

Smart Agriculture to Enhance Rural Livelihoods and Adapt Climate Resilience Practices

CropIn

Climate-Smart Agriculture: A Need to Build Resilience to Mitigate Climate Change Risks

Climate change has a potential impact the soil health through physical, chemical and biological properties of soil. The factors affecting soil health are soil organic matter, and uneven shifts in carbon and nitrogen ratio (C:N). Higher temperature will accelerate the decomposition of organic matter, resulting in release of CO₂ to atmosphere. The resultant decrease in C:N will lower the soil temperature that is suitable for growing crops. The dry soil conditions suppress the growth of roots and organic matter decomposition and result in soil erosion. Due to unfavorable climatic conditions, the occurrence of pest infestations and plant diseases are higher in tropical regions.

To respond to the unprecedented challenges posed by climate change, there is a dire need to become **climate-smart** and enhance agricultural productivity through a sustainable model. Climate-Smart Agriculture (CSA) is a holistic approach to address food security, increase agricultural productivity, improve the adaptive capacity to climate change, while also uplifting the rural-poor above the poverty line.

The Sustainable Livelihoods and Adaptation to Climate Change (SLACC) Project

The SLACC project was initiated by the Ministry of Rural Development (MoRD) and supported by the World Bank. As the Ag-tech partner to the project, CropIn implemented the pilot project in Madhya Pradesh and Bihar, in partnership with National Rural Livelihoods Project (NRLP) and supported by the respective State Rural Livelihood Missions (SRLMs).

The aim of this project is to eradicate rural poverty, improve food security and increase the household income of rural poor through sustainable livelihood enhancement and improved access to financial and selected public services.

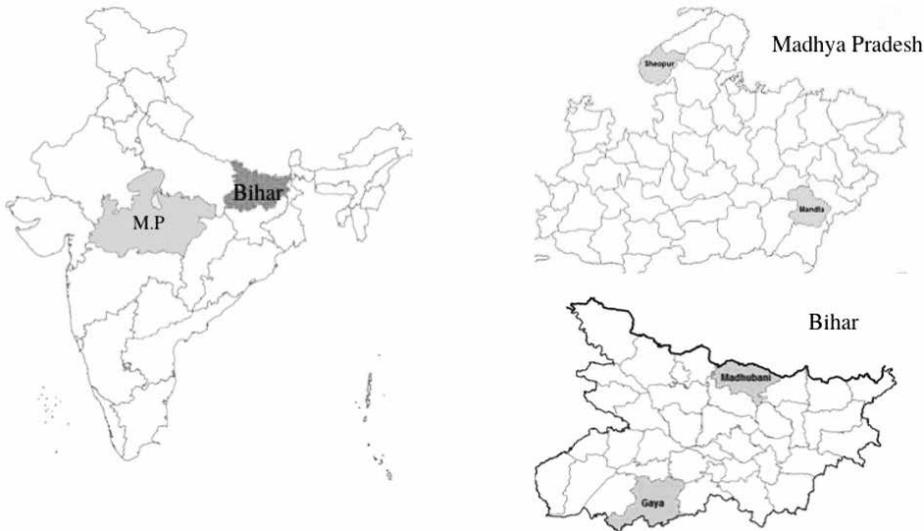
The objective of the SLACC project is to improve the ability of farmers to cope with climate uncertainty. Weather-based Agro Advisory Services (WBAAS) module provided by CropIn for short-term weather forecasts are intended to help farming households schedule their farm operations better, thereby minimizing loss or costs or both.

Longer-term weather forecasts are intended to help farmers make better varietal or crop choices and make appropriate arrangements to decrease the impact of climate change or even put in place adaptation mechanisms. However, not every farmer is equipped with the knowledge (or has access to) to make appropriate choices.

Therefore, instead of simply providing weather forecasts, the farmers are given weather based agro-advisories that inform them of likely impact of weather on crop, and also the steps that they need to take in order to tide over the situation. Improved capacity to learn and deal with unexpected, changing and adverse weather conditions are expected to gradually improve farmer resilience to weather variability and hence prepare them for climate change in the longer-term.

