# **Assessment of the Level of Farmers’ Satisfaction with the Use of AgriTecH in Disseminating improved oil palm production technologies in Western Tanzania**

# **Abstract**

This study assessed the level of farmers' satisfaction with the use of AgriTecH in disseminating improved oil palm production technologies in Tabora and Katavi regions in the Western parts of Tanzania. The study adopted a cross-sectional mixed-methods research design involving quantitative and qualitative methodologies. A semi-structured questionnaire was used to collect quantitative data from a sample of 120 respondents, while focus group discussions and key informant interviews were employed to obtain qualitative data. The collected quantitative data were analysed using a Statistical Package for Social Sciences (SPSS) to yield descriptive statistics while content analysis was used to analyse qualitative data. The study found that the majority of the farmers expressed high level of Satisfaction with the use of AgriTecH in dissemination of improved oil palm production technologies across all measurement indicators including responsiveness (93.3%), assurance (90.8%), reliability (89.2%), empathy (89.1%), timeliness (85.0%), access (65%) and tangibility (60.8%). Although farmers showed that they are satisfied with the AgriTecH in the dissemination of improved oil palm production technologies, the lower positive percentage scores in access (65%) and tangibility (60.8%) indicators implied that there is a need for improvements in the components of these indicators. Based on the findings of the study, TARI should make some improvements in the physical infrastructure component of the AgriTecH to ensure more efficiency in service delivery. Also, both TARI and the Local Government Authorities through the Division of Agriculture, Livestock and Fisheries should provide convenient ways to increase farmers’ regular visits to the AgriTecH by either supporting their visits at least once per each cropping season or decentralizing the services to the grass root level where farmers are found by strengthening the linkages between the AgriTecH and the Ward Agricultural Resources Centres (WARCs).

**Key words:** Farmers' Satisfaction, Oil Palm Production Technologies, Dissemination, AgriTecH

#

# **1.0 Introduction**

Agricultural Technology Transfer Hub (AgriTecH) is an organized facility that facilitates the dissemination of improved agricultural technologies to farmers, extension workers and other agricultural stakeholders (TARI, 2020). It is one among the pathways used by the Tanzania Agricultural Research Institute (TARI) for disseminating improved agricultural technologies developed by the Institute. TARI has established eight AgriTecHs in each Zonal Agricultural show grounds in Tanzania. They operate throughout the year, providing the opportunity to farmers and other agricultural stakeholders to learn various improved agricultural technologies. Improved agricultural technologies refer to all enhanced procedures and innovations which contribute to increasing agricultural productivity, resulting in significant increases in farm income and ensuring food security (Jain *et al.,* 2009; Challa & Tilahun, 2014). They include new crop varieties, soil and soil fertility management, pest management as well as irrigation and water management (Loevinsohn *et al.*, 2013).

The current study focuses on improved oil palm production technologies disseminated by the AgritecH, including improved oil palm seedlings (tenera), criteria for selecting oil palm fields, land preparation methods, nursery management practices, transplanting techniques, irrigation methods, pruning techniques, fertilizer application methods and pest control methods.

Fatuma Mwasa AgriTecH, which is the focus of this study, is located in the Fatuma Mwasa Agricultural showgrounds at Ipuli in Tabora Municipality. It is in charge of disseminating various improved agricultural technologies in the Western Zone of Tanzania (TARI, 2021). It operates under the supervision of the two TARI Centres, which are TARI Tumbi and TARI Kihinga. These two centres provide personnel, capacity development, and improved technologies, all of which are critical assets for AgriTecH’s operations. In addition to the technologies from the centre’s mandate areas, AgriTecH also provides technologies from other TARI centres. These technologies are disseminated through various extension methods, such as demonstration plots, farmer field days, exhibitions, and mass media. AgriTecH also collaborates with different stakeholders, including private agricultural enterprises, academic institutions and local government authorities in disseminating improved technologies. An attempt was made in this study to assess the level of farmers’ satisfaction with the use of AgriTecH in disseminating information to them.

