The Happa: A Replicable and Sustainable Model

SEBAK JANA

Helping villagers create a sustainable small scale irrigation structure in the form of a happa has wide ranging and long term benefits on their lives and livelihoods.

Fifty per cent of the people in India are dependent on agriculture for their livelihood. A majority of them are the rural poor and marginal farmers, without any assured food security. Their dependence on the rains to irrigate the land greatly jeopardizes their crops and their food security. The *happa* experiment was launched to provide them with assured irrigation. The *happa*, or small tank, model is part of Integrated Natural Resource Management (INRM), which focuses on both water and soil management.

The Government of India (GoI), under its flagship programme for employment generation, the MGNREGS, is funding the construction of *happa*s—mud-excavated small water harvesting structures—of an average size of 50 × 45 × 12 ft in a command area of about 0.6–0.75 acres. Introduced as an experiment in some dry zones, the *happa* is being excavated on the private land of farmers so that they can irrigate their agricultural land. The construction of the *happa* is paid for by the government but it is subsequently managed by the farmers and all operational expenditure for maintaining it is incurred by them. This model has seen some success in the dry zones. A village in Bankura district, a dry zone of West Bengal, has been selected for the case study. There is a geographical concentration of backwardness and poverty in this area that has led to a continuous degradation of natural resources.

INTRODUCTION

The Indian economy is an agrarian economy, even though the share of agriculture in the GDP is about 20 per cent. More than 50 per cent of the people in India are dependent on agriculture for their livelihood and the country faces the daunting challenge of providing food security to its people. Rain-fed areas in the country account for 60 per cent of the cultivated area and these areas are home to a majority of the rural poor and the marginal farmers. Repeated droughts and erratic rainfall continue to have an impact on the livelihood of the rural people, particularly those who live in the dry zones, because irrigation facilities are poor. In most states, households that have access to irrigation have only about half the poverty incidence as compared to households that have irrigated land. The impact of the existence of irrigation facilities can be seen among the tribal households as well. Irrigation in

India is divided into four categories—canal irrigation, river lift irrigation, tube well irrigation and tank (water harvesting structure) irrigation.

Repeated droughts and erratic rainfall continue to have an impact on the livelihood of the rural people, particularly those who live in the dry zones because irrigation facilities are poor.

Objectives of the Study

The main objectives of the study are:

i) To judge the economic viability of the project, using standard Cost Benefit Analysis tools.

ii) To assess the ecological and social impact of the project.

iii) To identify the benefits accrued from the project.

iv) To assess the scope of up-scaling the project as well as to identify the problem areas of up-scaling.

Our analysis reveals that a small irrigation programme like the construction of *happa*s has made a strong impact on the livelihoods of rural people. The impact on the environment includes the conservation of soil and moisture of the watershed area. The economic benefits include an incremental production of paddy and vegetable crops. The success and up-scaling of the programme depend on the systems of planning, application, execution,

monitoring and fund-flow adopted from here on. Based on the Cultivable Command Area (CCA), irrigation in India is divided into three categories—major (CCA above 10,000 ha), medium (CCA between 2,000 and 10,000 ha) and minor (below 2,000 ha). In 1951, when the planning process began in India, there was an emphasis on major irrigation, in the form of construction of dams and barrages. After that, India has increasingly been dependent on groundwater for irrigation. Groundwater, at present, provides water to 60 per cent of the net irrigated area in India. On the other hand, the area irrigated by tanks has fallen from 18 per cent in the 1950s to only about 4 per cent at present. The proportion of critical districts for over exploitation of groundwater has increased from 9 to 31 per cent during the period of 1995–2004 (GOI, 2010). The Fourth Assessment Report of IPCC has projected a rise in temperature in the Indian region by 0.5 per cent by 2020 that may affect agricultural production. The irrigation sector may also be affected by climate change, with the predicted increased variability in precipitation.

