CGIAR SUSTAINABLE FARMING

Monitoring, Evaluation, and Learning Tracking Report: Site Specific Fertilizer Advisory in the Mixed Highland Farming Systems in Ethiopia

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Introduction

The site-specific fertilizer advisory tool was developed to provide farmers with precise, landscape-driven nutrient management recommendations to produce teff, wheat, sorghum, and maize. Its main objective is to optimize fertilizer use efficiency, enhance crop productivity, and improve economic returns under Ethiopia's diverse agroecological conditions. Field events and training sessions were organized collaboratively by ICRISAT (36%) and the Ministry of Agriculture through the local extension services (64%). These sessions targeted smallholder farmers and included piloting and scaling of the advisory tool in farmer field conditions. This multi-actor engagement strengthened the quality, reach, and sustainability of the piloting and scaling activities, ensuring that both technical and local perspectives were integrated into the process.

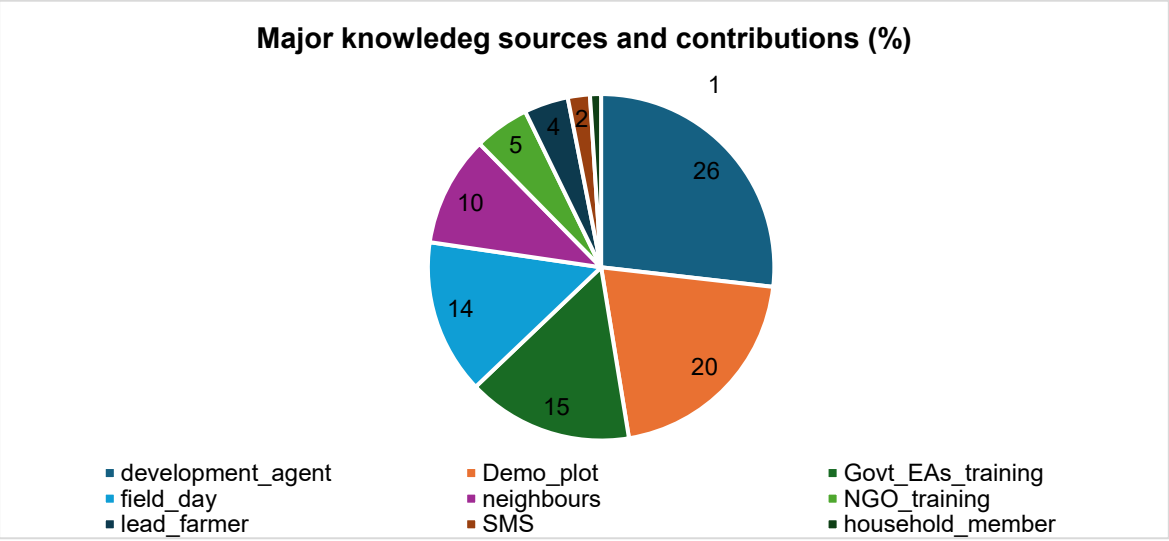
During the piloting and scaling phases of the site-specific fertilizer advisory service, partners organized three primary types of awareness and capacity-building activities: training sessions, field days, and demonstrations. These events were used to gather feedback on the performances of the site-specific fertilizer innovations through focus group discussions (FGD) and a telephone survey. About 1455 (218 female and 1237 male) samples of innovation users were participated in the MELIA feedback survey, constituting 284 in the training, 470 in the field day events and 700 in the field demonstrations over the three years. The percentage distribution of event types organized by the implementing partners reflects a balanced mix of engagement approaches designed to effectively reach farmers. Field demonstrations made up the largest share of events, underscoring their importance in practically showcasing the performance of the site-specific fertilizer advisory tool under real field conditions. Field days and experience-sharing sessions formed the next major category, providing opportunities for stakeholders to discuss implementation progress, share lessons, and provide feedback on the advisory service. In addition, field day events provided practical, on-farm demonstrations where participants observed the performance of site-specific nutrient recommendations under real farming conditions. These demonstrations reinforced learning by visually illustrating the differences in crop response across treatments and landscape positions. During the field days, the experience-sharing provided opportunities for stakeholders to discuss emerging lessons, challenges, and adoption trends.

