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Full Length Research

Information Literacy to Prevent Bean Losses Using Animated Videos: A Pilot Study of Women Entrepreneurs in Cape Coast, Ghana

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As elsewhere in Africa, the considerable increase of the informal sector as a major site of economic growth in Ghana mandates extending support to this sector to enhance and sustain its growth and economic contribution. For women who sell dry grain pulses such as beans in the marketplace, losses due to storage problems represent a significant decrease in the value chain. Informed by Paul Zurkowski and Peter Drucker's discourses of information literacy, then, a pre- and post-test survey design of 59 women entrepreneurs measured the efficacy of an animated video explaining how to prevent bean losses using a jerrican technique. A majority of participants reported that they understood the training content, could follow the technique, liked that the message was presented in their local language, and agreed to try the technique. Participants also connected bean losses to forms of storage and recognized how training via animated videos on Smartphones could be relevant to them.

Keywords: Information literacy**,** market women, animated videos, bean losses, Ghana, jerrican

INTRODUCTION

Liberalization policies in Ghana have gained macroeconomic stability, with important economic growth measures averaging approximately five to six percent yearly over the past decade (Brydon, 1999; ISSER, 2010; Langevang and Gough, 2009). This economic growth, however, has not translated into adequate formal job opportunities, especially for youth and women, and has generated a considerable informal economy (Langevang, 2008; Munive, 2008; Porter et al., 2012); by one estimate, as much as 90 percent of the labor force comes from the informal sector (African Union, 2008). The 2010 Ghanaian census, for instance, tallies women as comprising approximately 52% of the population, with more than 50% self-employed in the informal sector; in fact, for the Ghanaian informal sector in beans and other agricultural products women dominate. Traditionally, markets have been hotspots where women engage in economic activities, social relationships, entertainment, and information sharing and learning (Nezic and Kerr, 1996; Smith, 1971). There, relationships between sellers and customers crucially shape market exchange; that is, trust is established based on traders' reputation (Humphrey and Schmitz, 1998), whereby good quality goods enhance one's entrepreneurial reputation and can attract new customers.

Mobile Telephony and the Informal Sector

Hart (1973) originally developed his concept of the informal sector using empirical data on urban workers outside of the wage sector in Ghana. Also known as the *tertiary sector,* the informal sector includes small-scale operation economic activity, family ownership, labor intensiveness, and adopted technologies. Lately, the informal sector has benefited immensely from the technological solutions afforded by mobile telephony. In Africa,

mobile phone subscriptions are outpacing everywhere else in the world, particularly as an asset for entrepreneurship (Etzo and Collender, 2010). For

traders in Africa, mobile phones have become a critical tool for business and communication, helping to reduce transportation and transaction costs, extending the range of business into previously difficult-to-reach rural areas, and generally enhancing the range of information and opportunity available to entrepreneurs (Overå, 2006). Ghana is no exception (Boadi, Boateng, Hinson, and Opoku, 2007; Brouwer, 2010; Brouwer and Brito, 2008; Campbell and Kwak, 2010; Overå, 2008).

A major and easily overlooked affordance of cellphones is that users can communicate fluently in their most comfortable languages with them. In areas where literacy often means, or is measured, in terms of a national or ex-colonial language, print-media national campaigns often remain inaccessible to people fluent in other, non-national languages. As such, cellphone-supported entrepreneurship within these informal sectors potentially affords unique advantages for cost-effective training able to enhance or protect the value chains of this entrepreneurship along its various links from production to customer, *if* that training can be made available on cellphones *in a local language*. For Ghanaian bean sellers, for instance, improved storage options to prevent losses can help, but only if local Ghanaian women are persuaded that such storage improvement options are available, effective, and feasible.

Scientific Animations Without Borders (SAWBO) has been developing and distributing these kinds of cellphone-supported, cost-effective training materials in video animated form for 5 years. In this study, we used a pre/post-test study design to understand the connection that market women made between losses and storage and to measure the popularity of one such video animation, which describes the prevention of postharvest insect losses through the use of jerricans.

Information and Communication Technologies (ICTs), Information Literacy, and Entrepreneurship

Extensive literature documents the positive impact of training using information and communication technologies (Cross, 2006; Jonassen and Land, 2000; Naismith, Lonsdale, Vavoula, and Sharples, 2004; Sharples, Arnedillo-Sánchez, Milrad, and Vavoula, 2009), including live-action and animated videos in local languages for training in rural areas (Bello-Bravo and Baoua, 2012; Bello-Bravo, Olana, Enyadne, and Pittendrigh, 2013; Ladeira and Cutrell, 2010). And yet, while mobile technologies support information and video sharing via Facebook, Whatsapp, Facetime, and other programs, ICTs continue to

manifest a gender inequality of resource access (Overå, 2008); a problem compounded by existing and ubiquitous unequal gender relations (Wallis, 2011) that affect women's

small business opportunities and limit productivity (Chew, Levy, and Ilavarasan, 2011). Given that Namatovu, Balunywa, Kyejjusa, and Dawa (2011) found Ghana to be the third most entrepreneurial country in the world, and the only one of the 59 studied where women's participation in entrepreneurial activities outpaced their male counterparts, gendered inequalities in the informal sector have an especially deleterious effect overall for Ghana's economy.