MGNREGS is a government programme, which aims at enhancing livelihood security by providing at least 100 days of guaranteed employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

Considering this backdrop, it becomes urgent to explore the possibilities of sustainable forms of irrigation—through the construction/renovation of tanks, check dams, etc. The importance of tank irrigation in the country has been well documented. Participatory Irrigation Management and Rehabilitation of tanks became a part of the strategy in India from 1995 onwards. The case for sustainable irrigation was strengthened with the introduction of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) in India in 2005. MGNREGS is a government programme, which aims at enhancing livelihood security by providing at least 100 days of guaranteed employment in a financial year to every household whose adult members volunteer to do unskilled manual work. MGNREGS works include water conservation, water harvesting, renovation of traditional water bodies, and which, if effectively implemented, will promote sustainable irrigation.

INRM planning is very essential for chalking out effective interventions in rural poverty alleviation by enhancing agricultural income. This includes the formation of village-level associations, baseline data collection, resource mapping and ownership mapping. The main components of the INRM strategy includes harvesting rainwater and using it judiciously, conserving soil, meeting the livelihood needs of people through planting trees, growing crops, rearing animals and transferring resources to the next generation, safe and enriched.

SMALL IRRIGATION TECHNOLOGY: *HAPPA*

Water is a central issue for development in the rain-fed dry zones of the country; rainwater harvesting, therefore, can play a very vital role in the conservation of our water resources. However, tank irrigation structures in India are not well managed, and experiments with the formation of a water users' association have not been satisfactory at all in West Bengal. In the last few years, some innovative experiments have been introduced in different parts of India in the irrigation sector. One such experiment is the *happa* in West Bengal. Small tanks are being excavated on the private lands of the farmers; they can irrigate their own agricultural land with the water from these tanks. The farmers are responsible for managing and maintaining the tanks. A *happa* does not have any cement work or stone revetment. The sides of a *happa* are stepped with a slope of 1:1, such that both livestock and humans can access the water easily. A *happa* is constructed by the side of an agricultural field; its average length is 45 ft, breadth is 50 ft and depth 12 ft. The total earth extraction of a *happa* of this size is 17,360 cu ft, and requires 299 man-days to make. With the existing MGNREGS wage rate of Rs 100/day, the average construction cost for the above specifications would be about Rs 29,900. The average command area of a *happa* is about 0.6 acres. The model is also called the 5% model because it occupies that much area of the agricultural plot of the farmer. The construction cost of the *happa* is currently being financed by MGNREGS, and all the operational expenditure for maintaining the *happa* is incurred by the farmers. This model has become successful in some dry zones of West Bengal. There are two major cropping seasons in India, the *kharif* and the *rabi*. During the *kharif* season (July–October), agricultural activity takes place both in rain-fed and the irrigated areas. In the *rabi* season (October–June), agricultural activity takes place only in the irrigated areas. The *kharif* crop includes *aman* paddy, maize and pulses whereas the *rabi* crop includes wheat, barley and oilseeds. The con-struction of water harvesting structures such as the *happa* has created a strong impact on the livelihoods of farmers through the generation of additional income in the dry areas because they are able to:

(i) Provide life saving irrigation to the paddy crop during the *kharif* season.
(ii) Grow vegetables around the *bunds* of the happas.

Biradihi is spread over 289.9 ha and has 106 households with a population of 600. It is in the baid land, that is, medium upland, and agriculture is the main source of income in the village.

In most of the dry zones, the cropping intensity is very poor and an extra crop would have a perceptible impact on the standard of living of the farmers.

STUDY AREA

The area under study is Biradihi village in Musiaraha *gram panchayat (GP)*, Hirbandh block, western Bankura district, West Bengal. The survey was conducted in 2010. In the Human Development Report of Bankura district, Hirbandh has been ranked the last of 22 blocks in the district. About 54 per cent of the households in the block live below the poverty line. There is a concentration of backwardness in these regions of the district. Only 30 per cent of the agricultural land in the block is irrigated (Government of West Bengal, 2007). The per capita annual food grain availability in the block is 230 kg whereas the requirement is 365 kg. The backwardness can be explained through the lack of access to natural resources such as water.

