

Case studies developed by the Project team

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Multi-tier Agriculture: A case study from Purulia

Changing people's lives in Hathinada village in Ajodhya

Farming vegetables in newly created Mango Orchards have come up as a most viable livelihood for the people in the Hathinada village in Ajodhya Gram Panchayat of Baghmundi Block in Purulia. The practice creates new opportunities in bringing uncultivated/fallow lands under cultivation thus assuring income for the years till the Mango trees begin fruiting.

In Hathinada village in Ajodhya hills a small farmer Ajit Hembram and his wife Anjali Hembram used to cultivate Tomato in uplands during Kharif from which they could create an income of around ₹40000 annually. Apart from tomato they cultivated maize in homestead lands and after that mustard. They had a 1 acre patch near home which was left fallow with only Palash trees to dwell. And some shared uplands nearby which were only for tomato cultivation.



PRADAN reached out to the community in Hathinada and provided support to plan for Horticulture patches in the fallow uplands that is when they decided to turn those fallow lands into Horticulture patches. The planning was done through a community group which is a Water User's Association viz. Hathinada Champabaha Jolobyoboharkari Samity supported by PRADAN. The work was implemented by WBADMIP and started in May 2019 and completed in August 2019. A total of 6 Bighas (2 Acres) of uplands were converted into mixed fruit



Orchards with an estimated expenditure of ₹4,00,000.

Last year in Kharif he decided to cultivate tomato in the Mango orchards and got the support from WBADMIP to provide seeds and fertilizer. He cultivated tomato in 1 acre from which he gathered around 1800kg of produce which he sold for ₹40000 (approx.). Whereas this year they chose to opt for Groundnut with Pigeon-pea in 2 Bighas, Tomato in 3



Bighas and Horsegram in 1 Bighas thus utilizing all of his Mango Orchard for Multi-Tier Cropping. They got Groundnut seeds from WBADMIP. Everything else they managed on their own. Total estimated cost was about ₹6,850 (approx.) including seed and fertilizer and

additional to that around ₹7,000 on manual labour. For ploughing they used their own pair of oxen. No insecticides or pesticides were used.



All these efforts resulted to a successful produce of around 3 Quintals of Groundnut amounting to ₹12,000 adding to that they have already managed to sell around 6 quintals of tomato for ₹15,000 (approx.). This year they are expecting the total produce to be around 1.5 tonnes as compared to 1.8 of last year. So the total income expected from tomato this year is ₹34,000 (approx.).

effort for keeping the orchard clean as the field is ploughed thus minimizing weed growth. The fertilizers used for vegetable cultivation also provide nutrition to the plants thus reducing excess cost for fertilizers. This practice also helped the family to make around ₹46,000 of additional income from the uplands otherwise they would have waited for 4 years to get their 1st income from mango produce. The family expects to ensure an income of ₹50,000-₹60,000 from the Mango orchards after 6-7 years.

This multi-tier practice also facilitates no additional



To support the Mango Orchards and intercropping a WDS (Water Development Structure) has been excavated nearby this year in June in the area of 1.42 Bighas (0.19 Ha) by the WBADMIP with an estimated cost of ₹2,23,689. Ajit has cultivated Pumpkin on the bunds of the WDS. The department has also supported to provide Tilapia fingerlings to be cultivated in the WDS. A total of 8800 pieces of Tilapia amounting to ₹17,600 have been left off in the pond and also fish feed of ₹13,520 has been provided. The fingerlings were provided in



September and the harvest will be done in January-February. The expected income from the fish is about ₹25,000. For the next year the plan is to cultivate IMC (Indian Major Carps - Rui, Katla and Mrigel) in the pond as the water then will be more suitable for them.

This practice of multi-tier agriculture in the new Mango Orchards combined with aquaculture in WDS has come up as a Model for year-round income generation. This year Ajit and his family will make around ₹83,000 from the above-mentioned activities and it is expected to increase by 10-15% from next year as the WDS will help them to plan their agriculture more precisely and on time.

