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How Do Videos Fit into Current Agricultural Advisory Services?

Lessons from Kenya and Uganda

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Abstract

While video extension is a recognized means to overcome the challenges posed by traditional agricultural advisory services, adoption has been limited. This paper presents two case studies conducted in Kenya and Uganda that explore the potential of video extension for promoting climate-smart agriculture (CSA) practices. In Kenya, videos were rolled out by GROOTS Kenya, which predominantly serves women farmers. In Uganda, the Ministry of Agriculture, Animal Industry and Fisheries' Agricultural Extension Services implemented the video rollout, focusing on both women and men farmers. We used qualitative research linked to both video rollouts to understand the benefits and challenges linked to the intervention. We also compared the implementation strategies used in the two countries to evaluate the suitability of videos as a "best fit" advisory provision tool.

Both women and men farmers enjoyed watching the videos. They improved farmers' access to information, resulting in increased knowledge and adoption of CSA practices. Costs involved in some practices affected their adoption as did lack of intrahousehold decision-making power, particularly for women. In some cases, infrastructural challenges complicated the video showings. The findings underscore the importance of complementing traditional agricultural extension with interactive and context-specific video content without replacing and neglecting other modes of extension, as well as the need for political support to ensure the scalability and long-term success of video extension initiatives.

Keywords: Agricultural extension, digital tools, climate-smart agriculture practices, East Africa, best fit, women

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1. Introduction

Agricultural extension systems around the world experience challenges in terms of political will, human and material capacities, and inclusive outreach. The high cost of reaching farmers due to their large number and geographical dispersion and their low willingness to pay for extension services (Anderson & Feder, 2004; Graeub et al., 2016) is well documented as is the marginalization of women as recipients and providers of advisory services provision (Beevi et al., 2018; Meinzen-Dick et al., 2010; Mudege et al., 2015; Quaye et al., 2019).

In response to these challenges, several innovative extension models have been developed. They include the village-based agro-dealers and advisors' model (VBA), developed by the Alliance for a Green Revolution in Africa (AGRA). Under this model, selected farmers are trained as village-based advisors who provide farm inputs, services, and related training to fellow farmers (Agrilinks, 2021). Champion, model, or lead farmers take on similar roles elsewhere in Africa (Ragasa, 2020).

Over the last two decades, digital tools have been increasingly suggested or used to reach farmers with information about innovative practices while surmounting geospatial issues that restrict existing extension methods and other challenges, such as the COVID-19 pandemic. Aker (2011) and Zoundji et al. (2017) discuss the use of mass media, such as radio and television, to disseminate agricultural information. Other digital tools, such as phone calls or smartphone-based platforms, support two-way communication (Aker, 2011; Bell, 2015; Munthali et al., 2018), while interactive voice response (IVR) technology allows some targeting of farmers in addition to the potential to reach a large number of farmers (Ortiz-Crespo et al., 2021).

Specific to this study is the use of videos, which have been found to facilitate farmer-to-farmer learning, motivate farmers to adopt, create innovation, and activate existing but latent knowledge acquired previously through other means (van Campenhout et al., 2021; Zossou et al., 2009). Videos have been found to be cost-effective compared to traditional extension services and in contexts where the latter are difficult to implement (van Campenhout et al., 2017). They have also been used to train extension agents (Okry et al., 2014). Moreover, some evidence shows that video-based extension can increase access to extension by women farmers (Abate et al., 2023).

While some studies assess the quantitative impact of video-based extension on awareness, knowledge, and adoption of agricultural practices and technologies, little is known about the lived experiences and opinions of women and men farmers and extension agents regarding video-based

extension methods. Even less information exists on how women and men farmers relate to video-based extension focused on climate-smart agriculture (CSA) practices, which aim to improve agricultural incomes and productivity while also increasing climate change adaptation and mitigation. Previous studies have suggested a lack of attention to gendered differences in CSA strategies as well as their promotion, and have noted the heightened constraints of women farmers in accessing knowledge and capital that could help develop their resilience to climate change (Bernier et al., 2015; Brisebois et al., 2022; Bryan et al., 2013). Bernier et al. (2015) and Bryan et al. (2021) specifically found that if women had the same information as men, they were as likely or more likely to adopt certain CSA practices.

This study contributes to filling this knowledge gap by implementing qualitative studies of participatory video-based extension of CSA practices implemented in Kenya by the grassroots women's organization GROOTS and in Uganda by the extension arm of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). These two different types of extension organizations and their different target groups provide a unique opportunity for comparing the use of videos and the integration of this tool in existing extension systems and structures.

Section 2 provides an overview of the study sites; Section 3 describes the conceptual framework for the analysis; Section 4 presents results on (1) perceptions of the use of video-based extension approaches, (2) the perceived mechanisms by which watching the videos led to adoption of CSA practices, and (3) the suitability of the video-rollout strategies used by MAAIF and GROOTS to reach women farmers with information on CSA. Section 5 discusses the findings, while Section 6 concludes.

2. Study Context, Design, and Data Collection

The study was carried out in the context of the project "Reaching Smallholder Women with Information Services and Resilience Strategies to Respond to Climate Change," which was implemented in Kenya and Uganda, among others. The study's goal was to close gendered information gaps on CSA practices through participatory video-based extension, with videos shown in group settings followed by discussions by GROOTS in Kenya and MAAIF in Uganda. The short (3–6 minute) videos showcased women farmers implementing a series of women-preferred CSA practices. The theory of change of the project was that bridging the gendered information gap would contribute to increased awareness, knowledge, and adoption of these practices, help close gendered yield gaps, improve climate resilience, and potentially increase

women's empowerment in agriculture. The project aimed to reach more than 5,000 women in smallholder farm households in the two countries with videos on CSA practices. By the end of the project, GROOTS Kenya had reached 3,544 farmers, including 2,655 women farmers, while MAAIF in Uganda had reached 2,525 farmers, including 1,710 women farmers.

To implement the study in Kenya, three counties where GROOTS Kenya was operating were randomly selected; within these counties, a number of subcounties were randomly assigned as either treatment sites with video rollout or as control sites. In Uganda, the central region was selected for the study; within that region, the three poorest and three richest districts were selected. Among these six districts a number of villages were randomly selected as treatment and control villages. Following quantitative baseline and endline surveys which used the identified control and treatment design between 2020 and 2022, video showings were also rolled out to some of the control villages to increase the videos' reach. For this qualitative study, which did not fall under the impact assessment design, respondents were sampled from both treatment and control villages as the focus was on the experience of viewing the videos. For triangulation, we review the findings from the quantitative studies and discuss this in the discussion section alongside our findings.

2.1 Kenya

Three main CSA practices were covered in the Kenyan videos: cover crops, minimum tillage, and Zai pits. A few related practices—such as intercropping, mulching, and crop rotation—were presented together with the main CSA practices. Cover cropping was found suitable and selected as a target practice in all three intervention counties: Busia, Laikipia, and Nakuru. Cover crops such as desmodium (*Desmodium intortum*/*uncinatum*) generate additional sources of fodder for livestock. Cover crops were presented together with intercropping and crop rotation. For instance, when desmodium is planted with staple crops such as maize (*Zea mays*), it can serve as an affordable and organic source of nitrogen and also repel some pests, thereby helping women farmers maximize their labor time and income (Kifuko-Koech et al., 2012). Minimum tillage was identified as appropriate in all three counties but was highlighted in Laikipia county, which is located in the arid and semi-arid lands (ASAL) that suffer from water stress. Zai pits, also known as "planting pits," are a conservation agriculture practice that involves digging relatively small holes in which organic materials are placed. Zai pits can help with challenges such as land degradation, soil fertility, and soil moisture and can help increase the productivity of hard pan soils. The practice was also selected for its suitability for ASAL counties. Aside from these,

additional practices discussed in the videos were kitchen gardening, using planting bags for vegetables, planting drought-resistant crops, and using animal manure. To reach 3,600 smallholder women farmers in Kenya, videos were also shown in nonintervention counties. Video rollout was accompanied by GROOTS champion farmers and public extension officers to answer farmers' questions about the videos in a discussion session. Farmers were invited to the group video sessions through correspondence from the village elder or chief, whom a GROOTS Kenya local community leader contacted.

