Mobile Phone Use Efficiency of Garo Tribal Farmers in North- Eastern Himalayan Region of India

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ABSTRACT

The advancement of mobile phone technology in India and north-eastern Himalayan region as well gives a unique opportunity to provide right information at right time to the Garo tribal farmers. To have an idea about farm information communication through mobile phone in the region, the mobile phone use efficiency of farmers were put under study in an experimental research design with the objectives to explore the mobile phone usage, preferences, crop information need of farmers in gathering farm information and to enumerate the cause and effect relationship with some socio-economic and socio-psychological variables. The respondent of the study were selected through snowball sampling technique based on certain criteria from randomly selected six blocks of two districts of Garo Hills. Data were collected in semi-structured interview schedule against some socio-economic and socio-psychological variables, measured on scales developed by earlier researchers and mobile use efficiency was measured in 5-point semantic scale developed during the study. The results of the study reveal that use of mobile phone by the Garo tribal farmers in the region is very high. But, use of mobile phone for gathering farm information is not satisfactory. But, study envisaged that age of the farmers, educational status, annual income, material possession, planning orientation, production orientation, market orientation and farmer's attitude towards improved agriculture have direct bearing in mobile use efficiency. Despite of low status of mobile use efficiency mobile based agro-advisories has real potential to come out as alternate extension system for dissemination farm information in the region.

Key words: *Agricultural Information; Mobile Extension; Mobile Phone Use Efficiency; Garo Hills Agriculture; North-Eastern Himalayan Region;*

In an era of liberalization of the economy, modern agriculture can thrive only with up to date information access by the farming community. Access to the right information at the right time in the right format and from the right source may shift the balance between success and failure of the farmer (*Opara, 2008*). One potential mechanism for increasing yields is the use of improved agricultural technologies, such as fertilizers, seeds, and cropping techniques. Public sector programme have attempted to overcome information-related barriers to technological adoption by providing agricultural extension services. Such programs have been widely criticized for their limited scale, sustainability and impact. The rapid spread of mobile phone coverage in developing countries provides a unique opportunity to facilitate technological adoption via information and communication technology (ICT)-based extension programs (*Aker, 2011*). The information is also a critical input and as important as other key inputs such as credit, seeds, fertilizers and water. Different sources and channels of agriculture information can play important role to meet this requirement (*Yadav et al, 2011*). Modern agriculture is highly knowledge intensive and requires the support of Information and Communication Technologies (ICT) for planning, decision making and implementation. The Internet, mobile phones, television

and radio are providing opportunities to connect the people to obtain and disseminate information and to bring in a new revolution in agriculture. Mobile government (m-Government) is a subset of electronic government comprising an alternative provisioning channel of governmental information and services. Governments are increasingly making efforts to provide more access to information and services for citizens, businesses, and civil servants through wireless devices. One of the future challenges for the implementation of m-Government is the creation of effective business cases, e.g. tourism, health, agriculture (*Ntaliani et al, 2008*). Study also indicates that mobile phones are increasingly available to lower income groups, they are being used to improved communication with family and friends (*Molony, 2008*). The possibility of exchanging contextualized information and accessing contextualized services in the field, using well-known devices such as cell phones, may contribute to increase the rate of adoption of information technology and contribute to more efficient and closer-to-the-crops practices (*Cunha et al, 2010*).

The first mobile phone call made in India in July 1995, between Writer's Building in Kolkata and Sanchar Bhavan in Delhi, which was carried on the network of Mobile Net (*Saran, 2005*). Since then, expansion of mobile telephone network and its penetration in every section of the society have made a remarkable progress in India and immensely contributed in the development process. India is the second-largest mobile phone user after China with over 900 million users in the world. It accounted for over 10 per cent of the world's online population in 2011. In 2011 alone, 142 million mobile-cellular subscriptions were added in India, twice as many as in the whole of Africa, and more than in the Arab States, CIS and Europe put together. The mobile tariffs in India have become among the lowest in the world. A new mobile connection can be activated with a monthly commitment of 15 cents only (Press Release, PIB, GOI, New Delhi, 2013). Presently, the total mobile phone users in India are 1,034.25 million, which is 81.35 per cent of the total populace (Press Release, TRAI, GOI, New Delhi, 2016).

