*Reference Number: [*CBA2017-07SY-Raj*]*

Final Report of the project

Enhancing Women farmer's Adaptive Capacity to address the Challenges of Climate Change

Submitted to

ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESERACH

Submitted by

M.S.SWAMINATHAN RESERACH FOUNDATION

Aug 2019

Enhancing Women farmer's Adaptive Capacity to address the Challenges of Climate Change

Summary

The use of appropriate climate information[1] with suitable lead-time and finer spatial scale is one of the best climate change adaptation strategies. The improvement in science and technology facilitates access to reliable climate forecast information and piloted in diverse locations in African and Asian regions. The results have been encouraging and both at the international and national levels and steps have been taken to mainstream climate information services as one of the adaptation tools to meet climate variability and change. However, the main challenge is how to make the small holding men and women farmers to understand, access and use the services to improve food production by reducing risks. In this backdrop, effort has been taken to build the capacity of the actors engaged in climate the information chain in semi-arid region of south India. The report details the process adopted in the capacity building of diverse actors and learnt that it supports to make significant change in adding value to the utility and uptake of the climate information by women farmers. Of the strategies, enhancing capacities of the different actors to provide relevant value added content, use climate information services by the farmer collectives, community based trained women communicators and improved awareness among women are important.

[1] Climate information includes medium and extended range forecast details value added into location specific agro-advisories for practice.

Acronyms

AMFU – Agro Meteorological Field Unit

CRM – Climate Risk Managers

FPOs – Farmer Producer Organizations

KVK – Krishi Vigyan Kendra

IMD – Indian Meteorological Department

NABARD – National Bank for Agriculture and Rural Development

SCF – Seasonal climate forecast

SDGs – Sustainable Development Goals

TNAU – Tamil Nadu Agricultural University

I. INTRODUCTION

Climate variability and climate change is adversely affecting the food security and livelihoods of small holders in developing and under-developing countries. The recent Economic Survey in India report cautioned that the extreme temperatures and droughts will have adverse impacts on farm incomes, especially in unirrigated agroecology, which has great relevance to small holders especially women farmers. It further states that the year in which when temperatures increase by one degree Celsius, farmer incomes would drop by 6.2 per cent during the kharif season and 6 per cent during rabi in unirrigated districts. Likewise, in a year when rainfall is 100 mm less than average, income would reduce by 15 per cent during kharif and by 7 per cent during the rabi season (GoI, 2018). While the study of International Labour Organization warned that "the loss in productivity by 2030 because of heat stress could be the equivalent of India losing 34 million full-time jobs (up from 15 million in 1995)—the highest among the world's most populous nations" (ILO, 2019).

With the increasing degree of witness on the implications of climate variability, attention on climate actions gain importance in the development agenda. The recent effort of World Meteorological Organization (WMO) on Global Frame for Climate Services has created awareness and increased actions on climate services through its study on assessment of sustainability and effectiveness in climate information services in Africa (WMO 2019a). At the same time, the scientific advances and technical capacity in climate modelling has been improving in the recent past, which results in predicting variables like rainfall and temperature with increased accuracy. With the use of either dynamic forecasts or statistical methods, development of forecasts has been tailor made into different timescales depending upon the purpose. The time period ranges from now cast to longer period predictions. In rainfed agro-ecosystems, both weather and seasonal climate information especially for rainfall is increasingly relevant and have potential to make informed decisions, manage risk in farming and maximise opportunities when favourable rainfall is predicted.

The recent report of WRI and GCA (2019) pointed out the need for building the resilience and has shown that the overall rate of return on investments in resilience is significantly higher, with the benefit-cost ratios varying from 2:1 to 10:1. Of the five potential areas of action identified for building resilience, early warning systems assumes greater importance in the context of increasing degree of climate variability and change. In this backdrop, the importance of climate information services receive attention in taking informed decisions,

promote the adoption of climate smart agriculture as well as support a series of resilience building interventions (Hansen *et al*., 2019).

However, there are challenges in accessing and using this climate information by small holders. The most important barriers observed are quality and relevance of the information interms of content, time scale required by the smallholders, timely access to the information, linking climate information services to the overall crop production efforts like availability of suitable seeds of the required crops or varieties, inputs and labour or machinery support etc, and inclusiveness in terms of its reach to marginal holders including women farmers. WMO (2019 b) has given guidelines to adopt an integrated approach for capacity development of climate services covering institutional, infrastructural, human resources and procedural works.

In the context of increasing women's farmers' role as cultivators, entrepreneurs and labourers, the recent Economic survey in India (GOI, 2018) advocated for the policy change. It states, "Rural women are responsible for the integrated management and use of diverse natural resources to meet the daily household needs. This requires that women farmers should have enhanced access to resources like land, water, credit, technology and training which warrants critical analysis in the context of India"[2]. In this backdrop, it was proposed to enhance the utility and uptake of climate information services for better food production and nutrition security. The detailed goal and objectives of the interventions ere given in the next section.

2. Objectives

The overarching goal of the project was to engender the weather and climate information services and enabling its access and use to small holding farmers with special attention to women farmers

The key objective of the project was how to enhance the adaptive capacities of women farmers in using climate information by building capacities of the actors and put in practice; The study made an attempt to

---

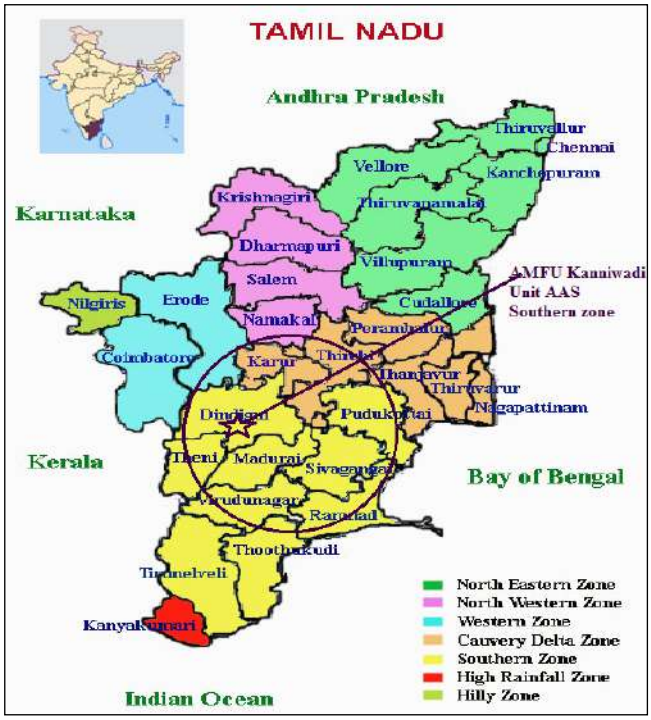
2 //economictimes.indiatimes.com/articleshow/62693042.cms?from=mdr&utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

