Empowering Smallholder Wheat Farmers with NextGen Agroadvisory in Ethiopia: A Tailored, Season-Smart, and Scalable Approach

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Abstract

This technical report presents a comprehensive overview of the pilot initiative for site-specific and season-smart fertilizer recommendations (SSFR) implemented during the 2022/2023 wheat farming season in Ethiopia. The initiative, led by key demand partners such as Digital Green in collaboration with the Ministry of Agriculture (MoA), utilized the advisoryintegrated with the Ethiopian Digital Agro-Climate Advisory Platform (EDACaP), targeting smallholder farmers through various dissemination channels. The collaborative effort, involving MoA,the Ethiopian Institute of Agrocultural Research (EIAR), GIZ-Ethiopia (Supporting Soil Health Inistitives, SSHI), CGIAR EiA (Excellence in Agronomy) Initiative, the Accelerating CGIAR Climate Research in Africa (AICCRA) project, and Digital Green aimed at co-creating tailored agro-advisory content and employing agile dissemination channels. A customized decision support tool (DST) was developed to guide planners, extension workers, and farmers in making optimal planting decisions and fertilizer use. The report details the training of extension agents, using different dissemination channels, primarily using a Telegram bot for communicating the advisory services, and the challenges faced during the pilot, such as fertilizer shortages and limited internet coverage. The findings in August 2023 highlight the effectiveness of the advisory, reaching 50,200 farmers, out of which 8,316 farmers adopting the recommendations. Notably, 20% of adopters were women. The achievement is notable considering the fact that the season was characterized with severe shortage or fertilizer and very high cost. The report also highlights key lessons learned, emphasizing the importance of contextual understanding, collaboration between organizations, and engagement at both the local and ministry levels. The pilot's success underscores the demand for customized advisories and sets the stage for broader adoption and impact within the agricultural extension system.

1. Background

This technical report encompasses several key areas in piloting site-specific and season-smart fertilizer recommendations (SSFRs). NextGen agroadvisory DST integrated with EDACaP, tailored to the specific site, seasonal climate, and household conditions, is the key initiative for piloting. The advice from this tool is being extensively piloted across wheat farming systems in Ethiopia during the 2022/2023 season. Digital Green is pivotal as the principal partner leading the piloting exercise. Primarily, a Telegram bot approach has been used to disseminate NextGen advisory to smallholder farmers and gather feedback from farmers. This is also integrated with other channels (maps and videos) to test which combinations of options are preferable by different groups of farmers. A dashboard developed by Digital Green is used to get near real-time feedback on the number of wheat growers targeted, reached, and adopted the advisory during the 2023 crop season.

An innovative collaboration has been established, bringing together governmental organizations, non-profit developmental institutions, and private sector entities, including Digital Green and MoA. This partnership is dedicated to fostering co-creation, generating agro-advisory content, and employing agile dissemination channels to effectively reach extension workers and farmers while actively collecting valuable feedback. The tangible result of this concerted effort is the co-development of a customized, SSFRs Decision Support Tool (DST). This DST guides planners, extension workers, and farmers on optimal planting decisions and the required types and amounts of fertilizers.

Validation results of the NextGen agroadvisory during the 2021/2022 cropping season have demonstrated significant positive impacts on wheat production. That is, the average grain yield increased by 24%, nutrient use efficiency improved by 40%, water use efficiency increased by 15%, and overall profitability exceeded $1100 per hectare per season compared to blanket recommendations (Report; Manuscript under review). Building on these accomplishments, Digital Green, the primary scaling partner of the Use Case, is currently engaged in an extensive pilot of the advisory across 16 wheat-growing districts and 201 Kebeles in Ethiopia for the 2022/2023 season. The selection of piloting sites was based on the wheat growing potential, with Digital Green operating in partnership with local agricultural bureaus and development agents (DAs). The criteria for selection included accessibility for implementation, monitoring capabilities, and farmers' willingness to attend training and implement recommendations. Specific Kebeles were identified, considering the availability of DAs to support the piloting.

