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Reaching tribal farmers in Meghalaya: Assessing the effectiveness of technology dissemination methods

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Abstract

Despite Meghalaya's rich biodiversity and significant agricultural potential, farmers there face numerous challenges that hinder productivity and technology adoption. This study investigates the effectiveness of technology dissemination methods for two specific agricultural technologies: artificial insemination (AI) in pigs and integrated farming system (IFS) models. Using a survey design, data were collected from 200 farmers in selected villages within the Umsning and Bhoirymbong blocks of the Ri-Bhoi district of Meghalaya. The perceived effectiveness of various dissemination methods, including training programs, demonstrations, and exposure visits, was assessed using an effectiveness index based on dimensions such as satisfaction, ease of understanding, timeliness, utility, and relevance. The findings reveal that training was the most effective method for disseminating AI in pigs, with a mean score of 26.31, while field days were deemed most effective for IFS models, with a mean score of 24.81. These results highlight the critical importance of selecting dissemination strategies tailored to farmers' specific needs and local agro-climatic conditions to improve technology adoption. Furthermore, this study emphasizes that effective dissemination not only improves immediate knowledge transfer but also has significant implications for future research in agricultural extension methodologies. The study concludes by advocating for customized extension services that enhance farmers' knowledge and address the practical challenges they encounter when adopting advanced agricultural practices.

Keywords: Effectiveness, technology dissemination methods, technology adoption, tribal farmers

Introduction

Meghalaya, a state renowned for its exceptional biodiversity and abundant natural resources, presents significant potential for the development of agricultural and allied sectors. With its diverse agro-climatic conditions and abundant water resources, the state has the potential to emerge as a significant food producer and a key driver of economic growth. This potential, if harnessed effectively, can transform the economy, generate employment, and improve the livelihood of its people. The farmer faces some specific challenges in the state like hilly terrain, limited access to education, lack of infrastructural facilities, and problem of transportation, lack of access to market, soil erosion, and in fact limited access to technology etc. These challenges significantly impact the productivity and profitability of farmers. Meijer, *et al*. 2015 [1] revealed that the bigger consequence of low adoption or dis-adoption of improved technologies is the continued decline in crop yields, thereby compromising food security, household income growth, and poverty reduction. Hereafter, the adoption of important and advanced agricultural technologies is crucial for achieving higher productivity and improved agricultural outcomes. The adoption of technology in agriculture is not just about modernization; it's also creating a more sustainable, efficient, and profitable agricultural sector that can feed a growing global population. However, technology adoption is not a one-time event; it involves multiple steps, and technology dissemination is a crucial stage where extension methods play a vital role. Typically, various extension methods such as training programs, demonstrations, on-farm demonstrations, field days, exposure visits, and awareness campaigns are employed to disseminate information about specific technologies. The ICAR Research Complex for NEH Region, Umiam, a premier institute in the North-East region of India, has developed and modified numerous agricultural technologies. As the headquarter of the institute is located in Meghalaya, it is actively involved in the dissemination of these technologies to farmers in the state. The primary challenge lies in accurately assessing the perceived effectiveness of these methods from the farmers' perspective as it is also having the influence on technology adoption behaviour. Like how effectively a particular method disseminates information about a specific technology? whether the information provided is truly useful and relevant to the farmers' needs? etc. Damba

et.al.2020 [2] reported that the effectiveness of various dissemination channels varies and consequently affects the extent to which farmers accept and utilize the technologies. Importantly, uptake and utilization of agricultural innovations depend on the understanding and willingness of farmers to accept the technologies and have confidence in the particular dissemination channels used. In fact, Farmers are more likely to be satisfied with technology dissemination methods if the technologies being promoted are relevant to their specific needs and circumstances, and definitely the perception of the system's effectiveness is higher when the technologies disseminated align with the local agro-climatic conditions, cropping patterns, and farming practices. (Ravikishore *et al*. 2024) [3]. With all these backdrop ideas, this present study aims to investigate the utilization of technology dissemination methods for two specific technologies, artificial insemination in pigs and integrated farming systems (IFS) models. It also seeks to evaluate the perceived effectiveness of these dissemination methods by farmers.

