



Use of mobiles in dairying for information dissemination: A multi-stakeholder analysis in India

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ABSTRACT

Among all the information and communication technology (ICT) tools, mobile phone has emerged as one of the widely accepted and adopted instruments for delivery of agriculture and livestock related information. Though, mobile use in dairying is considered as an emerging tool in Indian dairy industry, there is a need to study its impact at field conditions. With this theoretical background, the study has focused on the efforts of government of India for mobile message delivery, perception and per cent gap among multi-stakeholders with regards to relevance, profitability and sustainability of mobile use in dairying. The study included primary data using 360 dairy farmers, 80 research scientists and 40 extensionists in North India and also relevant secondary data. The study revealed that perception of scientists and extension experts was more favorable towards relevance, profitability and sustainability of mobile use in dairying, while the perception of farmers was less favourable towards mobile use. The study also observed that there was a wide gap (higher per cent gap) among farmers-scientists and farmers-extensionists with regards to relevance, profitability and sustainability, while the gap was very narrow among scientists and extensionists. The study concluded that researchers and extension experts need to be familiarized about use of mobiles to disseminate information and improve productivity in the dairy sector. Further, the scientists have to generate and transfer field relevant, profitable and sustainable tools and techniques with the involvement of farmers as the partners of research and extension for effective generation and transfer of dairy innovations.

Key words: Mobile, Multi-stakeholders, Profitability, Relevance, Sustainability

India is blessed with highest cattle (190.09 million) and buffaloes (108.7 million) (GOI 2012), but the productivity *per se* is very poor which is a major cause of concern in Indian livestock and dairy sector (Chander *et al.* 2010). This might be attributed to the fact that there is an increasing gap between technologies developed and actually being adopted or used by the farmers which might be due to poor information dissemination to the farmers. Among different modes and methods of delivering information to the farmers, Information and Communication Technology (ICT) has the potential to help farmers in acquiring and accessing information which can be transformed to enhance agricultural and livestock production. Presently, wide range ICT platforms are used to access and share agriculture information and knowledge in the form of web pages, audio, video and text messaging. Among various ICT tools, mobile phone has emerged as one of the widely accepted and adopted instruments in most parts of the world to ease the

information communication process among farming communities (Hayrol *et al.* 2009). Mittal and Tripathi (2009) reported the key role played by mobiles in lowering transaction costs and raising the income levels of farmers, by efficiently addressing agricultural information requirements, while Inigo *et al.* (2014) and Mittal *et al.* (2010) reported that mobile phones contribute greatly to agricultural and animal husbandry information dissemination. Mobile telephony is a new phenomenon in seeking dairy related information by opening up the opportunities in accessing information about various aspects like disease, management, marketing etc. But however, lack of customization of these services to serve specific needs of farmers and lack of operational knowledge are some of the impediments in effectively leveraging the potential of mobile phones (Gakuru *et al.* 2009, Babu and Ashokan 2011, Inigo *et al.* 2014) leading to the fact that, role of mobile phones for dairy farmers in information access, is an area which has not received due attention. Though, mobile is considered as an emerging tool in Indian dairying (Rathod and Chander 2014), still there is a need to emphasize the initiatives of public sector for information delivery through mobiles, and study the perception of multi-stakeholders viz. dairy farmers, scientists and extensionists towards mobile use in Indian dairying. With this theoretical

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background, the present study has focused on the efforts of government of India for mobile message delivery, perception and per cent gap among multi-stakeholders with regards to relevance, profitability and sustainability of mobile use in dairying and has proposed certain policy implications for Indian dairy industry to improve the production and productivity.

