Evaluation of mobile phone based agro-advisory programme and its implications for scaling up

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Farmers need information on a variety of topics, at a variety of stages, before adopting a new technology (De Silva and Ratnadiwakara, 2008 and Mittal, *et al*, 2010). Farmers have different types of information needs during each stage of the process, ranging from weather forecasts, pest attacks, inputs, cultivation practices, pest and disease management and prices and they need to access a wide range of information related to production technologies, post harvest processes, remunerative markets, credit and weather (Glendenning *et al*, 2010). Despite a wide range of reform initiatives in agricultural extension in the past decades, the coverage of, access to and quality of information provided to small holder farmers is uneven and the main sources of information to farmers till today are neighbours, input dealers, radio, TV, news paper and extension worker.

Considering this poor reach of extension, the information and communication technologies (ICTs) can play an important role in their endeavor of reaching the unreached farmers. Among the various ICT tools, the increasing penetration of mobile phone networks and handsets in India presents an opportunity to make useful information more widely available and offers several advantages over other alternatives in terms of cost, geographic coverage and ease of use (Aker and Mbiti 2010). Mobile phone networks with a subscriber base of more than 920 million and overall tele-density of 61.38 can play a significant role in technology transfer. Mobile telephony has been widely accepted mode of delivering information not only in India but also in other South Asian and African countries (Mittal, 2011).

There has been a proliferation of mobile phone-based applications and services in the agricultural sector, providing information on market prices, weather and agricultural techniques through voice and short message service (SMS). Some of the mobile based initiatives from India
are presented here:

m-agriculture initiative	Details
IFFCO Kisan Sanchar Limited (IKSL)	Audio based advisories and alerts on agricultural and allied sectors, weather and markets.
RML (Reuters Market Light)	Paid service. Text based advisories on agricultural and allied sectors, weather and markets.
CABI (Commonwealth Agricultural Bureaux International)	Direct to Farm (D2F). Text based advisories on agricultural practices particularly pest and disease management.
MSSRF (MS Swaminathan Research Foundation)	Text and audio advisories on agriculture, fisheries, weather and markets.
IMD (Indian Meteorological Department)	Text based Agromet advisory services to farmers.
e agriculture	Developed by Tamil Nadu Agricultural University. Text and audio advisories and alerts on agriculture and allied sectors, weather and markets.

e-Sagu	Text, audio and image based advisories on agriculture and horticultural crops, weather and markets.
Nokia Life Services	Developed by Nokia and bundled with Nokia mobile phones. Information on agriculture and allied sectors, weather and markets.
Behtar Jindagi	Developed by Idea Cellular. Advisories on agriculture and allied sectors, weather and markets.
mKisan	Consortium of International Labour Research Institute (ILRI), Digital Green, Handygo and CABI. Advisories on agriculture and allied sectors, weather and markets.
Mkrishi	Developed by Tata Consultancy Services (TCS). Information on agriculture and allied sectors, weather and markets.
Kisan Call Centres	Ministry of Agriculture. Pull based service.
Avaaj Otalo	Developed by IBM India Research Laboratory and the Development Support Centre an NGO in Gujarat. Advisories on agriculture and allied sectors, weather and markets.
vKVK	Developed by Indian Institute of Technology (IIT), Kanpur. Used by Krishi Vigyan Kendras (KVKs). Audio based advisories on agriculture and allied sectors, weather and markets. Facility for two-way communication between farmers and experts.
Advisories by ICAR institutes and State Agricultural Universities	In collaboration with National Informatics Centres and Private firms. Text based advisories and alerts on agricultural and allied sectors, weather and markets.
IIDS (Interactive Information Dissemination System	Developed by Media Lab Asia. Text, audio and image based advisories on selected crops, weather and markets.
Farmer SMS Portal	Developed by Ministry of Agriculture, Government of India. Used by KVKs, ICAR institutes and State Agricultural Departments. Text based advisories and alerts on agricultural and allied sectors, weather and markets.

In spite of several mobile based initiatives for providing access to timely and quality information to farmers, the rigorous impact evaluation of these initiatives were very few. In order to measure the impact of mobile phone-based applications and services in the agricultural sector on farmers' knowledge, adoption and welfare, rigorous impact evaluations are needed (Aker, 2011). To bridge this gap, Directorate of Oilseeds Research (DOR) has initiated mobile phone based agro-advisories to oilseed farmers with the collaboration of IFFCO Kisan Sanchar Limited.

