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Pre-Scaling Up of Groundnut Technology at Abaya District, Southern Oromia, Ethiopia

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A B S T R A C T

Despite being produced in the West Guji Zone's midlands, groundnut productivity fell short of expectations due to a variety of factors, including a lack of improved seed and biotic and abiotic factors. Purposively, the Abaya district was chosen, and a total of eight trial farmers with 0.25ha of land were used. The study used both quantitative and qualitative data, and descriptive statistics were used to analyze the results. The yield was shown to be significant ($p<0.05$) throughout the production years, and that access to agricultural inputs, capacity building, and the proper dissemination of technology helped to increase groundnut productivity. As a result, Tole-1 technology was suggested for further promotion at similar agro-ecology

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INTRODUCTION

Legume plant, groundnut (*Arachis hypogaea* L) is one of the most important oilseed grown worldwide. Asia and Africa account for more than 90% of global groundnut area and it is cultivated mostly under rain fed conditions by small-scale farmers. The African continent accounts for 31.1% of total global production (FAOSTAT, 2018). According to the report in 2018, worldwide groundnut is cultivated on 27.66 million ha, with an annual total production of 43.98 million tons where the leading groundnut producing countries in the world are India (20.97%), China (16.35%), Nigeria (9.68%), and Sudan (8.37%) (FAOSTAT, 2018).

Ethiopia grows a lot of groundnuts for food, money, and animal feed. It is exclusively grown by smallholder farmers in dryland conditions in the country's lowland and drought-prone areas. The total area used for groundnut cultivation is 80,841.57 hectares (CSA, 2018). Of the country's total groundnut production, the Oromia Region produces 59.2%, followed closely by Benishangul-Gumuz (24.83%), Amhara (7.43%), Harari (3.29%), and Southern Nation and Nationalities People (1.29%) regions (CSA, 2018).

There is now a great deal of potential for expanding the production of oil crops like groundnuts in Ethiopia's lowlands (Gutu et al., 2019). CSA (2017) estimates that Ethiopia's groundnut output and production area during the 2016–17 cropping season were 1,296,364.18 quintals and 74,861.37 hectares, respectively. The average groundnut production across the country was 17.96 qt/ha, according to CSA (2018). After a year, its average national production was 17.80qt/ha (CSA, 2020). Both the cultivated area and the yield have somewhat increased over the last several years. About 24 million hectares of peanuts were grown in 2010, yielding 38 million tons of output. A total of 73 million tons of peanuts were produced in 2019 over an area of around 35 million hectares under cultivation (FAOSTAT, 2022).

Similar to other parts of the Oromia region, groundnuts are one of the primary cash crops in the mid- and low-lying regions of the West Guji Zone. grew nearby. However, because of similar issues at the national level, the region's production and productivity fell short of expectations. According to Fredu et al. (2015), groundnut production was primarily limited by a number of biotic and abiotic factors, including diseases that affect both the plant's above- and below-ground parts, a lack of improved varieties and suitable production and post-harvest practices, and critical moisture stress, particularly during flowering. Additionally, the nation's output is hampered by a lack of mechanization (Sendekie, 2023).

With these issues in mind, Yabello Pastoral and Dry Land The Agriculture Research Center has conducted adaptation and demonstration tests on a variety of groundnut varieties in the West Guji Zone's Abaya region. During the research demonstration activity, the Agricultural Office was closely contacted with the trial farmers' plot areas using a participatory method (field day and field visit time). The demonstration's findings demonstrated that the top-performing variety, Tole-1, was early maturing, a high yielder (37qt/ha), had a bigger yield advantage, and had highly preformed growth when compared to both the Fayo

and NC4x varieties. (Abdulla and al., 2016). During a field day, the same authors discovered that farmers are drawn to and choose this cultivar.

However, demand generation, sustainable technology promotion alternatives, and broader users (number of farmers) were not included in the prior study. In order to further promote groundnut technology in the Abaya district, this study aimed to spread it using suitable extension techniques.