Being the second largest populated country in the world, the pressure of food insecurity is always a matter of great worry for the agriculturist in India. The overexploitation of the natural resources in intensive agricultural practices are showing stagnation and even declining trends in terms of agricultural production and productivity in different parts of India. In this regard, the relatively less exploited hilly areas of the country can be made a panacea to the problem and the north-eastern Himalayan regions of the country has the real potential to provide additional thrust to boost up the agricultural production in the country (*Lahiri, 2016*). Telecommunication, especially mobile phones have the potential to provide solution to the existing information asymmetry in various lagging sectors like agriculture. India's agricultural sector suffers from low growth rates and low productivity. Issues in access to information are weak points at every stage of the agri-supply chain (*Mittal and Tripathy, 2009*). The economy of North East Himalayan Region of India has remained dominantly agriculture based. Climatic conditions in the region also permit a large variety of agricultural and horticultural crops including fruits, vegetables, flowers, spices and medicinal plants of high economic values. Though the potential for development of the rural economy of the region through agriculture is vast, but this sector has not made much progress as compared to the rest of the country due to various reasons. Agricultural production and productivity always remained a major concern. The study was confined to particularly on Garo tribes of Meghalaya. The shifting cultivation (*Jhum*) is still the most popular pattern cultivation among the Garo tribe, though in some areas, farmers adopted settled cultivation. But, in both the cases farmers lack the proper scientific knowledge and information due to various reasons, which is the main impediment for the agricultural development in the area (*Lahiri and Das, 2010*). The issue of generation and delivery of appropriate, need based and location specific technology to the Garo tribal farmers of Meghalaya is the major loopholes in terms of extension activities. In this regards, mobile phones can act as catalyst to improving farm productivity and rural incomes, the quality of information, timeliness of information and trustworthiness of information are the three important aspects that have to be delivered to the farmers to meet their needs and expectations (*Mittal and Tripathi, 2009*). The total mobile phone users in north eastern states of Himalayan region of India are 4.1 million (*Press Release, TRAI, GOI, New Delhi, 2016*). Framers in this region gathers farm information from different sources and mobile phone also acts as major sources of

channel of farm information communication. Several mobile based agro-advisory initiatives like m4AgriNEI, e-KIRAN, Kisan Call Centre are providing farm information to the farmers' mobile phone through IVRS based applications. But, the mobile phone use efficiency of Garo tribal farmers for gathering farm information of north-eastern Himalayan region of India is needed to put under scanner to have an idea about farm information communication through mobile phone in the region. In this backdrop, the study was formulated in an experimental research design with the following objectives;

- To explore the mobile phone usage and preferences of Garo tribal farmers in gathering farm information.
- To find out the general and crop-wise information need of the Garo tribal farmers through mobile phone to access the farm information.
- To enumerate the mobile phone use efficiency of Garo tribal farmers for gathering farm information and its relation with some selected socio-economic and socio-psychological variables.

METHODOLOGY

The north eastern Himalayan region of India is comprises of eight different hilly states. Garo tribe is mainly found in different portion of Garo Hills of Meghalaya. They also live in some patches in other north-eastern states of India and also in some parts of Bangladesh. But, the study was restricted to the Garo Hills of Meghalaya as majority of the Garo population lives in Garo Hills of Meghalaya. Out of five districts in Garo Hills of Meghalaya, The West Garo Hills district and South Garo Hills districts were selected through simple random sampling method (Without Replacement). For selection of villages, three blocks from each district were selected through Simple Random Sampling (Without Replacement) and altogether six blocks were selected. For selection of respondents, snowball sampling technique was followed. The criteria for selection of villages and respondents were i) availability of mobile phone network in villages, ii) villages should have traditional and settled cultivation, iii) farming is the major sources livelihood, iv) farmers have less accessibility to scientific farming information and v) farmers should have mobile phone connection.

