AGRICULTURAL WATER UTILISATION THROUGH HAPA SYSTEM: A STUDY ON BANKURA DISTRICT, WEST BENGAL

Shakti Pada Mandal* and Dr. Krishnendu Gupta**

ABSTRACT
Hapa is a small, deep pond that dug on farmland to store rainwater. In the dry season, crops cannot be grown, drinking water wells are dried up and people migrate from the study area. This paper tries to analyze the spatio-temporal variation of agricultural water utilisation in Bankura district through the water of hapa.

KEY WORDS: Aquaponic, Efficient crop growth, Hapas, Tanks

INTRODUCTION

Small ponds on individual farms can store rainwater for the dry season allowing households to diversify crop production, introduce pisciculture, and increase livestock numbers and to store more water for domestic use. These are usually located on medium and high lands and have less water for cultivation. It is known fact that agriculture is a major user of water resources. Sustainable management of water in agriculture is essential to increase agricultural production. Hapa farms focus on aquaponic (sustainable food production system that combines a traditional aquaculture i.e. raising aquatic animals such as fish or prawns in tanks), static hydroponic technology and aquaculture. Many benefits of the hapas are efficient crop growth, low resource requirements, high production on marginal agricultural lands. Agricultural water resource management covers a wide range of agricultural systems in the district, based on varying water sources including surface water, groundwater and rainwater.

The hapa system rain water storage concept was brought to this district in 2006 by an NGO. Because in the dry season crops could not be grown, drinking water wells dried up and people often migrate. The authorities did not know how to address the problem. The NGO convinced the Secretary of the Panchayat and Rural Development Department to use unallocated government schemes funds construction of hapa and the scheme was launched (Banerjee, P.S., 2011).

OBJECTIVES OF THE STUDY

- To find out water crisis related agricultural practices in the area under study.
- To examine the relevance of hapa system of agricultural water utilization that is suited to the local environment to overcome the water related issues (scarcity of water) in the study area.
- To find out the effects of hapa system of agricultural water utilization both positive and negative and its applicability.
- To suggest some steps to be taken.

STUDY AREA

Bankura is located in the western part of the state of West Bengal. It is a part of Bardhaman Division of the state and included in the area known as "Rarh" in Bengal. It ranks forth according to population and literacy rate of 2001 Census in the State. The

*Ph.D Research Scholar, Department of Geography, Visva-Bharati University, Santiniketan, India PIN- 731235
** Assistant Professor, Department of Geography, Visva-Bharati University, Santiniketan PIN- 731 235

district Bankura is bounded by latitudes 22°38′N to 23°38′N and longitudes 86°36′E to 87°47′E. River Demodar flows along the northern boundary of the district. The adjacent districts are Bardhaman in the north, Purulia in the west and Paschim Medinapure in the south. The Survey of India topographical sheets covering the study areas are 73I, 73J, 73M and 73N.

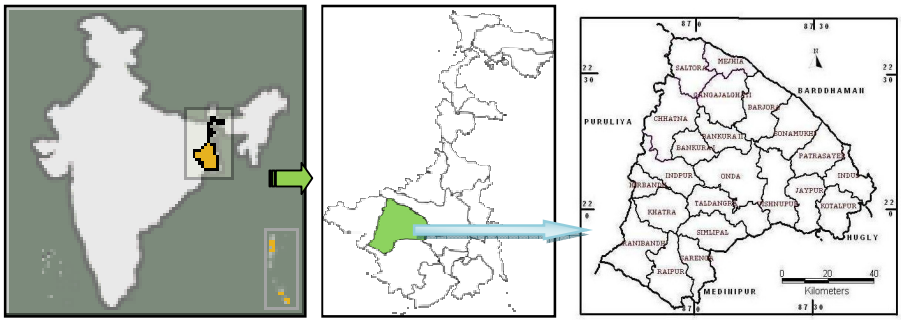


Fig.2, Location of West Bengal, Bankura District and CD Blocks of Bankura District

DATABASE AND METHODOLOGY

The present paper has been carried out by using both primary and secondary data from published reports and field investigation to show the spatio-temporal change in hapa system agri-water utilisation in Bankura district.