Selection of Project Locations

Before the start of the project, an environmental assessment was carried out to assess the vulnerability of various states to climate change. Through this assessment, Bihar and Madhya Pradesh were identified as the most flood-prone and drought-prone regions amongst other states in the country.



Picture 1: SLACC Project Area

Socio – economic Profile of Targeted Population

Madhya Pradesh (M.P.) is a highly populous state having a total population of 72.3 million¹. 80 percent of the population is rural, who are highly dependent on climate-sensitive sectors for their livelihood, viz. agriculture, forestry, and fishery. The rate of incidence of poverty is high in M.P with more than 40 percent of the population falling below the poverty line. M.P. has the highest concentration of tribal population in India. 71 percent of M.P's population is dependent on agriculture for a living. Out of 45 districts

¹ Census of India, 2011

in M.P, 14 are categorized as having very high vulnerability to climate change and 16 are categorised as having high vulnerability to sensitivity, exposure and adaptive capacity.

Bihar is another highly populated state in India. 42 percent of Bihar's population lives under poverty. Nearly 90 percent of the population depends on agriculture based livelihoods. Livelihoods in rural Bihar are characterized by high dependency on agriculture, predominance of landless labourers and high levels of seasonal migration.

The major crops cultivated in M.P. are rice, maize, millets, pulses, wheat and mustard for both *Kharif* and *Rabi* season. In Bihar, rice, maize, sorghum, pigeon pea and soybean are the commonly grown *Kharif* crops. Gram, wheat, and vegetables are the *Rabi* season crops.

Every year due to erratic weather conditions, 10 to 40 percent of the crop is reported lost in Bihar and M.P. The severity of crop loss emphasizes a need for local community-based interventions to reduce vulnerabilities to climate-induced losses.

Key Stakeholders in SLACC

The key stakeholders in this project are National Rural Livelihood Mission (NRLM) and SRLMs of Bihar and M.P., including Young Professionals, Village Resource Professionals (VRPs) and Community Resource Professionals (CRPs) who work with farmer communities.

The target population of SLACC project are the rural-poor supported by the NRLM including, self-help groups and their federations, farmer interest groups/ producer groups such as farmer association, livestock rearers' groups etc. and their collectives such as Producer Companies.

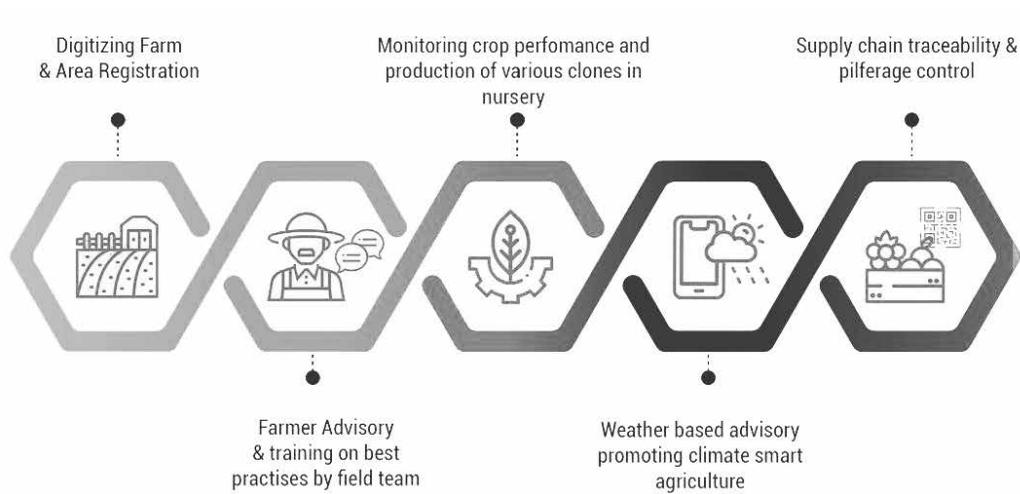
These community institutions of rural-poor, majority of whom depend directly on climate-sensitive sectors such as agriculture, animal husbandry, and aquaculture have limited adaptive capacity. The project specifically focuses on uplifting tribal, and small to marginal farmers belonging to disadvantaged social groups, including women farmers.