MATERIALS AND METHODS

Sampling: A combination of purposive and multi-stage random sampling was adopted in the study to select the respondents. Four Agricultural / Veterinary Universities and Institutes, which are at the forefront of research in livestock sector, were selected. All the selected Universities/Institutes have carried out researches in development of ICT-based information dissemination modules, including mobile telephony. The districts in which these Veterinary Universities/Institutes are situated were thus selected to ascertain the extent of adoption of mobile telephony as a means of accessing information related to dairying. Multistage random sampling and snow ball method were followed to select 15 dairy farmers from each village. Total six villages per district within a state were selected making a final sample size of 360 farmers from a total of 24 villages in four states as mentioned in Table 1. During the selection of respondents, care was taken to select the farmers having at least two dairy animals at the time of survey. The scientists or teaching faculty of the universities were randomly selected considering the fact that they were involved in teaching, research and extension activities of the university. During the selection of respondents, care was taken that among 30 scientists selected, 10 were extensionists from universities or allied Krishi Vigyan Kendras (KVKs) and remaining 20 were involved in research activities of the university.

Data collection: A judicious mix of both primary and secondary data was used in the study. The data from the dairy farmers was collected either at their farm or home using pretested interview schedule and open schedule, while that from the scientists was collected personally at their offices using questionnaire. The data from all the stakeholders was collected during November 2013 to June

2014. Information through observation during interview, group discussion and secondary sources like departmental documents, records, reports and other sources also were collected.

Analytical framework: The relevance of mobile use in dairying was studied using the score of 3, 2 and 1 for 'relevant', 'undecided' and 'irrelevant' at field conditions. The profitability of mobile use was studied on three point continuum as 'profitable', 'undecided' and 'not profitable' with the score of 3, 2 and 1, respectively. The sustainability of mobile use in dairying was studied using the sustainability index of Swaminathan (1991) with suitable modifications. The responses for sustainability were studied in 14 different dimensions and the responses were assigned the score of 3, 2 and 1 for 'agree', 'undecided' and 'disagree', respectively. Further, the responses were classified into low, medium and high favourability for sustainability categories. The data collected from sample respondents were coded, tabulated, analyzed and presented in the form of tables. The statistical tools viz. frequency, percentage, mean and standard deviation were used for analysis of the data. Further, Chi-square test was applied to compare the scenario in different states using SPSS version 20.0 package. The inferences were drawn in light of the results obtained, keeping in view the objectives laid in the study.

RESULTS AND DISCUSSION

mKisan Portal for advisory and mobile services: As a part of agricultural extension, under the National e-Governance Plan - Agriculture, various modes of services delivery have been envisaged. However, mobile telephony is the most potent and omnipresent tool of agricultural extension (Table 2). In this context, *mKisan* Short Message Service (SMS) portal for farmers enables all central and state government organizations in agriculture and allied sectors to give information/services/advisories to farmers by SMS in local language based on farming practices and location. Table 2 depicts the topic-wise and department or organizations wise number of advisory and message services delivered in India during 2011 to 2015 (GOI 2015).

Perception of dairy farmers about use of mobiles in dairying: With regards to use of mobiles in dairying, Table

Table 1. Locale of the study

Universities (for scientists and extensionists)	Districts under study under study (for dairy farmers)	States	Geographical location
ICAR-Indian , Veterinary Research Institute (IVRI) Izatnagar	Bareilly	Uttar Pradesh (UP)	28.36° N 79.41° E
G.B. Pant University of Agriculture & Technology (GBPUA&T), Pantnagar	Udham Singh Nagar	Uttarakhand (UK)	28.98° N 79.40° E
ICAR-National Dairy Research Institute (NDRI), Karnal	Karnal	Haryana	29.69° N 76.98° E
Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana	Ludhiana	Punjab	30.91° N 75.85° E

Table 2. Topic-wise and Department/Organization-wise mobile advisory and Message services during 2011-15 (in nos.)

Topic-wise mobile advisory and Message services			Department/Organization wise mobile advisory and Message services		
Topics	Advisory	Messages	Organization	Advisory	Messages
Agriculture	197200	1513292042	DAC	2028	190290011
Animal Husbandry	6941	69653714	DAHDF	32	30914618
Fisheries	1621	20057549	ICAR	1964	7616443
Horticulture	25890	197295494	IMD	38146	292927719
Others	3023	15585734	State Level	192607	1294149071
Sericulture	106	71946			

Source: GOI 2015. DAC, Department of Agriculture and Cooperation; DAHDF, Department of Animal Husbandry; Dairying and Fisheries, ICAR-Indian Council of Agricultural Research, IMD- Indian Meteorological Department.