Agricultural extension services in Ethiopia have relied on blanket fertilizer recommendations. However, with evolving scientific insights and a deeper understanding of localized needs, there is a growing acknowledgment that a one-size-fits-all approach may not be optimal. The Ethiopian Extension Service recognizes this paradigm shift. It is committed to adopting SSFR, a more nuanced and customized strategy in providing fertilizer recommendations tailored to the local context of smallholder farmers.

2. Site selection and training

After identifying sites, extension agents received training on the advisory information service, including the purpose and utilization of the main dissemination channels. Digital Green developed the telegram bot (**this link**). A variety of approaches, such as combinations of video, maps, and face-to-face dissemination, were employed to pilot the advisory during the 2022/2023 cropping season (Fig. 1). The telegram bot was utilized to monitor and track the progress of DAs, recording the number of smallholder farmers targeted, reached, and willing to adopt the NextGen advisory in near real-time throughout the 2023 rainy season. A total of 746 extension agents (535 male and 211 female) received training across the 201 Kebeles (Fig. 1).

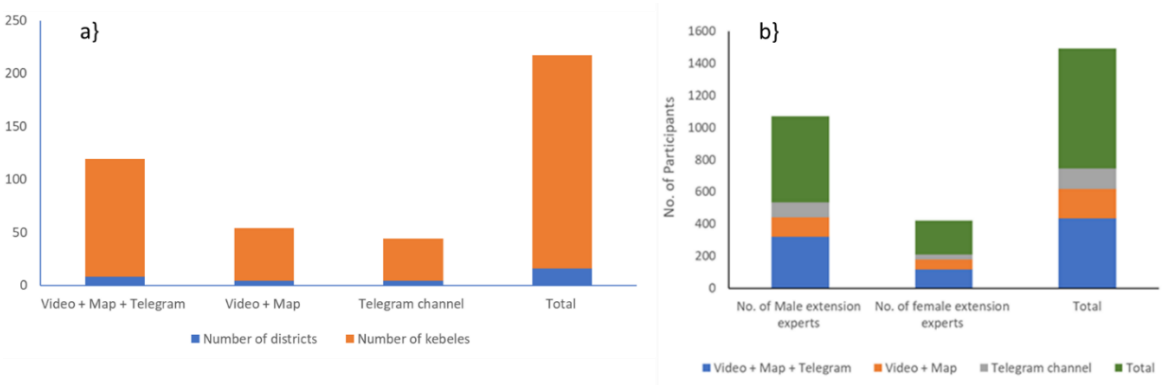

Fig 1. Overview of the total districts and Kebeles involved in the NextGen agroadvisory dissemination training, with (a) highlighting the participation of agricultural experts and development agents in the process (b).

3. Farmers reached/exposed and implemented the advisory

After the training, the Digital Green team, alongside extension agents who were equipped with knowledge about the advisory content and dissemination channels, conducted awareness creation and training sessions on fertilizer recommendations and other agronomic practices for farmers within the selected Kebeles. The advisory was disseminated through a multi-faceted approach and channel media (i.e., telegram bot only, video-based extension, or a combination of telegram bot and video). According to the Digital Green Dashboard feedback report in September 2023, Aaround 108,955 smallholder wheat growers across 16 woredas are expected to receive the advisory with the telegram bot, along with other dissemination channels, such as video and digital maps. Among the total wheat growers, over 28,400 farmers expressed their willingness to implement the advisory in Ethiopia across 170 Kebeles in three regions (Table 1). The data gathered from telegram bot usage highlights the extensive use of this channel by development agents to connect with numerous smallholder wheat growers.

After the implementation efforts in August 2023, the advisory reached 50,200 farmers have received the advisory successfully through the various media mentioned earlier, of which 6,800 farmers implemented the SSFR and 25% were women (Fig. 2). The relatively lower number of farmers adopting the advisory during the 2022/2023 season was attributed to the critical

fertilizer shortage and soaring prices in the country (e.g., see **this link** and **this link**). Because of those challenges, many farmers in Ethiopia could not apply fertilizer at all or did not apply the required amount of fertilizer. At the same time, security issues in some parts of the country also undermined fertilizer access and utilization by some farmers, which also affected the project.