It becomes important, then, to highlight research associated with mobile telephony and agency connected to empowerment. Even so, while Scott, McKemyey, and Batchelor (2004) noted that groups like traders in Africa have historically had some degree of access to telephony, Jagun, Heeks, and Whalley (2008) specifically could red-flag a lack of research seeking to understand or characterize the experiences of workers, especially underprivileged ones in the informal sector, and their historical relationship with telephony. Nonetheless, the explosion of mobile telephony in Africa over the past ten years has meant that its use by market women in Africa for business transactions is not unheard of (Naismith et al., 2004). Jagun et al. (2008), for instance, documented the entrepreneurial impacts of mobile phones for women cloth merchants in southern Nigeria, which included changes even to the mode of business; that is, where previously traders had had to make personal visits or to send an intermediary with oral and written messages to address even the most trivial business matters, now a call can afford these same outcomes (Overå, 2006). Unnecessary travel when tied to trade is cumbersome, time consuming, and expensive; mobile telephony saves those costs (Jagun et al., 2008; Overå, 2006).

Information literacy is not new, it can be traced to the Enlightenment period when thinkers started questioning opinions that were being conflated for facts and knowledge. French Philosopher Condorcet argued that improvement of knowledge when spread has benefits to societies and institutions such that lead to a democratic education, happiness and a politically engaged society (Shapiro and Hughes, 1996). Other benefits of information literacy that are tied to this paper include the imparting of lifelong skills and knowledge required for a learning society through lifelong preparation of a learning society. Information literacy refers to skill and strategies required to access, evaluate, organize, transform and transmit information (Bruce, 1999). In short critical thinking about the entire information provided (Shapiro and Hughes, 1996). Paul Zurkowski introduced the concept of information literacy in 1974. According to Zurkowski,

People trained in the application of information resources to their work can be called information literates. They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information-solutions to their problems information. The individuals in the remaining portion of the population, while literate in the sense that

they can read and write, do not have a measure for the value of information, do not have an ability to mold information to their needs, and realistically must be considered to be information illiterates (p.6).

Peter Drucker also discussed information literacy within organizations but this can be relevant in the case of markets. He posed questions that are pertinent to our discussion. These questions are: What information do we need in this company? When do we need it? In what form? How do we get it?, and then to ask further questions related to the impact of information received. Bruce (1999) pointed that information literacy is a nebulous term and that research and its definitions are only understood in library studies and education disciplines. Moreover it is usually assumed to be about computer and information technology literacy while it can be about knowledge and making meaning. Much of the literature on mobile phone usage in general focuses on its diverse socioeconomic transformations for health care, banking, communication, education, and business (Boadi et al., 2007; Brouwer, 2010; Brouwer and Brito, 2008; Campbell and Kwak, 2010; Di Castri, 2013; Hampshire et al., 2015; Mbiti and Weil, 2011; Porter et al., 2016). Availability made early cellphone adoption primarily as an urban phenomenon, especially among street traders and youth (Brouwer, 2010; Langevang and Gough, 2009; Osirim, 2009; Porter et al., 2012), but as cellphone networks have spread across the whole of the African continent (Naismith et al., 2004), and Ghana specifically, mobile telephony has reached rural business and changed trade generally (Boadi et al., 2007; Overå, 2008).

Informality, Entrepreneurship, and Mobile Telephony in Ghana

Liberalization policies for the Ghanaian telecommunication sector occurred in 1995, with a subsequent recognition of the benefits, especially to business, for expanded service coverage (Frempong, Esselaar, Stork, and Anyimadu, 2005). Like elsewhere in Africa, mobile telephony in Ghana has since grown rapidly, to upwards of 31 million subscribers in 2015 (Mayton, 2015), yet very little is known about the role of mobile telephony for supporting women entrepreneurs in the market in Ghana, despite both that women dominate the Ghanaian informal sector in general (Asiedu and Agyei-Mensah, 2008; Langevang and Gough, 2009; Overå, 2007; Wrigley-Asante, 2010) and that many of the informal sector products, such as food stuffs, retail trade, and dressmaking, are already traditionally women's areas of production.