Satisfactionis the fulfilment of certain prior expectations related to a product or service Raboca, 2006). On the other hand, Dkhar *et al. (*2019 and Singh and Kalra (2019)defined satisfaction as the extent to which the farmers were satisfied with the various services provided. According to this study, the level of farmers' satisfaction with the use of AgriTeCH in disseminating improved oil palm production technologies is operationalized as the degree to which farmers are satisfied with the services and products provided by AgriTeCH concerning oil palm production. Assessing the degree of farmers' satisfaction with AgriTecH's use is essential to comprehending the efficacy and influence of these hubs in advancing technologies for oil palm production; high satisfaction shows that the hubs successfully tackle farmers' problems and improve their agricultural output, whereas low satisfaction points to inadequacies in service provision or lack of alignment with farmers' requirements.

The level of farmer’s satisfaction on the use of particular extension delivery approach in technology disseminating was measured differently by various scholars; Dutta et al. (2021) measured farmer’s level of satisfaction in frequency (f) and percentage (%) according to their satisfaction on the feature/service of ATIC then Weighted Mean Score (WMS) was given on each feature/service to rank them accordingly. The overall satisfaction level of respondents was the calculated by the mean and standard deviation of the obtained scores. Singh and Karla (2019) measured farmers’ level of satisfaction on a three-point continuum, namely satisfied, somewhat satisfied, not satisfied, using the scores of 2, 1 and 0, respectively. Dkhar *et al.* (2019) and Debnath (2016) measured clientele satisfaction using a scale developed by Saravanan (2003) in four dimensions, which are relevancy, quality, usefulness and customer service. Ovharhe *et al.* (2020) measured farmers’ satisfaction with agricultural extension services in Delta State, Nigeria using the Likert scale ranged from strongly agree, agree, disagree, and strongly disagree, which were coded as 4,3, 2 and 1, respectively. Similarly, Elias *et al.* (2015) measured farmers’ satisfaction with agricultural extension services in Ethiopia using a Likert scale that ranged from strongly dissatisfied (1) to strongly satisfied (5). Furthermore, Khan *et al.* (2012) measured the level of farmers’ satisfaction towards the services of ATIC on a five-point continuum, namely Most satisfied, Quite satisfied, Satisfied, Somewhat satisfied and Dissatisfied, with a weightage of 5, 4, 3, 2 and 1, respectively. The overall satisfaction score of a farmer was then calculated by summing the scores of all the services related to diagnostic services, supply of research products, information through publication and information through audio-visual aids.

While there are few studies (Dutta *et al.,* 2021; Singh and Kalra, 2019; Kumar *et al.,* 2020; Dkhar *et al.,* 2019; Khan *et al.,* 2012; Mukherjee et *al.*, 2011) on the level of farmers’ satisfaction on the use of AgriTecH in disseminating improved agricultural technologies none of them evaluated the level of farmer’s satisfaction on the use of AgriTecH in disseminating improved oil palm production technologies. Thus, this study attempts to fill this knowledge gap. It presents an assessment of the level of farmers’ satisfaction on the use of AgriTecH as an approach for the dissemination of improved oil palm production technologies. The rest of the article is structured as follows: the next section describes the conceptual framework used in the study, followed by the methodology section. This is followed by the on results and discussion. The final section is conclusions based on the findings.

# **2.0 Conceptual Framework**

This study used the seven indicators from the SERVQUAL Model as modified by Rana *et al.* (2013) to measure the level of farmers’ satisfaction on the use of AgriTecH in the dissemination of improved oil palm production technologies concerning access, assurance, empathy, reliability, responsiveness, tangibility and timeliness. According to Tsiotsou (2006), measuring customer satisfaction is also a way of assessing the quality of the outputs delivered by the organisation, as higher satisfaction with its acquisition and use depends on the perceived quality of the product or service. On the other hand, Dutta et *al.* (2021) commented that satisfaction is a very important factor in determining the utilization, adoption and impact of a particular technology or information disseminated among the farmers. Therefore, the SERVQUAL model was useful in assessing the level of farmers’ satisfaction on the use of AgriTecH in the dissemination of improved oil palm production technologies. According to this study, the operational definitions for the seven SERVQUAL indicators are presented as follows.

