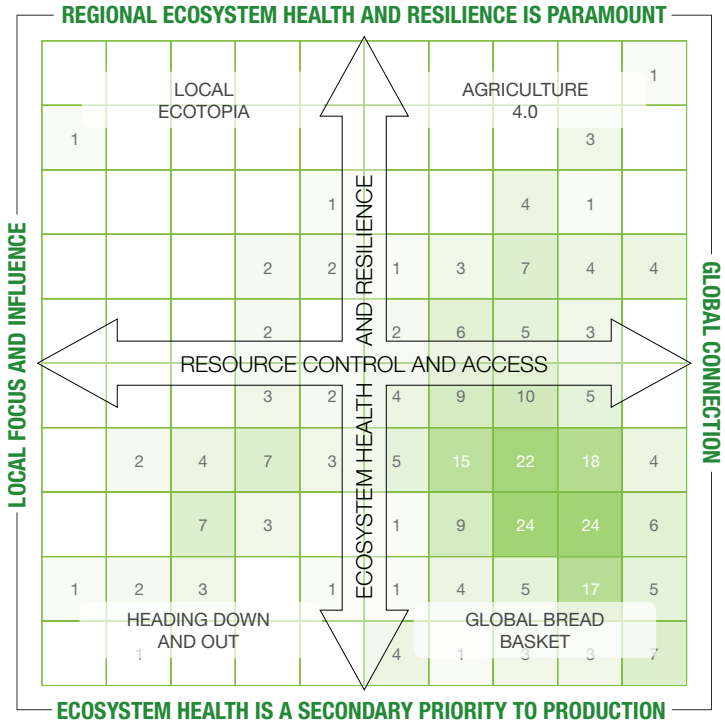
For both the expected and the preferred scenarios, each participant identified the cell representing the most plausible future in their view (given a weighting of 2); then the next most 4 plausible cells (given a weighting of 1). These results were aggregated across all workshop participants to produce a single number for each cell.

6.1 EXPECTED FUTURE

Scenario participants largely selected "Corporatopia" as the Expected Scenario – the scenario that Midwest Agriculture will end up with if current forces continue to play out with no changes to the system.

FUTURE OF MIDWEST AGRICULTURE

EXPECTED FUTURE – 2040



EXPECTED FUTURE PLAUSIBILITY MATRIX

This grid displays the plausibility level assigned by the workshop participants.

The darker the color, the greater the aggregate weighted plausibility score.

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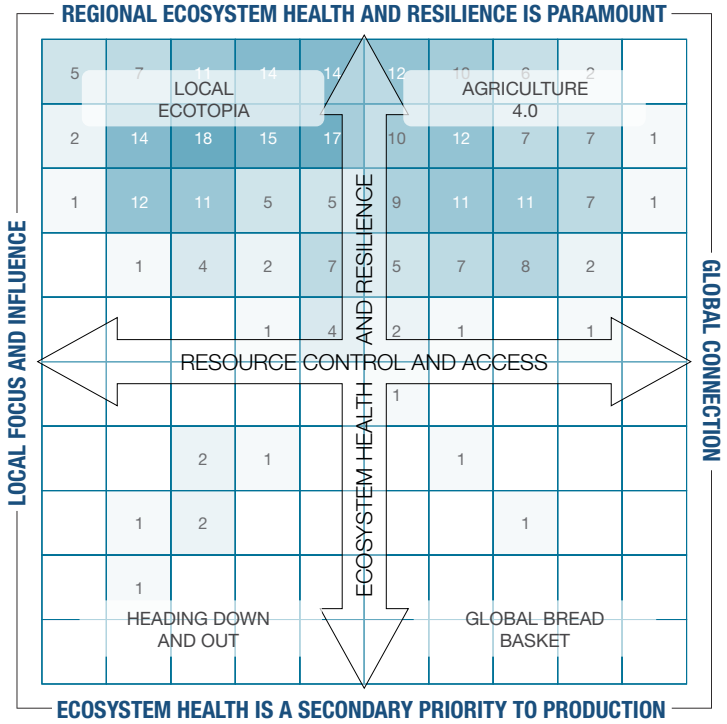
6.2 PREFERRED FUTURE

There was a relatively even spread of participants selecting between the scenarios of “Local Ecotopia” and “Agriculture 4.0” as their preferred futures. A tendency towards the “global connection” side of “Local Ecotopia” is noted.

