

Determinants of utility of Short Messaging Services (SMS) by Farmers of Tamil Nadu for Agricultural Technology Transfer

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Abstract

Short Messaging Services (SMS) through mobile phones have redrawn the contours of Agricultural Technology transfer. In order to enable the farmers to make full utilisation of SMS as tool for technology delivery, the extent of influence of myriad of factors are to be ascertained. Hence, a study was conducted with the aim of analysing the factors influencing the reception and utility of Short Messaging services among 120 farmers as respondents in Virudhunagar district of Tamil Nadu. The results revealed that among the factors, readability of messages, understandability of messages, size of the messages, font size of the messages and more information in one messages were found to have 'high influence' to 'moderate influence' on the respondents to receive and utilise SMS. There was moderate to high influence exerted by 'previous experience of receiving messages' on the respondents while the factor 'successful experience of adopting the technologies given through the messages' had less influence. The factor analysis resulted in the extraction of three factors which got loaded based on message and season, mobile and technical aspects of message and influence of personality on the reception of messages.

(Key word: Short Messaging Services Utility, Factor influencing SMS reception)

Introduction

The Information and Communication Technology (ICT) tools offer immense scope for agricultural technology delivery within short span of time and to the clients who are geographically disadvantaged. The Mobile phones in recent past has emerged into a powerful medium which transformed the information exchange related to agriculture and allied activities. Realising the potential of mobile phones for information dissemination, numerous empirical studies were attempted by researchers in India and across the globe.

Aker (2008) found that Mobile phone service has reduced grain price dispersion across markets by a minimum of 6.4 percent and reduced intra-annual price variation by 10 percent. Fafchamps and Minten (2011) studied the benefits that Indian farmers

41 derived from SMS based markets weather and crop advisory information through a
42 controlled randomized experiment in 100 villages of Maharashtra. They did not find
43 statistically significant effect of treatment on the price received by farmers, on crop
44 losses resulting from rainstorms, or on the likelihood of changing crop varieties and
45 cultivation practices. Lokanathan et. al., (2011) through their study suggested that
46 accurate, real-time price information improves farmer livelihoods. Furthermore, the
47 service facilitated behavioral changes that enabled farmers to improve their ability to
48 coordinate supply and demand for agricultural produce based on price signals

49 Raj et. al. (2011) found through his study that net income of the intervention
50 farmers was 15.2% higher than that of the control group. Spending of intervention
51 farmers on seeds, nursery, nutrient management, and weeding was significantly less
52 than that of control farmers. The intervention group was able to reduce costs by using
53 the recommended quantities of seeds and inputs, and realizing better market prices as
54 they had better information available on the inputs. Rizvi (2011) based on his study
55 revealed that the annual average income of users of LifeLines was about 37% more than
56 the control group. For 67% of the intervention group, there was an increase in savings
57 and earnings because of increased productivity and disease control. Burgos (2011)
58 revealed that farmers, when asked what the price would have been if they had not
59 received this information, 87 percent said that they obtained a higher price, averaging
60 12.5 percent more. Moeleltsi (2013) found that providing rainfall forecasts together
61 with recommendations assists the farmers during the growing season in making
62 decisions on planting time, weeding, fertilizing, application of pesticides and other
63 management practices.

64 Few studies have also been attempted to unravel the factors responsible for
65 utility of ICT services by farmers. According to a study conducted by Kante et.al.,(2016),
66 farmer's perception such as the relative advantage, compatibility, simplicity,
67 observability and social influence of ICTs and information quality had positively
68 affected the use of ICTs on agricultural input information in developing countries. Cost,
69 education, age and Gender play a significant role in the adoption or rejection of ICT
70 based services. (Ninsima, 2015). Though, few literature were traced on the factors
71 influencing the farmers to use ICT services, research on the factors governing the
72 reception and utility of Short Messaging Services(SMS) were found to be scarce. This
73 being so, many attempts were made to use SMS to transfer technologies, market
74 information and weather information by many Institutions. The Government of Tamil
75 Nadu has established Agricultural Market Intelligence and Business Promotion Centre,
76 (AMIBPC) a state level nodal body at Tiruchirappali which is sending SMS regularly to
77 farmers all over the state related to Market information. Besides, the State Department
78 of Agriculture of Tamil Nadu, has instituted Farm Crop Management System, a data base
79 of farmers in all districts through which SMS are being sent.

80 Keeping in mind, the paucity of studies on factors influencing the utility of
81 agriculture related SMS by farmers and to give policy suggestions to the interventions
82 as listed above of Tamil Nadu Government, a study has been contemplated with the
83 following objectives

1. To study the factors influencing the utility of Short Messaging Services (SMS) by farmer
2. To unravel the pattern between the factors and to meaningfully group them

The findings of the study will give useful suggestions to the Government institutions which are designing SMS for farmers. Further, the study will highlight the factors which are highly influencing and less influencing the utility of SMS by farmers thereby suggesting suitable policy measures for effective utilisation of SMS as a tool for agricultural technology transfer.