Table 1. Examining SSFR reach and adoption rates by region, district, and gender in 2023

Advisory Dissemination channels	Regional States	Districts	# Kebeles Reached	Reached			Adopted		
				Male	Female	Total	Male	Female	Total
Telegram Only	Amhara	Were Ilu	10	2,438	432	2,870	58	11	69
Telegram Only	SNNPR	Silite	10	1,152	598	1,750	415	254	669
Telegram Only	Oromia	Goro	10	1,188	234	1,422	139	34	173
Telegram Only	Oromia	Adaba	10	1,193	310	1,503	36	11	47
Telegram + Video	Amhara	Siyadebir	11	1,025	191	1,216	203	26	229
Telegram + Video	Oromia	Munesa	10	4935	1671	6606	776	231	1007
Telegram + Video	Amhara	Machakel	13	2251	452	2703	196	20	216
Telegram + Video	SNNPR	Lemo	25	6,230	1,901	8131	1,222	353	1575
Telegram + Video	Oromia	Kore	7	1,263	540	1803	156	18	174
Telegram + Video	Oromia	Goba	10	5,301	1,463	6764	608	196	804
Telegram + Video	Amhara	Debre Elias	10	874	89	963	0	0	0
Telegram + Video	Amhara	Basona Woerna	11	2357	722	3079	308	80	388
Video Only	Oromia	Lode Hetosa	10	1368	835	2203	120	3	123
Video Only	Oromia	Hetosa	10	1170	529	1699	0	0	0
Video Only	SNNPR	Mareko	5	815	353	1168	31	1	32
Video Only	SNNPR	Sodo	8	1096	487	1583	277	23	300
Total	**3 regions**	**16 districts**	**170**	**34656**	**10807**	45463	**4545**	**1261**	5806

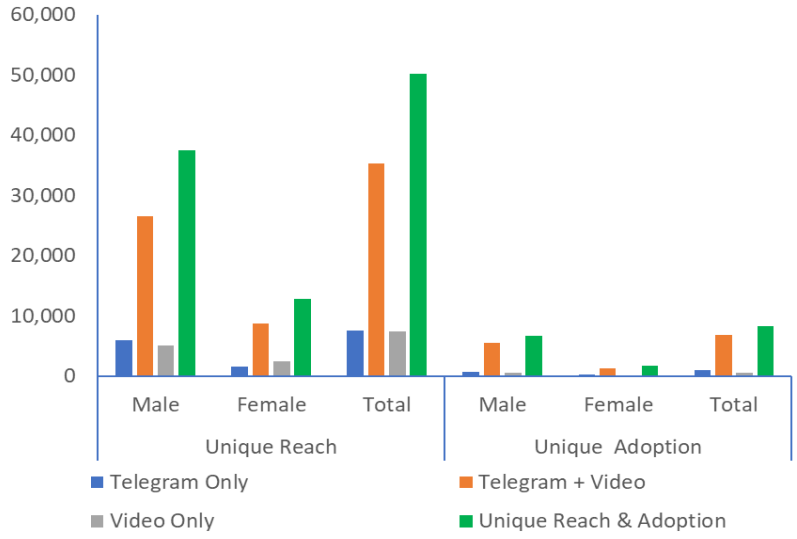

Fig 2. Distribution of male and female wheat growers reached and engaged in adopting site-specific fertilizer recommendations (SSFRs) during the 2023 crop season. (Data updated by Digital Green in August 2023)

Digital Green developed a real-time dashboard to track and monitor the DAs progress and record the number of smallholder farmers targeted, reached, and willing to adopt the SSFRs in Ethiopia during the 2023 rainy season (Fig 3). Information about the dashboard can be accessed through **this link**.