1. Build the scientific capacity and leadership of women farmers in understanding the climate change issues and potential of climate information on risk resilience, access and use of climate information and agro advisories to take informed decisions in farming

2. Promote and evolve a cadre of women farmers to communicate the climate information at the grassroots level and institutionalise it through existing Farmer Producer Organizations (FPO) at the local level and

3. Strengthen the capacity of climate information based agro-advisory providers at the organizational level to provide gender sensitive and need based information and integrate the framework within the advisory development framework and protocols.

3. Description of the study sites and partners



The project was carried out in the state of Tamil Nadu in India (Map 1). With reference to weather and climate information services (commonly referred as climate information services in the subsequent sections) operational forecast system at the national level for medium range weather (3-5 days) at the scale of district level, extended range (15-30 days) and seasonal climate forecast (more than a month) at the spatial scale of state is available. Apart from this TNAU is providing Seasonal Climate Forecast (SCF) for all the districts with one-month lead time during *Kharif* and *Rabi* cropping seasons. The project harnessed the available both weather and climate information to take it to farmers. The Tamil Nadu state has seven agro-climatic zones to work at the organizational level and one zone is selected for grassroots level action. Each Agro climatic zone is covered by an Agro Meteorological Field Units (AFMUs) which acts as nodal point to receive the forecast and develop agro-advisories.

4. ACTIVIITIES and OUTPUTS

The approach of Participatory Action Research approach was followed in the whole process of building the capacity of diverse actors such as agro advisory providers, farmer collectives or Farmer Producer Organizations (FPO's), women farmers including policy makers (referred as climate information chain) to ensure their active participation and ownership in the process (Fig 1). Awareness and capacity building programmes were organised to enhance their knowledge and skills in the utility and uptake of the climate information in order to strengthen the adaptive capacity of rural women farmers. The capacity building programmes was organised to improve the capacity at the organizational and individual levels covering the whole climate information chain to improve the efficiency. The details of the engagement process covering objectives, actors, methods of interaction, outputs achieved are described in the following sections

Fig 1. Chain of associated stakeholders in the climate and weather information services

4.1. AFMUs

At the first level the facilitators of the seven Agro Meteorological Field Units (AFMUs) who act as nodal points to receive the forecast and develop agro-advisories were oriented in gender issues and preparing the agro-advisories by considering the differential needs of the diverse farmers group in the field levels (Table 1). The key messages focussed on (i) ascertaining gender specific needs of women and men farmers across different seasons, (ii) creating simple contents on how to address the issues, and the sources to get further details and technical support, (iii) study the traditional knowledge in prediction and farmers practice in referring the intensity of the weather variables to enable the communication process and (iv) dissemination – apart from formal sources like website, radio, newspaper, agriculture department and KVKs, networks with NGOs who are working with women's groups and FPOs to reach more women farmers and innovative communication modes like

voice mails and whatsapp audio messages to reach women who have limitation on reading and writing. Participatory tools and processes were adopted to sensitize them on the gender issues and necessity to adopt gender lens. The participatory dialogues were facilitated to build the capacity on developing gender sensitive and need based advisory development. A simple training module on gender sensitization was prepared. Prior to that individual discussions were carried out with nodal persons of IMD and TNAU and shared the project objectives, activities, methods, expected outcomes and expected policy inputs.

Table 1. Details of the AMFUs trained

S. No.	Name of the AMFU	Agro-ecological Zones
1	TNAU, Coimbatore	Western zone
2	Agricultural Research Station, Kovilpatti	Southern zone 1
3	MSSRF, Kannivadi, Dindigul	Southern zone 2
4	Horticultural Research station, Ooty	Hill zone
5	Tamil Nadu University for Veterinary and Animal Sciences, Madhavaram	North Eastern Zone
6	Tamil Nadu University for Veterinary and Animal Sciences, Namakkal	North Western Zone
7	Tamil Nadu Rice Research Institute, Aduthurai	Cauvery Delta Zone
8	Horticultural Research station, Thirupathisaram	High Rainfall Zone

4.2. Farmer producer Organizations (FPOs)

For grassroots level action, among the seven-agro climatic zones, south zone covering six districts were selected. They are Ramanathapuram, Pudukottai, Sivagangai, Madurai, Theni and Dindigul were covered. From these districts, out of 67 Farmer Producer Organizations/Farmer groups/Farmers federations, 21 were selected (Table 2).

The main selection criteria employed were: institutions having about 1000 members and have been functioning more than three years in the region. Interaction with district level agricultural officials, known civil society organizations and the A meeting was organised at Dindigul to orient the FPOs on the purpose of this partnerships and intervention, importance of climate and weather information and agro advisories, role of FPOs in the whole process and their support in identifying innovative women farmers at the field level who intern serve as Community Risk Managers (CRMs) in their location to extend services to their members. With the partnership a brief qualitative survey was carried out to understand the level of awareness on the access to climate and weather information services and challenges in accessing to such information.