Training sessions, though accounting for a smaller proportion, played a critical role by offering hands-on instruction to farmers, extension agents, and development partners on how to apply the advisory recommendations. The training sessions were designed to strengthen participants' understanding of the advisory principles, operating procedures, and practical applications. Through hands-on exercises, farmers and extension agents learned how to correctly interpret and apply the nutrient recommendations generated by the tool.

The feedback survey was conducted over the last three years. In 2022, the feedback primarily centered on training events to showcase the piloting activities. In 2023, a mix of field days and training sessions was organized to expand awareness and reach more farmers. By 2024, the majority of farmers will participate in large-scale field demonstrations aimed at broader scaling and wider adoption of the advisory. Overall, while both training and field day events made valuable contributions, the dominance of training events reflects the commitment to building strong technical capacity and ensuring the correct and sustained use of the site-specific fertilizer advisory. The feedback events covered 47% for wheat, 40% for Teff, and 13% for sorghum.

Knowledge Sources

Farmers accessed information about the site-specific fertilizer advisory tools through several key knowledge sources. Field days served as the primary channel, allowing farmers to observe demonstrations and interact directly with experts. Training sessions organized by extension agents and partner institutions provided more structured learning and hands-on guidance. Additional knowledge sources included local extension officers, peer farmers, community meetings, and occasional awareness activities conducted at the kebele level. Overall, the combination of practical demonstrations, targeted training, and community-based information sharing ensured broad awareness and understanding of the advisory tools among participants and enabled the advisory tool to reach many farmers through both formal and informal learning events.



Farmers' Perception of Understanding and Application of the Advisory

Feedback collected during the events indicated that most farmers (98%) found the site-specific fertilizer advisory developed based on climatic regime, soil, and landscape conditions easy to understand. Participants appreciated the clarity of the recommendations and the simplicity of the guidance provided. The tool's ability to provide agronomic information and required inputs into practical, actionable advice contributed to its positive reception among farmers. This strong user acceptance suggests that the advisory tool has significant potential for wider adoption, provided that continued support and training are maintained. In addition to being easy to understand, the site-specific fertilizer advisory tool was also considered easy to apply (97%) by the majority of farmers and implementers. Farmers reported that the recommendations were practical, clearly structured, and compatible with their existing field management practices. Implementers—including extension agents and technical staff—also noted that the tool simplified decision-making and supported more accurate nutrient management guidance at the farm level. The combined ease of understanding and ease of application underscores the tool's suitability for scaling and wider adoption across farming communities.

Farmers also demonstrated a growing understanding of landscape strata and their importance in guiding appropriate nutrient management decisions. Many participants recognized the differences between hill slope, mid-slope, and foot slope fields, and how these variations influence soil fertility, moisture conditions, and crop response to fertilizer applications. Through the site-specific fertilizer advisory, farmers learned to match nutrient rates with the specific characteristics of each landscape position, allowing them to apply fertilizers more efficiently and effectively rather than applying uniform fertilizer rates across all fields. This improved knowledge of landscape-based nutrient management indicates that farmers are increasingly able to make informed, site-specific decisions, contributing to better resource use, higher productivity, and more sustainable soil management across their farms.

