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Leveraging ICT for Knowledge-Driven Agripreneurial Innovations: Advancing Sustainable Development Goals in Rural Economies

Abstract

Bringing innovation to agriculture is essential for the development of rural areas, but such development needs to be environmentally sustainable and grounded in technological advancement. Today, there is a need for innovations based on knowledge in order to ensure sustainable development in the agricultural sector. The present research compares the influence of access to ICT (Information and Communication Technology) infrastructure, knowledge acquisition for sustainable practices, and ICT literacy on the adoption of sustainable agricultural innovation, with data collection conducted through a structured questionnaire using structural equation modelling (SEM) with SmartPLS 4 to meet this objective. The results obtained demonstrate that Access to ICT Infrastructure, Knowledge acquisition for sustainable practices, and ICT Literacy have a significant impact on the adoption of sustainable agricultural innovation, with knowledge acquisition for sustainable practices showing the most critical impact, followed by access to ICT infrastructure and ICT literacy.

Keywords: green innovation, green entrepreneurship, sustainable farming, digitalisation, technology

Introduction

High-tech upgradation in agricultural accomplishments is essential for the expansion of rural economies (Kroupová et al., 2025). For the advancement of agriculturalists, it's vital to foster an environment grounded in suitable knowledge attainment that can ensure the longevity of their methods (Zossou et al., 2020), which is only possible if innovation is encouraged in the working style of the farming sector of the economy (Onegina et al., 2025). The promotion of Information and Communication Technology can be significantly helpful in promoting digitalisation amongst farmers (Paul & Jena, 2024). ICT is pivotal, as there is currently no viable substitute for digitalisation in achieving success (Chandio et al., 2024), and it is essential to establish a connection between every success and sustainable development to prevent progress at the expense of the environment (Requelme & Afonso, 2023).

The current study examines the impact of "access to ICT infrastructure, "knowledge acquisition for sustainable practices", and "ICT literacy" on "sustainable agricultural innovation adoption." The findings obtained through a methodical evaluation will be useful in reducing the digital gap and encouraging legislators to advance procedures related to sustainable farming with ICT.

Understanding the context in which terms are used in the present research is significant for grasping the essence of the results obtained. Table 1 presents a conceptual understanding of the variables, supporting clearer comprehension of the subsequent sections of research.

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Table 1
Important Definitions

Sr. No.	Terms	Detailed definitions
1	ICT	ICT, or Information and Communication Technology, epitomises the convergence of computational paradigms and telecommunication modalities to enable ubiquitous information synthesis, dissemination, and retrieval (Wang et al., 2025).
2	Agripreneurial innovations	Agripreneurial innovations embody the sophisticated confluence of transformative agronomic methodologies, disruptive entrepreneurial paradigms, and cutting-edge technological advancements, strategically orchestrated to revolutionise traditional agricultural ecosystems, optimise resource utilisation, enhance value-chain dynamics, and foster sustainable socio-economic development in an increasingly complex global agri-food landscape (Long et al., 2019).
3	ICT infrastructure	ICT infrastructure constitutes the intricate ensemble of advanced computational hardware, sophisticated software architectures, high-capacity telecommunication frameworks, and interoperable digital networks, meticulously engineered to enable the seamless transmission, storage and processing of data, thereby underpinning the technological scaffolding essential for pervasive connectivity, cyber-physical integration, and the propagation of information in an increasingly digitised and hyperconnected global ecosystem (Bibi et al., 2024).
4	ICT literacy	ICT literacy represents the comprehensive aptitude to proficiently navigate, critically evaluate (Eisenberg et al., 2016), and innovatively utilise an intricate array of digital technologies, computational tools, and telecommunication systems, encompassing advanced cognitive skills and nuanced technical proficiencies essential for effective engagement, adaptive problem-solving, and informed decision-making within an exponentially evolving, information-saturated digital paradigm (Adeyoyin, 2005).
5	Knowledge acquisition for sustainable practices	Knowledge acquisition for sustainable practices encompasses the intricate process of systematically assimilating, critically analysing, and innovatively applying multidisciplinary insights, empirical evidence, and contextualised expertise to devise and implement ecologically resilient, economically viable, and socially equitable strategies that harmonise anthropogenic activities with the imperatives of environmental stewardship and intergenerational equity within a dynamically evolving global sustainability framework (Chen et al., 2020).
6	Sustainable agripreneurial innovation adoption	Sustainable agripreneurial innovation adoption embodies the multifaceted process of integrating avant-garde agricultural methodologies, eco-centric entrepreneurial ventures, and disruptive technological paradigms, meticulously calibrated to optimise resource efficiency, bolster environmental resilience, and foster socio-economic inclusivity while navigating complex systemic interdependencies to achieve scalable, enduring and transformative impacts within the global agri-food ecosystem (Elzen et al., 2011).
7	Agripreneur	A farmer who adopts business principles in farming (Kasim & Salleh, 2023).
8	Agribusiness innovation	New methods or technologies enhancing agricultural productivity (Wei & Sutunyarak, 2025).
9	Sustainable farming practices	Eco-friendly methods ensuring long-term agricultural viability (Byfuglien et al., 2025).

