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Research Paper

Are KVKs digitally savvy? Insights from the assessment of the web presence and social media engagement of KVKs

Ananthan P.S.[1]*, Naila Majid Bhat[2], Deboshmita Dey[1],
Akilandeshwari A[1], Geetha M[1], Talib Mohammad[1]

[1]*Fisheries Economics, Extension and Social Science Division, Faculty of Fisheries, Sher-e- Kashmir University of Science and Technology, Kashmir, 191201;*
[2]*ICAR-Central Institute of Fisheries Education, Mumbai, 400061,*
*e-mail: *ananthan@cife.edu.in*

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ABSTRACT

Information and Communication Technologies (ICTs) play a vital role in enhancing information sharing, collaboration, and dialogue, particularly in addressing the shortage of extension support for fishers and fish farmers. Social media offers extension functionaries a promising platform to connect with farming communities effectively. This study evaluated the digital presence and social media engagement of *Krishi Vigyan Kendras* (KVKs) across seven Indian states - Andhra Pradesh, Bihar, Haryana, Maharashtra, Punjab, Tamil Nadu, and West Bengal - in partnership with their respective zonal Agricultural Technology Application Research Institutes (ATARIs). The digital outreach of KVKs was evaluated using eight indicators, including website presence (English and primary state language), staff and infrastructure details, training information, extension literature, regular updation, and social media usage by KVK-SMS. Among 211 KVKs analyzed, in December, 2023, 77% had independent websites, though only 8% offered content in the state language. Digital outreach scores varied across states, with Haryana leading at 5.25, followed by Punjab, Maharashtra, and West Bengal, while Bihar, Tamil Nadu, and Andhra Pradesh had comparatively lower scores. In terms of social media usage, 54% of Subject Matter Specialists (SMSs) actively engaged with farmers through social media, while only 4% did not utilize these platforms at all. The findings highlight the need to improve KVKs' digital presence by strengthening websites in both English and local languages, and SMS shall be encouraged and trained to regularly use social media for reaching out to farmers. Computer Assistant in each KVK should be made responsible for the regular updating & maintenance of KVK websites. KVK web portals shall be developed as a one stop source of all critical info for farmers in the district to empower them through easy access to technologies, trainings, market info, and other extension advisory services.

Keywords: Digital outreach, KVKs, social media connect websites

Information and Communication Technology (ICT) encompasses a range of tools, platforms, and applications that enable the exchange and management of data, playing a critical role in the transformation of agriculture and allied sectors globally (Anonymus, 2011). According to UNESCO, ICT is not only a technological tool but also a discipline that integrates social, economic, and cultural dimensions in handling information. In India, ICT has emerged as a

pivotal enabler in agricultural development, especially in enhancing the accessibility of information and services to farmers. The integration of ICT in agriculture supports real-time decision-making by providing updates on weather, market prices, pest control, and best practices, thereby improving productivity and sustainability. One vital component of ICT is social media, which enables rapid and interactive communication through platforms like WhatsApp, Facebook, and YouTube. These platforms are increasingly utilized by agricultural stakeholders, including researchers and extension personnel, to disseminate information and engage with farming communities (Suchiradipta and Saravanan, 2016; James and Lakshminarayan, 2017). Recent studies highlight a growing trend in the use of social media by Subject Matter Specialists (SMSs) and other extension professionals to reach farmers. For instance, in Bangladesh, fisheries extension workers extensively use Facebook and YouTube (Islam *et al.*, 2020), while in India, WhatsApp has become a preferred medium among *Krishi Vigyan Kendra* (KVK) staff and farmers alike (Sharma *et al.*, 2020; James *et al.*, 2022). Despite these developments, limited empirical studies have systematically examined the digital presence and social media engagement of KVKs, especially in a comparative, multi-state context. Most existing literature tends to focus on either the broader role of ICT or isolated case studies, leaving a gap in understanding how KVKs are leveraging social platforms institutionally. This study addresses that gap by evaluating the web presence and social media usage of KVKs in seven Indian states: Andhra Pradesh, Bihar, Haryana, Maharashtra, Punjab, Tamil Nadu, and West Bengal. Specifically, it investigates how Subject Matter Specialists (SMSs) within these KVKs utilize digital tools and platforms for agricultural communication and outreach. By offering a comparative analysis across different states, this research contributes to assessing the digital savviness and communication strategies of KVKs, informing future policy and capacity-building initiatives in digital agricultural extension.

