Research Article

A Pilot Study Using Educational Animations as a Way to Improve Farmers' Agricultural Practices and Health Around Adama, Ethiopia

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Abstract

This study focuses on the potential of animated videos in educational programs with low-literate farmers around Adama, Ethiopia. Scientific Animations Without Borders (SAWBO), a University of Illinois initiative, focuses on the creation of animations to explain complicated concepts in a simple and visual way that can be used to improve farmers' livelihoods in rural areas worldwide. Adama Science and Technology University (ASTU) has been collaborating with SAWBO in promoting, disseminating, and evaluating the deployment outcomes of educational animated videos (animations). In this pilot study, we investigated participants' attitudes toward such animations and surveyed them regarding the social settings and pathways through which they might obtain such animations, thereby determining potential approaches for a larger-scale release. We observed that animations were well received by the participants, who, when surveyed, liked the clarity of the audio and the message in their local languages as well as the animation presentation and duration. Additionally, respondents suggested potential deployment approaches using organizations familiar to them. This holds out the possibility of using informal social groups or traditional community-based organizations like iddirs *and* equbs *as dissemination pathways. These combined data suggest that individuals in this region are open to the use of animation as an educational tool and as a pathway for their social improvement and economic advancement. We also present, based on our findings, a model for a larger-scale deployment pathway.*

Introduction

Educational opportunities have long provided people with alternatives for earning a better income and increasing their chances of lifting themselves out of poverty. An increased level of education also provides individuals with the knowledge they need to be able to contribute to local community building (Umekachukelu, 2011). However, for low-literate (including illiterate) learners, gaining access to educational information has classically been and will likely continue to be a significant challenge in developing nations. Additionally, pedagogical approaches to educating low-literate learners have dramatically lagged behind those of literate learners. This is further exacerbated by the fact that many low-literate learners live in remote and rural areas that are often difficult and costly to reach.

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Easy access to communication channels in developing countries is changing the options for accessing information and knowledge. Low-literate sectors of developing countries' societies learn to solve their problems in diverse ways. For example, according to Murphy (2012) facilitated group learning is a potentially valuable component of a participatory problem-solving approach in agricultural extension programs that support innovation among farmers. Additionally, Ladeira and Cutrell (2010) and Medhi, Menon, Cutrell, and Toyama (2012) demonstrated the potential of instructional videos in learning gains for, respectively, low-income learners and low-literate learners. Finally, Medhi, Prasad, and Toyama (2007) demonstrated the effectiveness of using static hand-drawn images in educational strategies with low-literate learners. Combined, these observations suggest the potential of using animations in educational programs, even as a discussion starter for group learning.

In many rural areas of Africa, the radio is a critical mass media mechanism for accessing information; however, with technological changes emerging in the field, live action or animated video (or both) is a potential competing or complementary approach for deploying information (Ramirez & Quarry, 2004). For example, the cellphone industry is growing rapidly across Africa and may ultimately be a technological mechanism for sharing educational content with local groups in their local languages. Two major advantages of cellphones are that they are easy to use and highly transportable from place to place. Cellphones' incredible impact on the economic activities of nations, businesses, and small-scale entrepreneurs can be considered a paradigm shift in the way these organizations interact internally and with the outside world (Ogbomo & Ogbomo, 2008). These technological shifts, in information and communication technologies (ICTs), also hold great potential for new paradigms in education. For example, creating relevant educational animations (with input from global and local experts) in local languages offers the possibility of strengthening the livelihoods of people living in rural areas by giving them greater access to ideas they can incorporate into their lives.

Even though the cellphone industry is reshaping and revolutionizing communication globally, some cultural and institutional barriers must be addressed to determine if portable video-capable electronic devices can play at least a complementary role in breaking down educational obstacles for low-literate learners. However, communication technologies are rapidly changing; thus, the greater question is, how can we create educational content and facilitate deployment pathways of that content so low-literate learners can use both? Although cellphones represent one deployment technology, the greater issue is how we can develop socially acceptable content usable across emerging video-capable devices. Additionally, as we live in the age of hyper-collaborations and crowdsourcing, such studies as ours can be the basis for novel approaches to deploying content in cost-effective ways, both including and beyond the traditional deployment through agricultural extension agencies and other governmental institutional organizations.

Government-funded agricultural extension programs have traditionally played an active role in transferring and disseminating information. Additionally, they are the primary local or country-wide source for implementing agricultural technologies in developing countries. However, there is an emerging potential for new partners to participate in this process. In today's global context, new opportunities exist to bring organizations, beyond agricultural extension agencies, into these aforementioned roles (Cho & Bolan, 2002). Evidence also shows that the old linear model of knowledge transfer (scientists → users) is outdated and should be replaced by an interactive model of networked systems, which integrate knowledge production, adaptation, advice, and education (Murphy, 2012). Such models can also include a feedback loop, from the end users, via intermediary groups, to guide the development of new content. In this new environment, local stakeholders have the potential to connect with universities as well as other local formal and informal institutions and to have an increasingly active and impactful voice in international development.

The capacity of these new participants to find innovative ways to interact with low-literate learners can potentially bring novel approaches to international development and aid. Such programs for achieving new ways to deploy information into the hands of farmers, women, entrepreneurs, etc., may ultimately come from local universities, civil societies, community-based organizations (CBOs), nongovernmental organizations (NGOs), and other new providers. Two of the more well-developed and extensive CBOs in Ethiopia are the *iddirs* and *equbs,* representing potential important deployment partners for scaling of animated content (i.e., those that can use them in their own educational programs). *Iddirs* are autonomous, voluntary financial and social organizations. According to Pitamber (2003), an *equb* is a traditional Ethiopian saving and credit

association. Its purpose is to pool members' savings in accordance with rules established by the group. Such organized communities of practice, coupled with country partner groups, represent a logical mechanism for the deployment of educational content to target groups within communities.