Source: authors' own work based on the sources listed with each definition.

This study is structured into six main sections. Following the introduction, a literature review is presented, leading into the research methodology and Data Analysis. The findings are then discussed in comparison with previous studies. The paper concludes with a summary in the final section.

Need for Study

The study is imperative to address the critical need for empirical insights into how access to ICT infrastructure, ICT literacy, and Knowledge acquisition synergistically drive sustainable agripreneurial innovation adoption, thereby catalysing rural socio-economic transformation and advancing Sustainable Development Goals in under-resourced regions.

The present study will also help create a framework for the development of an agrarian class of the economy. Agricultural development plays a significant role in the development of the entire economy, as the primary sector is the base for the development of the secondary and tertiary sectors. It is therefore essential to stress the need to bring innovations in the farming sector that further support sustainable development.

Research Gap

Despite the increasing global emphasis on leveraging ICT for sustainable development, a significant research gap persists in comprehensively examining how ICT infrastructure accessibility (Hasan et al., 2023) and ICT literacy together influence both knowledge acquisition and the adoption of sustainable agribusiness innovations-particularly within the nuanced socio-economic and environmental contexts of rural economies (Banhazi et al., 2012).

Literature Review

Literature review in research is significant to have an assessment of available texts that serve as the basis for the identification of necessary variables that form part of the conceptual model in the present research. The Literature review section in this paper is divided into three parts:

- background of the study
- theoretical framework
- related studies.

Background of the Study

The study emanates from the pressing imperative to address systemic inefficiencies, structural inequities, and resource paucity within rural economies by exploring how the transformative nexus of Information and Communication Technology (ICT) and agripreneurial innovation can be harnessed within knowledge-driven ecosystems, expanding digital infrastructure, and adaptive capacity-building. Together, these dynamics aim to recalibrate socio-economic frameworks, fortify ecological resilience, and accelerate the realisation of Sustainable Development Goals (SDGs) amidst the complex challenges posed by globalisation, climate volatility, and demographic transitions.

Theoretical Framework

Theories are the foundation of a research paper's structure. The conceptual model (Figure 2) of the present research is based on the integration of five theories, as shown in Table 2. By borrowing the principles of these theories, the present research attempts to explore the Adoption of Innovation in Sustainable Agriculture.

Behind levying pertinent theories, it is also essential to scan related studies of present research. The subsequent division furnishes an exhaustive discussion of the hypothesis and ex-literature connected to it, recreating a paramount position in approximating recent developments with earlier consequences, in order to devise a research framework for prospective examinations.

Related Studies

The present research contains five hypotheses, shown in Table 3, each assuming a relationship between two variables, which will be tested by running Bootstrapping in the Data Analysis section of the Present research. Table 3 also contains several studies supporting the reasoning behind framing a specific hypothesis.