Accessibility refers to how simple it is for users to utilize the platform. Assurance is the confidence of farmers that AgriTecH has the required skills, expertise, resources and infrastructure to meet farmers’ requirements. Empathy is the measure of the interest and concern of the AgriTecH in addressing the needs of individual farmers and within their context. Reliability is the ability to provide relevant and quality services accurately and cost-effectively. Responsiveness is the measure of concern and supportive service of the AgriTecH. Tangibility implies physical facilities and materials for the benefit of farmers. Timeliness is the measure of timely provision of response and service.

# **3.0 Methodology**

The study was carried out in the four districts in Western Tanzania, covering Tabora Municipality, Urambo and Kaliua districts in Tabora region and Tanganyika district in Katavi region. These regions were selected because they are ecologically suitable for oil palm production and are among the regions which are served by Fatuma Mwasa AgriTecH. Katavi and Tabora Regions have respective populations of 1,152,958 and 3,391,679, according to the 2022 National Census. Katavi Region lies between longitudes 30° and 33° east and latitudes 5° 15' and 7° 03' south. Each year, the area receives 700 -1,300 millimetres of precipitation. In contrast, the Tabora Region, which lies between latitudes 4° and 7° south of the Equator, experiences 1010 millimetres of precipitation on average every year.



##### **Figure 1:** Map showing the study area

### **Source: Adam *et al.* (2025)**

A mixed-methods research strategy was used in the study, which combined qualitative and quantitative research techniques. Utilizing a mixed research approach makes triangulation easier, thus enhancing reliability and comprehensiveness of the findings. Oil palm producers were the target population for the study. To find out how gender contributed to oil palm productivity, the study included both male and female producers. Purposive sampling was used to select 30 oil palm producers from each district, making a total of 120 oil palm farmers. According to published research, socioeconomic studies in Tanzania and other sub-Saharan African nations can be conducted with a sample size of 80–120 respondents (Gbawoquiya, 2019; Iddi *et al.,* 2022; Masanja *et al.,* 2023).

The selection process concentrated on farmers who actively participate in AgriTecH activities, such as going to training sessions, seeking advice on oil palm cultivation, and using the technologies that have been distributed. This tactic made sure that the sample contained people who understood the technologies being distributed and who had relevant expertise that matched the goals of the study. AgriTecH Staff, Ward Agricultural Extension Officers (WAEO) and the District Agriculture, Livestock and Fisheries Officer (DALFO) were also chosen as Key Informants for this study because of their knowledge and experience in promoting the dissemination of improved agricultural technologies.

Eight KIIs, two from each district, comprising the DALFO and the WAEO, and four Focus Group Discussions (FGDs) with the oil palm farmers were carried out. The selection of FGD members was predicated on their knowledge of AgriTecH dissemination initiatives and their involvement in oil palm farming. To gather a variety of perspectives, each focus group discussion (FGD) included six members, including men, women, young people, and the elderly. Oil palm farmers who did not participate in the survey were included in the FGDs to avoid survey overlap. To create a neutral and fruitful discussion atmosphere, FGDs were mediated by a qualified facilitator who was familiar with the objectives of the study.

A standardized checklist that addressed key topics, particularly the level of farmers’ satisfaction with the use of AgriTecH in the dissemination of improved oil palm production technologies, assisted the discussions. Data were collected using a semi-structured questionnaire with KOBO Collect v2022.3.6 to gather information from 120 respondents. This software allows replies to be directly entered into a digital format, reducing human data entry errors, simplifying data management and ensuring data accuracy. To assess the level of farmers’ satisfaction, the collected data were subjected to descriptive statistics such as frequency count and percentage. Further, a five-point Likert scale covering seven dimensions (access, assurance, reliability, empathy, responsiveness, tangibility, and timeliness) was used to measure the level of farmers’ satisfaction with the use of AgriTecH in the dissemination of oil palm production technologies. Data were analysed using the Statistical Package for Social Sciences (SPSS) version 27. The collected quantitative data were arranged, coded and cleaned in MS Excel and then imported into SPSS version 27 for further analysis.