Scientific Animations Without Borders (SAWBO) focuses on creating educational animated videos (animations) to enhance learning and training for low-literate learners with limited access to information. SAWBO does not directly deploy its animations in the field, but instead creates content with partner groups through virtual online processes with global and local experts to create these educational materials. Then SAWBO provides these animations free of charge to all in-country partners to use for educational purposes in their local programs. However, to bring more actors into the educational process of disseminating such animations, the appropriateness of that content locally must first be determined. Thus, before making the effort to develop a larger community of practice to deploy SAWBO educational materials in Ethiopia, we must address the following issues:

- How acceptable do people in a given country or region find the SAWBO animations?
- Do they think the content would be useful in their context?
- Do they have access to mechanisms for watching and sharing such content?
- What are logical deployment pathways and the role of informal social institutions?
- How to obtain feedback to drive new content development of importance to these given regions?

The animation topics selected for pilot deployment discussed preventing malaria, using bed nets, preventing cholera, preparing an oral rehydration solution, and preparing a natural pesticide from neem seeds. The videos were motion graphic three-dimensional (3D) animations with an average duration of three minutes.[1,2,3,4,5] The animations have human characters as necessary and settings (such as houses and other objects) representing the environment within which the topic can be properly explained. While the characters in the animations are shown performing the steps, the step-by-step procedure is also explained in a selected local language (e.g., Afan Oromo). Each video has a voice overlay in a specific local language, and it is possible to have as many versions of the same content in different local languages as desired. In the neem seed video, for example, a farmer is shown harvesting seeds from a neem tree, selecting good seeds for making the pesticide, drying them in the sun, grinding the seeds, preparing a pesticide solution extract from the neem seed powder, and spraying the prepared solution on the crop. At the same time, the voice overlay explains in a local language how and why each step in the procedure is performed. The cholera prevention video explains how cholera transmission occurs via consumption of contaminated food or drinking water. The video describes several techniques that help prevent cholera, including how to treat water, wash hands, and seek medical advice when someone has symptoms of cholera. The oral rehydration solution (ORS) animation shows how to create an ORS solution using clean water, salt, and sugar.

Our study's intent was to determine the potential usefulness of the currently available animations listed above and to set the agenda for future animation development and deployment driven by an in-country academic institution. We used both quantitative and qualitative assessments to develop a proposed pathway for larger-scale content deployment and a feedback loop strategy for future content creation.

Literature Review

An increasing number of development projects use live-action and animated videos as a component of their training programs and as supporting materials for their educational training (see Bello-Bravo & Baoua, 2012; Bello-Bravo, Olana, Enyadne, & Pittendrigh, 2013; Bello-Bravo & Pittendrigh, 2012; Ghandi, Veeraghavan, Toyama, & Ramprasad, 2007; Ladeira & Cutrell, 2010; Medhi, Cutrell, & Toyama, 2012; Medhi et al., 2007).

1. Malaria prevention: https://youtu.be/dnugDchZL10
2. Malaria prevention (Bed Nets): https://youtu.be/E5e_QobqE3Q
3. Cholera prevention: https://youtu.be/TQQycDb2tdY
4. Oral rehydration solution: https://youtu.be/aQJoMKrt7Wg
5. Natural pesticide from neem seeds: https://youtu.be/t_LruzIC6vQ

In this section we highlight some of the research that has focused on the uses of videos for agriculture and health in developing countries.

A 2010 study by Van Mele et al. found that around 78% of development organizations, including institutions such as universities, research institutes, and NGOs, use live-action videos in their training programs with farmers. Videos' flexibility has multiple advantages, especially for agriculture training in developing countries (Van Mele, 2011). For example, videos can be shown almost anywhere at any time, when and where the proper audio and visual equipment is in place (Coldevin, 2003). Furthermore, Digital Green uses live-action digital video to disseminate agricultural information to small farmers in India (Ghandi et al., 2007). Digital Green has observed video-based training to be more effective than a traditional extension system in increasing the adoption of some agricultural practices. Additionally, the cost-per-adoption is more effective and less expensive than the classical extension system.

Regarding video use in the health sector, a 2007 research study using and comparing different visual representations of common illness symptoms (Medhi, Prasad, & Toyama, 2007) found that information provided in the live-action video and static hand-drawn images were accurately understood. A series of instructional live-action videos were also used to teach domestic workers in urban India. Ladeira and Cutrell (2010) found that participants were more motivated to pay attention to the live-action video and the motivational content-enhanced learning. Additionally, videos have the capacity to explain complicated concepts and raise awareness and influence people's decisions in a simple manner (Lie & Mandler, 2009). There are precedents for combining visual and audio approaches in educational programs. Cognitive learning emphasizes information processing theory that involves receiving, constructing, transforming, remembering, and storing information. Using visual and audio approaches, learners can connect existing knowledge with external stimulus in long-term memory. Information processing allows individuals to transfer and store information as well as to assimilate new ideas (Bovy, 1981). Visual information encourages learners to assimilate, process, associate, and connect concepts and abstractions that serve the learning process.

Visuals can facilitate the elaboration of new concepts, actions, abstractions, etc., that can impact the cognitive path (Scott, 1994). Regarding the information itself, the preferences of the learner will influence assimilation and the processing style of the learning path (Eastman, 2010). For instance, some learners prefer or remember visuals better than verbal or audio messages. Thus, in some circumstances visuals have an advantage over written text. In fact, it has been proposed that a considerable amount of human communication is nonverbal (Mehrabian, 1981). The visuals in a video could facilitate the learning process for low-literate learners. Lie and Mandler (2009) suggested that videos are an effective way to explain complicated concepts. Agricultural techniques, which are often difficult to describe in words, can often be demonstrated with visuals (see Ghandi et al., 2007).

