Original Research Article

'Agricultural Students' Perceptions of Artificial Intelligence: Challenges and Opportunities in Tamil Nadu, India

Abstract

Artificial Intelligence (AI) potential to revolutionize agricultural practices, from precision farming to decision-making, is increasingly recognized by students. Understanding their views is essential for fostering AI adoption and innovation in the agricultural sector. The research was conducted among 100 agricultural students from Tamil Nadu Agricultural University Coimbatore, Tamil Nadu, using a proportionate random sampling method. A well-structured questionnaire was used to collect data on students' perceived usefulness of AI, ease of use, its impact on learning, emotional responses and attitudes towards AI in agriculture and challenges faced by the agricultural students. Meanscore and percentage analysis were used to analyse the collected data. The results show that AI improves decision-making processes in farm management (4.52), AI is easy to use for agricultural studies (4.42), AI tools make learning more interactive and engaging in agricultural education (4.54), the idea of using AI in agriculture makes me feel excited (3.73) and students believe AI technologies will play a significant role in the future of agriculture (3.96). About85 per cent of students had technical limitations, such as insufficient access to equipment and software. Furthermore, the integration of AI with traditional agricultural practices was found to be difficult for 81 per cent of the respondents. The study concludes that while agricultural students are eager to embrace AI in their future careers, significant improvements in infrastructure, training, and support are needed to fully realize AI's potential in the agricultural sector. These findings offer valuable insights for educators seeking to foster AI-driven innovation in agriculture.

Key words: Artificial intelligence, farming, agricultural students, decision makingand perception

Introduction

The integration of AI into agriculture is transforming the sector, enabling farmers and stakeholders to tackle complex challenges such as climate change, resource scarcity, labour shortages, and rising food demand (Ziesche *et al.*, 2023). AI applications, including machine learning, robotics, computer vision, and data analytics, are being deployed to optimize decision-making processes, increase efficiency, and boost productivity (Soori *et al.*, 2023). Technologies like precision farming, automated irrigation systems, drone-based crop monitoring, predictive analytics for pest and disease management, and autonomous machinery have already demonstrated their potential to reshape agricultural practices (Adetunji *et al.*, 2023).

The agricultural students are the future workforce and experts who will propel innovation and transformation in the agricultural sector in the context of these technological advancements(Hoque &Padhiary2024). Their perception of AI, as well as their willingness and readiness to adopt and utilize AI technologies, will be pivotal in determining the pace of AI integration in agriculture (Khanna *et al.*, 2024). Therefore, understanding how agricultural students view AI whether they see it as a tool for positive change or as a disruptive force becomes critically important for both educational institutions and the industry at large (Javaid *et al.*, 2023).

Agricultural students' perception of AI is likely shaped by various factors such as perceived usefulness of AI, perceived ease of use, perception of AI's impact on learning and education, emotional response to AI in agriculture, attitude towards AI in agriculture (Kashive*et al.*, 2020; Mohr & Kuhl 2021). Moreover, cultural, social, and economic contexts, as well as personal interests, can influence how students perceive the benefits and challenges of AI (Dai *et al.*, 2020). With AI continuing to expand its presence in agriculture, the need for a workforce equipped with both traditional agricultural knowledge and modern technological skills has never been greater (Yahya 2018).

This study seeks to explore the perceptions of agricultural students towards AI in agriculture, focusing on their awareness, attitudes and challenges. This study intends to offer important insights into the abilities of the upcoming generation of agricultural professionals by investigating these perceptions. Furthermore, the study will identify potential gaps in the educational system, propose improvements in AI-related curriculum and training, and suggest strategies to enhance students' receptiveness to AI technologies. The findings from this

research will contribute to shaping educational policies and strategies that prepare students for the evolving landscape of agriculture powered by AI.