There are three land types in these districts:

i) Fallow uplands (called *tarh* land): These are at the top of the terrain with very thin topsoil and very low water-holding capacity.
ii) Medium uplands (called baid land): The soils are sandy and sandy loam, and

shallow with low organic matter and low moisture holding capacity.

iii) Lowlands (called *kanali/sol* land): These lands are loamier than *baid* and are the most advantageously located, in terms of water availability, with additional water from seepage from the upper catchment. In the region, about 50–60 per cent of the land is medium upland, 20–30 per cent is upland and 30 per cent is lowland. The water holding capacity of the barren upland is very low. The *tarh* and *baid* lands possess inferior soil and low moisture and, therefore, require irrigation. Paddy cultivation is classified season-wise into three types—Aus, Aman and Boro. Aman is the main paddy grown in the *kharif* season and it flowers in September. In case of a dry spell, the production of paddy in medium upland is badly affected. The conservation of moisture in the soil is very important. Biradihi is spread over 289.9 ha and has 106 households with a population of 600. It is in the *baid* land, that is, medium upland, and agriculture is the main source of income in the village. According to government records, the land-use pattern of the village is: forest–115.3 ha, cultivable waste—54.6 ha, not available for cultivation—48.7 ha, irrigated land—20 ha, unirrigated land—61.20 ha (GOI, 2001). A major part of the agricultural land is not irrigated as per records. There is not even a tube well in the village currently. The only source of irrigation is a *jorh* (a water harvesting canal that is the common property of the village). The region is hotter than the other regions in West Bengal. The temperature gradient reaches about 45° C in summer and the average annual rainfall in the region is about 1,400 mm per annum but there is a huge run-off because of the terrain and the rocky soil. Irrigation in this area can be greatly enhanced if this run-off is systematically tapped.

All the households say that water is a great problem in the area and water scarcity has become more acute in recent years. Any livelihood development strategy in the dry zones must focus on water as the central issue.

HOUSEHOLD CHARACTERISTICS

Twenty households were randomly selected from the sample village that has a *happa*. The households selected have the following characteristics:

The average family size is 5.5 and the percentage of male members is 55 per cent. The average educational class attained by the head of the household is 3.25 and 42 per cent of the sample members (excluding children) is illiterate.

Caste: Eighteen households are from the Scheduled Caste (SC) category and two households are from the Scheduled Tribe (ST) category. All the households belong to backward castes.

Poverty: Thirteen households fall in the Below Poverty Line (BPL) category. The poverty line in India is a monthly per capita expenditure of Rs 356.30 for the rural sector.

Occupation pattern: Only two families have members who are employed in the service sector. The average employment generated per family is calculated as 485 man-days, including family labour employed for own agricultural land. The average employment patterns are: agriculture—74 per cent, non-agriculture—5 per cent, service—8 per cent, employed under MGNREGS—14 per cent.

PRADAN acts as the project facilitating agency, working on two fronts—orienting the villagers about water conservation and providing the technical support in implementing the project.

There are 19 households that possess MGNREGS job cards. The average employment through MGNREGS per family per year is 59. The dependency burden (the percentage of people below the age of 18 years and above 24 years) of the households is 45 per cent.

The number of households with different assets is as follows: mobile phone—5, TV—2, cows—13, pumping machine—11.

The average agricultural landholding is calculated as 0.88 acres per family, of which the irrigated land from the *happa* is 0.35 acres.

Only nine households reportedly belong to an SHG. The group formation under the SGSY scheme does not seem to be effective in this area. Rural indebtedness in the area is high. Of the 20 households selected, 15 have taken loans from moneylenders. The average loan taken per family is Rs 7,250.