Interaction with FPOs

The main constraints are

- Lack of awareness on the availability and utility of the climate information services in reducing the climate risk in farming
- Not familiar with the actors and institutions working on providing such information
- Don't have capacity to spread the awareness and introduce climate information services as one of the potential service among the farmer members
- Limitation in continuously engaging with members for example extending site specific weather based agro-advisories and linking it with input services through FPOs

Table. 2 Details of FPOs/Farmer groups trained and support CRMs in different locations

S. No.	Name of the FPO/ Farmer groups	District	Date of the meeting	Place
1	Pudukkottai Organic Farmers Producer Company Ltd.	Pudukkottai	5.4.2018 and	VRC office, Pudukottai

2	Vrutti Livelihood Impact Partners, Alangudi	Pudukkottai	13.6.18	
3	Ambuliaru Farmers Producer Company Limited,	Pudukkottai		
4	Karambakudi Farmers Producer Company Ltd.	Pudukkottai		
5	Panchayat Level Federation, Thirumalairayasamuthram	Pudukkottai		
6	Panchayat Level Federation, Pallavarayanpathai	Pudukkottai		
7	SKETCH Trust, Mudhukulathur	Ramanathapuram	20.4.2018 11.5.18	KVK, TNAU, Paramakudi
8	Ramanathapuram Mundu Chilli Farmers producer Company Limited	Ramanathapuram		
9	Farmer Producer Group (Uzhavar Urpathiyalar Kuzhu) - State Agriculture Department, Thirupachethi	Sivagangai	8.6.18 28.6.18	JDA, Dept of Agriculture, Sivagangai
10	Panchayat Level Federation, Thirupachethi	Sivagangai		
11	Shadent Farmers Group, State Agriculture Department, Thirupachethi	Sivagangai		
12	Reddiyarchathram Sustainable Agriculture Producer Company Limited, Kannivadi	Dindigul	7.7.18 11.8.18	RSGA office, Kannivadi
13	LEO Trust, Batlagundu	Dindigul		
14	CIRHEP, Nilakkottai	Dindigul		
15	SPACE, Sanarpatti	Dindigul		
16	Panchayat Level Fedeartion, Athur	Dindigul		
17	ADISIL Farmers Group, Thirumangalam	Madurai	21.7.18 2.8.19	Kalangium office, Madurai
18	CREDA Trust, Alanganallur	Madurai		
19	Kalanjiyam Women Federation, Solavandhan	Madurai		
20	Theni District Goat Farmers producer Company Ltd, Vidiyal, Bodinayakkanur	Theni	17.6.18 12.7.18	Vidiyal, Rasingapuram , theni
21	IMAI Trust, Periyakulam	Theni		

At the end of the training and capacity building programmes, quick assessment was held on five indicators and the changes were compared on scoring basis before and after the engagement period across all the FPOs (Fig 2.).

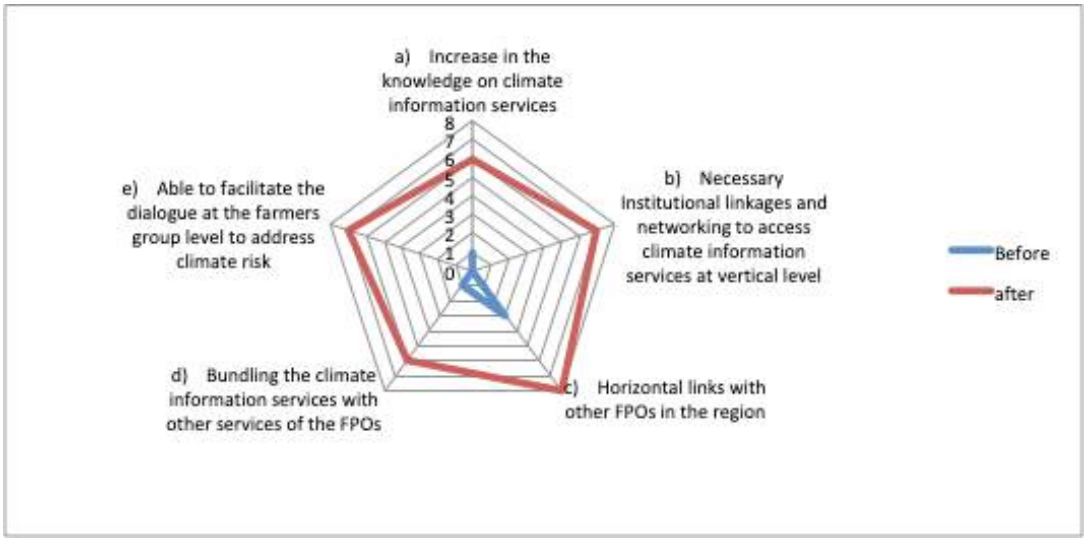


Fig 2. Outcomes of the capacity building and engagement of the FPOs in the programme

4.3. Climate Risk Managers:

With FPOs support 30 CRMs were identified in their respective locations (Table 3.), while selecting the CRMs following parameters were employed: (i) lead in adopting new technologies, have quest and attitude to learn continuously (iii) willing to share the experiences and process with other farmers (v) already playing the role of leader in such processes, (vi) having basic education to read and write and (v) with good mobilization and organization skills to discuss the issues closely with farmers. A training module was developed to train the CRMs on the different aspects related to climate and weather forecasts, agro advisories, institutions providing the details and sources to access the information, assessment and understanding of the local cropping systems, local agro-climatology, special training to understand the traditional knowledge of the men and women farmers to initiate the dialogue and communicate with them, potential adaptation practices using the weather and climate information etc.

Capacity building programme for the CRMs

Using the training module capacity building programmes were conducted to improve their capacity to understand, practice and share with other farmers. The main purpose of the programme was to build and strengthen the knowledge, skills and abilities of the CRMs to communicate climate information and facilitate the discussion on climate change adaptation using climate information as potential tool.

The key areas dealt in the programme were to:

- Comprehend the science and drivers of climate change, weather parameters and crop weather relations
- Understand how weather, extreme weather events and seasonal climate influence various sectors including the livelihoods of rural farming communities
- Impact on crop production, animal husbandry and other productive activities

- Practical contingency plans suitable to the area and crops/cropping systems and
- Enhance knowledge and skill to identify best adaptation measures in order to be able to cope up with the adverse effects and its coping/adaptation measures.

Orientation programme to the CRMs – Understanding needs

The training programmes were conducted in interconnected phases to link, relate the learning with the subsequent meetings to evolve practical strategy. Apart from face to face training, the communication tools like mobile telephony and social media (voice SMS, text SMS and social media like whatsapp) was used effectively by strengthen to augment the learning process.

Considering the advantages of group approach in capacity building and training, the horizontal network among the CRMs supported them to share their experiences and clarified their doubts. Here in order to understand the effectiveness of the training give to CRMs, pre and post training survey was organised to understand their Knowledge, Attitude and Practice level.

