



ND AGTECH
NSF AgTech Engine in North Dakota

NSF AgTECH ENGINE IN NORTH DAKOTA

Survey on Adoption of Agricultural Technological Innovations

ND AgTECH ENGINE: RESEARCH

Aims: The NSF AgTech Engine in North Dakota is an initiative funded by the National Science Foundation (NSF) of the United States. The program advances agricultural research and technology development in ways that are transdisciplinary, collaborative, use inspired, and translational. The resulting innovations contribute to economic development, resilience, and food security for the region.

Purpose of the Survey



Achieving Aims

Agricultural technological (agtech) innovations only achieve the aims above if farmers and ranchers actually **use** them.

Existing Knowledge

We know a lot about the factors that influence the adoption of new technologies, even in the more specific case of agtech.



Need to Know

We know far less about: (1) the relative importance of the different factors influencing the adoption of agtech innovations; and (2) how these factors matter in North Dakota.

The survey answers these questions, adding to an ecosystem in which innovators and producers can join forces to move food systems forward.



The Foundation



The social science team conducted an extensive, systematic review of existing knowledge.

This review resulted in a series of nine research briefs on innovation adoption, also available from the AgTech Engine. The review covered factors in general adoption of innovations and factors more specific to adoption of agtech innovations.

The team also identified other possible factors specific to North Dakota and the Northern Plains region, based on experience, research, anecdotes, and interactions with other AgTech Engine personnel.

Methods

Questionnaire. The team constructed the questionnaire based on the foundation described above. They pilot tested the questions with AgTech Engine personnel and North Dakota producers.

Participants. The team acquired a list of 10,000 mailing addresses selected randomly from all North Dakota farmers and ranchers who filed their cropping information with the United States Department of Agriculture (USDA).

Mailing. The survey packets included a cover letter, the questionnaire, and a prepaid reply envelope. Respondents were asked to reply within 7 days of receiving the packet (Feb-Mar 2026).

Participant rights. The Institutional Review Board (IRB) at North Dakota State University (NDSU) approved all procedures.



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Social Science Team

The research team included a mixture of subject-matter expertise, spanning topics in innovation adoption and resistance, food systems, and economic development.



Dr. Rajani Ganesh-Pillai, Marketing
Dr. David Westerman, Communication

Graduate students: Mahmuda Rahman, Aloaye Abdul-Saliu



Dr. Eric Raile, Public Policy
Graduate student: Sophia Wilder

Response to the Survey



Outgoing Mail

Of the 10,000 addresses, 298 were no longer deliverable. That left 9,702 valid addresses.

Ineligible Respondents

Another 243 individuals responded and indicated they were ineligible to complete the survey. Most of these people had recently retired. The eligible sample was down to 9,459 people.

Responses & Rates

In addition to the people reporting they were ineligible, **937** producers responded to the survey. Counting only eligible potential respondents, the response rate was 9.9% ($937/9,459$). Adding ineligible respondents, the response rate was 12.2% ($1,180/9,702$).

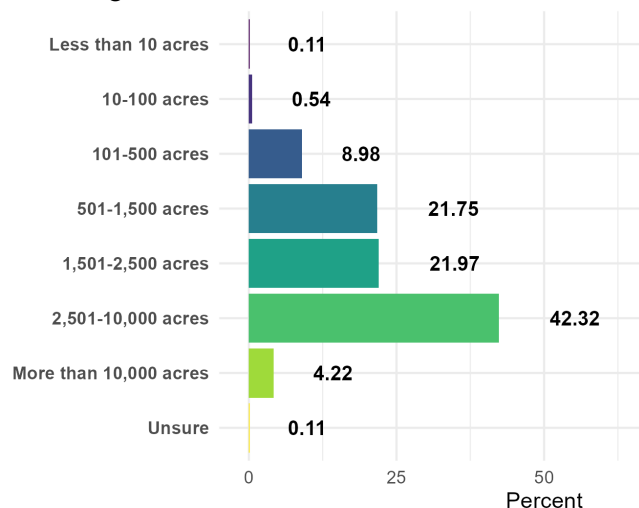
Respondent Characteristics

Strong majorities of respondents:

- Have been farming for over 20 years **88%**
- Are 3rd-generation farmers or more **91%**
- Are 45 years old or more **89%**
- Can reasonably borrow money **96%**
- Can access info about new agtech **87%**
- Have operations with 1-5 employees (including selves) **94%**

The following characteristics are relatively well distributed across respondents: acreage, annual sales, crop types, and level of education.

