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Practices of Command Area Farmers of Tank System for Potential Solutions to Global Climate Change Implications

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Abstract:
Farmers of command area of tank systems have evolved various measures to manage the deviations in the strength of monsoon and these adaptations help them to over the water shortages. This paper examines practices of command area farmers in Kolar district of Karnataka state.

1. Introduction

Karnataka is typically an agrarian state. About 66 per cent of the total population lives in rural areas and the main source of income is farm based economy. Out of ten agro-c1imatic zones of the State, five fall under dry zones and a large track of area falls under semiarid conditions, facing severe climatic and resource constraints. Karnataka is one of the few States with lowest proportion of area under irrigation and second only to Rajasthan in the share of drought prone area. Nearly 70 per cent of the total cultivated area is under rainfed farming. On the other hand, global climate change may have serious negative implications on the agricultural plans of the state (BCCI-K 2011). Intergovernmental Panel on Climate Change (IPCC), in its 2007 assessment report warned about significant changes of the climate world over as a cumulative impact of various anthropogenic activities. Global warming is expected to severely impact ecosystems, precipitation and agriculture. Having impacts on every component of ecosystem and more over, it may render agrarian economies more vulnerable. Ministry of Environment and Forests, GoI has listed several potential impacts due to global climate change in various sectors ranging from water resources, forest and biodiversity, agriculture, drought, health etc. (http://moef.nic.in/cc/adaptation/impmap.htm).

Referring to the global climate change implications, central to its debate is the 'Uncertainty Factor' in all estimations and projections. This uncertainty arises due to inherent difficulties in mimicking natural conditions in simulations models and hence, no two different Global Circulation (GCM) models are same in their predictions. However, all the models as well field based observations have confirmed the changes on global scale (IPCC 2007). This uncertainty is significantly higher in case of non-irrigated farming. Farming under irrigation tanks constitutes one such farming system with high systemic risk/ vulnerability/ uncertainty. In tank based irrigation, the amount of water available for irrigation depends on the inflows to the tank which in turn is dependent on the monsoon rains. Hence, the command area farmers of these irrigation tanks are uncertain about the quantum of water available for irrigation and in turn about the crop to be grown in command area. Therefore, this study is undertaken to study the management practices that the farmers of command area of tanks adopted over the years in Kolar district of Karnataka state.

Information about the water inflows to the tank and its availability for irrigation is available only after the monsoon has set in and thus leaving very short time to decide about the cropping pattern in the command area. This risk or uncertainty[1] returns back to the command area farmers, year after year. To deal with this uncertainty, it is essential for the command area farmers to evolve mechanisms that would be beneficial for all the concerned stakeholders (Ostrom 1990). This uncertainty about water availability is problem not only to the command area farmers of the irrigation tanks, but is central to the global climate change implications as well. Therefore, gist of this study is to study if measures/institutions that were evolved by the command area farmers of irrigation tanks for dealing with uncertainty can offer some potential solutions for the global climate challenges (Intercooperation 2005). Kolar district ideal as study area as it is land locked and hard rock terrain of Karnataka in the maiden (plain) region and covers an area of 8223 sq.km., experiences tropical climate throughout the year and owes its prosperity and development to the existence of ancient tanks and main occupation is agriculture.

[1] By Uncertainty, we are referring to the water resources for irrigation only.

2. Study Area

Kolar district is located in the southern region of the State and happens to be the eastern-most district of the Karnataka State. Situated between 2^0 46' & 13^0 58' North Latitude and 77^0 21' and 78^0 35' East Longitude, Kolar district is bounded by the districts of Bangalore and Tumkur on the west and on all other sides by the districts of the adjoining States of Andhra Pradesh and Tamil Nadu. On the north, it is bounded by Anantapur district; on the east by Chittoor district of Andhra Pradesh and on the south by the districts of North Arcot and Dharmapuri of Tamil Nadu. The district headquarters, Kolar town is located 65 Kms, north east of Bangalore. With an Area of 3969 Sq. Kms, Kolar District contains five Taluks. The lowest annual rainfall recorded in the district is around 300mm while the highest is over 1300mm. being a semi arid area the district is drought prone as well.

3. Practices Adopted in Water Management

For selection of crop, determining factor is its suitability in given conditions, primarily the available water resources for cultivation of that crop. If the water inflow to the tank is adequate, general practice in command area is the cultivation of paddy, both in Kharif and Rabi seasons. This preference for paddy is due to the fact that paddy crop is most suitable in command area which would higher soil moisture content and other crops would not grow well in such conditions. Further, paddy would supplement the fodder required for the livestock as well. In the event less than adequate flows to the tanks, various scenarios were observed during the field study and details are given in Fig 1.