For the purpose of this study, entrepreneurship includes these informal sector women as self-employed (Naudé, 2010). According to Anderson (2000), the entrepreneurial process embodies an interaction of an individual and her social context; in Ghana, this includes networks of other women as well as the environmental gender inequality that problematizes her entrepreneurial activity. One of the most powerful antidotes, or offsets, for this environmental inequality is information, through media (especially non-print media in areas of decreased national literacy, like television or radio, when available), mobile telephony, and personal communication, particular with other women and

farmers. Most of these forms of information, however, are not viewed as educational; that is, media typically suffices only for entertainment, while mobile telephony is seen as only communicative. Changing perceptions so that mobile phones are seen as educational devices as well, via free, easily downloaded, easily shared, and delightful video animations, is a major element of SAWBO (Bello-Bravo, Dannon, Agunbiade, Tamo, and Pittendrigh, 2013; Bello-Bravo, Olana, and Pittendrigh, 2015; Bello-Bravo et al., 2011).

Preventing Post-Harvest Loss at the Marketplace

According to the World Food Program (FAO, 2014), one third of food is lost before people consume it. Losses occur due to problems in the harvesting, storing, packing, transporting, and marketing of food, as well as institutional and legal issues. Presently, a concerted effort by governments, research institutions, producers, distributors, retailers and consumers to prevent food losses and waste is driving global-level initiatives, activities and projects on food losses, and waste reduction efforts through UN agency partnerships, other international organizations, and worldwide stakeholders, including the private sector and civil society (FAO, 2011).

As part of these efforts, FAO recently hosted the First International Congress on Postharvest Loss Prevention in Rome, Italy in 4-7 October 2015, with an aim to develop better tools and interventions to prevent postharvest loss for smallholders in developing countries (FAO, 2014). To date, SWABO has produced twelve, 2-4 minute long videos on postharvest loss prevention. And while considerable research has already addressed postharvest loss due, for example, to insect or disease degradation (Liu, Sui, Wisniewski, Droby, and Liu, 2013; Pimentel and Raman, 2003; Sosa, Lutz, Lefort, and Sanchez, 2016), transport/preservation issues (Mohammed, Wilson, and Gomes, 2016; Venus et al., 2013), and a host of other issues (Affognon, Mutungi, Sanginga, and Borgemeister, 2015), less research on postharvest loss specifically at markets, especially in Africa, has been conducted (FAO, 2011; Kaminski and Christiaensen, 2014). This study adds to what we know.

METHODOLOGY

This pilot project borrows from the concept

information literacy as discussed by Paul Zurkowski and Peter Drucker. Although these scholars are from the field of library studies and management, we see relevance to their work in this research on market women. This study focused on Ghanaian women entrepreneurs with respect to bean storage, and then found out their information literacy from a 3D animated video that delivers information on the prevention of postharvest bean loss using a jerrican approach.

Sample

Research was conducted at three locations in or around Cape Coast, Ghana in the Central Region. While this region's main economic activities are agriculture, tourism, and fishing, legumes are not grown so that traders must travel to other regions in Ghana to bring beans to market. Two markets in Cape Coast, Ghana— Kotokuraba, a relatively new market of cement block stores, and Abura, an open market with wooden sheds—and the market in the village of Fosu (Asin South District, Domenase community) were selected as testing sites, as all three have unhygienic floors, especially when it rains, that attract insect pests and rodents. Without raised storage pallets as well, this can lead to beans and other products rotting as well as fungus growth. In such a setting, the jerrican approach in principle offered an improvement over current storage methods (figure 1).

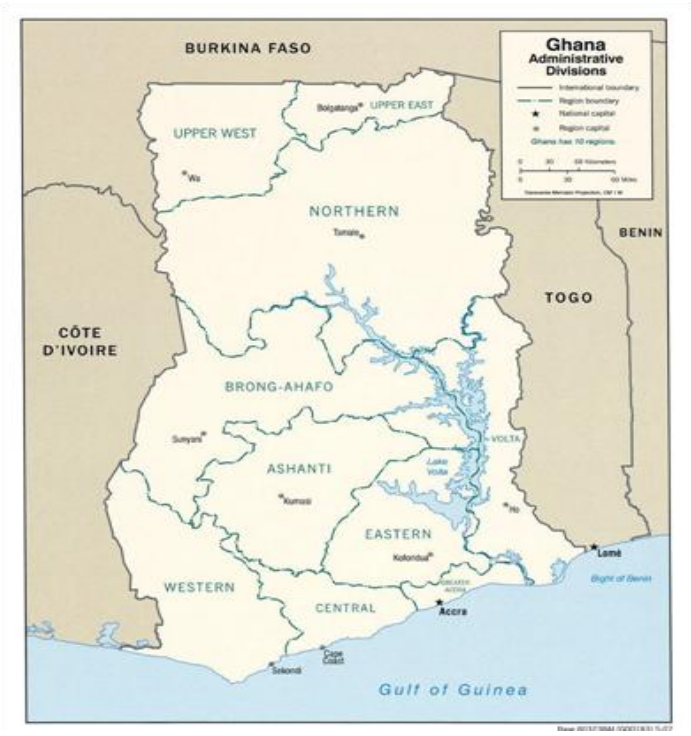

Figure 1: Map of Ghana showing Cape Coast in Central region

Using purposeful sampling, 40 women entrepreneurs at the two markets in Cape Coast, and 19 who sold and/or farmed beans in Fosu were selected if they expressed a willingness to be interviewed and to try the video intervention. Such purposeful sampling enhances the generalizability of qualitative data (Palinkas et al., 2015) by identifying likely information-rich sources related to a central phenomenon (Patton, 2002). Consent to participation and photography was obtained from all participants.