The diffusion theory of Rogers (2003) highlighted various factors for an innovation to get diffused in a social system. This study would indirectly add theoretical contribution to the emerging body of literature on diffusion of agricultural information through mobile phone. The grouping of enabling factors which is attempted in this study would unravel the underlying pattern of relationship among these factors which would give valuable inputs for the administrators in Public and Private institutions who are entrusted with the task of sending SMS carrying myriad agricultural information to a vast number of peasants in developing countries

Literature Review

Mobile phones have become indispensable with the life of people irrespective of the habitation. The faster diffusion of mobile phones into rural hinterland could be exemplified through the increasing possession of smart phones by even small and marginal farmers. Critical analysis of the mobile phone usage by the farming community revealed that farmers have been using mobiles for various purposes and their utility for Agriculture and rural development included sharing of information on weather forecasting, market price, pest and disease management, technological solutions to the crop and animal husbandry problems etc.,(Asif,2017; Lee and Bellemare, 2013; Muto and Yamano, 2011)

Short messaging Services (SMS) is an option available in the mobile phones which is used for transfer of both textual and Multimedia messages. The utility of SMS for the agricultural technology transfer is influenced by a plethora of direct and indirect factors. Though there were several research studies in the domain of ICT and agriculture, the literature linking SMS and technology transfer was limited. The crux of the study is to identify and group the relevant factors influencing the utility of short messaging services by farmers. An attempt is made to review some of the literature in this line which gave insight and to identify research gaps.

Asif et al., (2017) in their study among vegetable growers found that age and social participation were the influential factors affecting the use of mobile phone by the farmers. Lack of mobile servicing centre, expensiveness and electricity problem were the major constraints that cause hindrance to the use of mobile phone in receiving information on vegetables cultivation. Mobile applications can promote agricultural and rural development, including better access to extension services; better market links

and distribution networks; and better access to finance, including credit, insurance and payment methods (Qiang, 2011).

Several studies found that mobile phones reduced transportation costs where trips for social and business purposes were substituted with phone calls (Overa, 2006; Balasubramanian, 2010; Boadi, 2007; Frempong, et. al., 2007; Samuel, et al., 2005; Sife et al., 2010). Islam and Ake (2011) investigated the factors influencing the adoption of mobile phone technology among farmers in Bangladesh using a conceptual Rural Technology Acceptance Model (RUTAM) The most salient modification, compared to earlier models, is that social influence plays a bigger role than technology at early stages of adoption. 'Tech-service promotion' and 'tech-service attributes' are introduced as external factors which affected the behavioral intentions of an individual by means of perceived usefulness (PU) and perceived ease of use (PEU).

Tegegn and Akalu (2017) in their study reported that main factors that influence the use of mobile phone were high cost of available technologies, inadequate infrastructure and low ICT skills, poor and expensive connectivity, inappropriate ICT policies, language barriers, low bandwidth, inadequate and/or inappropriate credit facilities and systems

Nyamba (2017) in his study run regression analysis and the results indicated that socio-demographic characteristics significantly influenced the use of mobile phone to communicate agricultural information at 0.059, 0.012, 0.038, 0.265 and 0.043 coefficients for age, literacy levels, farm sizes, distance from market and type of agricultural information needed respectively.

While some of the m-services provided only one service, many are recognising the need for more comprehensive applications with complementary functions. Different types of information are often combined in one service such as market prices, farming advice, weather or disease outbreaks. Moreover, information services are increasingly being offered in combination with other m-services such as virtual markets (e.g. M-Farm, Esoko or iCow), supply management systems (Star Shea Network, African Cashew Initiative) or micro-loans (Star Shea Network). Such integrated services are useful to enable farmers to apply the information they receive and thereby support technology adoption at different stages (Gakuru et al. 2008)

An abstract of review of mobile based interventions by Haike (2012) at Centre for Development Research in University of Bonn is given below for better understanding of how the mobile phones are being used for Agricultural development across the world

Economic impact of the DrumNet project, a network of farmer business support centres	Transaction Agents use mobile to gather info on prices, collection days and grading standards	Kenya	Campaigne (2006)
Use of ICTs to reduce transaction costs in	Information search costs associated with all stages	Sri Lanka	de Silva & Ratnadiwakara

agriculture through better communication	of the ag value chain, in particular at decision (what to grow) and selling stages		(2008)
Impact of mobile phones on price dispersion across grain markets	10-16% reduction in price dispersion across markets due to reduction in search costs (esp. for market pairs with higher transport costs)	Niger	Aker (2010); Aker (2008)
Impact of mobile phone coverage expansion on market participation	Greater market participation of farmers in remote areas and producing perishable crops (bananas) and the price gains were higher for less remote banana farmers	Uganda	Muto & Yamano (2009)
Role of mobile phones in reducing information asymmetry in the agricultural sector and improving farm productivity and profitability	Mobiles used mainly for social purposes resulted in Increased convenience and cost savings among farmers Greater benefits where phones used as information rather than purely communication tool	India (Uttar Pradesh, Rajasthan, Maharashtra, New Delhi, Pondicherry)	Mittal et al. (2010); Gandhi et al. (2009)
Development contribution of mobile phones across the agricultural value chain	Mobile phone affects entire farming cycle, incl. preparations, farming, harvesting and post-harvesting which raised incomes by improving farmers' ability to deal with risks and take advantage of opportunities	Tanzania	Furuholt & Matotay (2011)
Impact of price information (provided through TradeNet) to reduce info asymmetries between farmers and buyers	Users obtained \$0.045-0.09/kg more for produce and could choose harvest and selling time due to better understanding of real-time price trends	Sri Lanka	Lokanathan et al. (2011)
Role of improved access to info through LifeLines in enhancing livelihoods of the poor	Perceived improvements in productivity (72% of respondents) and savings and earnings (67%), decrease in loans (31%)	India	Haider Rizvi (2011)

	and most queries about seeds, crop & animal diseases, new ag technologies and prices		
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Source: Haike (2012), Working Paper Series 93, Centre for Development Research, University of Bonn

From the review of various studies on Mobile based Agricultural Technology Transfer, the following conclusions could be drawn.