Objectives

- To increase groundnut technology productivity in the research region
- to increase local capacity for groundnut technology promotion
- To strengthen stakeholders linkage through collaboration

LITERATURE REVIEW

It is important to remember that there are a number of distinct extension strategies that are progressively being demonstrated to be essential to the agricultural industry. The extension theories are linked to these extension methodology. (Sennuga et al., 2021). Among numerous theories, the authors used technology acceptance theory described in (Teshome and Feyissa, 2024) outlining the routes of acceptance and diffusion strategy relevant to agricultural technology.

Technology Acceptance Model

An appropriate In order to determine the psychological elements influencing farmers' adoption of technology, Davis (1989) originally proposed the technology acceptance model. It was derived from the authors' Theory of Reasoned Action (Fishbein and Ajzen, 1980). An information system that users (farmers) come to embrace and use a technology is explained by the TAM model. It makes the case that several driving reasons arise when farmers are exposed to new technologies. influence their decisions about how and when they will implement and use the technology. This model contains some constructs, which explained as follow.

Perceived Usefulness: refers to the extent to which an individual thinks that utilizing a certain system will improve output efficiency and work performance (Lederer et al., 1998).

Perceived Ease of Use: one of the Perceived Ease of Use (PEU) is determined by the TAM concept, which describes how much a person believes the technology will need little to no effort. Farmers' attitudes about new technology are influenced by perceived utility and perceived ease of use, both of which have an impact on their desire to embrace the technology (Liu and Ma, 2006).

According to Compeau et al. (1999), the Technology Acceptance Model's broader idea also implies that consumers may decide to embrace a particular enhanced technology based on their own careful consideration of costs and advantages. This indicates that if a process has additional value, people are more inclined to embrace or utilize technology (Figure 1).

The theoretical foundation of the earlier iteration of the Theory of Reasoned Action, created by Davis (1989), was used to specify the underlying association between two essential components and users' attitudes, intention, and actual technology usage behavior. Perceived simplicity of use is also thought to have an effect on usefulness. Furthermore, the TAM has perhaps become the most prominent hypothesis after being extensively examined by several academics for a range of technology adoption scenarios. Additionally, TAM2 and TAM3 have been updated (Venkatesh and Davis, 2000).

TAM2's main contribution was the inclusion of extra theoretical constructs covering social influence mechanisms like subjective norms, voluntariness, and image; and cognitive instrumental processes like work relevance, output quality, outcome demonstrability, and perceived ease of use (Venkatesh and Davis, 2000); (Venkatesh and Bala, 2008). The TAM3 has also been proposed in the context of e-commerce (Venkatesh and Bala, 2008). It basically focuses on the elements that influence how practical and simple a new invention or technology is perceived to be.

This study applied the technology acceptance theory to comprehend the relationship between farmers, the usage of improved groundnut technology, and other enabling factors (facilities) provided by stakeholders.

H1: All farmers said the new groundnut technology (variety) was helpful and simple to employ.