Quantitative data were analysed using descriptive statistics such as frequency count and percentages. Qualitative information from FGDs and KIIs was analysed using content analysis. The information was coded, and related trends were grouped to represent farmers' viewpoints and experiences. After that, an expert evaluation verified that the categories accurately represented the experiences and perspectives of farmers. Content analysis was utilized to delve into particular issues regarding the level of farmers’ satisfaction on the use of AgriTecH in the dissemination of improved oil palm production technologies (Xu & Zammit, 2020).

## **4.0 Results and Discussion**

### **4.1 Socio-economic characteristics of the respondents**

Results in Table 1 show that the majority (83.3%) of the respondents were men, a significant majority (95.8%) were married, and a significant proportion (59.2%) had only completed primary education. The vast majority (72.5%) of the respondents had more than 10 years of farming experience, and the majority (96.7%) were employed in the agricultural industry. While 91.7per cent of the respondents still grow maize as their most common crop, a recent shift to oil palm production (68.3%) suggests diversification brought about by changes in the market and regulations.

**Table 1: Socio-economic characteristics of the respondents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Socioeconomic characteristics** | **Category** | **Frequency** | **Percent %** |
| Sex | Female | 20 | 16.7 |
|  | Male | 100 | 83.3 |
| Marital status | Single | 5 | 4.2 |
|  | Married | 115 | 95.8 |
| Level of education | No formal education | 2 | 1.7 |
|  | Primary Education | 71 | 59.2 |
|  | Secondary education | 25 | 20.8 |
|  | Tertiary/college education | 22 | 18.3 |
| Occupation | Government employee | 14 | 11.7 |
|  | Farmer | 116 | 96.7 |
|  | Local leader | 6 | 5.0 |
|  | Business/trade | 18 | 15.0 |
|  | Others (religious leader, plumber, carpenter) | 4 | 3.3 |
| How many years have you been engaged in agricultural activities? | Less than 3 years | 10 | 8.3 |
|  | 3 to 5 years | 8 | 6.7 |
|  | 6 to 10 years | 15 | 12.5 |
|  | More than 10 years | 87 | 72.5 |
| For how long have you been growing oil palm? | Less than 3 years | 82 | 68.3 |
|  | 3 to 5 years | 12 | 10.0 |
|  | 6 to 10 years | 5 | 4.2 |
|  | More than 10 years | 21 | 17.5 |
| Crops other than oil palm | Maize | 110 | 91.7 |
|  | Tobacco | 40 | 33.3 |
|  | Sweet potatoes | 17 | 14.2 |
|  | Rice | 64 | 53.3 |
|  | Others such as beans | 55 | 45.8 |

### **Source: Adam *et al.* (2025)**

## **4.2 Farmers’ Satisfaction on the Use of AgriTecH in Dissemination of Improved Oil Palm Production Technologies**

This section presents the level of farmers’ satisfaction on the use of AgriTecH in the dissemination of improved oil palm production technologies concerning SERVIQUAL indicators used: access, responsiveness, assurance, empathy, reliability, timeliness and tangibility.

## **4.2.1 Access**

The results in Table 2 show that the majority (65.0%) of the respondents were satisfied with the use of AgriTecH in the dissemination of improved oil palm production technologies in the access indicator. This suggests that farmers concurred that it is simple to get in touch with and speak with AgriTecH staff, to get AgriTecH information and to use the organization's prompt feedback system. As the farmers were able to contact the AgriTecH personnel at any time for advice, hence, they took appropriate decisions in time. However, 5.0per cent of the respondents were dissatisfied with the AgriTecH accessibility. This might be attributed to the distance from their homes to the AgriTecH, especially to those who live far from the centre. This discrepancy implies that farmers may not be able to make a full use of AgriTecH services due to regional constraints. This observation is supported by the findings from a study by Alemu (2021), who found that farmers who live comparatively far from Farmer Training Centres (FTC) are less likely to participate in FTC-based extension because it takes them more time, effort and money to travel to the centres. Furthermore, a male oil palm farmer was quoted as saying,