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MATERIALS AND METHODS

This study adopted an ex post facto research design and a survey approach to assess the digital presence and social media engagement of KVKs across seven states in the Indian mainland: Andhra Pradesh, Bihar, Haryana, Maharashtra, Punjab, Tamil Nadu, and West Bengal. The research was conducted in coordination with the respective Zonal ATARIs, including ATARI Hyderabad (Zone X), ATARI Patna (Zone IV), ATARI Jodhpur (Zone II), ATARI Pune (Zone VIII), ATARI Ludhiana (Zone I), and ATARI Kolkata (Zone V). The study covered almost all the 211 KVKs in these seven states, comprising 23 KVKs in Andhra Pradesh, 44 KVKs in Bihar, 19 KVKs in Haryana, 50 KVKs in Maharashtra, 22 KVKs in Punjab, 30 KVKs in Tamil Nadu, and 23 KVKs in West Bengal, as of December 2023.

Table 1: General Information about KVKs as of December 2023

State	No. of districts	No. of KVKs as per the ICAR directory	SMS in-position (No.)
Andhra Pradesh	26	23	94
Tamil Nadu	38	33[#]	169
Maharashtra	36	50	261
Haryana	22	18*	85
Punjab	23	22	117
Bihar	38	44	99
West Bengal	23	23	101
Total	206	213	926

Source: ICAR-KVK Portal, 2023

**Haryana has 22 districts with 18 KVKs as per the ICAR-KVK Portal. Besides, the state-funded KVKs in Palwal, Karnal, Panchkula and Nuh districts in Haryana have not been included in the ICAR directory. This study covered 19 KVKs, including the KVK in Panchkula. [#]In Tamil Nadu, the study covered the 30 KVKs that were functional during the study period.*

The study did not involve sampling, as it covered the entire universe, i.e., all KVKs in all seven study states. The states were selected purposively to represent the four regions of India: South, West, North, and East. The north-eastern, central and hilly states of India could not be covered due to the limitations of time and resources. This study was intended as a preliminary investigation to support a more detailed enquiry covering all KVKs across all Indian states. Secondary data was gathered from the ICAR-KVK portal and the individual websites of the KVKs. All the SMS in the 211 KVKs were included in the survey, and primary information was collected through a semi-structured and tested interview schedule, administered online using a Google form. A total of 333 KVK-SMS responded (36%) to the online survey, an acceptable response rate. Additionally, to supplement the survey and secondary data, particularly where some data were missing or inconsistent, the researchers conducted interviews with either KVK-SMS or KVK Program Coordinators in at least 14 instances. It was ensured that each KVK provided at least one response, and responses from multiple personnel within the same KVK were aggregated to generate a mean response, representing that of a particular KVK, while estimating the scores. To assess the digital outreach of the KVKs, eight relevant indicators were identified, reflecting various aspects of their digital presence namely, presence of an independent KVK website (English) (1), availability of the website in primary State language (2), information on staff details (0.5), information on infrastructure (0.5), information on training & extension activities (1), availability of extension literature (2), regular updation of the website (1), and usage of social media (2) to connect with farmers by KVK-SMS. Each indicator was assigned a score, as indicated in brackets, based on discussions with experts and the literature. Thus, the final index score of KVK's digital presence and outreach ranged from 0 to 10. This score was then used to rank the KVKs based on their extent of digital presence and engagement. The composite index of KVKs' website presence and social media engagement may be termed as the *KVK-Digital Outreach Index* (KVK-DOI), a handy tool for quick assessment.

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RESULTS AND DISCUSSION

Web presence of KVKs: In the contemporary era, the digital landscape has become an integral part of agricultural extension services, and the digital web presence of KVKs plays a pivotal role in enhancing communication and knowledge dissemination within the agricultural community of the respective district/block. These web platforms serve as dynamic hubs, providing farmers with valuable information, technological advancements, and updates on various trainings. Table 2 highlights the web presence of KVKs in seven Indian states. Table 2 presents the digital presence of KVKs across the seven states in India, highlighting the extent of their online engagement through various indicators. In terms of independent KVK websites, Bihar (87%) and Haryana (95%) exhibit strong digital presence, while Andhra Pradesh (57%) and Tamil Nadu (63%) have comparatively lower website availability. The availability of state language websites is limited, with Punjab (41%) leading in local language integration; however, other states, such as Bihar and Haryana, lack local language content altogether. Regarding transparency, Haryana stands out, with 84% of websites providing information about staff and infrastructure, while other states, such as Andhra Pradesh and Tamil Nadu, provide limited details about them. Information on training and extension activities is better represented in Bihar (55%) and Haryana (84%), but still lacks consistency across other states. The availability of extension literature is notably absent in Andhra Pradesh and Tamil Nadu, while Bihar and West Bengal provide better support. Regular updating of websites is a challenge, with very low percentages across the states, notably Andhra Pradesh (9%), Bihar (11%) and Haryana. Bhat *et al.* (2023) also reported that KVKs of Haryana don't update their websites regularly. Overall, while some states like Bihar and Haryana show strong digital engagement, the gaps in local language support, extension literature availability, and regular website updates remain significant challenges even in 2023. These findings align with as well as diverge from previous studies in interesting ways. For instance, similar trends have been noted in the fisheries sector in South Asia. Islam *et al.* (2020) found that digital engagement through platforms like Facebook and YouTube was widespread among fisheries

