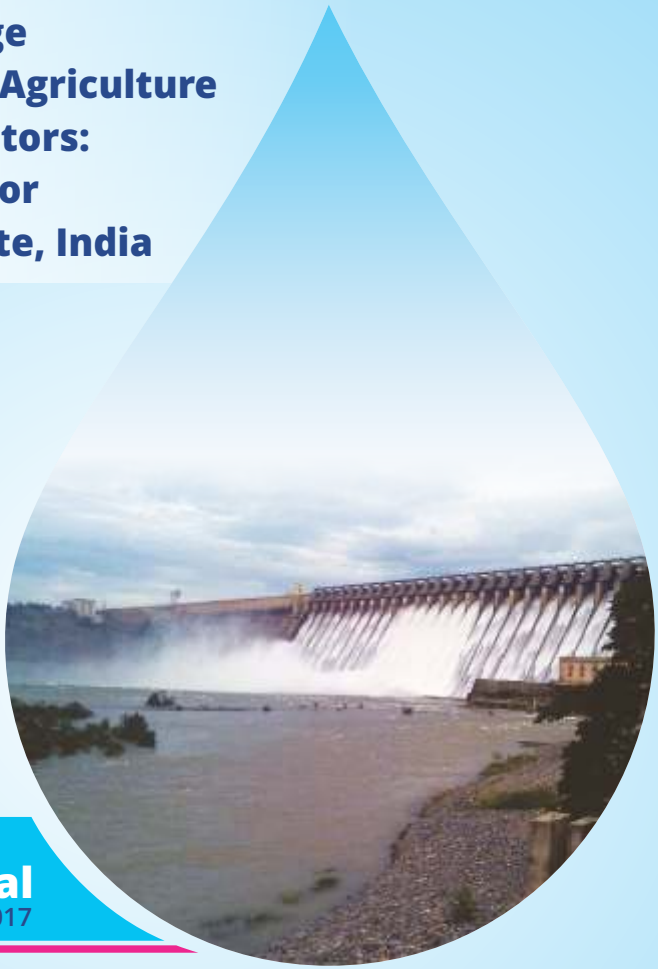
ClimaAdapt
Adaptation through innovation

Climate Change Adaptation in Agriculture and Water Sectors: Policy inputs for Telangana State, India



ClimaAdapt
Policy Manual
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Project Partners

IWMI International Water Management Institute

NIBIO Norwegian Institute of Bioeconomy Research

MSSRF

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1. Background

Climate variability and change, extreme weather including droughts in recent years are resulting in serious impacts on the water resources and thereby food production in Telangana state. The climate scenarios formulated for the mid-century and end-century periods for Telangana state predict a change in temperature and precipitation in both the Kharif and Rabi seasons. The precipitation is increasing in both scenarios (for 2030 and 2050) but the climate models do not provide adequate information on the rainfall distribution pattern for making medium and long-term plans by the governments.

One of the weakness of the climate modelling is that it is not able to predict the intra-annual or intra-seasonal variability and the erratic monsoon patterns that affects production. However, it is possible to make Seasonal Climate Forecast (SCF) available for different lead periods. If farmers have access to such SCF, they can plan their cropping calendar and adopt suitable strategies better. The two scenarios of the mid- and end-centuries also shows loss in productivity which leads to reduction in agricultural production (Palanisami et al, 2014).

In general, the south-west (June-Sept) and North East (October – January) monsoon patterns (element of uncertainty in the predictions) was observed to be shifting in the mid and end-centuries (Fig 1). The higher rainfall areas will get even more rainfall (in the lower parts of the Godavari and Krishna river basins/ and drier areas will become more dry (in the upper basin areas). Rainfall is expected to increase from May to December by 10-23% in Mid-century and 9-33% during end-century.

Therefore, it is necessary to focus on integrated water management approach to address the future climate change scenarios.

Fig 1: Climate projections using Global Circulation Models (GCM), Geophysical Fluid Dynamics Laboratory (GFDL), at a coarse resolution spatially downscaled using the IPRC - Regional Circulation Model (RCM)

2. Climate change adaptation and constraints

The Government of Telangana has prepared the State Level Action Plan on Climate Change (SAPCC) to address existing and future climate risks and vulnerabilities. However, implementation of the plan needs suitable Climate Smart Agricultural (CSA) technologies and investments. The main constraints to be addressed in climate change adaptation are:

- Government initiatives on enhancing the water availability should be demand driven rather supply based.
- Farmers adaptive capacity to cope up with the impacts of climate change in crop production especially through technologies and improved practices are limited.
- Policy supporting women farmers in the context of increasing feminization of agricultural work force, to strengthen their participation in agriculture and address their changing needs.
- Lack of technical knowhow among men and women farmers
- Low irrigation efficiency (i.e., 35%) and water productivity (0.48 kg/m3 of consumptive use).