Methodology

The ex-post facto research design was used for this study to investigate the perceptions of agricultural students towards AI in agriculture. The study was conducted among students from Tamil Nadu Agricultural University in Coimbatore district, which was purposively selected due to its prominence as an educational hub for agriculture and its involvement in advanced AI-based agricultural projects. One agricultural institution in Coimbatore was specifically chosen for this study based on its active engagement with AI-related educational programs. This institution not only includes AI modules in its curriculum but also collaborates with AI research initiatives in agriculture, making it an ideal population for this research. A total of 100 undergraduate agricultural students were selected as respondents, representing various levels of exposure to AI in agriculture across different academic years. The proportionate random sampling method was used for the study. This method ensured that students from all years of undergraduate study were included in proportion to their overall enrollment at the institution, thus providing a diverse cross-section of perspectives. Data collection was carried out using a pre-tested structured questionnaire designed to capture students' perceptions, awareness, and challenges of AI in agriculture. The personal interview method was adopted to gather in-depth insights, enabling the researchers to clarify responses and probe for detailed information where necessary. The data gathered from the respondents were analysed using percentage analysis and meanscore methods to draw clear conclusions regarding the students' perceptions. These statistical techniques provided a quantitative measure of student’sattitudes and highlighted key areas where they saw potential benefits or obstacles to the adoption of AI in the agricultural sector.

Results and discussion

Each respondent was given questions regarding artificial intelligence in agriculture to answer in order to assess their perception. Every respondent rated each item on the questionnaire using a five-point rating scale: Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, and Strongly Disagree = 1. This was carried out in order to calculate the mean score for every student as well as the mean score for each individual. As a result, a respondent's meanscore could be as high as five and as low as one. The respondents'

perceptions were reflected in this mean score. Positive perception has been associated to high mean scores and negative perception has been associated to low mean scores (Muchiri*et al.,* 2013).

Table 1 Demographic profile of the agricultural students

S.No.	Demographic profile	Frequency	Per cent
1.	Year of the study	I – 13	I – 13.00
		II – 27	II – 27.00
		III – 31	III – 31.00
		IV-29	IV – 29.00
2.	Gender	Male - 53	Male - 53.00
		Female - 47	Female - 47.00
3.	Family ownership of agricultural land	84	84.00
4.	Family involvement in farming	79	79.00
5.	Awareness of AI applications in agriculture	92	92.00
6.	Participation in AI-related training, workshops, or courses	74	74.00
7.	Preference for AI tools in future agricultural careers	94	94.00
8.	Interest in pursuing further studies or a career in AI-related fields within agriculture	93	93.00

From Table 1 it shows that the demographicprofile of the 100 agricultural students, in year of study the distribution across academic years shows a balanced representation, with the largest group of students in their third year (31.00 %), followed by fourth-year students(29.00 %), second-year students (27.00 %) and first-year students (13.00 %). This variety in academic levels ensures a diverse perspective, ranging from students early in their studies to those nearing graduation, who may have more exposure to AI concepts. In gender the students were57 per cent male and 43 per cent female students. This slight male majority suggests that both genders are equally engaged in agricultural education, with a growing interest in technology and AI in agriculture among male students. In family ownership of agricultural land, the respondents were majority (84.00%) of students come from families that own agricultural land. This direct connection to farming likely provides these students with practical insights into the challenges and opportunities in agriculture, which may influence their interest in using AI to improve farming operations.

Family involvement in farming found that 79 per cent of students come from families directly involved in farming. This suggests that a significant portion of the respondents have a personal stake in agriculture, which could make them more inclined to explore innovative

solutions like AI that could enhance productivity, reduce labour, or solve on-farm challenges.Awareness of AI applications in agriculture were found the (92.00 %) of the students are aware of AI applications in agriculture. This high level of awareness indicates that students are familiar with the concept of AI and its potential role in agriculture, which may reflect the integration of technology-oriented courses or discussions in their curriculum. In participation in AI-related training, workshops or courses(74.00 %) of the respondents have participated in AI-related training, workshops, or courses, reflecting a strong engagement with AI education. However, (26.00 %) of students have not had formal exposure to AI training, suggesting that institutions could increase access to AI-related learning opportunities to ensure more students receive hands-on experience.Preference for AI tools in future agricultural careers significant (94.00 %) of students indicated a preference for using AI tools in their future careers. This strong positive perception suggests that students recognize the benefits of AI in enhancing agricultural efficiency, improving decision-making, and addressing complex challenges like pest control, climate variability, and resource management. In interest in pursuing further studies or a career in AI-related fields within agriculture93 per cent of the students are interested in pursuing further studies or careers in AI-related fields within agriculture. This demonstrates that most students not only see AI as a tool for future use but are also motivated to deepen their knowledge and potentially specialize in AI applications in agriculture (Hooda *et al.*, 2022).