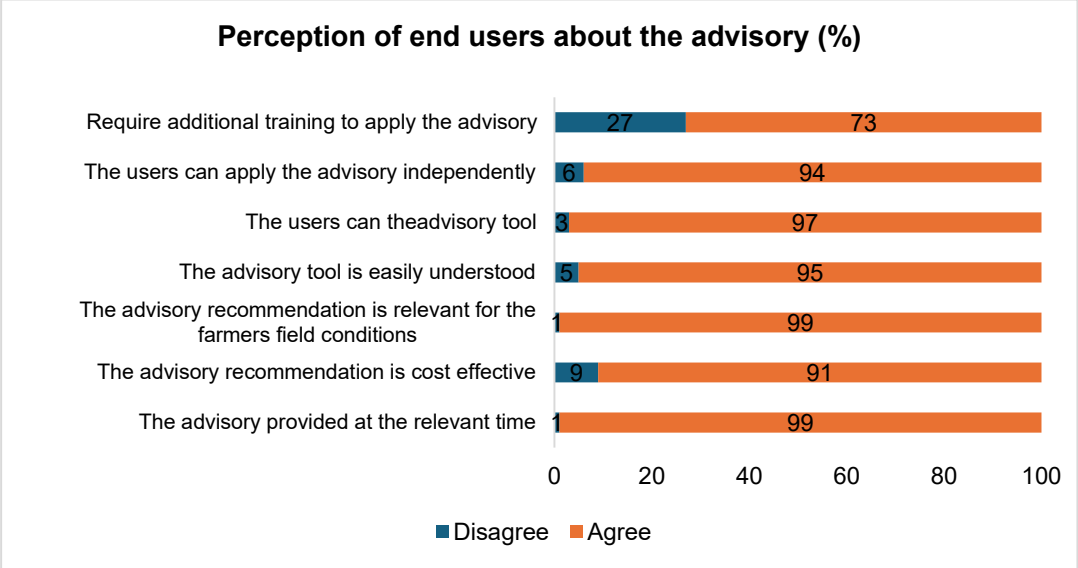
Time of Application of Urea

The telephone survey results show distinct patterns in how farmers applied urea at different stages of crop growth. About 88% of farmers applied one-third of the total urea at planting. A smaller proportion of farmers applied more urea at planting, where 10% of farmers applied half at planting and 2.5% applied two-thirds at planting. This reflects farmers' awareness that early application may not be efficient in many local soil and rainfall conditions. In contrast, a larger share of farmers applied two-thirds of urea as a top dressing, aligning with the recommended practice of supplying nitrogen during the crop's active growth phase for better nutrient uptake and yield response. These patterns indicate that farmers are increasingly aligning the time of fertilizer application with crop agronomic requirements, improving nitrogen-use efficiency and enhancing overall crop performance.

Relevance of the Advisory

Most respondents rated the advisory with strong agreement scores across the key indicators assessed. Farmers emphasized that the advisory is important, relevant, cost-effective, and practical, noting that its recommendations align well with their production objectives and local farming conditions. High rating values on attributes such as clarity of recommendations and ease of on-farm applicability demonstrate that users not only understand the advisory messages but also find them feasible to implement in their day-to-day crop management practices. Overall, the perception results indicate broad acceptance of the advisory and highlight its value in guiding farmers toward more informed fertilizer use decisions, ultimately contributing to improved crop productivity and resource use efficiency.

Despite this strong positive reception, many participants indicated a need for additional training and capacity strengthening. Farmers and extension agents noted that further training would enable them to deepen their understanding of the detailed advisory recommendations, improve precision in applying fertilizer rates, build confidence in using the tool independently, strengthen follow-up support, and improve accuracy during field implementation. These insights underscore the importance of continued technical backstopping and learning opportunities to enhance the effective adoption and sustained use of the site-specific fertilizer advisory.



Changes in Livelihoods and Farm Productivity

Surveyed farmers expressed strong agreement regarding the relevance and usefulness of the advisory tool. Key feedback includes recommendations are clear and understandable, the tool is aligned with farmers' production needs, and its implementation is practical and feasible. These results indicate that the advisory tool is well-accepted and appreciated by end users. User feedback analyses demonstrate that site-specific nutrient management increases crop yields and profitability. Farmers achieved higher benefit–cost ratios compared to conventional practices, suggesting that the tool not only improves agronomic outcomes but also enhances economic viability. By tailoring fertilizer recommendations to specific soils, landscapes, and rainfall patterns, the advisory enables farmers to make more informed and efficient fertilizer decisions.