Based on the above-said criteria exhaustive snowball techniques were followed. Thus, 132 farmers and farm women from 3 blocks (8 villages) of West Garo Hills district and 73 farmers and farm women from 3 blocks (7 villages) of South West Garo Hills district were selected. Hence, altogether 205 (Two hundred five) farmers and farm women have been selected, who have become the sample respondents of the study. The 205 (Two hundred five) sample respondents have been interviewed with semi-structured interview schedule for collection of information, needed for the study. The data collection has been done in the study area from January'2016 to March'2016.

Recent studies of mobile (cellular) phone use in the developing world categorizes into two major dimensions. One dimension distinguishes studies of the determinants of mobile adoption from those that assess the impacts of mobile use, and from those focused on the interrelationships between mobile technologies and users. A secondary dimension identifies a subset of studies with a strong economic development perspective (Donner, 2008). But, the issues of assessing financial need and the measurement of impact have been comparatively neglected in most of the researches, while application design and adoption studies have received greater attention (*Duncombe and Boateng, 2009*). After reviewing research works of conducted by various earlier researches like; *Bertolini (2002), Cohen and Lemish (2003), Donner (2006),* the study of mobile use efficiency for gathering farm information was conceptualized. The study was formulated in experimental research design with Mobile Phone Use Efficiency for Gathering Farm Information (Y) as dependent variable and causal variables such as Age (X_1), Educational Status (X_2), Size of Holding (X_3), Family Type (X_4), Family Size (X_5), Annual Income (X_6), Material Possession (X_7), Social Participation (X_8), Planning Orientation (X_9), Production Orientation (X_{10}), Market Orientation (X_{11}), Risk Orientation (X_{12}), Economic Motivation (X_{13}) and Farmer's Attitude towards Improved Agriculture (X_{14}). The different socio-economic and socio-psychological variables have been measured by the scales developed by different earlier researchers, which have been modified in accordance to present context and location specificity to make it relevant to the present situation in the study area. The Mobile Phone Use Efficiency of farmers for gathering farm information was measured with observed score in 5-point semantic scale developed during the study, which was calculated by taking in to consideration

of different parameters like; type of mobile owned, number of voice call for farm information, use of text and voice messages for farm information, information need of the farmers, frequency of contact of farmers towards mobile based information sources, Adequacy of information received and Usefulness of information received etc., which were measured by scales developed during the study. The reliability of the scales was measured with *Cronbach Alpha* (*Cronbach, 1951*), which were found reliable. Content validity of the scales was also measured with a team of experts from Line Department Officials in the Districts and which were found valid. To estimate the status of mobile phone use efficiency of farmers for gathering farm information, Mobile Phone Use Efficiency Index was also developed and the formula which was used for the calculation of the index is given below;

Mobile Phone Use Efficiency Index (MPUEI)

$$\text{MPUEI} = \sum_{i=1}^{n} \frac{(Me - Moi}{Me} \times 100$$

Where,

Me = Expected Summated Mobile Phone Use Efficiency for Gathering Farm Information Score.

Moi = Observed Summated Mobile Phone Use Efficiency for Gathering Farm Information Score of i^{th} respondent.

n = Total Number of Respondent

Before conducting the final study, a pilot study has been conducted in November'2015 for the modification of the interview schedule for farmers. To satisfy the different objectives taken for the study, statistical analyses have been done by frequency and percentage distribution, Pearson correlation co-efficient and Multiple Regression Analysis. The Kolgomerov-Sminrov tests of normality were also conducted and it was found that all the variables are following normal distribution. All the statistical analyses have been done by statistical software like SPSS-16.0 and MS-Excel Spreadsheet.