Table 2
Theoretical Framework

Name of theory	Description of theory	Relation and relevance of theory with current study
Diffusion of Innovations Theory	This theory elucidates how innovations are communicated (Moore, 1991) and adopted within social systems over time, emphasising the role of knowledge dissemination, social networks and perceived utility in influencing adoption trajectories across diverse adopter categories (Adams, 1997; Marshall, 1990).	The model reinforces the study's assertiveness on how access to ICT literacy facilitates knowledge acquisition and the adoption of sustainable agribusiness modernisation, arranging these consequences as key to achieving sustainable rural development.
Technology Acceptance Model (TAM)	This template investigates elements of technology acceptance, focusing on perceived usefulness and ease of use as pivotal factors influencing behavioural intentions and the actual adoption of technologies.	TAM is integral to understanding how ICT literacy influences the ease and perceived utility of ICT tools for knowledge acquisition and innovation adoption, thereby advancing sustainable agripreneurial practices in rural contexts.
Sustainable Livelihoods Framework	This framework highlights the interconnections between human, social and physical capital in enhancing resilience and fostering socio-economic sustainability in resource-constrained environments (Hinshelwood, 2003).	The framework aligns with the study by emphasising how access to ICT infrastructure and literacy empowers rural communities to acquire knowledge and adopt innovations, ultimately enhancing sustainable agripreneurial practices and socio-economic resilience.

Source: authors' own work based on the sources listed with each theory.

Table 3
Related Studies

Null Hypothesis	Hypothesis description	Related studies
H1	Access to ICT infrastructure impacts knowledge acquisition for sustainable practices	Access to ICT infrastructure significantly influences knowledge acquisition for sustainable practices by facilitating the dissemination of environmental information, enhancing awareness of sustainability issues, and empowering communities to adopt eco-friendly behaviours through platforms for learning and collaboration, with studies indicating that improved digital accessibility correlates with increased adoption of sustainable agricultural and energy practices (Aseey & Andollo, 2019).
H2	Access to ICT infrastructure affects sustainable agripreneurial innovation adoption	Access to ICT infrastructure plays a pivotal role in fostering sustainable agripreneurial innovation adoption by enabling real-time access to market information, enhancing knowledge exchange on sustainable farming practices and reducing transaction costs, thereby promoting innovation diffusion and entrepreneurial success in agriculture (Ahad et al., 2020; Lin et al., 2017; Monavvarifard et al., 2019; Nakayama et al., 2021).
H3	ICT Literacy impacts knowledge acquisition for sustainable practices	ICT literacy significantly impacts knowledge acquisition for sustainable practices by enabling individuals to efficiently access, interpret and utilise digital resources, enhancing their understanding of environmental issues, fostering awareness of innovative sustainability techniques and empowering them to implement informed decisions and eco-friendly behaviours that contribute to environmental conservation and long-term sustainability, while bridging knowledge gaps and promoting collaboration through digital networks, thereby ensuring equitable and inclusive access to critical information across diverse populations and geographies (Ceballos et al., 2024).
H4	ICT Literacy impacts sustainable agripreneurial innovation adoption	ICT literacy plays a crucial role in sustainable agripreneurial innovation adoption by empowering agripreneurs with the skills to navigate digital platforms, access real-time market information, interpret advanced technological tools. It also allows them to participate in global knowledge-sharing networks, thereby fostering the integration of eco-friendly innovations, enhancing resource efficiency and enabling informed decision-making to address environmental challenges, improve productivity, and promote economic resilience within agricultural systems, while simultaneously reducing barriers to technology adoption and supporting the transition to sustainable agricultural practices across diverse socio-economic contexts (Alant & Bakare, 2021).
H5	Knowledge acquisition for sustainable practices impacts sustainable agripreneurial innovation adoption	Knowledge acquisition for sustainable practices significantly impacts sustainable agripreneurial innovation adoption. It provides agripreneurs with critical insights into eco-friendly techniques, enhancing their ability to incorporate innovative technologies, fostering an understanding of market trends and environmental regulations, and equipping them to overcome operational challenges. It thereby enables the integration of sustainable practices into agripreneurial ventures, improving productivity and resilience, and promoting environmentally conscious entrepreneurship that aligns with long-term sustainability goals across diverse agricultural ecosystems (Duffy et al., 2021; Sadovska et al., 2020).

