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Perceptions of Agricultural University Students toward the Use of ICT in Assam: A Multi-dimensional Analysis

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HIGHLIGHTS

- B.Sc. (Agriculture) students in Kamrup district of Assam demonstrated a consistently positive perception toward ICT across all measured dimensions.
- The dimension of Future Prospects and Career Relevance of ICT showed the greatest mean score (25.00/30)
- Institutional Support for ICT obtained the lowest mean score (20.62/30), revealing persisting deficiencies in infrastructure and technical assistance within surveyed universities.
- Gender was the sole socio-personal variable that significantly influenced ICT perception (F=11.01, p=0.001, η^2=0.058), with female students recording higher perception scores than the male students
- A strong positive inter dimensional correlation was observed between Learning and Knowledge Development and Agricultural Curriculum Integration (r=0.724, p<0.01)

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Keywords: Perception, University students, ICT, Agricultural education, Gender differences, Assam.

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ABSTRACT

The study examined the perceptions of agricultural university students toward the utilisation of ICT in Kamrup district of Assam. A multi-stage random sampling was followed to select 180 students enrolled in B.Sc. and M.Sc. Agriculture programmes at two purposively chosen universities. Data collection was performed by using a self-constructed, validated questionnaire (test-retest reliability r=0.812) structured around five dimensions and each dimension comprised six items rated on a five-point likert scale. Analytical tools included mean, standard deviation, skewness, kurtosis, pearson inter-dimensional correlation, eta-squared (η^2) and one-way ANOVA. Findings revealed a consistently positive orientation toward ICT across all dimensions (composite M=117.93). Future Prospects and Career Relevance of ICT secured the highest mean (25.00), whereas Institutional Support for ICT recorded the lowest (20.62), indicating infrastructural limitations. ANOVA identified gender as the only significant socio-personal determinant of ICT perception (F=11.01, p=0.001; η^2=0.058; Cohen's d=0.49), with female students achieving higher scores (M=121.40) than that of the male students (M=114.68). Significant positive inter-dimensional correlations further confirmed the integrative role of ICT within the agricultural curriculum. The study calls for targeted investment in policy initiatives in ICT infrastructure and promotes gender-responsive digital literacy programmes to improve equitable ICT engagement in agricultural higher education.

INTRODUCTION

The 21st century has witnessed an unprecedented digital transformation that has fundamentally altered the way knowledge is created, disseminated and utilized across societies. Information and Communication Technology (ICT) constitutes a broad technological platform that enable individuals to access, retrieve,

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transform, store, organise and present data and information (Gay & Blades, 2019). Over the past two decades, the pervasive diffusion of digital technologies has exerted an unprecedented influence on higher education systems, reshaping pedagogical paradigms and learner engagement patterns across the globe (Kozma & Vota, 2013; Dhillon, 2026). The systematic embedding of ICT in university curricula has transitioned from an optional supplement to an institutionalised expectation (Shahid et al., 2019). The adoption of computer based and internet mediated applications is progressively transforming teaching and learning, with students increasingly making effective use of digital platforms for learning and knowledge construction, collaborative inquiry and academic productivity (Liu et al., 2010). Mustafa et al. (2023) observed that the integration of digital and mass media technologies into the teaching learning process enhances opportunities for interaction, collaboration and active engagement among learners across different levels of education. More critically, Kozlova and Pikhart (2021) demonstrated that ICT tools grant students access to diverse learning resources and facilitate dynamic engagement with instructors through digital platforms. Fu (2013) and Henderson et al. (2017) further established that contextualised ICT integration fosters innovative instructional strategies and measurably improves educational effectiveness

ICT enriched learning environments demonstrably sharpen student's analytical competencies and deepen their comprehension of agricultural methodologies (Mittal & Mehar, 2016, Aker, 2011). Consequently, integrating ICT into agricultural curricula is considered essential for enabling graduates to acquire technological fluency demanded by contemporary, precision centred farming systems (Qiang et al., 2012, Mapiye et al., 2023, Singh et al., 2025). In the context of Assam, ICT adoption in higher education has significantly expanded, with universities and colleges progressively incorporating digital resources, campus networks and technology enabled learning environments. Studies have documented the deployment of projectors, online learning management systems and digital library platforms, which have enhanced scholarly access and instructional efficiency (Nath, 2017; Upadhyaya & Rimzim, 2025). However, significant structural challenges persist, due to limited ICT infrastructure, inconsistent and unstable internet access (Das, 2020).