IFFCO Kisan Sanchar Limited (IKSL) is a tri-lateral joint venture between the Indian Farmers Fertilizer Cooperative Limited (IFFCO), Airtel and Star Global Resources Limited. IKSL provides voice-based agricultural information to empower rural farmers and reinforce the cooperative through the mobile network. IKSL distributes airtel SIM cards branded 'Green SIM' to its IFFCO members and other farmers. The Green SIM functions as a normal SIM as well as providing the agricultural valued added services (Agri VAS). Green SIM card users can access an Agri Helpline where they can get answers from agricultural experts to any farming question.

DOR has developed the content for agro-advisories on sunflower and in collaboration with IKSL disseminated them to the farmers of Andhra Pradesh, India. This paper aims to evaluate the impact of mobile phone based agro-advisory programme on sunflower with the following specific objectives:

- To assess the information needs of sunflower farmers
- To evaluate the listening behavior of farmers
- To determine the impact of the advisories in terms of knowledge, opinions, adoption behavior and economic welfare of farmers.

We selected two districts *viz.*, Mahabubnagar and Prakasham from Andhra Pradesh State, India for our research, adopting a multi-stage random sampling technique to select farmers. Three *taluks* were selected from each district, three villages were selected from each *taluk* based on the highest area under sunflower crop and 240 registered farmers with 'green sim cards' were selected by random sampling method from 18 villages. The study used an *expost facto* and experimental designs for survey and evaluation of impact of mobile phone advisory system respectively. Before the start of the season, (July-September, 2011) interviews were conducted with farmers to assess their information needs, level of knowledge, adoption and economics of sunflower cultivation. During *rabi*, 2011-12 and *kharif* 2012, knowledge on sunflower production technologies was disseminated through audio messages. At least two messages were disseminated in a week during the season. After the end of the each season during March-April and October-November, 2012, data were collected on farmers listening behavior, their opinions on messages, their knowledge, adoption and economics. The details of messages disseminated are as follows:

Topic on which messages were disseminated	Audio messages (no.)		Farmers interviewed (no.)
	Rabi	*kharif*	
Pre-sowing	6	6	240
Sowing and production	12	12	240
Plant protection	6	6	240
Harvest and post harvest management	4	4	240
Total	28	28	-

Measurement of variables

The information needs of farmers on sunflower cultivation were assessed on a three point continuum ranging from high, medium to low. Listening behavior was measured by three sub-components: listening frequency, listening pattern and listening response. Opinions of farmers were obtained on six subcomponents: timeliness of the messages, relevance, audio quality, message treatment, content adequacy and usefulness. Knowledge was characterized by the information gained by the farmers on various aspects of sunflower cultivation hearing through the mobile phone messages and measured by asking 25 questions. Adoption refers to use of an idea/practice on sunflower cultivation after listening to audio messages from mobile phones and measured by recording the practices adopted by the farmers after listening to messages. The economics of sunflower cultivation were worked out by recording the cost of cultivation (COC), gross monetary returns (GMR) and cost benefit ratio (BCR).

Evaluation process

An improvised Bennett's hierarchy, a logic model (Taylor and Sara, 1996, Taylor, 1999 and McCawley, Paul, 2013) was used for evaluation. The model consists of situations/priorities at level 1, inputs, outputs-activities, outputs-participation at level 2, 3 and 4, respectively and outcomes: short-term, medium-term and long-term at level 5, 6 and 7, respectively. Suitable indicators were identified for each level (Figure 1) and measured. An interview schedule was developed in local language and validated by field data. The data were collected by personal and telephone interviews of farmers. SAS software was used to analyze descriptive statistics such as frequency, mean, *per cent* and the differences in knowledge, adoption and economics of pre- and post-dissemination groups were tested by paired t test.

Situation- Level 1

The existing situation of the farmers was assessed by understanding the information needs in sunflower cultivation. Among 240 farmers interviewed, 160 farmers (66.67%) felt high information need on improved sunflower cultivars followed by market prices (60.42%), management of tobacco caterpillar (*Spodoptera litura*) and borer (*Helicoverpa armigera*) (54.17), information on weather (53.33%) and information on biological control agents (50.00%). Farmers had low information need on harvesting (43.75%), chemical seed treatment (42.50%) and method of sowing (41.67%). The results are in congruence with that of Mittal, *et al*, 2010, who reported that information regarding seeds is the most frequently accessed information by farmers followed by mandi prices, plant protection and fertilizer application.