DATA COLLECTION AND ANALYSIS

Data collection in July 2016 consisted of a demographic survey and pretest/posttest questionnaires administered at all three market locations in the local language (Fante) when possible, or via a translator for the English-only researchers. Following administration of the pretest, which measured the participants' issues, knowledge, and practices about the prevention of postharvest bean loss, participants were then once or sometimes twice shown a SWABO animation on a

cellphone or tablet. The animation described issues about bean storage as well as the use of jerricans as a way to improve storage and prevent postharvest loss; animations had translated voice-overs in the participants' local language. A follow-up post-test then measured any information literacy gains around the prevention of postharvest bean loss, and asked also how participants felt about the video animation in general and whether they would adopt the jerrican approach. Interviews conducted with participants about their experiences were recorded, transcribed, and translated in English, when needed.

Inasmuch as qualitative data analysis often goes hand in hand with data collection (Miles and Huberman, 1994; Ngulube, 2015), the researchers both individually and collaboratively analyzed field notes and the interview transcripts for emergent themes(Leech and Onwuegbuzie, 2007). Coding proceeded by chunking and labelling information along with identifying and connecting data points (Miles and Huberman, 1994; Ngulube,

2015). The quantitative data was analyzed using Excel where each questionnaire was entered and later tables and graphs were developed indicating various responses.

RESULTS

Table 1: Participant Demographic Data

Characteristic	Response	%
Gender	Female	100%
Marital status	Divorced	7%
	Separated	3%
	Widow	14%
	Single	21%
	Married	55%
Education status	Medium level	17%
	Basic level	45%
	Grade 6 to 7	19%
	None to grade 1/5	19%
Numbers of years selling beans	More than 25	17%
	16-25	8%
	11-15	17%
	6-10	20%
	Less than 6	38%
From whom do you buy the beans	Own farm	28%
	Farmer	10%
	Trader	62%

Bean Storage Practices and Risks

Sellers of beans in the marketplace sometimes store their beans for more than 30 days; 78 percent reported doing so, while the remaining 22 percent did not because they typically found buyers very rapidly. Such protracted storage times requires training for storage techniques, especially in the kind of markets studied in this research. Poor storage, for instance, can lead to bruchid attack and bean losses as quickly as three weeks due to the higher reproduction rate of these insects (Giga, 2001).

With regard to the manner of storage, 5 percent reported storing beans in sealed containers, 54 percent used sealed bags, while 26 percent said they stored their beans in open containers; the remaining 15 percent said this question did not apply to them. When asked what they did before storing their beans, 42 percent said they use pesticides like Furadan, while 51 percent used tablets or other chemicals that could cannot identified.

Phoxtoxine tablets, for instance, are common among retailers, whereby tablets are wrapped in a cotton cloth and placed in the middle of a jute bag. Some traders mentioned they used balls of camphor; others reported not using any chemicals because the farmers and traders had already used some, therefore precluding the need for any additional use. A small number of women recognized that chemicals are bad for health and used other remedies: 2 percent used hot pepper and 5 percent used ash to protect their beans.

Table 2 summarizes pretest knowledges and practices about bean storage, including prevailing risks of bean loss. The World Bank (2011) estimates a 10-20% grain loss due to insects, mold, and rodents; a loss that compounds also with lower prices for insect-damaged products (Jones, Alexander, and Lowenberg-DeBoer, 2014). The majority of entrepreneurs in this study (74%) reported incurring significant bean losses.

Anticipating this threat could have an effect as well, they reported, inasmuch as they might sell early and lower rather than risk waiting to sell at the time of seasonal price increases. Notably, while only 25% reported being aware of using sealed containers, like jerricans, for storage, an even smaller percentage (5%) actually used sealed containers.

Information literacy after Watching the Jerrican Animation

As noted, the majority of participants (75%) were unaware of the jerrican approach prior to the video. Table 3 summarizes information literary gained by watching the animated video voiced over in Fante once or twice on smartphones or tablets.