Materials and Methods

A survey design was employed to assess and evaluate the effectiveness of technology dissemination methods employed by scientists in two specific areas, namely Integrated Farming Systems (IFS) and Artificial Insemination (AI) in Pigs, in the state of Meghalaya, India. The study includes a sample size of 100 farmers for Integrated Farming System and 100 farmers for Artificial Insemination in Pigs. Thus, total 200 number farmers were selected randomly from selected villages namely Pynthor, Mynsain, Liarkhla, Umdem, Umdihar, Umdiker under Umsning and Bhoirymbong blocks of Ri-Bhoi district of Meghalaya state. Data collection was done by personal interview method using semi structured schedule. Frequency of use and effectiveness of technology dissemination methods were measured with the help of effectiveness index. To study the perceived effectiveness of each dissemination method, an effectiveness index was developed by using dimensions such as satisfaction, ease of understanding, timeliness, utility and relevancy, based on available relevant review of literature. The statements were ranked by their mean scores, in descending order of importance. The most important statement received a score of 5, while the least important received a score of 1, using a five-point scale.

Effectiveness index was calculated by using the formula as follows:

$$\text{Effectiveness Index} = \frac{\text{Total actual score obtained} - \text{Total minimum possible score}}{\text{Total maximum possible score} - \text{Total minimum possible score}} \times 100$$

Total minimum possible score (12) Total maximum possible score (60)

The indicators under different dimensions were identified based on literature and shortlisted after judges rating having relevancy scores more than 0.70. Using the test- retest method, the reliability of Effectiveness index was measured and the index validity was verified using content validity technique. The primary data collected from the farmers were analysed using appropriate statistical methods like data classification, frequency, percentage and index value calculations for each technology dissemination method. This study aims to evaluate the effectiveness of various technology dissemination methods appropriate for farmers, and to provide recommendations for improving technology dissemination strategies based on empirical evidence. This methodology provides a comprehensive framework for assessing the effectiveness of technology dissemination methods used in technologies specially AI in pigs and integrated farming system models.

Results and Discussion

Dissemination methods followed by Scientists for AI in pig

In addition to research, extension activities are a crucial mandate for the ICAR RC NEH, Umiam, Meghalaya. As part of their extension efforts, scientists engage in technology dissemination and adoption, focusing on technologies developed and modified within the institute. Data analysis from the past five years (2017-18 to 2021-22), as shown in Figure 1, revealed that training programs and exposure visits to the institute's research farm were the most frequent extension activities related to artificial insemination (AI) in pigs. Scientists also organized field days, awareness programs, training programs combined with demonstrations and input distribution. Notably, no radio or TV talks on AI in pig farming were recorded during this period, despite their potential as effective mass communication channels.

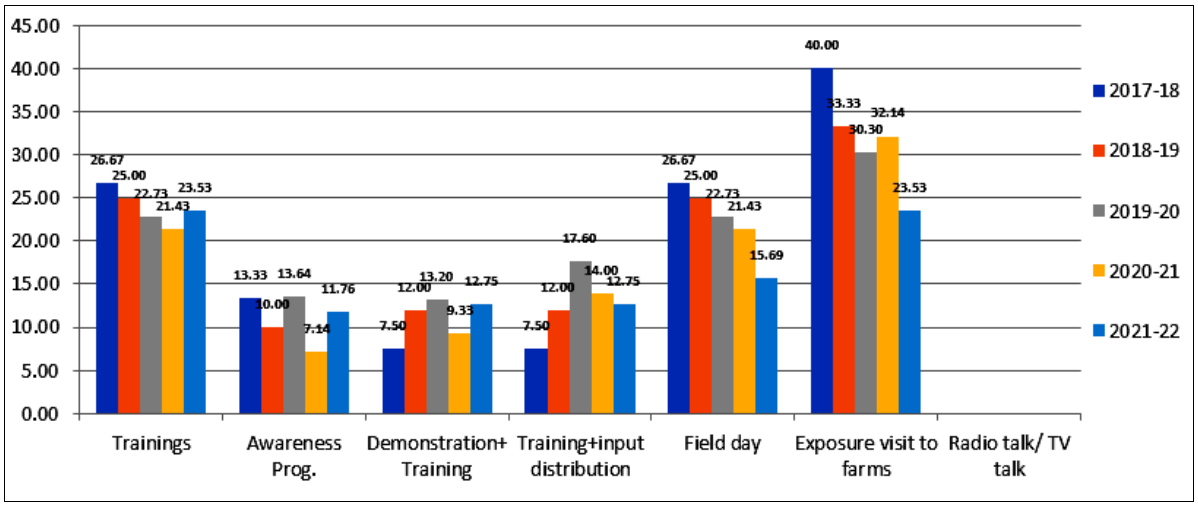

Fig 1: Dissemination methods used by the scientist for AI in Pig from 2017-18 to 2021-22

Table 1: Effectiveness of Dissemination Methods for AI in Pig

Methods	Mean score
Training	26.31
Demonstration + Training	21.28
Training +input distribution	20.76
Awareness programme	20.45
Field Day	20.21
Exposure Visit	17.46

The table above presents the perceived effectiveness by farmers in terms of mean scores for various methods used for technology dissemination in the context of agricultural technologies. The used methods includes training, exposure visits, demonstration combined with training, training with input distribution, awareness campaigns, and field days.