1. Most of the studies were conducted on Mobile phones and its utility for transferring market information. Studies specifically on the information utility for adoption of technologies were limited.
2. Weather information through ICT has attracted most of the researchers and some studies were conducted on it also. But except a few more indepth studies were not there to generalize the findings. This necessitated future endeavours in this line are to be initiated since risk dominates the farming globally
3. The content, infrastructure and tools have dominated most of the literature. One unique observation from the studies is that researchers concentrated on the tools rather than the factors affecting delivery from all angles.
4. Though roughly 40% of the studies related to ICT is being conducted in India, the Impact studies generated from foreign Universities employing Indian Scholars was on the rise. Studies from State Agricultural Universities and ICAR scientists are very limited.
5. An appreciable number of studies questioned the sustainability of the ICT projects once the project period is over

From the conclusions drawn above, the present study would try to identify the factors responsible for adoption gap, sustainability issues and the utilitarian issues pertaining to mobile usage.

Methodology

The research design used for the study was 'Ex-post facto design'. In Ex-post Facto design, the research instead of creating a treatment, evaluate the effect of a naturalistically occurring phenomenon after its occurrence. In this process, the causes were earthed out considering sociological and behavioural studies. The cause might be due to the personal and impersonal variables for the resultant behaviour. In the present study, the factors which influenced the farmers to use mobile phones for getting agricultural information was analysed which has already occurred and the research was not intended to manipulate the incidence of these factors. Hence, the Ex-post facto research design was contemplated to be suitable for the research

Sampling procedure

Mobile phones are being used by all citizens irrespective of their income and background. Uttar Pradesh has a total of 121.60 million mobile phone connections, while, Tamil Nadu has 71.81 million subscribers and stood second according to the TRAI data. Over 165 services of various government departments could be accessed through online e-sevai centres across the State of Tamil Nadu. IFFCO Kissan Sanchar

Limited (IKSL) and Reuters Market Light (RML) are providing services through sms and voice messages about agriculture related information (Marcel and Bart, 2012). Similarly, there are many private and public organizations that are disseminating agricultural related information on farmers' mobile phone. These are Bharat Sanchar Nigam Limited (BSNL) - price on agricultural commodities, Nokia Life Tools - information on seeds, fertilizer, pesticides, market prices and weather, Fisher Friend Project - Fishing opportunities, risk and market information, Rubber Board, India-Market Price by Short Message Service (SMS) - price on natural rubber (Saravanan, 2010).

The research was conducted in Virudhunagar district of Tamil Nadu in India during January 2018 to March 2018. Among 32 districts in Tamil Nadu, Virudhunagar district was chosen using purposive sampling technique. Among the districts Virudhunagar district farmers were reported to receive more number of SMS sent by AMIBPC (Agricultural Market Intelligence and Business Promotion Centre), a state level nodal body to help farmers to get timely SMS on Marketing of Agricultural produce. (Source: Office of AMIBPC, Trichirappalli, Tamil Nadu). Further the farmers of Virudhunagar have been receiving crop related advisories through SMS from Farm Crop Management System (FCMS) an online data base of farmers of the district maintained by the Department of Agriculture

In Virudhunagar district of Tamil Nadu, there were 9 blocks out of which two blocks namely Virudhunagar and Kariyapatti were purposively selected based on highest number of farmers registered for receiving SMS (Source: Office of Joint Director of Agriculture, Virudhunagar District, Tamil Nadu). In Virudhunagar block 2550 farmers and in Kariyapatti 1750 farmers were registered for the receipt of SMS from both the sources namely AMIBPC, Trichirappalli and FCMS, Joint Director of Agriculture office, Virudhunagar. One hundred and twenty respondents (120) from eight villages namely Sennelkudi, Pottalpatti, Mettukundam, Kadambankulam, Pisindi, Mallankinaru, Murungankulam and Kaluvanancherry were selected for the study using Proportionate Random Sampling procedure, the procedure of which is given below

The list of farmers receiving the agriculture and allied based SMS in the selected eight villages was collected from ADA office of viruthunagar and kariapatti block. Among the list of SMS receiving farmers, 120 respondents were selected through proportionate random sampling method, which took into account the proportion of SMS receiving farmers present in the selected villages besides ensuring the equal and independent chance of SMS receiving farmers got selected into the sample. The following is the formula for the selection of respondents through proportionate random sampling method.

$$ni = \frac{Ni}{N} \times n$$

Where

ni - number of respondents to be selected from the ith village

Ni - total number of respondents in the ith village

N – Total number of respondents in eight villages

n – Total number of respondents to be selected from eight villages

Data collection

A well structured interview schedule was constructed to collect data from respondents. The items with respect to socio-economic profile of respondents, twenty three factors to know about their influence on receiving and using SMS from Department of Agriculture were included in the schedule. Prior to the inclusion of factors, universe of factors numbering 60 was given to a group of judges and the reliability was calculated using split half method. Those factors whose reliability score was more than 0.6 were included in the schedule. The content validity of the selected factors were also assessed by assigning them to judges. Finally 23 factors with reliability score of 0.6 and above and higher content validity were included in the interview schedule. The interview schedule was pre tested in a non sampling village and the inadequacies in the schedule was corrected. The respondents were personally contacted and consent was obtained for giving information. The interview was conducted among 120 respondents from January 2018 to March 2018.

