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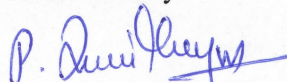
Sub: Your article entitled "GreenPHABLETTM Video (GPV) for effective information dissemination on hermetic groundnut storage technology" - reg.

Dear Sir,

The editorial board of the Journal of Oilseeds Research is pleased to inform you that your research article entitled "GreenPHABLETTM Video (GPV) for effective information dissemination on hermetic groundnut storage technology (authored by Sumanthkumar VV, Vijayraju P, Hari Kishan S, Kumara Charyulu D, Chakradhar T, Chakravarty Amit, KV Rao and Madhuri P)" has been accepted for publication. The paper has been included in the Vol. 34 (4) issue of the Journal.

With warm regards,

Yours sincerely



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GreenPHABLET™ Video (GPV) 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. Dissemination of the right information at the right time to the right person using the right channel is very critical especially in addressing constraints or challenges faced by farmers. However, the application of ICT in agriculture requires addressing impediments to adoption and diffusion of such technologies. Such impediments include the lack of awareness, low literacy, infrastructure deficiencies, and language and cultural barriers in ICT usage.

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. However, hermetic sealing is difficult to describe in writing or in voice message format. However it is easily understood by people if shown a video of the process. To facilitate visual learning of the use of hermetic storage, a five minute GreenPHABLET™ video (GPV) in the local language was developed at ICRISAT. The video covers the entire process including how to hermetically seal the PICS triple layer plastic bags.

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. The GPV was provided to two extension agents and two progressive **farmers**. 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% farmers received from the extension agents. It was also seen that female farmers shared the video only with female farmers and male farmers shared the video only with male farmers. Majority of the farmers received the video on their mobile phones through "Share It" (73.3%) and 13.3% received via "Bluetooth", further 10% 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 GreenPHABLET™ video (GPV) can be an effective tool for spreading information about the groundnut hermetic storage technology and other agricultural innovations.

Key words: GreenPHABLET™ video (GPV), PICS bags, ICT, Aflatoxin contamination, groundnut bruchids

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Introduction

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% (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. The crop occupies about 25.4 million ha worldwide with an annual production of 45.2 Mt and a productivity of 1.77 tonnes ha⁻¹ (FAOSTAT, 2013). 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⁻¹ (FAOSTAT, 2013). Groundnut is a rich source of protein, dietary fiber, minerals, and vitamins. 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 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 GreenPHABLET¹ 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.

¹ GreenPHABLET™: 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.



GreenPHABLET Video Dissemination - PICS Bag Tying and Uses



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% of the area is under rain-fed conditions. The selected *mandals*² 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.

² A mandal is the smallest administrative unit in the state of Andhra Pradesh.

Results

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% were males while 13.3% 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% had some level of education between primary level and below graduation while 6.6% had no education. With regards to household income, the highest number of respondents (53.3%) earned between INR 50,000 to 100,000 per annum, while 40% earned less than INR 50,000 per annum..

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 (1-7 th Class) | 2 | 6.6 |
| | Upper Primary Standard (8-10 th Class) | 6 | 20 |
| | Intermediate Education (>10 th Class) | 5 | 16.6 |
| | Higher education (Graduation and above) | 15 | 50 |
| Household income per year | Up to 50,000 INR (Low income category) | 12 | 40 |
| | 51,000 - < 1,00, 000 INR (Middle class) | 16 | 53.3 |
| | Above 1,00,000 INR (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 gives the details of the land particulars, source of irrigation and livestock owned. Around 90% of the respondents had unirrigated land and 73.3% had irrigated land (since some of the respondents had both categories). Responses on size of land showed that 83.3% were small farmers, 13.3% were marginal farmers and 3.3% 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 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 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 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% of the respondents reported that they subscribed to Airtel while 13.3% subscribed to Idea followed by Vodafone 10%, and BSNL 6.6% (Table 4.) The majority of the respondents reported that they had procured their mobile phones over two years (36.6%), 33.3% had procured a year ago while 30% had purchased more than 3 years ago. Further, 93.3% of the respondents were not receiving agricultural information on their mobile phones while 6.6% were received through iKisan & IKSL. All the respondents would like to receive the agricultural information on their mobile phones.

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 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% of the respondents had indicated that they received the video from fellow farmers and only 20% 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.