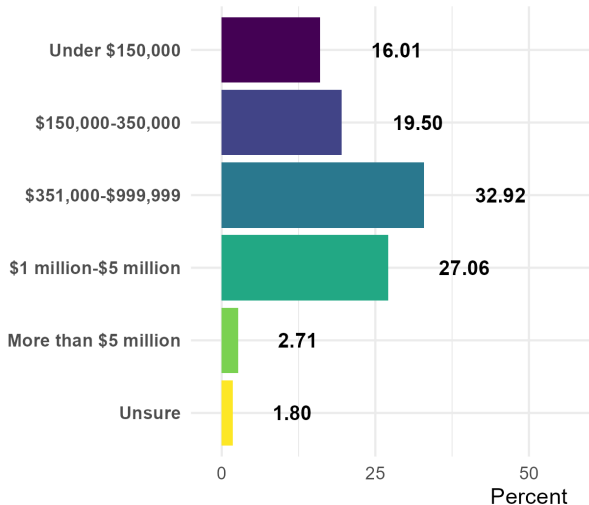
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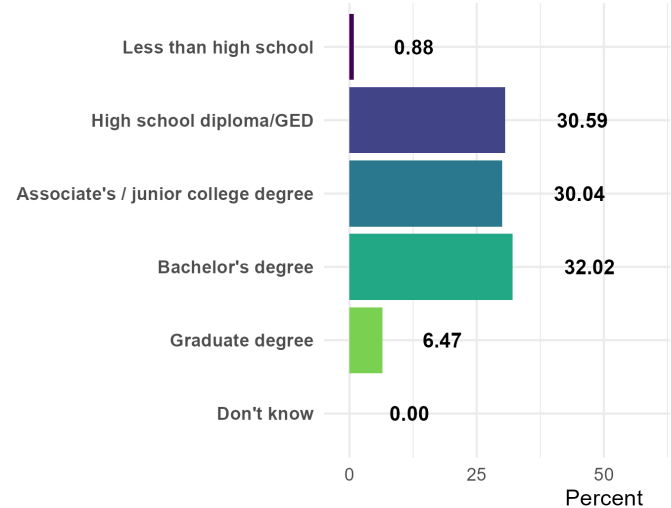


Respondent Characteristics (Continued)

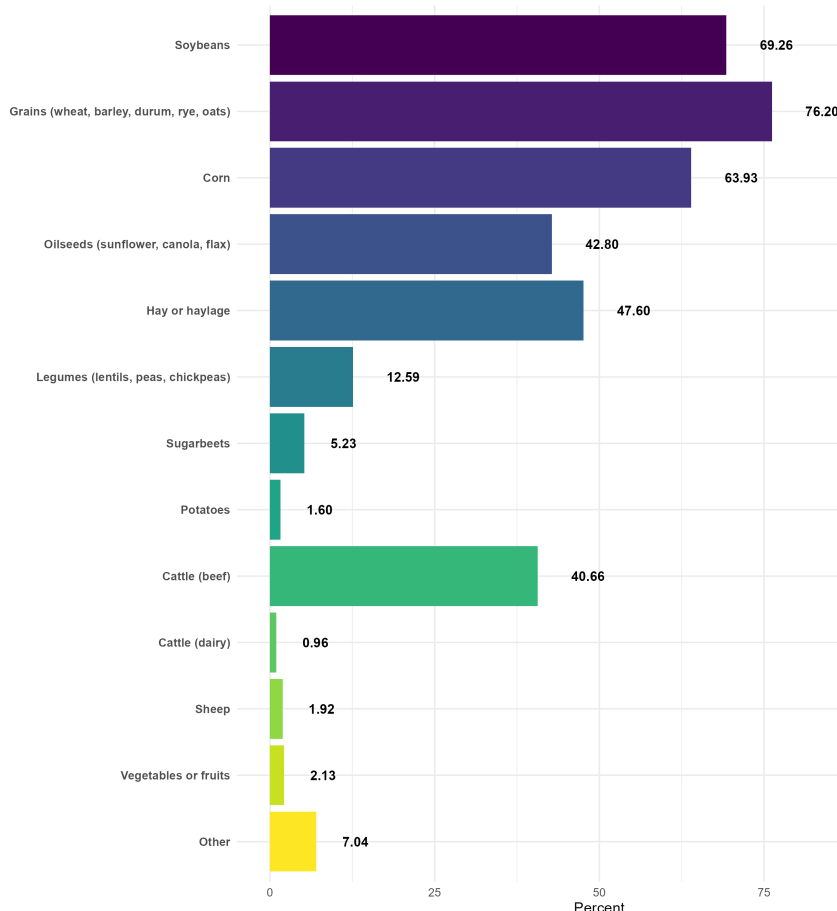
Annual Farm/Ranch Sales



Education



Crop & Animal Types



The 2022 USDA Census of Agriculture for North Dakota, while a bit older, provides a population baseline for assessing sample characteristics.

