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Constraints and suggestions in utilisation of ICT and AIs tools among faculties in SAUs of Gujarat

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Abstract

Information and Communication Technology (ICT) and Artificial Intelligence (AI) tools have emerged as transformative forces in agricultural education, offering innovative solutions for teaching, research and extension activities. The State Agricultural Universities (SAUs) of Gujarat play a pivotal role in agricultural higher education and technology dissemination. Keeping this in mind, a study was conducted to identify constraints faced by faculty members in adopting ICT and AI tools and to gather suggestions for overcoming these challenges. The research project was undertaken across four SAUs of Gujarat: Junagadh Agricultural University (JAU), Anand Agricultural University (AAU), Navsari Agricultural University (NAU) and Sardarkrushinagar Dantiwada Agricultural University (SDAU). The study employed an *ex-post facto* research design. A total of 240 faculty members were selected as respondents through proportionate random sampling from the four universities. Pre-tested questionnaires were used to measure responses. For analysis, mean scores were calculated and ranks were assigned accordingly. Major constraints faced by faculty members revealed that "Concern about data safety and privacy while using AI tools" was accorded the first rank (Mean=1.43), followed by "High cost of AI tools or software platforms" (Mean=1.24) and "Long screen time causes health issues like headaches or eye strain" (Mean=1.13) securing second and third ranks respectively. To overcome constraints, the majority of respondents suggested "Upgraded classrooms with smart boards and modern digital infrastructure" secured first rank (Mean=1.671), followed by "Dedicated support unit for maintenance and repair of ICT tools and software" (Mean=1.658) and "Periodical trainings to update information related to ICT and AI tools" (Mean=1.654) securing second and third ranks respectively. Addressing these challenges through targeted interventions can enhance the adoption of modern technologies in agricultural education, ultimately improving the quality of teaching and research in SAUs.

Keywords: ICT tools, Artificial Intelligence, agricultural education, faculty members, technology adoption

Introduction

Teaching-learning procedures, research techniques and extension outreach have all been transformed by the incorporation of artificial intelligence (AI) and information and communication technology (ICT) in agricultural education. Personalized learning, data-driven research and effective information sharing are all made possible by these technologies. By producing qualified experts and developing pertinent technology, India's agricultural education system especially the State Agricultural Universities (SAUs) serves as the foundation for agricultural development. Four well-known SAUs, Junagadh Agricultural University, Anand Agricultural University, Navsari Agricultural University and Sardarkrushinagar Dantiwada Agricultural University are located in Gujarat, one of the states that leads in agricultural production and technological adoption.

Technology integration in higher education, especially agriculture, is a key component of the National Education Policy (NEP) 2020. ICT resources like digital repositories, virtual labs and learning management systems are now

crucial parts of contemporary agricultural curricula. Similar to this, academic members must be knowledgeable about these cutting-edge technologies for AI applications in agriculture, such as crop modelling, disease prediction, precision farming and decision support systems. However, there are a number of obstacles to faculty members' adoption of these tools, from talent gaps to infrastructure constraints.

Meena *et al.* (2021) ^[7] claim that institutional support and faculty preparation play a major role in how well agricultural universities integrate technology. According to Singh and Patel (2022) ^[9], although SAUs have made strides toward digitization, there are still a number of obstacles preventing the widespread use of sophisticated AI tools. Faculty members' technological prowess will be crucial to the future development of agricultural education. In light of this, the current study was conducted to determine the obstacles faculty members encounter while implementing ICT and AI tools and to collect recommendations for resolving these issues.

Objective

To identify the constraints in utilization of ICT and AI tools by faculty of SAUs of Gujarat and to obtain suggestions for overcoming them.

Materials and Methods

The four state agricultural universities in Gujarat are Sardarkrushinagar Dantiwada Agricultural University (SDAU), Anand Agricultural University (AAU), Navsari Agricultural University (NAU) and Junagadh Agricultural University (JAU). These universities are in charge of agricultural education, research and extension initiatives across the state's several areas. All four of Gujarat's SAUs participated in the study endeavor. Gujarat was specifically picked since it is one of the top states in terms of agricultural output and has a strong network of agricultural universities with different degrees of technological infrastructure.

An *ex post facto* research design was used for the investigation. Because the independent variables' manifestations have already happened or are intrinsically unmanageable, the scientist has no direct control over them in this methodical empirical investigation. The study comprised faculty members from Agricultural Extension, Agronomy, Horticulture, Plant Pathology, Entomology, Agricultural Engineering and other related fields from each of the four SAUs.