extension professionals in Bangladesh, but infrastructure-level challenges persisted in ensuring timely updates and content localization - paralleling the low percentage of regularly updated websites observed in states like Andhra Pradesh (9%) and Bihar (11%) in this study. In the agricultural sector, Baumüller (2012) highlighted that mobile-based advisories were more readily adopted than full-scale website development due to lower costs and simpler infrastructure requirements.

Table 2: Web presence of KVKs state wise

State	Presence of independent KVK website %	Availability of website in state language %	Info. on staff details %	Info. on Infra structure %	Info. on training & extension activities %	Availability of extension literature %	Regular updation of the website %
Andhra Pradesh	57	4	52	48	43	0	9
Bihar	87	0	77	57	55	45	11
Haryana	95	0	84	84	84	74	11
Maharashtra	84	10	68	66	54	30	22
Punjab	64	41	64	36	59	27	45
Tamil Nadu	63	3	60	53	40	0	47
West Bengal	74	1	61	52	48	57	43
Mean Presence (%)	**75**	**8**	**67**	**57**	**55**	**33**	**27**

This could help explain the weak website maintenance and low availability of local language content in states like Bihar and Haryana, where mobile-based tools such as WhatsApp are increasingly preferred for real-time communication (Sharma *et al.*, 2020). Moreover, the findings reflect a broader concern raised by Chander and Sulaiman (2014), who noted that while ICTs in agriculture are expanding, their integration into formal extension systems is inconsistent. The fragmented presence of extension literature and training information across KVK websites mirrors this observation, indicating that institutional digitization remains uneven across states.