Moreover, geographic disparities in access to digital devices and stable connectivity entrench digital divides, disproportionately affecting rural and semi urban university communities. Against this backdrop, examining student's perceptions of ICT is not merely an academic exercise but a prerequisite for evidence based policy formulation. Perception shapes the willingness to adopt technology, the regularity of its use, and ultimately the magnitude of its educational impact (Zhao et al., 2021).

ICT enriches the pedagogical process by making instruction more responsive, participatory and contextually relevant (Feng et al., 2025). Its application in higher education has showed positive relationships with academic achievement (Karamti, 2016; Mehmood et al., 2022). Most previous studies have examined ICT adoption among general university students, teachers or farmers. However, empirical evidence focusing specifically on agricultural university students in northeast India remains limited.

METHODOLOGY

This study was conducted in the purposively selected Kamrup district of Assam during the academic year 2025-26. A multi stage sampling technique was employed for the selection of respondents. In the first stage, two universities namely Assam Down Town University and Royal Global University offering B.Sc. (Agriculture) programmes were purposively selected. In the second stage, out of 197 enrolled B.Sc. (Agriculture) students of Assam Down Town University 120 were selected and similarly out of 75 enrolled B.Sc. (Agriculture) students in Royal Global University 60 were selected, yielding a total sample of 180 students (93 male; 87 female). Data were collected through a self-constructed questionnaire designed to assess the multi-dimensional ICT perceptions of agricultural university students. An initial pool of 42 items was developed and after expert evaluation and pilot testing 30 items distributed equally (six items each) across five theoretically grounded dimensions: (i) Institutional Support for ICT (ii) ICT Use in Academic Activities (iii) Impact of ICT on Learning and Knowledge Development (iv) ICT and Agricultural Curriculum Integration, and (v) Future Prospects and Career Relevance of ICT. Responses were recorded on a five point Likert scale anchored at 1 (Strongly Disagree) and 5 (Strongly Agree), yielding a theoretical dimensional range of 6-30 and a composite range of 30-150. Content validity was established through review by twenty five subject matter experts in agricultural education and educational technology; items failing to achieve an item content validity index (I-CVI) of $\geq$0.78 were revised. Reliability was assessed using the test-retest method on a sub sample of 30 students over a two week interval, yielding a Pearson correlation coefficient of 0.812 ($p<0.01$), confirming satisfactory temporal stability of the instrument.

The study examined six socio-personal variables like gender, family background, father's education, mother's education (categorised into seven levels), father's occupation and mother's occupation and dependent variable perception. Data were analysed using IBM SPSS Statistics 27.0. Descriptive statistics (mean, standard deviation, skewness, and kurtosis) characterised the distribution of ICT perception scores. One-way ANOVA tested mean differences in overall ICT perception across socio-personal categories. Effect size was quantified using eta-squared (η^2 = SS_between / SS_total) and Cohen's d (for gender comparison) to contextualise the practical significance of statistically significant differences. A significance threshold of $\alpha = 0.05$ was uniformly applied throughout.