In Kenya, extension service provision follows a nationally decentralized, demand-driven, county-level system based on Common Interest Groups (CIGs) and has a low ratio of extension officers to farmers: 1:1000 (Tata and McNamara 2018). The demand-driven and CIG approach means that agricultural extension service providers do not provide services to farmers except when they are called upon through contact points developed by groups of farmers with common interests (Ong'ayo et al., 2016). This concept of accessing service only when a group of farmers comes together over an issue and then contacts providers has had mixed support from farmers (Ong'ayo et al., 2016). In some cases, farmers' lack of knowledge on the identity of the pests and diseases affecting their crops and livestock restricts them from effectively presenting their challenges and demands to extension officers (Ong'ayo et al., 2016).

2.2 Uganda

In Uganda, the videos were rolled out in six districts in the central region: Bukomansimbi, Kalungu, Kiboga, Mubende, Nakasongola, and Rakai. All of these districts lie within the proximity of Lake Victoria and receive an average of 139.7 centimeters (cm) of rainfall annually. In 2019, qualitative fieldwork was done to determine what CSA practices farmers preferred (Kawerau et al., 2023, under review). The project districts in the study region were categorized according to their main agricultural activities: Rakai, Bukomansimbi, and Kalungu are mostly crop-growing districts, while Nakasongola and Kiboga are mixed crop- and livestock-based districts.

Based on criteria of feasibility and preferences, the following technologies and practices were selected for promotion: integrated pest management (IPM), soil and water conservation, climate-smart pig management, and climate-smart poultry management. These practices were filmed featuring women farmers describing and applying CSA practices, and were rolled out in 2021 to women and men smallholder farmers in the selected treatment villages. In each village, an

agricultural extension agent was trained on the project's concept and personally accompanied the video rollout to answer farmers' questions. The farmers were selected and invited by MAAIF.

In Uganda, the demand-driven National Agricultural Advisory Services (NAADS) program—instituted in 2001 as part of the government's agricultural extension reforms—was considered a role model for Sub-Saharan Africa (Rwamigisa et al., 2017). Agricultural extension reforms have been part of Uganda's overarching poverty reduction strategy to transform agriculture from subsistence to commercial farming and to make agriculture more profitable, competitive, and sustainable by developing a demand-driven, farmer-led agricultural service delivery system targeting poor subsistence farmers, women, youth, and persons with disabilities (AfranaaKwapong & Nkonya, 2015). The latest National Agricultural Extension Strategy transferred the extension function from NAADS to MAAIF, which coordinates, harmonizes, and regulates the diverse set of state and nonstate providers, promotes decentralization to local governments, and recognizes the key role of agricultural extension and advisory services for adoption of promoted technologies (MAAIF, 2016a, 2016b).

Innovative approaches and methods introduced to promote climate change adaptation include extension methods for climate knowledge transfer, climate awareness mass media campaigns, and ICT, including videos and climate-smart villages (Turyasingura & Chavula, 2022) and SMS-based market information systems (Mugabi et al., 2018). With regard to climate change adaptation, further improvements include providing farmers with research-based skills and developing technologies with farmers, thereby catalyzing and facilitating innovation processes (Ampaire et al., 2017).

In sum, GROOTS Kenya organized video sessions for a total of 3,544 farmers (2,655 women, 75 percent) and MAAIF organized sessions for 2,525 Ugandan farmers (1,710 women, 68 percent).

3. Conceptual Framework and Methodology

This paper uses a comparative case study design, based on two independent qualitative case studies in Kenya and Uganda. The qualitative case studies used focus group discussions (FGD) and semi-structured interviews to collect data from farmers and extension agents, respectively. Semi-structured interviews imply that although structured interview protocols were prepared and tested before the actual interviews to guide the discussions, this was done with the allowance to adapt structure of discussion according to context. We analyze and compare the results obtained from

these studies to identify similarities and differences in the strategies used by the local partner advisory organizations as well as in the outcomes generated by the two agricultural extension service provision strategies.

Our analysis focuses on identifying the different components that are important for the design and analysis of agricultural advisory services according to the framework developed by Birner et al. (2009). This framework is relevant because the CSA videos were developed as an agricultural advisory tool and the framework provides criteria for evaluating the fit of such tools as used for agricultural extension provision. For example, the same conceptual framework was used in a similar study to examine the performance of agricultural extension managers and the factors influencing agriculture extension in Uganda (Namyenya et al., 2022). The framework is also helpful in exploring the different determinants of the quality of services provided and in guiding what service providers think about when considering farm households' perspectives. It is shown in the framework that a "*best fit"* agricultural service provision is cognizant of elements such as contextual factors specific to the area where service is being provided and the characteristics of the service provider (Figure 1).

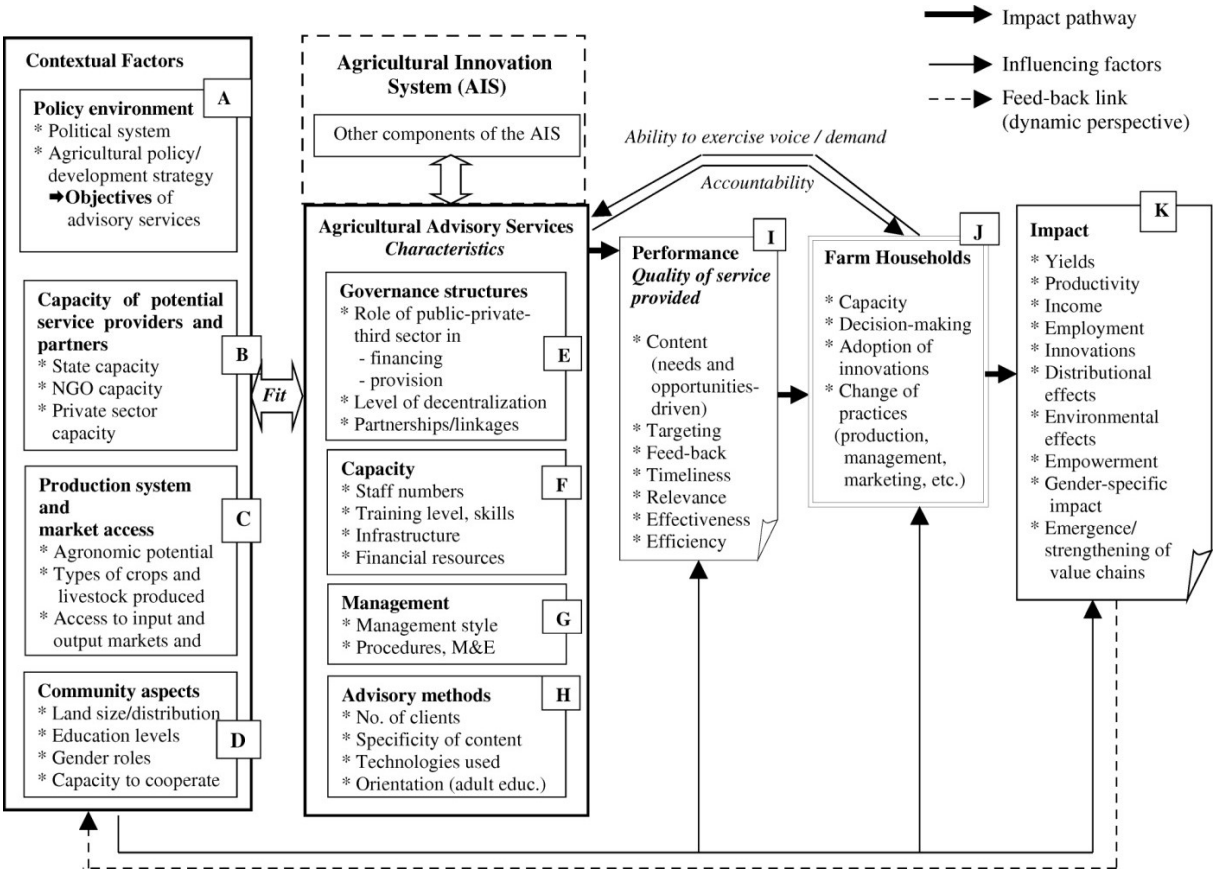

Figure 1: Conceptual framework for the design and analysis of agricultural advisory services
Source: Birner et al. (2009).