Role of CropIn

In 2017, CropIn was roped in as an Ag-tech partner to support the World Bank funded SLACC initiative to mitigate risks associated with climate change and enhance the rural livelihoods. In this endeavor, CropIn collaborated with a weather forecast provider to develop a Weather-based Agro Advisory Services (WBAAS) for Climate Change.

The innovative technology of CropIn has been instrumental in enhancing the adaptive capacity of farmers to climate change. The Model is depicted in the Picture 2.

CropIn's Climate-Smart Advisory module is enabled on both web and mobile-based platform to transmit WBAAS to farmers. The system is capable of electronically receiving



Cropin's Sustainability Model

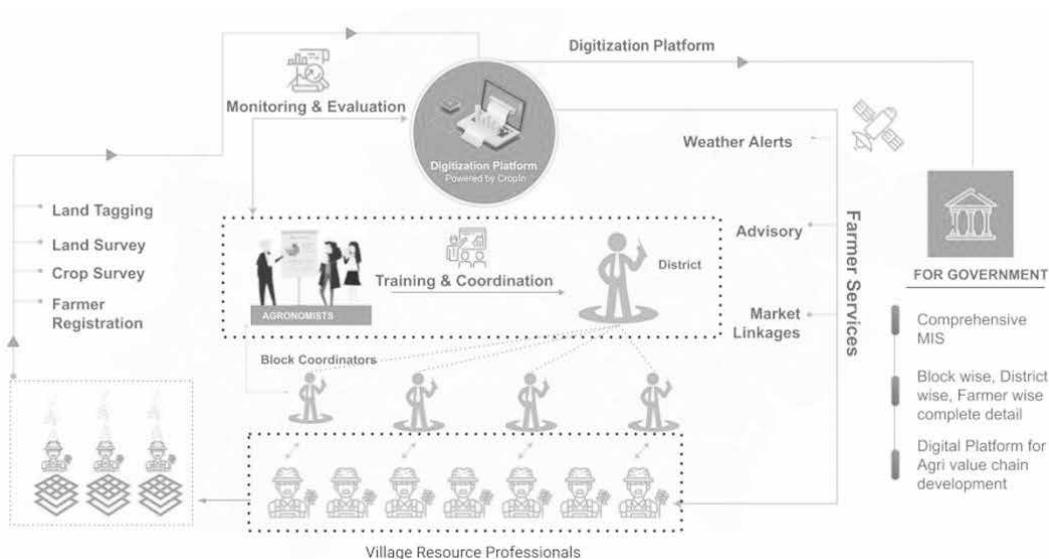
Picture 2: CropIn's Sustainability Model

and using data generated such as weather forecasts and farming advisories. CropIn adopted a systematic process for collecting and uploading data to the SmartFarm ICT Platform, which involves a regular, periodic and pre-decided visit schedule for VRPs, for each participating farm and for each crop.

CropIn has developed custom-forms and formats for collecting data on crop including pest and disease calendar for selection of critical period for each crop. It also schedules when the data must be collected, timing and technique of pictorial data (photographs of the crop) collection that shows crop growth, pest and disease attack, etc.

CropIn provides the following types of advisories to farmers through SMS:

- Weather Based Advisory and Weather alerts to SLACC farmers in local language
- Package of Practices (PoPs) to farmers for sustainable crop production
- Agronomic advisories to prevent and control the pest and diseases
- Nutrient, soil and water management practices for every crop stage to ensure high crop yield
- Livestock Management



Picture 3: CropIn Digital Platform for SLACC

Project Timelines

SLACC is a 3 years project conducted in three different phases based on the crop seasons - *Kharif*, and *Rabi*. The project started in March 2017. After witnessing a favourable impact in terms of crop yield, and adoption rate, the World Bank has extended the project to another year i.e till 2019.