RESULTS AND DISCUSSION

The study envisaged that mobile phones are owned by everybody, while 71 (34.63%) farmers are having featured phone and 134 (65.37%) farmers owned smart phone (Table 1). Majority of them (65.37%) use their mobile phone for listening music followed by 62.92 per cent farmers use for watching videos and 21.46 per

Table 1: Information on Mobile Phone Usage and Preferences (N=250)

Sources		No. (%)
Mobile owned	Featured Phone	71 (34.63)
	Smart Phone	134 (65.37)
Use of phone	Watching videos	129 (62.92)
	Listening music	134 (65.37)
	Listening radio	44 (21.46)
	Facebook	1 (0.49)
	Whats App	1 (0.49)
	Other	1 (0.49)
	Capturing images	11 (5.36)
	Capturing videos	1 (0.49)
	Mobile shopping	1 (0.49)
	Other mobile Apps	1 (0.49)
Use of text messaging		118 (57.56)
Use of call	Once a day	36 (17.56)
	Multiple times per day	49 (23.90)
	Emergency	82 (40.00)
	Never	1 (0.48)
Use for agriculture needs		180 (87.80)
Network availability	Airtel	153 (74.63)
	Aircel	162 (78.02)
	Reliance	25 (12.19)
	BSNL	0 (0.00)
	Idea	19 (9.27)
Information needed	Diseases/Insect	62 (30.24)
	Market	8 (3.90)
	Food processing	11 (5.36)
	Source of seeds	45 (21.95)
	Schemes	7 (3.41)
	Cropping System	55 (26.83)
	Weather forecast	62 (30.24)
	Manures & Fertilizers	4 (1.95)
	Method of Plantation	25 (12.19)
Advisory message type	Voice/Call	49 (23.90)
	Video	15 (7.32)
	SMS	163 (79.51)
	Picture	12 (5.85)
Convenient time of calling	Morning	45 (21.95)
	Daytime	52 (25.36)
	Evening	90 (43.90)
No. Of messages/week like to receive from advisory		
	Two to three	63 (30.73)
	Three to five	30 (14.63)
	More than five	75 (36.58)
Information like to receive on off season		
	New Technology	56 (27.32)
	Training	81 (39.51)
	Schemes	13 (6.34)

Figures in parenthesis indicate percentage to total

cent farmers use for listening radio. A negligible percentage of farmers use mobile phones for facebook, whatsapp, capturing videos and images, shopping and other activities. Among all the farmers, 57.56 per cent farmers use the facility of text messaging in local dialect only as majority of them are educated only up to Lower Primary level. A majority of the farmers (40.00%) make calls during emergency, which is followed by multiple times a day (23.90%) and 17.56 per cent make calls once a day. Farmers opined that the use of mobile phones has enabled them to communicate with each other more easily as they do not have to go physically to one another's house or to one another's village for communicating and it has made life easier and also saved time and energy. In relation to agriculture, only 87.80 per cent make use of their mobile phones for agricultural needs. According to the data collected, a majority of the respondents (78.02%) reported that Aircel network availability is the best followed by Airtel network (74.63%) as compared to the other cell phone network. More than half of the respondents agreed that they need a toll free number as it would help them in acquiring necessary information relating to agriculture and allied practices. The main information needed is on the management of insect and diseases (30.24%) and weather forecast (30.24%), which are followed by cropping system (26.83%) and source of seeds (21.95%) as the farmers do not have any sound knowledge regarding the control of insects and diseases and weather forecast. Farmers also opined that they do not have proper knowledge on cropping system and demand on source of seeds is high due to lack of knowledge on storing of seeds of the previous crop in their households. Regarding message type, most of the respondents (79.51%) want information through text messages as it is easy for those who can read text messages and they can keep it as reference information. Regarding time of calling or contacting, majority of the respondents felt that evening time (43.90%) is the most convenient time to call because at that time they would be at their homes after returning from their various works and activities. The response was less for morning time as most of the respondents would be engaged in farming and other household activities. More than 5 messages per day were preferred by majority of the respondents (36.58%). During the off season, the respondents wanted information mainly on training (39.51%) because most of the farmers do not have any idea about various trainings held by different organisations and as a result they do not have any chance to attend such trainings. They feel that training will help to improve their cultivation practices. This is followed by new technology (27.32%) and information on schemes (6.34%) as they feel that such information will help them in upgrading their agricultural practices and this will help in increasing their yield and production and hence in turn it will increase their returns.

