RISING TO THE CALL

Good practices of climate change adaptation in India
Weather matters

Weather-based agro-advisories come to the rescue of farmers in Maharashtra as they grapple with erratic weather brought on by climate change.

Erratic weather has been creating havoc in Ahmednagar district in Maharashtra. The year 2010 saw monsoons continue far longer than their usual duration in Akole taluka of Ahmednagar. Data from nine local meteorological stations showed that November had more than 150 mm of rain. This unprecedented intense rainfall destroyed standing, ready-for-harvest crops. The year also saw an unexpectedly early and unusually heavy onset of the monsoons, with over 100 mm of rain in three days, leading to disastrous effects on the summer crop. Villages in Akole then experienced frost in early February 2012, a first-ever experience for the people of this region. Standing crops of pearl millet, maize, beans and groundnut along with flowering mangoes and bananas shrivelled overnight.

In January 2013, Maharashtra declared 15 districts and over 11,000 villages drought affected, a carry-over from inadequate rains in 2011 and 2012. The Marathwada region reeled under a punishingly dry summer and severe water scarcity.

While many parts of Maharashtra are drought-prone, heightened weather variability and unpredictability has increased the woes of local communities. Their own knowledge systems did not have response solutions that they could draw on, leaving them reeling under uncertainty and financial loss.

WOTR’s response

Forecasting and making predictions are highly complex affairs fraught with uncertainty and compounded by the unreliability of rainfall and variations from place to place. Modern techniques have the means to calculate agriculture-specific forecasts in relation to rains or drought spells during the season but such forecasts are general and do not reflect local variability. What farmers need is information about local conditions and advice that can help them make strategic and tactical decisions for their farms.

In order to reduce risks and improve agriculture productivity despite local climatic variations, the Watershed Organisation Trust (WOTR) has launched a knowledge-embedded service to farmers that provides crop and locale-specific agro-advisories based on weather forecasts and the particular crop growth stage. The advisories focus on environment-friendly integrated solutions that are within the farmers’ capabilities.

How the system works

WOTR has installed 69 Automated Weather Stations (AWS) in project villages. These form a dense network grid of three-five km. Of the 69
AWSs, 54 have direct telemetry links to WOTR’s servers which send processed data directly to the India Meteorological Department (IMD). WOTR has a tie-up with IMD, providing round-the-clock weather information on an hourly basis. Based on this weather information, IMD provides WOTR with three-day weather forecasts for the project area received online on a daily basis. Unusual likely weather events such as unseasonal rain, frost or temperature spikes are conveyed directly to the villages either through word-of-mouth, SMSs or a phone call to key informants in the project villages.

The weather information obtained from the village-based AWSs is displayed daily on blackboards at accessible places in the village, by village youth who have been trained to read the weather data. This helps inform farmers of actual local weather conditions and alerts them to likely problems that may arise for their farms and livestock.

Based on these short-term (three-day) local weather forecasts, agricultural experts from WOTR prepare agro-advisories with inputs from CRIDA and the state agricultural university, Mahatma Phule Krushi Vidyapeeth (MPKV), with whom WOTR has a knowledge-sharing collaboration. These advisories are crop- and locale-specific and include integrated nutrient-, water-, pest- and disease-management recommendations that stress organic and environmentally sustainable interventions. Issued in the local language at least twice a week in the summer and more frequently during the agricultural season, as required, they alert farmers and give them adequate time to implement suggested measures. The advisories are disseminated through SMSs to mobile phones, wallpapers that are put up at prominent places in the project villages and by word of mouth. Newer technologies such as IVR (Interactive Voice Recording) are being explored to enable farmers who cannot read, especially women farmers, to access the SMS advisories sent through mobile phone. Meetings are organised with farmers at regular intervals to discuss these advisories and get their feedback.

In addition to developing and disseminating ‘regular’ crop advisories, crop-weather-related
contingency plans for specific crops and agro-ecological zones (in this case the project area) are prepared which are operationalised before and during the kharif and rabi seasons. This helps farmers respond better to unexpected weather events (for instance, delayed onset of rains, dry spells and pest attack), mitigate risks and reduce losses.

**AGRIMATE for agro-advisory generation**

WOTR is developing an IT-enabled, query-driven Automated Content Management System (ACMS) called AGRIMATE that can generate crop advisories for specific crops tailored to local weather and edaphic conditions. The system would be able to generate contingency plans in response to different meteorological scenarios.

In order to generate farmer-, location- and crop-specific advisories, AGRIMATE is integrated into a GIS-enabled platform which has a detailed geo-referenced data base of each of the participating farmers. It includes details like crops grown, land capability, soil quality and fertility status of farms as well as access to irrigation, if any. Besides this, information on traditional knowledge and indigenous practices is also collected and inputted into the system. The idea behind AGRIMATE is to reduce dependencies on high-end human expertise, make knowledge management menu-, process- and indicator-driven and obtain a holistic and nuanced understanding of the actual conditions a farmer has to deal with. The system also helps capture feedback from the field, enables learning, knowledge-management and better customisation and fine tuning of advisories.