RESULTS

Dimension wise perception towards ICT

Table 1 presents the descriptive statistics for the five dimensions of ICT perception. The overall composite mean of 117.93 (out of a maximum of 150) reflects a positive orientation toward ICT among agricultural students. All dimensions recorded mean scores well above the neutral midpoint of 18 (for a 6-item, 5-point scale), with Future Prospects and Career Relevance of ICT securing the highest mean (25.00) and Institutional Support for ICT the lowest (20.62). Negative skewness values across all dimensions (ranging from -0.062 to -0.760) confirm a consistent left-skewed

Table 1. Dimension-wise descriptive statistics of ICT perception (n=180; max score per dimension=30)

Dimension	N	Mean	Std. Dev.	Skewness	Kurtosis
Institutional Support for ICT	180	20.62	3.08	-0.062	0.383
ICT Use in Academic Activities	180	23.04	3.57	-0.181	-0.441
Impact of ICT on Learning and Knowledge Development	180	24.43	3.68	-0.352	-0.518
ICT and Agricultural Curriculum Integration	180	24.84	3.64	-0.684	-0.060
Future Prospects and Career Relevance of ICT	180	25.00	3.46	-0.760	-0.301
Composite Score (Total)	180	117.93	13.96	-0.606	-0.362

response pattern, indicating that respondents generally endorsed higher levels of agreement. The near-platykurtic kurtosis values for most dimensions suggest relatively flat, broadly distributed response profiles rather than sharply peaked concentration.

Gender wise comparison of ICT perception

Table 2 presents the gender-wise means and standard deviations for the five dimensions and the composite ICT perception score. Female students consistently reported higher mean scores across all dimensions, with the largest absolute gap observed in ICT Use in Academic Activities (Δ=1.56) and Future Prospects and Career Relevance (Δ=1.65). The composite score difference of 6.72 points is statistically significant (F=11.01, p=0.001), and the computed effect size (η^2=0.058; Cohen's d=0.49) indicates a medium practical effect. These findings suggest that female agricultural students, despite the broader societal narrative of differential technology access, demonstrate stronger positive perceptions and higher engagement with ICT in the academic context examined.

Inter dimensional correlation analysis

Table 3 present the Pearson inter-dimensional correlation matrix for the five ICT perception constructs. All correlation coefficients were positive and statistically significant (p<0.05), confirming the convergent validity of the instrument and the theoretical coherence of the ICT perception model. The strongest correlation was observed between Learning and Knowledge Development and Agricultural Curriculum Integration (r=0.724, p<0.01), pointing to the idea that students who regard ICT as enhancing their learning also tend to believe that it is well-integrated into their agricultural curriculum. Future Prospects and Career Relevance was most strongly correlated with Curriculum Integration (r=0.705, p<0.01) and Learning and Knowledge Development (r=0.652, p<0.01), reflecting the perceived career and educational value of curriculum-embedded digital practices. Institutional Support for ICT demonstrated the weakest correlations with other dimensions (r=0.352-0.524), consistent with the relatively lower mean scores on this dimension and suggesting that infrastructure-related perceptions form a somewhat independent sub-domain of overall ICT attitude. These inter-dimensional patterns highlight ICT perception as a multi-faceted but internally consistent construct.

ANOVA: Effect of socio-personal variables on ICT perception

Table 4 presents the results of the statistical analysis examining differences in composite ICT perception scores across selected socio-personal variables. Gender was assessed using an independent samples t-test, while variables comprising more than two categories were analysed using one way ANOVA. The result revealed a significant difference between male and female students with female students reporting more favourable perceptions towards ICT than

Table 2. Gender wise mean comparison of ICT perception scores across dimensions

Dimension	Male Mean (n=93)	Male SD	Female Mean (n=87)	Female SD	Mean Difference
Institutional Support for ICT	19.90	3.32	21.37	2.71	1.47
ICT Use in Academic Activities	22.30	3.84	23.86	3.24	1.56
Impact of ICT on Learning and Knowledge Development	23.90	3.88	25.01	3.40	1.11
ICT and Agricultural Curriculum Integration	24.40	3.82	25.33	3.38	0.93
Future Prospects and Career Relevance of ICT	24.18	3.62	25.83	3.18	1.65
Composite Score	114.68	14.89	121.40	12.05	6.72*

* Significant at p<0.001; F=11.01, df=1,178; η^2=0.058; Cohen's d=0.49 (medium effect)

Table 3. Inter-dimensional Pearson correlation matrix of ICT perception (n=180)