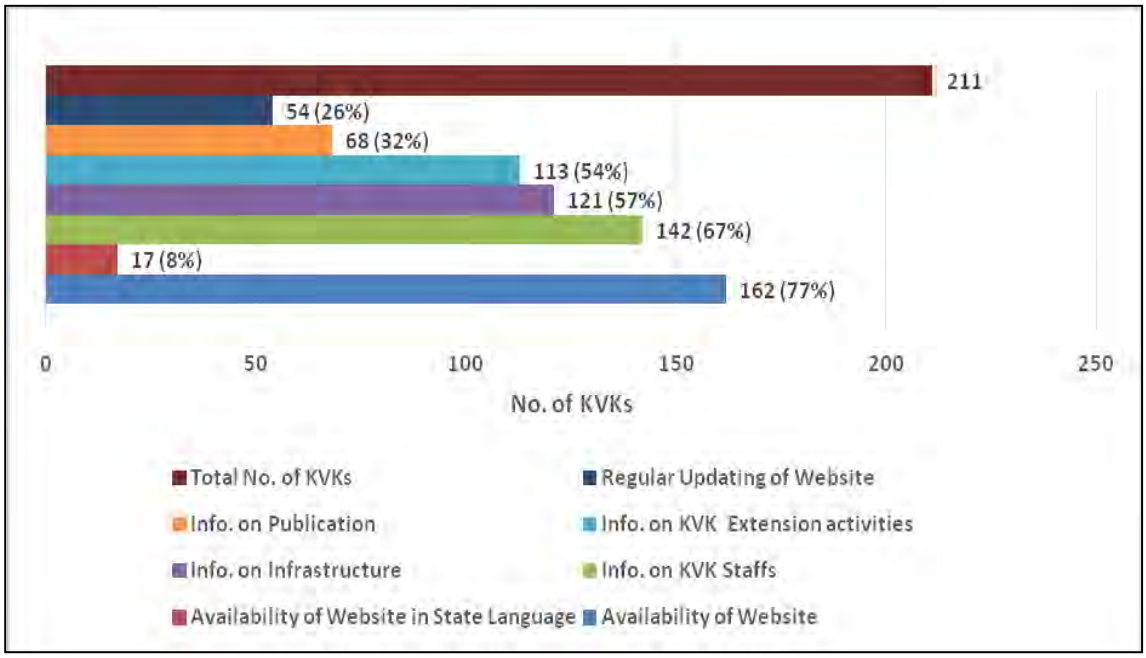


Fig. 1: Web presence of KVKs

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These discrepancies can also be influenced by state-specific policies and funding for digital agriculture. James *et al.* (2022) noted that WhatsApp use was most popular among SMS in South Indian KVKs, yet our findings show weaker website development in the same region. This suggests a shift in preference toward informal, mobile-centric communication over formal web platforms. Thus, our findings both corroborate and challenge existing literature. While some trends, such as weak website maintenance and the underutilization of local languages, are consistent across sectors, this study uniquely highlights how institutional-level indicators (e.g., availability of infrastructure and training data) differ significantly across states. This underscores the need for more integrated digital strategies that consider not only the availability of technology but also content quality, language accessibility, and maintenance practices. Thus, Figure 1 highlights that a total of 162 KVKs (77%) have their own independent websites, but only 17 KVK websites (8%) are available in the state language. Just over half of the KVKs provide essential information on their websites, including staff details (67%), infrastructure details (57%), and information about training and extension activities (54%). However, most KVKs do not update their websites regularly with information on upcoming events, training programs, and other extension services. Additionally, extension literature and training manuals are often not made available in an easily accessible format.

Social media connect by KVK-SMS: KVK-SMS utilize social media platforms to connect with farmers, sharing timely agricultural updates, expert advice, and training opportunities. Fig.2 illustrates the state-wise use of social media by Subject Matter Specialists (SMSs) to engage with farmers. The results show notably high engagement in Maharashtra (71%), Tamil Nadu (61%), and Andhra Pradesh (59%), whereas states like Haryana (35%) and Punjab (49%) exhibit moderate usage, with a small fraction of inactive/passive usage by SMS in each state. These findings are broadly in line with earlier studies that have documented the increasing adoption of social media among agricultural extension professionals.

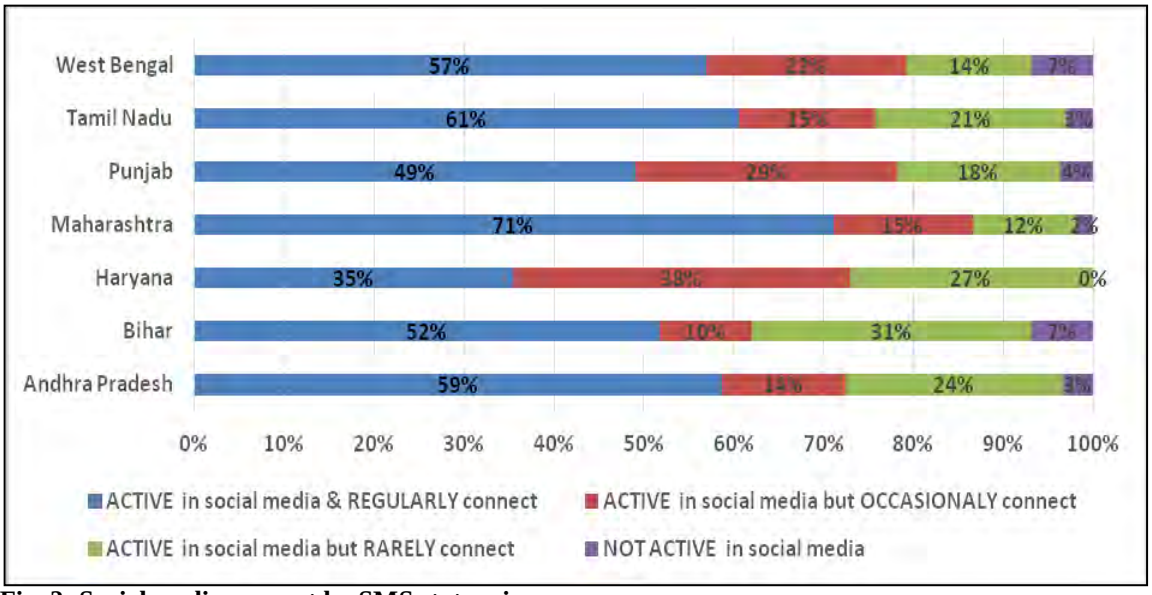


Fig. 2: Social media connect by SMS state-wise

For instance, James *et al.* (2022) found that in South India - especially in Tamil Nadu and Kerala -WhatsApp and Facebook were widely used by KVK scientists for farm communication, mirroring the high engagement levels seen in Tamil Nadu (61%) in this study. Similarly, Islam *et al.* (2020) reported frequent use of YouTube and Facebook by fisheries extension agents in Bangladesh, underscoring a cross-sectoral shift toward multimedia social platforms in extension work. Sharma *et al.* (2020) observed that 70% of farmers in Punjab relied on WhatsApp for updates on agricultural technologies, but interestingly, our data shows only 49% of SMS in Punjab use social media regularly. This discrepancy could reflect a lag between farmers'