A total sample size of 240 respondents was obtained by selecting 60 faculty members from each university using a proportionate random selection procedure. To ensure representativeness, care was taken to include academic members with diverse years of experience and different designations (Assistant Professors, Associate Professors and Professors). Before being administered, questionnaires of constraints were created and pre-tested to gauge faculty members' replies about the challenges they faced when implementing ICT and AI tools. Each constraint and

suggestion's mean score was determined for analysis and ranks were then allocated appropriately.

Results and Discussion

Constraints refer to a situation or circumstance which impedes, restricts or limits the activity or performance of an individual. In this study, it was operationalized as items of difficulties experienced by the faculty members in adopting ICT and AI tools for teaching, research and extension activities. Based on the responses from faculty members, the total score was calculated for each constraint, converted to mean score and accordingly, rank was given. The information regarding the constraints is depicted in Table 1. It is evident from the data presented in Table 1 that the foremost constraint reported by the respondents was "I am concerned about data safety and privacy while using AI tools" which secured the 1st rank with a mean score of 1.43. This indicates that faculty members are increasingly aware of the potential risks associated with AI platforms, including data breaches, unauthorized access and misuse of personal or institutional information. As AI tools often require sharing of data on cloud-based platforms, concerns regarding confidentiality and security have emerged as critical barriers to adoption. This finding assumes greater significance in the context of agricultural research data, which may include sensitive information related to ongoing experiments, unpublished findings and intellectual property. The second most critical constraint was "The cost of AI tools or software platforms was too high" (Mean=1.24) ranked 2nd. Many specialized AI tools, educational technology platforms and statistical software require expensive licenses or subscription fees that individual faculty members or even departments may find difficult to procure. This finding corroborates with the results of Sharma and Kumar (2021) ^[8] who documented similar financial constraints in technology adoption among agricultural university faculty.

Table 1: Distribution of respondents according to constraints faced while utilizing ICT and AI tools (n=240)

Sr. No.	Constraints	Total Score	Mean Score	Rank
1	I am concerned about data safety and privacy while using AI tools.	342	1.43	I
2	The cost of AI tools or software platforms was too high.	297	1.24	II
3	Long screen time causes me health issues like headaches or eye strain.	271	1.13	III
4	I do not have enough skills or training to properly use ICT and AI tools.	238	0.99	IV
5	I do not have enough free time to explore and learn these tools.	230	0.96	V
6	I am unaware of many newly available ICT and AI tools.	219	0.91	VI
7	ICT and AI tools were not well-suited for agriculture-related teaching or research.	211	0.88	VII
8	There was insufficient budget to purchase or upgrade ICT and AI tools.	202	0.84	VIII
9	Internet connectivity was often slow or not working properly.	188	0.78	IX
10	There was no regular facility for maintenance or repair of ICT tools and software.	183	0.76	X

"Long screen time causes me health issues like headaches or eye strain" (Mean=1.13) was accorded 3rd rank. This emerging constraint reflects the physical toll of increased digital engagement, particularly as faculty members balance online teaching, research and administrative responsibilities. The shift toward technology-mediated education has brought attention to ergonomic concerns and digital wellness, which were previously underexplored in agricultural education contexts.

Further, "I do not have enough skills or training to properly use ICT and AI tools" emerged as another prominent issue,

given 4th rank (Mean=0.99). This finding aligns with the observations of Anurag *et al.* (2013) ^[2] and Subash *et al.* (2013) ^[11] who reported that although faculty members recognize the importance of modern technologies, they often lack structured training opportunities to develop proficiency in these areas. The rapid evolution of ICT and AI tools requires continuous upskilling, which is currently not adequately addressed through faculty development programmes.

These findings were in close conformity with the earlier research of Anurag *et al.* (2013) ^[2], Subash *et al.* (2013) ^[11],

Tanko *et al.* (2013) ^[12], Sireesha *et al.* (2014) ^[10], Agwu and Ogbonah (2015) ^[1], Mathews (2019) ^[6], Dash (2021) ^[3] and Kumawat (2023) ^[5], who also reported that lack of technical expertise, inadequate training, insufficient budget, erratic internet connectivity, poor maintenance, high equipment costs and health-related challenges acted as major obstacles in ICT adoption.