Powerful images have the potential to remove some of the learning obstacles for low-literate learners. However, two critiques of the video-based approach state that it will likely not replace all aspects of traditional training approaches, and the potential of that approach has not fully been evaluated in training programs (Gurumurthy, 2006; Van Mele, 2011; Van Mele et al., 2010; Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009a, 2009b, 2010). Conversely, extension agents may deploy video-based educational approaches as one more tool for a given message, even if videos ultimately do not replace many other highly effective strategies. One advantage of freely accessible video-based materials, available to anyone who can download the material, is the potential to include many actors and agents who traditionally have been unable to play a role in this educational development process. Thus, instead of videos replacing traditional extension approaches, the potential exists to allow a greater number of people to access educational materials. Additionally, based on the SAWBO model, learners can now be involved in creating material, adapting existing material, and using and disseminating these materials in their own educational programs. One goal of making such animations freely available is to increase the numbers of actors involved in traditional extension and outreach processes.

Partners for the Process

Ethiopia's Adama Science and Technology University (ASTU) is a public university that closely partners with SAWBO to generate, translate, and deploy educational content via animated videos based on local needs. In so

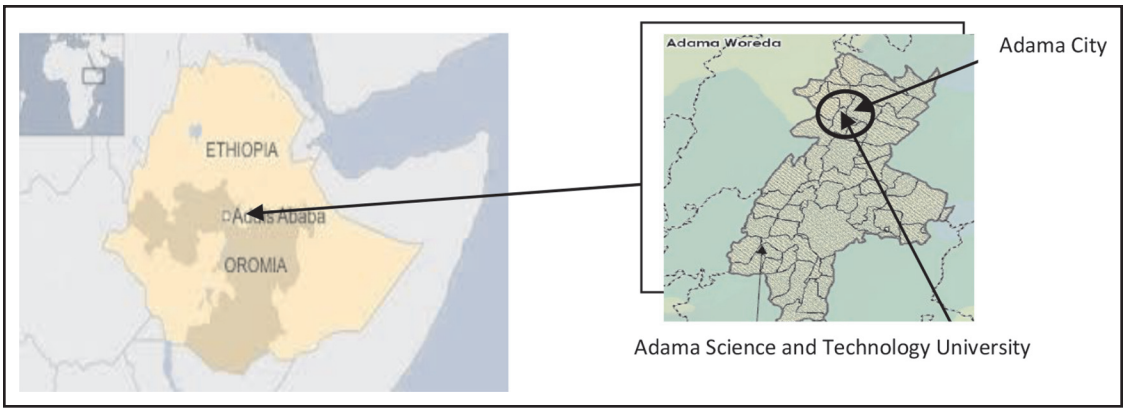

Figure 1. Map of Adama woreda*.*

doing, the partners engage several actors from public, private, and CBO communities. SAWBO is based at the University of Illinois at Urbana-Champaign and provides educational materials in the form of animations in local languages. SAWBO continuously develops educational animations on a variety of issues and topics to improve the livelihoods of low-literate learners in several parts of the world, particularly in developing countries. Educational materials developed through such collaborations in the form of animations are made available for users—farmers, for example—in multiple local languages.

The animation-based educational materials developed through partnerships and collaborations are freely made available through various approaches, including online systems for easy download, using any local video-supporting devices (e.g., VCDs, DVDs, cellphones, tablets, computers, projectors, etc.). For learners with low bandwidth, full and mobile versions of these animations can be downloaded from SAWBO's websites. Animations are also available via the online journal-style system known as the *Sustainable Development Knowledge Interface* (*SusDeViKI;* http://susdeviki.illinois.edu) (Bello-Bravo & Baoua, 2012; Bello-Bravo & Pittendrigh, 2012; Bello-Bravo et al., 2011; Bello-Bravo et al., 2013). Like many other developing countries in Africa, Ethiopia has many needs for such educational content. While more than 80% of the population lives in rural areas dependent on agriculture, many socioeconomic issues can only be addressed through awareness creation via formal and informal educational interventions.

One primary purpose of the SAWBO-ASTU partnership is to produce and deploy educational animated videos that communities can use to improve their health and agricultural practices. However, before large-scale production and deployment of educational materials are possible, small-scale deployment and feedback collection on existing educational materials were necessary. As a result, a pilot deployment project was designed and implemented in selected *kebeles* within the Adama *woreda.*[6] The initiative was based on educational materials provided by SAWBO and translated into local languages by ASTU volunteers.

Target Deployment Region

Ethiopia is home to more than 50 languages, which provide immense opportunities to create animations in multiple local languages specifically appropriate within a local context. Although illiteracy has steadily decreased in Ethiopia in recent years, literacy rates are still low, especially in the countryside. Oromia is Ethiopia's largest regional state. Adama *woreda* is one of Oromia's counties located in the Great Rift Valley nearly 90 kms from Addis Ababa, Ethiopia's capital city. Adama city, where Adama Science and Technology University is located, is located in Adama *woreda.*

6. Ethiopia is divided into eight regional states, each subdivided into zones. The zones are further partitioned into woredas *that are roughly equivalent to a county in the United States or United Kingdom.* Woredas*, in turn, are divided into* kebeles*, administrative units consisting of several villages (Hoddinott, Dercon, & Krishna, 2005).*

Methodology

The study presented in this article occurred in three stages. In the first stage we held a consultative meeting, at which all the project's interested partners were invited to participate in the discussion and decision-making. Through this consultative meeting, along with the proposed pilot deployment to be used in the *kebele* context, we acquired a better understanding of the *kebele* organizational structure and the challenges of using animations as training materials within these communities. In the second stage, ASTU provided training programs to nine *kebeles* on downloading and using the selected animated videos. The third stage included the design, use, and analysis of the follow-up surveys.

