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GreenPHABLET™ video for effective information dissemination on hermetic groundnut storage technology

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ABSTRACT

Information and communication technologies (ICT) tools can facilitate dissemination of need based and farmer centric information at an affordable cost to India's rural population. One of the major constraints of groundnut production is aflatoxin accumulation and insect infestation during storage. In our studies conducted at ICRISAT, the Purdue Improved Crop Storage (PICS) hermetic storage technology proved effective against insect infestation and aflatoxin accumulation during storage. To facilitate visual learning of the use of hermetic storage, a five minute GreenPHABLET™ video (GPV) in the local language was developed at ICRISAT. A 3-month long experiment was conducted in collaboration with an NGO Samatha of Penugonda in Anantapur district of Andhra Pradesh, India to assess the dissemination potential of GPV. A survey conducted among 30 farmers who received the video, revealed that about 80% of farmers received the video from a fellow farmer and only 20 per cent farmers received from the extension agents. Majority of the farmers received the video on their mobile phones through "Share It" (73.3%) and 13.3 per cent received via "Bluetooth", further 10 per cent reported through "WhatsApp" and while only 3.3% received it through the computer by USB Copy. After three months, 300 farmers from 40 villages received the GPV, while our 30 respondents shared the GPV with 150 farmers and screened the GPV to 200 farmers. The experiment shows that GPV can be an effective tool for spreading information about the groundnut hermetic storage technology and other agricultural innovations.

Keywords: Aflatoxin, Bruchids, GreenPHABLET™ video, Groundnut, PICS bags, ICT

Information and communications technology (ICT) has immense potential in empowering farming communities in many parts of the world. The major challenge is the widespread illiteracy in rural areas. One approach that shows potential is video based information dissemination through mobile phones. It was found to be effective and illiterate farmers in rural areas could easily understand the information conveyed. Digital Green in India produces videos and provides public screenings in villages to transfer information and enable dissemination of best agricultural practices that can boost farm productivity and improve nutrition (Gandhi *et al.,* 2009). However, this approach remains largely unused by the extension services. Hence farmers have little or no access to informative videos which can support agricultural operations. In India the number of mobile network subscribers had reached 969.89 million in March 2015. Of this around 43 per cent (414.18 million) were rural subscribers (TRAI, 2015). A rural population of 833 million (Census of India, 2011) implies that every second person in rural India owns a mobile phone. Hence mobile phones are fast becoming a tool of choice for disseminating need based and farmer centric information services at an affordable cost in a timely manner. Mobile phones have become an important tool for communication in rural India, with availability of cheaper and imported mobiles from developed and developing countries. Video access, Share it, WhatsApp and Bluetooth technology have become increasingly accessible to the rural population. An added advantage of mobile based video dissemination is that they are mainly viewed by individual farmers or by entire family members at their convenient time.

In India, smallholder farmers face numerous challenges in storing their produce after harvest. Damage during storage significantly reduces the quality and quantity of the produce resulting in loss of income. Many smallholder farmers lack access to effective and economic storage technologies, such as hermetic (airtight) storage bags. This technology has proved effective against groundnut storage pests and aflatoxin accumulation during storage. Groundnut (*Arachis hypogaea* L.) is an important food legume and oilseed crop with huge revenue potential. In India, the crop is grown on 5.25 million ha with a production of 9.47 mt and productivity of 1.80 tonnes/ha (FAOSTAT, 2013). All over the world, groundnut production is hampered by several biotic and abiotic stresses which results in severe yield losses. After harvest, insect pests (especially bruchids) and mold fungi are majorly responsible in reducing the quantity and quality of produce during storage. For this reason, farmers usually do

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not store groundnut and prefer to sell-off even the price is not remunerative immediately after harvest. Another important biotic stress in groundnut cultivation is aflatoxin contamination which occurs at both pre-and post-harvest stages of the crop (Waliyar *et al*., 2008). It is a qualitative problem affecting grain quality and trade. The Purdue Improved Crop Storage (PICS) bags works on the principle of hermetic storage. Typically the bag consists of two inner liners each 80 microns in thickness made of high density polyethylene (HDPE) and an outer layer made up of polypropylene woven sack. All the three layers are disconnected. The efficacy of these bags for groundnut storage has been proved recently (Sudini *et al.,* 2015). However, the method for sealing the bags is tricky and difficult to describe accurately in words, but most farmers understand this if it is shown in video format.