Such advisory services also recognize the voice and demand of farm households, just as this study consulted farmers to receive feedback about the videos they were shown. Therefore, the discussion in this paper revolves around highlighting the differences and similarities in the contextual factors of the extension providers. We look at the other characteristics—performance, accountability to farm households, and impact—of the strategies used by the engaged local advisory service providers in Kenya and Uganda. We illustrate how different mechanisms contribute to the resulting impacts of videos and stakeholders' perceptions as obtained in the independent case studies. Lastly, we draw lessons about opportunities and challenges faced by the kind of advisory service provision studied here.

3.1 Study area and sampling in Kenya

Nakuru, Busia, and Laikipia counties were selected as study areas for the independent study in Kenya (Figure 2), adopting the research design procedure used for the quantitative baseline and endline surveys as well as implementation of the video intervention project.

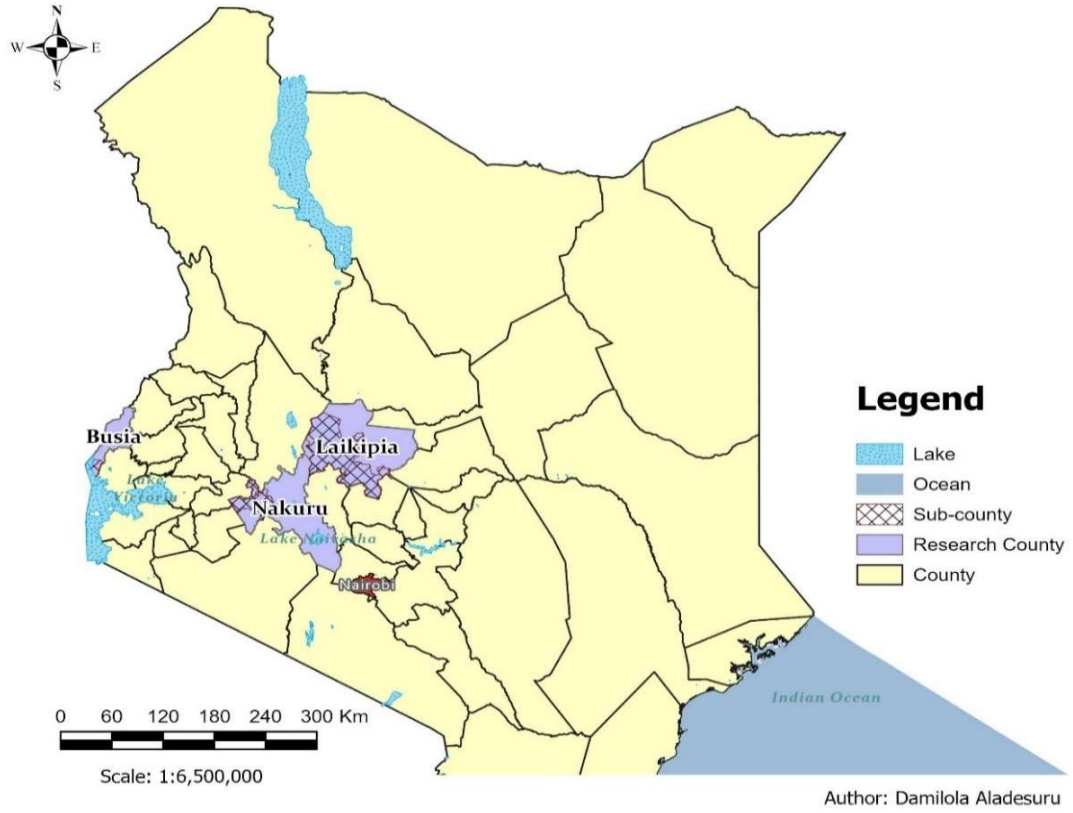

Figure 2: Study area map of Kenya (Coordinate system used is Arc 1960 UTM Zone 37s)

Within Busia, Nakuru, and Laikipia counties, five subcounties in which GROOTS Kenya was already operating were purposively selected. In these subcounties, 16 locations, divided into 25 sublocations and 26 villages, participated in the qualitative study (Table 3.1).

Table 3.1: Allocation and ratio of treatment (TG) and control group (CG) villages in study area: Kenya

County	Subcounty	# Locations	# Sublocations	# Village/Clusters	TG/CG
Busia	Budalangi	4	8	8	4/4
Nakuru	Molo	4	5	5	3/2
	Kuresoi North	3	5	5	3/2
Laikipia	Laikipia East	3	4	4	2/2
	Laikipia West	2	3	4	2/2
Total		16	25	26	14/12

Source: Authors.

Sampling these participating villages—and eventually individual participants—involved three stages. First, considering available resources and the characteristics of the different villages

mapped for the project, the research team and project partner decided to sample 26 villages, calculating that this number of villages was sufficient to generate adequate findings. This number was then split into 12 control villages and 14 treatment villages. The treatment group (TG) refers to the group of farmers shown the videos in 2021, while the control group (CG) saw the videos during 2022, partially during the data collection phase for this study. Based on this split, villages were randomly selected from the database of 20 treatment and 20 control villages earlier mapped for the project. The Budalangi study area comprised four locations, with eight sublocations and eight villages, of which four belonged to the TG and four to the CG. The Molo study area comprised four locations, with five sublocations and five villages, of which three belonged to the TG and two to the CG. Kuresoi North comprised three locations, with five sublocations and five villages, of which three belonged to the TG and two to the CG. The Laikipia East study area comprised three locations, with four sublocations and four villages that were evenly divided into TGs and CGs. The Laikipia West study area comprised two locations, with three sublocations and four villages that, as in Laikipia East, were evenly divided into TGs and CGs.

The second sampling stage involved drawing on the database of farm households that were mapped to the two groups and contacting potential participants selected according to two main criteria: participation in the video intervention and gender. Respondents must have participated in the video intervention as either a farmer who watched the videos in either the first (2021) or second (2022) treatment phase, or as a stakeholder involved in the video showing. In aggregate, 48 percent of FGD respondents belonged to CG villages and 52 percent belonged to TG group villages. Six women and four men key informants were also interviewed; these included extension officers, GROOTS lead Champions, and one village elder.

3.2 Study area and sampling in Uganda

For the Uganda case study, 17 villages were selected depending on the districts where the video rollout was conducted (Figure 3). Districts were chosen based on farming activities in the area.

Figure 3: Study areas in Uganda.

Note: Study areas are marked in red; the pre-test district is marked in green.

Source: Uganda Bureau of Statistics

Since the study's target population was large, farmers were randomly selected to participate in the study as a subset of the list of farmers who had participated in the video rollout phase. In villages with a large number of participating farmers, every third man and woman farmer from the video rollout list was selected. In villages with fewer farmers, all farmers were asked to participate. In total, 111 women and 60 men farmers were selected to participate in the study. Random sampling ensured that findings approximate what would have been obtained if all farmers who participated in the video rollout exercise had been interviewed.

3.3 Data collection and analysis

For both studies, data were collected through FGDs, key informant interviews, and participant observation. FGDs and interviews covered respondents' awareness and knowledge about general CSA practices, the specific practices about which the videos provided information, and their

perceptions on the promoted CSA practices. Additionally, respondents evaluated the use of videos as an extension tool.

In each studied Kenyan county, only one FGD was organized to understand the perspective of men farmers, whereas multiple women's groups were convened. This skewed the gender distribution of participants toward women (89 percent). In Uganda, 111 women farmers distributed among 13 women's FGDs and 70 men farmers split across 8 men's FGDs were sampled, and 6 key informant interviews with men extension agents were conducted, with at least one key informant interview from each of the selected study locations (Table 3.2). Due to the sensitivity of some aspects (for example, related to women empowerment), FGDs in both countries were held separately with men and women. Data collected were analyzed qualitatively through content analysis using a deductive approach, based on identification of themes. For this, transcriptions from each FGD and individual interviews were compiled in different documents, with each document only containing data or information provided by one group of farmers or one stakeholder.

In Kenya, additional socioeconomic and study-specific variables, such as implementation of the promoted CSA practices, education, gender, county, and farm ownership, were collected and analyzed to generate descriptive and inferential statistics. A few selected farmers from the FGDs also received farm visits. These observations enabled researchers to more fully comprehend which farmers had embraced the CSA techniques introduced in the videos.

Table 3.2: Total number of respondents in Kenya and Uganda

	# of Districts	# of FGDs	# of Women farmers	# of Men farmers	# of Key informants	Total respondents
Kenya	3	27	187	23	10	220
Uganda	4	21	111	60	6	170

Source: Authors.