Source: authors' own work based on the sources listed with each related study.

Research Methodology

Multi-stage sampling was employed to collect responses from the state of Maharashtra, India, to achieve the research objectives. Given its heterogeneous agro-climatic conditions, progressive adoption of agritech innovations, and robust digital infrastructure bolstered by extensive rural connectivity initiatives, Maharashtra emerges as a quintessential locus for examining the intersection of agripreneurial innovation, sustainable resource management, and ICT-driven knowledge dissemination. Multi-stage sampling is a blend of stratified and convenience sampling. In Stratified sampling, groups are made from regions of research on a specific basis, and then data is collected from those groups on a random basis. However, instead of choosing respondents randomly, in the present research data is collected from them on the basis of convenience.

Table 4 contains a demographic breakdown of the respondent's profile, with the sample stratified based on four regions: Pune, Nagpur, Nashik and Aurangabad. These regions are strategically significant due to their distinct agro-ecological zones, substantial smallholder farmer populations, burgeoning agritech hubs, and well-established institutional frameworks that collectively facilitate the gathering of diverse, representative and nuanced data sets essential for comprehensively analysing ICT-enabled agripreneurial innovations. The sample size is 368 respondents, which is appropriate for G*power software as per calculations shown in Figure 1. According to the software, the minimum sample size is 164, so the sample size in this case is more than double the minimum sample size.

The respondents were given the research instrument as in the attached Appendix. The data on this research instrument was collected using the direct personal investigation method, as the farmers from the area needed detailed information regarding the essence of the question. To ensure that the respondents grasped the question appropriately, each question was explained systematically to the respondents before recording their responses.

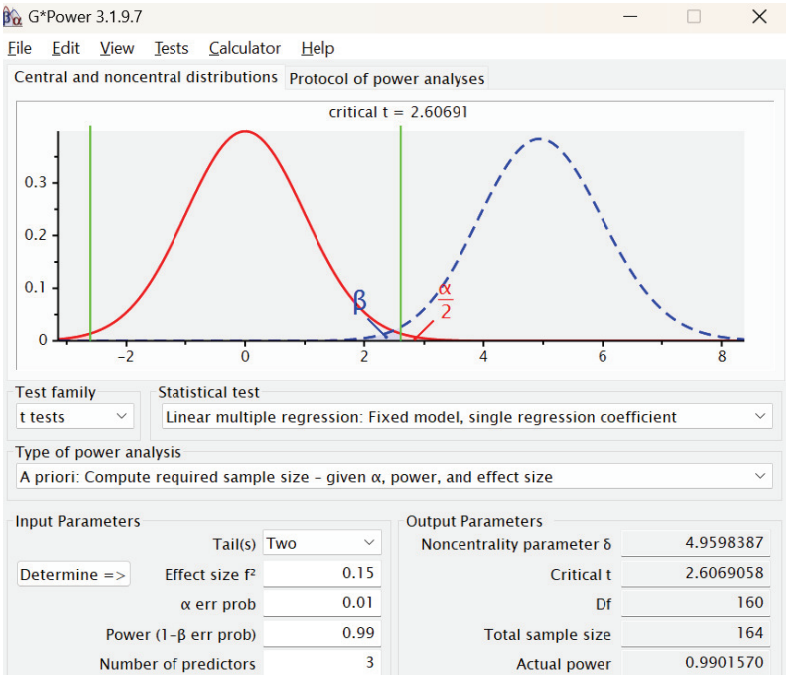
After following the methodology stated in the current section, the next step was to run data in SMART PLS 4 software. The next section shows the results of running data in the required software, which forms the basis for further discussion.