*‘‘The distance between our home and the AgriTecH limits the frequency of our visits. We have to spend time and money traveling to the hub. We are requesting that TARI and the government find ways to bring these services closer to our residence.…’' (Male Oil palm farmer during FGD at Tumbi Ward on July 11, 2024)*

## **4.2.2 Responsiveness**

The findings in Table 2 show that the majority (93.3%) of the respondents were satisfied with the use of AgriTecH in the dissemination of improved oil palm production technologies concerning the responsiveness indicator. The highest rating might be attributed to the genuine concern for farmers’ well-being, personnel service-mindedness and their willingness to support the farmers. This finding aligns well with the findings in a study by Singh and Karla (2019), who reported that the majority (93.23%) of the farmers were satisfied with the interest of experts at ATIC in advising the farmers. The higher interest of the extension service provider in extension services delivery is crucial in the dissemination of improved agricultural technologies. However, the findings from this study were in contrast with findings in a study by Meja and Geta (2017), who reported poor concern of FTC experts for farmers’ well-being.

## **4.2.3 Assurance**

The data in Table 2 indicated that the majority (90.8%) of the farmers were satisfied with the AgriTecH use in the dissemination of improved oil palm production technologies concerning the assurance indicator. These results imply that farmers value the AgriTecH’s expertise, capital resources and the usefulness of the extension services and products provided. A similar finding is reported by Singh and Karla (2019), who revealed that the majority of the farmers were satisfied with the availability and technical knowledge of the experts present at ATIC, which is operated by Punjab Agricultural University, by 80.73 and 93.75 per cent respectively. The findings, however, are in contrast with the findings in a study by Meja and Geta (2017), who reported skills and attitudinal problems among some of the FTC experts in Damote Gale District in Ethiopia. According to Liao (2020), competent and compassionate extension agents help foster confidence and boost the uptake of agricultural technologies. One female oil palm farmer commented,;

*‘‘…TARI should increase financial and technical support to facilitate effective operations of the AgriTecH….’’ (Female Oil palm farmer at Kafisha village on July 11, 2024).*

# **4.2.4 Empathy**

The majority (89.1%) of the respondents were satisfied with the use of AgriTecH in the dissemination of improved oil palm production technologies. This might be attributed to the AgriTecH localized solutions, regular interaction and personalized attention to farmers,which contributed to the creation of a friendly atmosphere for effective provision of extension services. Their crop problems were solved on the spot because of regular interaction with the AgriTecH personnel. Furthermore, the farmers perceived that the extension personnel were motivated to serve as they put proper attention to the farmers most of the time, but incentives or rewards or in-service training may be given to motivate more and to improve the clientele accountability of the AgriTecH personnel for better job performance. This finding aligns well with the findings in a study by Wonde *et al.* (2022), who reported close supervision, special attention and follow-up of the farmers by FTC experts on attending FTC training programmes. However, the findings are in contrast with the findings in a study by Makundi (2017) reported a poor engagement of researchers at the ATDC with key stakeholders in the rice sector in Dakawa and the lack of formal links between the centre and local institutions, including UWAWAKUDA and the village government. Such linkages are important for facilitating interactions with farmers and enhancing the centre’s overall performance. One male oil palm farmer suggested,

*‘‘….AgriTecH staff should also be facilitated to visit us in our fields so that you can see how we practise the technologies learnt from the Hub. This will give you a room to make follow-up on the adherence to the provided recommendations, then you will be able to advise on improvement. (Male Oil palm farmer at Usimba village on July 11, 2024)*

# **4.2.5 Reliability**

Data in Table 2 reveal that the majority (89.2%) of the respondents were satisfied with all aspects of the reliability indicator, including the accuracy of provided information, quality, relevancy, suitability and cost-effectiveness of the services and products provided by the AgriTecH. The findings from this study conform with the findings in a study by Singh and Karla (2019) who reported that the majority of the farmers were satisfied with the quality of the planting materials (91.78%) and seeds (75%), as well as their prices (83.56%) and (87.96%), respectively. However, these findings are in contrast with the findings by a study by Xu *et al.* (2016), who reported that although the Chinese rice varieties distributed by ATDC in Tanzania were technically very productive, some farmers believed that the varieties' taste and aroma were inferior to those of the local varieties.