Table 2: Specific Agril. Information through Mobile Phone

Type of information	Crop	No. (%)
Price information		49 (23.90)
Marketing facilities		16 (7.80)
Weather forecasting		62 (30.24)
Information on any crop		
	Rice	149 (72.68)
	Maize	23 (11.22)
	Pineapple	8 (3.90)
	Orange	6 (2.92)
	Spices	23 (11.22)
	Vegetables	114 (55.60)
	Ginger	6 (2.92)
	Banana	1 (0.49)
	Cashewnut	65 (31.70)
	Rubber	17 (8.29)
	Arecanut	150 (73.17)
	Pulses	1 (0.49)
	Vanila	1 (0.49)
	Coconut	1 (0.49)
	Tobacco	2 (0.97)
	Tea leaf	1 (0.49)
	Litchi	1 (0.49)
	Betel vine	5 (2.44)
Information of IPM	Vegetables	13 (6.34)
	Rice	34 (16.58)
	Orange	4 (1.95)
	Arecanut	34 (16.58)
	Cashewnut	8 (3.90)
	Betel vine	1 (0.49)

Figures in parenthesis indicate percentage to total

From Table 2, it is observed that the information on the weather forecast (30.24%) is mostly needed by the farmers, which is followed by information on the price of agricultural inputs (23.90%) and information on marketing facilities (7.80%). Now farmers are getting more aware of weather forecasting facilities for their cultivation of crops and most of the respondent feels

that it will help in knowing the right time of sowing without taking risk. Particular information on cultivation of areca nut (73.17%), rice (72.68%) and vegetables (55.60%) were highly demanded. Information on management of pest and diseases of rice (16.58%), areca nut (16.58%) and vegetables (6.34%) were also highly needed by the respondents as these are the main crops in the areas and in much demand.

Table 3: Preference of language and other information required through mobile phone

Type of information	Details	No. (%)
Preference of Language	Garo	200 (97.56)
	English	1 (0.49)
	Hindi	4 (1.95)
Information other than agriculture	Health	94 (45.85)
	Marketing	16 (7.80)
	Livestock*	69 (33.66)
	Social Activities	94 (45.85)
	Business	3 (1.46)
	Fishery	9 (4.39)

Figures in parenthesis indicate percentage to total
*(Piggery/cattle/Poultry)

It is evident from the Table 3 that in case of language preference, local dialect i.e., Garo (97.56 %) is mostly preferred language as most of the farmers in the villages were very less educated. Other than agriculture, half of the respondents needed information on health (45.85%) followed by information on social activities (45.85%) and livestock (33.66%).

Table 4: Status of mobile phone use efficiency of farmers for gathering farm information

Mobile Phone Use Efficiency Index	No.	%
High (>Mean+SD)	39	19.02
Medium (Between Mean ± SD)	57	27.80
Low (<Mean-SD)	109	53.18
Total	205	100.0

Mean=43.87; SD=16.59

The study depicts that the status of mobile phone use efficiency of Garo tribal farmers for gathering farm information is unsatisfactory as majority of them fall under category low (53.18%) as it is evident in Table 4. This is mainly because farmers are using mobile phone in less intensity for gathering farm information in comparison to other usages. But, considerable numbers of respondents are under medium (27.80%) and high (19.02%) categories. The younger generation of the Garo tribal farmers are under these two categories as they are more conversant with mobile phone technology.

Table 5: Correlation between mobile phone use efficiency of farmers for gathering farm information and other causal variables

Independent Variables	Correlation Co-efficient (r)
Age (X_1)	-0.212*
Educational Status (X_2)	0.485*
Size of Holding (X_3)	0.025*
Family Type (X_4)	0.094
Family Size (X_5)	-0.254
Annual Income (X_6)	0.243
Material Possession (X_7)	0.509*
Social Participation (X_8)	0.452
Planning Orientation (X_9)	0.039
Production Orientation (X_{10})	0.541*
Market Orientation (X_{11})	0.498**
Risk Orientation (X_{12})	0.583
Economic Motivation (X_{13})	0.446**
Farmer's Attitude towards Improved Agril. (X_{14})	0.389**