Each CRMs have been communicating and facilitating the information flow of climate and weather advisories and related information to 100 women farmers in the respective village. It was carried out through participation in women farmers group meetings and evening times through showing simple videos to stimulate discussions.

The process was participatory and structured interactions to get the feedback with men and women farmers. The main interaction points are monthly meetings of the farmers group at

Training and interaction among CRMs and sharing their learning

the village level as well as FPO group leaders at monthly meetings.

For this the technical inputs of experts from TNAU were leveraged. Series of capacity building programmes were organised to the CRMs: initial orientation followed by an in-depth programme. While starting the programme, CRMs from 13 FPOs were initially joined the programme and by seeing the programme remaining eight representation from FPOs came forward to join the initiatives.

After the training programme with the help of respective FPOs, hand-holding support was provided to disseminate weather forecast based advisory services and coping strategy which is the short term measures provided in the form of an agro-advisories.

The members were promoted to be a part of the farmers network in social media such as Whats app (*Vanilaiyum vivasayamum* – weather/climate and agriculture, *kalanilai melanmaiyum* – weather/climate management and a farmers association group as well as FPO networks operates at district level) to regularly receive forecast and advisories etc.

Table 3. List of women farmers selected for CRM Training Programme :

S. No	Name of the Farmer	Age	Qfn	Name of the FPO	District
1	Vimala	46	12th	Panchayat level federation, Thirumalairayasamudhram.	Pudukkottai
2	Adaikalamary	50	8th	Panchayat level federation, Pallavarayanpathai.	Pudukkottai
3	AnithaBose	26	M.Sc.	Ambuliaru Farmers Producer company limited, (Vrutti)	Pudukkottai
				Karampaikudi Farmers Producer company ltd (Vrutti)	Pudukkottai
4	A.Santhiya Beulet	20	B.Sc.	Pudukkottai Organic Farmers Producer Company Ltd.	Pudukkottai
5	R.Vijaya	47	10th	Pudukkottai Organic Farmers Producer Company Ltd.	Pudukkottai.
6	Suganya	28	12th	Mundu Chilli Farmers producer Company limited	Ramanathapuram
7	Ananthi	32	M.Sc.	Mundu Chilli Farmers producer Company limited	Ramanathapuram
8	Maha Sathya	24	BBA	Mundu Chilli Farmers producer Company limited	Ramanathapuram
9	Karthiga	28	B.Sc	Mundu Chilli Farmers producer Company limited	Ramanathapuram
10	G. Shanthi	49	8th	Shadent Farmers group, State Agri department, Thirupachethi.	Sivagangai
11	V. Selvi	45	10th	Farmers Producer Group (Ulavar Urpathiyalar kuzhu) State Agri department, Thirupachethi.	Sivagangai

12	I. Vijaya	31	B.Sc.	Panchayat Level Federation, Thirupachethi	Sivagangai
13	Uma Nandhini	41	B.com	Leo Trust Batlagundu	Dindigul
14	Pandiselvi	43	10th	Leo Trust Batlagundu	Dindigul
15	Parvathi	31	10th	Leo Trust Batlagundu	Dindigul
16	Arockiamary	52	10th	Reddiarchathram Sustainable Producer Company Ltd.	Dindigul
17	Muthulakshmi	39	BA	Reddiarchathram Sustainable Producer Company Ltd.	Dindigul
18	Sudha	32	10th	Panchayat level Fedration	Dindigul
19	Muthumani	31	10th	Panchayat level Fedration	Dindigul
20	Panchavarnam	50	8th	CIRHEP	Dindigul
21	Anusiya	23	12th	CIRHEP	Dindigul
22	Kiruabamary	45	12th	SPACE	Dindigul
23	Mahalakshmi	27	12th	ADISIL	Madurai
24	Menaka	38	12th	ADISIL	Madurai
25	Latha	52	10th	CREDA	Madurai
26	Mehar banu	48	10th	Kalanjiyam	Madurai
27	Deepa	36	12th	IMAI Trust	Theni
28	Bhavani	30	12th	IMAI Trust	Theni
29	Shanmugathai	42	12th	Theni District Farmers Goat producer Company Ltd	Theni
30	Lakshmi	45	10th	Theni District Farmers Goat Producer Company Ltd	Theni

The changes in the capacity of the CRMs were compared to the pre and post intervention phases on their level of knowledge, skills, leadership, institutional linkages and social network (number of farmers approaching her to get the climate information) at the village level. It was done using ten point scale to understand the changes (Fig 3.)

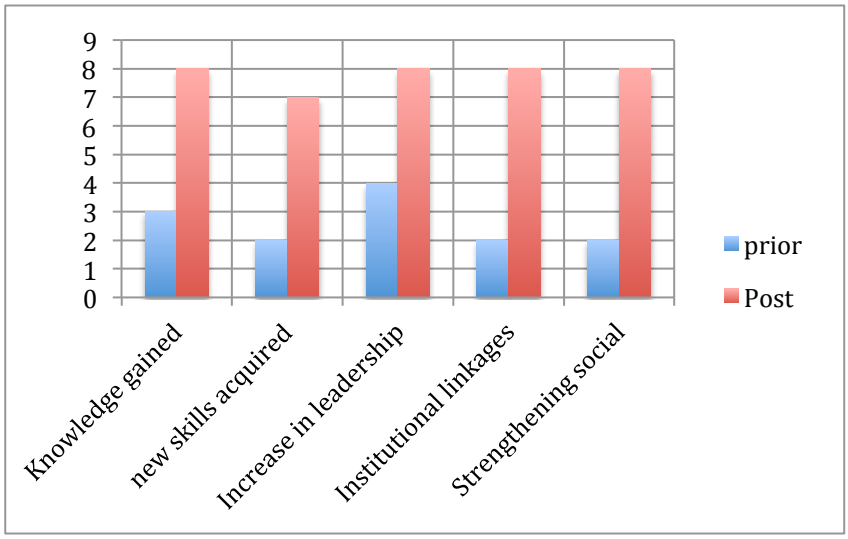


Fig 3. Outcomes of the capacity building programme among CRMs.

