Research Poster

U.S. Consumers' Perceived Benefits of Automation Technology Use in Agriculture

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Introduction

Automation technology offers multiple benefits to both consumers and producers in the context of agriculture: (1) it reduces manual labor, thereby reducing costs associated with labor and production; (2) inputs resources efficiently and consistently; and (3) improves production time (Rath et al., 2021; Warner et al., 2022). Previous studies have revealed producers possess positive perceptions of automation's ability to increase productivity while decreasing operational costs and improving conditions for existing employees (Schroeder et al., 2024; Warner et al., 2022). Additionally, Gan et al. (2023) explored consumers' acceptance of automation based on sustainability framing, and Wilmes et al. (2022) analyzed how the degree of automation adoption and environmental considerations influenced consumers' attitudes and willingness-to-buy these products. However, there is limited literature related to consumer perceptions of specific benefits associated with agricultural automation, and these perceptions could be a key driver for future purchases and adoption of this technology. Therefore, the purpose of this study was to explore U.S. consumers' perceptions of benefits associated with the use of automation technology in agriculture for both consumers and producers.

Conceptual Framework

Schema Theory (Neisser, 1976) served as the conceptual framework for this study. This theory is helpful to understand cognitive linkages between symbols and meaning (Reichel, 2009) and has been utilized in research to understand how consumers' attitudes and experiences shape their purchasing behaviors (Wilson et al., 2017). The foundations of cognition, or schemata, are critical for interpreting linguistic data (Rumelhart, 1980) and determine what information the consumer will resonate with based on their past experiences (Neisser, 1976). For the purpose of this study, respondents were asked about how they perceived the benefits of automation in agriculture to explore their schemas, or cognitive shortcuts, related to the topic. These identified benefits can be used to inform information used in marketing materials to ensure the content aligns with consumers' current cognitive patterns of recognition to promote purchases.

Methods

A quantitative content analysis was used to fulfill the purpose of this study. An online survey was distributed via Qualtrics to a non-probability quota sample of 1,020 (n = 1020) U.S. residents in April 2025. Quotas for age, gender, race, ethnicity, and income were set to reflect the U.S. census data in an effort to help increase generalizability of the findings (Baker et al., 2013; Twyman, 2008). Additionally, respondents had to indicate they had purchased plants in the past 12 months and made/shared the primary landscaping, gardening, or planting decisions for their household before proceeding to take the survey. To understand perceived benefits of automation for both consumers and producers, respondents were shown two separate, open-ended survey questions asking them to state what benefits they thought would occur for each group. This question served as an additional screener for quality responses, so any nonsensical responses were removed prior to closing out the survey. The data were then exported as a CSV file and uploaded to NVivo, a qualitative analysis software. A *word frequency query* was run within NVivo for each open-ended question, and related words were treated as one word in the word count (i.*e.,* products, product, and production). After the initial analysis, filler words and words from the question (*i.e.,* agriculture, grower, etc.) were omitted from a second word frequency query to provide more accurate data, which have been reported for this study.

Findings

Table 1 reports the findings from this study, which includes an example response for each of the top five words used to describe benefits to consumers and to producers for additional context.

Table 1. *Perceived Benefits of Automation use in Agriculture*

	Benefits to Consumers		Benefits to Producers	
	Word	Example Response	Word	Example Response
1	Plants	"I would think that more **plants** would be available. I assume that the **plants** would be more prolific and fruitful."	Cost	"The **cost** of planting and maintaining would go down and they would not have to pay as many employees."
2	Product	"It would no doubt improve **production** and lessen the chance of damage to the plants."	Plants	"The entire process of **planting** would be made simpler and stress free allowing them to potentially **plant** more and make more money."
3	Prices	"Lowering **prices**, automated processes reduce labor and operational cost which can lead to more affordable plant **prices** for customers."	Productivity	"It will increase efficiency, **productivity**, accuracy, etc."
4	Cost	"The big benefit would come from the growers being able to lower their **cost** and passing down some of the savings to the consumer."	Labor	"There are benefits in the reduction of manual **labor** and costs associated with labor."
5	Quality	"The **quality** of the vegetation could be improved as the automation processes must be very precise."	Time	"More **time** to work on other aspects of the business, more time with family."