* and ** represent significance at p<0.05 and 0.01respectively

The study of cause and effect relationship reveals that increase in educational status, size of holding and material possession of farmers have positive and significant correlation with the mobile phone use efficiency of the farmers for gathering farm information. *Agwu and Adeniran (2009)* also reported positive significant relationships between educational attainment and use of professional information sources; farmers' age and use of various information sources; household size and professional mass media sources as well as farming experience and use of various professional information sources. But, most importantly, age of the respondents has negative and significant correlation with the mobile phone use efficiency of the farmers for gathering farm information as it is evident in Table 5. This is mainly because; younger respondents are more mobile phone savvy and more conversant with mobile phone technologies, whereas elder group of respondents more rely on the conventional sources of farm information. The study also reflects that positive change of some of the socio-psychological variables like production orientation, market orientation, economic motivation and farmer's attitude towards improved agriculture may bring positive significant changes in the mobile phone use efficiency for farm information of the farmers in the study area.

Table 6: Multiple Regression Analysis of mobile phone use efficiency of farmers for gathering farm information (Y) with other causal variables

Variables	B-value	SE	β -value
Intercept	27.132	11.721	-
Age (X_1)	-0.127	0.023	-0.016*
Educational Status (X_2)	0.435	0.307	0.063**
Size of Holding (X_3)	2.843	0.983	-0.892
Family Type (X_4)	-0.469	1.255	-0.294
Family Size (X_5)	0.401	0.873	0.064
Annual Income (X_6)	0.596	0.654	0.432*
Material Possession (X_7)	0.079	0.092	0.015**
Social Participation (X_8)	1.694	1.397	0.479
Planning Orientation (X_9)	0.562	0.842	0.385*
Production Orientation (X_{10})	1.703	1.285	0.097*
Market Orientation (X_{11})	1.162	0.296	0.088**
Risk Orientation (X_{12})	0.212	0.293	0.159
Economic Motivation (X_{13})	0.805	0.571	0.698
Attitude towards agril. (X_{14})	0.293	0.489	0.052**

$R^2 = 0.621$; F value= 6.179**; Adjusted $R^2 = 0.514$

* and ** represent significance at $p<0.05$ and 0.01respectively

Multiple regression analysis suggests that the causal variables namely; age of the farmers, educational status, annual income, material possession, planning orientation, production orientation, market orientation and farmer's attitude towards improved agriculture have substantial and significant effects on the mobile phone use efficiency of the farmers for gathering farm information. It indicates that a unit change in age of the farmers, educational status, annual income, material possession, planning orientation, production orientation, market orientation and farmer's attitude towards improved agriculture will contribute a change in mobile phone use efficiency of the farmers for gathering farm information in the tune of -0.016, 0.063, 0.432, 0.015, 0.385, 0.097, 0.088 and 0.052 respectively. The adjusted R^2 was found 0.514, which suggests that all causal variables put together, the amount of variation in the consequent variable is explained to the tune of 51.40 per cent.

Hence on the basis of this regression analysis the following linear model can be suggested;

$$Y = 27.132 - 0.127X_1 + 0.435X_2 + 0.596X_6 + 0.079X_7 + 0.562X_9 + 1.703X_{10} + 1.162\ X_{11} + 0.293X_{14}$$

Where,

Y is mobile phone use efficiency of the farmers for gathering farm information as dependent variable and $X_1, X_2, X_6, X_7, X_9, X_{10}, X_{11}, X_{14}$ are age of the farmers, educational status, annual income, material possession, planning orientation, production orientation, market orientation and farmer's attitude towards improved agriculture respectively.

CONCLUSION

The study reveals that use of mobile phone by the Garo tribal farmers in the region is very high. But, use of mobile phone for gathering farm information is not satisfactory. They use mobile phone for different personal purpose, but less in terms of gathering farm information, which reduced their mobile use efficiency score in terms of gathering farm information. But, study envisaged that some of the socio-economic and socio-psychological variables have direct bearing in mobile use efficiency of farmers for gathering farm information. The younger generation of the Garo tribal farmers are more technology savvy and inclined to the use of mobile phone for different purpose and even agricultural purpose as well. Hence, it can be concluded that despite of low status of mobile use efficiency of farmers for gathering farm information among the Garo tribal farmers in the north-eastern Himalayan region of India, mobile based agro-advisories has real potential to come out as alternate extension system for dissemination farm information to the farming communities in the region, which will eventually result in increasing mobile use efficiency of the farmers in gathering farm information and ultimately help the farmers in the region to access right farm information at right time.