Inputs – level 2

The total money spent on the programme was 3.75 lakhs (approximately US$6,214) and there were 1,511 people involved, which includes seven scientists from DOR, two technical persons each from IKSL and DOR and 2000 sunflower farmers, five organizations: DOR, IKSL, Airtel (service provider) and two NGOs *viz*., Research in Environment Education and Development Society (REEDS) and Rythu Mitra Sangam (RMS) (Table 2).

Outputs – level 3 & 4 (Activities & Participation)

The activities allotted to and completed by seven scientists were screening of content/scripts for messages, organizing meetings/farmers' days and discussion with farmers on sunflower production technologies. The activities of technical persons of DOR were identifying the farmers, registrations, providing green sim cards and explaining about the broadcast of the messages. Further, the technical persons were also involved in evaluation of responses, record keeping, tabulation of scores, arranging for meetings and distribution of pamphlets. The NGOs (REEDS and RMS) were involved in facilitating the identification of farmers, building rapport, distribution of sim cards, arrangements for meetings and creating awareness about the dissemination of messages. The activities of technical persons of IKSL were recording of the OBD messages and disseminating through service provider (airtel). Among 1,500 registered participants, 240 farmers were selected for survey. The activities of these farmers were registration with DOR, listening to the messages, attending the meetings/farmers days and providing responses during the interviews for data collection.

Outcomes- level 5 (short term)

Listening behavior: Only 20.00% of the farmers listened to all the 25 messages and majority of farmers (34.58%) listened to 8-15 messages. Majority of the farmers (70.35%) listened to messages and 26.25% of the farmers listened to messages, simultaneously doing some work either at field or home. Few have taken notes (1.67%) or recorded the messages (1.25%). Majority of the farmers (84.17%) have only listened to the messages without discussing with friends or family members and negligible *per cent* of farmers had sought additional information by calling back either DOR staff or the IKSL help line (2.50%). Overall, majority of the farmers (66.67%) were in the below average listening behaviour category (Table 3).

Opinions of farmers: Half of the farmers (50.00%) thought that the messages were presented in time coinciding with the crop growth. Forty *per cent* of the farmers felt, messages were late. The farmers, who had sown the crop early in *rabi* during second fortnight of September in Prakasham district felt, the messages were late. Majority of the farmers (57.92%) reported that the content of the messages was highly relevant, quality of audio was good (70.83%), messages were highly technical (44.58%), content was adequate (40.83%) and highly useful (61.66%). Overall, 74.58% of the farmers had medium opinion of the mobile phone based messages followed by 18.75% and 6.67% with low and high opinion respectively (Table 4).

Knowledge of farmers: About 66.67% of the farmers were in moderate knowledge category before hearing the audio messages over mobile phones (answered 15 to 22 questions) and this increased to 70.42% after hearing the messages over mobile phones (answered 18 to 23 questions). The farmers in low knowledge category decreased from 16.25% (answered < 15 questions) to 08.33% (answered < 18 questions) and in high knowledge category increased from 17.08% (answered more than 22 questions) to 21.25% (answered more than 23 questions) in pre- and post-dissemination groups respectively. The mean scores, range of scores for knowledge were higher in post-dissemination group than those of pre-dissemination group and the paired t value was significant between the groups (17.48, $P < 0.01$) (Table 5). The mobile phone based audio messages have helped in increasing the knowledge of sunflower farmers.

Outcomes- level 6 (medium term)

Behaviour/Practice change: Farmers in low adoption category decreased from 17.50% to 10.42% in pre- and post-dissemination groups respectively and that of high adoption category increased from 15.83% to 22.08% indicating the impact of mobile phone based dissemination. The mean adoption scores increased from 28.27 to 31.10 in pre- and post-dissemination groups respectively. The paired t value was significant (14.5, $P < 0.01$) between pre- and post-dissemination scores (Table 6).