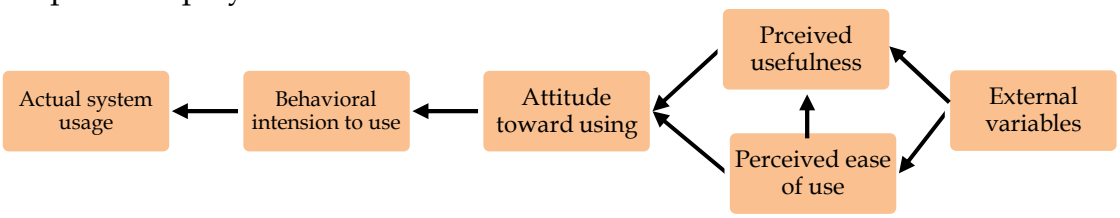
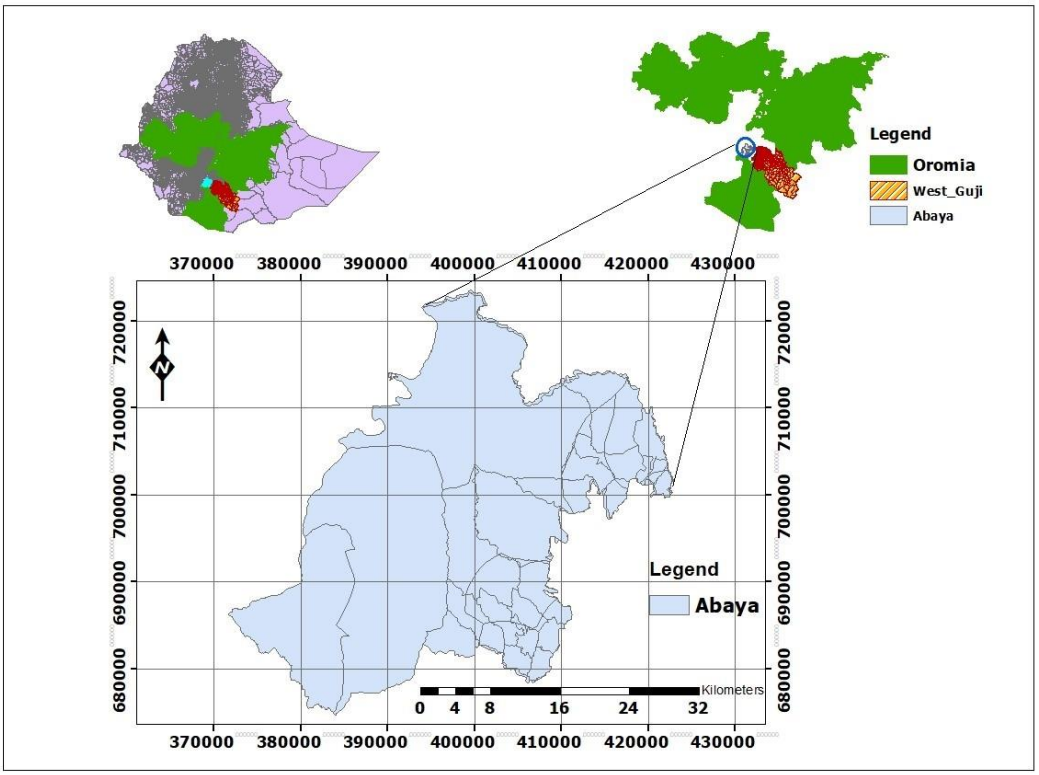


Figure 1. Technology Acceptance Model Adapted from (Sennuga *et al*., 2021; Teshome and Feyissa, 2024)

METHODOLOGY

Description of the Study Area

The study was carried out in the Abaya area, which is located 365 kilometers south of Addis Ababa. Abaya is situated in latitude 60 14′N and longitude 30010′E. The district sits between 1200 and 2060 meters above sea level. Its typical annual temperature ranges from 160°C to 280°C, and its estimated average annual rainfall is 1223 mm. It shares borders with the Gelana district in the south, Lake Abaya to the west, and the regional condition of countries, ethnic groups, and people living in the north and east of southern Ethiopia. There are only two types of agroclimatic conditions in the district: mid-land (Waynadega) and lowland (Kola). The district is categorized as mid-land, which makes up around 30% of the entire area. The remaining 70% are found in the lowland agroclimatic conditions. According to data from the District Agricultural Office, the primary crops produced were maize, groundnut, barley, "teff," sorghum, haricot bean, wheat, field pea, and faba bean (Abaya District Finance and Development Office, 2016).).



Source: Own Sketch using ArcGIS Version 10.4, 2023

Figure 1. Map of the Study Area

Site and Trial Farmers Selection

The West Guji Zone's Abaya district was specifically chosen for this investigation. Through careful consultation with the district's DAs and Agriculture Office, eight farmers—four from each of the two probable groundnut-producing kebeles, Guanga Badiya and Samaro—were purposefully chosen. Trial farmers were employed in the study. were chosen based on factors including their experience, the farm's accessibility, and their willingness to participate in FRG, exchange experiences, and donate land for demonstration. Two FRGs were then formed, each with ten members (youth, women, and men). For this work, groundnut technology—known as Tole-1—which is versatile, early maturing, and high yielding—was employed. Each of the chosen farmers' fields had a 2500m2 (0.25ha) area coverage. The research covered 4 hectares in total, with 2 hectares used for each kebele. theoretical as well as Trial farmers were chosen based on factors including their experience, the farm's accessibility, and their willingness to participate in FRG, exchange experiences, and donate land for demonstration. Two FRGs were then formed, each with ten members (youth, women, and men). For this work, groundnut technology—known as Tole-1—which is versatile, early maturing, and high yielding—was employed. Each of the chosen farmers' fields had a 2500m2 (0.25ha) area coverage. The research covered 4 hectares in total, with 2 hectares used for each kebele. theoretical as well as