Stage 1: Consultative Meeting

We planned a four-phase pilot deployment of the educational materials, which involved organizing a consultative meeting, training extension agents who would be involved in the deployment, conducting the pilot deployment, and performing follow-up surveys to generate feedback on the educational materials. SAWBO developed the selected educational animations on universal needs that impact lives in developing countries. Among the topics were cholera prevention, malaria prevention, tuberculosis prevention and treatment, as well as prevention of postharvest loss in major cropping systems.

The consultative meeting was conducted in collaboration with the Forum on Sustainable Child Empowerment Adama Area Program Office, a local NGO, on December 7, 2012. The meeting's primary purposes were to promote the SAWBO-developed educational animations that were locally translated into three major Ethiopian languages (Afan Oromo, Amharic, and Tigrigna) and to elicit discussions among stakeholders on the nature of the animations and alternative approaches for deployment around Adama. In the meeting, participants represented various local government offices, NGOs and CBOs in and around Adama, *kebele*s in the Adama *woreda* (health extension agents, agriculture extension agents, *kebele* chairpersons), Adama *woreda* administration (PR and Health Bureau), Adama Science and Technology University (vice president for research and post-graduate studies and the schools of Health and Agriculture), a local CBO (Eniredada Iddir), and three NGOs (FSCE, FGAE-CAO, and Remember the Poor-RPC).

Participants were introduced to SAWBO's educational materials and given the SAWBO animations. The meeting purpose and project plans were explained. Participants viewed the animations that were available in local languages. They were then asked to form small groups and discuss what they had learned from each animation, what they thought about the videos, if they believed the videos would be helpful to their communities, and how the animations could be improved. The outcomes led to the selection of nine *kebeles* for the initial deployment. The participants also discussed which features of the animations could be improved prior to deployment. They also recommended making the animations available on DVD in addition to sharing them via cellphone. Other recommendations were made on holding meetings with health and agricultural agents in each target *kebele*, allowing them to use flexible pathways to reach communities (mainly farmers), depending on local circumstances. Participants suggested the need for health and agriculture agents to attend a technical training session before involving them in the pilot deployment.

Finally, details of the pre-deployment training were explained and a common understanding of the nature of the pilot deployment was discussed. The nine *kebeles* where pilot deployments were going to occur were selected through a participatory approach. The main selection criteria for those *kebeles* were geographical convenience and preference of *kebele* representatives, including health and agriculture agents. The selected *kebeles* were Debibisa Wachu Lafa, Goraja Ferda, Merebe Mermersa, Adulala Hatttie Harore, Wake Miya Tiyo, Dabe Dengore, Kobo Luto, Wonji Kuruftu, and Kechema.

Stage 2: Training Program

Following the decisions of the consultative meeting, all healthcare extension and agricultural development agents from the nine selected *kebeles* were invited to attend a training session on January 17, 2013. For that particular training and pilot deployment, 10 3D animations were made available for distribution in the Afan Oromo and Amharic languages. The animations were on a diversity of topics, including malaria prevention, bed nets, cholera prevention, ORS, and creating natural insecticides from neem seeds.

Thirty-five agricultural extension agents and health extension workers from the nine *kebeles* attended the training. They received the educational materials and were shown how to share animated videos via smartphones with farmers. These animated videos were placed on cellphones (3gp format) and on 100 DVDs for distribution. Trainees learned how to download the animations from SAWBO's websites and place them on smartphones, how to copy the animations from their cellphones to other cellphones, and how to copy animations in different formats between DVDs and from DVDs to cellphones.

In general, the aim of the pilot deployment was to distribute the animations to users on a small scale before embarking on a large-scale deployment that would cover more regional states and additional local languages. Although SAWBO had earlier successfully deployed videos in other African countries (Bello-Bravo & Baoua, 2012), this was the first attempt in Ethiopia. The deployment's other objectives were to:

- evaluate the perceptions of farmers, local administrators, and extension agents who watched the videos on the usefulness, message clarity, and other features;
- examine the respondents' intentions to use and share the animations within their target groups;
- identify alternative and preferred deployment pathways to ensure further accessibility of the videos to users;
- document lessons learned for further development of educational animations and large-scale deployment; and,
- identify potential stakeholders who would be needed in future efforts.

Stage 3: Conducting the Survey

Design

The period between the training in mid-January 2013 and the follow-up survey in mid-June 2013 gave trainees about five months of pilot deployment time. Of the nine *kebeles* represented in the training, six were randomly selected for the survey. The survey's purpose was aligned with the objectives set forth in the pilot deployment. The *kebeles* selected for the survey included Adulala, Dongore Denku, Guraja Ferda, Kechema, Wake, and Wonji Kurifitu.

For the survey, four versions of the questionnaires and the interview guides were designed to collect data from the following four groups: farmers, local administrators including *kebele* administrators, health agents, and agricultural extension agents. The SAWBO team at the University of Illinois and a country consultant based at ASTU developed the survey questionnaires. Before data collection began, the questionnaires received approval from the Institutional Review Board (IRB) at the University of Illinois. In the data collection instruments, we recorded the perceptions and opinions of the four subject groups.

Six data collectors were hired and an independent survey coordinator was assigned. A training session was arranged for them in June 2013 on data collection procedures and use of data collection instruments and tools. Additionally, selected representatives of health and agricultural agents, who were actively involved in the video deployment for the selected *kebeles,* were called to ASTU for further survey orientation. During this training, a brief orientation on the detailed survey procedures was given to extension agents regularly stationed in the *kebeles,* who were needed to facilitate the data collection process in their respective *kebeles;* data collectors and/or enumerators who were well-informed about the detailed procedures, the tools designed for data collection, and on how to obtain assistance from representatives in each *kebele;* and a survey coordinator, who was also made aware of all the procedures, including mechanisms to supervise survey takers and the follow up the process.