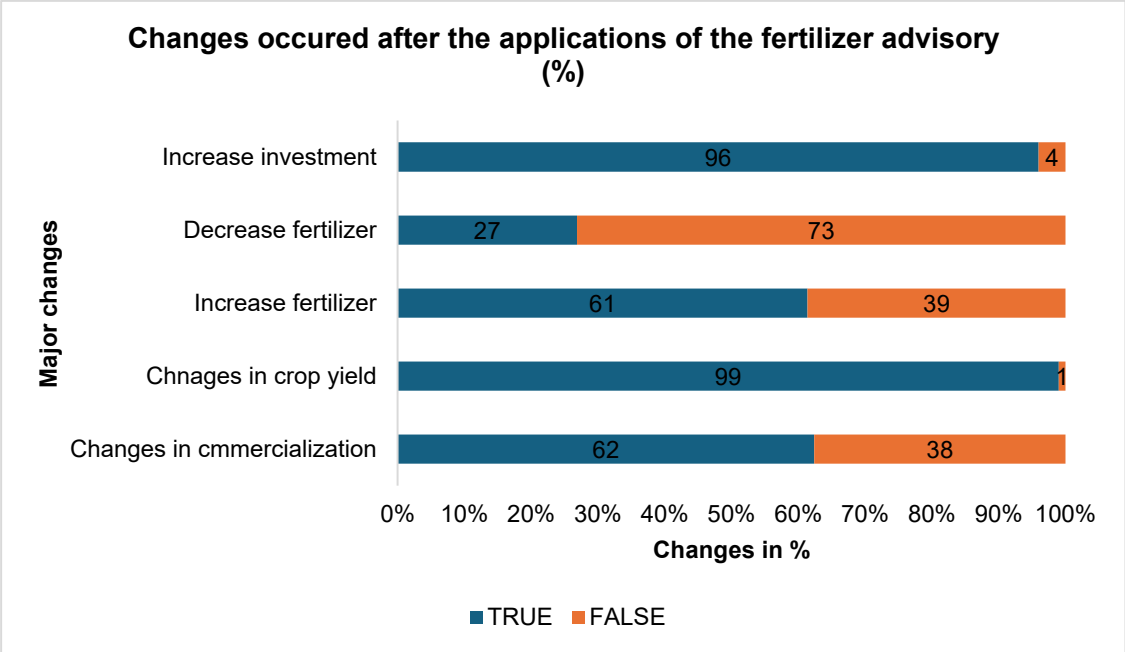
The introduction of the site-specific fertilizer advisory brought noticeable improvements to farmers' livelihoods and farm productivity. According to the survey results:

- Yield Increment: from the respondents' response, yield increased by 39% which is a significant increase after applying the advisory recommendations.
- Portion Sold: The market share of crops approximately increased by 40% of the harvested produce, indicating improved marketable surplus.
- Market Gain: Farmers experienced a substantial improvement in income, with an average annual market gain of 295,995 ETB ($1970) per household, reflecting the economic benefits of adopting the improved fertilizer advisory.

Impacts of the Advisory

Beyond improvements in yield and income, the site-specific fertilizer advisory generated several additional positive impacts on farmers' production practices and livelihoods. Many farmers reported increased investment in their farming activities, using the gains from improved productivity to purchase better inputs, enhance farm management, or expand cultivated land. The advisory also influenced fertilizer use patterns across different areas. In some locations, farmers were able to reduce the amount of fertilizer applied without compromising yield. The typical

example is the wheat-growing farmers in Siyadebir District at North Shewa, Amhara region used to apply 1200 to 1400 kgs of fertilizer for a hectare. Farmers who applied the site-specific fertilizer advisory reduced their usual fertilizer application by two-thirds, thanks to more precise and efficient recommendations. In contrast, farmers in other areas increased their fertilizer use, guided by the advisory to meet optimal nutrient requirements for improved performance. These differentiated outcomes show that the advisory tool helped farmers align fertilizer use with the specific needs of their soils and crops, leading to more efficient resource use, better crop response, and improved overall farm management.

