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Farmers' capacity strengthening and climate advisory services for combating climate change in India

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Abstract
Agriculture is highly sensitive to variations in climate. The Indian climate is already changing and these changes have a measurable impact on Indian agricultural economy also. India is a land of small cultivators and 80 per cent of its farmers owning less than 2 ha of land. In other words, the land provides livelihood security for 65 per cent of the people, and the small farmers provide food security for 1 billion people. With large and growing population, emissions of greenhouse gases, India acts both as source of climate change and as a sink for its impacts. There is a national imperative to equip Indian agriculture to be prepared to adapt to climate change. New approaches like Climate Smart Agriculture are the need of the hour which warrants community participation. A recent study conducted in Tamil Nadu state warrants capacity building of clientele and multi stake holder approach to combat climate change.

Keywords: Climate Smart Agriculture, Capacity building, Climate advisories

Introduction
Climate change scenario like monsoon failure, unexpected droughts and depletion of natural resources are the prime factors that drive our farmers out of the farming occupation. According to Institute of Applied Manpower Research (IAMR) Report 2012, we are losing 2,000 Farmers every Single Day. The overall number of Indian farmers has dropped by 15 million since 1991. Projections of future climate are based on climate models, complicated computer programs that attempt to describe how the atmosphere will behave in future course of time. Stern, (2006) revealed that climatic model results have shown that compared to the pre- Industrial era, the world temperature has warmed by half a degree centigrade. The major causes for this global warming have been attributed to the rising levels of greenhouse gases in the atmosphere including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), chloro-and fluoro-carbons and a number of other gases. The current level or stock of greenhouse gases in the atmosphere is estimated to be equivalent to 430 parts per million (ppm) of carbon dioxide compared to 280 ppm before the industrial revolution. It was predicted that by the end of 2035, there would be a chance of 2°C increase in temperature. The prevailing situation warrants suitable mitigation against climate change both at individual and community levels.

Climate change projections for India
Various studies conducted in the country have shown that the surface air temperature in India is rising at the rate of 0.4º C per hundred years, particularly during the post-monsoon and winter season. Models project that mean winter temperatures will increase by as much as 3.2º C in the 2050s and 4.5º C by 2080s. Summer temperatures will increase by 2.2º C in the 2050s and 3.2º C in the 2080s. Extreme temperatures and heat spells have already become common over Northern India, often causing loss of human life. An annual mean surface temperature rise by the end of the century, ranging from 3 to 5° C under A2 scenario and 2.5 to 4° C under B2 scenario, with warming more pronounced in the northern parts of India. A 20 per cent rise in all India summer monsoon rainfall and further rise in rainfall is projected over all states except Punjab, Rajasthan and Tamil Nadu, which show a slight decrease (Sudha Rani.V and Shivakrishna Kota, 2013). In this context Climate Smart Agriculture is an approach for ensuring food security in future. Climate Smart Agriculture (CSA) is based on three pillars of

Climate smart technologies, Adaptation and mitigation strategies.

Climate Smart Agriculture (CSA)

Climate-smart agriculture (CSA) is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change. It also contributes to the achievement of sustainable development goals. The CSA approach is designed to identify and operationalize sustainable agricultural development within the explicit parameters of climate change. It integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. This approach also aims to strengthen community livelihoods and food security, especially of smallholder farmers, by improving the management and use of natural resources and adopting appropriate methods and technologies for the production, processing and marketing of agricultural commodities. To maximize the benefits and minimize the stumbling blocks, CSA takes into consideration the social, economic, and environmental context where it will be applied. Renewable energy and local resources are also analysed and implementation of sustainable / cost effective technologies. A key component is the integrated landscape approach that follows the principles of ecosystem management and sustainable land and water use. Innovative financing mechanisms that link and blend climate and agricultural finance from public and private sectors are a key means for implementation. The scaling up of climate-smart practices will require appropriate institutional and governance mechanisms to disseminate information, ensure broad participation and harmonize policies. The area- specific priorities need to be determined, and the outcomes are evaluated. CSA approach requires site-specific assessments to identify suitable agricultural production technologies and practices.

The CSA approach will addresses the complex interrelated challenges of food security, development and climate change, and identifies integrated options that create synergies and benefits and reduce trade-offs; It also assesses the interactions between sectors and the needs of different involved stakeholders. The CSA approach identifies barriers to adoption, especially among farmers, and provides appropriate solutions in terms of policies, strategies, actions and incentives. (Climate Smart Agriculture Source book. FAO. 2013)

Methodology

A case study was conducted at Kanakiliyanallur village of Trichy district to document the people's mindset on climate change. Kanakiliyanallur village of Lalgudi taluk in Trichy District, Tamil nadu is situated 11 kms away from Cauvery – Pullampadi canal. The main occupation of the village is agriculture supporting 1500 farm families directly or indirectly. Since the soil is clay loam in nature, getting water bore wells is always an issue for this village. Though near to Cauvery River, Rain fed agriculture is the only resort for crop production. Over the years, the Cropping pattern of the village shifted from paddy to cotton, sorghum, and pulses. Due to vast variation in climate and rainfall, even one crop is uncertain now a days. Though the residents of the village noticed the changes in temperature, rainfall and groundwater for the past two to three decades, they were not aware of the climate change terminology and mitigation measures. About 120 farmers including 30 women farmers were interviewed by focus Discussion groups (FDG) meetings along with Long interviews.