Data Collection

Survey data collection was conducted during the first two weeks of July 2013. For each *kebele,* 25 questionnaires were prepared. The distribution of these questionnaires among the respondents is shown in Table 1. Since six *kebeles* were selected for the survey, 150 questionnaires were made available. However, despite the efforts made to collect data from all target groups, 138 were returned, for a response rate of 92%. During the data collection process the enumerators read the questions for the respondents and recorded their responses.

Table 1. Targeted Number of Groups and Number of Questionnaires Distributed and Received for Those Groups.

Targeted respondents	Number of questionnaires per *kebele*	Total questionnaires distributed (received)
Local administrators	1	6 (6)
Farmers	20	120 (108)
Health extension agents	2	12 (12)
Agricultural extension agents	2	12 (12)
Total	**25**	**150 (138)**

Table 2. Respondent Gender and Educational Profiles.

Respondents' profiles	Response categories	Number of responses	Percentage of total responses (%)
Gender	Male	69	64
	Female	39	36
	Total	**108**	**100**
Educational status	Illiterate	21	19
	Grades 1–6	59	55
	Grades 7–8	10	9
	Grades 9–10	13	12
	TVET* and other	5	5
	Total	**108**	**100**

**Technical and Vocational Education and Training*

Survey Results and Discussion

The survey primarily considered the views of the participants, the health and agriculture agents, and the local administrators who were directly involved in the process. Table 2 shows the respondents' gender and educational status.

The majority (81%) of respondents had attended some type of formal schooling. However, only 5% earned a diploma or beyond. Close to 20% of respondents never attended school and were considered illiterate, that is, unable to read or write.

Farmers' Perceptions of the Educational Materials

As indicated in Table 3, participant responses suggested the farmers who viewed the animations liked them (99%) and found the messages clear (99%). All respondents perceived that the messages were useful and improved their understanding of the issues explained in the animations. Videos on health (e.g., cholera prevention, bed nets, malaria prevention, and ORS) were widely disseminated (watched by 88% of the respondents), while only 12% of the respondent farmers watched the animations on agriculture (pesticide made from neem seeds). When they were asked if they would apply the techniques they learned from the animations, 79% stated they were ready to apply some of the concepts and indicated that the content was of use to them. Which factors make this information useful or not useful to specific individuals remain to be determined.

Farmers' Suggestions for Future Topics and Focus of Future Animations

Further responses obtained from the participants suggested that the deployed educational materials had practical relevance for their day-to-day lives. When asked if they remembered the messages they watched on the

Table 3. Farmers' Perceptions of the Animations.

Respondents' perceptions of the animations	Response options	Number of responses	Percentage of total responses (%)
Did you like the videos?	Yes	107	99
	No	1	1
Were the messages clear?	Yes	107	99
	No	1	1
Do you think that educational videos like the one you watched could be useful to improve your quality of life?	Yes	108	100
	No	0	0
	Not sure	0	0
Could you use the information from the video you watched?	Yes	85	79
	No	23	21

Table 4. Farmers' Access to Mobile Phones.

Response category	Response options	Number of responses	Percentage of total responses
Do you have access to a cellular phone?	Yes	49	45
	No	59	55
If you have or had a cellular phone, would you like to have these videos on it?	Yes	95	88
	No	13	12

videos and which ones they remembered, the following core messages emerged as highly rated content: how to boil and purify water to prevent disease, practical ways to prevent malaria and cholera, washing hands after using the toilet, using bed nets, and preparing oral rehydration solutions.

Devices Used to Distribute Educational Materials

In Ethiopia, access to mobile phone services is improving progressively. And the number of schools and health centers with TV access has been increasing. This provides both short- and long-term opportunities to disseminate the materials using VCDs and DVDs in addition to mobile phones. Nevertheless, using mobile phones to disseminate animated videos proved to be a challenge due to limited access to the phones. In addition to the number of cellphone users in the community, as shown in Table 4, the dissemination challenge was also due to limited literacy among farmers on operating their phones, especially those phones with sophisticated functions.

As indicated in Table 4, nearly 45% of the farmers had access to mobile phones. However, it is expected that some of these phones may lack the features that support video. Participant responses revealed another interesting finding: Although some lacked a personal cellphone or access to one, they wanted to get the videos on their phones when they did own or gain access to one with video capacity. This intention is important from the perspective of future large-scale deployment of educational materials. It should also be noted that ownership of or access to a smartphone is not the only option available to farmers who would like access to the educational videos. Since the videos can be prepared in formats playable on various video-supporting devices, alternatives are available. Additionally, one can view content on the phones of others in their community. Thus, direct ownership may not be critical for accessing educational content, a concept that needs to be tested in future studies.

Table 5. Suggested Pathways for Deployment of Animated Videos.

Response category	Response options*	Number of responses
In your opinion, what is the best way to show the educational animated videos?	Show directly by development (agriculture and health) agents to farmers	21
	Show at FTCs	33
	Show to women's associations	57
	Show at CBOs such as *iddirs, equbs,* etc.	65
	Show at health centers	60
	Show at *kebele*-level public meetings and events	7
	Distribute to households	43

**Multiple responses were accepted per respondent. Group descriptions are given in Table 1.*

Pilot Deployment

During pilot deployment, the extension agents reported they used their own creative approaches to disseminate the materials to as many farmers as possible. Survey results indicated they used various approaches to make the videos accessible to their communities, which included:

- showing the videos to individuals or groups of farmers from their own cellphones and sharing the videos with farmers who had their own video and Bluetooth®-capable devices and
- distributing the videos on DVDs to selected households owning DVD players, then those households watched them with their neighbors during social gatherings.

The extension agents also provided some DVDs to *kebele* women's association leaders. CBO (e.g., *equbs* and *iddirs*) coordinators gave copies of the videos to health care centers and FTCs. The extension agents followed up on the videos they distributed to make sure that as many farmers and other community members as possible had an opportunity to watch the videos at least once.