Table 3. Perception of dairy farmers about mobile use in dairying

						N=360	
Variables	Categories	States				Pooled	χ^2
		UP	UK	Haryana	Punjab		
Relevance	Irrelevant	14 (15.56)	11 (12.22)	05 (5.55)	02 (2.22)	32 (8.89)	55.55**
	Undecided	64 (71.11)	56 (62.22)	41 (45.56)	35 (38.89)	196 (54.44)	
	Relevant	12 (13.33)	23 (25.56)	44 (48.89)	53 (58.89)	132 (36.67)	
	Non-profitable	13 (14.45)	09 (10.0)	08 (8.89)	03 (3.33)	33 (9.17)	
Profitability	Undecided	65 (72.22)	65 (72.22)	42 (46.67)	32 (35.56)	203 (56.39)	64.3**
	Profitable	12 (13.33)	16 (17.78)	40 (44.44)	55 (61.11)	124 (34.44)	
	Low	40 (44.44)	06 (6.67)	01 (1.11)	0 (0)	47 (13.05)	
Sustainability (favorability)	Medium	50 (55.56)	82 (91.11)	69 (76.67)	33 (36.67)	234 (65.0)	224.1**
	High	0 (0)	02 (2.22)	20 (22.22)	57 (63.33)	79 (21.95)	
	Mean± S.D: 28.29±5.37						

Figures in the parenthesis indicate percentage.

3 indicates that majority of the dairy farmers were unable to decide on the role of mobile in dairying and hence responded as “undecided” followed by 36.67 per cent farmers who responded as relevant to field conditions in dairying. The study also revealed that majority of the dairy farmers replied as ‘undecided’ towards profitability of mobiles in dairying at field conditions followed by the response of profitable in dairying (Table 3). Further, the study also reported that majority of the dairy farmers were in medium favourable category of sustainability followed by high and low favourable category of sustainability at field conditions. During the period of the study, it was also observed that only few of the respondents used mobiles for communicating with the agricultural or veterinary universities or institutions to know about scientific information while, they frequently contacted veterinarian or para-veterinarian for getting certain health services. Although all the farmers possessed mobiles in their homes,

they rarely realized the role of mobiles in dairying. Few respondents received text or voice messages from institutes or universities which made them to perceive that mobiles were profitable and sustainable in dairying at field conditions. There was highly significant difference ($p < 0.001$) among the respondents across the states with regards to relevance, profitability and sustainability of mobile use in dairying. In a similar study, Inigo *et al.* (2014) also reported that dairy farmers in Tamil Nadu used mobile phones for seeking information about animal husbandry and dairying from various sources. They also pointed out that farmers were ready to pay for mobile phone calls to seek information related to animal husbandry and dairying.

Perception of scientists towards use of mobiles in dairying: Table 4 indicates that majority of the scientists in pooled data perceived that mobiles in dairying were highly relevant followed by “undecided” category and irrelevant category. The study on the profitability of mobile use in

Table 4. Perception of scientists towards use of mobiles in dairying

Variables	Categories	Universities				Pooled	χ^2
		IVRI	GBPUAT	NDRI	GADVASU		
Relevance (n=58)	Irrelevant	01 (6.67)	01 (7.15)	01 (6.66)	0 (0)	03 (5.18)	6.17
	Undecided	02 (13.33)	06 (42.85)	02 (13.34)	05 (35.71)	15 (25.86)	
	Relevant	12 (80.00)	07 (50.0)	12 (80.0)	09 (64.29)	40 (68.96)	
Profitability (n=58)	Non-profitable (0)	0 (7.14)	01 (0)	0 (0)	0 (1.72)	01	4.35
	Undecided	05 (33.33)	06 (42.86)	04 (26.66)	05 (35.72)	20 (34.49)	
	Profitable	10 (66.67)	07 (50.0)	11 (73.34)	09 (64.28)	37 (63.79)	
Sustainability) (favorability) (n=29) 34.72±4.63 Mean± S.D	Low	01 (12.5)	01 (20.0)	0 (0)	02 (25.0)		6.0
	Medium	07 (87.5)	04 (80.0)	07 (87.5)	04 (50.0)	22 (75.87)	
	High	0(0)	00(0)	01 (12.5)	02 (25.0)	03 (10.34)	