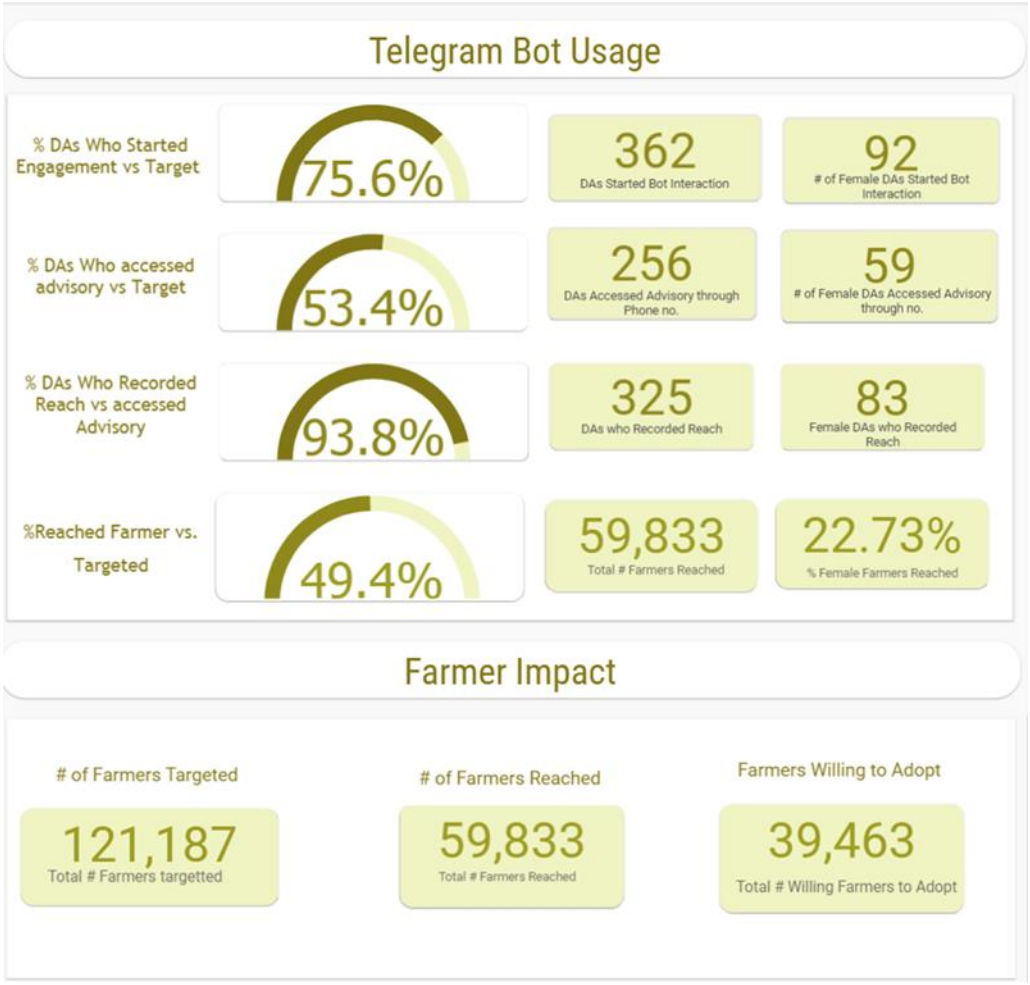

Fig. 3. Overview of the involvement of extension agents in pilot scaling and the outreach to farmers, depicting the number targeted, reached, and willing to adopt site-specific fertilizer recommendations (SSFRs) during the 2023 pilot scaling season in Ethiopia. Data is tracked and visualized through the Digital Green dashboard. URL: AgAdvisory Ethiopia Telegram bot usage report › Summary Report (All use cases) (google.com)

4. Piloting implementation by the Ministry of Agriculture (MoA)

Historically, agricultural extension services in Ethiopia have relied on blanket fertilizer recommendations. However, with evolving scientific insights and a deeper understanding of localized needs, there is a growing acknowledgment that a one-size-fits-all approach may not be optimal. The Ethiopian Extension Service recognizes this paradigm shift. It is committed to adopting SSFRs, a more nuanced and customized strategy in providing fertilizer recommendations tailored to the local context of smallholder farmers.

In the main cropping season of 2023, the Ministry of Agriculture (MoA) initiated the pilot of SSFRs in Doyogena district by collaborating with the Agricultural Commercialization Cluster (ACC) through Farmers, Research, and Extension (FRE) linkage facilitation. ACC production has emerged as a promising strategy for enhancing wheat production and productivity in Ethiopia. The alignment of FRE and ACCs fosters collaboration and knowledge sharing among farmers, researchers, and other stakeholders. It concentrates resources and expertise in the district, promoting the adoption of LSFR and other improved technologies and practices.