4.4. Women farmers:

As a follow up of the CRM training programme – series of sharing meetings were organised at the village level with 3000 women farmers in total by the CRMs to introduce the availability of climate information services and how it can be used to make informed decisions in the field, how their practices are contributing to climate change and how their local actions can contribute for the mitigation of the whole climate change issues at the larger level. To facilitate the process, the first meeting was organised in a structured manner as on when the FPOs and CRMs were ready and extended support to the FPOs and the CRMs in conducting the interactions.

It helped the CRMs to make a good beginning and served as a based for further interactions. Focus group discussions using video's communicating how climate change is making on local impact by relating to the changes happening at the local level as well as the availability of climate information services especially to prepare the farmers to meet the challenges.

Capacity building programmes and follow up hand-holding programmes with women farmers

Table 4. Details on women farmers trained on climate Adaptation practices

S. No.	Name of the CRM	Location		Date of the first programme	Number of women farmers trained
		Village	Block		
1	Vimala	Thirumalairaya Samudhram	Pudukkottai	9.4.18	100
2	Adaikalamary	Pallavarayanpathai	Karambakudi	23.4.18	100
3	Anita bose	Vadakadu	Thiruvarankulam	14.5.18	50
		Maankollampatti	Karambakudi	21.5.18	50
4	A.Santhiya Beulet	Perunkudi	Arimalam	28.5.18	100
5	R.Vijaya	Maruthaanthalai	Annavasal	4.6.18	100
6	Suganya	Melayakudi	Paramakudi	11.6.18	100
7	Ananthi	Pulikulam	Paramakudi	18.6.18	100
8	Maha Sathya	Muthuvijayapuram	Mudhukulathur	26.6.18	100
9	Karthiga	Ulaiyoor & Kodarenthal	Mudhukulathur	2.7.18	100
10	Santhi	Thirupachethi (S)	Thirubhuvanam	9.7.18	100
11	Selvi	Thirupachethi	Thirubhuvanam	16.7.18	100
12	Vijaya	Kannur	Thirubhuvanam	23.7.18	100
13	Uma Nandhini	Old Batlagundu	Vathalagundu	30.7.18	100
14	Pandiselvi	Kamachipuram	Vathalagundu	6.8.18	100
15	Parvathi	Kottaipatti	Vathalagundu	13.8.18	100
16	Ms. Arockiamary	Dharmathupatti	Reddiarchatram	20.7.18	100
17	Muthulakshmi	Maniyakaranpatti & Pothinayakkanpatti	Reddiarchatram	28.8.18	100
18	Sudha	Thimminayakkanpatti	Athur	3.9.18	100
19	Muthumani	Melapatti	Athur	10.9.18	100
20	Panchavarnam	Veelinayakkanpatti	Nilakottai	17.9.18	100
21	Anusiya	Mallanampatti	Nilakottai	24.9.18	100
22	Kiruabamary	Alagarnayakkanpatti	Sanarpatti	28.9.18	100
23	Mahalkashmi	Thangalacheri	Thirumangalam	4.10.18	100
24	Menaka	Kondurettipatti	Thirumangalam	8.10.18	100
25	Latha	Kottaimedu	Alanganallur	16.10.18	100
26	Mehar banu	Nachikulam	Vadipatti	20.10.18	100
27	Deepa	Vadugapatti	Periyakulam	22.10.18	100
28	Bhavani	E. Puduottai	Periyakulam	29.10.18	100
29	Shanmugathai	Bodi & Bathirakalipuram	Bodi	6.11.18	100
30	Lakshmi	Silamalai & Soolapuram	Bodi	12.11.18	100
	Total	**35 villages**	**18 Block**		**3000 women farmers**

4.5. Policy maker's consultation

The policy level workshop was organised 3 May 2019 at MSSRF, Chennai in which researchers, policy making institutions like Department of Environment who update the state action plan on climate change, Tata Institute of Social sciences and Tata Energy Research Institute who have been associated with the UNFCC report contribution and reviewing processes (table 5). A policy brief was developed highlighting the chain of capacity building processes. The field experience helped to interact with them effectively by sharing the evidence based inputs to policymaking process especially need for the capacity building initiatives in the different levels to make the whole climate information services as gender sensitive. It was organised in a consultative mode and the case was presented which kindled the interest of the TISS scientists who are looking at the climate information services of the UNFCC report and came forward to work in partnership to strengthen the evidences much more regressive and deeper. Apart from this the experience was shared with AMFUs network working at the national level in Annual Review Meeting of GKMS held between Dec 3-5th 2018 at Acharya N. G. Ranga Agricultural University, Tirupati, Andhra Pradesh.

Table 5. List of members participate in the Policy level workshop

S. No.	Name of the participant
1	Dr.Jayaraman, Professor, Director, Climate change and Sustainability Studies, TISS, Mumbai
2	Dr. Tejal Kanitkar, Centre for Climate Change and Sustainability Studies, TISS, Mumbai
3	Dr. Kamal Kumar Murari, Centre for Climate Change and Sustainability Studies, TISS, Mumbai
4	Dr. Indrajit Bose Third World Network
5	Dr.Sowmithiri, GIZ, Chennai
6	Dr. Surya Sethi UNESCO Chair Professor for Climate Science and Policy, TERI
7	Dr. B Venkateswarlu Member of NICRA Projects, CRIDA, ICAR, Hydrabad
8	Prof. Purnamita Dasgupta Professor, Indian Institute of Economic Growth
9	Dr. Geethalakshhmi, Director, SCMS, TNAU, Coimbatore
10	Dr.P.Ramnathan, Head, ACRC, TNAU, Coimbatore
11	Dr.P.Radha Priya, GIZ/DOE Climate Change, Dept. of Environment, Tamil Nadu
12	Dr.Anusiya, Clmate Cell, National Centre for Climate Change Research, Anna University, Chennai
13	Mr.Santhanam, Dhan Foundation
14	Mr.Sekhar, JDA, Department of Agriculture, Dindigul
15	Ms.Sumathi, Virutti, network of FPOs, Chennai

Interaction with District collector and officials of the Department of Agriculture explaining the impact of climate change and need to build

Similarly, at the district level to promote the awareness among the policy makers an exposure visit to the FPO and AMFU was organised on 12.8.2018. This has raised awareness among the district level agricultural officers of the Department of Agriculture to take an account of climate information in their planning and extension services.