Technology Transfer Approaches

Each group was given groundnut seed (Tole-1) to enable them to manage all tasks. Training participants, showcasing the technology's effectiveness The best method to spread the technology was to connect them with other stakeholders on the day of production on the farm and in the field. One definition of technology is a way to help smallholders receive information, skills, and knowledge in order to increase agricultural productivity (Rogers, 2003). In the West Guji Zone's Abaya district, pre-scaling up of groundnuts was carried out using a participatory method. In this sense, the Farmers Research Group (FRG) was founded as a driving force behind the intervention, involving various stakeholders such as farmers, experts, and DAs. Ten (10) people, representing a range of farmer age groups, including adolescents, adult males, and females, made up the FRGs. Inputs from YPDARC included

Study Design

Tole-1 During the 2019–20–2021/22 trial period, eight experimental farmers' farms employed this cultivar. Only the recently suggested (Tole-1) and introduced cultivar was utilized in the Abaya district. On each trial farmer's 50 m × 50 m plot, a suggested seed rate of 90 kg/ha and 100 kg DAP/ha were applied, with The seed was drilled in a line of rows with a 35 cm line gap between them. Weeds were managed by hand weeding. Hand labor was used for both harvesting and threshing. Experts and DAs at FTC, as well as trial farmers, received training. Researchers and Development Agents assigned to each kebele kept an eye on the activities.

Data Collection Methods

Both primary and secondary data were used in this investigation, depending on their type. The following appropriate main data collecting methods were used: personal observation, yield record (kg), farmers' group discussions, a basic survey employing check lists (knowledge and skill assessments of before and after training), and produce data that is both qualitative and quantitative. On the other hand, a critical evaluation of annual report papers, journal articles, sessions, and journal volumes was used to gather secondary data, both published and unpublished. Qualitative data, such as farmers' opinions and feedback on the production process, was triangulated with quantifiable information, including production figures, the overall number of farmers who participated in the project and attended extension events (training, field day, demonstration).

Data Analysis Methods

For this investigation, both There were both qualitative and quantitative data generated. Quantitative data was analyzed using descriptive statistics such as mean, SD, and percentage using SPSS software (version 21), whilst qualitative data was evaluated using narrative explanation.

RESULTS

Capacity Building on Tole-1 Variety

The interdisciplinary researchers at Dryland Agriculture Yabello Pastoral and the Research Center conducted training to guarantee the success of the intervention's execution. The training was given by a team of researchers from the center's oil and pulse crop, research-extension, socioeconomic, and agricultural agronomics departments. The training addressed a wide range of subtopics, such as improved groundnut production packages, agronomic practices, market data, experience sharing, and knowledge transfer tactics. The participation of those involved in the training who might affect and profit from the intervention is represented in table 1 below.

Table 1. Stakeholders Training on Tole-1 Production

Stakeholders	Number of participants across production years						Grand Total
	2019/20			2021/22			
	Male	Female	Sub-total	Male	Female	Sub-total	
Experts	2	1	3	3	1	4	7
DA's	2	1	3	2	2	4	7
Farmers	7	3	10	7	3	10	20
Others	2	1	3	2	2	4	7
Total	13	6	**19**	14	8	**22**	41

Source: Own Sketch Using ArcGIS Version 10.4, 2023

Field Day

One of the information dissemination mechanism is field day where it jointly organized with district level agriculture office so as create opportunities for all relevant stakeholders', to create awareness on the importance and availability of the technology, to learn from the technology promotion activities and also to evaluate the performance of improved variety under farmers' condition, to enhance farmers' knowledge and skill on groundnut production and management and to collect feedback from all relevant stakeholders' for further way forward. Considering gender, a total of 22 farmers, 2 development agents, 1 district expert and others 6 from others (GOs and NGOs) were invited and attended on the field day event as shown in the table 2 below.