Table 4
Demography of Respondents

Occupational profile	**Frequency**	**Percentage**
Rural farmers	98	26.63%
Agricultural extension workers	82	22.28%
Small-scale agribusiness owners	19	5.16%
Local community leaders	5	1.36%
Agricultural cooperatives members	23	6.25%
Rural youth groups	11	2.99%
Local government officials	35	9.51%
Agricultural consultants	41	11.14%
Academicians	54	14.67%
Total	**368**	**100%**
Gender	**Frequency**	**Percentage**
Male	206	55.98%
Female	162	44.02%
Total	368	100%
Place	**Frequency**	**Percentage**
Pune	94	25.54%
Nagpur	105	28.53%
Nashik	87	23.64%
Aurangabad	82	22.28%
Total	**368**	**100%**

Source: authors' own work.

Figure 1
Minimum Sample Size



Source: authors' own work.

The following processes are applied to obtain the results:

$$\lambda XY = \mathrm{Cov}(X, Y) \,/\, \mathrm{Var}(X) \tag{1}$$

$$r_{xy} = \frac{\Sigma(x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\Sigma(x_i - \overline{x})^2 \Sigma(y_i - \overline{y})^2}} \tag{2}$$

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum_{i=1}^{k} \sigma_{y_i}^2}{\sigma_x^2}\right) \tag{3}$$

$$\frac{\left(\sum_{i=1}^{p} \lambda_i\right)^2}{\left(\sum_{i=1}^{p} \lambda_i\right)^2 + \sum_{i}^{p} \mathrm{V}(\delta)} \tag{4}$$

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n} \tag{5}$$

$$\mathrm{HTMT}_{ij} = \frac{1}{K_i K_j} \sum_{g=1}^{K_i} \sum_{h=1}^{K_j} r_{ig,jh} \div \left(\frac{2}{K_i(K_i-1)} \cdot \sum_{g=1}^{K_i-1} \sum_{h=g+1}^{K_i} r_{ig,ih} \cdot \frac{2}{K_j(K_j-1)} \cdot \sum_{g=1}^{K_j-1} \sum_{h=g+1}^{K_j} r_{jg,jh} \right)^{\frac{1}{2}} \tag{6}$$

$$\overline{X} = \frac{\sum_{i=1}^{n} x_i}{n} \tag{7}$$

$$\sigma = \frac{1}{N} \sqrt{N \sum_{i=1}^{n} f_i x_i^2 - \left(\sum_{i=1}^{n} f_i x_i\right)^2} \tag{8}$$

$$t = \frac{\bar{x}_d - \mu_d}{\left(\frac{s_d}{\sqrt{n}}\right)}, df = n - 1 \tag{9}$$

$$Z = \frac{\hat{p} - p0}{\sqrt{p0(1-p0)}} \tag{10}$$

$$\widehat{\mathrm{se}}_{\mathrm{boot}} = \left\{ \sum_{b=1}^{B} \left[s(\mathbf{x}^{*b}) - s(\cdot) \right]^2 / (B-1) \right\}^{\frac{1}{2}} \tag{11}$$

Data Analysis

Data analysis is a dual stage process in current research:

- PLS Algorithm
- Bootstrapping.