Measurement of variables and data analysis

Age, education, Area under cultivation, occupational status, annual income, Possession and utility of Mobile phones were the socio economic characteristics for which data was collected from the respondents. The operationalisation of the socio economic profile is given below in the table

Age	:	Chronological age of the respondents at the time of interview
Education	:	The educational attainment of respondent in years
Occupational Status	:	The occupational profile of respondents which took into account not only farming but also non- farm activities.
Area under cultivation	:	Refers to area owned and also taken on lease which are being cultivated by the respondent
Annual Income	:	The money earned by the respondent in an year through farming and non farming activities
Possession of smart phone	:	This refers to the possession of smart phone by the respondent which was measured through dichotomous response of 'yes' and 'no'
Utility of smart phone	:	The degree of utility of smart phones which was measured through three point continuum of frequently, occasionally and rarely

The data related to these variables were collected, post stratified, scored, tabulated and percentage was worked out.

The data pertaining to 23 identified factors influencing the receipt and utility of SMS by farmers from the Department of Agriculture, Virudhunagar district and AMIBPC, Trichirappalli was measured on four point continuum namely 'High influence', 'Moderate influence', 'Less influence' and 'no influence' which were given with the

scores of 4,3,2 and 1 respectively. Percentage was worked out for each of the factor in four response categories.

Factor analysis is a variable reduction technique and served the purpose of grouping variables based on underlying pattern between the variables. In the present study the determinants of influencing the reception and utility of agriculture related SMS by the farmers were grouped together into different factors using factor analysis.

Model specification

The theoretical basis for factor analysis is that variable correlated because they share one or more common components. That is, correlations among variables are explained by underlying factors. Mathematically a one-factor model for three variables can be represented as follows (Vs are variables, Fs are factors, Es represent random error)

$$V1 = L1 *F1 + E1$$

$$V2 = L2 *F1 + E2$$

$$V3 = L3 *F1 + E3$$

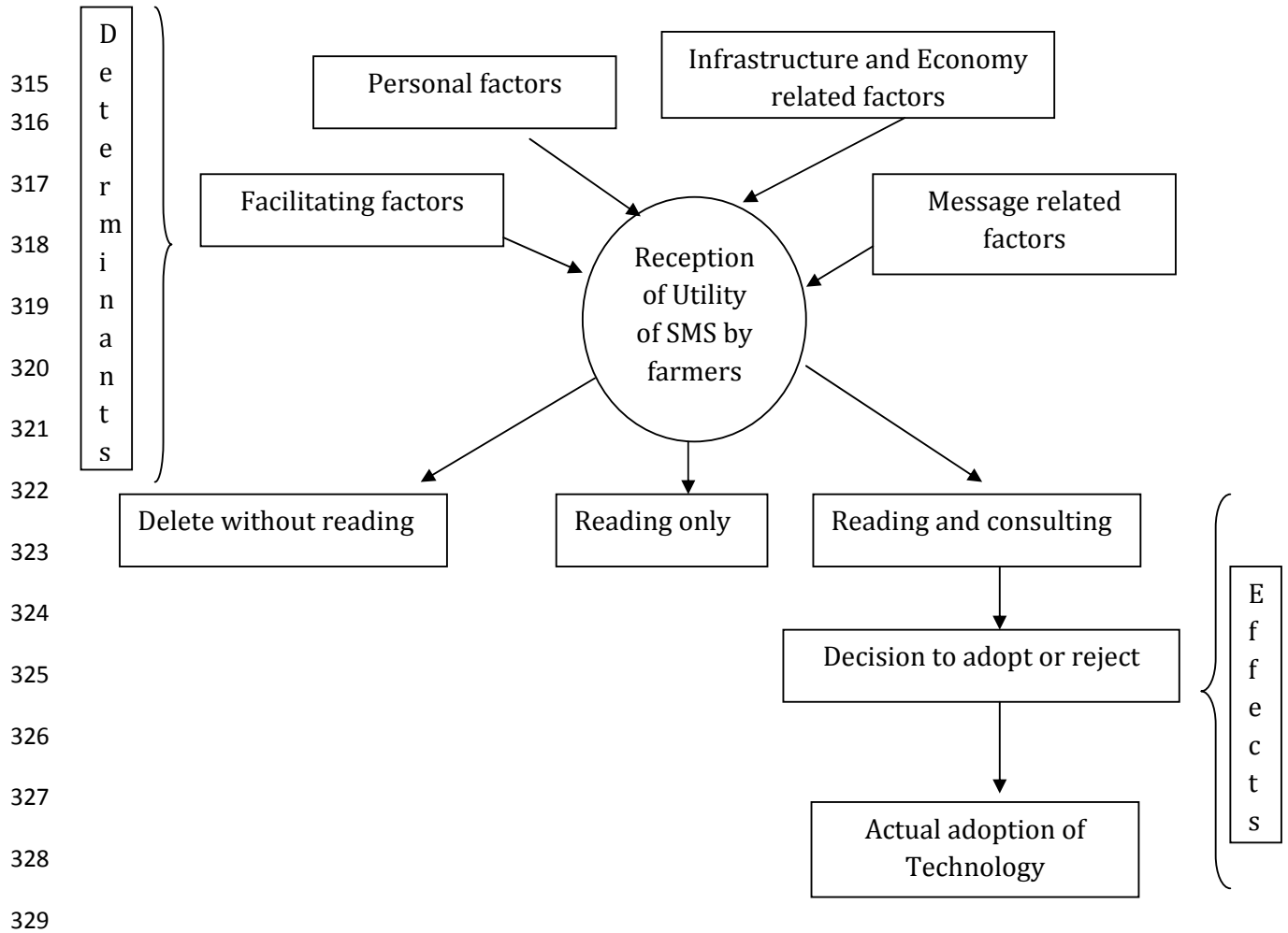
Each variable is composed of the common factor (F1) multiplied by a loading coefficient (L1,L2,L3-the lambdas) plus a random component. If the factor were directly measurable, this would amount to a simple regression equation. Since these equation cannot be solved as given (the Ls, Fs and Es are unknowns), factor analysis takes an indirect approach.

