Capacity constraints to climate change adaptation *in India*: *Policies, institutions and markets*

Summary

This brief summarizes the results of an assessment on the current capacity and constraints of Indian smallholder farmers to climate change adaptation in relation to *policies*, *institutions* and *markets*. The study was carried out in the districts of Ganjam and Cuttack in Odisha State, and Sibsagar and Golaghat districts in Assam state in India. The study assessed the knowledge, awareness, and farmers adoption of alternative Climate Smart Agriculture (CSA) technologies; factors that affect the adoption/non-adoption; and current adaptation measures to climate change practised at district and state levels. The assessment was based on literature reviews, focus group discussions, key informant interviews and household survey (n = 1627).

Policy Recommendations

- Increase targeted training of KVK staff, extension workers, and champion farmers on relevant CSA technologies and their implementation;
- Promote **Village Knowledge Centers (VKCs)** that are virtual/physical and similar ICT-based extension services to supplement ongoing state extension activities;
- Exploit mobile based Apps and ICT tools and their use by smallholders to increase knowledge exchange of CSA & weather-related information;
- Gender sensitization by Government agencies, extension workers and other development agencies to enhance balanced participation of women and men in CSA adaptation, capacity building exercises; and
- Link **financial institutions** and develop **financial products** that will allow farmers access to loans and crop insurance from formal institutions.

Introduction

Indian agriculture is highly vulnerable to climate change impacts leading to food insecurity and threatening the livelihood activities of smallholder farmers. One of the options to build smallholders' resilience to climate change is to make agriculture climate-smart. Climate Smart Agriculture (CSA) if properly implemented can increase agricultural productivity, build climate resilience of smallholders, and at the same time can reduce greenhouse gas emissions. A large number of CSA technologies and practices exist throughout the world including in India to reduce impacts from extreme weather events (e.g. flooding, droughts). CSA has attracted widespread support from the national and state governments in India. However, the adoption of CSA technologies by smallholders, is generally low due to the *lack of appropriate technology, access and affordability of quality inputs at the right time and lack of proper implementation of institutional and policy measures* to adapt and mitigate climate change.

Key Findings

The study used the "analytical framework of policies, institutions and markets" to explore and assess the current capacity constraints of smallholder farmers in the adoption of CSA technologies in Odisha and Assam states. The main capacity constraints that affect adoption of CSA technologies by smallholders from the policy, institutions and markets perspectives, and Resilience project inputs, are described and discussed in the following sections.

i) Policies constraints and Resilience project inputs

National Food Security Mission (NFSM) for rice, pulses and coarse meals aims to increase the production and productivity of rice, wheat, pulses, coarse cereals and commercial crops. [1] NFSM Pulses is implemented in all study districts of the Resilience Project while NFSM Coarse Cereals is only implemented in Ganjam district. The Resilience project have implemented the following measures in the study districts: *1) demonstrations of direct seeded rice and mechanical transplanting*, *2) demonstration of crop diversification* from upland rice to ragi and maize during kharif season for rainfed areas, and *3) introduction of Rice-vegetables, Rice-potato, Rice-sweet corn, Rice-sunflower, Rice-sesamum*.**National Mission for Sustainable Agriculture (NMSA)** aims to enhance agricultural productivity and minimize climatic risks with a special focus on rainfed areas.[2] To date, around 36000 and 4000 soil samples were

[1] https://www.nfsm.gov.in/

[2] https://nmsa.dac.gov.in/

tested in Assam and Odisha, respectively. So far, the Resilience Project has implemented the following CSA technologies in the study sites: *1) soil health cards/soil testing, 2) community nursery, 3) integrated nutrient management (INM)* involving rotation with legumes and use of rhizobium, *4) site specific nutrient management* using customised leaf color chart, and 5) *agri-horti-animal husbandry-based system.*

Pradhan Mantri Krishi Sinchayee Yojana/ Prime Minister Agriculture Irrigation Plan (PMKSY) addresses water scarcity problems and unsustainable agricultural water use.[3] In line with this, the Resilience project has implemented: 1) *drip irrigation demonstration plots* and other water management practices such as *soil moisture-based irrigation scheduling, alternate wetting and drying* (AWD) using perforated pipes and 2) *systems rice intensification (SRI)* in the project areas of Odisha and Assam.

Rashtriya Krishi Vikas Yojana (RKVY) aims to provide support to various kinds of interventions in agricultural production and growth, infrastructure and assets, special schemes, and flexi fund.[4] This policy scheme has not reached most of the farmers in the study districts. In response to this, the Resilience Project has introduced stress tolerant varieties of rice (both drought and submergence), green gram and black gram that are yellow mosaic virus (YMV) tolerant and heat tolerant.