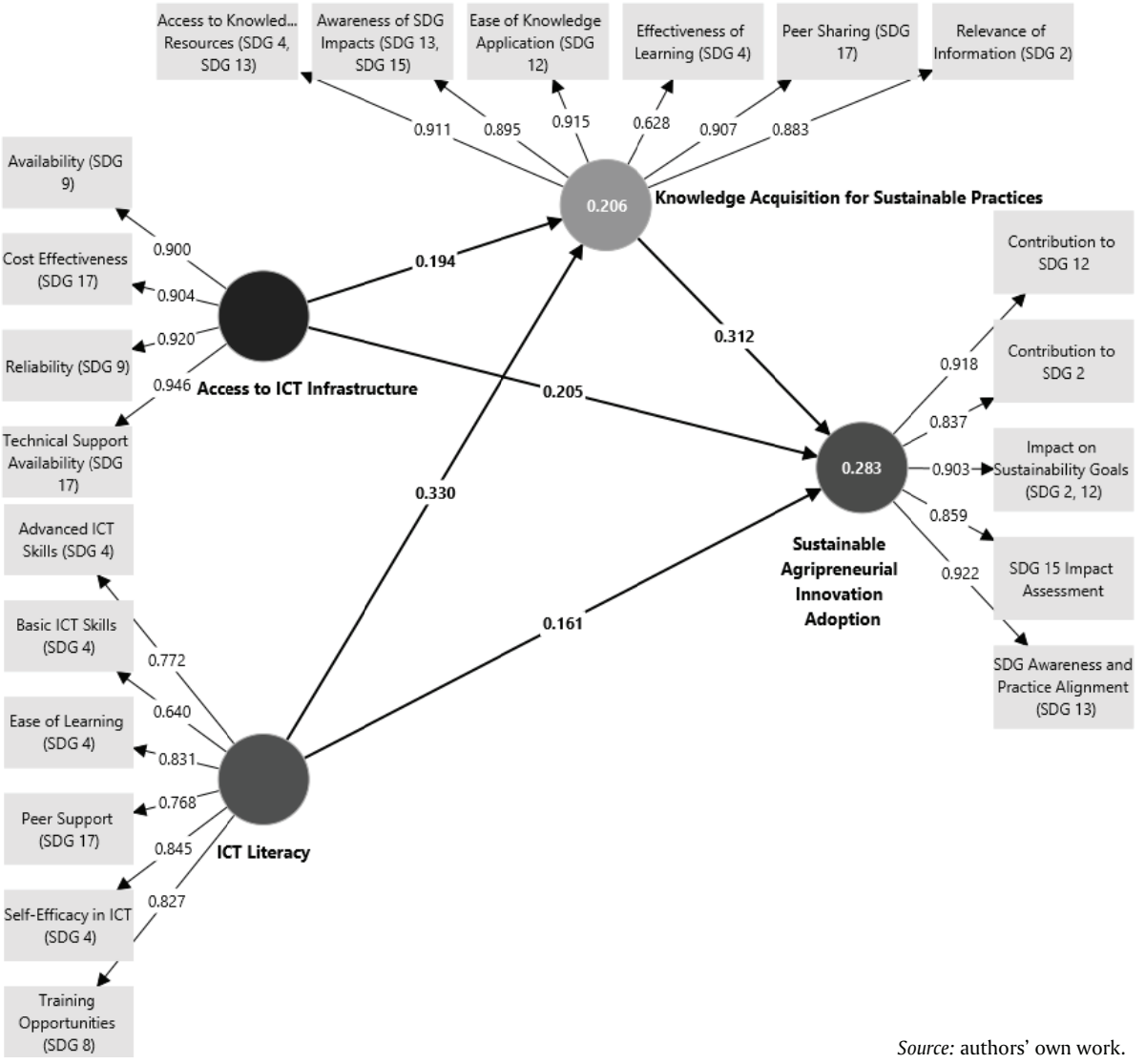
The results depicted in the PLS structural model (Figure 2) illustrate the relationships and influence of ICT literacy and access to ICT infrastructure on knowledge acquisition for sustainable practices and its subsequent impact on sustainable agripreneurial innovation adoption. The path coefficients (e.g. 0.330, 0.205, 0.161) indicate the strength and direction of relationships, the R^2 values (0.206 and 0.283) demonstrate the explanatory power of dependent variables, and the outer loadings validate the constructs' reliability, highlighting significant contributions of SDG-aligned variables such as ease of learning, cost-effectiveness, and technical support to sustainability goals.

The construct reliability and validity results (Table 5) indicate strong internal consistency and convergent validity for all constructs. This is evidenced by high Cronbach's alpha (ranging from 0.873 to 0.937) and composite reliability (rho_c ranging from 0.904 to 0.955), along with average variance extracted (AVE) values exceeding the threshold of 0.50 (ranging from 0.614 to 0.842), confirming that the measurement model is robust and reliably captures the intended dimensions of access to ICT infrastructure, ICT literacy, knowledge acquisition for sustainable practices, and sustainable agripreneurial innovation adoption.