Conclusions, Implications, and Recommendations

The findings from this research provide insight into U.S. consumers' current schemata (Neisser, 1976) related to the use of automation in agriculture, specifically related to their perceptions of benefits for consumers as well as growers and producers. Table 1 illustrates that there is overlap in perceived benefits for the two groups when it comes to improved production related to plants as well as decreased costs for both consumers and producers. Benefits to consumers also included tangible benefits, like improved quality of products and decreased prices. Benefits for producers focused more on worker conditions, including increased time and reduced manual labor. These perceived benefits aligned with the actual benefits for using automation in agricultural production (Rath et al., 2021; Warner et al., 2022), which will make communicating about this technology to consumers more straight forward than if their opinions had diverged from reality. Communicators and Extension personnel should frame the information in their materials around these identified benefits to align with existing schemas and promote future purchases (Neisser, 1976). Because many of the respondents' answers included more than one of the top words identified in this study, future research should specifically explore the association of these words to better map consumers' cognitive linkages. An exploratory qualitative analysis of this data would also yield more nuanced findings related to consumer perceptions to help direct future marketing and outreach material development.

References

Baker, R., Brick, J. M., Bates, N. A., Battaglia, M., Couper, M. P., Dever, J. A., Gile, K. J., & Tourangeau, R. (2013). Summary report of the AAPOR task force on non-probability sampling. *Journal of Survey Statistics and Methodology, 1*(2), 90–143. https://doi.org/10.1093/jssam/smt008

Gan, C. I., Soukoutou, R., & Conroy, D. M. (2023). Sustainability Framing of Controlled Environment Agriculture and Consumer Perceptions: A Review. *Sustainability, 15*, 304.

Neisser, U. (1976). *Cognition and reality: principles and implications of cognitive psychology*. W.H. Freeman.

Rath, K. C., Maharana, S. N., and Rajak, J. (2021). Replacement of human labour with integration of machines into a self-governing system. *International Journal of System Dynamics Applications, 10*(2), 73-87. https://doi.org/10.4018/IJSDA.2021040105

Reichel, S. (2009). *Cognitive principles, critical practice: Reading literature at university.* Vienna University Press.

Rumelhart, D. E. (1980). Schemata: The building blocks of cognition. In R. J. Spiro, B. C. Bruce, & W. E Brewer (Eds.). *Theoretical issues in reading comprehension: Perspectives from cognitive psychology, linguistics, artificial intelligence, and education* (pp. 33-58). Erlbaum.

Schroeder, S., Lehberger, M., & Sparke, K. (2024). Threat or opportunity? - Managers' and employees' perception of automation and digitalization in the horticultural sector. *Procedia Computer Science, 232*, 564-573. https://doi.org/10.1016/j.procs.2024.01.056

Twyman, J. (2008). Getting it right: YouGov and online survey research in Britain. *Journal of Elections, Public Opinion and Parties*, *18*(4), 343–354. https://doi.org/10.1080/17457280802305169

Warner, L. A., Rihn, A. L., Fulcher, A., Schexnayder, S., LeBude, A. V. (2022). Relating Grower Perceptions and Adoption of Automated Nursery Technologies to Address Labor Needs. *Journal of Agricultural Education, 63*(2), 150-168. https://doi.org/10.5032/jae.2022.02150

Wilmes, R., Waldhof, G., & Breunig, P. (2022). Can digital farming technologies enhance the willingness to buy products from current farming systems? *PLoS ONE, 17*(11): e0277731. https://doi.org/10.1371/journal.pone.0277731

Wilson, K., Barnes, C., & Irani, T. (2013). An exploration of consumer perceptions of plants and plant characteristics: A qualitative study of Florida plant and garden consumers. *Journal of Applied Communications*, *97*(3). https://doi.org/10.4148/1051-0834.1113