The average expenditure per month per family has been calculated at Rs 4,377. The allocation of expenditure on major items on an average has been as follows: rice—31 per cent, pulses—4 per cent, spices—14 per cent, fish and meat—8 per cent, fruit—2 per cent, medicine—13 per cent, education—21 per cent, clothes—6 per cent, others—2 per cent. The average water level is 39.5 ft in the summer season and 8.75 ft. in the rainy season. Aman paddy is the main crop grown by the households. The crop failed in 2010 because of poor rainfall. The number of households that use sources of irrigation other than the *happa* (mainly *jorh*) are 14. *Aman* paddy is usually grown from June to November and vegetables are grown from July to November. In the other seasons, limited amounts of potato, wheat and mustard are grown mainly because of the lack of irrigation facilities. Vegetables need to be irrigated the most number of times during cultivation (10–15); Aman paddy is irrigated three to five times and wheat three to four times.

All the households say that water is a great problem in the area and water scarcity has become more acute in recent years.

STRATEGY FOR IMPLEMENTATION

Any livelihood development strategy in the dry zones must focus on water as the central issue. The methods that have been considered at the core of the strategy are *in-situ* conservation of soil and water along with checking the surface run-off; harvesting of rainwater on the surface; economizing the use of groundwater; rejuvenating sub-surface water; and planning livelihoods through a participatory approach at the village/hamlet level (based on micro watershed-level flow). There is also an urgent need to promote livelihoods in these areas by working with government departments, to strengthen the farming system support services and influencing local governments to invest in INRM-based livelihood activities for directly addressing poverty.

Under a new initiative of the Planning Commission, PRADAN, an NGO, has been selected as one of the technical resource agencies, to facilitate district-level planning in Purulia and Bankura districts of West Bengal. PRADAN promotes livelihoods in the backward regions. The implementing agency is the block-level local body, the *panchayat samiti.* PRADAN acts as the project facilitating agency, working on two fronts—orienting the villagers about water conservation and providing the technical support in implementing the project.

The changes in the irrigated area have had a positive impact on rural livelihoods, particularly in the regions where the opportunities for alternative livelihoods are very little.

PRADAN has adopted various strategies for addressing poverty. One such strategy is to organize the village women into small SHGs, help them plan livelihoods, and approach the local body, administration and banks for funds and loans for the implementation of livelihood programmes. The cost of this support is provided through the project management cost as allotted in the project.

PRADAN works very closely with *panchayati raj* institutions (PRI) at the *panchayat* level. Panchayati Raj is a system of governance in which the *gram panchayats* are the basic units of administration. In Bankura, as in other places in West Bengal, the PRI plays a key developmental role. It has three levels: the village (*panchayat*), the block (*panchayat samiti*) and the district (*zilla parishad*). The gram sansad (GS), or village council, comprising one or two villages, is the lowest level at which village-level plans are made. The elected members from the GS constitute the *gram panchayat* (GP). These elected representatives, or GP members, are accountable for the preparation and implementation of the Annual Plan for the entire GP area (comprising 12–15 villages). PRIs have funds from of the MGNREGS, to finance the largely labour-intensive activities, leading to INRM.

A village-level INRM includes the following steps:

i) Social mobilization and vision.
ii) Delineating the ridge line and drainage.
iii) Mapping the resource.
iv) Mapping the land ownership in each area.
(v) Ranking wealth.
vi) Preparing the land-use map.
vii) Mapping problems and generating options for remedial measures.
viii) Checking whether all families are adequately addressed.
ix) Prioritizing and preparing the action

Table 1: Average Productivity (Tonnes/hector) Before and After Construction of Happa

Crops	**Before Construction Productivity**	**After Construction Productivity**	**Incremental Productivity**
Aus Paddy	4.00	4.45	0.44
Aman Paddy	3.58	4.58	1.00
Potato	6.67	7.46	0.79
Wheat	-	2.04	-
Vegetable	6.34	8.46	2.12
Muslard	-	0.86	-

Source: Own Estimation from the Primary Data plan.

x) Preparing the proposal.