REFERENCES

Agwu, A. E. and Adeniran, A. A. (2009). "Sources Of Agricultural Information Used by Arable Crop Farmers in Isale Osun Farm Settlement, Osogbo Local Government Area of Osun State". *Journal of Agricultural Extension,* **13**(1): 24-34.

Aker, J. C. (2011). Dial 'A' for Agriculture: A Review of Information and Communication Technologies for Agricultural Extension in Developing Countries. *Agricultural Economics*, **42**(6): 631-647.

Bertolini, R. (2002). Telecommunication Services in Sub-Saharan Africa: An Analysis of Access and Use in the Southern Volta Region in Ghana. Vol. 26. L. Peter, Stuttgart, Germany,.

Cohen, A. A., and D. Lemish. (2003). Real Time and Recall Measure of Mobile Phone Use: Some Methodological Concerns and Empirical Applications. *New Media and Society*, **5**(2): 167–83.

Cronbach, L. J. (1951). Coefficient Alpha and the Internal Structure of Test. *Psychometrika*, **16**: 297-334.

Cunha, C. R.; Peres, E.; Morais, R.; Oliveira, A. A.; Matos, S. G.; Fernandes, M. A.; Ferreira, P. J. S. G. and Reis, M. J. C. S. (2010). The Use of Mobile Devices with Multi-Tag Technologies for an Overall Contextualized Vineyard Management. *Computers and Electronics in Agriculture*, **73** (2): 154-164.

Donner, J (2006). The Use of Mobile Phones by Micro-entrepreneurs in Kigali, Rwanda: Changes to Social and Business Networks. *Information Technologies and International Development, MIT,* **3**(2): 3-19.

Donner, J. (2008). Research Approaches to Mobile Use in the Developing World: A Review of the Literature. *The Information Society*. **24**(3): 17-26.

Duncombe, R. and Boateng, R. (2009). Mobile Phones and Financial Services in Developing Countries: A Review of Concepts, Methods, Issues, Evidence and Future Research Directions. *Third World Quarterly*, **30** (7).

Lahiri, B. (2016). Agricultural Information Seeking Behaviour of Garo Tribal Farmers of Meghalaya, India. *Ecology, Environment and Conservation*, **22**: 227-236.

Lahiri, B. and Das, P. (2010). Role of Nokma (Village Headman) in Agriculture of West Garo Hills, Meghalaya. *Journal of Ext. Edu.*, **15**(1&2):72-82.

Mittal, S. and Tripathi, G. (2009). Role of Mobile Phone Technology in Improving Small Farm Productivity. *Agril. Eco. Res. Review*, **22**:451-459.

Molony, T. (2008). Running Out of Credit: The Limitations of Mobile Telephony in a Tanzanian Agricultural Marketing System. *The J. of Modern African Studies*, **46:** 637-658.

Ntaliani, B.; Costopoulou, C. and Karetsos, S. (2008). Mobile Government: A Challenge for Agriculture. *Govt. Inf. Quarterly*, **25** (4): 699-716

Opara, U. N. (2008). Agricultural Information Sources Used by Farmers in Imo State, Nigeria. *Information Development*, **24**: 289-295

Press Release (2013). India is the Second-Largest Mobile Phone user in World. Press Information Bureau, Govt. of India, New Delhi. (Release ID: 85669).

Press Release (2016). Highlights of Telecom Subscription Data as on 30th April, 2016. Telecom Regulatory Authority of India, Govt. of India, New Delhi, Press Release no. - 49/2016.

Saran, R. (2005). Cell Phones Arrive from Sweepers to CEOs, From Curiosity to Necessity, in 10 Years". *India Today*. December Issue: 14-20

Yadav, B. S.; Khan, I. M. and Kumar, M (2011). Utilization Pattern of Different Sources and Channels of Agriculture Information Used by the Fenugreek Growers. *Indian Res. J. of Ext. Edu.***11** (1): 44-49.

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