This research has tried to find out the impact of hapas by interviewing 50 beneficiary and 25 non-beneficiary households in five villages in Bankura sub-division and five villages in Khatra sub-division. Interviews have also been conducted with several government officials and the implementing organization etc.

Three stages of investigation have been constructed by identification and assessment in pre-field stage; Pond digging site identification and its uses in low water consuming crop cultivation, fish breeding and fisheries etc. in field investigation stage and lastly, organizational set up of the beneficiaries and monitoring in the post-field (constructional) work of the study.

RESULTS AND DISCUSSION

Agriculture in Bankura district is dominated by paddy cultivation in the kharif season and mustard cultivation in rabi season. For the district as a whole, there is very little irrigation infrastructure- i. e. tube wells, dug wells, surface flow irrigation schemes and surface lift structures.

There is no irrigation facility in the area under study. The majority of the population, many of whom are from scheduled castes (SCs) and scheduled tribes (STs), rely on rain-fed agriculture. They are only able to cultivate in the rainy season . Popular crops are paddy and vegetables only.

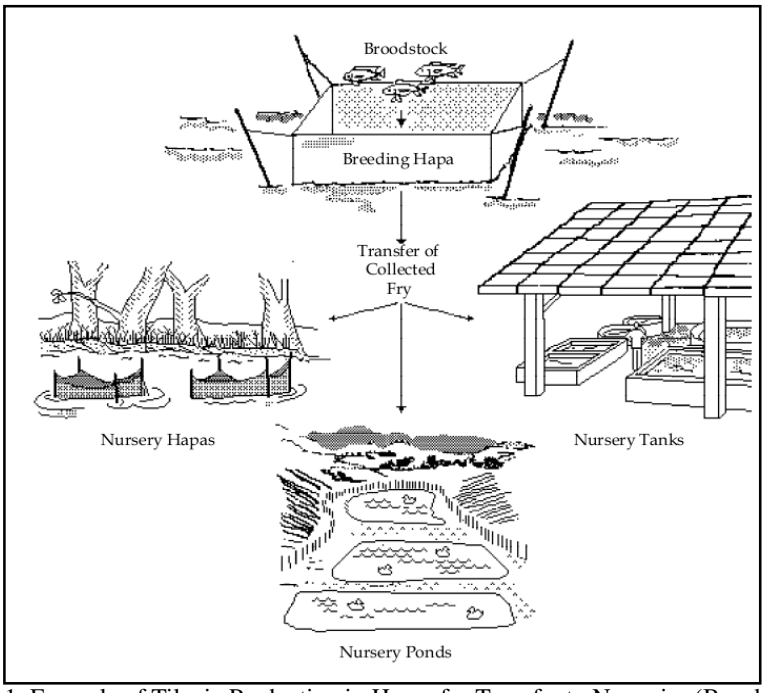


Fig. 1, Example of Tilapia Production in Hapas for Transfer to Nurseries (Bocek A., 2011).

From the field visit, it is noted that sometimes, very late monsoon as well as the extended summer period, soil moisture regime goes down, even below threshold limit. This strongly affects and creates physiological stress to the plant life. So, deficit in water is very important and to be precise most important issue in the area under study. Harvesting rainwater and making it available in the dry season could have major contribution for agriculture and livelihoods. It will enable farmers to grow other crops in the winter season. A program was set up to install "Hapas" on farmers' land, funded by the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), these hapas were designed to cover 5 percent of the land and to provide supplementary irrigation to paddy in the kharif season and use the residual water to grow an additional rabi crops.

The Opportunity

Bankura District, West Bengal receives 1100-1400 mm of rainwater per year. Much of the terrain is undulating with the result that there is rapid run-off and soil moisture content is low.

Area Expansion

The amount of cultivated land ultimately is increased because farmers can use fallow land and leveled sloping land with earth and water excavated from the hapas. 56 hapa owners (86 percent) have increased their cultivated area thereby. On average, farmers with hapas have increased their cultivated area by 0.31 acres per farmer.