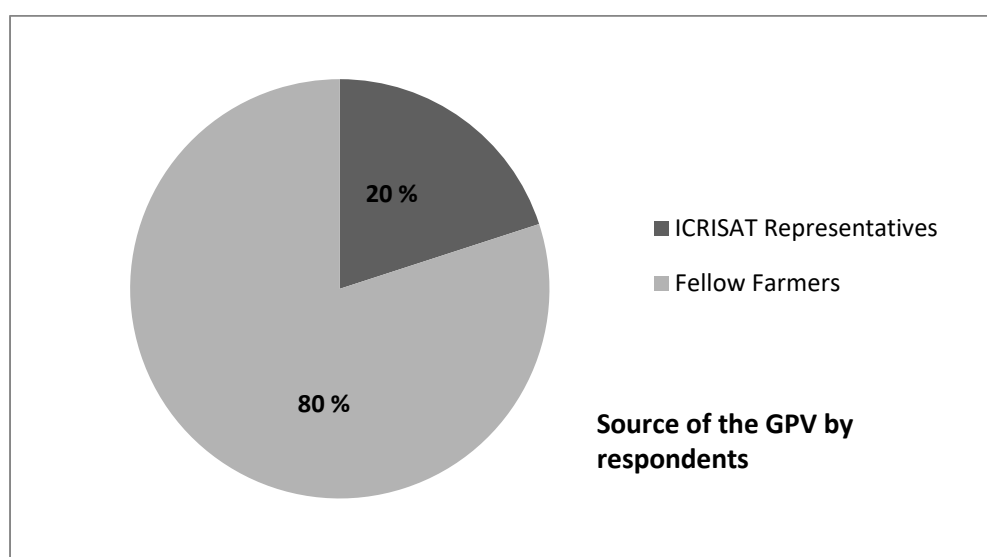


Fig 1. Response regarding Source of GPV by Respondents

Fig 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% were received the video via Share It and 13.3 % indicated via Bluetooth, further 10 % reported WhatsApp while only 3.3% received it through the computer.

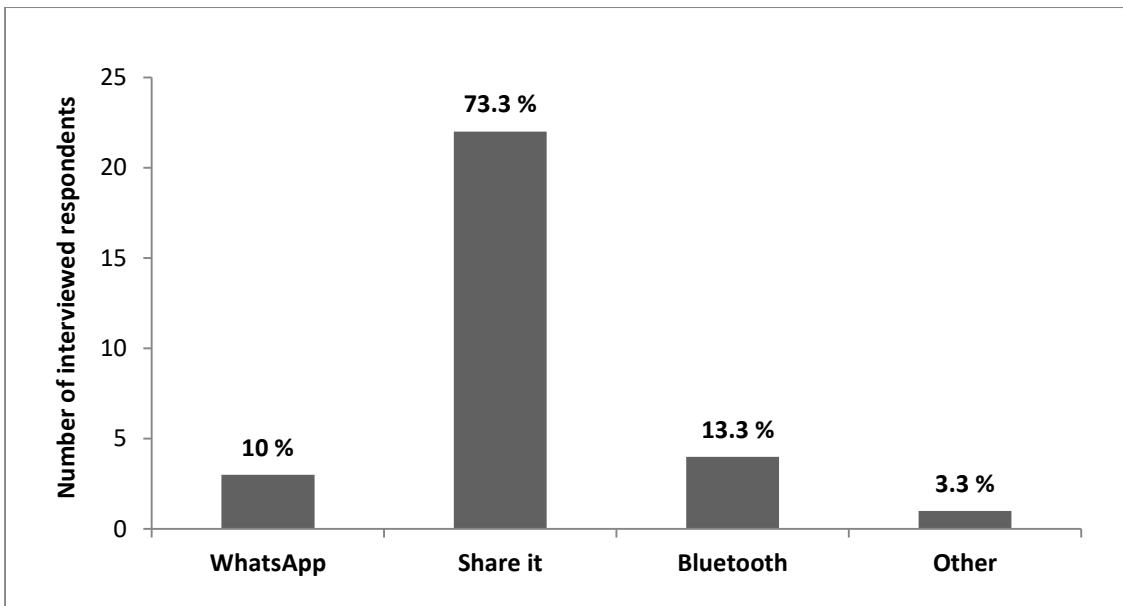


Fig 2. Channel of GPV dissemination among interviewed farmers

Discussion and Conclusion

GreenPHABLET™ 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.

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™, 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 GreenPHABLET™ Video.

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