Dimension	IS	AA	LK	CI	FC
Institutional Support (IS)	1.000	0.524**	0.441**	0.383**	0.352*
Academic Activities (AA)	0.524**	1.000	0.683**	0.612**	0.578**
Learning & Knowledge Dev. (LK)	0.441**	0.683**	1.000	0.724**	0.652**
Curriculum Integration (CI)	0.383**	0.612**	0.724**	1.000	0.705**
Future Prospects (FC)	0.352*	0.578**	0.652**	0.705**	1.000

* p<0.05; ** p<0.01 (two-tailed). IS=Institutional Support; AA=Academic Activities; LK=Learning & Knowledge Development; CI=Curriculum Integration; FC=Future Prospects & Career Relevance

Table 4. Comparison of Composite ICT Perception Scores across Socio-personal Variables

Variable	Statistical Test	Test Statistic	p-value	Effect Size
Gender	Independent Samples t-test	t = 3.32	0.001**	Cohen's d = 0.49
Family Background	One-way ANOVA	F = 0.176	0.840	η^2 = 0.002
Father's Education	One-way ANOVA	F = 1.419	0.210	η^2 = 0.047
Mother's Education	One-way ANOVA	F = 2.120	0.053†	η^2 = 0.069
Father's Occupation	One-way ANOVA	F = 0.723	0.487	η^2 = 0.008
Mother's Occupation	One-way ANOVA	F = 0.825	0.440	η^2 = 0.009

Notes: η^2 = Eta-squared effect size. Cohen's d was calculated for gender comparison. ** *p<0.01*

their male counter parts (t=3.32, p= 0.001, Cohen's d= 0.49). The magnitude of the effect was moderate, indicating that gender contributed meaningfully to variations in ICT perception. No significant difference was observed with respect to family background, father's education, father's occupation, mother's occupation. Although mothers education did not reach the conventional level of statistical significance, the result approached significance (F=2.120, P=0.053) suggesting that maternal education attainment may warrant further investigation in future studies. The non-significance across parental educational and occupational categories suggests a degree of homogeneity in ICT exposure and attitudes within this student cohort, potentially attributable to the equalising effect of university-level digital exposure transcending home background differentials.

DISCUSSION

The overall positive orientation of agricultural students toward ICT (composite M=117.93/150) is consistent with the growing body of evidence documenting favourable technology attitudes among university cohorts in developing economies (Shanila & Helen, 2025). The consistently high mean scores across learning focused and curriculum related dimensions echo Aker (2011), who documented the transformative potential of ICT in democratising access to agricultural and educational information in regions where formal extension infrastructure remains limited. Similarly, Mittal and Mehar (2016) and Panda et al. (2019) reported that ICT tools substantially augmented knowledge transmission and analytical capacity among agricultural learners a pattern replicated in the present study, where the dimension of impact of ict on learning and knowledge development attained a mean of 24.43 reinforcing Fu's (2013) assertion that contextualised ICT integration fosters innovative instructional strategies and measurably improves educational outcomes. The highest ranked dimension i.e. future prospects and career relevance of ICT (M=25.00) corroborates the findings of Qiang et al. (2012), who demonstrated that digital tools directly expand professional opportunities and career readiness in developing countries, particularly for agriculture related occupations undergoing rapid technological transformation. The prominence of the future prospects and career relevance dimension may also reflect the ongoing digital transformation of agriculture. Technologies such as precision farming, remote sensing, geographic information systems, digital advisory services and artificial intelligence are increasingly shaping agricultural practice. Consequently, students may view ICT competence as a prerequisite for employability and professional success in the evolving agricultural sector. The alignment of these findings with Kozlova and Pikhart (2021) further supports the proposition that ICT augments the flexibility and diversity of learning resources available to students, thereby enhancing higher education systems adaptive capacity. The high scores recorded for learning enhancement, curriculum integration and career relevance indicate that agricultural students largely recognise the practical value of ICT in supporting both academic and professional development. Such perceptions are likely to encourage greater acceptance of digital technologies within agricultural education settings.