Initially the project team depended on village-level demonstrations to train all farmers about sealing of PICS bags for storage of groundnuts. The demonstrations include various modules on how to distinguish an acceptable bag for storing groundnut and how to test these bags for air tightness, etc. However covering all farmers through live demonstrations is very time consuming. Organizing these demonstrations in every village is practically impossible and it is also not possible for everyone to attend these demonstrations due to lack of time as some of the activities such as sensitization and demonstration coincide with the period when farmers are busy harvesting and threshing their groundnut or engaged in other agricultural activities. To overcome these issues ICRISAT has developed a five minute GreenPHABLET* video (GPV) (https://www.youtube.com/watch?v=IeE3OySdSaI) to disseminate information on the effective use of PICS bags. However, effective implementation use of the PICS bag requires that farmers be able to access the video. Hence the objective of this study is to assess the dissemination potential of the GPV on PICS storage in groundnut.

MATERIALS AND METHODS

Description of the study area: The three month study was conducted in Anantapur district of Andhra Pradesh, India between October to December, 2016. The area was selected as groundnut is the principal rainy season crop grown over an area of about 800,000 ha and 90 per cent of the area is under rainfed conditions. The selected mandals in this survey area show a high incidence of insect induced storage losses, the damaged pods are also of lighter weight and poorer quality, and would therefore fetch lower price in the market. In addition, low quality groundnuts mainly due to aflatoxin contamination and bruchid damage are hampering the farmers from selling their produce in niche markets.

Methodology: The five minute GreenPHABLET™ video (GPV) was developed in the local language (Telugu). The video showed viewers how to hermetically seal the PICS bags. The GPV was provided to two extension agents and two pilot farmers initially. ICRISAT staff followed up as to whom the video was shown and to whom and how it was transferred. A questionnaire was designed to capture socio-economic characteristics of the farmers, irrigation sources, land and livestock owned; ICT infrastructure and usage; mobile phone particulars and how the videos were received by the farmers. In this study, 30 farmers were interviewed using survey questionnaire. The participants were those who had received or seen the video and were engaged in groundnut production and storage activities. A field assistant was appointed for data collection and he was trained by the researcher. During the interview questions were asked in the local language using survey questionnaire and the responses recorded in English by the field assistant for ease of analysis.

Data analysis: Data collected from the survey questionnaire including socio-demographic characteristics of respondents, irrigation sources, land and livestock owned; ICT infrastructure and mobile phone particulars including their network providers, way of approach to receive the video were summarized and analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics in the form of frequencies and means were used to analyze the data obtained.

RESULTS AND DISCUSSION

Socio-demographic background of respondents: The socio-demographic characteristics of the interviewed respondents in this study area are depicted in Table.1. Of the 30 respondents 86.6 per cent were males while 13.3 per cent were females. Majority (63.3%) of the respondents were below 39 years of age. Most of the interviewed respondents were married (80%). Half the respondents had studied up to graduate level and above, around 43 per cent had some level of education between primary level and below graduation while 6.6 per cent had no education. With regards to household income, the highest number of respondents (53.3%) earned between ₹ 50,000 to 100,000 per annum, while 40 per cent earned less than ₹ 50,000 per annum.

Table 2 gives the details of the land particulars, source of irrigation and livestock owned. Around 90 per cent of the respondents had unirrigated land and 73.3 per cent had irrigated land (since some of the respondents had both categories). Responses on size of land showed that 83.3 per cent were small farmers, 13.3 per cent were marginal farmers

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GreenPHABLETTM: An electronic device integrated with phone and tablet (Phablet) technology, coupled with other required components for use of agriculture data, information, knowledge, aggregation, dissemination, and various other activities. The device comes with unique features like water resistance, dustproof, shockproof, break proof, sunlight readability, etc.

and 3.3 per cent were large farmers. With regards to livestock details owned by the interviewed respondents, majority were having cows (56.6%) and buffaloes (26.6%). In addition, very few respondents had ox (10%) while 26.6% had no livestock. Responses regarding the using of these livestock in the survey area indicated that cows and buffaloes are used for milk and production of farmyard manure (63.3%) and 6.6% of the respondents reported that ox were used for ploughing, while 3.3% mentioned livestock were used for production of Gobar gas (3.3%) for cooking.