5. Discussion

a) *5.1. Structure of the capacity building initiatives in the climate chain:* The capacity building initiatives were structured in a way that it works along the whole chain in creating access and promoting utility of the climate and weather information and suitable adaptation practices in the respective locations. As mentioned in the methodology part, four different sets of actors have been oriented on gender sensitive climate and weather information services. The table 1 to 5 indicates those seven AMFU facilitators and 21 FPOs at the organization level and 30 CRMs and 3000 farmers at the grassroots level. Such a knitted training and a comprehensive intervention at multiple levels helps to increase the uptake of the climate and weather information. WMO (2014) has put forth similar approach in its Global Framework on Climate Services and it was later reiterated by the pilot initiatives of USAID, WMO and World Bank (2018) as systems perspective to climate services. On this line the study of Opitz – Stapleton (2010) brought out the factors responsible for slow uptake of climate information as lack of awareness and capacity among farmers to access and use climate information. Hansen *et al.*, (2014) also suggested an informal open network of information users, providers, developers and researchers as Climate Services Partnership to share and exchange knowledge and learnings.

While the Ambani and Percy (2014) study in Africa reiterated the need for capacity building of all stakeholders involved in the process of climate information at production, communication and adoption to realise its potential use in risk reduction. However, organizing mere training programme may not make any significant changes to translate

the learning in to actions. The approach of the programme should be in such a way that farmer have to understand the issue and ownership in the learning. Here adoption of the process based capacity building approach helped to reach out the community level trainers effectively who can continuously support local farmers as well as while working with famers and other stake holders in building their capacity (Fig 4.).

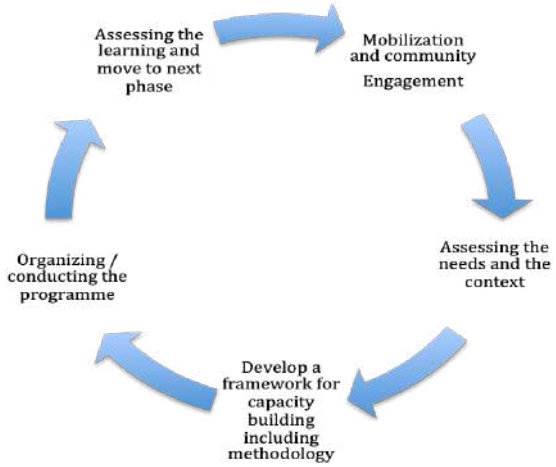


Fig 4. Process of capacity building

*5.2. Role of trained women communicators and group approach to improve the uptake of weather and climate information for women***:** Creating a cadre of intermediaries at the community level helped to improve the nodal points in the social network seeking the weather and climate information. Using simple thumb rules and understanding the crop weather relations the CRMs are equipped to develop and disseminate locale and need based agro-advisories for the weather and climate forecasts. The study of Venkatasubramanian *et al.,* (2014) and Rengalakshmi *et al.,* (2018) in India highlighted the result of women communicators in enhancing the utility of weather and climate information and its dissemination among women. The programme and the continuous engagement supported to build the awareness among women farmers which is in line with the suggestion of Coulibaly *et al.,* (2017), whose study pointed out the need to build the awareness on weather and climate information among women to enhance its uptake and utility. From the farmers level programme it is learnt that though at the initial phase women are not taking any decisions, they observe and share the details with their husbands and in–laws. However, with the continuous engagement and interventions of the climate communicators at the

village level, there have been changes in the behaviour to test the same in the field context (See the section on outcomes for the details). Here the group approach, as they are part of the farmers group and FPOs, it helped to remove the barrier and enable women to share and demand climate information. The main barriers were in accessing the information, understanding the technical details and ability to convince and gain the trust of the family members on their new skills.

5.3. Making relevance for climate and weather information: The experience shows that providing simple need based climate and weather information improve the uptake by women farmers. This necessitates the need to build the capacity of the AMFU facilitators to add value to the climate and weather forecast, which has relevance to women's actual, needs. The World Meteorological Organization has been advocating the need to provide clear and user-targeted information on weather and climate through its national focal points. In addition it gives importance to improve the awareness of farmers and other user groups on the value of climate information in decision-making (WMO, 2007). Kniveton *et al*., (2015) study in Kenya and Senegal also clearly indicated the importance of producing user need based information and advisories for practice. At the horizontal level there has been a platform at the individual category level to share the learnings. The annual review programme and the state level AMFU meetings helped the AMFU facilitators to discuss among them. While at the FPO level, now there has been a district level federation of FPOs is being promoted which provide space for them to interact. In case of CRMs, since the community resource persons are coming from different villages, a mobile-based network has been initiated to share the learning's and clarify the doubts. At the farmers level, the group, whether Self Help Group/Joint Liability Group/farmers interest group supports them to mutually share the experiences in using the climate and weather information.

5.4. Sustaining the demand for the climate and weather information : Creating awareness among women on the availability of weather and climate information services, supporting them in getting connected to the services through mobile network, strengthening their capacity to seek the information and facilitating information sharing mechanism in the groups are some of the potential strategies to strengthen their capacity to act on the information. The continuous interaction of the CRMs with women in sharing the forecast and agro-advisories support women farmers to observe, develop trust and translate them in to actions. However, limited resource control and lack of opportunity to participate in agricultural decision-making can significantly restrict women's capacity to make full use of climate information.

Integration of these weather and climate services along with other agricultural services like access to quality seeds of required crops and varieties, capacity building on technologies and institutional linkages can support women to act on the information (Muema *et al.,* 2018). While it can be difficult for climate services alone to address the rising challenges that more marginalized groups confront to act on climate and weather information, coordination with other sectors can be a key opportunity to enhance impacts in these cases (Carr and Onzere, 2017).