The Heterotrait-Monotrait Ratio (HTMT) values (Table 6), all below the recommended threshold of 0.85 (ranging from 0.369 to 0.495), confirm the discriminant validity of the constructs, indicating that access to ICT infrastructure, ICT literacy, knowledge acquisition for sustainable practices, and sustainable agripreneurial innovation adoption are empirically

Figure 2

PLS Algorithm/Conceptual Model



Source: authors' own work.

Table 5
Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Access to ICT infrastructure	0.937	0.939	0.955	0.842
ICT Literacy	0.873	0.874	0.904	0.614
Knowledge acquisition for sustainable practices	0.927	0.931	0.945	0.744
Sustainable agripreneurial innovation adoption	0.933	0.938	0.949	0.789

Source: authors' own work.

Table 6
HTMT

Particulars	Heterotrait-monotrait ratio (HTMT)
ICT literacy <-> Access to ICT infrastructure	0.495
Knowledge acquisition for sustainable practices <-> Access to ICT infrastructure	0.369
Knowledge acquisition for sustainable practices <-> ICT literacy	0.453
Sustainable agripreneurial innovation adoption <-> Access to ICT infrastructure	0.402
Sustainable agripreneurial innovation adoption <-> ICT literacy	0.411
Sustainable agripreneurial innovation adoption <-> Knowledge acquisition for sustainable practices	0.479

Source: authors' own work.

distinct while maintaining meaningful interrelationships.

The hypothesis testing results in Table 7 confirm that all the hypothesised relationships are statistically significant, as indicated by high t-statistics (ranging from 2.735 to 5.944) and low p-values (≤ 0.006). This demonstrates that access to ICT infrastructure positively influences both knowledge acquisition for sustainable practices ($\beta = 0.194$, $p = 0.001$) and sustainable agripreneurial innovation adoption ($\beta = 0.205$, $p = 0.002$), ICT literacy significantly impacts knowledge acquisition ($\beta = 0.330$, $p = 0.000$) and innovation adoption ($\beta = 0.161$, $p = 0.006$), and knowledge acquisition strongly drives sustainable agripreneurial innovation adoption ($\beta = 0.312$, $p = 0.000$), thereby validating the critical role of ICT resources and literacy in fostering sustainability-aligned innovations.

Table 7
Hypothesis Testing

H_0: Hypothesis	Relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values	Comments
H1	Access to ICT infrastructure –> Knowledge acquisition for sustainable practices	0.194	0.194	0.058	3.352	0.001	Supported
H2	Access to ICT infrastructure –> Sustainable agripreneurial innovation adoption	0.205	0.207	0.067	3.036	0.002	Supported
H3	ICT literacy –> Knowledge acquisition for sustainable practices	0.330	0.333	0.056	5.944	0.000	Supported
H4	ICT literacy –> Sustainable agripreneurial Innovation adoption	0.161	0.161	0.059	2.735	0.006	Supported
H5	Knowledge acquisition for sustainable practices –> Sustainable agripreneurial innovation adoption	0.312	0.313	0.057	5.506	0.000	Supported

Source: authors' own work.

Discussion

The conclusions from our analysis indicate a significant favourable consequence of access to ICT infrastructure and ICT literacy on knowledge acquisition for sustainable practices, which in turn entirely influences sustainable agribusiness innovation adoption. These associations are in line with the academic bases that underpin the adoption of Information and Communications Technology integrated resolutions in farming and green growth of the agricultural sector.

The robust association amongst access to ICT infrastructure and knowledge acquisition for sustainable practices reveals that augmented access to Information and Communications Technology infrastructure equips agrarian agripreneurs with a practical understanding of sustainable approaches, a consequence that is uniform with previous analyses (e.g. Maniriho, 2024) that highlight how potent Information and Communications Technology infrastructure enables bridge knowledge apertures, particularly in resource-constrained agrarian backdrops.