Table 3 gives the details of the ICT infrastructure possessed by respondents. Responses regarding ICT infrastructure owned showed that no more than 3.3% had radio to access information. All the respondents noted that they had TVs and the majority had a cable network connection (93.3%), while 3.3% did not have cable network connection. Very few respondents (6.6%) in the study had computer and laptop, and without internet connection. Almost, all the interviewed respondents had mobile phones. However, smart mobile phones penetration is very high in comparison with feature phones in the study area. In our study, all the respondents had smart mobile phones (100%) for personal use and about 26.6% had feature phones for family access.

Table 1 Socio-demographic characteristics of the interviewed respondents

Variables	Responses	Total	Percentage (%)
Gender	Male	26	86.6
	Female	4	13.3
Age	<39 Years and below	19	63.3
	>40 Years and above	11	36.6
Marital Status	Unmarried	6	20
	Married	24	80
Education Level	None of Education	2	6.6
	Primary Standard (1-7th Class)	2	6.6
	Upper Primary Standard (8-10th Class)	6	20
	Intermediate Education (>10th Class)	5	16.6
	Higher education (Graduation and above)	15	50
Household income per year	Up to ₹ 50,000 (Low income category)	12	40
	₹ 51,000 - < 1,00, 000 (Middle class)	16	53.3
	Above ₹ 1,00,000 (Upper middle class)	2	6.6

N=30; Values with the same subscript under the "Percentage" add up to 100; Indian National Rupee (INR)

Table 2 Irrigation sources, land and livestock owned by interviewed farmers

Variables	Response	Total	Percentage (%)
Land particulars owned	Rainfed	27	90
	Irrigated	22	73.3
Distribution of farmers	Small (1-5 Acres)	25	83.3
	Marginal (6-10 Acres)	4	13.3
	Large (Above 10 Acres)	1	3.3
Available Irrigation sources	Bore well	27	90
	Farm ponds	2	6.6
	Rivers	0	0
	Others	1	3.3
Livestock owned	None	8	26.6
	Cow	17	56.6
	Ox	3	10
	Buffaloes	8	26.6
Livestock usage	Milk and farmyard manure	19	63.3
	Agri. Ploughing activities	2	6.6
	Bio-gas production	1	3.3

*Some of the interviewed respondents have both irrigated and rain-fed lands

Table 3 Responses regarding ICT infrastructure owned by the interviewed respondents

Variable	Response	Total	Percentage (%)
Radio	FM	1	3.3
	AM	0	0
TV	With cable network	28	93.3
	Without cable network	1	3.3
Computer/Laptop/Tablet	With Internet	0	0
	Without internet	2	6.6
Mobile Phones	Feature Phone	8	26.6
	Smart Phone	30	100

*Some of the interviewed respondents having both normal phone and smart phone
*Very few interviewed respondents having computer and laptop without internet

In the study area, about 70 per cent of the respondents reported that they subscribed to Airtel while 13.3 per cent subscribed to Idea followed by Vodafone 10 per cent, and BSNL 6.6 per cent (Table 4.) The majority of the respondents reported that they had procured their mobile phones over two years (36.6%), 33.3 per cent had procured a year ago while 30 per cent had purchased more than 3 years ago. Further, 93.3 per cent of the respondents were not receiving agricultural information on their mobile phones while 6.6 per cent were received through iKisan & IKSL. All the respondents would like to receive the agricultural information on their mobile phones.

Figure 1 gives details of the source of the video received by the interviewed respondents. Most of the farmers reported that they come to know about the source of the video from the fellow farmer. Females share the GPV only to females and male share only with males. About 80 per cent of the respondents had indicated that they received the video from fellow farmers and only 20 per cent were received from ICRISAT representative. After three months, 300 farmers from 40 villages received the GPV, while our 30 respondents shared the GPV with 150 farmers and screened the GPV to 200 farmers.