Results and Discussion

Socio profile characteristics of the respondents

The results were analyzed with descriptive statistics and presented in Table 1. The Socio profile characteristics of the respondents about 75 percent of the people completed their school level education. Around 78 percent of the people are coming under the category of Rs 2,000 per month income class. The extension agency contact was also under the poor side, about 63 percent of the respondents had occasional contact with the extension agents.

Though the people noticed about the changes in temperature, rainfall and crop yields, miserably around 77 percent of the people were not aware of the term 'climate change'. More than 50 percent of the people still believes that climate change mitigation steps should be taken only by Government body and 23 percent of the respondents were keen on the NGO / SHG initiatives on mitigation efforts. This clearly shows the need of strong emphasis on capacity building of the clientele in the lines of climate change.

Table 1: Distribution of respondents based on their socio economic characteristics (n=120)

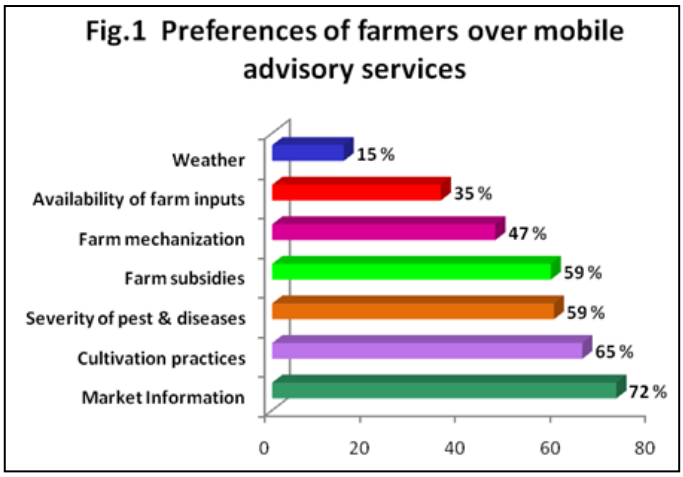
Sl. No	Socio-economic characteristics	No.	%
1.	Age		
	Young < 25 years	30	25
	Middle 25- 40 years	55	46
	Old > 40	35	29
2.	Education		
	Illiterate	14	12
	Functionally literate	12	10
	Up to middle School	82	68
	Hr. Secondary	8	7
	Collegiate	4	3
3.	Income		
	Up to 12,000 per annum	44	37
	Rs.12,000 to Rs.24,000	49	41
	Rs.24,000 to Rs.48,000	20	16
	> Rs.48,000	7	6
4.	Training attended		
	Yes	95	79
	No	25	21
5.	Extension agency contact		
	Rare	20	17
	Occasionally	76	63
	Frequently	24	20
6.	Awareness on Climate change		
	Yes	27	23
	No	93	77
7.	Ever noticed changes in		
	a. Temperature		
	Yes	76	63
	No	44	37
	b. Rainfall		
	Yes	87	73
	No	33	27
	c. Pest incidence		
	Yes	68	57
	No	52	43
	d. Farm income		
	Yes	80	67
	No	40	33
8.	Mitigation steps should be taken by		
	Community	24	20
	Non – Governmental organization	28	23
	Government	68	57

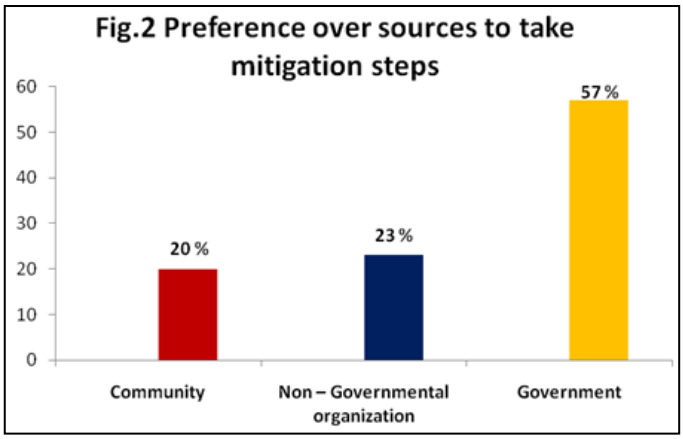
(ii) Preferences of farmers over mobile advisory services

Based on the research study on the preference of mobile advisories by the farmers, it was inferred that market information were preferred most rather than cultivation practices and plant protection. On the other hand, the weather alerts were the least preferred which clearly shows the lack of awareness community over the importance of climate change. (Table. 2 and Figures.1& 2)

Table 2: Preferences of farmers over mobile advisory services (n = 120)

Sl. No.	Preferences	User respondents	
		Garrett's Score	Rank
1.	Market Information	72.32	I
2.	Cultivation practices	65.17	II
3.	Severity of pest & diseases	59.21	III
4.	Farm subsidies	58.55	IV
5.	Farm mechanization	46.89	V
6.	Availability of farm inputs	35.44	VI
7.	Weather	15.03	VII