The steps followed are:

a) Mobilizing the community and grooming a pool of Local Resource Persons (LRPs) by training them to implement the INRM plan. LRPs are selected by the Gram Unnayan Committee.

b) The LRPs prepare a village-level INRM plan, involving all the households, and collect the application forms for the happa.

c) The LRPs place the plan in the GS meeting/Village Development Council (VDC). The plan is sent to the GP, with the recommendations of the GS/VDC.

d) The GP issues a work order to the LRP after getting a sanction from the block. The LRPs supervize the work and prepare the muster rolls of the workers; the payment is made to the workers with the advice of the *Nirman Sahayak*. In most areas, the SHGs are involved in implementing the pro-gramme. In the study area, this was not the case because the SHGs are not strong.

The process of the happa construction has also led to institutional development, in terms of greater participation of the poor and marginalized farmers in village affairs, improvement in the relationship between different stakeholders.

IMPACT OF THE *HAPPA* IRRIGATION EXPERIMENT

The environmental and the economic impact of having a *happa* in the region is reported to be very encouraging. The changes in the irrigated area have had a positive impact on rural livelihoods, particularly in the regions where the opportunities for alternative livelihoods are very little. The economic benefits of the programme in the study area include:

- All the households surveyed reported that the yield and cropping intensity of the land had increased because of the construction of the *happas*. Farmers were able to irrigate their land and save the paddy crop during the *kharif* season, resulting in an improvement in the yield. The yield of Aman paddy increased from 3.5 tonnes to 4.5 tonnes per acre in a poor rainfall year.
- Farmers were able to grow vegetables around the bunds of the *happas* and

Table 2: Cropping Pattern: Before and after construction of happa for the aggregate sample households

	Before Construction		After Contruction		
Crops	**Total Area (Acre)**	**Nos. of Family**	**Total Area (Acre)**	**Nos. of Family**	**Incremental Total Area**
Aus	1.16	04	0.25	02	-0.91
Aman	10.97	13	7.84	08	-3.14
Potato	0.69	06	0.92	07	0.23
Wheat	0.00	00	0.25	02	0.25
Vegaetable	3.22	09	8.31	19	5.09
Mustard	0.00	00	0.63	03	0.63
Others	0.33	01	0.00	00	-0.33
Total	16.37		18.19		1.82

Source: Estimation Based on Primary Survery diversify their cropping pattern. In spite of the drought year, the cropping intensity improved from 93 per cent to 102 per cent for the sample farmers.

- In addition, there is an opportunity to earn wages during the construction of the *happa*. The constr-uction of one *happa* generates about 300 man-days of labour.
- The involvement of the local people in the planning and imple-mentation of the programme has led to a feeling of ownership of the programme.
- Of the 20 households surveyed, 13 households used the happa for growing fish. The annual average income per *happa* from fisheries is Rs 1,152.
- The value of the land in the village has increased because of the irrigation facilities provided by the *happa*. The price of the irrigated land is Rs 1,25,250 per acre and the price of unirrigated land is Rs 87,450.
- The *happa*s also meet the water needs of the livestock.

Initially the farmers' interest was very low; the success of the happas*, however, has acted as an inspiration to other farmers to construct* happas *on their land.*

The following table presents the average productivity of different crops cultivated by 20 sample farmers. We see that after the construction of the *happa*, the average productivity has improved for all the crops. This has happened despite the fact that the rainfall this year has been below normal. In West Bengal, paddy is the main crop and is grown in three seasons—Aus, Aman and Boro. As the rainfall was very poor in the surveyed year, paddy production was greatly hampered. Nevertheless, the farmers shifted to different crops such as vegetables (mainly cabbage), using the *happa* water. Table 2 presents the crop-wise area before and after the construction of the *happa*.