Outcomes- level 7 (long term)

Economics: The seed yield increased marginally during *kharif* and *rabi* seasons in post-dissemination group (Figure 2), but statistically significant differences were not observed between pre- and post-dissemination groups. The COC and GMR increased slightly, but the BCR remained almost same for pre- (*kharif*: 1.85, 2.57) and post-dissemination (*rabi*: 1.89, 2.58) groups (Figure 3). This indicated that the increase in GMR was not reflected in higher BCR due to increase in COC. Aker and Mibiti, 2010 reported that mobile phone coverage and adoption have had positive impacts on agricultural and labor market efficiency and welfare in certain countries. A pioneering study by Jenson, 2007 indicated that adoption of mobile phones by fishermen and wholesalers was associated with a dramatic reduction in price dispersion, complete elimination of waste and near-perfect adherence to the law of one price.

Both consumer and producer welfare increased Mobiles allow fishermen, particularly the more prosperous ones, to get timely price information and decide on the best place to land and sell their daily catch.

External factors

External factors will have either supporting or antagonistic effects on the outcomes of the programme. Particularly, the decision to adopt a technology/practice depends on many external factors such as institutional, policy environment and community. The institutional factors like timely availability of required inputs in the markets, their quality and cost affects the adoption decision of farmers. Even though the knowledge scores were higher (mean: 38.6), the adoption scores were lower (mean: 32.1) due to these external factors. The policy of the State regarding minimum support price to sunflower may act as a trigger for adoption of new techniques, which may influence the adoption scores. The farmers might have been exposed to information on sunflower from other community sources, which were not accounted in the study. Apart from this, other factors such as the climatic conditions influence the adoption decisions of the farmers. During *kharif* there was prolonged dry spells after sowing of the crop, hence farmers had not taken the risk of higher investment in nutrient management particularly boron and sulphur application, which may be one of the reason for low adoption scores.

Implications for scaling up

This study has clearly bought out the use of mobile phone networks for dissemination of agricultural knowledge as one of the powerful means of increasing access to quality information to farmers who may not be reached by the extension programmes.

With the increased availability, access and ownership of mobile phones in India, mobile based agro-advisories would play a significant role in reducing the information gap and information asymmetry between the farmers.

Mobile based dissemination has the potential to reach many farmers with timely and accessible content. But the content that the system delivers has to be more relevant, it is to be localized and context specific, as this improves the value and actionability of the information, which can have important impacts on farm management. Localization and personalization of content is very important as we have seen the sowing time may vary from location to location and the subsequent advisories would vary. Developing content specific to the each location is a challenge in scaling up the system. The localization of content is influenced by how the system accesses, assess, apply and deliver content.

In order to scale up the mobile based dissemination system, make it more effective and increase the uptake of advisories proper treatment of the messages is crucial, where communication experts could play a major role to improve the relevancy of the content.

In the process of up scaling identification of farmers, exploring their information needs and registration of the farmers in to the advisory system is a huge task involving time, money and men.

In order to scale up the system, a multi-lingual, push and pull based model had to be developed, wherein farmers can have an equal opportunity to obtain the information of his choice and make his own contribution/share experiences with other farmers. For this a dynamic and integrated information dissemination system has to be developed.

Conclusions

Based on our evaluation, it can be concluded that mobile phones based advisories can create awareness and make knowledge accessible to farmers. To some extent mobilize communities to adopt best practices and make research findings easily available to farmers in a simple and understandable language. This process can link the researcher with farmers and field extension workers in a systematic way.

If active participation of farmers is to be achieved, the needs and interests of the target farmers, their local dialects, cultural values, technical language and social norms must be considered before dissemination of messages.

To improve knowledge and adoption of improved practices, training sessions and demonstrations should be organized immediately after the broadcast of advisory in order to impart the required skills.

Other formats such as question-answer, quizzes and pull based advisories may also be combined to create and sustain the interest of farmers in the advisories and improve their uptake.

Acknowledgments

The authors are thankful to the farmers and NGOs (REEDS and RSS) for their enthusiasm and cooperation during the field study for data collection. We are grateful to IKSL for facilitating this study by disseminating the messages over their networks.