Sandhya and her Dreams

“When I will get a good amount from selling the mangoes of my orchard, I would like to buy a gold chain for myself. I gave all the jewellery I had to my son and daughter for their wedding.” – says Sandhya Rani Mahato, member of Khududih WUA.

Sandhya Rani and her husband Niranjan Mahato own 4.5 bigha of upland (tanr) where there were vast jungles of Sal and other trees. They cleared those jungles and trees and sowed kulthi dal (horse gram) for 35 years in 2 bighas of land, but the income from horse-gram wasn't enough for the family of 4 to carry out their expenses and save something for the future as well and so they shifted from pulse cultivation to tomato and chilly cultivation. They had seen a mango orchard in Bandudih village and since then had thought they too would also raise an orchard on their land but did not know who to approach and how to do it. Though there were provisions from the Panchayat to do it but they had trust issues from there and hence did not approach them.

In December 2018 first meeting was conducted by the PRADAN professional and the



community member and the concept of WUA, mango orchard implementation and construction of WHS was shared with them. After the meeting some member from the community were given an exposure to **Gokulnagar** WUA and **Sandhya Didi** was also part of the group that had been for the exposure, to see how the work was being carried

out and implemented. Khududih WUA was formed in 2018 and under that WUA 6.05 hectare of orchard and 6 no. of water harvesting structures have been constructed which can irrigate a total of 10 hectare of land. Out of the total area 4.81 hectares of mango orchard activity is done in Srirampur and the rest is done in Khududih village. 4 WDS have been created in Srirampur and 2 have been done in Khududih.

Sandhya had shared about the entire discussion in the meeting and the exposure to Gokulnagar made her more strong head to go ahead and build an orchard on her land. Her family members agreed and when the WUA was conducting INRM planning they submitted their plan of orchard and WHS to the WUA. But post submission of the plan there were rumours doing round in the village that the land where the orchards were raised, the fruits will be sold by the WUA only which was bit scary for them because they thought all the hard work of taking care and raising the plants will be done by us and the WUA will take the benefit. But after a meeting in the village where such questions were clarified by the dada's from PRADAN, it brought a sigh of relief for them and eventually they agreed.

The vision they had from the orchard was that once the trees after 3 – 4 years start bearing fruits they will get a higher income through less labourious input and also with that they thought that the land is used for cultivating of vegetables only for 4 – 5 months and for the rest of the year it remains idle and when there will be mango orchard they can also use it to cultivate vegetable that require less water during the summers along with watering their mango plants. They said “Even if we will not able to taste the fruits of our labour our children will get the benefit out of it and this will prove as an asset to them.”



Training on plantation of mango plants in mango orchard of SandhyaMahato

From June 2019 the implementation work of the orchard and WDS started and within 3 months the orchard and the WHS was ready. Today there are 180 mango plants and 20 guava plants in their orchard. Niranjn Mahato shares “**this year there was less rainfall and the stream through which we used to irrigate our land was not flowing we transplanted chilli and tomato on god’s faith. But rains during later filled the WHS and we are currently using it for providing irrigation.**”



WHS of SandhyaMahato and NiranjnMahato

Today they are cultivating tomato and chilli in 2 and 1.5 bigha of land and along with that they have raised carrots, coriander, radish seed beds in 15 decimal of land provided by WBADMIP and will plant potato in 1 bigha of the left over area in the patch. Besides that they have utilised the bunds alongside of the orchard by planting pigeon pea on them. NiranjnMahato says that the other benefit of intercropping is that we don’t need to add additional inputs to the mango trees, the fertiliser, and pesticide/insecticide given to the



SandhyaMahato and NiranjnMahato in their Mango orchard with their tomato and chilly plants inter cropped

vegetables are also utilised by the mango plants and the irrigation given to the vegetables also gives irrigation to the plants. Once the mango plants grow into trees, vegetables like yam, turmeric, ginger etc can be grown giving us income from both the trees as well as vegetables. Till now they have earned 10,000 rs from their land expect to earn more 1 lakh rs from it.