ECOLOGICAL BENEFITS

Sample *happas* were constructed in 2009 and 2010; therefore, the full impact of the ecological benefit is yet to be seen. The soil and moisture conservation of the watershed area has improved in the village. Because of enhanced moisture retention, microbial activities and biomass deposition have increased. As a result, the local micro environment has improved. Of the house-holds surveyed, 80 per cent say that the construction of the *happas* has checked soil erosion and run-off. Seventy per cent say that the quality of the land has improved. According to the villagers, the colour of the soil has changed from red to yellowish and the soil has become loamier; more herbs and shrubs grow in the area now and 25 per cent of the families say that the water table has improved. All the households are in favour of NGO involvement in water management.

SOCIAL BENEFITS

The water from the *happa* is used for various purposes such as bathing, washing clothes, and cleaning of utensils. Before the construction of the *happas*, 45 households had to share one dug well and one tube well for bathing as well as for drinking water. The tube well is not operational now. Migration in search of work has also been checked. According to the survey results, migration in the sample households has fallen from 21 persons to 15 persons. The process of the happa construction has also led to institutional development, in terms of greater participation of the poor and marginalized farmers in village affairs, improvement in the relationship between different stakeholders—the farmers, the traditional institutions (*panchayats*) and the bureaucracy (block-level authorities).

ECONOMIC VIABILITY OF THE *HAPPA*: COST BENEFIT ANALYSIS

This analysis of the data from the sample group gives us an idea about the economic viability of a *happa* in a drought-prone region. We compared the cost of construction of the *happa* and its annual maintenance cost with the annual benefits generated from it. We selected 20 *happas* for this analysis. A programme such as this generates social, environmental as well as economic benefits. The environmental and social benefits are difficult to estimate because of their complexity; therefore, we studied the economic benefits, in terms of the incremental income from crop production. If we were to add the environmental and social benefits to the economic benefits, the incremental benefits would be much higher.

To assess the viability of the programme in the long run, it is important to see whether the programme generates enough benefits to outweigh the costs. The construction cost of a *happa* is incurred only once. The restoration cost of a tank is estimated at Rs 500 per year and the incremental returns have been calculated by net profit from the increased production because of the *happa*. The main crops grown in the command are paddy and vegetables. The Net Present Value (NPV), the Benefit Cost Ratio (BCR) and the Internal Rate of Return (IRR) for the CBA were calculated using the standard technique. The lifetime of a *happa* is assumed to be 10 years and the discount rate is at 15 per cent, which is taken as the long-term lending rate. All the 20 *happas* in our sample were constructed between 2008 and 2010. The number of *happas* constructed each year is: 2008–1, 2009—24 and 2010—1. For our sample, the average length of the *happa* is 52 ft with a maximum of 60 ft and a minimum of 40 ft; the average width of the *happa* is 36 ft with a maximum of 50 ft and a minimum of 30 ft; and the average depth of the *happa* is 11 ft with a maximum of 12 ft and a minimum of 10 ft. The average construction cost of the *happa* is Rs. 25,260 with a maximum of Rs 33, 600 and the minimum of Rs 9,400. The average incre-mental profit per *happa* has been calculated at Rs 11,241.

The results of the CBA have been presented in Table 3. This table has been prepared by averaging the data of the 20 sample *happas* under consideration. The results reveal that there is much economic justification for the construction of happas. The present value of the benefits of the incremental returns assumed to be accrued for the next 10 years

Table 3: Cost Benefit Analysis Results for a *happa*

	Value (Rs.)
Present Value of Benefit	64.682
Present Value of of Cost	27.646
Net Pressent Value	37.36
Benefit Cost Ration	2.3
IRR	75.71

Source: Own Estimation form the Primary Ssurvey Data is calculated at Rs 64,682 and NPV is calculated as Rs 37,036. The IRR is about 75.7 per cent, much higher than the market rate of interest.