Table 2 Perception scores of agricultural students regarding the artificial intelligence in agriculture

S.No.	Statements related to artificial intelligence in agriculture	Mean
A.	**Perceived Usefulness of AI**	
	AI helps me understand complex agricultural concepts more easily	4.28
	AI provides innovative solutions to common farming problems (e.g., pest control, crop management)	4.48
	Using AI enhances my ability to conduct agricultural research (e.g., data analysis, simulation)	4.32
	AI improves decision-making processes in farm management	4.52
	AI tools are useful for precision farming techniques	4.28
B.	**Perceived Ease of Use**	

	AI is easy to use for agricultural studies	4.42
	I feel confident using AI for agricultural tasks (e.g., soil analysis, crop prediction)	4.37
	AI tools have user-friendly interfaces for agricultural applications	4.16
	I can quickly learn to use new AI technologies relevant to agriculture	4.42
	Technical support for AI tools in agriculture is readily available	4.10
C.	**Perception of AI's Impact on Learning and Education**	
	AI has improved my ability to grasp complex agricultural topics	4.37
	AI tools make learning more interactive and engaging in agricultural education	4.54
	AI makes it easier to access educational resources related to agriculture	4.23
	The use of AI in education motivates me to learn more about innovative farming techniques	3.93
D.	**Emotional Response to AI in Agriculture**	
	The idea of using AI in agriculture makes me feel excited	3.73
	I feel anxious about the increasing role of AI in agriculture	3.15
	Using AI in agriculture makes me feel more connected to modern farming techniques	3.61
E.	**Attitude Towards AI in Agriculture**	
	I believe AI technologies will play a significant role in the future of agriculture	3.96
	AI can help address the challenges of climate change in agriculture	3.33
	I am likely to use AI in my future agricultural career	3.70

From Table 2 it shows that the perception of agricultural students towards various aspects of Artificial Intelligence (AI) in agriculture, grouped into five key categories. The first category perceived usefulness of AI provides that the agricultural students particularly

agree that AI improves decision-making in farm management (4.52), followed by AI provides innovative solutions to farming problems (4.48). This suggests that students clearly see AI as a valuable tool for enhancing efficiency, precision farming, and agricultural research. Using AI enhances my ability to conduct agricultural research (4.32), AI helps me understand complex agricultural concepts more easily and AI tools are useful for precision farming techniques (4.28). The results are in accordance with the findings of (Obenza*et al.,* 2024; Padhiary& Kumar2024).

The second category perceived ease of use suggests that the students generally find AI tools easy to use for agricultural studies and the also can quickly learn to use new AI technologies relevant to agriculture (4.42), followed by confidence in using AI for tasks like soil analysis and crop prediction (4.37). AI tools have user-friendly interfaces for agricultural applications (4.16). However, the availability of technical support (4.10) scored slightly lower, suggesting that while AI is perceived as user-friendly, some students feel that more support or infrastructure could improve their experience (Shamsi *et al.,* 2022).

The third category perception of AI's impact on learning and education provides that the agricultural students feel that AI positively impacts their learning experience, particularly making education more interactive and engaging (4.54), followed by AI also helps students better grasp complex agricultural topics (4.37). AI makes it easier to access educational resources related to agriculture (4.23). However, the motivational impact of AI on learning new techniques scored slightly lower at 3.93, indicating that while AI enhances learning, its role in motivating students to explore new farming techniques may need further encouragement (Tapalova&Zhiyenbayeva 2022).

The fourth category emotional response to AI in agriculture shows that the agricultural students the idea of using AI in agriculture makes me feel excited(3.73),showing that while there is enthusiasm, it is not overwhelming, followed by using AI in agriculture makes me feel more connected to modern farming techniques (3.61). Anxiety about AI's increasing role in agriculture scored the lowest (3.15), indicating that students may have some concerns or uncertainties about its growing influence and potential impacts on traditional farming.

The fifth category attitude towards AI in agriculture provides that the students generally believe that AI will play a significant role in the future of agriculture (3.96), followed by the students are moderately likely to use AI in their future careers (3.70).

However, AI's ability to address challenges like climate change (3.33), possibly due to a lack of clear understanding or examples of AI being applied to this area (Holzinger *et al.*, 2019).