Additionally, the connection between Access to ICT infrastructure and sustainable agripreneurial innovation adoption demonstrates that enhanced digital connectivity and technical accessibility facilitate the adoption of ingenious and sustainable agrarian practices. This finding parallels the developments of Klimova et al. (2016) and Somers and Stapleton, (2012) who discovered that agriculturalists with steadfast internet access and Information and Communications Technology resources were more willing to incorporate environmentally amicable techniques and progressive agri-tech resolution.

Case Study for Policy Implications

Additionally, a case study of E-Choupal has been included to provide a practical perspicuity into agripreneurial innovations ameliorated by ICT. The case mentioned provides an assessment of how leveraging ICT can help achieve the SDGs through the development of rural economies (Mathew, 2018).

E-Choupal combines information technology and agricultural practices to foster the development of an agripreneurial class, enabling informed decision-making based on knowledge-driven practices. The platform is established by ITC (Indian Tobacco Company). The e-Choupal initiative epitomises the transformative integration of Information and Communication Technologies (ICT) in agripreneurial ecosystems, facilitating a paradigm shift in rural agricultural practices by empowering farmers through digital enablement—leveraging decentralised kiosks that provide real-time meteorological insights, market intelligence, and agronomic advisories, thereby circumventing traditional supply chain bottlenecks, enhancing price discovery mechanisms, and fostering agripreneurial self-reliance in an era marked by technological convergence and disruptive innovation in the global agribusiness landscape. The given platform provides access to ICT infrastructure, which is not possible for an individual farmer or a group of farmers to develop. This accessibility provides reliable and pocket-friendly information to farmers, accompanied by technical support to inform their decision-making. The presence of the most up-to-date and accurate information brings innovation to agricultural ventures, facilitating the sustainable adoption of farming practices. If a farmer (agripreneur) can acquire ICT literacy, knowledge of sustainable practices becomes practical, promoting innovative advancements in sustainable agriculture.

Limitations of the Study

The present study provides meaningful insights into introducing sustainability to the lives of farmers through ICT-based decision-making, but there are a few limitations that need to be specified, despite their relatively minor impact. The present study employs the PLS SEM quantitative research technique while excluding qualitative statistical methods, as they were outside the scope of the current study. The technique of the PLS Algorithm and Bootstrapping is applied in the current research, rather than CB-Based SEM, as it does not involve an exact application of the theory. The present study demonstrates high internal consistency and convergent validity, ensuring that the constructs accurately reflect their underlying concepts; however, it over-relies on internal consistency metrics without addressing potential response biases. Additionally, the application of HTMT may result in conceptual overlap, although multiple tests confirm that the constructs are distinct and well-defined, provided they are grounded in more robust qualitative validation.

Conclusion

The present research shows a statistically significant connection between the dependent and independent variables. The results obtained from the analysis provide beneficial insights by clarifying the terms of policy-making for achieving sustainability in farming, while at the same time, in framing policies, maximum importance must be given to knowledge acquisition, as it has a maximum beta value of 0.312, which means that knowledge has the most decisive influence on innovation adoption in sustainable farming. The second most influential predictor is Access to ICT, which impacts sustainable agriculture, as well as statistically significantly influences the response variable and should therefore play a significant role in the policy framework for rural development. The ICT infrastructure must be accessible to all farmers and should be within their purchasing power, considering their economic status, with the government supposed to give subsidies or interest-free loans to farmers who are willing to adopt ICT infrastructure. The last explanatory variable is ICT Literacy, which is also found to be statistically significant but with the lowest beta value of 0.161. However, despite the minimum value of beta, its contribution to impacting the dependent

variable cannot be ignored, as it has a p-value of less than 0.05, making it necessary to develop a practical framework to raise awareness about the usage and benefits of ICT in achieving the goal of sustainable agriculture. In a nutshell, it is essential to embrace all input variables in policy formulation to achieve a robust impact on sustainable entrepreneurial innovation adoption.

The appendix is available in the online version of the journal.

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