Preparation for Storage

Because preparation of beans prior to storage is crucial for preventing bean losses, the animated video

Table 2: Pretest Bean Storage Knowledge and Practices

Questions	Responses	%
In the past year did you store beans for more than 30 days?	No Yes	22% 78%
What method did you use to store your beans for sale?	Store in open container Store in sealed bag Store in sealed container Other	26% 54% 5% 15%
Prior to storing, did you make a dry test?	Yes No	86% 14%
If you store them, what method do you use to test dryness?	Dry them in the sun Bite them They are light in weight Seeds are hard and shiny Other	6% 49% 18% 13% 14%
When storing, do you add anything to protect?	Yes No	43% 57%
If yes, what do you add?	Ash Hot pepper Chemical like Furadan Other	5% 2% 42% 51%
Do you incur economic losses due to bean losses?	Yes No	74% 26%
Are you aware of storing beans in a sealed containers?	Yes No	25% 75%

Table 3: Posttest Bean Storage Knowledge and Practices

Questions	Response	%
If you want to sell beans later, it is safe to store them in jerricans?	No Yes	0% 100%
How long is it safe to store beans if you want to sale later?	Not safe for anytime Six months Recorded another time	0% 96% 4%
Could you store beans safely for a year if you want to sell later?	No Yes	2% 98%
Why is it important to seal the container tightly using an extra piece of plastic?	Prevent oxygen to get in Keep moisture out There is no need Don't know	100% 0% 0% 0%
If you remove few beans for sell and reseal the container again, will your beans still be protected?	No, insects can multiply Yes, it is ok, but seal again	96% 4%

outlined four key steps prior to placing the beans in jerricans. Table 4 summarizes the five steps and percentage of participants who learned them.

While at least >50% of participants mentioned all

Table 4: Knowledge Gains for Storage Preparation

Step	Mentioned	%
Dry beans properly	No	8%
	Yes	92%
Remove broken or damaged beans	No	20%
	Yes	80%
Remove dirt	No	39%
	Yes	61%
Remove beans damaged by insects	No	44%
	Yes	56%

of the key steps, responses varied in frequency for mentioning them, although each item received equal emphasis in the animation. Although the video is less than 4 minutes in length, the order of presentation may play a role. Further research into this is needed.

DISCUSSION

A main emphasis in this kind of informational/educational intervention is not simply to impart knowledge but also provide a rationale for, or to inspire a change of behavior in, implementing the intervention. This includes for the researchers as well who not only learn from the successes and challenges of each attempt, but also have access to local practitioners who can point out gaps (of local knowledge) in those interventions. In this respect, transfer of learning (in both directions) becomes critically important.

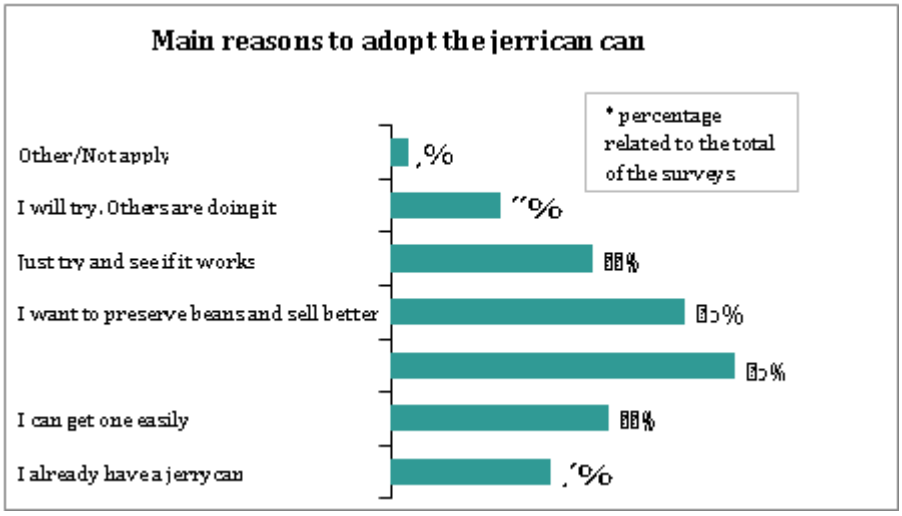

Figure 2: Participant Reasons for Adopting Jerrican Approach

Transfer of learning

Transfer of learning is also known as the application of skills, knowledge, and attitudes that were learned in another learning situation or in the real world (Holton, Bates, Seyler, and Carvalho, 1997; Perkins and Salomon, 1992). Here, transfer of learning manifests in reasons participants gave for adopting the jerrican approach (summarized in Figure 2):

It is important to note that these responses may or may not take into account the necessity of acquiring a jerrican (discussed more below); nonetheless, the range of responses and general positive attitude toward the approach indicates a first step (motivation) for putting the

approach into actual use. These answers are informed as well, of course, by the advantages that jerricans offer. Participants stated these are: save beans from insect attack (86%), protect the quality of the beans (51%), prevent moisture (37%), keep beans safe until sale (39%), and other reasons (7%).

