Making the Best of Scanty and Variable Rains with Telemetric Rain Gauges & Weather Systems

Background & Objectives

The larger part of agriculture in India is rain-fed; more so in Karnataka with average rain-fall of only 73 cm per year in Northern Karnataka compared to the national average of 125 cm. Deficient rainfall, coupled with high temporal and spatial variability, leaves farmers in worse condition. Average rainfalls can further be quite deceptive if it is measured over longer distances. This was the situation in Karnataka. The state had practically only one rainfall measuring device in one Taluk and that too used very old technology making the rainfall data suspect. Inadequately measured rainfall and absence of any localised prediction created problems for farmers not only in sowing and nurturing crops, but also created problems in insurance claim settlement, if their crops failed on account of either drought or flood, which has been an annual feature every year since 2001. Insurance settlement is more accurate if it is

based on rainfall data of small geographical units, but can be quite disastrous if averaged out for very large geographical units like a Taluka. In this scenario, it is imperative to have an effective and accurate rainfall monitoring system.

The genesis of this project started in 2001. A study of the performance of rain-gauges, installed by irrigation department at the field level, revealed several practical problems. These included quick dust accumulation, weed growth, blockage, complete lack of maintenance, misuse of the instrument, non transmittance of data due to frequent power cuts in the rural areas and poor connectivity in remote areas. These problems were diligently and systematically addressed which led to evolution of a sturdy, solar dependent, weight based rather than volume based instrument needing minimal maintenance and care. This gave birth to the present day TRGs, which have proved their sturdiness and efficiency in the fields.

Karnataka recognised the need for installing Telemetric Rain Gauges (TRGs) and initiated a pilot study in the year 2005 by installing TRGs at 27 district headquarters. This project was initiated through the funds available in the erstwhile Drought Monitoring Cell which was strengthened and renamed as Karnataka State Natural Disasters Monitoring Centre (KSNDMC), a Registered Society and an autonomous body affiliated to Dept of Science and Technology.

TRGs are indigenously developed instruments and offer low cost and customised telemetric data transfer solutions. TRGs are GPRS enabled, solar powered, tipping bucket telemetric rain gauges. TRGs measures near real time received rainfall data at 15 minutes interval and record the same in digital format. TRGs can store 6 months rainfall data measured and have provision for onsite retrieval. They transmit data at an interval of 15 minutes through GPRS facility to a central server leading to rainfall data availability on hourly/sub-hourly basis. It was, therefore, decided to install TRGs in all the 747 Hoblis (Hobli is mid way between Tehsil and village Panchayat).

Bringing about a paradigm shift in agriculture and other related sectors from development to management requires not only accurate, reliable and timely rainfall data but also information on other weather parameters like temperature, moisture, wind velocity etc. The state, therefore, decided to move forward and install Telemetric Weather Stations (TWS), to begin with, at Taluka level.

Collection of data was through TRGs/TWSs was planned to be complemented with thorough analysis and dissemination thereof. The State level monitoring station developed the capacity to analyse data on near real time basis and generate alert recognition also on near real time on high intensity rain, heavy rainfall, very heavy rainfall etc. Report was also generated and disseminated on near real time basis to the Agriculture, Horticulture, Revenue, Water Resources Departments and Police officers functioning at State/District/Taluk/Hobli level. A help desk was set up to provide information to the farming community. Further, a Meso-scale (areas ranging from 2 – 2000 km) rainfall forecast model was developed for providing information twice a day for supporting the decision support system.

This project has sought to transform the way meteorology could be incorporated into agriculture management systems. TRGs/TWSs and the entire weather management system developed in the state allows web enabled data base management to process the data on near real time, alert recognition and dissemination of early warning on high intensity rain, high rain and very heavy rain on auto mode.

Intervention

Actual project was initiated four years ago with the state government taking up installation of TRGs in about 600 Hobli headquarters in 2008-09 with funding support of Rs. 2.61 crores from the Department of Revenue, Government of Karnataka. RKVY funding was introduced in the programme in the later part

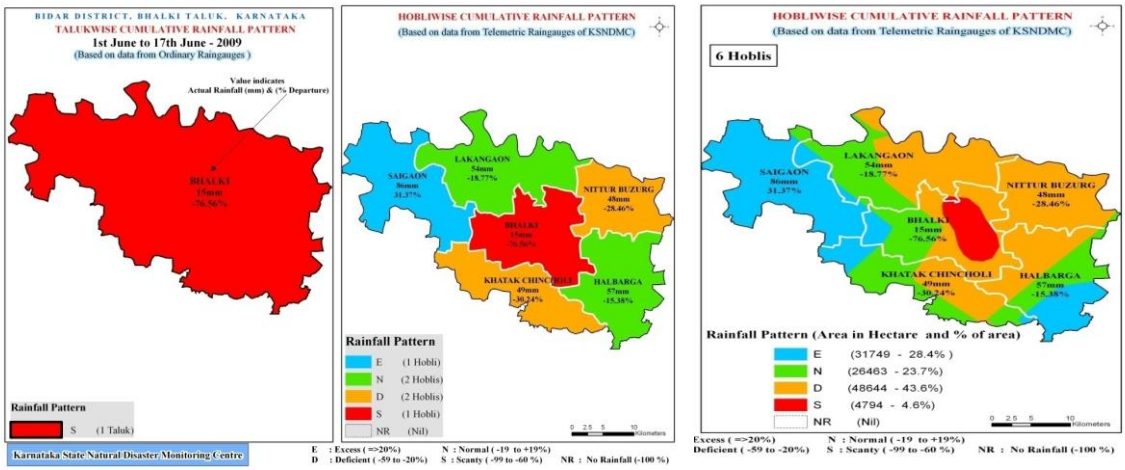
of 2008-09 with infusion of funds to the tune of Rs. 50 lakh initially. RKVY support was further enhanced to Rs. 4 crores in 2009-10 to expand the scope of the project to install TRGs in all the 747 Hoblis located in 30 districts of Karnataka and also to take these to Gram Panchayats with 100 gram Panchayats being taken up in the first page. The State then expanded their vision to take TRGs to all the 4688 Gram Panchayats and install TWSs in all the 137 Talukas, with further support of Rs. 2.93 crores from RKVY in 2010-11.