Table 1. Situation analysis for assessing the information needs of sunflower farmers in the region

(n = 240)

Information need	**High**	**Medium**	**Low**
Suitable cropping system	98 (40.83)	82 (34.17)	60 (25.00)
Suitable intercropping systems	110 (45.83)	95 (39.58)	35 (14.58)
Recommended improved cultivars	160 (66.67)	60 (25.00)	20 (08.33)
Seed treatment with biological control agents	120 (50.00)	68 (28.33)	52 (21.67)
Seed treatment with chemicals	60 (25.00)	78 (32.50)	102 (42.50)
Method of sowing	80 (33.33)	60(25.00)	100 (41.67)
Thinning in sunflower	95 (39.58)	85 (35.42)	60 (25.00)
Critical stages for moisture stress	60 (25.00)	75 (31.25)	105 (43.75)
Fertilizer management	105 (43.75)	80 (33.33)	55 (22.92)
Sources of various fertilizers	80 (33.33)	90 (37.50)	70 (29.17)
Utility of Boron application	115 (47.92)	100 (41.67)	25 (10.42)
Utility of S application	105 (43.75)	86 (35.83)	49 (20.42)
Manual weed management	28 (11.67)	40 (16.67)	172 (71.67)
Herbicide application	110 (45.83)	85 (35.42)	45 (18.75)
Management of sucking insect pests	115 (47.92)	90 (37.50)	35 (14.58)
Management of foliage eating insect pests	130 (54.17)	79 (32.92)	31 (12.92)
Management of alternaria	98 (40.83)	96 (40.00)	46 (19.17)
Management of powdery mildews	100 (41.67)	85 (35.42)	55 (22.92)
Management of SND	90 (37.50)	81 (33.75)	69 (28.75)
Supplemental pollination	115 (47.92)	95 (39.58)	30 (12.50)
Harvesting	40 (16.67)	95 (39.58)	105 (43.75)
Value addition by use of sunflower heads	115 (47.92)	95 (39.58)	30 (12.50)
Value addition for producing honey	90 (37.50)	120 (50.00)	30 (12.50)
Market prices	145 (60.42)	80 (33.33)	15 (06.25)
Information on weather	128 (53.33)	70 (29.17)	42 (17.50)

Table 2. Investments in terms of human resources, partners and finances in the programme

Human resources	No./ Value (Rs.*)
Scientists from DOR	7
Technical persons from IKSL for OBD recordings	2
Technical persons for dissemination	2
Registered participants (advisories were sent to 40,000 farmers among whom around 1,500 farmers grown sunflower crop during the season)	1,500
Total	1,511
Partners	
IFFCO Kisan Sanchar Limited	
Service provider (Airtel)	
local NGOs (REEDS and RSS)	
Money spent	
Procurement of green sim cards	15,840
Publication of pamphlets	7,000
Transportation charges for registration and discussions with farmers	15,000
Cost for recording of messages	10,000
Cost for the service providers for dissemination	25,000
Salaries of scientists and technical persons	300,000
Total	372,840

* 1 US$ = 60 INR

Table 3. Listening behaviour of the surveyed farmers

Variable		Frequency (%)
1. Listening frequency		
a. listened to all 28 messages		48 (20.0)
b. Listened to all 19-27 messages		64 (26.67)
c. Listened to all 10-18 messages		83 (34.58)
d. Listened to fewer than 10 messages		45 (18.75)
2. Listening pattern		
a. Listening and simultaneously doing some work		63 (26.25)
b. Only listening		170 (70.83)
c. Listening and taking notes		04 (01.67)
d. Recording		03 (01.25)
3. Listening response		
a. Only listening		202 (84.17)
b. Discussion with friends		26 (10.83)
c. Discussion with family members		18 (07.50)
d. Seeking additional information with IFFCO/DOR		06 (02.50)
Overall listening behaviour (a + b + c)		
Mean: 6.80	Low	160 (66.67)
SD: 2.52	Medium	60 (25.00)
Range: 3-11	High	20 (8.33)

Table 4. Opinions of farmers on mobile phone based audio messages

Variables	Categories	Frequency (%)
a. Timeliness of the messages		
	Coinciding with the crop growth	120 (50.00)
	Early	24 (10.0)
	Late	96 (40.0)
b. Relevance		
	Highly relevant	139 (57.92)
	Somewhat relevant	83 (34.58)
	Irrelevant	18 (07.50)
c. Audio quality		
	Good	170 (70.83)
	Fair	48 (20.0)
	Poor	22 (09.17)
d. Message treatment		
	Less technical	65 (27.08)
	Moderately technical	68 (28.33)
	Highly technical	107 (44.58)
e. Content adequacy		
	Adequate	98 (40.83)
	needs more details	86 (35.83)
	not at all adequate	56 (23.33)
f. Content usefulness		
	Very useful	148 (61.66)
	little useful	70 (29.17)
	not useful	22 (9.17)
Overall opinion (a+b+c+d+e+f)		
mean = 11.13	low	45 (18.75)
SD = 3.12	medium	179 (74.58)
Range = 6-17	high	16 (6.67)