expectations and institutional responsiveness, possibly due to inadequate training or lower prioritization of digital outreach by certain KVKs. Relatively less regular use in Haryana (35%), despite a relatively strong digital infrastructure (as noted in Table 2), suggests that institutional infrastructure does not automatically translate to high individual-level engagement. This supports observations by Chander and Sulaiman (2014), who emphasized that digital extension success relies not only on infrastructure but also on institutional incentives, digital literacy, and individual motivation. Conversely, high engagement in Maharashtra (71%) may stem from state-led ICT initiatives,localized digital content, and targeted capacity-building programs for extension agents. This is consistent with Baumüller (2012), who highlighted that states with proactive digital agriculture policies tend to exhibit higher user participation among extension staff. Furthermore, Suchiradipta and Saravanan (2016) emphasized that digital engagement is higher when social media use is integrated into the work culture of KVKs, with performance metrics or internal recognition linked to online communication. This cultural integration may partly explain the higher percentages in states like Tamil Nadu and Andhra Pradesh.

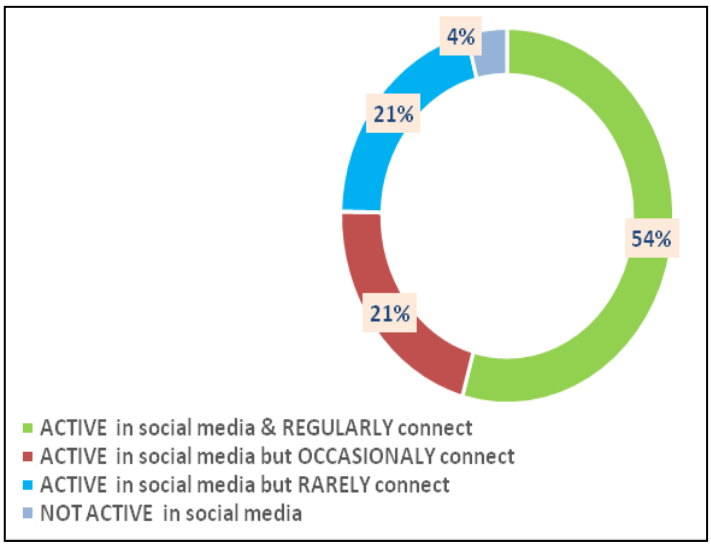
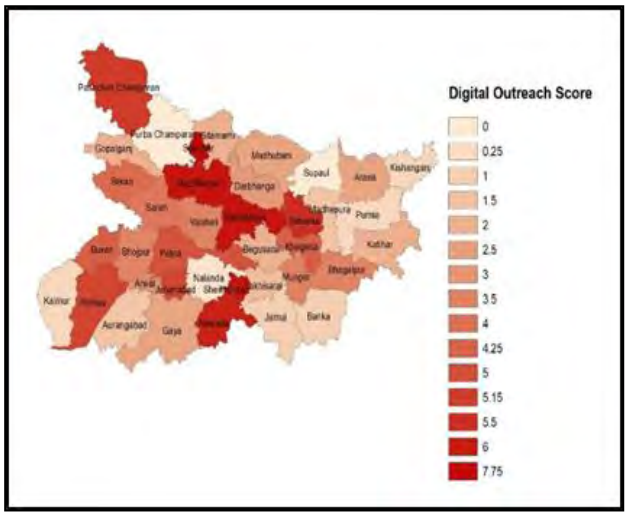


Fig. 3. Social media connect of SMS

Fig. 3 highlights that the majority of SMS respondents (54%) across the seven states reported using social media regularly to connect with farmers, while 42% used it occasionally or rarely.Only 4% of respondents are not active on social media and do not use it to connect with farmers. The delivery of extension services is continuously evolving, and social media presents a valuable tool for maintaining regular communication with farmers. SMS should be encouraged to use social media more actively to enhance their outreach. Additionally, while most respondents have access to mass media sources such as radio, TV, journals, and magazines, they often fail to utilize these resources effectively due to time constraints and lack of interest (Nongdu *et al.*, 2012).