Water use efficiency (WUE) problems exist at three levels: (i) water acquisition, conveyance and delivery; (ii) water distribution among farmers; and (iii) the field system for water application. Water management practices to improve the WUE will result in multiple benefits including better yields, save water and energy, decrease fertilizer requirements, and reduce non-point source pollution. Information is most critical to decide on exact amount of water required by a crop in a given climatic condition and for effective design and management of irrigation system, irrigation scheduling, etc.

3. Experience in improving farmers' resilience and adaptive capacity in Telangana state

a). Technologies at farm level: Selected CSA technologies were pilot tested in ClimaAdapt project through farmer led field demonstrations in multiple locations using cluster approach (group of contiguous fields and villages) involving both men and women

farmers. Some of the alternative systems tested were Direct Seeding of Rice (DSR), Modified System of Rice Intensification (MSRI), Alternate Wetting and Drying (AWD). The WUE (yield /water used) was higher under the tested adaptation strategies compared to conventional methods (Table 1). The impact of capacity building and implementation of these water saving interventions were significant on the expected positive line and has increased the crop yields by 0.96, 0.93 and 0.77 tonne/ha through AWD, MSRI and DSR respectively.

Table 1. Water use efficiency under different adaptation strategies (kg/m3)

Methods	NM	DSR	NM	MSRI	NM	AWD
DSR	0.35	0.59				
MSRI			0.46	0.57		
AWD					0.30	0.40

NM=normal method; DSR=direct sown rice; MSRI=modified SRI; AWD=alternate wetting and drying

The DSR method is suitable to rain-fed and irrigated environment with better water control. Our studies showed that it was most favourable to rain-fed lowlands and irrigated areas with good drainage facilities. The adoption of DSR method can save labour and water resources (25%) and crop matured 7-10 days earlier and reduce cost of cultivation by INR 10,000 per hectare. DSR also reduced the methane emissions by 30% from rice. The method was adopted in 64% of the rice area during d-16 in Guntur district.

The MSRI was able overcome the labour scarcity, pest and disease problems. MSRI is beneficial in reducing the seed cost, water usage and improving water use efficiency (15%). Understanding the labour challenges and water scarcity, the state Government has provided input incentives to the farmers for adopting MSRI. However, availability of transplanters on time through service providers is challenging.

Rice grown under AWD was found to improve WUE from 0.16 in light to 0.30 in black soils.

[1] The Telangana state was formed on 2ndJune, 2014 as a result of bifurcation from the erstwhile Andhra Pradesh state

AWD is helpful in facilitating nutrient uptake and increase water productivity (25%) and increased the yield by 14% in the study sites. The practice was well adopted by the Telangana state Irrigation Department and farmers during the Rabi seasons. Three to four scheduled irrigations with on and off practice at the project level was developed with prior notification to the farmers. The farmers are willing to adopt new rice cultivation methods with assured irrigation schedule under the project area. All the three methods (DSR, AWD and MSRI) can reduce the methane emission, increase water productivity and income to the farmers.

The gender sensitive training methods and strategies adopted for the capacity building programmes by WALAMTARI enabled the active participation of women farmers up to 40% in training programmes and the acquired knowledge and skill subsequently helped them to participate in the discussion and decision making while adopting different technologies.

b). Smart technologies for measuring water use efficiency at project level:

Improving the performance of completed Major and Medium Irrigation (MMI) schemes has been the main focus of the National Water Mission (NWM) and set a target of increasing the Water Use Efficiency (WUE) by 20% in the current plan period. The NWM and 12th FYP targets the average figure would need to rise to 46% by the end of the plan period. Water measurement and quantification, participatory irrigation management, conjunctive use of surface and ground water, integrated water resource management, modernization of irrigation systems, demand based delivery of irrigation water are some of the areas identified for sustainable management of irrigation water. Hydrometric equipment for measuring canal flows with high time frequencies are expensive. For more balanced space over time hydrological measurements, there is a need to develop alternative soft metrological approaches that permit one to estimate water fluxes in catchments with a higher spatial sampling rate.

RBC flumes and flow meters were installed to accurately measure the water flow in the field channels. The water depth in the field was monitored with the help of Bowmen tube. Ultrasonic sensors were used for accurate measurement of water depth, both in the flume and in the field. This has helped in educating the men and women farmers, field

[2] ClimaAdapt program contribute to the improvement of adaptive capacity of farmers and link science-policy research to develop adaptation framework for water and agricultural sectors (www.climaadapt.org)

level officials and school children about the importance of water measurement and quantification. There is scope for upscale the adoption of flumes and sensors based instruments for farm water management and improve efficiency in all the project areas.