Significant Outcomes

1. The initiative resulted in building a cadre of 30 community based trained climate communicators at the grassroots level and who in-turn interacting with 3000 women in 35 villages (Table 4) on regular basis by raising awareness on climate change related issues in their local context and disseminating the forecast information and suitable agro advisories. Developed a horizontal level network between the CRM's to share and mutually learn from each other with linkages from agro-advisory providers for MRWF and ERF through Whatsapp (*Kalanilai Melaalargal*) group and organising audio conferencing. With the existing *Grameen Kisan Mausam Service*, the initiative will be further strengthened through intensive engagements and by this way the initiative the opportunity for strengthening the dimension of sustainability.
2. Oriented and trained 3000 women farmers at the grassroot level The initiative helped to enhance the awareness of the facilitators of seven AMFUs on preparing gendered agro advisories and being institutionalised the process at the organizational level with the support of Indian Meteorological Department
3. Developed a simple training module to build the capacity of the CRMs to carry forward the message at the community level.
4. Consolidated the learning in to a research paper on the issues, challenges and processes adopted to build the capacity at grassroots level and organizational level to provide gender sensitive and need based agro advisories and
5. A policy brief and one policy advocacy workshop to share the key learning's

Outcome analysis of weather & climate based agro advisory services at the users level

1. Usefulness of the advisory bulletins enumerating from the selected cases when advisories were helpful or otherwise

a) The awareness on the weather forecast has been increased among the farmers.
b) Forecast information helped the farmers to protect their animals from high temperature, rain, thunders and lightning especially for women as they are the care takers of the livestock.
c) Information on wind speed and wind direction helped in saving from lodging of very sensitive crops such as banana and moringa.
d) Based on weather forecast farmers are planning accordingly for their weather sensitive operations such as land preparation, sowing, weeding, top-dressing of fertilizers, harvesting, post-harvest operations.
e) The weather based advisory on pest and disease helps the farmer to go for defensive spray, and helps from loss due to most vulnerable pest and diseases.
f) One way the weather based advisory helps the farmers to improve the use efficiency of the inputs and on other way, it reduces the risk on loss of inputs and outputs.

2. The economic analysis was carried out in the field shows the significant changes in the yield loss by taking suitable decisions on the basis of the climate (weather) information provided to the farmers in three different locations

Case 1: Mr.Ravi, kanavai,
Crop: Ridge gourd
Climate information: As rainfall is expected, Drainage facility may be created to drain the excess water immediately after the event of rainfall.
Farmers Decision : Earlier the farmer has planned to cultivate ridgegourd by directly sowing the seeds. After receiving the weather forecast, the farmer, immediately postponed the sowing process and decided to buy the seedlings from the nearby nursery, instead of buying seed. If he selected the seeds, then due to rain, the soil would get hardened and it might affect the germination of seeds. But by planting the seedlings, he protected about 80 seedlings out of 100 seedlings. Thus, i) he saved around 25 days, ii) one weeding cost – Rs2000/acre, iii) Cost of Seed – Rs.2000.

Estimated difference between the use and non-use of the information in Ridge gourd

Loss (Rs/acre)		**Gains (Rs/acre)**	
Added cost : Creating drainage facility. 1000 Seedlings cost@2.50p	 Rs. 300 Rs.2500	**Added return:** By avoiding re –sowing of nursery By avoiding one weeding cost	 Rs.2300 Rs.2200
Reduced return :	Nil	Reduced Cost :	Nil
Sub total	Rs. 2800		Rs. 4500
Net Benefit Rs. 4500-2800 = Rs. 1700 /acre			

Case 2: Ms. Mariammal, Illupur,
Crop: Jasmine field

Climate information: As the maximum temperature is very high and the evaporation is also high. Farmers are advised to irrigate the vegetable/floriculture fields in evening hrs to protect the crop and place coir pith or other mulching materials in the field to avoid quick evaporation of water.

Farmers Decision : Based on the weather forecast, the farmer decided to use the mulching technology in his jasmine field. Thus the farmer benefited in two ways. i) Evaporation of water has been controlled. ii) Cultivated the flower with less amount of water iii) Controlled the weed growth, iv) weeding cost reduced, v) avoided the loss due to the damage of roots during irrigation, vi) avoided the loss of soluble fertilizer get evaporated along with the water, vii) no tension in hiring labour for weeding work iv) Reasonable profit due to high yield.

Estimated difference between the use and non-use of the information in Jasmine

Loss (Rs/acre)		**Gains (Rs/acre)**	
Added cost : Creating Mulching facility	Rs. 18500	**Added return:** By avoiding damages of plant and thru 20% of increase in yield	Rs. 23000
Reduced return:	Nil	Reduced Cost:	Nil
Sub total	Rs. 18500		Rs.20000
Net Benefit Rs. 23000-18500 = Rs. 4500 /acre			

Case 3:
Crop: Banana, Kannivadi

Climate inforamtion: Since the wind speed is more than 18 KmPH, propping may be given to the banana trees and support may be given to moringa trees.

Farmers Decision: Based on the weather forecast information, a banana cultivator provide support to the banana trees in his field. By creating the propping facility, he saved the banana plantation with fruit bunches and flowers. Thus the farmer, got a profit near Rs.2 Lakh per acre and escaped from total crop loss.

Estimated difference between the use and non-use of the information in Ridge gourd

Loss (Rs/acre)		**Gains (Rs/acre)**	
Added cost : Creating propping facility (support) to banana (Rs.65/treeX 650 tree)	Rs. 42250	**Added return:** By avoiding complete crop loss (600 bunches x Rs.400)	Rs.210000
Reduced return:	Nil	Reduced Cost:	Nil
Sub total	Rs. 42250		Rs.210000
Net Benefit Rs. 210000 - 42500 = Rs.167750/acre			

6. Relevance to Global Change and Sustainability

Relevance to APNs framework: At the overall level, the primary objective of building women farmers capacity to meet the challenges of climate change' is largely aligned with the goal no 2 of APN's fourth strategic plan. Here initiatives were undertaken to build the local capacity of women farmers and a cadre of community based climate communicators called as CRMs to disseminate climate information to farmers. New knowledge and learning on climate and weather information and advisories are being supporting women farmers to understand the science behind actions and enable them to take knowledge based decision making for better farming which was evident from the cases presented above as evidences.

The activities were also aligned with the APN's goal no 3, dealt with the establishment of partnerships and participation of other stakeholders (Farmer producer organizations, civil society groups and IMD officials and extension officers of agriculture department) in raising the shared understanding. It provides platform at two levels; one for the community leaders to work closely with scientists who is associated with the value addition of forecast information into agro advisories and an another at the scientists level to interact with policy makers in showcasing the evidences which would help in exchange of scientific inputs to policy decision making processes.