- 75% of all farmers had been farming 11 years or more, with an average of 25.9 years on the farm. The sample value is 97% of all farmers.
- The average population age was 56.8, with about half in the 55-74 age range. 61% of the sample falls in that range.
- 86% of all farms were family farms, which fits well with the sample employee numbers.
- The average farm size overall was 1,537 acres. The sample value is likely higher, with more large producers.
- 53% of all farmers had less than \$100k in farm sales, so the sample again over-represents larger producers.
- The top population commodities were wheat, soybeans, and corn. This aligns well with the sample values.



Measuring Adoption Influences

Choosing an Anchor

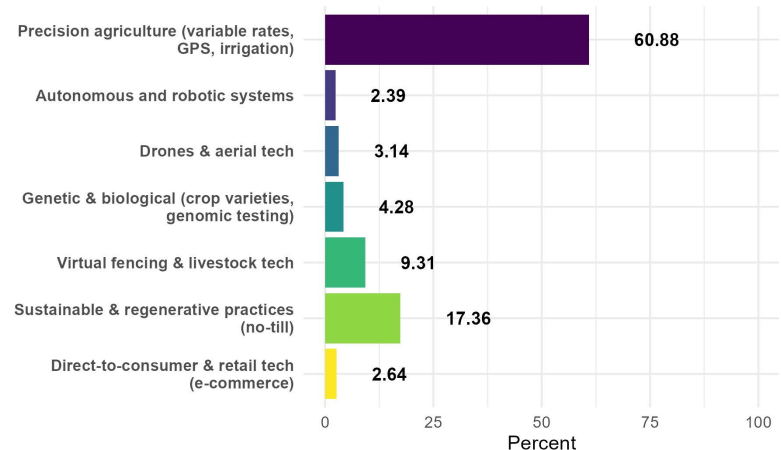
The questionnaire asked respondents to choose one type of technology to use as an anchor while thinking about other questions. Precision ag (e.g., variable rates, GPS, irrigation) was by far the most common at 61%, followed by sustainable and regenerative practices (e.g., no-till) at 17%.

Degree of Importance

Items about adoption influences asked how important each factor was when deciding whether to use a new farming or ranching technology. Response options ranged from 1 (Not at all important) to 10 (Extremely important). This scale was standard across all 34 factors.

Direct Comparison

The questionnaire also used an alternative measure to compare the importance of adoption influences. It directly asked the respondent to choose their 2 most important influences when deciding whether to adopt a farm or ranch technology.



12. How important is each of the following when you decide whether to use a new farming or ranching technology?
[Mark a box under a single number for each row.]

	Not at all important				Moderately important				Extremely important	
	1	2	3	4	5	6	7	8	9	10
Cost to get started	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Whether someone else is paying	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
How much money you could make	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
How it affects your labor needs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Risks for your operation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Satisfaction with your current operation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Whether it would be an improvement	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Whether it solves a problem you have	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