Expenditure and income calculation for intercropping in mango orchard of 4.5 bigha of land:-

EXPENSES FOR INTERCROPPING				INCOME FROM INTER CROPPING				
Input for Vegetable farming (0.6 Ha)	Unit	Price	Total	Inter crops (0.6)	Ongoing produce (Till November 2nd week)	Rate	Income generated	Expected income
Tomato seed	4 pkt	300/10gm	1200	Tomatoes	70 kg	20	1400	35000
Chilli seed	2pkt	400/10 gm	800	Chilli	140 kg	35rs/Kg	4900	48000
Carrot	100 gm	2500/kg	250	Carrot	Yet to sell harvest			5000
Potato	50kg	18/kg	900	Potato	Planned for sowing			25000
Radish	100gm	2240/kg	224	Radish	Yet to sell harvest			15000
DAP	10kg	30rs/kg	300	Total Income :-			8300	115000
Phospahte	5kg	16rs/kg	80					
Micro nutrient	2kg	400/kg	800					
Pesticide/Insecticide			1000					
Total Expenditure			5554					

Sandhya Mahato's mango orchard has helped other members of the community to believe that plans taken can also be implemented and do not just remain I pen and paper and hence many other members are approaching the WUA, PRADAN and even the orchard owners to incorporate their plans for the coming years. Sandhya Didi when asked about her plans of building more orchards in other uplands says "in other patch I have a small area for orchard around 1.5 bigha I will try to convince other people who have land nearby to give their plans in the coming year."

The Income estimated from mango orchard on approximate value from 180 mango trees after fruiting starts.

Year	Production in (Kg/tree)	Rate (Rs)	Total Income
1st Year	10	30	36000
2nd Year	20	30	108000
3rd Year	40	35	252000
4th Year	40	35	252000
5th Year	60	35	378000
Total Income in 5 years :-			1026000

Fish on Hills- A case study from Purulia

Fishery in Ajodhya Hills as a source of year-round income

Fishery in Existing water harvesting structures or ponds is now an option for the farmers to do commendable income over a period of time. Along with the support to the farmlands for paddy or vegetable cultivation these structures are now being extensively utilised for fishery cultivation in Hathinada village in Ajodhya Gram Panchayet of Baghmundi Block.

Guhiram Mandi a small farmer along with his wife Sonamuni Mandi in Hathinada village has chosen this option for additional source of income. They have a perennial pond which was excavated in 2007 by the support from D.R.D.C. Purulia in an area about 49 decimals (21562 sq. ft.). Earlier the use was only limited to providing irrigation to farmlands until next year when they decided to buy some fingerlings from a local seller and left them in their pond. To their surprise they got enough fish to eat twice a week.



Then he decided to invest some more (₹3000 approx.) the following year. He brought Rui, Mrigel, and Katla as they were available in the nearest of markets in Baghmundi and Arsha. That year he managed to sell the fish and garnered an income of ₹8000. Also the family started having fish in their meal about thrice in a week. He saw the opportunity and continued doing the same for years. In the coming years he faced challenges in finding good varieties, improper rainfall and financial issues in some years.

In 2017 the fishery division of WBADMIP Puruliya decided to support the ponds in Ajodhya with proper aquaculture techniques and providing good varieties of fishes. Guhiram sought this opportunity and with the support of PRADAN he submitted his plan for the same. In August 2017 he got Rui, Mrigel and Katla (Indian Major Carps) and Grass-carps, American Rui/ Common Carps and Silver Carps (Exotic Carps) from the department. Apart from providing fingerlings & feed, department also provided technical support and trainings like pond preparation by removing aquatic weeds and unwanted fishes, pH checking and balancing, liming, stocking of advanced fingerlings, incubation of fingerlings, application of supplementary feed, fish health monitoring which was done every 15 day and also the most suitable ways of harvesting.