In case of AI in Pig, training emerged as the most effective method for technology dissemination, with a mean score of 26.31 (data presented in Table 1) followed by Demonstration + Training (21.28) in Meghalaya condition. This reflects that structured educational programs significantly enhance farmers' understanding and skills related to new technologies. Training sessions can provide in-depth knowledge, hands-on experience, and opportunities for interaction with experts, which are essential for fostering confidence in adopting new practices.

Further, the method of combining training with input distribution scored 20.76, indicating its effectiveness in promoting technology adoption. By providing essential inputs like medicines, feed along with training, addresses both knowledge gaps and resource availability issues faced by farmers in Meghalaya. This dual approach facilitates farmers and encourages them to participate. Among the other methods awareness campaigns scored 20.45, with a reason being effective in raising awareness about new technologies among farmers, while creating awareness is crucial for initiating interest and understanding among the mass.

Field day, another important extension method, scored slightly lower at 20.21. Exposure visits received a mean score of 17.46, indicating a moderate level of effectiveness in case dissemination of technology like AI in pig. These visits allow farmers to observe successful practices in action at other farms or demonstration sites.

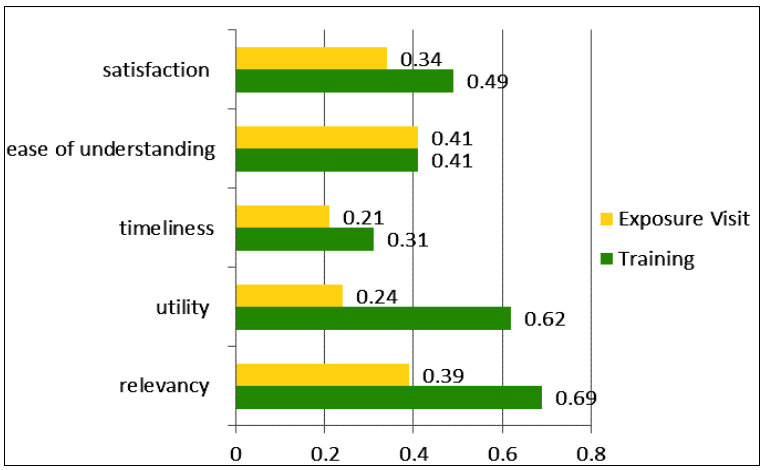

Fig.2 Most (Training) and Least (Exposure visit) effective methods for AI in pig

The effectiveness of technology dissemination methods was analysed across five interconnected dimensions: relevancy, utility, timeliness, ease of understanding, and user satisfaction. By comparing all indicators, the most and least effective methods were identified. Training emerged as the most effective method, scoring highest in relevancy (0.69)

due to its content alignment with farmers' needs, followed by utility (0.62) as shown in Figure 2. From the farmers' perspective, the training was found to be effective, with a score of 0.41 for ease of understanding its content and approach. Conversely, exposure visits for AI in pig farming were identified as the least effective method. This method scored lowest in dimensions such as utility (0.24), timeliness (0.21), and satisfaction (0.31). Exposure visits were found to be less effective in addressing farmers' needs and answering their AI-related queries. This is likely because farmers often perceive advanced technologies like AI in pig as more suitable for research farms than their own fields, recognizing the resource-intensive and technically demanding nature of AI applications.