Table 2. Number of Participants on Field Day

	Participants by gender		
	Male	Female	Total
Stakeholders			
Farmers	16	6	22
DA's	1	1	2
Experts	1	0	1
Others	5	1	6
Grand-total	23	8	**31**

On Farm Yield Performance of Tole-1 Variety

The activity was carried out on farmers' fields during the major rainy season, which runs from March to June. Data from two years in a row was gathered utilizing a data sheet. Table 3's results showed that the 2019–20 production season produced the greater mean yield. The first year's pooled mean yield was 27.46 qt/ha, while the second year's mean yield was 26.38 qt/ha (Table 3). When utilizing typical kebeles (Guanga Badiya and Samaro) in the Abaya district, the district's total yield is 26.92qt/ha. This suggests that, at the 5% accuracy level, the intended yield over production years was statistically significant. Remarkably, it was seen that favorable environmental circumstances and optimal management methods will contribute to improved output.

Table 3. Yield Performance of Pre-Scaled up Tole-1 (Qt/ha)

Years	**N**	**Mean**	**SD**	**Min.**	**Max.**	**Std. Error of mean**	**t-value(sig.)**
2019/20	8	27.46	0.87	25.96	28.52	0.309	
2021/22	8	26.38	0.99	25.12	27.92	0.351	
Total	16	26.92	1.06	25.12	28.52	0.265	2.309(0.037)**

Source: Own Data Computation, 2023. ** Indicates 5% Significance Level

The pooled mean yield under pre-scaling up was greater than the suggested yield (17.8qt/ha) and lower than the demonstration yield (37qt/ha) when compared to the results of both strategies (Figure 2).

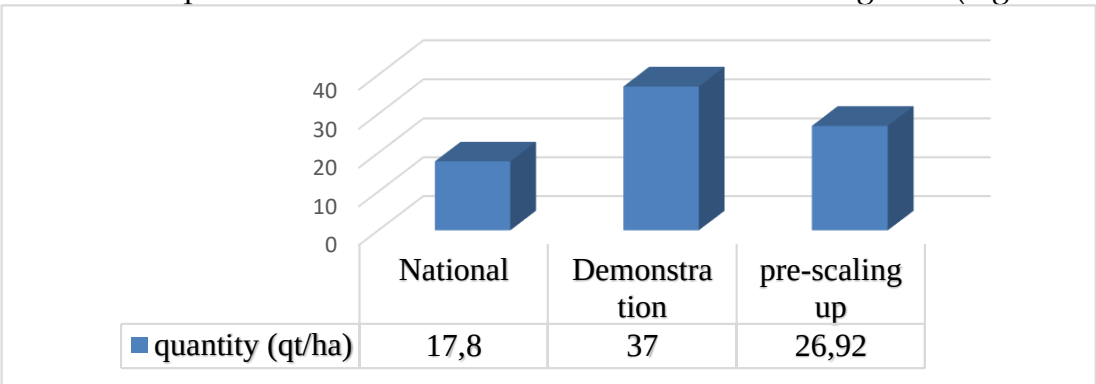


Figure 2. Comparison of Mean Across Different Production Stages

Intervention Impacts

In terms of stakeholder connection status, farmers' knowledge development, and farmers' feedback on the enhanced technology, this study shows the effects or changes brought about by the intervention on pre-scaling up groundnut technology.