Table 3 Challenges faced by agricultural students towards artificial intelligence in agriculture

S.No.	Statement	Frequency*	Per cent
1.	I find it challenging to access AI tools due to technical limitations (e.g., lack of equipment, software)	85	85.00
2.	The cost of AI tools is a barrier to their use in agricultural studies	46	46.00
3.	I am concerned about the accuracy and reliability of AI predictions in agriculture	78	78.00
4.	There is a lack of training opportunities to learn about AI in agriculture	58	58.00
5.	Integrating AI with traditional agricultural practices is difficult	81	81.00
6.	I struggle with understanding the underlying algorithms and data used in AI tools	65	65.00
7.	There is insufficient support from my institution to explore AI in agriculture	72	72.00
8.	The complexity of AI tools makes them difficult to use without expert guidance	66	66.00

*Multiple responses obtained

From Table 3 it could be seen that majority 85 per cent of the students find it challenging to access AI tools due to technical limitations such as a lack of equipment or software. This suggests that infrastructural barriers, like insufficient availability of hardware and appropriate software, are a major concern for students, impeding their ability to explore AI in agriculture fully. Nearly half of the respondents (46.00 %) feel that the cost of AI tools is a barrier to their use in agricultural studies. About 78 per cent of students' express concerns about the accuracy and reliability of AI predictions in agriculture. This highlights a trust issue regarding the efficacy of AI tools in real-world agricultural applications. Students may be wary of over-reliance on AI for critical decisions without understanding the factors influencing AI's accuracy. More than half of the respondents (58.00 %) indicate that a lack of training opportunities is a barrier to learning about AI in agriculture. This suggests that while AI tools may be available, formal education and skill development opportunities are

insufficient, limiting the ability of students to use these tools effectively.The results are in line up with the findings of (Pedro *et al.*, 2019).

About 81 per cent of the students find it difficult to integrate AI with traditional agricultural practices. This points to the complexity involved in merging modern AI technologies with conventional farming methods, a gap that might require more education, demonstration and examples of successful integration to reduce resistance. About 65 per cent of students struggle with understanding the underlying algorithms and data used in AI tools. This indicates a knowledge gap regarding how AI functions, which may prevent students from fully utilizing AI in agriculture. To overcome this, there may be a need for more accessible explanations and educational content focused on AI's technical foundations. About 72 per cent of students feel that their institution does not provide sufficient support for exploring AI in agriculture. This lack of institutional backing, whether in the form of resources, guidance, or mentorship, can significantly hinder students' ability to engage with AI technologies. About (66.00 %)of students report that the complexity of AI tools makes them difficult to use without expert guidance. This reveals that while AI tools are available, their complexity poses a significant barrier to independent use, requiring expert intervention to make these tools accessible to students (Chen *et al.*, 2023).

Implications of the study

The necessity of incorporating AI into agricultural education through enhanced curricula, skill development, and infrastructure improvements is highlighted by the study 'Agricultural Students' Perceptions of AI: Challenges and Opportunities in Tamil Nadu. It emphasises how crucial it is to address regional agricultural issues by increasing awareness, offering practical training, and encouraging research and innovation. While policymakers can encourage AI education through funding and scholarships, institutions should concentrate on partnerships and capacity building. By bridging the gap between traditional farming and new technology, students with AI expertise can promote precision agriculture adoption and workforce readiness. To fully realise AI's potential for sustainable agricultural development in Tamil Nadu, cooperation between stakeholders including academia, business, and policymakers is crucial.

Conclusion

The research on the perception of agricultural students towards Artificial Intelligence (AI) in agriculture reveals a generally positive outlook, with most students recognizing the potential of AI to enhance various aspects of agricultural practices. The findings indicate that students perceive AI as a valuable tool for improving decision-making, research, and precision farming techniques. A high percentage of respondents acknowledged the usefulness of AI in solving complex agricultural problems, reflecting optimism about its future role in the sector. However, despite the positive perception of AI's benefits, several challenges were identified. Technical limitations, such as the lack of access to equipment and software, were major barriers for students. Additionally, concerns about the accuracy and reliability of AI predictions, the complexity of AI tools, and insufficient institutional support highlighted areas where improvements are necessary. The difficulty in integrating AI with traditional farming practices also emerged as a significant concern, suggesting that students need more practical examples and training to bridge this gap. Overall, while the students are keen to incorporate AI in their future careers, the research highlights the need for increased investment in AI infrastructure, more comprehensive training opportunities, and enhanced institutional support. Addressing these barriers will empower agricultural students to leverage AI technologies effectively, enabling them to contribute to the modernization of the agricultural sector. The study underscores the importance of equipping the next generation of agricultural professionals with the knowledge and tools required to fully embrace AI's potential in transforming agriculture.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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