In the canal modernisation programs in Telangana, installation of low cost moisture sensors to know the moisture content of the soil in the paddy fields at distributary committee (DC) and water user association (WUA) level would help in water budgeting and scheduling of irrigation water according to the selection of the crop. The innovative sensors developed in ClimaAdapt project have demonstrated that they can be effective in providing information to farmers on their mobiles and guide them in proper timing of their irrigation schedules.

c). ICT based Village knowledge Centers (VKCs) to improve farmer connectivity:

In general, both men and women farmers are in need of timely, value added and authenticated information and knowledge to address their crucial needs in the context of climate change. More so ever, farmers have limited understanding about the effect of climate change and its adaptation strategies. In order to demonstrate the effective usage of information communication technologies, the community based, Village Knowledge Centers (VKCs) were established in Telangana State. VKCs adopted gender responsive approaches to promote better access to information by women and men farmers.

VKCs cater to the information and knowledge demands of farming community in the context of climate change for informed decision making to improve WUE and adopt CSA practices. Knowledge disseminated through VKCs covered CSA practices, pest and disease management, soil and water conservation, market prices and other agriculture related issues. VKCs in ClimaAdapt have also taken deliberate efforts to promote climate literacy among the farming community to deepen their understanding about the existing vulnerabilities due to climate change and follow appropriate adaptation techniques.

As a result, the timely decision-making and direct discussion with experts enabled them to reduce loss, risks and vulnerabilities connecting to their livelihoods, and maximize economic returns, and thereby ensure self-sufficiency and sustainability. The gender responsive approaches adopted in the VKCs resulted in bridging the gender digital divide. Some key results from the VKC are:

- Improved capacity of women knowledge workers who hailed from the local community to demonstrate their ability to reduce knowledge divide between community and strategic partners

d). Climate cell for weather forecasting

A unique initiative taken-up in the program is establishment of Climate Cell. Training the trainers program designed under the project has targeted for the wider outreach, having a

[3] The computer based `Village Knowledge Centers' (VKC) with Internet connection provides static information about the agronomical practices of the different crops cultivated in the region and the dynamic information like price details of the main agricultural produce from different markets, availability of inputs, farmers' entitlements etc. The local community manages the VKCs; access is ensured to all irrespective of caste, class, gender and age. Need based content creation is being regularly done on the basis of the feedback from the local women and men farmers. The local village people have been trained in the management of modern information and communication technologies including networking.

multiplier effect. The Climate Cell set-up in the state at WALAMTARI, Hyderabad, was responsible for carrying out further climate and hydrological scenarios development, advice on suitable adaptation measures, maintain climate and water databases and advice policy makers when needed. The Climate Cell has trained irrigation engineers and scientists on farm management strategies to improve crop-water productivity using Aquacrop and hydrological scenarios to strengthen the capacities for sustainable measures.

e). State level supervisory committee/Stakeholder committee

The state government of Telangana has constituted the State Level Supervisory Committee (SLSC) to review the progress of the Climate Change adaptation in the state. The validated and promising technologies were discussed regularly by the SLSC and proposed for the upscaling of the technologies. The DSR, AWD and MSRI are being validated by the program at different locations in the state based on SCLC recommendations. The state government has shown interest to further validation in the ongoing programs. The climate and water forum was also initiated to synthesis, share and advocate the research findings from various studies. The forum can act as a platform to exchanging of ideas as well as research results for upscaling.

4. Framework of up-scaling

Up-scaling of the CSA strategies needs more investments and integration with the ongoing state government programs. Involvement of the Department of Agriculture (DoA), Krishi Vigyan Kendra (KVK), and the Irrigation & Command Area Development (I & CAD) officials is essential for scaling up. Dissemination materials in local languages help wide spread information dissemination. These initiatives provide a basis for the institutionalization of the interventions and innovations for up-scaling through Agricultural Technology Management Agency (ATMA), which is part of DoA. The following are a summary of the recommendations from ClimaAdapt program

Policy recommendations:

- Improve capacity and provide resources for upscaling of climate smart agricultural practices viz., DSR, AWD and MSRI to different regions in the state.
- Gender sensitive Capacity building models from ClimaAdapt and successful training modules on climate adaptation standardized in the project by WALAMTARI for different stakeholders, should be integrated into state training institutes and programs.
- State government should provide adequate resources for training stakeholders on climate issues.
- VKCs established in ClimaAdapt project proved to be effective in integrating different departments at the village level, thereby reducing gender and digital divide, improve farmer connectivity and adaptive capacity. Thus, they can be useful interventions to be included in the State Climate Action Plan.
- Gender mainstreaming should be considered by agriculture and water sectors while planning and implementing the state adaptation programs.
- Convergence of ongoing state adaptation programs and cooperation of the implementation agencies to address specific climate risks can help in the usage and implementation of the adaptation strategies more effectively.
- State government should ensure that proper data/ information are readily available to scientists for making climate projections, and identifying vulnerable groups and hot spots.
- Establishing a Climate Water Forum involving all stakeholders will help to address some of the key emerging issues in a periodical manner and help prepare the state action plan on climate resilient agriculture.

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