National Mission on Agricultural Extension and Technology (NMAET) aims to increase crop productivity, cropping intensity, and profitability through farm mechanization.[5] Only 4% of the farmers in the study districts used farm machines (e.g. power tiller, combine harvester). To connect farmers with other relevant stakeholders (e.g. private enterprises, public sector), Resilience Project formed two Stakeholder Advisory Committees (SACs) that are functional in Odisha and Assam. In addition, mechanical transplanting, drum seeding of rice (WDSR), seed drill (DDSR), self-propelled weeder SACs can connect FPOs to other relevant stakeholders. KVKs in Odisha are also to be associated with FPO activities in the districts.

ii) Institutional constraints and Resilience project inputs

are being demonstrated in the study sites. There is also a plan to establish custom hiring centers in KVKs/VKCs for all farmers. F2F (Farmer to farmer exchange) seed village was established to enable self-sufficiency of the villages.

Pradhan Mantri Fasal Bima Yojana (PMFBY) aims to provide risk coverage to Indian farmers from production vulnerabilities. This scheme replaced the National Agricultural Insurance Scheme.[6] Risk coverage includes prevented sowing, standing crop, post-harvest losses, localized calamities, mid-season adversity. PMFBY is being implemented by selected agro-insurance companies in Odisha and Assam. SACs members include FPOs and VKCs that can facilitate linkage between farmers and agro-insurance companies.

National Horticulture Mission (NHM) aims promote holistic growth of horticulture; water-use efficiency through dissemination of micro-irrigation.[7] INM, integrated pest management (IPM) and micro-irrigation is very limited in the study districts. In Assam some activities under the scheme is going on in Bukakhat area. Green-house equipment, planting materials for flowers, mushroom, strawberry are being provided. Resilience Project also introduced suitable horticultural crop varieties like mango, lime, drumstick, papaya, banana, sapota, and chili. INM, IPM and drip irrigation demonstration plots are being conducted as well.

Rural Infrastructural development fund (RIDF)-STW scheme aims to o create assured irrigation potential through installation of shallow tubewells.[8] Solar pumps are being installed in Sivasagar district, with 85% government subsidy. Resilience provides linkage for the RIDF scheme.

Formation and Promotion of Farmer Producer Organization (FPO) aims to form an effective alliance of producers to collectively improved access to investment, technology, inputs and markets.[9] FPOs exist in the study districts.

***Institutional capacity constraints*:** Institutional capacity is an important element for climate change adaptation. However, *limited access to agricultural information and extension services, low budgetary allocation, and understaffing of state extension service offices* in the study districts, has resulted to: i) low

[3] https://pmksy.gov.in/
[4] http://rkvy.nic.in/
[5] http://agricoop.nic.in/sites/default/files/Chapter%20on%20NMAET%20for%20all%20Guidelines_1.pdf
[6] https://pmfby.gov.in/
[7] https://hortnet.gov.in/
[8] https://agri-horti.assam.gov.in/schemes/rural-infrastructure-development-fund-ridf-0
[9] http://sfacindia.com

adoption rate (only 10% of farmers adopted CSA technologies); ii) only 1% of farmers were visited by state agricultural extension service personnel, iii) zero participation of farmers in field days/field demonstrations and study tour activities/ visits to get awareness about CSA, iv) limited number of Farmer Producer Organizations (FPOs) exists, and v) only 7% of the farmers are members of Water Users' Associations (WUA). A further challenge in realizing the full potential of CSA technologies has been the limited focus on gender in climate change (CC) adaptation. The resilience project is implementing various activities related to institutional capacity building in the study districts. These include:

Village Knowledge Centers (VKC): The VKC (5) running under the Resilience project are providing services related to agricultural information for farmers at village level through ICT based Apps and various social media including mobile messaging and farmers' WhatsApp group at gram panchayat level. The project also conducts awareness raising of farmers about the use of mKisan, Kisan Call Centre, Ama Krushi, AGMARKNET, and other agro advisory services. It also organizes training of FPOs for increased membership. In addition, climate smart model villages have been set-up, and farmer-to-farmer seed village for stress tolerant varieties are established to enable self-sufficiency. Agricultural technologies can also be disseminated through women's self-help groups.