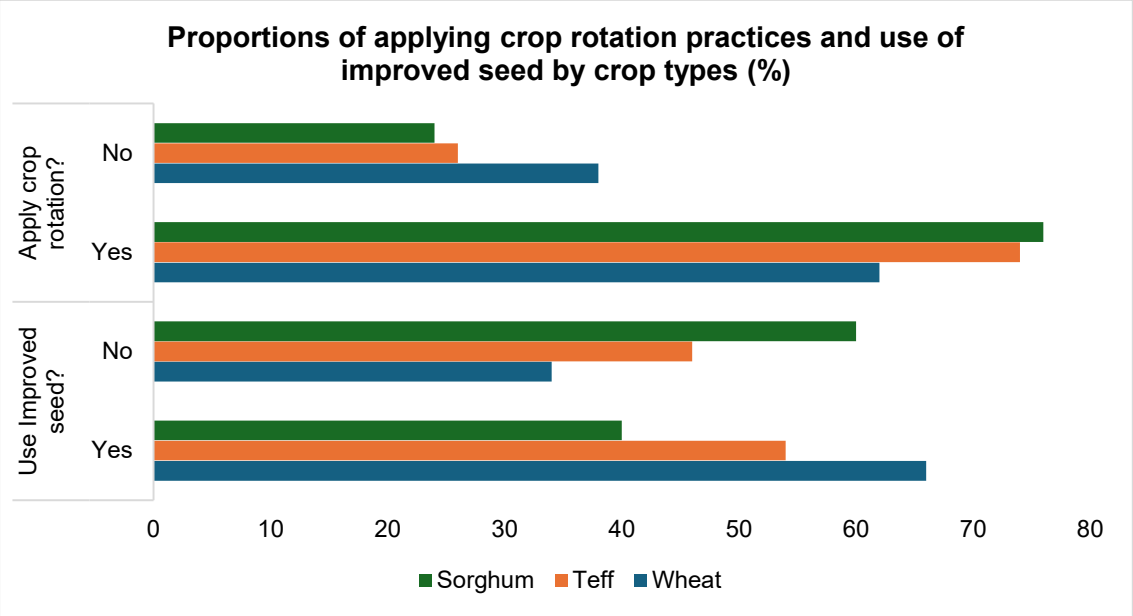


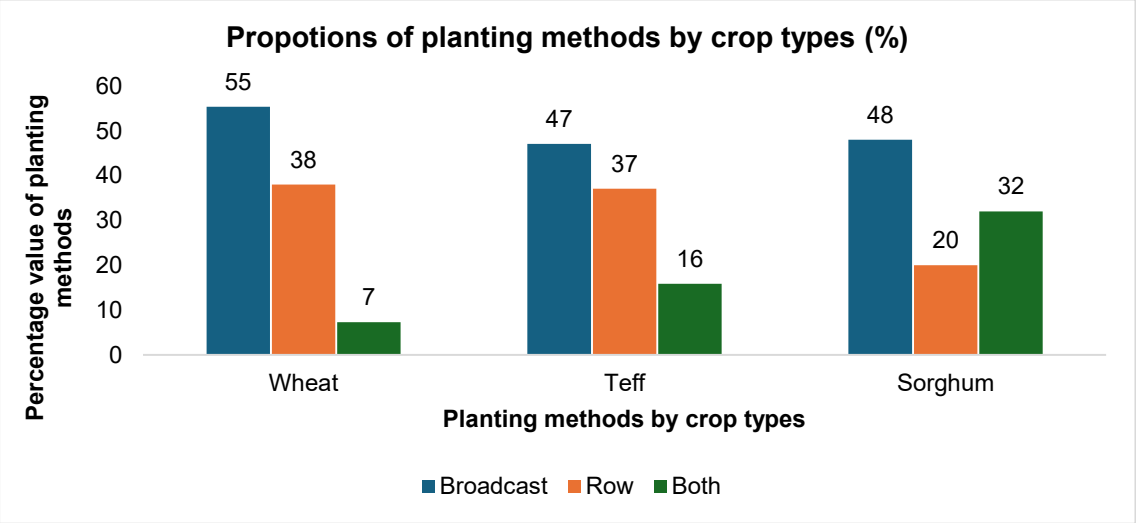
Complementary Agronomic Practice Change

The site-specific fertilizer advisory not only improved nutrient management but also encouraged farmers to adopt complementary agronomic practices that further enhanced yield and productivity. Many farmers reported increased use of improved seed varieties, which strengthened crop performance and contributed to higher output. In addition, the advisory promoted better crop rotation practices, helping farmers manage soil fertility, reduce pest pressure, and improve overall farm sustainability. These combined agronomic improvements indicate that the advisory served as a catalyst for broader changes in farm management, leading to more efficient, productive, and resilient farming systems.

Many innovation users reported implementing improved planting techniques, including appropriate seed spacing, row planting, and optimal planting depth, which helped improve crop establishment and overall crop management. Some farmers also integrated timely weeding, improved land preparation, and better residue management practices as part of their production strategy. Such agronomic measures demonstrate that farmers not only applied the fertilizer recommendations but also strengthened their overall farm management, contributing to better yield outcomes and more sustainable production systems.

Farmers applied different tillage frequencies depending on the characteristics of their fields and the types of crops they cultivated. Fields with heavier soils or those prone to compaction typically received more frequent tillage to improve soil workability and seedbed quality. In contrast, lighter soils or fields planted with crops requiring minimal disturbance were tilled fewer times. This variation reflects farmers' adaptive management practices, where tillage decisions are guided by field conditions, crop requirements, and the need to balance labor, cost, and productivity.





Net Promoter Score (NPS) of the Fertilizer Advisory

The Net Promoter Score (NPS) of the site-specific fertilizer advisory across different implementation sites. Key observations include:

- High NPS in Major Sites: The tool recorded high NPS values (100%) in the major fertilizer scaling intervention areas, indicating strong farmer satisfaction and a high likelihood of recommending the advisory to others.

- Lower NPS in Some Sites: Some locations showed relatively lower NPS values (60%), suggesting variations in user experiences, understanding, or engagement across sites and a relatively low likelihood to recommend to others.
- The average NPS value of the advisory in the majority of the sites: many locations showed average NPS values (90%), suggesting relatively best in user experiences, understanding, and engagement across the sites, and 90% recommending to others.
- Implication: The differences in NPS highlight the success of the advisory in many scaling areas while signaling the need for targeted support or additional training in lower-performing sites.

In summary, the site-specific fertilizer advisory tool represents a practical, farmer-friendly, and economically viable approach to improve nutrient management in Ethiopia's highland mixed farming systems. Continued promotion, gender-inclusive engagement, and integration of digital advisory services with existing extension services are essential to achieve widespread adoption and sustained impact on crop productivity and farmer livelihoods.