Key Challenges in Implementation

During the implementation of the project, CropIn confronted major challenges in terms of technology adoption by the rural communities as they lacked awareness on technology and its application in farming to mitigate climate change risks. Understanding the socio-economic profiles and the literacy levels of farmers in the project areas, CropIn took an initiative to conduct training on how to use the application exclusively meant for VRPs / CRPs and Young Professionals.

The VRPs, CRPs, and Young Professionals are the farmers who are moderately equipped with agriculture literacy and work with farmers on the farm fields. These trained farmers, in turn, educate other farmers on the right usage of climate-smart advisories, PoPs and other chemical applications. Furthermore, considering the language barrier and low literacy rate, CropIn provides the SmartFarm application in the local language.

Exclusive trainings of field executives on usage of CropIn's technology and building local capacity of rural community is carried out for:

- Web and mobile applications data capturing process such as on how to register a farmer plot, crop varieties, different crop stages, raise alerts, use and act on advisories

- How to monitor and close activities including raising and resolving alerts
- How to capture, harvest and archive data
- How to utilize PoP advisories for better farm management

Monitoring and Evaluation of Project Activity

Adoption Survey to Measure the Adoption Rate of Farmer Advisories

CropIn conducted advisory adoption survey to measure the impact of WBAAS on farmers. The purpose of this survey was to identify whether the advisories are being utilised and implemented at the farmer's end.

The results of the Adoption Survey revealed that there was a dramatic change in the behavior of the the participating community towards the adoption of climate-smart practices.

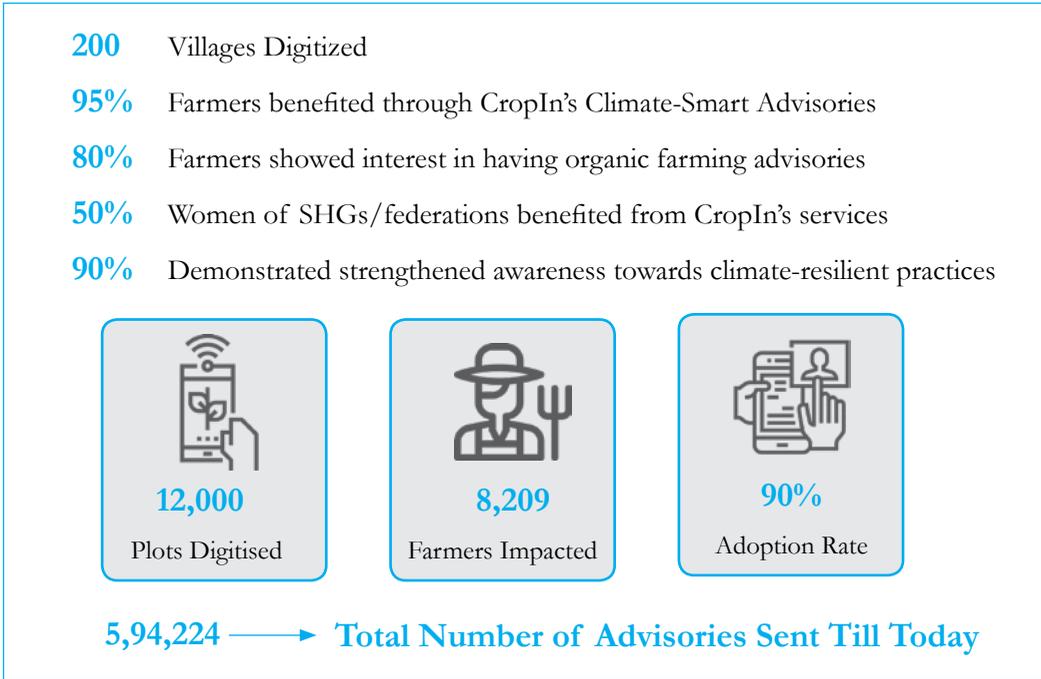
The key outcomes of the survey are as follows:

- 200 community institutions implemented climate adaptation measures
- 92.3 percent respondents considered weather-based advisories as a game changer in terms of effective cultivation.
- 95 percent farmers considered advisory and alerts on pest/diseases as beneficial
- 81 percent farmers showed interest in having organic based plant protection advisories

There was a huge uptake of CropIn's technology and high-level farmer engagement with optimum agricultural productivity. Each Village Resource Person (VRP) covers about 40 farmers and spends about 10-15 days per month on SLACC work. In this way, CropIn strengthens the capacity of rural communities by responding to their vulnerabilities and risks to climate-induced losses.

Third-party Evaluation

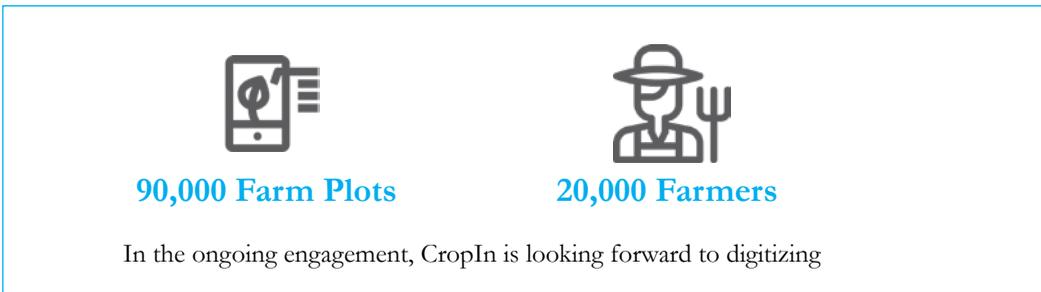
The World Bank conducted an independent survey and evaluation of the project through a third- party to measure the impact created through SLACC pilot. It aimed to assess the impact of the program, including the effectiveness of program design, relevance, sustainability of results, and impact of the SLACC intervention on the target community. The agency carried out monitoring and evaluation in three phases - baseline, mid-term and end term - for Mandla, Sheopur, Madhubani and Gaya districts.



Picture 4: Illustration of Independent Audit Results from Third Party Evaluation

Looking Ahead

Ushering technology transformation in agriculture is critical to fight climate change and ensure food security. Since its inception stage, WBAAS services has gone through a significant learning phase. The lessons learnt have been integrated in the next phase of implementation to achieve sustainable impact. CropIn continues to address the farmers' issues through the WBAAS intervention accompanied by remote sensing, Artificial Intelligence (AI) & Machine Learning (ML) capabilities.



Picture 5: CropIn's Future Plans



A Proud Patron of JEEViKA

Kanti Devi, a farmer from Barachatti, is proudly using the services of CropIn since Kharif 2017. Kanti says, “The advisories which I receive on a regular basis for seed treatment, sowing, irrigation and harvesting have helped me tackle various problems and keep an eye on my crops, without having to frequently visit my farms.” She adds that the recent services on livestock advisory has been phenomenal. She now understands various symptoms of diseases and deficiencies because of the advisories received on her phone.

Based on the current activities, feedback and increase in farmers adoption rate, CropIn proposes to extend the services to other regions of M.P and Bihar as follows:

- Cropin will apply satellite-based weather data to disease and pest alert incidences
- As subject matter expertise is hard to find in villages, CropIn plans to test out automation of forecast-based advisories through built-in AI and ML algorithms which will rely less on SMS
- The advisories will not only be sent based-on weather but also other allied services such as sowing window prediction, crop health monitoring through remote sensing, and yield estimation
- Promoting organic based nutrient and crop protection management and introduction of Good Agricultural Practices (GAP)
- Enhancing visibility of messages by effectively installing blackboard in community places of every village where the VRPs will write down the advisory on Package of Practice (PoP) for the major crop of that village