Benefits of information literacy -While 81% indicated a willingness to try the jerrican approach, some participants indicated they did not intend to, even though they agreed that it affords preventing bean losses. Importantly, the principle objections here are economic; that is, not having enough beans to justify acquiring jerricans (4%), not having a jerrican (2%), and, possibly, not having enough space for jerricans (6%) could be addressed by more cost-effective jerricans or a more affordable storage area. In the terms offered by Enos et al. (2003), the video animation may not have met the entrepreneur's daily needs, as an additional logistical or economic expense. The belief that jerricans will not protect against insects may point, in contrast, to a case where there is no information literacy or perhaps an entrepreneurial experience that sealed containers do not, or have not, worked. Similarly, that beans are not damaged seems to disregard the possibility of damage in the future or points to an experience where mold and/or disease have not been a problem.

Use and ownership of cellphones among market women

Most of the market women who participated in this study indicated that they did not own smartphones but would like to; the majority of participants (83%) owned basic mobile phones, while only 5% had video-capable smartphones. In general, participants described their phones as functioning only for communication, i.e., making and receiving calls; none had computers or tablets and 14% have radios (figure 3).

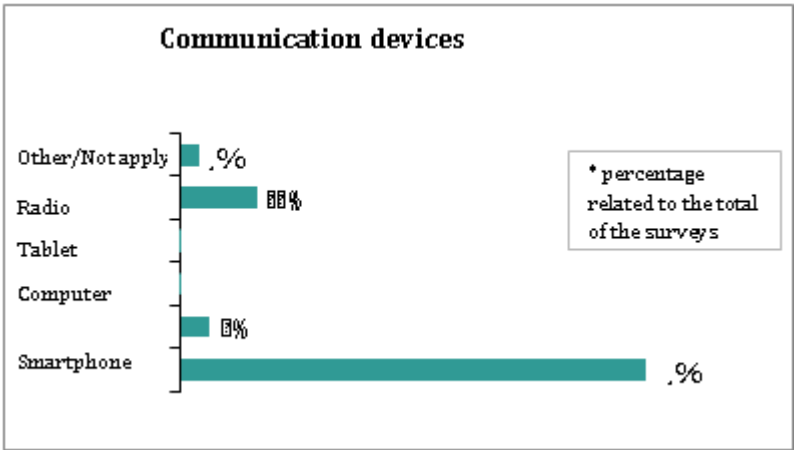

Figure 3: ICT-Device Ownership

Participants described mobile phone use for communicating directly with the farmers and traders in Northern Ghana, one source location of legumes. This is both convenient and removes a middleman who would otherwise facilitate buyer/seller arrangements. Phone also allowed entrepreneurs to inform local customers about new products or changes in prices. One woman, who only had a SIM card and not a handset, described how she could borrow a mobile phone from other women, insert her SIM card, and make needed calls.

In their study in rural Western Kenya, Murphy and Priebe (2011) observed that while cellphones were individually owned, they were thought of as communal and could be shared as noted above. People could also buy "top-up" cards and add minutes to a borrowed phone. Since SAWBO animations afford easy downloading, replayability, and sharing to others on video-capable phones, thus reproducing at no cost the original information literacy opportunity that the video-sharer experienced, supporting the social habit of mobile phones particularly around video-enabled smartphones would be one way to enhance the reach and effectiveness of the animations. Programs to provide or sell inexpensive, video-capable phones would similarly accomplish this.

Sources of information to improve bean selling

This study sought to determine the preferred or habitual sources of information that women entrepreneurs relied on for access in the market; responses about sources are summarized in Figure 4.