- Scenario I: Water is insufficient for even one crop
- Scenario II: Water is sufficient for one crop for part of command area
- Scenario III: Water is sufficient for one crop for entire command
- Scenario IV: Water is sufficient for part of command for second crop
- Scenario V: Water is sufficient for second crop for entire command area

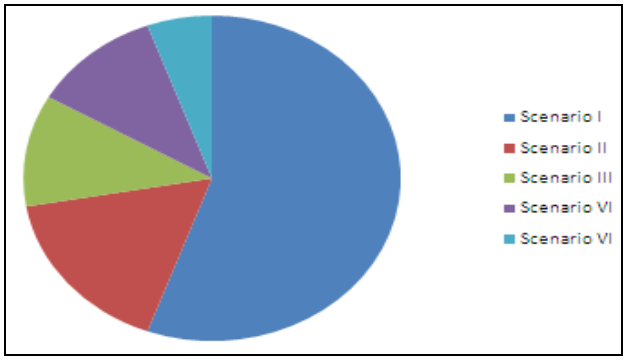

Figure 1: Incidence of Various Scenarios

- **Scenario 1: Insufficient Water for khariff crop**
  Water inflows to the tank are meager during the pre-monsoon showers in the current year. With progressing monsoon also there was no improvement in the inflows to the tank. Assuming that similar trend of little/no water flows to the tank, command area farmers have decided to go for the crops that could grow well with existing soil moisture, such as vegetables. They kept the option for rabi crop open to be decided later in month of November depending on the tank water status. In this event, farmers have not considered the paddy cultivation and replaced with vegetables such as beans, cabbage in the command area.
- **Scenario II: Water Sufficient for Part of Command Area only**
  Tank water, during the initial stages, was felt that sufficient for the parts of the command area, i.e., for the head reach and middle reach of the command area. Tail end of the command area, as the water is insufficient, need to forgo paddy cultivation and other crops can be grown.
- **Scenario III: Water Sufficient for Entire Command Area**
  Water level in the tank during the initial stages of agricultural planning was felt that sufficient to provide water for irrigation of paddy for entire command area and therefore, all the command area farmers opted for paddy cultivation.
- **Scenario IV: Water is Sufficient for the Part of Command only for Second Crop**
  Tank water level is dynamic in nature. Depending on the use, evaporation, inflows etc, tank water levels fluctuates. During the month of December, during the harvest stages of kharif crop, command area farmers take a decision about the possibility of second crop cultivation. Depending on the water levels, farmers would decide on the extent of command area that will be given cultivation. In case water is not sufficient for entire command area, then the tail end farmers need to cultivate alternate crops.
- **Scenario V: Water is sufficient for Second crop for entire command area**
  Water levels are adequate to provide irrigation for second crop of paddy during khariff season, command area farmers will cultivate paddy.

4. Institutionalization of Best Suited Adaptations

Irrigation tank is a common property resources but community participation in its management is on decline. In such circumstances, restraining some command area farmers from the use of tank water is difficult situation. However, during the field work, it was observed that through the system of Neeraganti or Water Man, this was effectively dealt by.

For the optimum use of water resources, particularly in lean monsoon year, it is important ensure the required water to all the fields in decided command area. Neeraganti System is evolved and under this system, one person (hereditary in nature) is given the responsibility of implementing the collective decision of command area farmers. For effective implementation of the farming community, Neeraganti needs to have very good understanding of the command area and water flow dynamics within the command area, water requirement for the crop at various stages of growth and he will ensure that maximum utilization is made of tank water. dIn return, his services will be rewarded by a part of the crop produce in that year by all the command area farmers.. This system, developed by the community and evolved over the years was found to be working in all the tanks with the exception of Scenario I tanks (neeraganti was redundant as there is no water in the tank). Neerganti, being hereditary occupation, generally has a very good understanding of the entire command area and also knows how much water to be released from the tank to ensure the minimum water was supplied to all the fields in the command area (Dikshit 1993, von Oppen and Subba Rao 1987, Raju et al 2003, Ostrom 1990).

5. Summary of Findings

From the interaction with command area farmers, following are major points that could be examined in detail is that Shift from water intense crop – Paddy to less water consuming crops such as minor millets/ maize. This shift is self imposed by the community itself and there is no state agency involved.

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