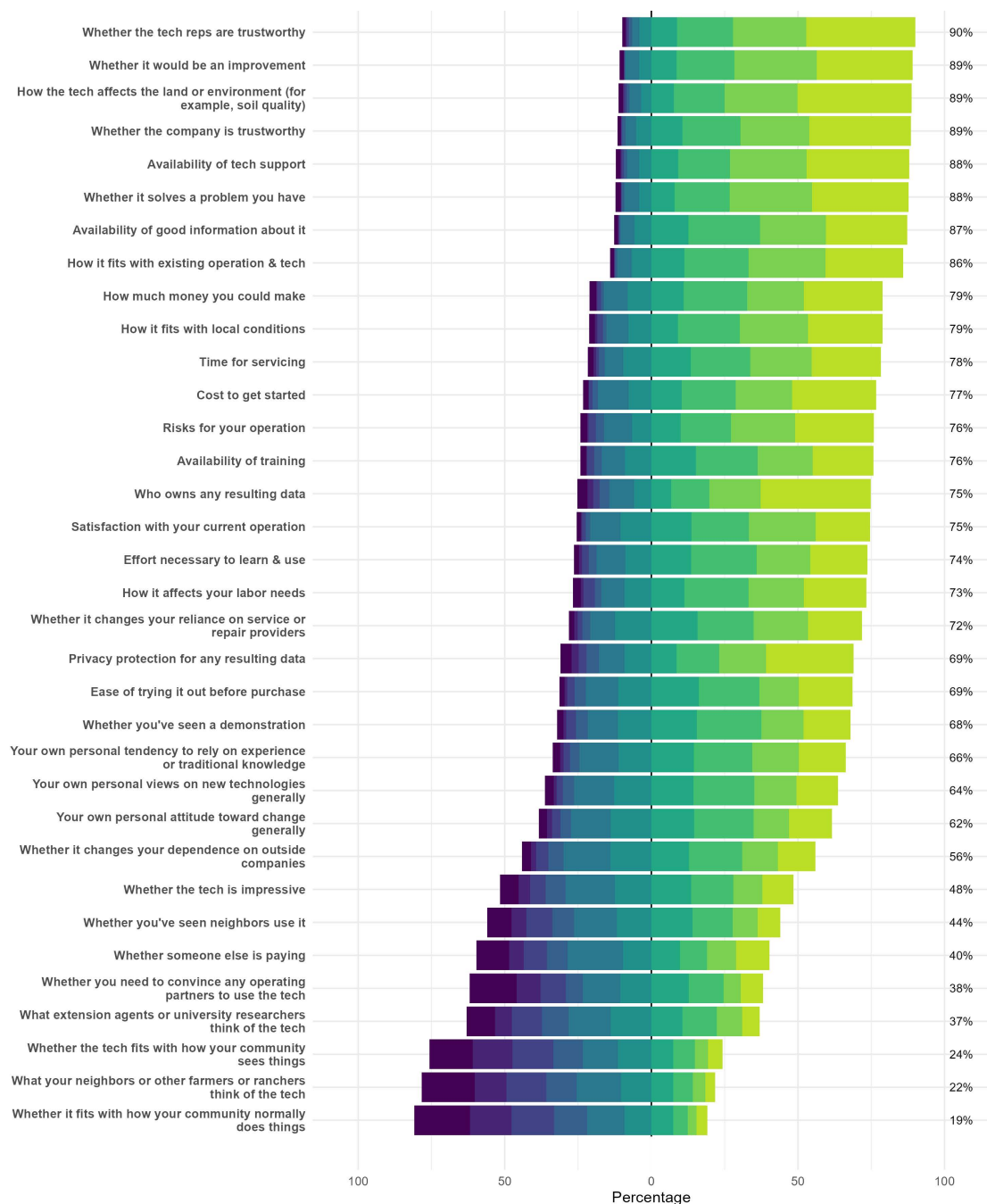
17. Pick the **2 most important** things that affect your decision about adopting a new farm or ranch technology:
[Mark 2 boxes]

- ☐ Cost, return on investment, & risk
- ☐ How it affects labor needs
- ☐ Whether it solves a problem or improves a situation
- ☐ Ability to try it out
- ☐ Its demonstrated effectiveness
- ☐ Its complexity
- ☐ How it fits with your existing operation
- ☐ Whether it increases independence
- ☐ Service, support, & repair issues
- ☐ Data privacy & ownership issues
- ☐ What others think about it
- ☐ Whether you trust the people involved
- ☐ Your general views on change & technology
- ☐ Community views & standards