Conversely, Institutional Support for ICT yielded the lowest dimension mean (20.62). This finding is consistent with the infrastructural deficiencies documented by Das (2020) in North-East Indian universities and parallels the recurrent theme in ICT adoption literature that institutional and contextual constraints constitute a more significant barrier than individual attitudinal resistance. The study found gender significantly differentiated ICT perception (t= 3.32, p= 0.001) challenges the commonly held assumption that male students are more positively disposed toward technology. This is partly consistent with Claro et al. (2012), who found that gender based differences in ICT attitudes are mediated by contextual exposure and curricular engagement, rather than determined by fixed dispositional traits. The findings may also indicate changing patterns of digital participation among young women in higher education. Increasing access to digital devices, improved educational opportunities, and growing exposure to technology-enabled learning environments may be contributing to the narrowing of traditional gender gaps in ICT-related attitudes. Within agricultural education, ICT may additionally be perceived as a means of enhancing access to information, professional networking, and career opportunities. The lower standard deviation among female respondents may also indicate greater internal consistency in their ICT attitudes, possibly reflecting more uniform patterns of ICT use within the female student cohort (Paliwal et al., 2026). The consistency of higher perception scores among female students highlights the need for gender responsive digital literature initiatives that recognise and build upon the favourable attitudes towards ICT demonstrated by female agricultural students. However, present findings should be interpreted as reflecting perceptions rather than actual pattern of ICT utilization. However, the marginal significance of mother's education (p=0.053, η^2=0.069) merits further investigation: emerging evidence from comparable contexts indicates that maternal education and its associated digital socialisation practices exert a subtle influence on children's educational technology attitudes (Karamti, 2016; Mehmood et al.,

2022). The inter-dimensional correlation analysis revealed that impact of ICT on learning and knowledge development and agricultural curriculum integration shared the strongest positive relationship ($r=0.724$, $p<0.01$), confirming that curriculum embedded ICT use is perceived as a meaningful mechanism of knowledge construction rather than a superficial instructional add-on. The relatively weaker correlations involving Institutional Support ($r=0.352$-0.524) reinforce the interpretation that infrastructure related perceptions are somewhat detached from the experiential, learning oriented dimensions a pattern that may reflect students' capacity to derive educational value from ICT even in the presence of institutional shortcomings, leveraging personal devices and off-campus connectivity. This resilience is documented in the literature on mobile learning in resource constrained environments (Qiang et al., 2012; Sondarava et al., 2023; Sahoo et al., 2025).

On the basis of these findings, the study recommends; targeted investment in ICT infrastructure including reliable internet access, upgraded computer laboratories, and resident technical support teams - particularly in agriculture departments of universities in Assam; the design of gender-responsive digital literacy programmes that channel the stronger ICT engagement observed among female students into peer-learning and mentorship roles; structured curriculum reform that formally integrating ICT tools into agricultural course delivery, assessment, and field-based learning; and periodic perception audits using validated multi-dimensional instruments to track institutional progress in ICT adoption. These findings are of direct utility for agricultural education policymakers, institutional administrators, and curriculum designers committed to building digitally fluent, career ready graduates capable of navigating the technology intensive demands of modern agricultural science and practice.

CONCLUSION

Selected students exhibited a consistently positive and multi-dimensionally coherent perception toward ICT. The dimension of future prospects and career relevance of ICT attracted the highest endorsement. Agricultural curriculum integration and learning and knowledge development were comparably well regarded, underscoring ICT's perceived pedagogical centrality. The relatively lower mean for institutional support signals a persistent infrastructure gap, if unaddressed, risks limiting the conversion of positive ICT attitudes into consistent, high quality digital learning practices. Gender emerged as the sole statistically significant socio-personal differentiator of ICT perception, with female students demonstrating stronger positive attitudes. Inter dimensional correlation analysis confirmed the internal coherence and convergent validity of the five dimensional perception model, with particularly strong linkages between learning oriented and curriculum related constructs.

DECLARATION

Ethical approval and consent to participate: Our study did not require ethical approval and all the authors agree. However the informed consent was sought from the respondents.

Consent of publication: Participants provided consent for publication

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