From the results of the Table 2, it is inferred that nearly three-fourth (72.32 %) of the respondents ranked market information in first place. Though the farmers adopted the latest technologies, the profitability out of farming could be realized only through better market decisions. The market forces *viz.* middlemen, traders could exploit the price margin of the farmers, if the farmers unaware about the prevailing price and market environment. Hence knowing the price of the commodities and better market details could enhance the market arbitrage and price arbitrage. This might be the reason for ranking market information as the prime spot. The crop cultivation practices and severity of pest & diseases information were preferred by two-third (65.17 %) and less than two-third (59.21%) of the respondents. A little more than half of the respondents (58.55 %) ranked information on farm subsidies on seed, agro inputs and agro infrastructure utilities like green house nets etc. The information on new arrivals of farm machinery and wheeled vehicles were preferred by more than two-fifth (46.89%) of the respondents. Little more than one-third (35.44 %) of the respondents opted availability of farm inputs in the sixth rank where as only 15.03 per cent of the respondents preferred for weather information. The reason for least preference might be due to freely available information about farm inputs and weather in print media, electronic media and face to face communication channels.

Conclusion

Climate information Services - Mobile based agro advisory services

It is imperative to keep our farmers informed with climate change threats and mitigation strategies. The better informed farmers are better decision makers in choosing the crops for the upcoming season as well as taking up suitable crop management practices. The isolated and primitive agriculture can be rejuvenated as profitable and remunerative agriculture through latest communication gadgets. In this context new and advanced Information and Communication Technology (ICT) tools such as Computers, Internet and Mobile phones have tremendous potential to facilitate technology transfer to farming community.

Presently there are 1164.20 million mobile users in India with 492.57 million belongs to rural areas (TRAI report, Feb, 2017). The telecommunication advancements can be effectively utilized for agricultural and rural development. Recent research reveals that the mobile phone is playing a very useful role in fulfilling the informational needs of farmers, particularly among marginal and small ones. The mobile-phone based agricultural information services are now swiftly becoming popular. These services, through SMS (AMIC & BIC, Trichy) or voice-messages (IFFCO) provide a variety of agriculture related information on crop-cultivation, fertilizer use, plant-diseases, pesticides, market-prices, weather and important government policy decisions. Various State Agricultural Universities and ICAR professors have been co-opted in the expert panel of these service providers. The information is provided to farmers in local language, within a specified time and also two-way interaction through customer care centers is available. The farmers who have subscribed to these services have highlighted that they have now been more aware and have also enhanced agricultural earnings. The farmers who are not the subscribers but possess a mobile phone also revealed that the instrument has helped reduce costs and wastages and increased incomes. The popular uses of mobile phone in agricultural operations (when used just as a communication medium) included, getting to know the market-prices of crops at various places; receiving instantaneous solutions regarding seed-variety, fertilizer and pesticide availability/application; calling distant livestock-doctors and so on. Significant saving in both time and money/fuel were reported by farmers on account of mobile communication. The research also provides evidence on the key role that mobile phones are playing in improving the information transfer between farmers and research institutions, government & private input companies, input-dealers, doctors, markets and other farmers.

Thus agriculture today must feed a growing population in a world of static or shrinking natural resources and increasing social and environmental constraints. Agricultural information

professionals similarly must support agriculture by managing and improving access to a proliferating and increasingly complex array of information resources in a climate of shrinking resources and expanding constraints. To meet out these challenges a dynamic technology generation and transfer of technology system is needed. Hence it is imperative to keep the farmers with profitable and remunerative agriculture through latest communication gadgets.

Integrated Agro-meteorological Advisory Service- IAAS

Integrated Agro-meteorological Advisory Service was started on 2007 by the joint efforts of Indian Meteorological Department, ICAR and MoA. About 20 lakhs farmers were benefitted and is was estimated that by mobile information services 10-15 % higher yields was attained by the farmers with 2-5 % lower costs.

Capacity strengthening of farmers

Though global summits insist on global initiatives on climate change and mitigation, communities are the real time respondents to any agro-climate variations. Therefore, communities should be mobilized and trained to assess their own threats through a participation assessment process. For a better understanding of threats and opportunities, the capacity building of farmers, stakeholders should be up scaled based on the felt need of the people.

Stakeholder convergence

To combat the climate change, there arise the needs of convergence of all players in the rural domain. All stakeholders, not only the farmers group, buyers, input suppliers, rural ICT companies, insurance companies, meteorological agencies, local government functionaries and researchers should be brought under a common umbrella for the coherent efforts. In this context new and advanced Information and Communication Technology (ICT) tools such as Computers, Internet and Mobile phones have tremendous potential to facilitate technology transfer to farming community. Through ICT tools, people in rural areas can connect with the local, regional and national economy and access markets, banking/ financial services and also farm based services. The vulnerabilities of local communities are also up scaling due to lack of coherent group efforts. The climate change information needs assessment of the communities and linkages among Research- Extension – farmer are some of the areas where top priorities should be given.

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