**What this means for farmers**

Farmers receive the advisories in two ways – through *Krushi Salla* (the weekly paper) that is posted at public places in the villages and through text messages issued in the local language on a bi-weekly basis. But in the likely event of extreme weather occurrences, alerts are sent immediately to the farmers. Where necessary and possible, public address systems are also used to disseminate advisories. Feedback from the farmers is regularly and systematically collected, which helps WOTR fine tune advisories and update the AGRIMATE CMS.

Balasaheb Mendhe of Mahalwadi village grows brinjal in summer. Based on the SMS advisory he applied jeevanrit slurry at the rate of 200 litre/acre and sprayed 30 milliliter silicon and 45 grammes of micronutrients for the growth and development of the fruits. “There is a 15 per cent increase in the yields even though it has been an intensely hot summer,” he says.

Manjula, a 45-year-old farmer, cultivates three acre of her land singlehandedly as her husband works in the city. She grows bajra, gram, wheat, onion and tomato on her field. She also has a small plot of 30 guntas (1 gunta is about 100 sq m) in which she grows pomegranates. She has constructed a 10x10 sq m farm-pond which she uses to drip irrigate the plot.

Manjula came across the *Krushi Salla* and found it very useful. Based on its advisory, she used mulch on her pomegranate plot, which reduced the evaporation rate considerably and brought down her water use by 50 per cent. “Earlier I used the drip for two hours every day. Now I use it for only one hour,” she says.

She also began to use amritpani – the organic fertiliser/pesticide preparation made with cattle dung – which has brought down the pest and disease incidences substantially. “I have stopped
using chemical spray on my tomato crop entirely.”

She is also the first farmer in her village to see the merits of composting and is preparing four tonne of compost on her farm for the next season.

Manjula is also part of the group of 15 women farmers in her village that WOTR is now working with intensively. WOTR has taken the "Krushi Sallas" and SMS advisories further and fortified them by providing farmer-specific extensions and hand-holding services, a need expressed by farmers themselves. Since each farmer has his own specific issues related to crops grown, soil conditions, and social and economic constraints, they require the last-mile handholding to become completely resilient. Such small groups are being piloted in two villages of Maharashtra.

**Costs, upscaling and sustainability**

According to WOTR, for purposes of agriculture-related forecasting, robust mid-range AWSs would generally suffice. Securely establishing it in a village together with telemetry equipment and back-up power source should cost, at the present exchange rates, between Rs 2.5 lakh and Rs 3.5 lakh. This is a one-time cost. In addition, there would be costs incurred for personnel, servicing and maintenance that depend on the number and locations of the AWSes, the distances involved and the hazards they are exposed to as well as costs incurred for back-office support – specialised personnel, equipment, infrastructure, communications and institutional collaborations – and costs of fielding specialised teams to provide on-farm extension services if deemed necessary. However, as the scale of the project increases and more farmers participate, costs will inevitably decline.

The AWS centres will not be more than 10 km apart so that localised and precise advisories can be given. Advisories will include temperature, humidity, rainfall, wind speed and cloud formation within a radius of 10 km.

The project is being implemented under WOTR’s integrated climate change adaption project funded by the Swiss Agency for Development Cooperation (SDC), National Bank for Agriculture and Rural Development (NABARD) and the Swiss Re. The technology and knowledge partners in this effort are IMD, which provides weather forecasts based on the field data we send them, Pune College of Agriculture (of Mahatma Phule Krushi Vidyapeeth) which supports the team of agricultural specialists develop crop calendars, and the Central Research Institute of Dryland Agriculture (CRIDA) in Hyderabad, which supports WOTR in crop-contingency planning.

WOTR is currently running the project on a pilot basis, so farmers are offered this service free of charge. They would, however, need to develop a revenue model that charges user fees if this project is to become sustainable and scalable. Alternately, if this is considered vital for public good, there is a case for public, donor or philanthropic funds supporting such initiatives.
Rising to the Call is a collection of case studies from all over India about the nature of climate variability, how it is affecting lives and livelihoods, and how communities are responding and adapting successfully to the changes. It studies the impacts and replicability of the different approaches to adaptation and brings out valuable insights for developing countries in the region and beyond.

Five regions are considered: The Indian Himalayan region, the Indo-Gangetic plain, the desert region, central and peninsular India, and coasts and islands. Case studies highlight crop diversification, payment for eco-system services, flood-proof housing, restoration of watersheds, protection of mangroves, groundwater management, weather forecasting and advisory services, flood-resistant rice, and more.

This book is a first-of-its kind that looks at adaptation with an ear to the ground. It looks into why some actions worked, the challenges and enabling conditions.