4. Results

4.1 Perceptions of farmers and key informants on the use and role of videos for agricultural extension

The next sections describe the perceptions of farmers who watched videos of CSA practices during this intervention in both countries, as well extension officers and other stakeholders who participated in the video sessions.

4.1.1 Perceptions of farmers on the use of videos

In both Kenya and Uganda, farmers perceive videos to play an integral role in visually representing agricultural practices, allowing farmers not only to learn through auditory means, but to see what the practices look like and how they are performed (Table 4.1). During FGDs, several men and women farmers reported that videos helped them remember the farming practices that extension agents emphasized in previous extension training sessions. In particular, the visualization presented by videos made learning easier to digest for farmers.

Table 4.1: Role of videos (sorted by frequency of mention by farmers among FGDs)

Kenya		Uganda
	Frequency mentioned	
Videos provide visual representation that improves understanding and captures attention.	57%	Visual aspects are a useful complement because farmers can simultaneously learn and observe.
Videos facilitate easy dissemination of agricultural information.	21%	Using videos, extension agents may serve multiple farmers simultaneously, hence saving everyone time. Videos can be rewatched and shared with other farmers, while reducing phone bills or transport costs of inviting extension agents or veterinary officers to visit a farm.
Videos educate and motivate farmers to try out practices.	14%	With videos, farmers can easily recall what they have watched.
Videos stimulate farmers' interest and help them remember lessons.	7%	Videos can demonstrate a number of farming practices at once.
Videos enlighten farmers about farm activities in other locations.	7%	Videos have the potential to introduce agricultural techniques to farmers in distant or inaccessible areas.

Note: For Uganda, no frequencies were collected.

Source: Authors.

Furthermore, videos are considered as tools that could improve farmers' access to agricultural extension. As seen in Uganda, farmers consider videos to be an alternative to the cost of transportation and phone calls required to bring extension officers to their farms. And as observed during videos sessions and farm visits in Kenya, well-detailed and accurate videos can enable a farmer to observe the methods other farmers are implementing without physically visiting their farms. This also allows farmers to learn practices used in distant locations or less accessible regions.

However, according to both men and women farmers, if videos were not shown in public events but were only accessible on smartphones or within farmer group meetings, farmers without smartphones and those who are not members of farmer group might be excluded.

4.1.2 Perceptions of key informants on the use of videos

In Kenya, extension officers and community leaders expressed positive feelings about the videos. Among others, these stakeholders were particularly excited to see farmers from their localities teaching CSA practices in the videos. A woman extension officer from Nakuru was impressed that videos contained on-farm presentations of the practices that were talked about rather than some off-farm theoretical discussion telling farmers what to do about climate change.

In Uganda, extension agents reported that videos are more cost-effective than transporting farmers to field days, they reach more farmers than other extension approaches, and they provide knowledge on farming practices used by other farmers in difficult-to-reach places. They also reported that videos function as a motivational factor for women farmers, who were enthused to see other women farmers achieving their farming goals in the videos, giving them hope that they too could improve their livelihoods via farming. Table 4.1 contains quotes illustrating extension officers' perceptions.

In both countries, extension officers pointed out that the videos' contents lacked depth, providing only basic information about practices. Extension officers therefore strongly suggested their involvement in the different stages from development to use of video tools. They also reported that for old farmers, the majority of whom have vision problems, viewing videos is difficult. Additionally, young people might be more interested than older ones in attending video sessions but might lack the decision-making power to adopt practices. Finally, the use of videos involves costs for electricity or hiring a generator, renting a suitable viewing location, and technical know-how to run the equipment. However, all interviewed extension officers expressed that videos could play a significant role in agricultural extension because they visually present practical farming information.

Table 4.2: Sample quotes illustrating extension officers' perceptions of the use of videos

Perception of extension officers-Kenya	Quotes from Kenya	Perception of extension agents-Uganda	Quotes from Uganda
On-farm demonstration and presentation captured in the Kenyan videos is impressive	"*At first, I thought that the video you wanted to show them on Climate Agriculture was just entailing on what they should do. I was happy to see it was the practical bit with the farmers there in their farms showing what they were discussing*." (*Woman extension officer, Nakuru*)	Videos are a cost-effective extension approach	*"In my opinion videos are cheaper than transporting farmers for a field day. They are able to see what farmers in other areas are doing." (Man District Agricultural Officer, Bukomansimbi)*
Kenyan videos contain basic, summative information	*"The videos were only showing the basics" (EO5 – man extension officer, Nakuru)* *"It showed a farmer being captured at the final stage giving more of a history of what they did." (Man extension officer, Laikipia)*	Videos present to farmers content from different locations	*"They can see what farmers from other regions are doing." (Man assistant veterinary officer, Nakasongola)* *"When a farmer watches a video of a fellow farmer from a different region or location carrying out a farming practise, he or she is more likely to adopt that practise. Farmers are typically persuaded that this is doable when they view videos of farmers in other regions engaged in comparable agricultural practises." (Man District Agricultural Officer, Kiboga)*
Video aids visual presentation	*"When you teach without a video not all farmers will understand. We need the video then an extension*	Videos serve as inspiration for women farmers	*"Women farmers were inspired and motivated by the video." Because the women in the videos were just like them,*

Perception of extension officers-Kenya	Quotes from Kenya	Perception of extension agents-Uganda	Quotes from Uganda
	officer for explaining." (Woman extension officer, Busia) *"Seeing is believing so if you ask me, I feel like it's a good idea to use the videos in reaching out to many farmers and getting them much educated on different agricultural practices." (Man extension officer, Nakuru)*		*it gave the women farmers hope that they, too, could reach their farming goals." (Man District Veterinary, Bukomansimbi)* *"Women usually feel inferior, so when they see fellow woman taking on a lead role in doing something to the extent that, they are recorded on video, they get very encouraged, secondly, garden work is mainly done by women." (Man crop extension officer, Kalungu)*

Source: Authors.

4.2 Stakeholders' preferences on the use of videos

4.2.1 Kenya

Every group of farmers watched the videos in an enclosed building, such as a church, classroom, or public meeting hall, where the videos were projected onto the wall. Reflecting later on this method of showing videos, farmers in 50 percent of FGDs expressed a preference for watching agricultural extension videos in groups, just like they would normally meet for classical extension trainings. Compared to a personal delivery medium—such as a personally owned device like a smartphone, which a few farmers in 6 of Kenya's 27 groups suggested—group sessions were much more popular. The preference for group meetings and video viewings was justified by the fact that few farmers owned smartphones and by a perceived higher level of concentration, group interaction, and engagement on the content when videos were watched in groups. This interaction further helps farmers to develop an interest in implementing, or at least trying, the content of the videos.

A majority of farmers preferred extension officers to be present at videos showings. Farmers in about one-half of the FGDs referred to how helpful it is to have an in-person officer who can provide additional information to better understand the content. In contrast, in 10 (37 percent) groups, farmers asserted that without an extension officer, they would have learned just as much as they did because the video presented a form of demonstration, a similar technique used by extension officers during agricultural training.

Also, all community leaders interviewed and 60 percent of extension officers considered videos to be insufficient on their own without an extension officer providing more information or guiding discussions during pauses.

4.2.2 Uganda

Several women and men farmers preferred demonstration gardens over videos alone for learning (Table 4.3). One man respondent said, *"In my opinion, the demonstration garden experience is better than watching a video because you get the opportunity to learn and practically do what you are learning simultaneously."* On the other hand, a few farmers reported that videos help them learn more because they can see how other farmers implement the methods in hard-to-reach places. Videos give information on different methods, and videos reach more farmers than demonstration gardens.

Farmers claimed they learned more when they could ask questions of extension agents who were present during the gatherings, as illustrated by the following three quotes by one woman respondent:

"Watching videos with an extension agent is great because you can learn a lot and ask questions."

"Videos give me constant information, and I don't have to pay for gas or airtime for an extension worker or veterinary officer to come to my house."

"It is simple to recall what one has seen; we can learn a lot from videos."

Table 4.3: Learning preferences by FGDs in Uganda

Learning preferences	**Women's FGD**		**Men's FGD**	
	Freq.	**Percent**	Freq.	**Percent**
Prefer learning from demonstration gardens compared to videos	8	62%	5	71%
Prefer learning from extension agents compared to videos	7	54%	2	29
Prefer learning from videos with an extension agent	3	23%	1	14%
Reference total of FGD	13	100%	7	100%

Note: Multiple answers were possible.