Figures in the parenthesis indicate percentage.

Table 5. Perception of extensionists towards use of mobiles in dairying

Variables	Categories	Universities				Pooled	χ^2
		IVRI	GBPUAT	NDRI	GADVASU		
Relevance (n=40)	Irrelevant	01(10.0)	01(10.0)	0 (0)	03(30.0)	5(12.5)	6.67
	Undecided	0(0)	02(20.0)	01(10.0)	01(10.0)	4(10.0)	
	Relevant	09(90.0)	07(70.0)	09(90.0)	06(60.0)	31(77.5)	
Profitability (n=40)	Non-profitable	01(10.0)	01(10.0)	0(0)	01(10.0)	03(7.5)	1.84
	Undecided	02(20.0)	01(10.0)	01(10.0)	02(20.0)	06(15.0)	
	Profitable	07(70.0)	08(80.0)	09(90.0)	07(70.0)	31(77.5)	
Sustainability (favorability) (n=22) Mean± SD 34.50±7.67	Low	0(0)	0(0)	0(0)	0(0)	0(0)	6.08
	Medium	03(42.8)	02(33.33)	0(0)	04(80.0)	9(40.90)	
	High	04(57.1)	04(66.67)	04(100.0)	01(20.0)	13(59.10)	

Figures in the parenthesis indicate percentage.

dairying depicted that majority of the scientists in pooled data responded that mobiles were profitable, followed by “undecided” category. Further, the sustainability of mobile use in dairying, revealed that majority (75.87 %) of the scientists in pooled data were in medium favourable category of sustainability followed by low and highly favourable sustainable categories. It was observed from the study that role of mobiles in dairying was still not explored to the greater extent by the scientists of the universities. The status was better in GADVASU, Ludhiana as compared to other universities which might be due to the fact that it was sending text and voice messages for the farmers in collaboration with agricultural university.

Perception of extensionists towards use of mobiles in dairying: The study revealed that majority of the extensionists in pooled data perceived that mobile in dairying were highly relevant followed by irrelevant and

“undecided” category. The profitability of mobile use in dairying indicated that majority of the extensionists in pooled data responded that mobiles were profitable followed by ‘undecided’ category at field conditions (Table 5). With regards to the sustainability of mobile use in dairying, the study indicated that majority of the extension faculty were in high favourable category of sustainability followed by medium favourable sustainable category, while none of them were in low favourability category. It was interesting to note that, none of the respondents reported that mobile was less sustainable at field conditions which indicated that role of mobiles was perceived to be highly favourable at field conditions.

Perception of multi-stakeholders towards relevance, profitability and sustainability of mobile use in dairying With regards to use of mobiles in dairying, Fig 1 indicates

that majority of the dairy farmers responded as undecided, while majority of the scientists and extensionists perceived that use of mobiles in dairying was relevant at field conditions. Fig 2 depicts that majority of the dairy farmers responded as 'undecided' for profitability of mobile use in dairying at field conditions, while majority of the scientists and extensionists perceived that use of mobiles in dairying was profitable at field conditions.

The sustainability of mobile use in dairying as perceived by different stakeholders was studied and is depicted in Fig 3. The study indicated that 41.67 per cent and 36.39 per cent of the dairy farmers were in medium (21–28) and highly (28–35) sustainable score categories, respectively, while 15.0 per cent fell under very high (35–42) sustainable score categories. The study also found that majority of the scientists fell under very high (55.18 %) and high (34.48 %) sustainable score categories, while majority of the extensionists were categorized under very high (59.09 %) and high (18.19 %) sustainable categories. It was noted that scientists and extensionists perceived that use of mobile in dairying was more sustainable at field conditions as compared to dairy farmers.