TRGs have actually been installed by last quarter of December 2011 in all 747 Hoblis and also in 770 Panchayats at a total investment exceeding Rs. 6.90 crores. In addition, installation of 137 TWS has been completed at Taluk level with sensor calibration & commissioning being under progress at the cost of Rs. 97.6 lakhs.

Collaborating with the Department of Revenue at the Gram Panchayat level, the RKVY funded KSNDMC has evolved a 3 level maintenance protocol for ensuring efficient working of the installed Rain gauges at the field level. This includes co-opting a local caretaker, an employee of Department of Revenue or Agriculture, with additional incentive to take care of the day-to-day maintenance, mandatory monthly monitoring visits to a minimum of 10% of the installation sites by the KSNDMC officers and Annual Maintenance Kits containing specific syringes, brushes, cleaning cloth, and even a bottle of water for the caretaker. Orientation programs at the Taluk level and television programs have created a huge awareness among the farmers and have ensured their participation in this project.

KSNDMC is now generating Hobli level and also Panchayat level rainfall data and providing the same to farmers, state governments and insurance companies. Many a times, it is quite telling to see difference in Gram Panchayat rainfall data as averaged by a Taluk level rain-gauge and the one based on Panchayat level TRGs.

Improvement in capturing Spatial Resolution of Rainfall Example: Bhalki Taluk, Bidar District



1 2 3

1. One rain gauge for the taluk
2. Hobli level telemetric rain gauge without Interpolation
3. Hobli level telemetric rain gauge with Interpolation by krigging

Outcome

The project has brought under its umbrella all farmer communities located in 747 Hoblis located in 30 districts of Karnataka. The benefits that have accrued from the project include:

- Near real time received rainfall data;
- Significant reduction in time gap between data generation and information generation;
- Rainfall data on hourly/sub hourly basis;
- Alerts on high intensity/heavy/very heavy rainfall events;
- Accurate and reliable data in building up trust under weather based crop insurance program;
- Data dissemination in weather forecast model;
- Rainfall forecast and advisories at Hobli level;
- Speedy dynamic and informed decisions taken at the State Level Weather Watch Committee, State Level

Coordination Committee on Crop Insurance and Executive Committee/General Body of KSNDMC.

The project focuses on providing advisories (warnings about bad weather conditions) to farmers and inputs to the Weather Based Crop Insurance program in Karnataka. The monitoring system dovetailed with meso scale (areas ranging from 2 – 2000 acres) rainfall forecasting system on pilot basis provides valuable advisories to the farming community. These mid course corrections aid adoption of better agriculture practices are leading to significant financial savings and returns. The financial gain for the farmer can be assessed as an aggregate of the following three factors:

- Improving the efficacy of the operations and enhancing productivity by advancing or postponing critical field level operations;
- Minimizing wastage of valuable seeds, labour, and time due to informed choices about the time and acreage of sowing, based on impending rainfall data; and
- Securing the produce against rain damage by hastening harvesting operations.

While precise quantification of the benefit is difficult to assess in a project such as this, implied quantification reveals benefit accruals exceeding a 10 fold improvement. The advisories to farmers in crop management and farming activity have far reaching benefits which are difficult to be analysed comprehensively. The alerts provided in case of heavy rains especially in the flood prone areas have helped in taking timely precautionary measures in mitigating the impact of heavy rains/floods.

The help desk at the KSNDMC centre receives an average of about 450 farmers' calls from all over the state requesting forecasts, advisories and operational suggestions.

This unique RKVY funded Karnataka project serves as a major reference within all the government agencies in Karnataka dealing with related data information collection and dissemination, use of imagery in the field of rainfall and other disaster management.

This intervention has successfully bridged the gap between the worlds of technical experts and the grassroots farmer with easy to use rain gauges. Collaborating with CSIR- CMMACS for developing mathematical forecasting models using Supercomputers, to provide early warning and alert capsules to the farmer has helped development of this project to provide one-of-a-kind service to the agricultural community anywhere in India.

Given the frequency of drought occurrence in Karnataka, the need for macro and micro level readjustments and analysis to reach the extension workers and farmers in time for suitable action is critical. Research organisations and Universities have always valued the importance of information databases and have methodically archived research and development findings. However, the urgency to make relevant local rainfall information available to the communities and farmers for whom well-informed decision making would mean better and more efficient management of the scarce resources like water and seed stocks, has been underlined only in the recent years. At the end of the day, dry land agriculture is still the most sustainable of all our agriculture systems . Scarce natural resources led our farmers to make farming part of a life style, in spite of all odds; the least technological advances can do is to support them with accurate and real time weather information and advisories to enable necessary mid course corrective measures for effective agricultural planning.

When it rains on your parade, look up
rather than down. Without the rain,
there would be no rainbow.
Jerry Chin