The initiative addressed the two main thematic areas namely Climate variability and Climate Change as well as Risk reduction and Resilience which are part of the APN's Strategic Plan. The main mode of coverage was how climate information can be a better tool to promote adaptive decision making to the climate variability and change. The APN's framework of capacity development was covered in the whole climate information chain by strengthening the scientific capacity of women farmers to improve their capacity on understanding the issue and move towards decision making. to achieve the desired outcomes.

Relevance to Sustainable Developmental Goals: It directly contributed the goal 13 – Climate Actions of SDGs and especially it addressed the part related to raising awareness on climate change and its impact on farming among women farmer leaders and farmers by improving their scientific understanding and potential options to adopt different strategies.

National level: At the Indian context, it has been an evidence to contribute and place the importance of Climate information services as part of the Government of India's 'National Action plan on Climate Change'. In which, it supported to strengthen the mission number 7 and 8 that are focussing on Sustainable Agriculture and Strategic Knowledge for Climate change respectively on providing climate information for risk reduction and resilience.

Most importantly under the National Mission on Sustainable Agriculture its results will be useful to bring climate information services as one of the key strategies or pathways to improve the adaptive capacity of the farmers in coping with the changes.

Others: it is planned to share the key learning from this project to START International newsletter for its wider sharing

7. Concluding Remarks

The utility and uptake of climate information services in strengthening the adaptive capacity of smallholding women farmers by building the capacities of associated actors. The integrated approach of engagement with actors in the whole climate information chain appears to fill the gap at both in the production and user levels. The role of trained climate communicators at the village level is crucial who acts as infomediaries to enhance the use of climate information to take informed decisions. In this way, the intervention made an effort to promote links between science, practice and policy linkages to promote public awareness on climate information and resilience. This process ensured the sustained access by institutionalising at the farmers level through CRMs at the village level and FPOs and AMFUs at the organizational level.

Acknowledgements

The project team duly acknowledges the financial support extended by the Asia Pacific Network for Global Challenges, Japan in successfully implementing the project activities. The team expresses their appreciation and gratitude for the support and cooperation extended to the partner organisations namely Tamil Nadu Agricultural University, Indian Meteorological Department, Department of Agriculture, Tamil Nadu, Farmer Producer Organizations in the six districts in the south zone of Tamil Nadu, community resource persons and women farmers for their active participation and cooperation.

References

Ambani.M and F. Percy (2014). 'Facing uncertainty: The value of climate information for adaptation, risk reduction and resilience in Africa, CARE International. http:// http://www.careclimatechange.org/files/Facing_Uncertainty_ALP_Climate_Communications_Brief.pdf.

Carr, E. R and Onzere, S. N., (2017). Really effective (for 15% of the men): Lessons in understanding and addressing user needs in climate service from Mali. *Climate Risk Management*, 1-14.

Coulibaly, J.Y., Birachi, E.A., Kagabo, D.M., & Mutua, M. (2017). Climate services for agriculture in Rwanda: Baseline survey report. *CCAFS Working Paper no. 202***.** Wageningen, Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Retrieved from www.worldagroforestry.org/downloads/Publications/PDFS/RP17108.pdf

FAO (2019). FAO in India. (30.8.2019). Retrieved from http://www.fao.org/india/fao-in-india/india-at-a-glance/en/

Government of India (2018), *Economic Survey of India (2017-18)*. Chapter 6. Climate, Climate change and Agriculture.

Hansen JW, Vaughan C, Kagabo DM, Dinku T, Carr ER, Körner J and Zougmoré RB (2019) Climate Services Can Support African Farmers' Context-Specific Adaptation Needs at Scale. *Front. Sustain. Food Syst.* 3:21. doi: 10.3389/fsufs.2019.00021

Hansen J.W., S. Zebiak and C.Kevin. 2014. Shaping global agendas on climate risk management and climate services: an IRI perspective, *Earth Perspectives Transdisciplinarity Enabled*, 1:13 pp.

ILO, (2019). Working on a warmer planet: The impact of heat stress on labour productivity and decent work International Labour Office, Geneva.

Kniveton.D., E. Visman, A. Tall, M.Diop, R.Ewbank, E.Njoroge and L.Pearson (2015). Dealing with uncertainty: integrating local and scientific knowledge of the climate and weather. *Disasters*, 39(1): 35-53 pp.

Muema, E., Mburu, J., Coulibaly, J., and Mutune, J. (2018). Determinants of access and utilization of seasonal climate information services among smallholder farmers in Makueni County, Kenya. *Heliyon*, 4 (11), e00889.

Opitz-Stapleton, S. (2010). Only Death is Certain, Yet You Still Get Out of Bed in the Morning: Observations on the Use of Climate Information in Adaptation and Resilience Practice. Climate Resilience in Concept and Practice Working Paper Series. Boulder, Colorado.

Rengalakshmi, R., Manjula, M., & Devaraj, M. (2018). Making climate information gender sensitive: Lessons from Tamil Nadu. *Economic and Political Weekly LIII*(17), 87-95.

Venkatasubramanian, K., Tall, A., Hansen, J., & Aggarwal, P. K. (2014). Assessment of India's Integrated Agro-meteorological Advisory Service program from a farmer perspective. *CCAFS Working Paper no. 54*. Wageningen, Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Retrieved from https://cgspace.cgiar.org/rest/bitstreams/34467/retrieve.

World Resource Institute and Global Commission on Adaptation (2019). Adapt Now. A global call for leadership on climate resilience. Retrieved from https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf

WMO. (2007). Climate information for adaptation and development needs. WMO no 125. http://www.wmo.int/pages/prog/wcp/cca/documents/WMO_1025_web_E.pdf

WMO (2019 a). WMO supports sustainable climate information services, World Meteorological Organization. Retrieved from https://public.wmo.int/en/media/news/wmo-supports-sustainable-climate-information-services

WMO (2019 b). Capacity development for information services, World Meteorological Organization. Retrieved from https://public.wmo.int/en/our-mandate/what-we-do/capacity-development/capacity-development-climate-services.