Linkage among Stakeholders

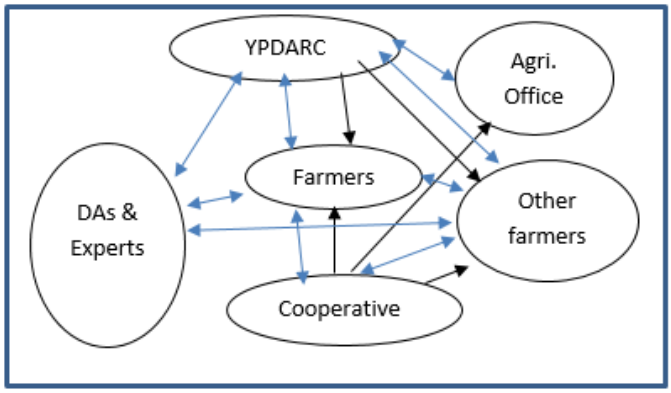
A desired connection between/among stakeholders that aids in the promotion of groundnut technology was established in this study. The function that each stakeholder plays in groundnut production largely determines how they interact (Table 4). Both vertical and horizontal relationships showed a complicated interplay between the participants. This indicates a horizontal relationship between actors (e.g., farmer to farmer) and a vertical connection between players (e.g., farmers to DAs, YPDARC to specialists, farmers to cooperatives, etc.) and vice versa. In this sense, each stakeholder contributed significantly to the production's improvement. The majority of the stakeholders engaged in both the technical and material connections that were established (Table 4).

Table 4. Stakeholders' Role on Groundnut Production

Stakeholders	Roles	Linkage types		
		Material (a)	Technical (b)	Both (c)
YPDARC	Seed provision, training, monitoring, site and farmers selection, information delivery			✓
DAs	Monitoring, site and farmers selection, information delivery			✓
Experts	Monitoring, site and farmers selection, information delivery			✓
Farmers	Management, information, follow up farm, land provision			✓
Agricultural cooperatives	Input provision (seeds, pesticides, fertilizer, herbicide), information etc.			✓
Other farmers	Information/experience, seeds etc.			✓

Throughout the study period, a total of six (6) distinct stakeholders were employed. Kebede et al. (2021) assert that connection requires several stakeholders with a shared objective to enhance agricultural productivity. To illustrate the connections between stakeholders, this study employed both technical (shown by a two-headed arrow) and material (shown by a one-headed arrow) symbols (Figure 3). Abaya District Agricultural Offices, Agricultural Cooperatives, Yabello Pastoral and Dryland Agricultural Research Center, and other players' interactions to achieve this Development agents, specialists, hosting farmers, and the local community can all benefit from the flow of agricultural inputs (materials), such as seed distribution, pesticides, herbicides, fertilizers, etc., and technical information for groundnut production. were created. This result was in line with what Choo (2009) found. The majority of the stakeholders took part in the mini-field day and training. Throughout the production seasons, the principal movers, or famers, took part.

Technical and material connections were created for this project so that players may interact with one another in their roles. Technically, with the assistance of DAs, specialists, and the Agriculture Office in Abaya District, YPDARC carried out the identification of suitable sites and farmers, training, and information dissemination. The hand construction of the graphic to depict the interactions between the stakeholders during the production seasons was excellent. In order to facilitate actors' interaction through their respective roles, technical and material linkages were developed for this study. Technically, proper With the assistance of DAs, specialists, and the Agriculture Office in the Abaya District, YPDARC carried out site and farmer selection, training, and information dissemination. It was essential for the diagram to be made by hand in order to show how the stakeholders interacted during the manufacturing seasons.



Source: Own Sketch, 2023

Figure 3. Stakeholders' Linkage Structure

Farmers' Knowledge

As seen in table 4 below, the majority of farmers (75%) used the existing techniques, while the other 25% gained information about seed rate, row spacing, and spacing after receiving training. Local NGOs, specialists, and DAs are examples of supportive organizations that assist farmers in gaining the knowledge and skills necessary to plant a variety of crops. Farmers' understanding of fertilizer use, management techniques (weeding, insect control, etc.), and the utilization of new varieties improved in comparison to before the intervention. Nonetheless, under farmers' conditions, poor post-harvest handling performance was noted in 12.5% of cases, plant spacing in 12.5% of cases, and seed rate in 25% of cases (Table 5). This could be because of a lack of storage, labor, and funding. In general, farmers were able to recognize a desired change in their knowledge and skills because of full technical support, delivery of inputs, theoretical and practical training, and ongoing monitoring throughout the duration of the intervention.