Constraints or problems in adoption of mobile use as perceived by farmers: The group discussion with farmers depicted following problems faced by dairy farmers for the use of mobiles in dairying.

- Illiteracy/poor educational status
- Lack of power supply to charge the mobiles
- Operational difficulties
- High maintenance cost
- Lack of mobile compatibility to receive SMS in vernacular language.
- Lack of immediate interaction for better understanding
- Human element is missing
- Lack of practical exposure

The results of the study as a whole revealed that linkages among the three stakeholders viz. farmers, researchers and extensionists were not strong enough which was clear with the constraints or problems faced by the farmers in adoption of mobiles in dairying. With regards to use of mobiles in dairying, Mittal and Tripathi (2009) pointed out that although mobile phones act as catalyst to improve farm

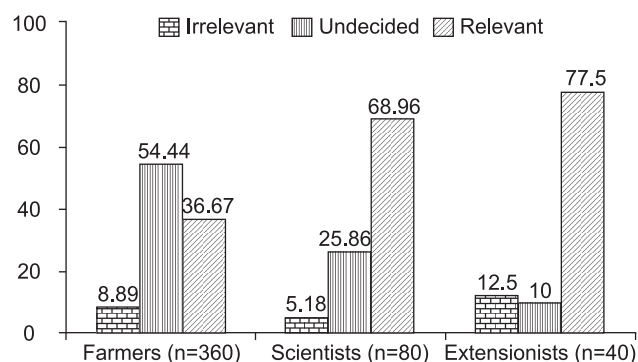


Fig. 1. Perception of multi-stakeholders towards relevance of mobiles use in dairying.

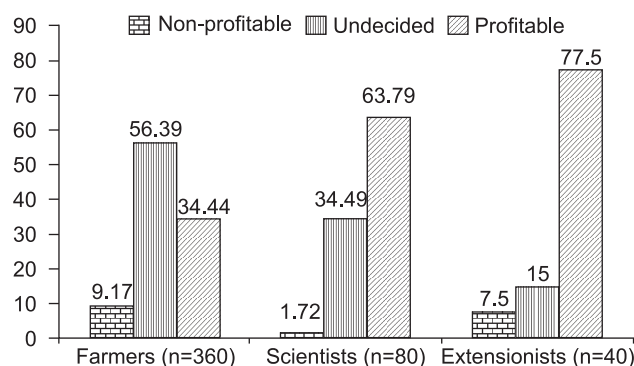


Fig. 2. Perception of multi-stakeholders towards profitability of mobile use in dairying.

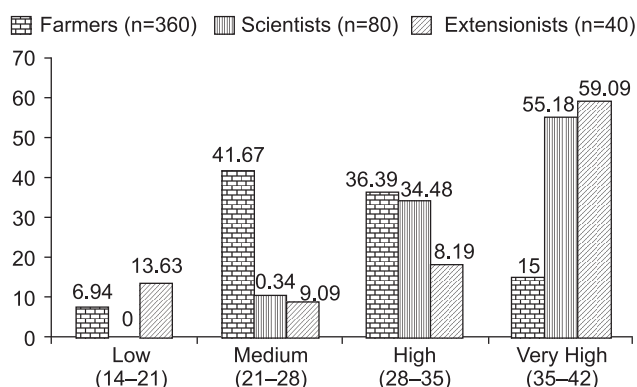


Fig. 3. Perception of multi-stakeholders towards sustainability of mobile use in dairying (favorability).

productivity and rural incomes, the quality of information, timeliness of information and trustworthiness of information were the three important aspects which required special focus to meet the needs and expectations of the farmers. Inigo *et al.* (2014) also revealed that dairy farmers in Tamil Nadu faced the constraints of language and network coverage for effective utilization of mobile enabled services in animal husbandry and dairying. In a similar context, Moran (2014) also reported that poor acceptance rate by small farmers for majority of the technologies was attributed to the lack of extension facilities, unavailability of inputs under small farm situations.