# **4.2.6 Timeliness**

The majority (85.0%) of the respondents were satisfied with the use of AgriTecH in the dissemination of improved oil palm production technologies with regard to the timeliness indicator. This high rating might be attributed to the AgriTecH's timely responses to farmers’ inquiries and requests. Farmers’ concerns like pest and disease attacks require immediate responses to avoid detrimental effects to the crops, which will in turn cause crop destruction and low crop productivity. The findings from this study are supported by the findings in a study by Singh and Karla (2019) who reported that the majority (92.19%) of the farmers were satisfied with the time taken by ATIC to solve the problem presented to them by farmers. However, these findings are in contrast with the findings by a study of Dkhar *et al*.(2019), who reported the low Clientele Satisfaction Index (CSI) of 47.00, indicating that farmers were not satisfied with the non-timely delivery of extension services of Meghalaya KVK in India.

**Table 2: Satisfaction of Farmers on the Use of AgriTecH**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Indicator** | **Most Satisfied** | **Satisfied** | **Neutral** | **Dissatisfied** | **Most Dissatisfied** |
| Access | 7 (5.8%) | 71 (59.2%) | 36 (30.0%) | 4 (3.3%) | 2 (1.7%) |
| Assurance | 42 (35.0%) | 67 (55.8%) | 10 (8.3%) | 1 (0.8%) | 0 (0.0% |
| Empathy | 34 (28.3%) | 73 (60.8%) | 6 (5.0%) | 4 (3.3%) | 3 (2.5%) |
| Reliability | 39 (32.5%) | 68 (56.7%) | 9 (7.5%) | 3 (2.5%) | 1 (0.8%) |
| Responsiveness | 48 (40.0%) | 64 (53.3%) | 7 (5.8%) | 1 (0.8%) | 0 (0.0%) |
| Tangibility | 21 (17.5%) | 52 (43.3%) | 28 (23.3%) | 15 (12.5%) | 4 (3.3%) |
| Timeliness | 39 (32.5%) | 63 (52.5%) | 14 (11.7%) | 4 (3.3%) | 0 (0.0%) |

# **4.2.7 Tangibility**

The majority (60.8%) of the respondents were satisfied with the use of AgriTecH in the dissemination of improved oil palm production technologies with regard to tangibility indicator. Although the majority of the farmers were satisfied, tangibility indicator had the lowest satisfaction value (60.8%), the highest dissatisfaction value (15.5%) and the highest neutral value (23.3%) compared to all other indicators. This implies that despite that farmers are satisfied with the aspects of this indicator; the findings indicate the need for improvement in the aspects of the tangibility indicator including physical facilities and communication materials in terms of acquisition and maintenance.

The results from this study conform with the findings in a study by Sajesh and Padaria (2019) who reported the highest score in the tangibility dimension for KVK Farm Science Centre in Akola, India. Similarly, Dutta *et al.* (2021) reported the level of farmers’ satisfaction with the infrastructure of ATIC by a Weighted Mean Score (WMS) of 3.82. The findings, however, contradict the findings in a study by Meja and Geta (2017) who reported unavailability of some physical facilities, including living houses for development agents and teaching materials in the FTC at Damote Gale District in Ethiopia. Similarly, Adam *et al.* (2025) reported on the need for improvement in the tangibility components of the Fatuma Mwasa AgriTecH. This observation was supported by the remarks by the Fatuma Mwasa AgriTecH Supervisor when quoted, saying;

*‘‘…We need some improvements in the training room so that it can accommodate a sufficient number of farmers at once. Also, some facilities like a living house for staff, offices, a bore hole, a fence and a storage facility are not in place. If these issues are addressed the working and learning environment for both AgriTecH Staffs and farmers will be improved…’’*