Preferences for Deployment Pathways

During the survey, respondents were asked (as shown in Table 1) which deployment pathways they found more successful than others in getting the videos to as many farmers as possible. As summarized in Table 5, alternative pathways are available in Ethiopia to serve as preferred deployment approaches. The available social and institutional setups within a community could serve as ready-made deployment infrastructures for SAWBO animations. Such formal and informal institutional arrangements may allow for dissemination of educational materials when farmers gather for other purposes. This may provide a platform to reach large numbers of target groups.

Preference for Accessing Animated Videos

Farmers' responses on how they preferred to access similar videos in the future clearly showed there are alternative or a mix of alternative deployment pathways. Based on their responses, *iddirs* and *equbs* are the most preferred pathways. Secondarily, viewers would prefer to watch similar videos at health centers/clinics because such centers usually have TVs and video players for patients and their companions to watch while awaiting their appointment. The third suggested approach was to distribute the animated videos through women's associations. Women's associations are formal groups that arise out of *kebele* initiatives. From the survey responses, it is evident that even male respondents suggested this pathway. We know this because 57 survey respondents suggested this approach, but only 39 survey participants were female.

Community-Based Organizations

Given the responses regarding the role of CBOs among Ethiopian communities, it is important to give due attention to CBOs when planning a large-scale deployment. It has previously been shown that *iddirs* are familiar institutions in Ethiopia (Hoddinott et al., 2005). *Iddir* membership is widespread, with nearly 90% of households reporting they belong to at least one *iddir* (Hoddinott et al., 2005), thus CBOs represent potential

opportunities for deployment of SAWBO educational content. For example, CBOs can host meetings where a video is shown as an integral part of a presentation and discussion on a given topic important to that group.

Suggested Deployment Pathways Based on Survey Responses

From the responses in Table 5, it is apparent that there are two groups of potential institutional pathways based on their level of formality. Institutions such as FTCs, health centers, and *kebeles* are among the formal institutions, while community-based institutions such as *iddirs* and *equbs* are part of the informal social networks.

In addition it is important to recognize the roles played by development agents assigned to each *kebele* to provide agriculture and health extension services to farmers. *Kebeles* could offer significant assistance and support by showing the videos individually to farmers on their own cellphones or show them how to view videos on their phones. The development agents could also distribute the videos for use on VCD or DVD devices at farmer households during agents' regular visits to provide extension support.

In general, the *kebele* administrators and extension agents could be of great help in facilitating future deployments. Therefore, it is advisable to coordinate closely with these people to ensure the widest possible dissemination of educational materials.

Kebele *Administrators' Comments on the Potential Use of Animations in Their Administrative Areas*

The responses obtained from all six *kebele* administrators suggested that they personally watched the educational videos and found them useful. They also indicated that videos on health, agriculture, and other community issues would be helpful to support their organizations' outreach programs. They suggested that video distribution occur during farmer training programs that occur periodically in different seasons. *Kebele* administrators strongly believed the animations were relevant to Ethiopia and could positively influence farmers' lives. Administrators also suggested the need for more animations focused on other problems common among the farmers.

Health and Agricultural Extension Agents' Views on the Potential Use of Animations

The profiles of health and agricultural agents indicated that they had technical and vocational education, with 4–8 years' work experience with training programs. The agents' ages ranged from 24–37 for both genders. The extension agents indicated they strongly believed the educational videos were important in assisting them to perform their duties. They saw the need for more educational videos on agriculture- and health-related issues.

All the extension agents who participated in the survey had their own mobile phones. Typically, their first concern was that they used their cellphones for receiving/answering calls and text messages rather than using them as educational tools. The other concern regarding the use of their personal cellphones for teaching farmers was that not all phones had the video and Bluetooth features. This suggests that video deployment and use could occur through LCD projectors and TVs (using DVD or VCD players) in addition to cellphones.

In general, based on their perceptions, extension agents strongly believed that videos were useful and relevant and they needed more videos on health- and agriculture-related topics. Agents also believed that if deployment was done in an organized way and covered additional topics, a large number of farmers' lives could be improved, and the extension agents could use the videos to augment what they were doing to help farmers. The agents also suggested further exploration of other potential and innovative large-scale deployment options.

Lessons Learned for Future Educational Animated Videos

The survey results showed that the educational materials were useful for the targeted learner groups. Yet the effective use of such educational materials could be further improved by:

- devising mechanisms to involve target learners in selecting topics for new animations;
- identifying priority topics by both farmers and local administrators to enhance the importance and acceptance of the educational animations; and
- coordinating deployment efforts with similar programs already running.

In addition, respondents indicated the need for creating more animations on other topics the communities most needed to improve their lives. Some suggested topics[7] included family planning, pneumonia prevention, the impacts of unsafe abortion, prevention of female genital mutilation, preventing HIV, preventing sexually transmitted diseases, using toilets properly, reducing poverty, eliminating bad cultural practices, using improved seeds, preparing cattle feed, applying fertilizers, line planting and improving cropping strategies, cattle hybrids and animal fattening, preparing cattle feed, decreasing maternal mortality, and promoting gender equality.

Based on the survey findings of the pilot deployment, the key lessons learned will be critical for future larger-scale deployment. It was also evident that a need exists for a proper deployment pathway model for similar programs, particularly within the context of developing countries. In this survey, the roles of both formal and informal local institutions were found to be determinant. Particularly, the key role of informal institutions identified in this study was consistent with what previous studies have found about developing countries (Dercon, 1999; Pankhurst & Haile Mariam, 2000; Hoddinott et al., 2005; Vaarst, Nalunga, Tibasiima, Dissing, & Dissing, 2012). For example, according to Hoddinott et al. (2005) sociologists and anthropologists have extensively documented the role of informal networks in Africa. Even though some informal networks focus primarily on insurance and credit activities, the platform they provide—particularly in Ethiopia—can be useful for initiatives such as SAWBO's because they are well-functioning social institutions (Dercon, 1999) at the grassroots level.