KVK-digital outreach index (KVK-DOI): Fig. 4 provides a visual representation of the district-wise composite digital outreach index scores for each KVK in the states under study.

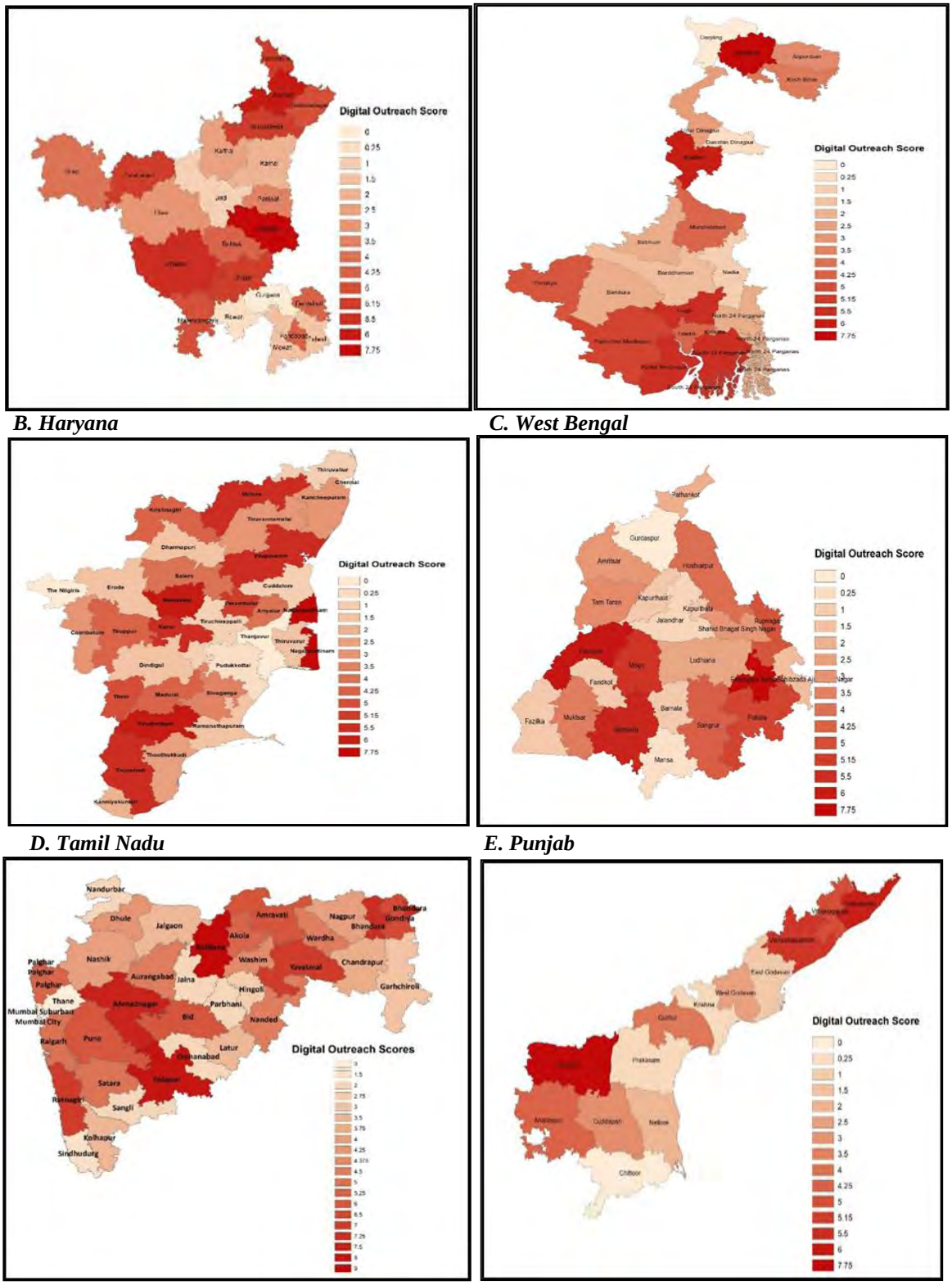
The KVK-DOI maps were prepared using the open GIS platform, the darker shades indicating the districts with a higher score, i.e. better digital outreach in respective states. The scores were categorized into three equal classes of low (0 - 3.33), moderate (3.34-6.66) and high (6.67-10.00) digital outreach, and the frequencies of KVKs/districts were counted and percentages calculated. Additionally, category-wise and state-wise mean KVK-DOI scores were calculated to provide a summary snapshot of the extent of digital outreach at the district, state, and national levels (Table 3).