*(KII with Fatuma Mwasa, AgriTecH Supervisor, July 30, 2024)*

## **5.0 Conclusion**

The study attempted to assess the level of farmers’ satisfaction with the use of AgriTecH in the dissemination of improved oil palm production technologies. It can be concluded that high majority of the farmers were satisfied with the use of AgriTecH in dissemination of these technologies across all seven SERVIQUAL indicators used including responsiveness (93.3%), assurance (90.8%), reliability (89.2%), empathy (89.1%), timeliness (85.0%), access (65%) and tangibility (60.8%). The highest ranking in responsiveness (93.3%) indicates that the majority of oil palm farmers were mostly satisfied with the AgriTecH staff genuine concern for farmers’ well-being, personnel service mindedness and their willingness to support the farmers while the lower positive percentage score on tangibility (60.8%) and access (65.0%) indicators imply that improvement should be done in the components of these indicators for effective operations.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

# **References**

Adam, M. R., Kidudu, J. S., & Mwaseba, D. L. (2025). Perceived Effectiveness of AgriTecH in Disseminating Oil Palm Production Technologies in Western Tanzania. *Asian Journal of Advanced Research and Reports, 19(1), 37–55.*

Alemu, A. (2021). Determinants of Participation in Farmers Training Centre Based Extension Training in Ethiopia. *Journal of Agricultural Extension 25.*

Challa, M., & Tilahun, U (2014). Determinants and Impacts of Modern Agricultural Technology Adoption in West Wollega: The Case of Gulliso District. *Journal of Biology, Agriculture and Healthcare 2014: 4-20.*

Debnath, A., Saravanan, R., & Datta, J. (2016). Farmers’ Satisfaction with the Public Agricultural Extension Services in Tripura State of North-East India. *International Journal of Social Sciences 5(2): 65-80:*

Dkhar, S.E., Devarani, L., & Singh, R. (2019). Clientele Satisfaction of Extension Services

 [<http://dx.doi.org/10.20961/carakatani.v36i1.43381>] site visitd on 10/12/2024.

Dutta, C., Borah, D., & Das, P. (2021). Farmers’ Level of Satisfaction on Agricultural Technology

Elias, A., Nohmi, M., Yasunobu, K., & Ishida, A. (2015). Farmers’ Satisfaction with Agricultural Extension Service and Its Influencing Factors: A Case Study in North West Ethiopia*.**Journal of Agriculture Science Technical 18: 39-53.*

 Gbawoquiya, P. D. (2017). Effectiveness of farmer field schools in improving agricultural productivity in Tanzania: a case study of smallholder rice farmers in Mvomero district, Morogoro region. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 125pp.

Iddi, H., Nyamba, S., & Busindeli, I. (2023). Accessibility of improved chicken farming business information to women improved chicken farmers through mobile phones in Misungwi District, Tanzania. *European Journal of Agriculture and Food Sciences,* 16: (2): 1-7.

 Information Centre of AAU, Jorhat, Assam. *Indian Research Journal of Extension Education,* 21(4): 85-91.

Jain, R., Arora, A., & Raju, S. (2009). A novel adoption index of selected agricultural technologies: Linkages with infrastructure and productivity: *Agricultural Economics Research Review* 22: 109-120.

 Khan, I.M., Singh, S., Bangarwa, G.S., & Dhanraj, R. (2012). Impact of ATIC in Terms of the Satisfaction Level of the ATIC Beneficiary Farmers towards the Services of ATIC. *Indian Research Journal of Extension Education* I: 245-251.

Kumar, A., Shehrawat, P.S., Malik, A., Kumar, R., Yadav, K.K., Singh, S., & Rakesh, K. R. (2020). Awareness and Satisfaction level of cotton growers’ callers about the ATIC toll free number. *International Journal of Education & Management Studies* 10(2): 151-153.