Suggestions proposed by dairy farmers for effective use of mobiles in dairying: The modifications/alternatives suggested by dairy farmers for effective transfer of mobile use in dairying are enlisted below.

- Regular power supply for the villages
- Educate the farmers for operating mobiles
- Low/nominal maintenance cost
- Create provision to directly contact the experts
- Mobile compatibility to receive message in vernacular language
- Immediate interaction for better understanding must be made always possible
- Engage educated rural youths to provide practical exposure

The results of the study revealed that farmers had various problems for mobile use and hence, they demanded for

Table 6. Per cent gap among multi-stakeholders about use of mobiles in dairying

Variables	Categories	Percent gap among the stakeholders		
		Farmers-Scientists	Scientists-extensionists	Farmers-extensionists
Relevance	Irrelevant	3.71	7.32	3.61
	Undecided	28.58	15.86	44.44
	Relevant	32.29	8.54	40.83
Profitability	Non profitable	7.45	5.78	1.67
	Undecided	21.9	19.49	41.39
	Profitable	29.35	13.71	43.06
Sustainability (favorability)	Low (14–21)	6.94	13.63	6.69
	Medium (21–28)	31.33	1.25	32.58
	High (28–35)	1.91	16.29	1.91
	Very High (35–42)	40.18	3.91	40.18

support from various stakeholders like research and extension institutes, government etc. In a similar study, Rao *et al.* (1995) also reported that it was essential to appreciate and recognize the perceptions and priorities of the farmers. Smith *et al.* (2004) also reported that farmers should therefore be considered as natural partners of research for a mutual exchange and reconciliation of modern and traditional knowledge.

Per cent gap among multi-stakeholders about use of mobiles in dairying: The Table 6 highlights that there was a wider percent gap between farmers-scientists and farmers-extensionists, while the percent gap between scientist-extensionists was very low to the extent of 8.54 for relevance of mobile use in dairying. Further, the study also pointed that there was a wider percent gap between farmers-scientists and farmers-extensionists, while the percent gap between scientist-extensionists was very low for profitability of mobile use in dairying. The study also revealed that there was wider percent gap between farmers-scientists in very high (40.18) and medium (31.33) favourable sustainable categories, while the per cent gap for farmers-extensionists was 40.18 and 32.58 for very high and medium sustainable categories, respectively. In a similar context, Zamani (2000) have offered recommendations to strengthen the interactions between extension and research institutions. Glendenning *et al.* (2010) also reported that these institutes faced the challenges in terms of staff, partnership etc. which would facilitate the joint offering of demonstrations of recent technologies. Further, on the similar lines, Sulaiman and Holt (2002) also reported that feedback from extension to research was limited due to which research agendas are not influenced by extension experience. There is a need for a thorough evaluation of extension approaches in order to identify best practices and understand their impact on farming communities, and to recognize how extension can be strengthened, particularly to reach smallholder and marginal farmers (Glendenning *et al.* 2010).

The study revealed that perception of scientists and extension experts was more favorable towards relevance, profitability and sustainability of mobile use in dairying, while the perception of farmers was less favourable towards

mobile use. The study also observed that there was a wide gap (higher per cent gap) among farmers-scientists and farmers-extensionists with regards to relevance, profitability and sustainability, while the gap was very narrow among scientists and extensionists for perception towards mobile use in dairying. The study concluded that researchers and extension experts need to make farmers more aware about the use of mobiles to disseminate information and improve productivity in the dairy sector. Since the stakeholders reported various constraints leading to poor adoption by farmers, a need based long-run study under field conditions must be undertaken to determine the relevance, profitability and sustainability of mobiles in dairying by involving farmers as the partners of research and extension based on the suggestions proposed by them.

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