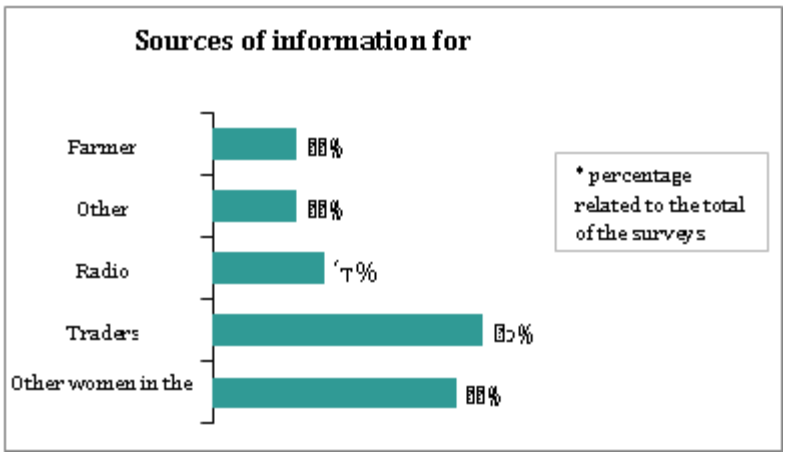

Figure 4: Sources of information for selling

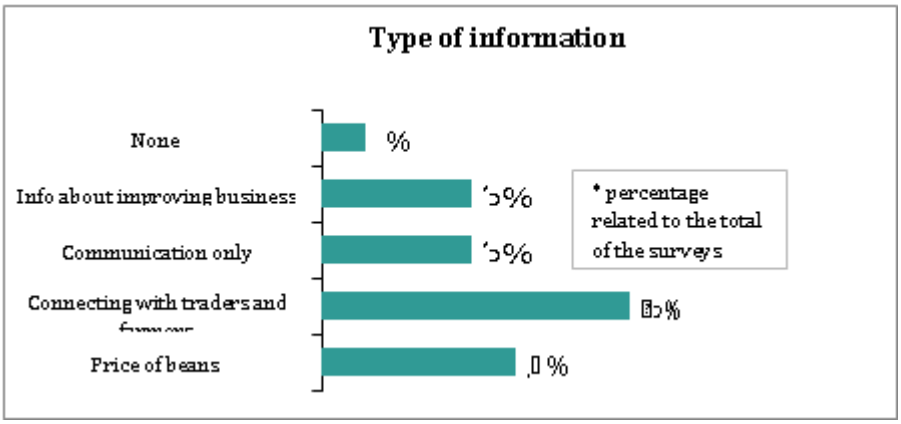

Figure 5: Types of Information

Notwithstanding the dominance of women in the informal bean sector, that other sellers constitute a major source of information seems significant and may reflect a resort taken in light of the gendered economic inequality in Ghana. With regard to the type of information women entrepreneurs obtain from mobile phones (see Figure 5,): connecting with farmers and traders is the most prevalent use (59%), with price checking on beans second (37%). General communication and information about improving one's business had an equal prevalence (29%), suggesting that phones are not just "business before pleasure" but also "business as usual" information devices. In this regard, lobbying for smartphones (or simply video-enabled phones) faces a challenge of demonstrating relevance for Ghanaian women entrepreneurs.

Feedback about the training using animation in cellphones

Qualitative participant reactions to the animated video content are summarized in Table 5. 73% stated they liked receiving information via animated video, while 76% stated they could see and hear the message clearly. A follow-up for those who replied in the negative pointed to market noise in or around their stalls but that the animation video itself was clear and could be adjusted for volume. 54% answered they would need orwant to watch the video more than once, again in part due to surrounding distractions and some catering to customers while watching the video. Some specifically asked to watch the video again in order to confirm their understanding of some point. The majority indicated it was the first time they received training via smartphone or tablet.

Table 5: Participant Reactions to the Animated Video Information

Question	Response	%
Did the video you watched today focus on an important problem you have?	Very important	92%
	Somewhat important	4%
	Not very important	2%
	Not important	2%
Did the video cover the topic clearly and completely?	Yes	100%
	No	0%
What is your opinion about how effective the jerrican method would be to protect beans?	Very important	92%
	Somewhat important	4%
	Not very important	2%
	Not important at all	2%

RECOMMENDATIONS

To prevent bean storage losses symbolizes a significant victory not only for women entrepreneurs and the Ghanaian national economy in general, but also for the world initiatives currently dedicated to food security for everyone (FAO, 2014). The approach described above represents one such effort to enhance food security in Ghana, and raises two issues: addressing a storage space problem for the less stackable jerricans (as opposed to traditional jute bags), and increased access to video-enabled cellphones (or smartphones) in order to more widely disseminate the jerrican approach to bean storage loss prevention.

Solutions to the first issue involve somehow “collapsible” jerricans or otherwise air-tight containers, increased storage space market areas without increased (or with government- subsidized) use-costs, and donations of jerricans to women entrepreneurs. Wider provision, or sharing, of video-enabled phones addresses the second. But this also requires training in the use, downloading, and phone-to-phone sharing of animated videos. This underscores the emphasis by Wyche, Steinfield, Cai, Simiyu, and Othieno (2016) that human interaction remains necessary even when using videos on mobile phones.

The real-time setting of Ghanaian women entrepreneurs work-world suggest both finding ways to create time away from the shop to present animations or, in the opposite direction, to decrease the footprint of video animation presentations even more, so that they integrate in an undisturbed and undisturbing way into the very work flow of women entrepreneur’s activity.

The use of animated videos on mobile phones for the prevention of bean storage demonstrates considerable promise, and shows positive outcomes, for women entrepreneurs in Ghana. The majority of these entrepreneurs expressed interest ininformation on how to prevent bean storage losses by this means, provided that the spoken voiceover is in the women’s locally familiar language and dialect. Moreover, while a social infrastructure exists for sharing phones, wider ownership video-capable mobile phones would even more effectively operationalize the video animations through sharing. Admittedly, the use of a language that is familiar to the women and the use of animated videos strengthen their information base and understanding of the content.