Source: Authors.

Extension officers reported that videos are more cost-effective than transporting farmers to field days and demonstration gardens. They are visually appealing, reach more farmers than demonstration gardens, and have the power to engage farmers and arouse their curiosity.

4.3 Mechanisms by which videos led to adoption of CSA practices

4.3.1 Kenya

Videos taught farmers a few targeted CSA practices, as well as a few that were not targeted. Through the broad/extensive presentation of featured farmers' farms, participants gained visual information about how plants such as potatoes, peas, and maize could be spaced, how planting rows could be made, as well as the different crops to plant depending on the time and season. In some cases, farmers remember what was learned by referring to the crops seen in the video rather than the practice itself because they forgot what a given practice was called but vividly remembered the crop they had seen. For example, *"We can remember the planting of spinach, sweet potatoes, arrowroots, potatoes, cabbages, tomatoes, indigenous vegetables, onions and the use of manure from the video." (Kenya-Laikipia women's TG).*

Farmers also implemented some of the practices they learned from the videos on their farms. Table 4.4 shows how many farmers from the villages where the videos were shown in 2021 indicated implementing each of the listed practices.

Table 4.4: Distribution of practices reported as implemented by farmers in TG villages: Kenya

	Busia		Nakuru		Laikipia		All	
Practice	**Freq.**	**Percent**	**Freq.**	**Percent**	**Freq.**	**Percent**	**Freq.**	**Percent**
Mulching	15	33.3%	17	41.5%	2	8.3%	34	30.9%
Cover cropping (promoted)	-	-	1	2.4%	-	-	1	0.9%
Use of manure	12	26.7%	8	19.5%	-	-	20	18.2%
Minimum tillage (promoted)	2	4.4%	1	2.4%	-	-	2	1.8%
Crop rotation	1	2.2%	2	4.9%	-	-	3	2.7%
Zai pits (promoted)	-	-	-	-	-	-	-	-
Terraces	9	20.0%	-	-	-	-	9	8.2%
Kitchen garden	1	2.2%	1	2.4%	-	-	2	1.8%
Reference total of farmers who saw videos in 2021	45	100%	41	100%	24	100%	110	100%

Note: Multiple answers were possible.

Source: Authors.

Farmers expressed the ways in which the videos helped them to better understand previously known practices. The visual representation of practices was said to inspire new and alternative farming ideas, as well as remind farmers of known practices. Mulching was the specific practice most practiced by farmers, and was recognized as being helpful in preventing the direct impact of the sun on the soil, thus retaining soil moisture. Farmers commonly adopted mulching because for many the practice was vaguely familiar and, after seeing the videos, they could understand the benefits of this low-cost practice, which only requires plant waste from their farms. The effect on moisture retention can be observed shortly after mulching. Cover crops provide similar moisture retention benefits aside from their nitrogen fixation, but this practice was rarely mentioned as a new practice adopted as a result of the videos. In many cases, farmers indicated learning the "cover cropping" terminology from the video but not the practice. "*We have been planting covers like potatoes like mentioned but not with the knowledge that it is a cover crop. Rather with the ideology that it is a normal crop which is expected to give great yields*." *(Kenya-Busia women's TG).*

However, constraints limiting farmers' use of the practices include environmental factors such as lack of water, biological constraints like termite or rodent infestation when mulching is done, and, specifically for women, the lack of decision-making power over production on farms as well as the "physical tedium" of practices such as minimum tillage. Although minimum tillage and Zai pits were targeted by the videos, little to no adoption of these practices occurred in Kenya. Mostly, the farmers did not remember these practices. Only 6.4 percent and 1.8 percent of respondents mentioned learning about minimum tillage and Zai pits, respectively. Among the 6.4 percent of farmers who mentioned learning minimum tillage, one farmer from Nakuru indicated that although good for soil fertility, minimum tillage hardens the soil, making it physically strenuous to harvest root crops like potato. This perception was acknowledged by other farmers, and we assume that this contributed to the low adoption of minimum tillage. In the case of Zai pit adoption or percentage of learning among farmers, we find that the concept of Zai pits was not very clear from the video. Perhaps, this factored into the low record of farmers implementing Zai pits. This points to the lack of specificity in the video content and how information can be lost when too many activities are included in a single agricultural training video. This was the case with the Kenyan videos which were unlike the Ugandan videos where each video targeted a specific production activity (see Section 4.3.2).

Nevertheless, in comparing the use of learned practices in Kenya, 76.0 percent of women farmers implemented some practices, while only 36.4 percent of men farmers did. This finding is supported by one stakeholder's opinion that *"Women are more receptive than men so even if it were men being featured in the videos, women would still be able to pick up a lot from it." (Woman extension officer in Busia).*

Among the men and women farmers who did not implement any of the targeted techniques, 57 percent said that their farmland belongs to a spouse. Among those who implemented and are still using the practice, the largest share (45.3 percent) are farmers whose farm belongs to the family. This finding is significant (at a probability of 5 percent with χ^2 Pr = 0.045) and is illustrated by a farmer whose main challenge in implementing a practice from the video was seeking her husband's consent: *"The only challenge I have is, I share the farm with my husband, and it belongs to him, so if he says no to the implementation, I won't implement a thing. The final decision is still his." (Kenya-Nakuru women's CG).* These findings reinforce that even with the introduction of videos,

the existing land tenure system in many African countries—which does not recognize women's ownership of farmland—remains a challenge.

Women farmers indicated being empowered through the use of the CSA practices learned in the videos, as they were able to sell vegetables left over after own consumption, and to use the income to pay children's school fees or to start alternative businesses, such as poultry keeping and other nonagricultural business ventures. Women also emphasized the pleasantness of being able to identify with the women in the videos, and that they were motivated by seeing that women farmers' contributions were recognized.

Lastly, respondents addressed the limitations of video technology. Opinions differed about the sufficient length for a video to educate farmers. Ultimately, farmers indicated that if (1) content is specific to one practice at a time or specific practices that are interlinked, such as intercropping and cover cropping, and (2) information provided by the featured farmer is verified—for example by also featuring an extension officer—then 30–60 minutes should be sufficient to capture all necessary information. "Necessary information" was suggested to include a clear definition of the practice, a step-by-step guide on how it is conducted, content showing a farm before and after implementing the practice, and what resources were required. Also, specifically in the case of this study, there was a discontinuity of involvement of public extension officers in producing and showing videos. Some extension officers invited to explain the videos lacked information about the practices. These officers indicated they could have been better prepared to educate farmers had they been informed of the topics covered in the videos.

4.3.2 Uganda

As noted in Section 4.3.1 on Kenya, the videos in Uganda were more targeted and specialized, containing only one of the main introduced practices per video. Table 4.5 shows the practices farmers reported to have adopted after watching the videos.

After viewing the soil and water management CSA video, 38.5 percent of women and 50 percent of men farmers implemented soil bund construction with compartments. Farmers adopted the technique because soil bunds reduce soil nutrient loss due to erosion and distribute water evenly across the field, as illustrated in the CSA video. For example, a man respondent stated that *"Soil bunds are useful because they help to minimize soil erosion and also water retention in the soil."* Farmers appear to have been previously aware of the practice and its benefits, but the message

contained in the CSA video inspired some farmers to put this knowledge into practice: *"I needed the trenches in my garden, and for some reason, I had never constructed them,"* a woman respondent stated, *"but after watching the video, I decided to find the money, pay someone, and dig the trenches."* Most women farmers who did not adopt the practices in this video were constrained because they are labor-intensive and costly, particularly for women who need permission from their spouses. A women respondent stated, *"Digging trenches is difficult since it requires effort, or you must pay someone to do it for you."* Extension agents also noted that due to the labor-intensive nature of soil bund construction, few men farmers adopted the practice.

The majority of women farmers adopted IPM practices, such as proper pruning of coffee and bananas with the prescribed tools, mulching of banana plantations, removal and burning of affected coffee branches, and the use of pig urine in banana gardens. Across all project districts, more women farmers (46 percent) adopted pruning of coffee and banana than men farmers (25 percent). And only women farmers adopted the use of an animal urine-based concoction and mulching in banana plantations. Banana and coffee pests do not respond to chemical pesticides, so the majority of women farmers implemented the techniques shown in the videos. "*I collected the urine and produced the concoction to put on my bananas because they were infested, and I was able to get rid of the pest problem,"* said one woman respondent.