Facilitated by the Ministry of Agriculture (MoA), the Alliance, and GIZ, a pilot project for SSFR for wheat was initiated in Doyogena District, Gomora Kebele. This initiative brought together 185 farmers, forming a cluster covering 35 hectares of land. The district office of agriculture played a crucial role in establishing the Agricultural Commercialization Cluster (ACC) and implementing the LSFRs. They identified sites, delineated the cluster, collected GPS points for each farmer's field, and shared this information with the Alliance to generate personalized LSFRs for each farmer's plot.

5. Recognition of the potential of LSFR by the MoA

A field day was organized in September 2023 to provide farmers, agricultural experts, extension workers, and zonal administrators with the opportunity to observe and learn from practitioners about successful practices and experiences related to SSFRs and wheat clustering at Gomora Keble in the Doyogena and Shumu kebele in the Lemo district. Figure 4 showcases the performance of SSFRs beneficiary farmers in the Doyogena district, demonstrated to participants during the field day.

A total of 140 participants attended, including 120 men, 20 women, 56 extension workers, and 7 individuals from the media and other sectors. The significance of LSFR, tailored to the specific needs of each field, was highlighted during the field day held in Doyogena (Gomora kebele) and Lemo district (Shurmu kebele), aimed at enhancing wheat productivity. The event in the Kenbata and Hadiya zones was broadcasted on regional channels.

Fig. 4. LSFR piloting field at Doyogena District in the SNNPR in the 2023 cropping season

6. Challenges Encountered During the Pilot Implementation

- **Shortage of Chemical Fertilizer:** One notable challenge surfaced during the second and third phases of the LSFR pilot program, where a lack of chemical fertilizer hindered the intended outreach to many farmers. This issue was particularly evident during the 2022 and 2023 cropping seasons.
- **Weak Adoption of Organic Fertilizer:** Despite being presented as an alternative recommendation in the advisory, the adoption of organic fertilizer faced several hurdles, including labor-intensive production and transportation to the field, Requirement of substantial materials (dry materials, wet materials, and water) for preparation, and negative perception among farmers due to the unpleasant odor during preparation, a common issue in the conventional composting process if not managed properly.
- **Limited Internet Coverage:** In the pilot woredas, there is a challenge related to limited internet coverage. As the telegram bot serves as one of the channels for delivering the advisory during this cropping season, the restricted internet access poses difficulties for Development Agents (DAs) to retrieve the advisory on their phones.

7. Key Findings from the piloting and Lessons learned

- **Government Adoption and Demand:** From the validation process up to now, the government has demonstrated a strong willingness to accept and adopt the advisory. This underscores an apparent demand for customized advisories. Addressing farmers' needs in this context requires additional efforts to ensure the effectiveness of our advisory services.
- **Collaboration Between Digital Green and Alliance of Bioversity & CIAT (ABC):** Digital Green and ABC, as organizations with distinct areas of expertise, have the potential to generate significant and impactful results by coordinating with each other. Such collaboration can play a transformative role in influencing the extension and research systems within the country.
- **Lesson on Contextual Understanding:** The pilot has highlighted the importance of understanding the context on the ground and pinpointing areas for integration and collaboration. This lesson underscores the need for tailored approaches that resonate with the local environment.
- **Government Engagement at Woreda and Zonal Levels:** Close collaboration with government offices at the Woreda and Zonal levels has been a crucial factor contributing to the successful outcomes of the pilot. This emphasizes the significance of engaging with local decision-makers to ensure the relevance and effectiveness of interventions.
- **Influence at the Ministry Level:** Another key lesson learned is the importance of working closely with decision-making offices at the Ministry level. This engagement can potentially wield significant influence over the broader extension system, thereby amplifying the impact of the initiative.

8. Acknowledgments

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9. References

Dashboard Data. (2023, November 27). AgAdvisory Ethiopia Telegram bot usage. Digital Green. URL: AgAdvisory Ethiopia Telegram bot usage report › Summary Report (All use cases) (google.com)