Table 5. Evaluation of Knowledge Improvement Before and After Training (n=8)

Criteria	Before				After			
	yes	%	no	%	yes	%	no	%
Application of seed rate	2	25	6	75	6	75	2	25
Application of fertilizer rate	3	37.5	5	62.5	8	100	0	0
Sowing in rows & spacing	2	25	6	75	7	87.5	1	12.5
Management practices	4	50	4	50	8	100	0	0
Seed preference and use of new variety	2	25	6	75	8	100	0	0
Pre and post-harvest management	1	12.5	7	87.5	7	87.5	1	12.5

Farmers' Feedback Towards Tole-1 Variety

The West Guji zone's chosen prospective region was the site of the enhanced groundnut technology intervention. Assessments have been made of farmers' understanding of Tole-1's application in local food processing, marketability, productivity and output, and typical problems. Following a group discussion with a sample of eight trial farmers, qualitative data was generated based on their perspectives. Checklists were used to collect and record farmers' thoughts. Farmers stated that the Tole-1 type is so extremely valued since it is tolerant to pests and diseases, produces a lot, is suitable for the local environment, and has a good market price. According to the respondents, using variety promotes family food consumption and economic diversification by combining different agricultural revenue streams. To provide for their families, farmers employed groundnut roast along with barley, wheat, and maize. It was also viewed as a way to diversify the local economy.

Due to its better seed, revenue streams, and significant benefit in the local food chain, the seed was generally in high demand in the local market. In the research region, it was mostly harvested by private and cooperative entities and sold at super markets.

However, because the collectors lower the amount per kilogram, farmers complained about a price issue at the farm gate. Furthermore, because it required more effort, time, and money, farmers didn't enjoy the physical labor required to shell the groundnut.

Exit Strategy

It was demonstrated that technological development, Taking into consideration the YPDARC's mission and scope, agro-ecology base adaptation and demand generation through demonstration and pre-scaling activities have been conducted under farmers' conditions. The District Office of Agriculture, YPDARC's primary partner, was essential to the intervention's success. But the intervention's viability was still within the Office of Agriculture. Therefore, the Office of Agriculture in the Abaya district should be responsible for transferring and implementing the technology's broader scope or diffusion (Tole-1). In order to do this, a formal conversation was held in the Abaya District with leaders, DAs, specialists, and researchers present. An agreement on an exit plan for how to promote in a sustainable manner in order to reach a broader audience was signed. As a result, the Abaya district agricultural office has been tasked with promoting the technology's sustainable spread with little assistance from research centers.

DISCUSSION

This study was known to be action research type where active participation and technical support critically considered. To effect this, the multidisciplinary research teams working Training was provided at Dryland Agriculture Research Center and Yabello Pastoral. Research-extension, cereal crop, socioeconomic, and crop agronomics researchers are among the multi-professional team members that give the training. Improved groundnut varieties, agronomic techniques, market data, pre- and post-harvest techniques, and technology transfer strategies were among the subtopics covered in the program.

An appropriate technology transfer approach so called "field day" where YPDARC was utilized and the event was arranged in conjunction with the district-level Agriculture Office. It was used to increase farmers' understanding of production packages, raise awareness of the technology's accessibility and significance, promote it, evaluate improved varieties on-farm under farmers' conditions, and create opportunities for participation from pertinent stakeholders.. Yabello Pastoral and Dryland Agriculture Research Center served as training locations. The training is provided by a multi-professional team that includes researchers from the fields of crop agronomics, cereal crops, research-extension, and socioeconomics. The program's subtopics included improved groundnut varieties, agronomic methods, market data, pre- and post-harvest methods, and technology transfer tactics.

Seasonal based application of all agronomic practices were used to enhance the groundnut productivity. The activity, which captured data from two consecutive years, was carried out on farmers' fields throughout the major rainy season, which runs from March to June. It should be noted that optimal management techniques and favorable environmental circumstances would contribute to increased output. There is a notable variation in mean yield throughout the production phases, according to a comparison of the average yield at several stages, including adaption, demonstration, and pre-scaling up. This aids in analyzing the technology's viability, manufacturing limitations, and gaps in distribution.