Figure 2 details the channel through which GPV was received by the interviewed respondents. As per the survey conducted among 30 farmers these who have received the video, revealed that 73.3 per cent were received the video via Share It and 13.3 per cent indicated via Bluetooth, further 10 per cent reported WhatsApp while only 3.3 per cent received it through the computer.

GreenPHABLET^{TM} Video is a new tool for visual and oral communication about PICS-based triple layer plastic bags technology for effective storage of groundnut produce at farmers' level. The videos are easy and inexpensive to produce and successful videos like GPV go viral with little or no effort. Once proved useful these videos are passed from farmer to farmer via different ICT tools. Previously farmers in rural communities had limited or no access to computers and the internet, but GPV could serve as communication intermediaries for disseminating skills that are difficult to describe in text/writings or by audio (on the radio) and print. The method for sealing the bags is tricky and difficult to describe accurately in words, but most farmers understand this if it is shown in video format. This on-farm experience shows how GPVs have potential for assisting agricultural producers with information and advice that could help them improve crop productivity, reduce losses and improve profitability. GPVs have the potential to help many development and government agencies interested in improving the lives of rural communities by disseminating skills that are difficult to describe in writing/print.

Table 4 Respondents using information on their mobile phone

Item	Total	Percentage (%)
Details of the interviewed respondents network provider		
Airtel	21	70
BSNL	2	6.6
Vodafone	3	10
Idea	4	13.3
No. of years using mobile phone		
One Year	10	33.3
Two Years	11	36.6
Three Years	9	30
Receiving any agricultural information on their mobile phones		
Yes	2	6.6
No	28	93.3
If no, would you like to receive agricultural information		
Yes	30	100
No	0	0