Sl. No.	Type	Quantity(Pc / Kg)	Rate(₹/Pc /Kg)	Total(₹)
1	IMC	1470	6	8820
2	Exotic carps	840	5.5	4620
3	Feed	270	45	12150
4	Lime	100	14	1400
TOTAL				26990



Department Fishery specialist imparting training of beneficiaries and other women on Plankton measurement.

All these trainings and support helped the family to gather an income of about ₹48000 and also assurance of fish in meal for thrice in a week. Guhiram planned to deposit 10% of his income to the WUA (Hathinada Champabaha Jolbyoboharkari Samity). He also stocked ₹10000 for buying fingerlings for the coming year. With the knowledge and resources in hand he is expecting an income of about ₹60000 this year.

Fishery has become an integral part of his livelihood planning in the past few years and plans to achieve more in the coming years. The income as he states has helped in up gradation of lifestyle of the whole family as now they can afford nutritious food and good medication when needed. With the additional income he is planning to buy some land or more such ponds in the nearby villages to extend his activities and gather more income.



Guhiram's efforts and his achievement has become an example of success which motivated more 64 families to choose fishery as a viable livelihood option in Ajodhya.

Groundnut-a highly remunerative crop during kharif for uplands & fallow lands in Purulia

-A case study from Purulia DPMU

Jorisha is a heterogeneous village with 172 families in Kashipur block of Purulia district. Total household of the village is 172 It is a Backward Caste (OBC) dominated village. Intermittent drought is the regular phenomenon of the village though agriculture is the major source of income of the farming community. In 2017 a Water User's Association was formed comprising 79 marginal and small farmers with the support of DPMU, Purulia. Both men and women were involved in the WUA.

Same year a river lift irrigation (RLI) was constructed on a small river named Boko by the ADMI Project in Jorisha village for creation of irrigation facilities. The actual command area of this irrigation facility is **12 hectare (ha)**. Besides, saving Kharif paddy from the drought with the supplemental irrigation as and when needed, farmers of WUA started cultivation of Rabi and Pre Kharif crops by using RLI irrigation facility for enhancement of economic condition of the benefitted farmers.

In Purulia, generally farmers are not practicing the improved agricultural practices on commercial basis, however, relatively progressive farmers are coming forward to accept scientific agricultural practices on commercial basis for more earnings.

During 2019, the WUA members got training on seasonal agriculture practices and gained knowledge on modern methods and technology for improved cropping practices on improved seed variety, crop management and irrigation management which is very effective for the area.

The community development of support organization (SO) and agriculture support services (ASS) team of the ADMI Project successfully motivated and trained the farmers to change their knowledge, attitude and practices (KAP) in favour of scientific and commercial agriculture. Improving their knowledge from traditional to modern agriculture practices, the farmers started adopting and spreading technologies that is suitable for their agro ecological conditions. **During Kharif 2019-2020**, the farmers were motivated and trained to utilise their relatively upland, where paddy cultivation is unpredictable and the fallow lands by introduction of "**Groundnut**" (**Variety-K-6, 90d duration**) The seeds were provided from the project. These lands remained uncultivated during the previous years. Total **35 Bighas** of land was cultivated in a cluster format (DC) by **46 WUA members**.

Improved practices like, seed treatment with Rhizobium culture, line sowing, intercultural operation, recommended dose of fertilisers etc were followed. It has been observed that all farmers were very much enthusiastic and sincere during the entire cultivation period. The average productivity was **3.2 quintal/bigha**. Total market value was **Rs. 12,800/- @ Rs.40 per Kg**, with an investment of **Rs 6000/- per bigha and net profit of Rs.6800.00 per bigha**. The

total production of 35 bighas was **110 quintal** of which market value is **Rs. 4,40,000/-**. Total investment for 35 bigha was **Rs 2,10,000**. After harvesting they earned **Rs 2,30,000 as net profit**.

The WUA members have planned to preserve the seed for the next Kharif season for a target of sowing in 50 bighas area. The significant achievement behind the groundnut cultivation **was generation of additional income** beside paddy cultivation during kharif season. They are convinced to take this type of endeavour for enhancement of their livelihood in future.