A. Bihar

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B. Haryana *C. West Bengal*

D. Tamil Nadu *E. Punjab*

F. Maharashtra *G. Andhra Pradesh*

Fig. 4: District wise digital outreach scores of KVKs of seven states

Table 3 illustrates stark contrasts in the digital outreach performance of KVKs across the seven states, categorized into high, moderate, and low engagement levels. The standout performance of Haryana, with 68.4% of its KVKs scoring in the high category and only 15.8% in low, signals a strong institutional push for digital communication. This aligns with findings by Chander and

Sulaiman (2014), who noted that states with robust extension systems and investments in ICT capacity-building demonstrate higher digital outreach. Haryana's agricultural development policies have consistently emphasized technology-led extension, including the use of real-time data sharing, which may have contributed to these results.

Table 3: State-wise KVK-Digital outreach index (KVK-DOI) scores

State	Percent of KVKs/Districts in different KVK-DOI Categories			State-wise mean KVK-DoI Score (0-10)
	High	Moderate	Low	
Andhra Pradesh	8.7	39.1	52.2	2.90
Bihar	27.3	43.2	29.5	3.96
Haryana	68.4	15.8	15.8	5.25
Maharashtra	31.0	42.9	26.1	4.11
Punjab	43.5	17.4	39.1	4.60
Tamil Nadu	28.1	18.8	53.1	3.40
West Bengal	43.5	13.0	43.5	4.07

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On the other hand, Andhra Pradesh (8.7%) and Tamil Nadu (28.1%) display poor digital outreach scores, with over 50% of KVKs in both states categorized as low. These findings partially contradict earlier studies such as James *et al.* (2022), which identified high WhatsApp use by extension professionals in South India, particularly Tamil Nadu. This suggests that while individual-level social media usage may be high, institutional digital outreach-measured through structured web and platform presence - lags behind. A plausible explanation is that informal digital practices are not yet systematically integrated into formal KVK outreach mechanisms, as noted by Suchiradipta and Saravanan (2016). Bihar and Maharashtra display more balanced digital engagement patterns. Prior research by Baumüller (2012) highlighted Maharashtra's relatively strong mobile-based agricultural services and content localization initiatives, which may explain its moderate-to-high distribution in digital outreach scores. Meanwhile, Bihar's emerging digital initiatives, despite infrastructural constraints, have enabled nearly 70.5% of KVKs to fall within moderate or high categories - showing promising trends. West Bengal's bimodal distribution, with 43.5% of KVKs in each of the high and low categories, suggests an unequal adoption of digital tools across districts. This could stem from variation in digital literacy, regional leadership, or ICT budget allocation across KVKs. Similar regional disparities were observed in livestock sector ICT adoption studies by Patil *et al.* (2019), indicating that digital capacity and institutional leadership vary widely even within the same state.

Finally, Punjab's relatively high percentage of low-performing KVKs (39.1%) is notable given that its farmers have demonstrated strong digital engagement (Sharma *et al.*, 2020). This mismatch suggests that while demand for digital content is high, institutional delivery mechanisms need enhancement such as better training, web infrastructure, or content management systems at KVKs. In summary, while the overall findings confirm trends in the broader literature regarding regional disparities in ICT-led agricultural extension, they also reveal specific mismatches between institutional digital infrastructure and individual digital practices. This underscores the importance of harmonizing informal digital communication (e.g., WhatsApp groups) with formal, structured outreach through web platforms to ensure consistency, transparency, and impact. Fig. 5 highlights that KVKs of Haryana have an average Digital Outreach Score of 5.25 out of 10 followed by the KVKs of Punjab (4.6), Maharashtra (4.11), West Bengal (4.07), Bihar (3.96), Tamil Nadu (3.4) and Andhra Pradesh (2.9).