Women Self Help Groups[10] *:* The Self-Help Groups (SHGs) for women are present in all districts, and most of the farmer-respondents are aware of its existence. For example, in Ganjam alone, there were 17-18 women SHGs consisting of 10 members each in one village. Women participation in farming activities (e.g. in mushroom cultivation, Fig. 1) is high in Ganjam, Sibsagar, and Golaghat. Women's roles in farming are primarily on sowing, transplanting? threshing/drying. They have less participation in purchase of inputs, tillage and fertilizer/pesticide application, and sale of produce. They are not a major target group in agricultural extension and CC awareness programs. This suggests women have limited access to resources and are dependent on men, with heavy workload in the household, making it even more difficult for them to adopt CSA practices.

iii) Market constraints and Resilience project inputs

Improved input and output market access is a critical factor for the adoption of new CSA technologies and practices. In the project districts, the key market-related constraints, and possible opportunities available to the widespread adoption of CSA technologies are discussed below:

Labour market: The main constraints are low involvement of youth in farming, high cost of hired labour and inadequate supply of labour. We identified the following opportunities: *1) digitalization of agriculture* including farm mechanization using ICT-based tools and Apps (for e.g. by Resilience project), stable prices and incentives; *2) agri-business, processing, and marketing* where youth could play a key role; *3) participation of women farmers* in management & institutional linkages; and *4) skills development of rural youth* for e.g. in agricultural technologies.

Capital constraints: the ability of farmers to purchase inputs is low and/or have limited awareness on the existence of bank services. Only 30% of farmers belong to a credit cooperative and only 7% of farmers have availed credit to finance farming activities. Commercial banks, cooperatives banks, and regional rural banks extend institutional credit to farmers. The FPOs and SHGs run by the Resilience project can provided credit services to farmers.

Insurance market: Only 14% of farmers were aware of crop insurance concept and its mechanism and its functionality. Crop insurance scheme is primarily

Fig 1. Women SHG cultivating mushroom

[10] *www.resilienceindia.org*

availed by farmers who take-out loans from banks. It is much more difficult for non-loanee farmers to avail insurance, in particular tenant farmers and share-croppers cannot avail crop insurance without proper documentation, which they often lack. The VKCs in the project districts and the agricultural insurance schemes in the local communities can initiate awareness campaign aimed at increasing the level of farmers availing crop insurance. Alternative bank business models should be created to make easier for tenant farmers or non-loanee to avail crop insurance.

Crop risks and losses due to wild animals: These losses are not covered by crop insurance and most farmers are not aware of the schemes related to management of wildlife and its habitat. Measures such as *creation of water points* (e.g. buckets of water) for wild animals, *production of barrier crops* (e.g. shrubs) and use of *solar fencing* in a cluster approach, can be alternative solutions. There is also available financial assistance for management of wildlife and its habitats in India (e.g. Project Tiger, Project Elephant).

Storage and processing constraints: 97% of farmers do not have access to storage and processing facility and 70% of them were unaware of minimum support price for their produce. Private-public partnerships can help for setting up processing units. In this regard, the Resilience project promotes improved seed distribution through *public-private partnership in Assam*. The input and output market price information can also be included in the *RiceXpert* mobile application.

Meeting with private sector at Chawdang Pather VKC, Assam

Conclusion

Despite the presence of enabling climate change adaptation policy measures, farmers' actual awareness and adoption rate for CSA practices is extremely low. Some of the key reasons for low adoption of CSA include: *low risk bearing capacity of small and marginal farmers, limited access to information and inputs; lack of proper resources and training; lack of agricultural insurance related-infrastructures; limited capacity of government extension services; low access to credit, storage, marketing and processing facilities*. Besides these, one of the most crucial point for low adaptation and poor implementation of CSA is also the *lack of convergence of different CSA related schemes.* Some of the specific measures (related to policies, institutions and market) to improve CSA adaptation and outreach in the study districts include:

- Strengthen science-policy-stakeholder linkages through SACs in the study districts to take up project results to policy makers;
- Explore complementarities between existing CSA schemes and suggest policy makers and implementers on convergence possibilities;
- Enhance institutional and human capacity building of KVK staff, local extension workers, leaders on CSA technologies and farmer champions;
- Expand virtual VKC and increase complementarity with KVKs to disseminate information to farmers at district and/or village levels;
- Increase memberships of FPOs through awareness campaigns and develop alternative bank business models;
- Strengthen the agricultural insurance companies by establishing infrastructures (e.g. weather stations) and inclusion of more crops and livestock under insurance purview; and
- Promote public-private partnership for improved seed distribution and other value chain products.

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