During this kharif season, total 450 bighas have been cultivated with Groundnut in the fallows and uplands by involving 425 farmers in our ADMI Project areas covering 8 blocks.

Cost of cultivation of Groundnut & Paddy during Kharif

S No	Item	Kharif Groundnut (Rs)	Kharif Paddy (Rs)
1	Land preparation	500	850
2	Seed	800	240
3	Chemical fertilizer	300	650
4	Organic fertilizer & micronutrient	800	100
5	Plant Protection	200	250
6	Irrigation	400	650
7	Labour cost (hired & own)	3000	1970
8	Total cost of cultivation	6000.00	4710.00
9	Total Production	3.2 qtl	4.8 qtl
10	Selling Price (Rs)	40/- per kg	15 /- per Kg
11	Gross income (Rs)	12800.00	7200.00
12	Net Profit (Rs.)	6800.00	2490.00

S No	Crops	Water Requirement (acre inch)	Quantity of water/irrigation (inch)	Irrigation interval (days)	Normal sowing time
1.	Kharif Paddy	45-50	2.0-2.5	5-6	
2	Groundnut	15-20	2.0-2.5	20-25	Nov-March & April-July
3	Kharif Groundnut		Rainfed, maximum one (1) supplemental light irrigation during kharif may be required		

Water requirement for groundnut and paddy





1. Groundnut field selection



2. Groundnut decortication



3. Rhizobium culture



10. Stripping of pods by wua members



4. Seed sowing



9. Drying groundnut in the field



5. Groundnut seed emergence



8. Harvesting of groundnut



7. Pegging in groundnut



6. Intercultural Operation

Schematic Representation of Groundnut Cultivation

Maize an alternative to Paddy during Kharif season

-A case study for Birbhum DPMU

Due to unpredictable climatic condition during monsoon, there has been a decline in the production of Kharif paddy in the recent years, having direct impact on the economic return of the farmers.

Keeping this in mind, DPMU, Birbhum selected some climate resilient short duration crops like Maize, Black Gram & Radish to be grown as a totally rainfed sustainable alternative to Paddy in medium lands, relatively uplands & temporarily fallows.

As a follow up, during Kharif, 2019, a short duration (90 - 95 d) Hybrid Maize (Bio-9637) provided from the Project, was grown in such land ecosystem in a total area of 43 bigha (5.7 ha) in 3 WUAs covering 51 farmers. The result was very encouraging and the farmers could get a net profit of **Rs 11100.00** per bigha with the cultivation of Hybrid Maize as against an average net profit of **Rs. 3400 - 3800** per bigha with Kharif Paddy. The details are mentioned below.

Variety: Hybrid (Bio 9637) Duration: 90-95 days

Kanmora Jhairthan cluster II PDW Solar

S No	Total no of farmers	Area (Bigha)
1	23	15

Madarpur PDW

S No	Total no of farmers	Area (Bigha)
1	26	18

Khordanagri baragaon CD WUA

Sl.No	Total no of farmers	Area(Bigha)
1	2	10

S No	Crops	Water Requirement (acre inch)	Quantity of water / irrigation (inch)	Irrigation interval (days)
1.	Kharif Paddy	45-50	2.0-2.5	5-6
2	Rabi Maize	18-20	2.5-3.0	20-22
3	Kharif Maize	Rainfed, supplemental irrigation during kharif usually not required		

Crop water requirement

Cost of cultivation / Bigha (Paddy & Maize)

S No	Item	Kharif Maize (Rs)	Kharif Paddy (Rs)
1	Land preparation	1000	950
2	Seed	350	240
3	Chemical fertilizer	800	750
4	Bio-fertilizer	500	500
5	Plant Protection	250	350
6	Irrigation (Rainfed)	Nil	650
7	Labour cost (hired & own)	2000	2675
8	Total cost of cultivation	4900.00	6115.00
9	Total Production	8 qtl	6.5 qtl
10	Selling Price	20/kg	15 / Kg
11	Gross income	16000.00	9750.00
12	Net income	11100.00	3635.00