Social Media Community of Practice: Telegram Channel and Bot Usage Analysis

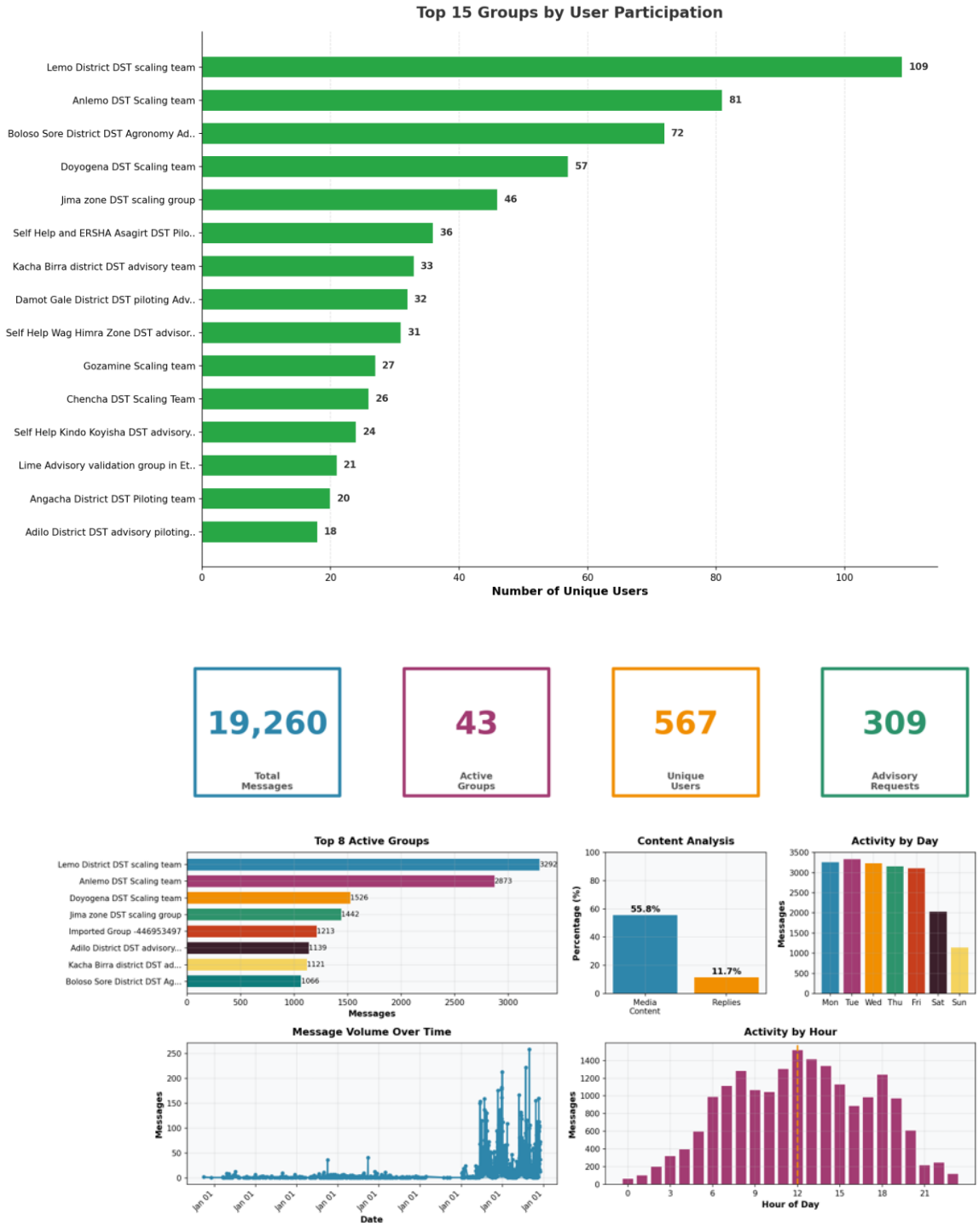
This section presents a comprehensive analysis of Telegram group activity of each scaling participant district within the monitoring and learning framework, covering 19,260 messages across 43 groups, of which 38 are active groups with 568 unique users over a 3.5-year observation period (June 2022 - December 2025). The Telegram social media platform has demonstrated strong and sustained engagement:

- Total Messages Tracked: 19,260
- Observation Period: June 2, 2022 - December 2, 2025 (~3.5 years)
- Total Active Groups: 43
- Unique Active Users: 568 with 34 messages per user
- Average Messages per Day: 14.3
- Reply Messages: 2,244 (12.3%)