If the equations above hold, then consider why variables V1 and V2 correlate. Each contains an error (the E1S, assumed to be random or unique) component that cannot contribute to their correlation (errors are assumed to have 0 correlation). However, they share the factor F1, so if they correlate their correlation should be related to L1 and L2 (the factor loadings). If this logic is applied to all the pairwise correlations, the loading coefficients can be estimated from the correlation data. Thus one factor might account for the correlations in a set of variables.

Different factors solutions can be consistent with a single set of correlations (e.g., the same correlations can be produced by several sets of factor loadings, or by a varying number of factors). This makes determining the underlying structure (the real factors) difficult. The solution involves adoption of two summations. First, since factor analysis is based on correlations, only linear relations are assumed to be present. So a basic assumption of factor analysis is that the variables used in factor analysis are linear combinations of some underlying factors. This eliminates non-linear solutions. To resolve which of two (or more) otherwise equivalent solutions is chosen the researcher picks the more parsimonious one.

Further, the researcher tried to confirm the validity of the solution. Typically the first step in confirming a factor solution is to be validating it with a different factor method and on a new sample. In addition, one might conduct additional tests to evaluate factors. The general form of these additional tests would be "if this is really a factor then the following should be true.

A diagrammatic conceptual model of the study is given below



The conceptual model depicts that the reception and utility of SMS related to agriculture and allied technologies is being influenced by at least four sets of factors namely personal, infrastructure and economy related, message related and facilitating factors which are termed as 'determinants'. The study conceptualise that the due to the influence of these determinants, the farmers may respond in at least four ways namely delete without reading, reading only, reading and consulting and actual adoption of technology which are termed as 'effects'. Nevertheless, the study tried to concentrate on the exploration of determinants only for the reception and utility of SMS by farmers.

Results and Discussions

This section is dealt in three parts. First, the socio economic profile of the respondents was discussed briefly followed by the detailed discussion on the factors influencing the reception and utility of SMS by the farmers. The last section dealt with the results of factor analysis.

Socio-Economic Profile

The socio economic profile of the respondents was studied and presented in the table 1.

Table.1 Socio-economic profile

S.No	Profile	Number	Per cent
1.	Age		
	Young	17	14.20
	Middle age	49	40.80
	Old	54	45.00
2.	Education		
	Illiterate	22	18.30
	Functionally literate	11	9.20
	Primary Education	25	20.80
	Secondary Education	40	33.30
	Collegiate Education	22	18.30
3.	Area under cultivation		
	Less than 2.5 acre	20	16.70
	2.6 to 5.5 acre	93	77.50
	More than 5.6 acre	7	5.80
4.	Occupational status		
	Farming alone	76	63.30
	Farming and business	8	6.70
	Farming and wage earning	36	30.00
5.	Annual Income		
	Upto Rs.50000	72	60.00
	From Rs. 50001 to 1.00 lakh	34	28.33
	Above Rs.1.00 lakh	14	11.67
6.	Possession of Smart phones	60	50.00
7.	Utility of smart phones (n=60)		
	Frequently	52	86.67
	Occasionally	6	10.00
	Rarely	2	3.33

346

347 Majority of respondents were old aged (45.00%) to middle aged (40.80%). One
348 third (33.30%) of respondents were educated upto secondary level followed by primary
349 (20.80%) and collegiate (18.30%) level. Land holding possessed by majority of the
350 respondents was in the range of 2.6 to 5.5 acres. Farming alone (63.30%) was reported
351 as the primary occupation followed by farming and wage earning (30.00%). Two-third
352 of the respondents were found to be in the annual income category of RS. 50000.
353 Exactly half of the selected respondents possessed smart phones which was used
354 frequently by majority of them (86.67 percent)

355 As detailed in methodology factors influencing the farmers to use mobile phones
356 for receiving and to act upon the short messaging services (SMS) was studied and
357 presented in table 2. These factors were classified into four heads namely message
358 related factors, infrastructure and economy factors, personal factors and facilitating
359 factors.