After viewing the CSA poultry video, the majority of men and women farmers in Kiboga, Kalungu, and Bukomansimbi districts adopted the practices of constructing wooden chicken homes and managing waste collected from poultry houses. Farmers stated that they learned that birds kept in a shelter are easier to monitor and feed, and the risk of infection from other birds in the neighborhood is reduced. For instance, a woman respondent said, "*I have since built a wooden structure for my chicken and because of the benefits of keeping chicken in a shelter were good, I had to implement the practice."*

After watching the video on pig management, a few women and men farmers constructed a wooden pig shelter, provided clean water to pigs, and implemented hygiene management measures in the pig sty. According to respondents, this was because the video demonstrated the benefits of keeping animals in a shelter, such as the fact that pigs would acquire more weight due to the conserved energy that would have been used to search for food in a free-range environment. In addition, animal monitoring is easy, pigs are protected from harsh weather conditions, the risk of contracting diseases from other animals is minimal, and manure collection is easier. *"I already had a pig, but*

I had never constructed a shelter for it. I used to tie the pig on a rope, and its leg had swollen, so after watching the video, I went and constructed a shelter for it. I would never sweep under the tree where I had tied it, the place was very dirty, but now I sweep the shelter, the pig moves around freely, the leg has healed, I collect manure and put it in the pit and cover it."

Because of cultural and financial constraints, some farmers could not adopt the practices shown. Some cultures, for example, do not allow women to rear pigs and chickens. The videos taught farmers to construct animal shelters with brick, cement, and sand. Most farmers could not afford this, so some built them using cheaper materials such as wood. A woman respondent stated, *"Except for changing how we prune bananas and coffee, implementing the other practices requires money; you need to build the animal shelter with cement to collect the animal droppings and urine, but we do not have money."* However, extension agents reported that a few women farmers did construct simple wooden poultry and pig housing structures using inexpensive local materials, as illustrated by one extension agent: *"I have met a few women who have constructed simple wooden shelters for pigs and chickens."*

Finally, most interviewed extension agents expressed that more information could be included in the videos. For example, the pig and poultry videos could have provided farmers with information on feeding and disease treatment (such as signs and symptoms for early illness diagnosis), as well as information on animal shelter dimensions and the different breed types to rear. Overall, extension agents advised that more comprehensive videos could deliver more information than other extension approaches.

Table 4.5: Distribution of adopted/implemented practices by FGDs based on videos: Uganda

Adopted/implemented practice after viewing video	**Women's FGDs**		**Men's FGDs**	
Soil and water management	Freq.	Percent	Freq.	Percent
Construction of soil bunds with compartments	5	38.5%	4	50%
Integrated pest management (IPM)				
Proper pruning of coffee and bananas	6	46%	2	25%
Removal and burning of affected coffee branches	1	7.7%	1	12.5%
Trapping of urine and making of concoction	4	30.8%	0	-
Mulching in bananas	1	7.7%	0	-
Pig and poultry management				
Construction of wooden pig and chicken shelters	8	61.5%	4	25%
Management of manure	3	23%	0	-
Provision of clean water to animals	0	-	1	12.5%
Cleaning of animal shelters	1	7.7%	1	12.5%
Reference total of FGD	13		8	

Note: Multiple answers were possible.
Source: Authors.

5. Discussion

5.1 Best-fit framework

We use the best-fit framework by Birner et al. (2009) described in Section 3.2 as a guide to analyze the fit of videos in agricultural extension service provision for achieving the goals of the reformers associated with this study's context: GROOTS and MAAIF. In the future, the reformers will include policy makers in the public, private, and third sectors who are interested in using videos for agricultural extension and climate information dissemination.

Table 5.1 shows elements of the "best fit" framework and discusses how the components are specific to the Kenyan and Ugandan contexts of this study.

Table 5.1: Mapping of best-fit framework to case studies

Element from framework	Kenya	Uganda
Contextual factors	**Policy environment** *Decentralized agricultural system - Agricultural service provision devolved to county level and privatized *Priority 2 of the Kenya National Climate Change Action Plan 2018–2022 targeted food and nutrition security with the first action plan being to "*improve crop productivity through the implementation of CSA interventions"* (Government of Kenya, 2018) **Production system** *Main crops cultivated include maize, bean, Irish potato, and wheat. *Promoted practices in videos include minimum tillage, cover cropping, and Zai pits. Other practices in use include kitchen gardening, mulching, and intercropping. **Community aspects** *Targeted locations are agricultural communities with large percentage of women in farming. *Presence of partner organization provided linkage and facilitated cooperation.	**Policy environment** MAAIF Agricultural Extension Department: * Uganda implemented a Climate-Smart Agriculture Programme 2015–2025, and a variety of institutions are promoting CSA (Eriksen et al., 2019). **Production system** *Main crops cultivated include bananas, maize, beans, cassava, and sweet potatoes. *Promoted practices in videos include soil bund construction, agronomic practices in bananas and coffee like pruning, removal of affected coffee branches, and banana fiber removal until the bottom, construction of animal shelters in pig and poultry, concoction formation, and manure management. **Community aspects** *Target locations are agricultural communities, mainly in crop and livestock-related activities.
Agricultural advisory service characteristics	**Governance structures** *Donor-financed pilot study (GIZ/BMZ) *Implemented by third-sector organizations (IFPRI, GROOTS Kenya), with minor involvement of public extension services **Capacity** ***Human resources*** Development and rollout of videos involved public extension officers in each	**Governance structures** *Donor-financed pilot study (GIZ/BMZ) *Implemented by third-sector research organization (IFPRI) and public organization (extension department of MAAIF) **Capacity** ***Human resources*** Development and rollout of videos involved the extension department of MAAIF and extension officers at subcounty level

Element from framework	Kenya	Uganda
	county, community-based GROOTS Kenya leaders, and GROOTS Kenya staff ***Infrastructure*** Projector, computer, meeting halls **Management** GROOTS Kenya field management **Advisory method** *25–30 farmers at each video rollout *Site-specific content *Videos recorded in Kiswahili and subtitled in English	***Infrastructure*** Projector, computer, generators, speakers, meeting halls **Management** MAAIF **Advisory method** *25–40 farmers at each video rollout; all four videos were shown at each site *Videos recorded in Luganda, Runyankole, and English
Performance	**Quality examined for:** *Content, targeting, feedback, relevance, and duration of videos	**Quality examined for:** *Content, duration of videos, timing/agricultural season of video rollout
Farm households	*Acceptability of video technology *Consideration of farming practices that farmers are aware of and using before the videos *Decision making about use of video content *Changes in practices based on lessons from videos and adoption of new practices	*Acceptability of video technology *Stating of preferences for selected practices *Involvement in video shooting *Increase in awareness and knowledge *Changes in practices based on lessons from videos, and adoption of new practices
Impact	*Women farmers described improved access to agricultural information *Increased yield *Income generation *Several women farmers expressed high inspiration for improving farming practices as a result of seeing other women farmers featured in videos *Men and women farmers gained knowledge of actual practices learned from other advisory methods	*Boosted women and men farmers' knowledge and adoption of CSA practices *Improved women's empowerment in terms of production decision making *Increased crop yield on women's plots

Source: Authors.

5.2 Contextual factors that influence "best fit"

Contextual factors influence the choice of structure of advisory service provision (recall Section 3). In the case of this study context, the agricultural policy environment in Kenya, which is devolved and privatized, allows without constraint the use of pluralistic tools in agricultural extension, such as the introduction of video technology. This decentralized system and the nation's active strategies on mitigating climate change impacts create an enabling environment for the participation of third-sector reformers. Locations for the video rollout were selected based on the local partner organization's presence in communities. GROOTS Kenya provided the linkage through which women farmers in these communities could be reached for agricultural information dissemination. Lastly, the videos' contents were developed after a baseline study that identified the CSA practices farmers were aware and that could be beneficial given the climate change challenges of each county. Zai pits were highlighted as more beneficial for Laikipia, an ASAL community, while the two other counties were targeted for minimum tillage and cover cropping. Three videos, each featuring a farmer from a county, were shown to all farmers in the different counties.[1] However, the video content was similar, with no clear delineation, for instance, in the form of statements addressing what content was targeted for which county or farmer group.