It is important to overcome constraints and seek suggestions from the respondents to improve the adoption of ICT and AI tools among faculty members. It gave value to the technical knowledge of the respondents and their understanding of technology integration in agricultural education. For this, suggestions were invited openly from the respondents. Most respondents gave similar suggestions, so the total score for each suggestion was calculated, converted into mean scores and rank was given accordingly. The information is presented in Table 2.

It is reflected from Table 2 that the most prominent suggestion ranked 1st with a mean score of 1.671 was "There should be upgraded classrooms with smart boards

and modern digital infrastructure." This emphasizes the foundational need for physical infrastructure that supports technology-enhanced learning. Smart classrooms equipped with interactive boards, high-resolution projectors, audio-visual systems and reliable internet connectivity create an environment conducive to integrating ICT and AI tools in teaching. Faculty members are more likely to adopt new technologies when the necessary infrastructure is readily available and functional.

This was closely followed by the 2nd rank given to "There should be a dedicated support unit for the maintenance and repair of ICT tools and software" with a mean score of 1.658. The presence of reliable technical support can significantly reduce faculty members' anxiety related to technology use. A dedicated support unit ensures timely resolution of hardware and software issues, regular maintenance of equipment and assistance during technology-integrated sessions, thereby encouraging faculty to incorporate these tools more frequently in their academic work.

Table 2: Distribution of respondents according to suggestions for increasing utilization of ICT and AI tools (n=240)

Sr. No.	Suggestions	Total Score	Mean Score	Rank
1	There should be upgraded classrooms with smart boards and modern digital infrastructure.	401	1.671	I
2	There should be a dedicated support unit for the maintenance and repair of ICT tools and software.	398	1.658	II
3	Periodical trainings should be given to professionals to update information related to ICT and AI tools.	397	1.654	III
4	There should be training and awareness programs on the safe and ethical use of AI tools.	396	1.650	IV
5	There should be regular awareness sessions on the latest developments in ICT and AI tools.	395	1.646	V
6	There should be increased budget allocation for purchasing and upgrading ICT and AI tools.	389	1.621	VI
7	There should be regular training programs to enhance faculty skills in using ICT and AI tools.	388	1.617	VII
8	There should be university-level policies that promote and support the effective use of ICT and AI tools.	380	1.583	VIII
9	There should be allocation of time in the academic schedule for exploring and using new ICT and AI tools.	379	1.579	IX
10	There should be efforts to motivate and encourage faculties to adopt new technologies in their academic work.	378	1.575	X

The 3rd rank was assigned to "Periodical trainings should be given to professionals to update information related to ICT and AI tools" with a mean score of 1.654. This highlights the urgent need for structured, continuous faculty development programmes that focus not only on basic digital literacy but also on advanced applications of AI in agricultural education. Such programmes should be designed to cater to faculty members at different levels of technological proficiency and should be updated regularly to reflect the rapid advancements in technology.

These findings were in conformity with the research of Subash *et al.* (2013) ^[11], Sireesha *et al.* (2014) ^[10], Agwu and Ogbonah (2015) ^[1], James (2017) ^[4], Mathews (2019) ^[6] and Dash (2021) ^[3], who similarly emphasized that regular training, infrastructure upgradation, sufficient budget allocation, better internet connectivity and supportive institutional policies were essential to increase ICT utilization in agricultural universities.

Conclusion

The study highlights the various challenges faculty members encounter in adopting ICT and AI tools for agricultural education across the four State Agricultural Universities of Gujarat. It was found that concerns about data safety and privacy, high cost of AI tools and health issues related to long screen time were the most significant constraints, with data safety concerns emerging as the biggest challenge

(Mean=1.43). Other notable issues include lack of skills and training, insufficient time to explore new tools and lack of awareness about newly available technologies.

On the other hand, the study also revealed potential solutions proposed by faculty members, with the majority emphasizing the need for upgraded classrooms with modern infrastructure, dedicated technical support units and periodical training programmes. Training on safe and ethical use of AI tools, regular awareness sessions on latest developments and increased budget allocation were also suggested as critical measures to improve technology adoption among faculty members.

Addressing these constraints and implementing the suggested measures could significantly enhance the integration of ICT and AI tools in agricultural education, contributing to improved teaching quality, research output and extension effectiveness in Gujarat's SAUs and beyond. As agricultural education continues to evolve in response to technological advancements and changing societal needs, investing in faculty members' technological capabilities becomes not just beneficial but essential for maintaining relevance and excellence in agricultural higher education.

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