Table 5. Farmers' knowledge on sunflower production technologies

Knowledge categories	Pre- dissemination	Post- dissemination
Low knowledge	39 (16.25)	20 (08.33)
Medium	160 (66.67	169 (70.42
High knowledge	41 (17.08)	51 (21.25)
Mean	32.71	38.6
SD	3.16	4.71
Range	26-42	26-47
Paired '*t*' value	17.486 ($p < 0.01$)	

Table 6. Farmers' adoption of sunflower production technologies

Adoption categories	Pre- dissemination	Post- dissemination
Low Adoption	42 (17.50)	25 (10.42)
Medium	160 (66.67)	162 (67.50)
High	38 (15.83)	53 (22.08)
Mean	28.27	32.1
SD	2.55	3.51
Range	26-39	26-44
Paired '*t*' value	14.17 ($p < 0.01$)	

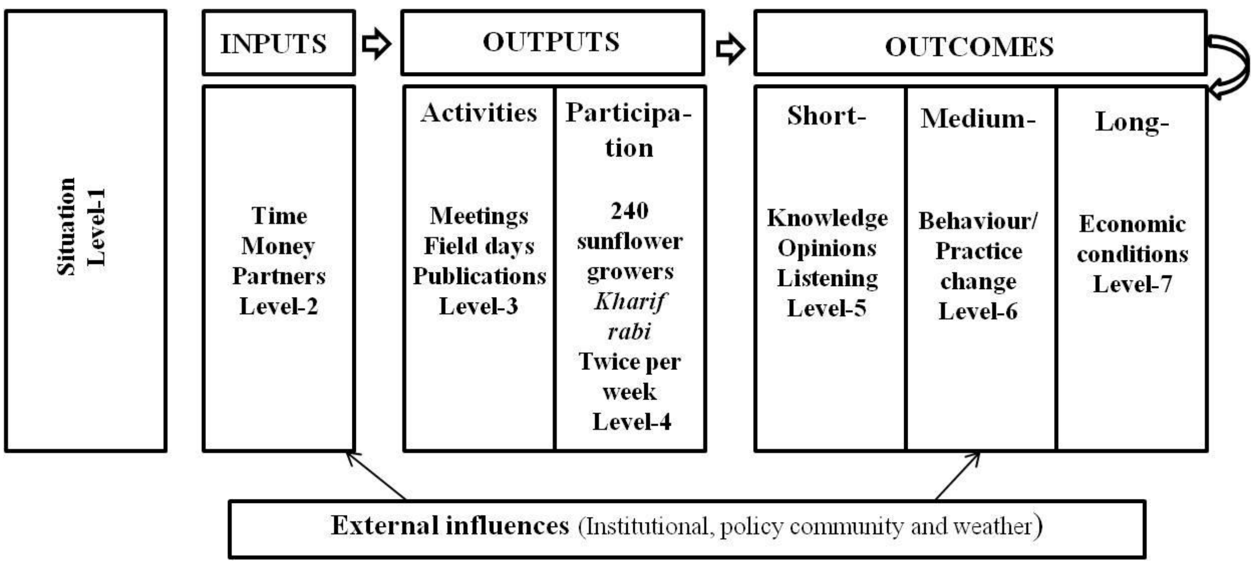

Figure 1. Logic model applied to evaluation of mobile advisory system

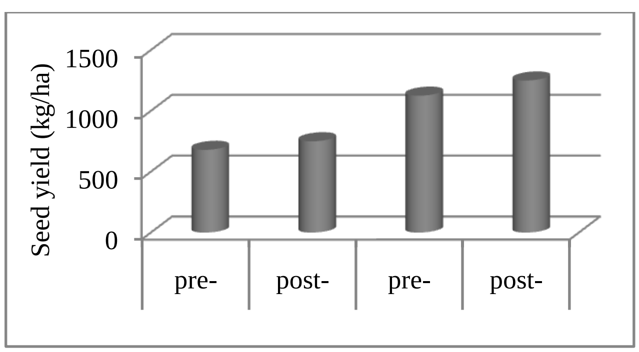

Figure 2. Seed yield of sunflower for pre-and post-dissemination groups

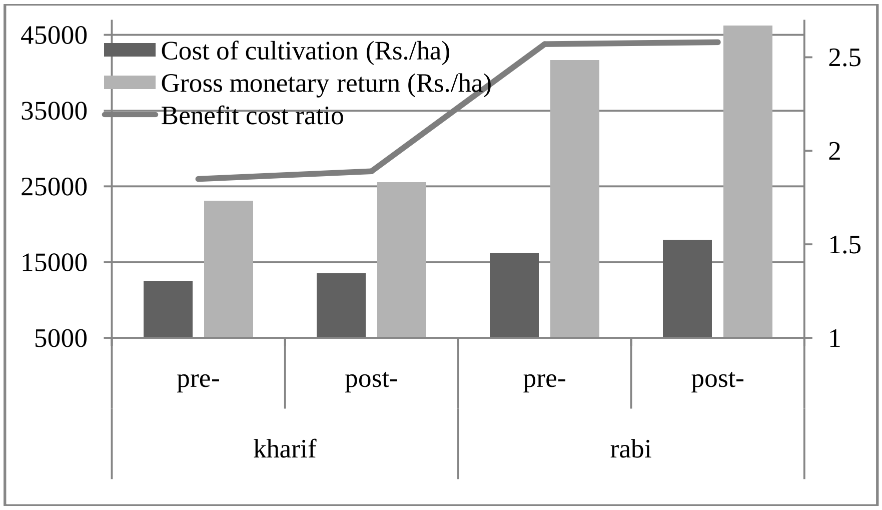

Figure 3. Economics of sunflower cultivation for pre- and post-dissemination groups

References

Aker Jenny, C. (2011), Dial "A" for Agriculture: A Review of Information and Communication Technologies for Agricultural Extension in Developing Countries. *Agricultural Economics*, Vol 42, No 6, pp 631–647.

Aker Jenny, C., and Isaac Mbiti, M. (2010), Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives*, Vol 24, No 3, pp 207–232.

De Silva, Harsha., and Dimuthu, Ratnadiwakara. (2008), Using ICT to reduce transaction costs in agriculture through better communication: A case-study from Sri Lanka, LIRNEasia, Colombo, Sri Lanka.

Glendenning Clair, J., Babu Suresh and Asenso Okyere Kwado. (2010), Review of Agricultural Extension in India: Are farmers' information needs being met? IFPRI Discussion Paper 01048. International Food Policy Research Institute.