360 **Message related factors**

Since the core of study is to analyse the factors influencing the SMS utility by the farmers for receiving agriculture related information, the nature, type, relevance of the messages in line with the requirement of the farmers were studied.

Among these factors readability of messages (63.30% and 25.80%), understandability of messages (55% and 31.70%), size of the messages (51.70% and 21.70%), font size of the messages (47.50% and 35.80%) and more information in one messages (43.30% and 31.70%) were found to have 'high influence' to 'moderate influence' among the respondents to receive and utilize the SMS related to agricultural technologies. The respondents reported when the messages were readable, understandable, they tended to read the messages.

Along with these two factors 'the size of the messages' were also found to influence the respondents to look into the messages. The respondents opined that they were interested to look into shorter messages rather than lengthier messages. Since, most of the respondents of the study were middle aged to old aged (above 45 years), the larger font size seemed to influence them to look into the messages as it is closely related to eye sight of the respondents. They reported that most of the SMS related to agriculture information were in appropriate font size and they could read it.

The information richness is another factor or wholistic information about a technology given in one messages was preferred by the respondents as they need not search for additional information. Considerable number of respondents were in 'moderate influence' (31.70%) and 'less influence' category (24.20%) for this factor which indicated that the SMS given was not comprehensive and the administrators who shoot up SMS need to design messages in such a way that they are comprehensive.

There was 'moderate influence' (30.80%) to high influence for the factor 'requirement or demand of technical information'. Cumulatively half of the respondents were also found to have 'less influence' to 'no influence' towards this factor which clearly revealed that more efforts are to be initiated by the service providers of agriculture based SMS to give demand based information. There was less influence (40.80%) to moderate influence (30.80%) of push messages which indicated that the respondents were not perturbed by the push messages.

The results from the table 2, indicated that one third (31.70%) of respondents were 'highly influenced' by 'timeliness of message relevant to crop stage'. Despite, put together, nearly half of the respondents (29.20% and 24.20%) were found to be in 'moderate influence' and 'no influence' categories for this factor. The respondents told the researcher that often they used to receive SMS which were not relevant to the stage of crop in their field. Yet another factor supported this finding was the 'message about the crop which was present in the field' did not influence nearly two fifth (40.80%) of the respondents followed by 'less influence' (20.50%) and 'moderate influence' (20.00%).

It was found that no influence was exerted by the following factors 'continuity of message' (39.20% and 34.20%) and 'diversity of information' (37.50% and 33.30%). The respondents reported that they had been receiving messages about crop which were not in the field. Further they told that there was neither continuity of message nor diversity of information in the SMS that they have received.

The message related to weather forecasting was abundant than technology related and market related SMS. The continuous reception of information starting from variety to market was rarely experienced by the respondents. Though there was 'less influence' (41.70%) and 'no influence' (25.80%) pertained to the usage of technical jargon in the message, nearly one fourth (25.20%) were in moderate influence category and substantiated that messages still need to be technical jargon free which will motivate the respondents to look into the messages.

Infrastructure and economy related factors

It was found from table 2, that there was 'high influence' to 'moderate influence' experienced by the respondents for the factors 'ease in opening messages in the mobile' (50.80% and 29.20%) and 'connectivity, speed of service provider' (44.30% and 36.70%). The respondents felt that certain mobile phones especially smart mobiles did not facilitate them to open the message at once and they found difficulty in opening the message. Similarly they were concerned about connectivity and speed which was affected by absence or limited availability of towers. There was 'moderate influence' (39.20%) which was followed by high influence (34.20%) and less influence (21.70%) exerted on the respondents by the factor 'type of mobile phone'. As discussed already the opening of message varied for different types of mobile phone and hence this factor influenced majority of the respondents.

Personal factors

Nearly three fifth (59.20%) of respondents were found to be 'highly influenced' by the availability of time to look into the messages followed by nearly one-fourth (27.50%) who were in 'moderate influence' category. Majority of the respondents during interview reported that time availability amidst the regular work really influenced them to look into the messages. Mood and interest at the time of reception of message was found to be 'highly influencing' (41.70%) and 'moderate influencing' (40.80%) of the respondents in receiving SMS. The respondents during the interview registered their views that they had been receiving lot of unsolicited messages from advertisers from various sources which they reported to have negative effect on the mood and interest in looking into agriculture related SMS.

There was moderate (40.00%) to high influence (35.80%) exerted by the factor 'previous experience of receiving messages' on the respondents. The factor 'successful experience of adopting the technologies given through the messages' had less influence (40.80%) on the respondents followed by nil influence (23.30%). The researcher

439 reported that they rarely adopted the technologies given through SMS. This has clearly
440 indicated that the adoption of technologies or making full use of information has rarely
441 been achieved by the agriculture related SMS.