Technology Dissemination Methods for Integrated Farming System models

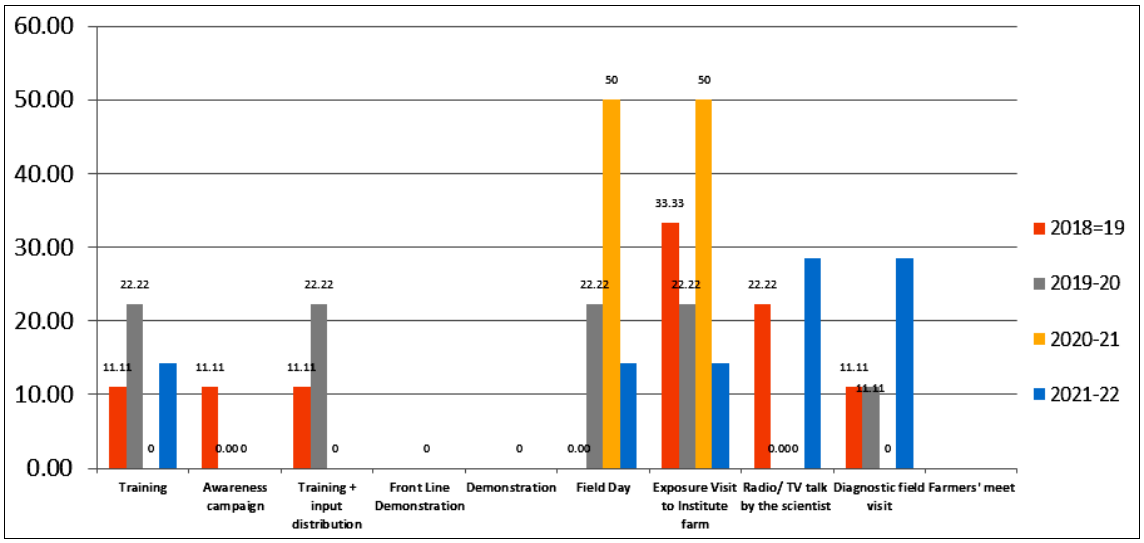

Fig 3: Dissemination methods used by the scientist for IFS from 2018-19 to 2021-22

Data analysis from the past four years (2018-19 to 2021-22) revealed that exposure visits to the institute's research farm and field days were the most frequent extension activities for Integrated Farming System (IFS) models as presented in Figure 3. Scientists also conducted trainings, awareness programs, and training combined with input distribution. Radio or TV talks on IFS were also utilized as effective mass communication channels during this period. Scientists also conducted diagnostic field visits to farmers' fields. However, on-farm demonstrations were less frequent, likely due to the resource-intensive nature of these activities and the challenges of implementing them on small-scale farms.

Table 2: Effectiveness of Dissemination Methods for IFS

Methods	Mean score
Field Day	24.81
Exposure visit	20.94
Training	19.76
Awareness Programme	20.45
Training+ input distribution	20.78
Radio/TV talk	15.49
Diagnostic visit	14.08

Data presented in Table 2. revealed that field days were perceived as the most effective technology dissemination method for IFS by farmers, with a mean score of 24.81. This high rating is attributed to field days allowing farmers to observe new technologies first-hand and facilitating peer-to-peer learning. Exposure visits were ranked as the second most effective method; provide farmers with the opportunity to witness real-time practices in IFS models research farms of the institute. Additionally, awareness programs, training programs, and training programs combined with input distribution were also effective, scoring 20.45, 19.76, and 20.78 respectively. Awareness programs, one- to three-day training programs are valuable in imparting knowledge about specific technologies and sensitizing farmers to their usefulness.

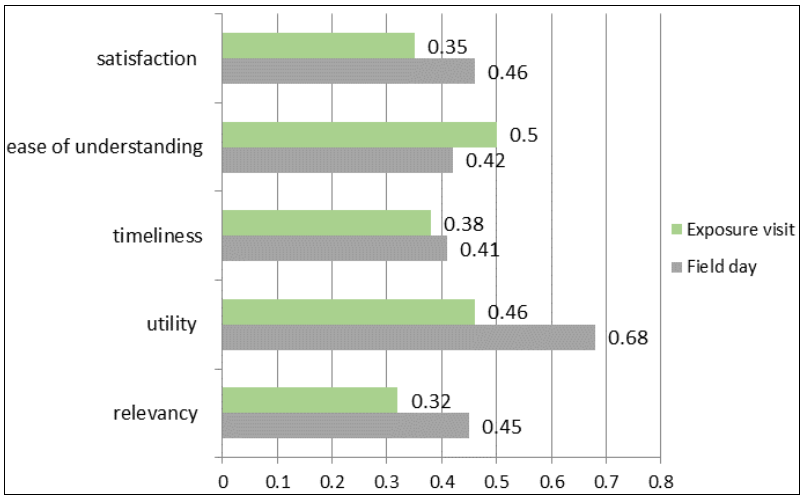

Fig 4: Two most effective method of technology dissemination for IFS

Among the evaluated technology dissemination methods, including training, awareness programs, combined training and input distribution programs, radio/TV talks, and diagnostic visits, field days and exposure visits to the institute farm were found to be most effective in terms of timeliness, utility, relevancy of information, and ease of understanding as presented in fig.4. This was reflected in their higher satisfaction scores, with field days scoring 0.46 and exposure visits scoring 0.35.