Limitations and Future Research

This research occurred in real-time at markets as the women entrepreneurs worked; questionnaires and interviews alike were interrupted by customers and other details of running a shop. While this may have influenced the results in some ways, on the other hand it represents the resilience and ease-of-use that animated videos affords, being able to be deployed (even with a formal research apparatus around them) in real-time settings.

Second, that the research focused only women entrepreneurs who sold beans may not be generalized to other informal sectors of the economy occupied by women entrepreneurs. While success rates from other animated video implementations enhance the general validity of this approach in diverse applications (Bello-Bravo et al., 2015; Bello-Bravo and Pittendrigh, 2012; Bello-Bravo et al., 2011; Miresmailli, Bello-Bravo, and Pittendrigh, 2015), the necessity of creating generally relevant, thematic videos across the entire range of needed health- and agriculture-related topics always means that each given video has a limited applicability, no matter how many countries its topic spans. This acknowledged, to research the specific experiences of other informal sector Ghanaian women entrepreneurs will surely disclose other helpful issues for making this, or other interventions, more effective.

Participants were interested to acquire

smartphones for information literary in future, and saw them both as a means for teaching others and as a resource to refer to when they had time, but the lack of such smartphones prevented the greater “reach” of animated video teaching. That is, while participants demonstrate information literacy in this domain, they did not have the means to share this information via video-capable cellphones.

Another area for future research involves the scaling of Research for Development (R4D). Broadly, R4D involves analyses and approaches for scaling up innovations, technologies, or techniques as a kind of process-generalization born out of specific initial applications. For the approach in this study, it could involve all, rather than only one, link in the food production value-chain.R4D in developing nations, however, remains considerably challenging on a number of fronts: notwithstanding the perennial shortage

of resources, interventions into key components of a value chain can be affected by literacy issues, cultural factors can influence uptake, and reliably and easily reproducing R4D components across value chains that span communities and countries can prove almost intractable. In Ghana, the gendered inequality of the largest demographic of the informal sector may additionally make the greater resource constraints faced by women one of the cultural R4D issues.

To do this would involve scaling educationally based R4D innovations in a cost effective and understandable manner so that those understood innovations are actually motivated into practice. This study already partly meets this requirement: it.

(1) identified a component of a value chain where women entrepreneurs are key to an intervention,

(2) assessed the status of those women entrepreneurs,

(3) asked about how they deal with their storage problems,

(4) presented a video animation intervention described afterward by the participants as clear and understandable,

(5) asked for the reasons both for adopting and not adopting the jerrican approach, and

(6) solicited feedback about the process itself, both in form and content, as an input for further, new research.

Generalization of this process to the entire value chain, or to value chains generally, represents a fruitful area for future research.

Lastly, given that participants requested video-enabled mobile phones (or smartphones) so as to download and share relevant animated videos, while also enhancing the communicativity for their businesses, research to determine how to answer this request is in order. Similarly, some of the participants asked for SAWBO video animations that could enhance existing jute sack storage systems.

CONCLUSIONS

Women entrepreneurs in the Ghanaian markets we studied combined their work in the street with traditional household chores, child care, and other activities, as others have also noted (Mensah, Yeboah-Manu, Owusu-Darko, and Ablordey, 2002). Despite a predominance of women selling beans in the market, this not translated into a good knowledge of storage conditions for loss prevention. Most of the women follow the traditional method of storing beans in jute sacks, which suffer as a storage technique in unhygienic, rain- and pest-exposed markets. Similarly, participants had limited or knowledge about storing beans in airtight containers and did not associate proper storage with economic gains. Against the idea of storing beans when the price was low in order to sell them when the price was higher, most of the participants indicated that they preferred to sell their stock quickly, perhaps due to limited, or a lack of, storage space within and without the market.

Nonetheless, participants positively rated the use of animated video for presenting a means for preventing bean storage loss by a jerrican approach. All of the participants agreed that jerrican containers afforded the storage of the beans for a long period of time if one wanted to sell them later. After watching the video animation, moreover, the majority could describe the four key steps for preparing beans prior to putting them into a jerrican container. Participants expressed that they understood the technique, and all agreed both that the animated video covered the topic clearly and that the theme was really important for them.

Participants also mentioned some of the limitations of using jerricans: not only can big jerricans be difficult to obtain, their very size encounters storage problems in the smaller market spaces. Additionally, since they (and the people in the market around them) are accustomed to jute bags, the novelty of jerricans might seem unusual; in an informal sector where trust and reputation play a significant role (Humphrey and Schmitz, 1998), standing out as unusual can prove a problem. Nonetheless, most of the participants stated their willingness to recommend jerricans for the prevention of bean storage loss.

Lastly, a majority of participants also stated that they would like to receive further training via animated videos in the future. Participants appreciated the possibility of re- watching part or all of an animated video as a refresher, as well as the ability to play, stop, fast-forward, and replay the videos. Van Mele (2011) observed that this kind of flexibility in videos facilitates effective training in development countries.

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