442 **Table.2.Factors influencing utility of Mobile phones for technology delivery**

S.no	Influencing Factors	High Influence		Moderate influence		Less influence		No influence	
		No	Per cent	No	Per cent	No	Per cent	No	Per cent
I	Message related Factors								
1.	Requirement/demand of a technical information in the form of messages	28	23.30	37	30.80	35	29.20	20	16.70
2.	Push messages sent by advertiser received in the mobile	19	15.80	37	30.80	49	40.80	15	12.50
3.	Font size of the messages	57	47.50	43	35.80	16	13.30	4	3.20
4.	Readability of the messages	76	63.30	31	25.80	11	9.20	2	1.70
5.	Understandability of the messages	66	55.00	38	31.70	16	13.30	-	-
6.	More information in one messages	52	43.30	38	31.70	29	24.20	1	0.80
7.	Timeliness of message relevant to crop stage	38	31.70	18	15.00	35	29.20	29	24.20
8.	Message about the crop which is right in the field	22	18.30	24	20.00	25	20.80	49	40.80
9.	continuity of messages about crop operations	11	9.20	21	17.50	41	34.20	47	39.20
10.	Diversity of information given the messages	8	6.70	27	22.50	40	33.30	45	37.50
11.	Technical jargon used in the messages	4	3.30	35	29.20	50	41.70	31	25.80
12.	Size of the messages	62	51.70	33	27.50	22	18.30	3	2.50

II	Infrastructure and Economy related factors								
13.	The type of mobile phone	41	34.20	47	39.20	26	21.70	6	5.00
14.	Ease in opening a message in mobile	61	50.80	35	29.20	20	16.70	4	3.30
15.	Connectivity and speed of service provider	53	44.20	44	36.70	19	15.00	4	3.30
III	Personal factors								
16.	Availability of Time to look into message	71	59.20	33	27.50	13	10.80	3	2.50
17.	Previous experience in receiving messages	43	35.80	48	40.0	26	21.70	3	2.50
18.	Successful experience in adopting the information given the messages	17	14.20	26	21.70	49	40.80	28	23.30
19.	Mood and interest at the time of reception of messages	50	41.70	49	40.80	12	10.00	9	7.50
IV	Facilitating Factors								
20.	Time in a day at which messages being received.	53	44.20	43	35.80	17	14.20	7	5.80
21.	Credibility of the sender of messages	41	34.20	52	43.3	21	17.50	6	5.00
22.	Influence of fellow farmers /friends/ relatives	25	20.80	43	35.8	39	32.50	13	10.80
23.	Possibility of feedback	-	-	14	11.70	36	30.00	70	58.30

Facilitating factors

Among the facilitating factors 'time in a day at which messages are being received' had a say as it 'highly influenced' (44.20%) and 'moderate influenced' (33.50%) the respondents to look into the messages which indicated that the respondents were satisfied with this factor. Majority of the respondents were in 'moderate influence' (43.30%) and 'high influence' (34.20%) categories pertaining to credibility of the sender of the messages. This result indicated that there existed credibility gap which the Extension personnel of Department of Agriculture need to plug.

The fellow farmers, friends, relatives were found to 'moderate influence' (34.80%) and 'less influence' (32.50%) the respondents to receive and look into the SMS related to agriculture. This indicated that there was lesser networks among the respondents and they seemed to work in isolation. The possibility of feedback as a factor had nil influence (58.30%) to less influence (30.00%) on the respondents as there was no feedback mechanism inbuilt in the SMS received by the farmers from department of agriculture and AMIBPC. The respondents told that they did not know how to clarify the doubts related to messages as there was no feedback mechanism.

Factoring of attributes influencing the farmers to receive and to utilise the Short Messaging Services (SMS) related to Agriculture

The factors which influence the Farmers to receive and to utilise the Short Messaging Services (SMS) related to Agriculture have been detailed in the previous section. These factors may be associated with the message related, personal related, infrastructure related or any other facilitating factors etc., In order to find out the pattern of grouping among these factors and to identify underlying relationship between them, factor analysis was run with the help of SPSS version 16.00 and the results are presented below.

As a first step, the suitability of the data for factor analysis was checked. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.704, which indicated that the data was amenable for factor analysis. Hence it was decided to proceed further. The principal component analysis extracted three factors through varimax rotation and the results revealed that 43.64 per cent variation in the reception and utility of SMS by the farmers was explained cumulatively by the extracted three factors.

The first factor accounted for variation of 19.46 in the reception and utility of SMS by farmers followed by 16.85 per cent and 7.32 per cent of variation explained by second and third factors respectively. The Table 3 showed the factors loaded into three components and the magnitude of factor loadings.

481 **Table.3. Rotated Component Matrix**

S.no	Factors	Component		
		1	2	3
1	Availability of Time to look into message			0.555
2	Previous experience in receiving messages			0.720
3	Mood and interest at the time of reception of messages			0.734
4	Time in a day at which messages being received.			0.568
5	Credibility on the sender of messages			
6	Demand of a technical information in the form of messages	0.622		
7	Push messages sent by advertiser received in the mobile			
8	The type of mobile phone		0.527	
9	Ease in opening a message in mobile		0.571	
10	Font size of the messages		0.725	
11	Readability of the messages		0.710	
12	Understanding of the messages		0.730	
13	More information in one messages			
14	Timeliness of message relevant to crop stage	0.731		
15	Message about the crop which is right in the field	0.859		
16	Continuing of messages about crop operations	0.749		
17	Diversity of information given the messages	0.645		
18	Technical jargon used in the messages			
19	Influence of fellow farmers /friends relatives			
20	Size of the messages			
21	Connectivity and speed of service provider			
22	Successful experience in adopting the information given the messages	0.547		
23	Possibility of feedback	0.708		