Effective dissemination methods, such as trainings, training + demonstrations and training + input distribution, exposure visit, field days are highly relevant as they directly address the specific needs of the target audience, ensuring that the information is applicable to their context. These methods also demonstrate high utility, as they provide hands-on experience and practical knowledge that can be immediately implemented. Timeliness is strength, as these methods allow for real-time feedback and adjustments based on audience reactions, enhancing the overall learning experience. Satisfaction levels tend to be higher with these approaches due to the interactive nature of the sessions which enhances their engagement and encourages farmers to ask questions. Similarly, the ease of understanding is significantly improved through visual demonstrations and direct interaction, making complex concepts more accessible.

In contrast, least effective methods, such as radio/tv talk, awareness programme etc. often lack relevancy since they may not cater to the specific needs or contexts of the audience. Their utility is limited as these methods typically do not facilitate practical application or engagement with the content. Consequently, satisfaction levels are generally lower, as audiences may feel disconnected from the content presented. Lastly, ease of understanding suffers due to the passive nature of these methods; without interactive elements or tailored explanations, audiences may struggle to grasp complex information effectively. This comparison underscores the importance of selecting appropriate dissemination strategies to maximize impact and foster effective knowledge transfer.

According to Ravikishore *et al.* (2024) [3], the study on farmers' perceptions of technology dissemination methods employed by the Kerala State Department of Agriculture indicated that a majority of farmers expressed a moderate level of favourability towards these dissemination methods. Likewise a study by Sandeep *et al.* (2022) [4] found that nearly 40% of respondents considered information from social media to be moderately effective. These farmers viewed the information on social media platforms as helpful and practical for their farming practices, ultimately assisting them in adopting better agricultural methods.

Sunil *et al.* (2017) [5] evaluated the effectiveness of RKMP, an online portal offering information on rice cultivation. Their findings revealed varying levels of usefulness for different stakeholders (farmers, scientists, and extension personnel). While the platform provided valuable information, its specific utility varied depending on the user's role. Notably, a significant number of farmers strongly believed that RKMP effectively assisted them in preventing pest infestations, which is crucial for their farming practices. Ravikishore and Allan (2016) [3] assessed agricultural expert systems such as 'KAU-Fertulator' and 'e-Crop Doctor,' developed by Kerala Agricultural University. They developed an effectiveness index for these systems and found them effective in areas like quick availability, accessibility, and the reliability of the information provided. While technology dissemination is crucial, selecting the *right* dissemination method is even more critical. Different technologies and diverse farmer demographics require tailored approaches, as not all methods are equally effective for every situation. The selection of a technology dissemination method requires careful consideration of the technology's nature, its usefulness, and the farmers' actual needs. Crucially, farmer characteristics such as education level, age, background, and experience also significantly influence their satisfaction and the effectiveness of the chosen dissemination methods. This study found that for smaller farmer groups (up to 25 members), training, or training combined with demonstrations (as in the case of artificial insemination in pigs), proved effective. For more complex technologies like integrated farming systems (IFS) models, training coupled with exposure visits to established farms scored highly in terms of perceived effectiveness among farmers in Meghalaya. Therefore, effective dissemination and successful technology adoption require careful strategic planning. This involves analysing prevailing conditions and farmers' needs, timely effort to select the appropriate dissemination method, or combination of methods, for optimal impact.

Conclusion

This study investigated technology dissemination methods used for artificial insemination (AI) in pigs and integrated farming systems (IFS) models, focusing on scientists' approaches and farmers' perceptions of effectiveness. The findings highlight the importance of tailored dissemination strategies. For AI in pigs, training, particularly when combined with demonstrations at the farm, proved effective for small farmer groups. This suggests that hands-on experience and practical application are crucial for successful adoption of this type of specific technology. For the technology like IFS models, a combination of training and field visits to institute or successful farms was highly valued by farmers in Meghalaya. This emphasizes the value of learning from real-world examples and observing the practical integration of various components within IFS. Overall, the study reinforces the critical role of careful selection of dissemination methods. The choice of method, or combination of methods, should be guided by the specific characteristics of the technology being disseminated, the size of the target farmer group, and the unique needs and attributes of the farmers themselves. Future research could explore the long-term impact of these different dissemination approaches on technology adoption and agricultural outcomes, as well as investigate the potential of newer methods, such as digital platforms, to further enhance technology transfer to farmers.

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