Uganda's agricultural policy environment is also pluralistic, allowing the introduction of new advisory services and the participation of nonstate actors as advisory providers. However, a public sector organization, MAAIF, implemented the intervention, involving one public extension officer per district. In contrast to Kenya, extension officers were trained and shown the video recordings prior to participating in the rollout. In Uganda, locations for the video rollout were selected based on recommendations by extension agents with regard to the farming activities featured in the videos. Before the video design, a qualitative study identified practices that women farmers were most interested in (Kawerau et al., 2023). Similar to Kenya, a baseline study was conducted to identify all CSA practices in the project districts. CSA practices that showed low uptake levels at baseline were selected, as it was hypothesized that videos would make a difference for them. Another selection criterion, also advocated by MAAIF, was the strong connection between the practices and women's livelihoods (for example, for the case of poultry and piggery). Similar to Kenya, farmers were then shown all four CSA videos.

[1] In Busia's farmers' video, promoted practices of both minimum tillage and cover cropping as well as a nonpromoted practice, mulching, were discussed. Nakuru's video promoted the same practices as Busia's, whereas Laikipia's video promoted Zai pits, mulching, and minimum tillage.

5.3 Agricultural advisory service characteristics

In Kenya, the governance structure involved in the study context includes financing by GIZ/BMZ, provision of resources and project information by IFPRI, and partnership with the local third-sector organization GROOTS Kenya, which worked with women farmers to implement the project. In Uganda, MAAIF, in partnership with Makerere University-Africa Institute for Strategic Animal Resource Services and Development (AFRISA), implemented the project. With the financing and resource provision by GIZ/BMZ and IFPRI, GROOTS Kenya implemented the video intervention with human resource capacity that involved one public extension officer per intervention county/district at the video development and CSA practice identification stage. In Uganda, MAAIF implemented the intervention. Two farmers engaged in livestock production and two farmers involved in crop production participated in the video shoot along with three public extension agents (two from Kalungu and Rakai, which are crop-related districts, and one from Nakasongola, a livestock-related district). The videos were shown to other extension agents in the four project districts, who then provided feedback that was incorporated into the videos' final versions.

Both GROOTS Kenya and MAAIF engaged an extension officer to attend each video screening for a question and answer session with each group of farmers. At the video rollouts, GROOTS or MAAIF staff transported the mobile infrastructural materials, computer, and projector to the locations where farmers viewed the videos.

In Kenya, the extension officers who went to the rollout were not the ones involved in the video development. Therefore, the quality of information that farmer groups received might have been weakened, given that extension officers themselves mentioned that being more involved in the different stages of the project could better prepared them to explain the video content. In Uganda, extension agents' involvement during the video rollout phase prepared them to answer any questions about the content, aiding farmers' understanding of the CSA practices. Farmers were given the opportunity to comment on what was missing from the videos that would have been valuable to them.

In Kenya, the project engaged local community leaders among women farmers who belonged to the GROOTS organization. These women are referred to as GROOTS Champions. One Champion was featured as a farmer in the videos in each of the three counties or districts. The women also provided mobilization support and arranged enclosed buildings where the videos could be shown to farmers at the rollout stage. During the rollout phase in Uganda, extension agents and local

chairpersons assisted with mobilization and identified venues where farmers could view the videos.

One of the most impressive concepts of the use of videos for women farmers was to feature a woman. In 67 percent of the women FGDs in Kenya, women expressed feeling happy that women farmers were featured, and in 58 percent of the women FGDs, they expressed how featuring women motivated them to improve their farm production. Among men farmers, 33 percent indicated that featuring women portrays them as agricultural experts, and another 33 percent indicated that this concept shows that women can be empowered through agriculture. In one FGD, a woman respondent stated with agreement from other members of the group that "*It felt nice seeing our fellow women being feature in the videos as they teach us on agricultural practices and skills. I was happy to see women in those videos because from that day, women in our group became motivated and empowered at the same time. Most of us used to get money from our husbands to get the household provisions but after watching the videos, we now farm and sell our produces hence becoming more financially empowered."*

Another woman respondent expressed, "*After watching my fellow women in the videos, I felt challenged to share the skills and practices I get from the videos with my fellow women farmers that did not get the opportunity to learn the videos on that day. I was inspired and motivated at the same time because I believe I can do the same practices as the Nakuru featured farmer and maybe one day be featured as well*."

While we cannot prove an association between featuring women farmers in these videos with the final outcome of adoption or implementation of CSA practices, the evidence on farmers' perception of the concept highlights the importance of gender sensitivity and the inclusion of gender perspectives when targeting agricultural information and technologies. Future research could study the outcome on adoption when specific video content is made to show how women can implement physically strenuous practices, such as minimum tillage. Such agricultural information would target women's unique needs.

In Uganda, village chairpersons are responsible for managing all social development issues in their respective communities. They are a resource that can be rapidly consulted when needed, and they are a wealth of knowledge about each individual farmer in the community. As a result, the most popular strategy used for mobilizing farmers to obtain access to the videos was correspondence with village chairpersons, who contacted farmers via mobile phones. In Kenya, farmers were

reached mainly through the GROOTS Champions, who often sought the support of village elders or leaders in reaching farmers. This strategy made it easy to retrace farmers after the pilot intervention and during the qualitative study. While both targeting strategies have been shown to reach farmers who are interested and have the capacity to implement practices, they may exclude others without the necessary networks, financial means, assets, or labor or because of their gender and social background (Brisebois et al., 2022).

To reiterate, a limitation in Kenya was that each video was not specific in promoting the targeted CSA practices. Too many crops were shown and practices other than those targeted were discussed by the farmers featured in the videos. Thus, when considering the use of a tool such as videos for agricultural extension or advisory services in the future, the local contexts of the environment in which the videos are made should capture site- and farmer-specific requirements, ensuring that content intended to be passed to farmers is emphasized. Trade-offs obviously exist between outreach and specificity, but information in videos should not be so complicated that farmers miss out on key points.

5.4 Performance/quality of service provided

For an advisory service, one performance indicator is the quality of its outputs, and it is recommended that these indicators be identified through a participatory approach with stakeholders or a clientele base (Birner et al., 2009). Thus, this study considers the outcomes of the qualitative studies with stakeholders in Uganda and Kenya—as elicited in Sections 4.1, 4.2, and 4.3—as proxies for describing performance. Sections 2.1 and 2.2 relate to the mechanism for selecting the content captured in the videos, the relevance of the selected practice, and targeting of the video. Crucially, the background of this study context shows how to involve farmers and extension officers in making a good-quality video advisory tool. The endline and qualitative studies of the project created an avenue for stakeholders to communicate feedback and discuss the perceived effectiveness and efficiency of videos for disseminating agricultural information and for bringing about adoption of CSA practices. As presented in Section 4, both farmers and extension officers considered videos to be an effective advisory tool for providing new agricultural information, reminding farmers of previously learned practices and providing visual demonstrations of the process of implementing agricultural practices. As a proxy for efficiency, farmers highlighted how videos could serve as a reusable means of access to agricultural information, for instance when available on their smartphones, and this could potentially save the

cost usually involved in engaging advisory professionals in person. Reaching women by smartphones comes with caveats, however. In Uganda for instance, cellphone ownership among women farmers is less than 1 percent versus 16 percent for men (Kato et al., 2023). Sending video-based agricultural information on smartphones is therefore less likely to reach women, at least in our study districts. The only viable approach to widely reach women farmers with videos is to stage group-level shows in villages.

5.5 Farm households

Farm households were engaged at different stages of the project in both countries. During the baseline survey and the qualitative study, the project sought to understand households' capacities by learning about their farm practices and preferences. During the endline survey and the qualitative study, households were also asked about changes in their practices, enabling agricultural extension reformers to understand the performance of the video tool and its possible impacts. Furthermore, farmers were allowed to discuss their perceptions of the acceptability of video technology as an innovation in agricultural extension. Women farmers were asked about their decision-making power in the context of implementing the practices learned in the videos and all participating farmers were consulted about recommendations for future videos.