Factor I

In the first component, as shown in Table.3, the factors which got positively loaded with highest factor loadings were message about the crop which is right in the field (0.859), Continuity of messages about crop operations (0.749), Timeliness of messages relevant to the crop stage (0.731), Possibility of feedback (0.708), diversity of information (0.645), demand for technical information in the form of SMS (0.622) and successful experience in adopting the information given through messages (0.547). As discussed already in the previous section, the timeliness, continuity, diversity had lesser or nil influence on the respondents. Though, these factors got loaded heavily into this component which implied that they need harnessed attention by the senders of SMS. Similarly the demand for information and successful adoption of technologies given through SMS were reported to have less or nil influence from which it is inferred that more efforts are needed by the senders of SMS to study the process of technology adoption for the technologies given through SMS, keeping in mind the location specific demands of those technologies.

Factor II

There was a clear grouping of factors observed in component II. Understandability of messages (0.730), font size of message (0.725) and readability of the message (0.710) were the factors which got loaded positively with higher factor loadings. The findings presented in the preceding section revealed that these factors had higher to moderate influence on respondents. The striking point here is that the creators and senders of SMS should keep in mind these factors which were found to influence the farmers predominantly. The mobile related factors of type of mobile (0.527) and ease in opening messages (0.571) were moderately loaded into the second component. From this loading it could be inferred that besides the nature of messages the mobile set also had influenced the farmers to make use of the SMS effectively.

Factor III

The grouping of factors in component III lucidly portrays that the factors related to individual farmers characteristics was loaded positively. Mood and interest at the time of reception of messages (0.734), previous experience in receiving information (0.720) were loaded with higher positive factor loadings whereas time in a day at which messages are being received (0.568) and availability of time to look into the message (0.555) moderately got loaded into this component. The personal characteristics do play a pivotal role in stimulating the farmers to devote time for looking into the message. Preferably farmer's experience and interest will go a long way in shaping their SMS reception and utility.

Conclusion and Recommendations from the study

A study was conducted among 120 farmers as respondents in Virudhunagar district of Tamil Nadu with the objective of analysing the factors influencing the

reception and utility of Short Messaging services given by two sources namely Farm Crop Management System(FCMS) of Department of Agriculture, Virudhunagar district and Agricultural Market Intelligence and Business Promotion Centre, a Tamil Nadu Government entity in Tiruchirappalli of Tamil Nadu. Ex-post facto research design was employed and the farmers were selected using proportionate random sampling procedure. The data was collected using a well-structured interview schedule.

Among the factors, readability of messages, understandability of messages, size of the messages, font size of the messages and more information in one messages were found to have 'high influence' to 'moderate influence' on the respondents to receive and utilise SMS. There was little or no influence' exerted by the factors 'continuity of message' and 'diversity of information'. Nearly three fifth of respondents were found to be 'highly influenced' by the availability of time to look into the messages Mood and interest at the time of reception of message was found to be 'highly influencing' and 'moderate influencing'. There was moderate (to high influence exerted by the factor 'previous experience of receiving messages' on the respondents while the factor 'successful experience of adopting the technologies given through the messages' had less influence on the respondents. The factor analysis resulted in three factors which got loaded based on message and season, mobile and technical aspects of message and influence of personality on the reception of messages.

The following recommendation could be drawn from the findings of the study.

1. The study results revealed that timeliness, continuity of messages, messages about the crop in the field and demand based location specific SMS had little or nil influence on the respondents. This implied that the SMS creators and senders should keep in mind the area, stage of crop and demand for technology before shooting up the messages to the farmers.
2. There was no possibility of feed back in the message. Hence, the administrators of this intervention should think of including free of cost feedback mechanism to be set inbuilt into the system of SMS based technology delivery
3. Very lesser number of farmers were reported to adopt the technologies given through the SMS. Efforts are to be taken by the Extension workers of line departments to study the process of travel of information and the reception behaviour of farmers to understand the constraints in adopting those technologies.
4. The respondents of the study were found to have been influenced by readability, understandability and font size of the messages which implied that the extension workers should design the messages which are readable, understandable easily by the farmers.
5. The predominance of the factors like readability, font size, understandability resulted in a recommendation to Agricultural Extension researchers that a study may be commissioned for 'Participatory Designing of Messages for SMS' and this can be conducted in an Action research mode with the participation of farmers and Extension researchers.

6. The study results revealed that the utility of SMS by farmers was not influenced by friends, relatives and fellow farmers which indirectly indicated poor networking among farmers. Hence, the Extension personnel of Department of Agriculture who are already forming Farmer Producer Groups may strengthen their activities in forming farmers groups and these group members may be enrolled for receiving SMS which will be purposeful as farmers of same attitude could be networked.
7. In nut shell, the data was distributed among four categories, and there were significant number of respondents in little or no influence categories which indicated that the respondents were not too confident about the mobile based technology delivery. Hence, it is recommended that the Extension personnel of line departments should design trainings for farmers on ICT based agricultural technology delivery along with their regular technology oriented trainings to farmers.

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