Liao, C. (2020). The role of agricultural extension services and farmers' practices in meeting smallholder farmers' needs in China. A thesis submitted for the degree of Doctor of Philosophy at The University of Queensland in 2020, School of Agriculture and Food Sciences.

Loevinsohn, M., Sumberg, J., Diagne, A., & Whitfield, S. (2013). Under what circumstances and conditions does the adoption of technology result in increased agricultural productivity? A Systematic Review.

Makundi, H. (2017). Diffusing Chinese rice technology in rural Tanzania: Lessons from the Dakawa agro-technology demonstration center, Working Paper, No. 2017/12, China Africa Research Initiative (CARI), School of Advanced International Studies (SAIS), Johns Hopkins University, Washington, DC. <https://hdl.handle.net/10419/248140>

Mannan, S., Nordin, S., & Galea, S.R. (2015). Influence of Innovation Attributes and Communication Channels on New Fertilizer Technology Adoption by Paddy Farmers. *Australian Journal of Basic and Applied Sciences* 9(19):109-111

Meja, F.M., & Geta, E. (2017). Analyzing farmers’ training centres through integrated innovative capacity building and technologies transfer: A case study of Damote Gale District, Woliata Zone, Ethiopia. *International Journal of Environmental Sciences,* 6(4): 94-100.

Mottaleb, K. A. (2018). Perception and adoption of a new agricultural technology: Evidence from a developing country. *Technology in Society* 55(2018): 126–135.

Mukherjee, A., Bahal, R., Burman, R., Dubey. S. K., & Jha, G. K. (2011). Effectiveness of Tata Kisan Sansar in technology advisory and delivery services in Uttar Pradesh. *Indian ResearchJournal Extension Education,* 11(3).

Ovharhe, O. J., Okwuokenye, G. F., & Emaziye, P. (2020). Farmers’ satisfaction with agricultural extension services in Delta State, Nigeria. *International Journal of Agricultural Technology,* 16(6): 1463-1474.

Raboca, H.M. (2006). Determinants of customer satisfaction and service quality. the case of romanian public services. *Transylvanian Review of Administrative Sciences,* 16: 124-135.

Rana, A. S., Reddy G. P., & Sontakki, B. S. (2013). Perceived service quality of agricultural organizations comparative analysis of public and private sector. *International Journal of Advanced Research in Management and Social Sciences,* 2(1): 286-295*.*

Sajesh, V. K., & Padaria, R. N. (2019). Effectiveness of extension agencies: A case of cotton farmers in Akola District of Maharashtra, India. *Indian Journal of Extension Education, 55(3), 43-48*

Saravanan, R., & Veerabhadraiah, V. (2003). Clientele Satisfaction and Their Willingness to Pay for Public and Private Extension Services. *Tropical Agricultural Research,* 15: 87-97*.*

Singh, D., & Kalra, R. K. (2019). Level of Satisfaction of Farmers from the Services Provided by Agricultural Technology and Information Centre (ATIC) Run by Punjab Agricultural University. *International Journal of Bio-resource and Stress Management,* 10(5):575-579.

TARI (2020). Proposal for Establishment of Agriculture Technology Transfer Hubs (AgriTecH).

TARI (2021). Report on the Official Launch of the Fatma Mwasa Agricultural Technology Transfer Hub in Western zone.

Tsiotsou, R. (2006). The role of perceived product quality and overall satisfaction on purchase intentions. *International Journal of Consumer Studies* 30(2): 207-217.

Wonde, K. M., Tsehay, A. S., & Lemma, S. E. (2022). Training at farmers training centres and its impact on crop productivity and households' income in Ethiopia: A propensity score matching (PSM) analysis. *Heliyon (8):1-13*

Xu, W., & Zammit, K. (2020). Applying thematic analysis to education: A hybrid approach to interpreting data in practitioner research*. International Journal of Qualitative Methods* 19: 1–9.

Xu, X., Li, X., Qi, G., Tang, L., & Mukwereza, L. (2016). Science, Technology, and the Politics of Knowledge: The Case of China’s Agricultural Technology Demonstration Centers in Africa. *World Development* 81: 82–91.