Kumar, G.D.S., and Padmaiah, M. (2012), *Mobile based agro-advisories on castor and sunflower*, In: Role of ICT in Rural Transformation, Abstracts & Biography. pp 14-15. Lead paper presented at 8th convention of Grameen Gyan Abhiyan: Rural Knowledge Movement held during 28-29th October, 2012 at M.S.Swaminathan Research Foundation, Chennai, India.

McCawley, Paul.F. (2013), *The Logic Model for Program Planning and Evaluation*. http://www.uiweb.uidaho.edu/extension/LogicModel.pdf, accessed on 05.08.2013.

Mittal, S. (2011), *Role of mobile phones in agriculture growth*. Paper presented at Mobile Plus International conference held during 15-17 September, 2011 at M S Swaminathan Research Foundation (MSSRF), Chennai, India. In: Mobile Plus Work book, pp 68.

Mittal, S. Sanjay, Gandhi., and Gaurav, Tripathi. (2010), *Socio-economic Impact of mobile phones on Indian agriculture*. Working Paper No. 246, Indian Council for Research on International Economic Relations, New Delhi, India.

Taylor, P.E., and Sara, S. (1996), Planning a Programme Evaluation *In*: Programme Development and Evaluation. University of Wisconsin Extension. http://learningstore.uwex.edu/assets/pdfs/g3658-1.pdf, accessed on 05.08.2013.

Taylor, P.E. (1999), *Providing leadership for program evaluation*, University of Wisconsin Extension, Madison.

Xiaolan, Fu., and Shaheen, Akter. (2012), Impact of mobile telephone on the quality and speed of agricultural extension services delivery: Evidence from the rural e-services project in India. Poster presented at the International Association of Agricultural Economists (IAAE) 2012-Triennial Conference, Foz do Iguacu, Brazil 18-24 August 2012.