To Diversify or Not to Diversify: A Preliminary Report on Farmers' Perspectives on Diversification in the U.S. Midwest

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Appendix Table 1. Overview of farmer survey sampling design

Variable	Stratification method	Source	Explanation	
State	Proportional	USDA NASS 2017 Census of Agriculture	Indiana	26%
			Illinois	34%
			Iowa	40%
Farm size (small, medium, large)	Equal representation	None	Small (40 to 500 acres)	One-third
			Med (500 to 1,000 acres)	One-third
			Large (1000+ acres)	One-third
Level of diversification	Proportional (approximate)	USDA ERS 2021 Agricultural Resource Management Survey (ARMS)	>=3 crops	35%, 45% of which included livestock
			<3 crops	65%, 10% of which included livestock

Appendix Table 2. Numbers of surveys disseminated by category based on stratified random sampling

	Illinois	Iowa	Indiana
More diversified			
>= 3 crops plus livestock			
Small-scale (40-500 acres)	58	69	46
Medium-scale (500-1000 acres)	58	69	46
Large-scale (1000+ acres)	58	69	46
>= 3 crops no livestock			
Small-scale (40-500 acres)	71	85	56
Medium-scale (500-1000 acres)	71	85	56
Large-scale (1000+ acres)	71	85	56
Less diversified			
<3 crops plus livestock			
Small-scale (40-500 acres)	24	29	19
Medium-scale (500-1000 acres)	24	29	19
Large-scale (1000+ acres)	24	29	19
<3 crops no livestock			
Small-scale (40-500 acres)	217	257	169

Medium-scale (500-1000 acres)	217	257	169
Large-scale (1000+ acres)	217	257	169
State total	**1110**	**1320**	**870**
Grand total	**3,300**		

Appendix Table 3. Comparison of production system best equipped to achieve various goals over the next 20 years by diversified and non-diversified farmers

	Non-diversified farmers			**Diversified farmers**			**Wilcoxon rank-sum (Mann-Whitney) test**	
Production system best equipped to…	Mean	SD	n	Mean	SD	n	*z*	*p*
a...increase resilience to economic shocks, including price volatility	3.01	1.15	266	3.33	1.14	401	-3.711	.000
b...increase resilience to environmental shocks (e.g., extreme rain events and droughts)	3.14	1.15	266	3.56	1.09	400	-4.776	.000
c...manage generational changes on the farm	2.78	1.13	269	3.07	1.07	400	-3.351	.001
d...feed an increasing population	2.45	1.25	267	2.87	1.27	392	-4.178	.000
e...manage weeds, pests, and diseases	2.70	1.30	268	3.16	1.31	402	-4.524	.000
f...appeal to processors, retailers, and consumers	2.81	1.16	268	3.10	1.20	393	-3.202	.001
g...improve health and nutrition in local communities	3.02	0.99	267	3.30	1.07	398	-3.636	.000
h...enhance quality of life for farmers	2.77	1.07	266	3.17	1.12	398	-4.663	.000
i...manage yield impacts of changing climatic conditions	2.89	1.11	265	3.27	1.16	397	-4.460	.000
j...conserve land, soil, water, and wildlife habitat	3.27	1.30	270	3.58	1.25	404	-3.139	.002
k...create local jobs	3.06	1.08	264	3.35	1.12	397	-3.312	.001

Notes: The mean is the average of the five-point diversification scale across each group where: 1=Highly specialized; 2=Somewhat specialized; 3=Neither diversified nor specialized; 4=Somewhat diversified; 5=Highly diversified. In other words, lower numbers indicate specialization and higher numbers indicate diversification. Chi-square tests were performed in place of Wilcoxon Rank Sum tests for each variable and produced similar results.

Appendix Table 4. Comparison of agreement with various statements about agricultural diversification by diversified and non-diversified farmers

	Non-diversified farmers			Diversified farmers			Wilcoxon rank-sum (Mann-Whitney) test	
	Mean	SD	n	Mean	SD	n	*z*	*p*
a. In the future, I would like to see more types of crops, trees, and/or grazed livestock produced in my community.	3.10	0.929	262	3.44	0.863	391	-4.806	.000
b. The environmental or physical characteristics of my farm make diversifying challenging.	3.37	0.866	261	3.18	0.910	392	-2.743	.006
c. Diversifying (or further diversifying) my farm would positively impact my health and well-being.	2.86	0.871	261	3.02	0.898	388	-2.152	.031
d. There are trustworthy people or organizations working on agricultural diversification that I can turn to for information.	2.99	0.820	260	3.11	0.895	391	-2.049	.040

Notes: The mean is the average response on a five-point agreement scale across each group where: 1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree. Only the statements with significant differences ($p \leq 0.05$) between non-diversified and diversified farmers are shown.