FUTURE OF MIDWEST AGRICULTURE

PREFERRED FUTURE – 2040



PREFERRED FUTURE PLAUSIBILITY MATRIX

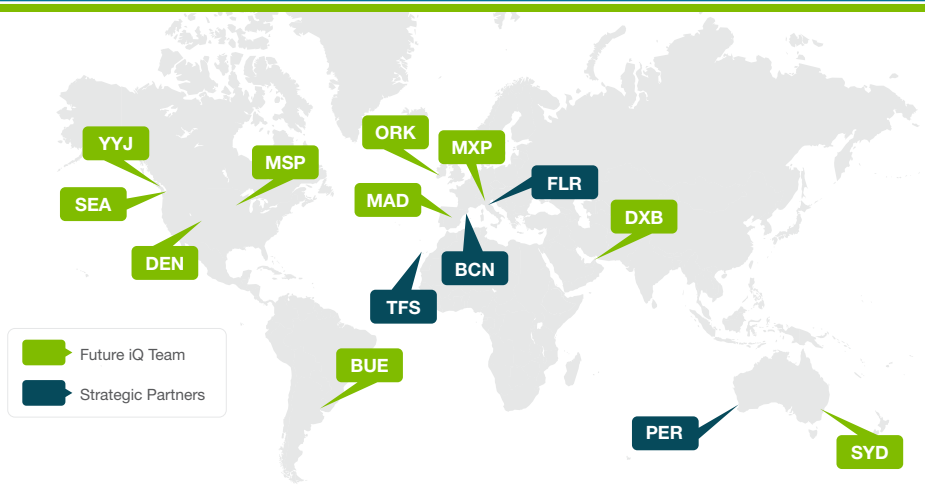
This grid displays the plausibility level assigned by the workshop participants.

The darker the color, the greater the aggregate weighted plausibility score.

6.3 CLOSING THE GAP: STEPS NEEDED TO REACH PREFERRED VS. EXPECTED SCENARIO

Workshop participants discussed the ramifications and implications of failing to achieve a preferred future. Participants were given the opportunity to brainstorm ways that the future of Midwest Agriculture could go from the expected scenario of the future to the preferred one and arrived at the following steps.

1. New markets for what we grow in the Midwest and new product diversification to increase resilience.
2. Bipartisan collaboration and trust building.
3. Changing the discussion around the values of the ecosystem. Values don't have to be the same but overall value needs to be increased.
4. Values in the ecosystems services.
5. Value human health – grapes cheaper than burger.
6. Building trust and sharing of risk so that competing stakeholders can collaborate and build alliances.
7. Using soil health indicators to determine cost of crop insurance.
8. Need to reinvigorate citizenship to reengage people in the system.
9. More resources are needed for increased entrepreneurship.
10. Need to develop end uses to new crops. Perennial grass – what we grow it how we grow it, make sure there is END use to the products we use.
11. Demand for corporate responsibility, especially in the areas of environmental impact, human impacts, ownership and access to capital.



7.0 ABOUT FUTURE IQ

Future iQ is a market leader in the development and application of scenario planning; network analysis, industry and regional analysis, and stakeholder engagement and capacity building. The company specializes in applying innovative tools and approaches to assist organizations, regions and industries shape their futures. To learn more about Future iQ visit www.future-iq.com or contact us by email at info@future-iq.com

REPORT AND SCENARIO PLANNING WORKSHOP PREPARED BY:

DAVID BEURLE, CEO, FUTURE IQ

As CEO of Future iQ, David specializes in creating future planning approaches for the use in regional, community and organizational settings. David has worked in the field of organizational and regional economic and community planning for over 20 years. His work in community and economic development has earned his work international, national and state awards.

HEATHER BRANIGIN, VICE PRESIDENT, BUSINESS DEVELOPMENT

Heather has an academic background in Political Science, International Relations and Education and is committed to helping people understand global interconnectedness and collaboration. She is past President and current Advisory Council member of the United Nations Association of Minnesota and has worked for over 20 years in the fields of international education and development.

JULIANA PANETTA, J.D., ENGAGEMENT SPECIALIST AND IN-HOUSE ATTORNEY

Juliana has particular expertise in client engagement and works closely with clients to ensure a rich and fulfilling Future iQ experience. Her legal background is in Corporate, Employment and Immigration. Before joining Future iQ, she was an Associate Corporate Counsel for a futures and options derivatives exchange and worked for the fifth largest commercial bank in the United States.

8.0 FOR MORE INFORMATION

This scenario planning workshop was convened by the University of Minnesota, and the participants included stakeholders from the private, public, academic and non-profit sectors. The scenario narratives and descriptions were developed by the participants, and the axes reflect the drivers and themes they collectively judged as the most important for the future of Midwest Agriculture looking out to 2040.

For more information on this report and the Future of Midwest Agriculture project please contact:

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