Another goal of this study was to improve linkage, which was accomplished by developing technical and material ties among stakeholders. Thus, through the distribution of seeds, the supply of agricultural inputs (fertilizers, insecticides, herbicides, etc.), and the exchange of information regarding groundnut production, the connections between Yabello Pastoral and Dryland Agricultural Research Center, Abaya District Agricultural Offices, Agricultural Cooperatives, Development Agents, and farmers were reinforced. Additionally, it was noted that the horizontal distribution of seeds and the sharing of agricultural knowledge and experience with other farmers and communities in the research region improved the material and technical relationships among farmers. In a broad sense, a desired relationship required complicated interactions between and/or among stakeholders. This made it possible for the farmers to obtain inputs and farm data for the intended results. because of the increased demand for the Tole-1 type. Triangulating qualitative narratives of opinions with

quantitative yield values has validated the findings. According to farmers, Tole-1 was the most lucrative stipple food and oil crop in the area.

CONCLUSIONS AND RECOMMENDATIONS

Despite being widely grown in the West Guji Zone, groundnut output and productivity fell short of expectations because of a number of biotic and abiotic issues, such as pests, disease (leaf rust), moisture stress, and a lack of better seeds. However, in order to reach a large number of people in the Abaya area, the earlier research were overlooked. The Pre-scaling up, improving connectivity, and disseminating the technologies in the research were the objectives of the Yabello Pastoral and Dryland Agricultural Research Centre (YPDARC) project. region in order to address these issues. Wide users have been reached and educated through the usage of a participatory method. Following capacity training, farmers realized that using this technology increases their advantages and reduces seed shortages.

Furthermore, the outcome of the The Tole-1 variant was highly prized, as the group discussion shows, because to its high yield in the region, pest tolerance, and suitability for local circumstances. Narrative data gathered from farmers' perspectives revealed that "*producing this variety is alleviating the existed seed in the locality. The variety was believed as a source of food and income for farmers' benefit.*" "*This could be assured if and only if multiple stakeholders contributes the required farm inputs, knowledge, skills as well as motivation*." However, it was stated that the price inflation of agricultural inputs (fertilizer) is a significant issue that requires urgent action.

It has been demonstrated that increasing our farmers' production is still difficult and requires careful consideration. Following training and extensive technical assistance in the areas of plant spacing, seed rate, and pre- and post-harvest management techniques, knowledge deficiencies were typically noted.

Thus, the researchers came to the conclusion that linkage creation, access to agricultural inputs, and capacity building all increased groundnut yield. Farmers embraced the variety, and it was recommended that it be actively promoted by the Abaya district's Office of Agriculture to benefit farmers with little assistance from the research center. Applying suitable extension strategies, such as exchanging training experiences, planning field days, and cooperating with private producers, NGOs, stakeholders, and other accountable entities, might accomplish this. In order to get the desired pooled mean yield (26.92qt/ha) during the growing seasons, farmers' expertise increased regarding fertilizer rate, management, and usage of improved seeds.

The researchers made the following recommendations in light of the study's findings:

- A participatory extension approach should be used to further scale up improved groundnut (Tole-1) in Abaya district and allied agro-ecologies. Field days and training sessions are examples of extension activities that should be used to exchange farmer experiences and promote technology.
- Professionals, DAs, and practitioners should enhance seed distribution, multiplication, and district-level technical support in order to reach more

people. The professional support would help with pre- and post-harvest management practices, seed rate, and raw spacing.

- To make it easier for farmers to access markets, agricultural inputs (such seeds, fertilizer, insecticides, and herbicides), consulting services, and other resources, stakeholder relationships should be strengthened. The connection would close the information gap.

FURTHER STUDY

Improving the productivity The high cost of farm inputs (marketing), seasonal variation, recurrent drought, adaptable technology, limited technical and material linkages, appropriate technology transfer approaches, and other issues continued to plague our farmers' production. To solve these problems, future research needs to have a better knowledge of empirical research in order to find additional factors that influence and forecast crop yield. Given that farmers are key players in agricultural activity, future research should also concentrate on examining their levels of motivation and institutional commitment. Furthermore, it was suggested that future research look into additional linkage types that could improve farmers' benefits, which could then be applied to new technologies. promotion across locations.

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