The performance of a *happa* depends greatly on rainfall. The year in which the survey was conducted was declared as a drought year for the district—the annual rainfall was 600 mm whereas the normal is about 1,400 mm. The programme would have been more successful if the rains had been normal. Though this analysis covered 20 households, the results will not differ much if more households are included.

SCALING UP

Scaling up means that the geographical area covered is enhanced. It could also mean that the number of beneficiaries of the programme is increased. The viability of scaling up of a technology depends on how much human resource development has taken place at the local level. The programme has strong potential, judged by sustainability indicators for the farmers such as increased market access, employment opportunities and more control over water resource. Farmers' beliefs and practices can be changed if a campaign is systematically planned and implemented. The key ingredient in participatory research is co-operation and understanding among stakeholders. Because most of the agricultural area is single cropped, there is a great scope for scaling up this experiment in the area and further afield. According to the reports, there is huge demand for *happa*s in this region. Initially the farmers' interest was very low; the success of the *happa*s, however, has acted as an inspiration to other farmers to construct *happa*s on their land. In fact, some households have constructed more than one *happa*. For example, in 20 households there are 26 *happa*s. At present, the *happa* programme is on in three out of five GPs of Hirbandh block. The number of *happa*s constructed each year in Hirbandh block is: 2008–09: 40, 2009–10: 950 and 2010–11: 1,200. About 2,000 *happa*s can be constructed in a single GP. The survey revealed that some people prefer the *indara* (dug well) to the *happa*. Nevertheless, on grounds of sustainability, *indara* is less preferred because it is based on ground water instead of surface water harvesting. In addition, the cost of construction of an *indara* is high. Three families could have a *happa* each for the cost of construction of one *indara*.

The major hindrances to up-scaling the programme in this region are:

i) Lack of awareness about the scheme
ii) Lack of an efficient system to invest mainstream government funds for land husbandry
iii) Lack of political will

CONCLUSION

A small irrigation structure like the *happa* has a strong impact on the livelihood security of the rural people. It has improved the productivity, intensity and diversity of crops. Farmers have diversified their production from a single *kharif* crop of paddy to other crops such as vegetables and into new areas such as fisheries; such diversifications have reduced farmers' vulnerability to the climate shock they used to face before the construction of the *happa*. The success and up-scaling of the programme depends very much on the system of planning, app-lication, execution, monitoring and fund-flow. The field survey indicates that there should be more emphasis on crop diversification. Paddy cultivation is more risky compared to crops such as maize and vegetables because the paddy crop suffers heavily when there is low rainfall. The survey results also reveal that 100 per cent of the households have said that they are unable to utilize the land fully because of lack of water. There is a huge demand for irrigation facilities in the area. The government needs to take a more pro-active role in up-scaling the experiment. To make the programme more successful, technological interventions are required, in terms of new production techniques such as SRI cultivation, new irrigation techniques such as drip and sprinkler irrigation techniques for conserving water, and introducing organic farming methods. The average annual rainfall in the district of Bankura is about 1,400 mm. Therefore, there is huge scope for enhancing irrigation if the run-off water is systematically and correctly tapped. Another advantage of this model is that the number of beneficiaries per unit expenditure spent is much higher i n the *happa* than in the bigger irrigation model. A *happa* is the private property of individual farmers; they, therefore, have an incentive for maintaining the structure. Moreover, the low maintenance cost makes it affordable for them. A strong feature of the *happa* model is that it is both replicable and sustainable. There is enough scope for uplifting of livelihoods of the marginalized sections of the rural community through this programme. This programme needs to be integrated with other watershed activities so that water can be more efficiently utilized. In addition, there is need to think about how small farmers, landless farmers and those with scattered land can avail of the benefits of this programme.

There is also great need to create awareness about the programme and to increase support for it. Involving more women in the decision-making process may also make the programme more successful. More emphasis on capacity building at the local level and the development of institutional arrangements is vital. The success and up-scaling of the programme depends greatly on its planning, application, execution, monitoring and fund-flow.