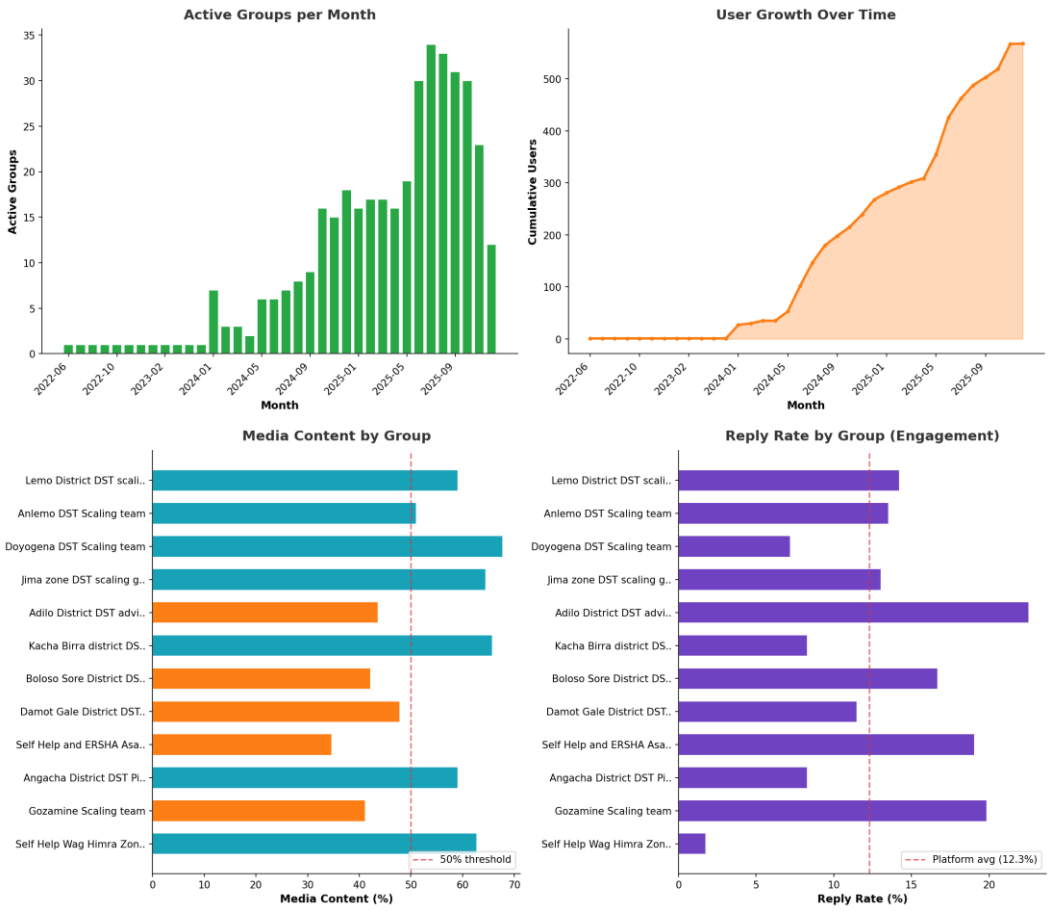
These metrics reflect high adoption, consistent participation, and active content flow across districts.

The telegram bot usage recorded 120 feedback interactions, with most queries linked to crop and disease diagnostics. The majority of the interactions were on wheat fertilizer advisory (40%), followed by plant diseases (30%) and on maize advisory (15%). These figures indicate a strong demand for diagnostic services and crop-specific guidance, particularly for wheat.

The social media community of practice using a Telegram channel is a robust and widely used digital ecosystem for agricultural extension and farmer learning. High message volumes, strong regional coverage, active group engagement, and meaningful bot interactions underscore its value as a scalable, cost-effective channel for innovation dissemination, monitoring, and stakeholder coordination. Telegram groups have proven to be more than communication tools—they function as collaborative innovation ecosystems that enhance participation, accountability, and evidence-based decision-making in agricultural development.



Telegram Groups Activity Dashboard – Comprehensive overview of 19,260 messages across 38 groups with 568 users



Group Growth Analysis – Active groups per month, media content, and reply rate analysis

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Ministry of Agriculture, Self Help Africa, Sasakawa Africa Association, Catholic Church South Synod

About CGIAR Sustainable Farming Science Program:

The CGIAR Sustainable Farming Science Program will address key challenges in agrifood systems by fostering efficient production of nutritious foods and safeguarding the environment to create fair employment opportunities, as we simultaneously tackle climate change, soil degradation, pests, diseases, and desertification.