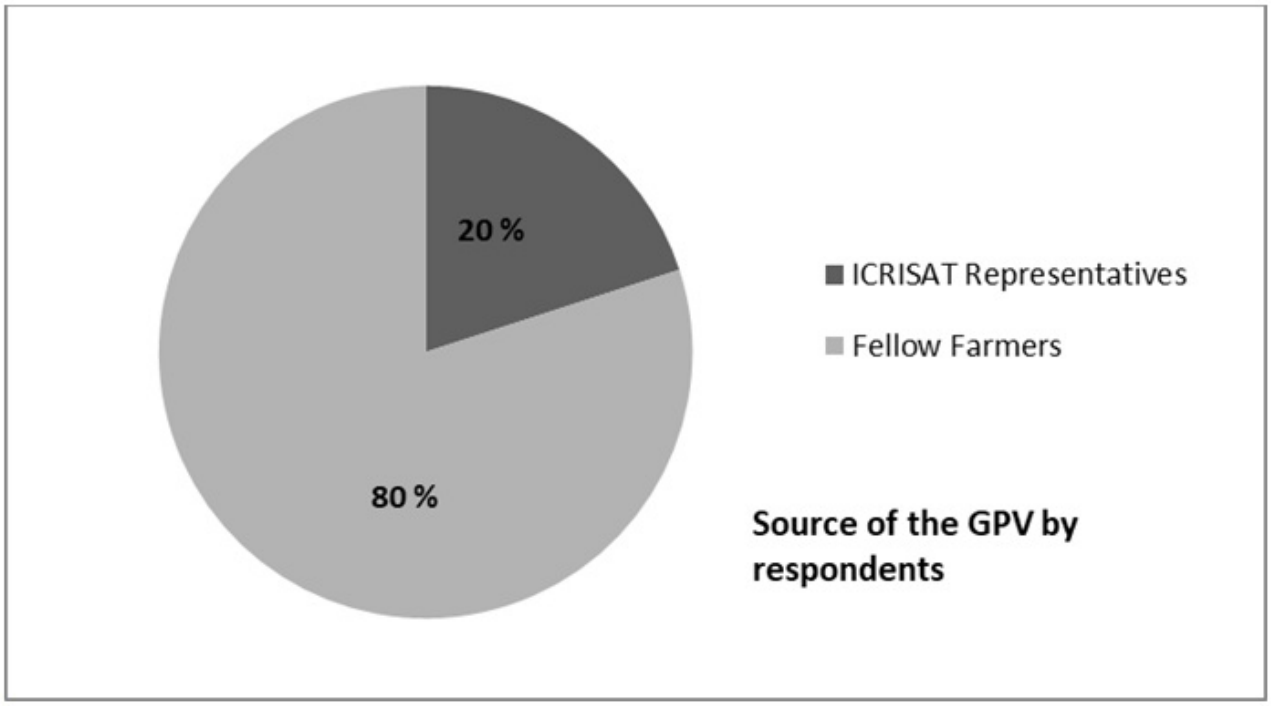

Fig. 1. Response regarding Source of GPV by Respondents

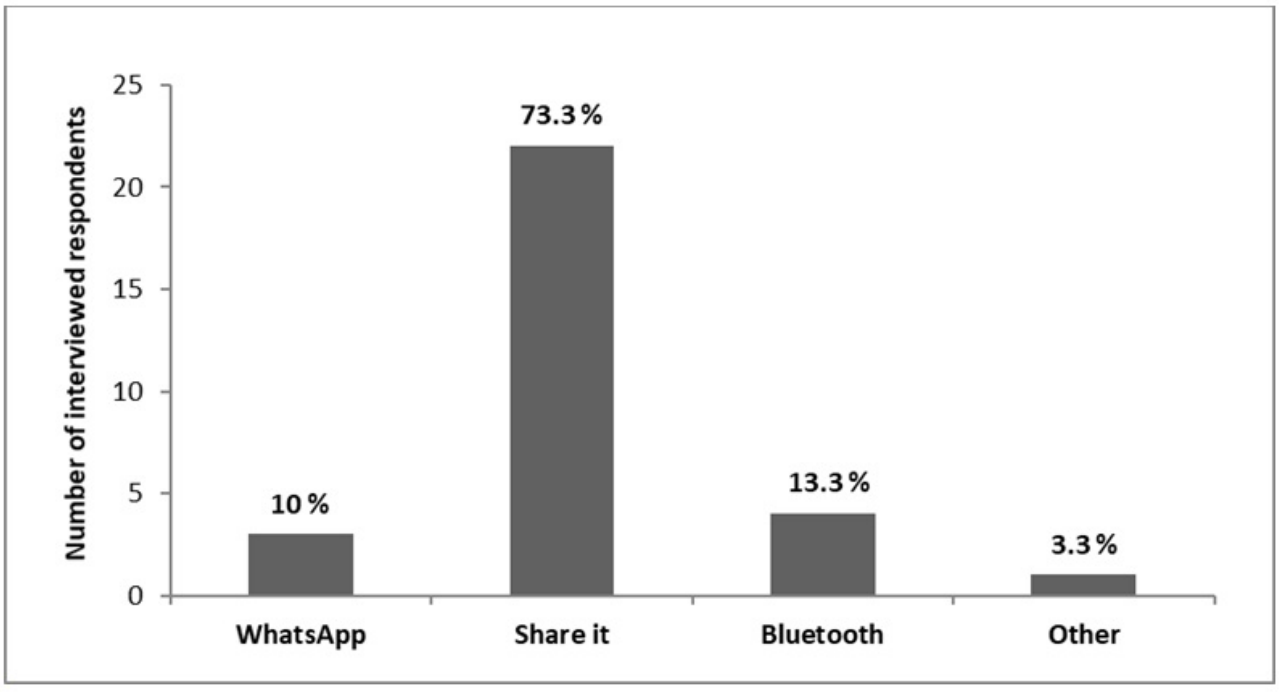

Fig. 2. Channel of GPV dissemination among interviewed farmers

The GPV can strengthen the public extension system to deliver up-to-date information on post-harvest management in groundnut in a more effective and timely manner. Such information can be disseminated by using the contemporary information and communication technologies (ICTs) like GreenPHABLET^{TM}, through the existing system of government extension workers and farmer's groups as the main channels in the study areas. However strong partnerships are required between research institutions, the state department of agriculture of various states, marketing agencies, NGOs, farmers and consumer groups and other stakeholders to make effective use of contemporary ICTs like GreenPHABLETTM Video.

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