Adoption Importance for 34 Factors

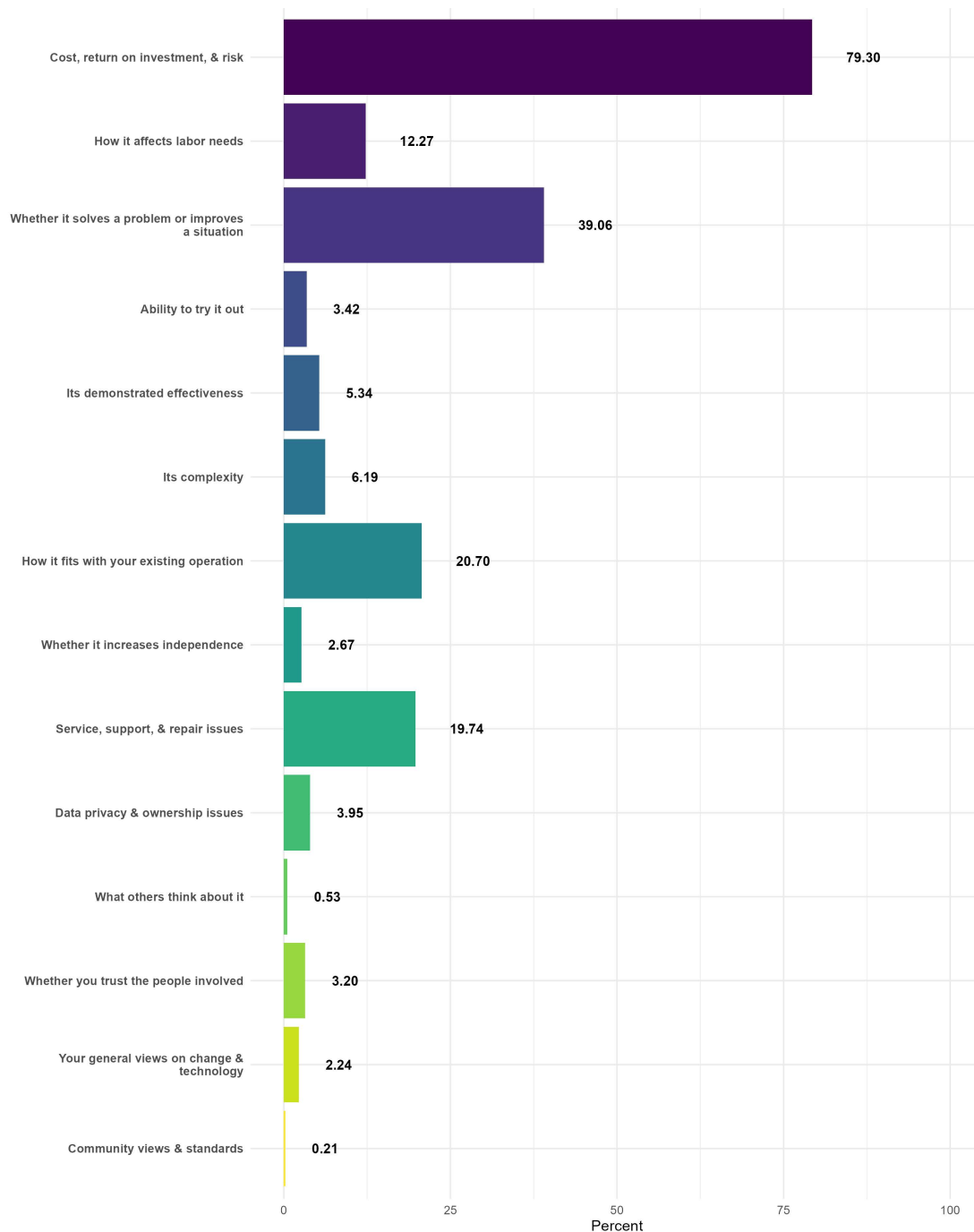
The graph below shows the results for all 34 potential influences on adoption of agtech innovations. The reported percentage is the percent of respondents scoring the factor as "7" or higher (i.e., above "moderate" importance). The results are sorted in decreasing order of importance. The bars start with a score of "1" in dark purple at the left and move toward "10" in lime green at the right.





Top 2 Influences per Producer

The graph below shows the results of asking respondents directly for the two most important influences on their adoption of agtech innovations. Each person could choose 2 of the 14 categories, which combine some of the earlier items.





Conclusions

MANY Important Influences

Majorities of respondents indicate that 26 of the 34 potential influences are important to adoption decisions. Producers may be weighing many different factors when deciding.

Top Two Categories

However, when asked to choose the top two categories of influence in a direct comparison, practical factors rise to the top by far.

- **79%:** Cost, return on investment, & risk
 - **39%:** Whether it solves a problem or improves a situation
 - **21%:** How it fits with the existing operation
 - **20%:** Service, support, & repair issues
-



MOST Important by 1-10 Measure

The most important influences on adoption based on the 1-10 measure are:

- Trustworthiness of tech reps and company
 - Whether tech would be improvement and solve a problem
 - Effects on land and environment
 - Availability of tech support and good information
 - Fit with existing operation and tech
-

LEAST Important by 1-10 Measure

The least important influences on adoption based on the 1-10 self-reported measure are social factors. These factors include what others think, the need to convince others, and community norms. Minorities of respondents report that these factors are important.

Analysis

Many different factors influence innovation adoption decisions, with trust in the tech reps and company almost always being important. However, practical factors matter most when directly comparing these influences on adoption decisions.

More general research suggests social factors are important. The lesser importance assigned here may represent a true regional difference. The stated lesser importance of social factors could also be evidence of social norms working in other ways (i.e., a social norm of being or appearing to be independent).