Appendix Table 5. Comparison of importance of barriers to diversifying agricultural operations by diversified and non-diversified farmers

	Non-diversified farmers			Diversified farmers			Wilcoxon rank-sum (Mann-Whitney) test	
	Mean	SD	n	Mean	SD	n	*z*	*p*
a. Low short-term returns on investment from diversification (1-3 years)	3.18	.97	233	3.06	.89	361	-2.065	.039
b. Low medium-term returns on investment from diversification (4 or more years)	3.11	.91	230	2.99	.85	358	-2.018	.044
c. Long distances to markets for diversified crops/livestock	3.13	1.01	242	2.92	1.02	282	-2.275	.005

d. Lack of access to buyers for diversified crops/livestock shocks, including price volatility	3.07	1.07	241	2.93	1.00	375	-2.275	.023
e. Restrictive lease agreements (if renting land from someone else)	2.73	1.07	223	2.50	1.05	362	-2.529	.011

Notes: The mean is the average of the four-point barrier scale across each group where: 1=Not a barrier; 2=Slight barrier; 3=Moderate barrier; 4=Large barrier. Only barriers with significant differences ($p \leq 0.05$) between non-diversified and diversified farmers are shown. Don't know responses were removed for statistical analysis.

Appendix Table 6. Comparison of importance of various factors for supporting agricultural diversification by diversified and non-diversified farmers

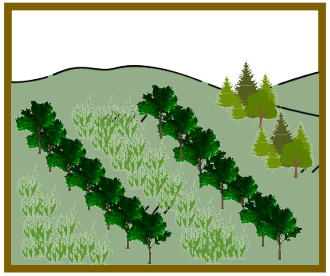
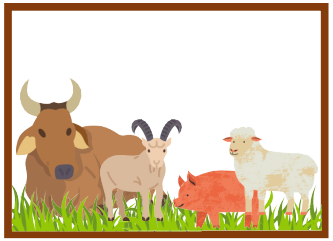
	Non-diversified farmers			**Diversified farmers**			**Wilcoxon rank-sum (Mann-Whitney) test**	
	Mean	SD	n	Mean	SD	n	*z*	*p*
a. Help for landowners to find tenants/operators using diversified practices shocks, including price volatility	2.20	1.00	235	2.45	.96	235	-3.028	.002
b. Programs to match new/beginning farmers with established farms to support development of diversified enterprises	2.56	.98	227	2.75	.94	351	-2.008	.045

Notes: The mean is the average of the four-point importance scale across each group where: 1=Not important; 2=Somewhat important; 3=Important; 4=Very important. Only factors with significant differences ($p \leq 0.05$) between non-diversified and diversified farmers are shown. Don't know responses were removed for statistical analysis.

Appendix Figure 1. One page overview of five key diversification practices identified by the Diverse Corn Belt project team

Descriptions of Diversified Production Systems

This project is focused on collaborative research with farmers, and we recognize that our understanding of diversification may change. Our preliminary farm-level framework of diversification includes the five production systems/management practices below.

Diversified production system		Description
	Extended rotation with 3 or more crops over 3+ year period	In addition to corn and soybean, extended rotations can include small grains like oats, wheat, and cereal rye, forages like alfalfa, as well as buckwheat, peas, and sunflower. While cover crops bring environmental benefits, we do not consider their use in an exclusive corn/soybean rotation to be diversification unless they are integrated into an extended rotation or incorporated in one of the other diversified production systems listed here.
	Perennial pasture/forage and perennial bioenergy crops	This category refers to perennial crops in permanent stands/pasture. This could include alfalfa and various perennial grasses, legumes, and forbs; as well as alternative bioenergy and/or biomass crops like miscanthus and switchgrass.
	Agroforestry	Agroforestry refers to the intentional integration of trees and other woody perennials (e.g., shrubs) on farms, including “alley cropping” (planting trees in widely space rows), windbreaks, riparian forest buffers, trees integrated with livestock production (silvopasture), and cultivation of forest plants and mushrooms (forest farming). Agroforestry does NOT include farm woodlots (e.g., those managed for fuelwood or timber) OR fruit tree monoculture systems (e.g., apples) if they are not actively integrated with crop or livestock production.
	Horticultural food crops	Horticultural food crops include tomatoes, squash and pumpkins, melons, apples and berries, and herbs like spearmint and peppermint. This is not an exhaustive list.
	Grazed livestock	**For cattle, goats, and sheep:** Livestock fed a forage-based diet derived from pasture or annual forages throughout the entire lifecycle (after weaning) or while the livestock are on the farm and provided maximum access to pasture/grazed annual forages during the grazing season. Does not include animals raised in confinement or on a Concentrated Animal Feeding Operation (CAFO). **For poultry/hogs**: Livestock provided maximum access to pasture/wooded areas/grazed annual forages during the grazing season. Does not include animals raised in confinement or on a CAFO.