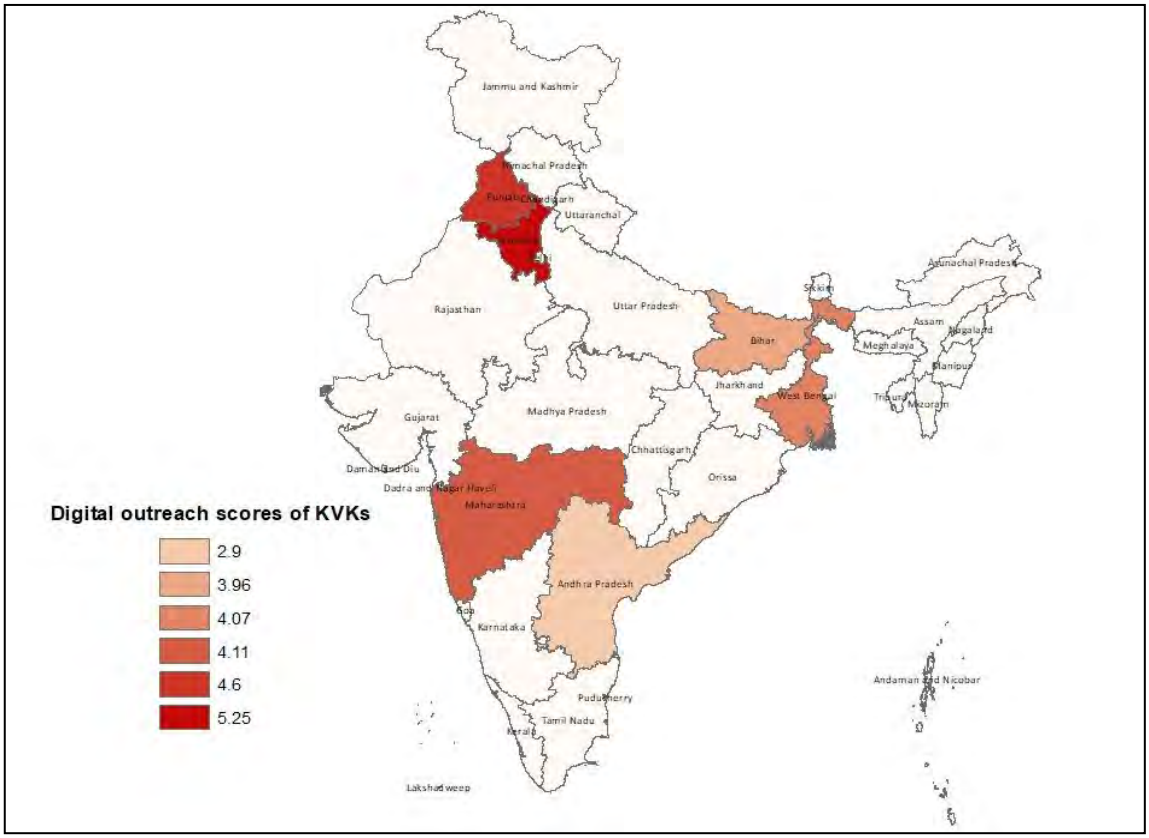


Fig. 5: Digital outreach Index of KVKs (KVK-DOI) across study states

CONCLUSION

The study underscores the critical role of ICT, particularly the digital presence and social media engagement of KVKs, in bridging the gap between extension services and farming communities. While a substantial proportion of KVKs have established their websites and initiated digital outreach, significant disparities persist in terms of accessibility, content relevance, and language inclusion. The findings highlight that although many KVKs actively utilize social media for networking and knowledge sharing, the lack of consistent engagement and inadequate availability of user-friendly extension literature remain significant challenges. To maximize the potential of ICT for agricultural development, a mission-oriented approach is essential. KVKs should be encouraged to enhance their digital infrastructure, ensuring bilingual or multilingual websites to cater to diverse linguistic demographics within their district/block. Additionally, targeted training programs and incentives for SMS can foster a more active and committed use of social media as a tool for extension, empowering farming communities through timely, accessible, and actionable information. By addressing these gaps, KVKs can transform into dynamic hubs of digital innovation, contributing significantly to reducing farmers' vulnerabilities and fostering inclusive agricultural growth. However, a key limitation of the study is its reliance on self-reported responses and secondary data, which may not fully reflect the real-time functionality or user experience of KVK digital platforms. To build on these findings, future research should cover all the KVKs in all the states, and also investigate how socio-economic factors such as age, education, and digital skills of KVK staff influence their ICT usage, offering deeper insights into the determinants of digital engagement, which would help the ICAR-ATARIs/Directorate of Extension of State Agricultural Universities to take targeted interventions and enable KVKs become more digital friendly and digital outreach ready.

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CONFLIT OF INTEREST

All the authors affirm that there is no conflict of interest among them. All research activities comply with relevant legal, institutional and ethical standards.

AUTHOR CONTRIBUTION

All the authors contributed equally in the present study

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