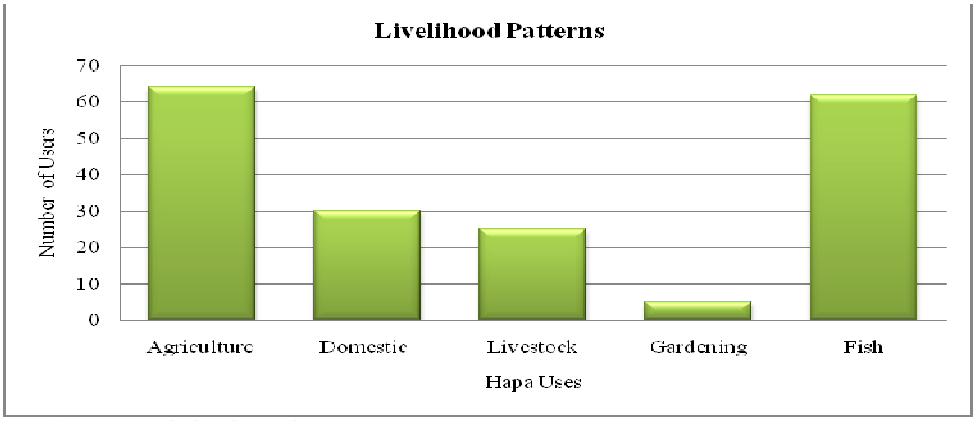
TABLE 1: MONTHLY RAINFALL IN THE DISTRICT OF BANKURA (IN MM)

Month	Actual Rainfall				
	2004	2005	2006	2007	2008
January	2	19	-	-	22
February	-	33	-	52	3
March	20	48	5	49	4
April	46	33	52	45	52
May	98	42	162	81	122
June	189	153	205	192	299
July	201	303	320	626	310
August	327	191	240	293	302
September	199	155	295	421	198
October	128	214	19	22	22
November	-	-	15	22	-
December	1	22	-	-	-
Total	**1211**	**1213**	**1313**	**1803**	**1334**

Source: Indian Meteorological Department

Livelihood Pattern

Many hapa owners have diversified their crops production 78 percent now cultivate few additional crops and 95 percent cultivate multiple crops including maize, mustard and various vegetables. Farmer report that crop yields have also been increased with the help of hapa. In some farms, mustard yields have doubled and paddy has increased by 20 percent. Hapas are used not only for agriculture but also for gardening, livestock, domestic purposes and fish culture in the study area (Figure 2).



Source: made by the authors

The number of livestock owned by farmers with hapas has increased, which may be a result of water or fodder availability or the general improvement in the economic situation. Cattle numbers have increased by 9 percent, goats 57 percent and ducks by 35 percent. Households have also got domestic water for use from nearby hapas.

Income Level
On average, the annual income of hapa owners has become higher than non-owners in the study area. This is significant as the hapa owners were previously belongs to BPL but not now. The income coming from agriculture alone is 34 percent more than pre-hapa income.

Land being cultivated
Initially, small farmers were reluctant to give up land for rainwater harvesting but by 2010, the number of hapas has been rising rapidly with positive outcomes.

Social benefits
Among the households, that own hapas, 69 percent say that they do not migrate in the dry season. As a result, more children are attending school. The programme has generated jobs in hapa construction also. People report that groundwater level is also increasing and the area has turning into green thereby. This helps to control soil erosion significantly.

CONCLUDING REMARKS
From the above discussion, following proposals have been suggested which may influence the hapa system agri-water utilization in the study area:

- Involve all villagers from initiation to implementation.
- Involve all political parties, to minimize politicization.
- Train implementing agencies of hapa system of agri-water utilization in planning and implementation, i.e. how to involve all stakeholders.
- Seek government funds for the benefits of hapas.

ACKNOWLEDGEMENT
The author pays his sincere thanks to Professor G. P. Chattopadhyay, Professor D. Das and Professor P. Das for their help, cognitive support to do the research work. Thanks are due to the respondents without whom the paper would remain incomplete.

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