The attention paid by the project to the voices of farm households is a crucial characteristic that aligns with the "*best-fit*" framework. According to Kawerau et al. (2023), one way to institutionalize farmer participation and increase learning from peers could be low-cost videos produced on-farm with the help of extension officers or trained farmers. Another important aspect highlighted by our results is the need to focus on intrahousehold decision making. The strategy by MAAIF to also invite men to the video sessions may have been helpful for realizing changes, because it involved men in women's adoption decisions. In Kenya, many women reported not being able to implement practices because of a lack of decision-making power. This is consistent with the findings of Abate et al. (2023) who found that while their video intervention in Ethiopia increased women's access to extension, it did not increase their adoption, suggesting that underlying gender inequalities need to be addressed.

5.6 Impacts

This study contributes to understanding impact pathways that lead from watching videos to awareness, knowledge, and adoption of practices. For actual impacts of the videos as depicted in

the conceptual framework, we focus on yield, productivity, and empowerment, and draw on findings from two representative household surveys that compared control and intervention sites. As a reminder, many of the control sites participated in video showings after the quantitative impact assessment had concluded (Kato et al., 2023; Ndegwa et al., 2023).

For Kenya, as adoption was very low, no significant impacts on these outcomes could be detected (Ndegwa et al., 2023). Quantitative evidence shows that the videos had significant impacts only on increasing women's awareness (by 9–12 percent compared to control villages, depending on the practice) but no impacts on adoption (Ndegwa et al., 2023). Increased awareness in Kenya appeared not to have been sufficient to increase uptake of CSA practices among study participants. Yet other binding constraints hampered adoption. In the FGDs, some women reported not having sufficient decision-making power within the household to change farming practices, while others referenced environmental and biophysical constraints, such as lack of water and invasion by wild animals like elephants, that generally reduce motivation for farming or trying new practices.

Second, it became evident from the FGDs that women often adopted practices other than the promoted CSA practices (for example, mulching and terracing; see Section 4.3.1). These adopted farming practices had a common attribute: farmers could easily relate to them. This could be through recalling previous learning or recognizing the simplicity of the techniques required and possible immediate application. For example, mulching videos reminded farmers of the usefulness of weeds and maize stems, which were readily available resources. Another factor influencing adoption was the time-horizon risk and the adoption costs (for example, labor). Practices like terracing, minimum tillage, and Zai pits require labor-intensive procedures such as digging. Terracing was the most widely adopted practice, while farmers had little awareness of Zai pits. Terracing has the shortest wait time for outcomes, while minimum tillage requires a longer period before its impact can be seen, thus farmers may perceive a food security risk. These suggest that (1) videos can serve as handy tool to remind farmers of sustainable practices, and (2) it is easier for farmers to make adoption decisions when (a) they can assess the required resources and their accessibility, and (b) there is a lower investment cost or associated risk.

For Uganda, the qualitative results are largely consistent with the quantitative analysis measuring video impacts in the same study sites (Kato et al. 2023). Kato et al. report robust significant positive impacts of the videos on several welfare outcomes, including knowledge, awareness, adoption, crop yields, empowerment, and resilience.

Compared to women in control villages where videos were not shown, impacts on women's knowledge on CSA practices and associated linkages to climate change mitigation in treated villages ranged between 4–16 percent, depending on the video (Kato et al. 2023). The climate smart pig management video increased women's knowledge by 16 percent, the climate smart poultry management video by 11 percent, the soil bunds and soil management video by 9 percent, and the IPM video by 4 percent (Kato et al. 2023). The differences in knowledge impacts across videos might indicate the level of knowledge gaps that existed among women on the technologies shown. The two videos on animal keeping especially promoted knowledge on scientifically appropriate management of animal manure at farm level to minimize greenhouse gas emissions. Alternatively, the differences in knowledge impacts might be due to women's increasing interest in participating in pig and poultry income-earning enterprises. While the videos significantly improved men's knowledge levels (with impacts varying between 2–19 percent, depending on the video), women's knowledge levels were close to those of men (Kato et al. 2023), suggesting the potential of videos to reduce gendered knowledge gaps in the use of CSA practices.

In Uganda, the videos significantly improved women's adoption of CSA practices by 10–13 percent, depending on the type of practice (Kato et al. 2023). None of the practices were new to farmers, so adoption might rather have been driven by the knowledge on adapting to climate change and increasing productivity. Videos increased women's adoption of soil bunds (by 11.0 percent), composted pig manure (9.6 percent), and composted cattle manure (12.6 percent); however, no adoption impacts were found for IPM, poultry keeping, and manure, or on men's adoption rates (Kato et al. 2023). For soil bunds, this might be due to women seeing women driving forward a task—soil bunds—that might be more typically associated with men's activities. Moreover, women had indicated during the FGDs that soil erosion was a key challenge for them. Crop yields on women's plots improved by 16–65 percent, and women's empowerment in production decisions increased by 8 percent. Importantly, however, no impacts were found on women's work balance. The implementation of the new practices learnt from the videos was also found to have reduced women participation in leadership, possibly because the practices were time-consuming and women spent more time on the farm, as revealed during FGDs carried out in Uganda (Kato et al. 2023).

Former research on advisory services in East Africa corroborates these findings. In Uganda, NAADS had relatively higher success in promoting improved varieties and other yield-enhancing

practices, and relatively lower success in improved soil fertility management, for which other constraints like the lack of financial services were more binding (Benin et al., 2007). In Ethiopia, Hörner et al. (2022) found that videos in addition to model farmer training increased farmer knowledge on more complex aspects of the promoted technology package and reached a larger number of (non-training participating) farmers.

Given the differences in practices showcased in the videos in Kenya and Uganda as well as differences in video rollout, a direct comparison of adoption levels is not feasible.

6. Conclusion

In this study, the use of participatory video extension considered the voices of women farmers and engaged different levels of stakeholders, enabling the video intervention to reach women farmers with agricultural information. The video development also accounted for local context (for example, the language and agricultural practices in the locations where farmers were shown videos).

Our qualitative study of the video roll out contributes to the literature in two ways: by shedding light on the gendered perceptions of farmers and extension stakeholders on video-based agricultural extension, and by discussing the possible fit of videos in agricultural advisory services in Kenya and Uganda. Our results show that videos can be a useful extension tool for both more privatized and NGO-based and public actor-based extension systems.

Lessons learned include the importance of farmers' participation in all stages of a video intervention, the importance of featuring women in the videos, and the need for relevant content in future video tools. Practices were more widely adopted when latent knowledge was activated, when farmers' aspirations were triggered, and when women's preferences (and constraints) were addressed. Therefore, videos might have an advantage for practices that are already known to farmers and where knowledge can be deepened. For new practices, other extension methods might be more suitable.

The study identified several avenues for improvement of videos. These include the content of videos and coordination with public agricultural extension officers, who were engaged at the development and rollout stages. Given challenges experienced with electricity access and finding suitable locations—particularly due to the COVID-19 pandemic—the use of tablets for showing videos could be considered. Specific videos on aspects like pest management could be combined

with more general videos on farm management strategies like diversification or on empowerment perspectives. Both MAAIF and GROOTS possess institutional influence that can contribute to scaling up the use of videos. MAAIF's influence at the institutional level and GROOTS's influence at the grassroots level make them valuable stakeholders for promoting the wider adoption and implementation of videos. In Uganda, videos have been used extensively in the health sector. For videos to be used effectively in the agriculture sector, trained personnel should be available at the subcounty level to operate the video equipment. At the village level, agricultural mobilization teams that arrange suitable venues for showing videos and context-specific dates to show them (for example, in the evening hours) proved to be helpful. Our study showed that despite the challenges with equipment and infrastructure in the field, videos could be integrated rather easily in public extension services. Studies with other extension actors could support a better understanding of their perceptions and incentives for promoting video-based extension services. For instance, Namyenya et al. (2022) studied the role and determinants of performance of extension managers in Uganda, and stressed the importance of incentives for extension stakeholders. Lastly, agricultural development projects and other nonstate extension actors could use this approach for their extension components.

Given the short duration between the video intervention and this study, data on the impact of this video intervention on climate resilience could not be obtained. However, from the perception shared by stakeholders and as described in the results, the video provision improved men and women farmers' access to agricultural information, motivated farmers to improve their practices, and, at the time of the study, women farmers had already implemented some practices shown in the videos. Further research is recommended on resilience and other welfare outcomes, as well as on the programs' cost-effectiveness. Moreover, our studies did not address the potential of increasing inequalities between farm households. Households that are not part of farmer organizations, that are less well connected, or that have less financial capacity to implement beneficial practices might be left out.

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