Implications for a Deployment Model

For future large-scale deployment of educational materials such as those provided by SAWBO, it is important to define appropriate deployment models that work well in developing country contexts. It is necessary that the models involve the key roles of social institutions (formal and informal) and that the role of community-based organizations not be undermined. Pankhurst and Haile Mariam (2000) emphasized this when they highlighted how CBOs are strategically placed to play important roles in the successful implementation of the multisectorial response to communities' diverse problems. Taking all these learnings into account, we propose the model shown in Figure 2 for a large-scale deployment pathway.

Potential for Response Bias

Finally, we recognize the potential for a response bias in our surveys and this process (Dell, Vaidyanathan, Medhi, Cutrell, & Thies, 2012). *Response bias* refers to the tendency of participants in a survey or in focus groups to offer responses they think the evaluator expects or desires. Thus the possibility exists that the survey questioners may not receive honest reactions from participants.[8] As noted by Dell et al. (2012), having foreign researchers directly involved in the survey process dramatically increases response bias. With this in mind, all aspects of the in-country efforts in Ethiopia were handled by ASTU staff, thereby reducing the potential for response bias.

Conclusions

As the preliminary survey findings suggested, the vast majority of respondents viewed the animated educational materials in a positive manner. Such an approach may be useful to educate low-literate learners on wider issues that affect their health, education, agriculture, and, possibly, some social and cultural matters. The animations are entertaining and educational, yet dissemination and wider accessibility, given the local context, require the design of proper network and deployment strategies. And if proper follow-up mechanisms are put in place, there exists a demand for additional videos to benefit the society and enhance the educational role of, in particular, agriculture and health extension agents.

This pilot study suggests that providing extension educators with educational animated videos would allow them to supplement or improve training quality and quantity. Educational videos viewable on mobile phones

7. Presented in the order mentioned by respondents, not necessarily in order of importance.

8. This issue represents an important and researchable question to determine strategies for future surveys to elicit minimal response bias.

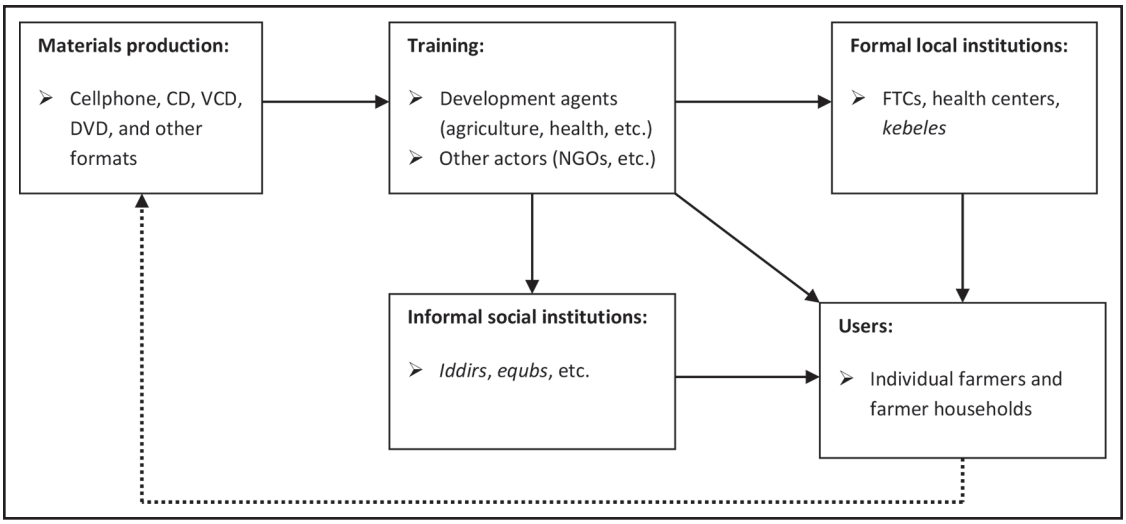

Figure 2. Proposed large-scale deployment pathway and feedback system for new content production.

Note: Content development must be driven by end user needs. New content is deployed during training sessions for educators, who in turn distribute this content directly or through other formal and informal social networks. Feedback can be delivered to SAWBO via online interactions such as emails and online conference calls from within-country groups that deal directly with farmers and farm organizations.

and other video-supporting devices will help address the problems of limited numbers of trainers in rural areas. Information and communication technologies (ICTs) could also provide the resources for content delivery in local languages since many low-literate learners currently lack the information access that others already enjoy due to infrastructure and social reasons. ■

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References

Bello-Bravo, J., & Baoua, I. (2012). Animated videos as a learning tool in developing nations: A pilot study of three animations in Maradi and surrounding areas in Niger. *The Electronic Journal of Information Systems in Developing Countries, 55*(6), 1–12.

Bello-Bravo, J., Olana, G. W., Enyadne, L. G., & Pittendrigh, B. R. (2013). Scientific Animations Without Borders and communities of practice: Promotion and pilot deployment of educational materials for low-literate learners around Adama (Ethiopia) by Adama Science and Technology University. *The Electronic Journal of Information Systems in Developing Countries, 56*(4), 1–11.

Bello-Bravo, J., & Pittendrigh, B. (2012). Scientific Animations Without Borders: A new approach to capture, preserve and share indigenous knowledge. *The Journal of World Universities Forum, 5*(2), 11–20.

Bello-Bravo, J., Seufferheld, F., Steele, L. D., Agunbiade, T., Guillot, D., Cutz, G., & Pittendrigh, B. R. (2011). Scientific Animations Without Borders: An international online approach for building applicable scientific educational materials for use on cell phones and the Internet in developing nations. *The International Journal of Science in Society, 2*(4), 49–62.

Bovy, R. C. (1981). Successful instructional methods: A cognitive information processing approach. *Educational Communications and Technology Journal, 29,* 203–217.

Cho, K. M., & Boland, H. (2002). *Participatory learning for agricultural extension and future development in Myanmar.* Giessen, Germany: Institute of Rural Sociology and Extension, University of Giessen. Retrieved from http://www.tropentag.de/2002/abstracts/full/302.pdf

Coldevin, G. (2003). *Participatory communication: A key to rural learning systems.* Rome, Italy: The Food and Agriculture Organization of the United Nations.

Dell, N., Vaidyanathan, V., Medhi, I., Cutrell, E., & Thies, W. (2012). "Yours is better!": Participant response bias in HCI. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (*CHI '12;* pp. 1321–1330). Retrieved from http://doi.acm.org/10.1145/2207676.2208589

Dercon, S. (1999). *ETHIOPIA Poverty Assessment Study.* Retrieved from http:www.worldbank.org/afr/et/marco.htm

Eastman, V. (2010). *Small group instruction: Reading instruction utilizing learning style preferences and the reading achievement of first grade students.* (Unpublished doctoral dissertation). Ball State University, Muncie, IN.

Ghandi, R., Veeraghavan, R., Toyama, K., & Ramprasad, V. (2007, December 15–16). *Digital Green: Participatory video for agricultural extension.* Paper presented at the IEEE/ACM International Conference on Information and Communication Technologies and Development, Bangalore, India.

Gurumurthy, A. (2006). Promoting gender equality? Some development-related uses of ICTs by women. *Development in Practice, 6*(6), 611–616.

Hoddinott, J., Dercon, S., & Krishna, P. (2005). Networks and informal mutual support in 15 Ethiopian villages. In J. F. Kirsten, A. Dorward, C. Poulton, & N. Vink (Eds.), *Institutional economics perspectives on African agricultural development* (pp. 273–286). Washington, DC: Springer Science and Business Media.

Ladeira, I., & Cutrell, E. (2010). Teaching with storytelling: An investigation of narrative videos for skills training. *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development* (*ICTD '10;* Article 22). Retrieved from http://doi.acm.org/10.1145/2369220.2369240

Lie, R., & Mandler, A. (2009). *Video in development: Filming for rural change.* Retrieved from http://www.anancy.net/documents/file_en/Video_in_Development.pdf

Medhi, I., Menon, R. S., Cutrell, E., & Toyama, K. (2012). Correlation between limited education and transfer of learning. *Information Technologies & International Development, 8*(2), 51–65.

Medhi, I., Prasad, A., & Toyama, K. (2007). Optimal audio-visual representations for illiterate users of computers. *Proceedings of the 16th International Conference on World Wide Web* (*WWW '07;* pp. 873–882). Retrieved from http://doi.acm.org/10.1145/1242572.1242690

Mehrabian, A. (1981). *Silent messages: Implicit communication of emotions and attitudes* (2nd ed.). Belmont, CA: Wadsworth.

Murphy, J. (2012). The contribution of facilitated group learning to supporting innovation amongst farmers. *Studies in Agricultural Economics, 114,* 93–98.

Ogbomo, M. O., & Ogbomo, E. F. (2008). Importance of information and communication technologies (ICTs) in making a healthy information society: A case study of Ethiope east local government area of delta state, Nigeria. *Library Philosophy and Practice.* Retrieved from unllib.unl.edu/LPP/ogbomo2htm

Pankhurst, A. & Haile Mariam, D. (2000). The *iddir* in Ethiopia: Historical development, social function, and potential role in HIV/AIDS prevention and control. *Northeast African Studies, 7*(2), 35–57.

Pitamber, S. (2003). *Micro-finance policy and development framework: Ethiopia.* Abidjan, Côte d'Ivoire: The African Development Bank.

Ramirez, R., & Quarry, W. (2004). *Communication for development: A medium for innovation in natural resource management.* Ottawa, ON: International Development Resource Centre.

Scott, L. M. (1994). Images in advertising: The need for a theory of visual rhetoric. *Journal of Consumer Research, 21*(2), 252–273.

Umekachukelu, F. C. (2011). *Education as a tool of social reconstruction* (Bulletin Version 4.2.0). Retrieved from http://www.nigeriavillagesquare.com/guest-articles/education-as-a-tool-of-social-reconstruction.html

Vaarst, M., Nalunga, J., Tibasiima, T., Dissing, A., & Dissing, I. L. (2012). *The Rwenzori experience: The farmer family learning group approach to human and social capital building, environmental care and food sovereignty.* Penang, Malaysia: Third World Network.

Van Mele, P. (2011). *Video mediated farmer-to-farmer learning for sustainable agriculture.* Ghent, Belgium: Agro-Insight.

Van Mele, P., Wanvoeke, J., Akakpo, C., Dacko, R. M., Ceesay, M., Beavogui, L., . . . & Anyang, R. (2010). Video bridging Asia and Africa: Overcoming cultural and institutional barriers in technology mediated rural learning. *The Journal of Agricultural Education and Extension, 16*(1), 75–87.

Zossou, E., Van Mele, P., Vodouhe, S. D., & Wanvoeke, J. (2009a). The power of video to trigger innovation: Rice processing in central Benin. *International Journal of Agricultural Sustainability, 7*(2), 119–129.

Zossou, E., Van Mele, P., Vodouhe, S. D., & Wanvoeke, J. (2009b). Comparing farmer-to-farmer video with workshops to train rural women in improved rice parboiling in central Benin. *Journal of Agricultural Education and Extension, 15*(4), 329–339.

Zossou, E., Van Mele, P., Vodouhe, S. D., & Wanvoeke, J. (2010). Women groups formed in response to public video screenings on rice processing in Benin. *International Journal of Agricultural Sustainability, 8*(4), 270–277.