Seed Treatment



Decimal DMS
 Latitude 24.00446 24°0'16" N
 Longitude 87.249879 87°14'59" E
 2019-06-26(Wed) 07:27(AM)





Case Study of Ranigram Sri Gonsaibaba Check Dam WUA

A newly formed WUA, Block- Rajnagar, Block – Rajnagar, Birbhum

*Ranigram Sri Gonsaibaba Check dam - WUA is a relatively new Water Users' Association with 45 members and nine member management board. Three of the MC members are women. WUA has started promoting fisheries in an organized manner in one big pond. There is formation of Fisheries Interest Group with 11 members. WUA is also going to start a new technology / method of fish rearing - **Cage fish culture of Koi carp (desi)** by using 5 small cages. The cages are formed and procured by the WUA and soon it will start. Members are quite aware about availing financial services for the business. Out of the total 45 members, 15 are availing Kisan Credit Card (KCC). Besides Kisan Credit Card, 2 members have also got credit services from cooperative and 20 from SHGs. All the 45 members of the WUA are also getting loans from **Bandhan bank and Aarohan (MFI)** for agriculture and fisheries activities. **All the 45 (100%) members are having Health insurance under Rastriya Swasthya Bima Yojna.** Out of the 45 families in the WUA, **34 (75.55 %) families are already linked with SHGs** so women participation in various activities is high. Private players play role in providing services to take water from source to the field. WUA is planning to purchase two pumps and also pipes so as to provide water services at the field of the farmers. Possibilities of innovative methods like sprinklers and drip irrigation are also high. It will increase the efficient use of water by the farmers.*

The Ranigram Sri Gonsaibaba Check dam was constructed on Jahanabad – Arali Stream to cover 8 hectare area for irrigation with an estimated cost of Rs. 81.93 lakh.

Formation and Legal Status of WUA - Ranigram Sri Gonsaibaba Check dam Water Users Association is a legal entity by virtue of its registration under West Bengal Societies registration Act 1961. Since it was registered on 27.05.2016, so it has yet to complete one year of its functioning and therefore considered as a new WUA. The structure was handed over to the WUA on 16th June 2017.

Membership Fee – The membership fee per member in the WUA is Rs. 10 per month. This is a meager amount so not much funds are generated out of it.

Composition of WUA in terms of membership — Ranigram Sri Gonsaibaba Check dam - WUA is having a membership of 45 wherein 27 are small and marginal farmers and 18 are tenant farmers who do farming on leased lands.

Special initiatives of WUA

Changes in the agriculture after availability of water: After the arrangement of water, the cropping pattern has changed in the area:

Kharif – Now after the arrangement of water vegetables like tomatoes, cabbage, cauliflower is grown in 37 bighas. Paddy cultivation is taken up in SRI process in 6 Bighas.

Rabi – Rabi crop is cultivated in 54.5 bighas for the first time this year. Earlier members were able to use only 5-6 Bighas. Sweet pea and French beans are two new crops that are introduced. Bengal Gram cultivation has also increased. Wheat and mustard was also cultivated by few farmers.

Pre-Kharif – In pre-kharif vegetables were grown in 20 bighas for the first time. Vegetable cultivation is also taken up in Poly house for demonstration purpose.

Nursery activity has also taken up by WUA, using new technology– using pluck tray and poly tunnel

Fisheries Promotion: WUA has started promoting fisheries in an organized manner in one big pond. Production has increased from 1.5 quintals to 14.5 quintals. Further scientific fish culture started in 23 other ponds. There is formation of Fisheries interest group with 11 members. Out of the 11 FIG members, 5 have taken pond on lease.

Cage fish culture - a new technology / method of fish rearing - Cage fish culture of Koi carp (desi) by using 5 small cages. The cages are formed and procured by the WUA and soon it will start. It will be an innovative activity in the area.

WUA has taken a more than 3 bigha pond for the pilot project. Out of the total outputs 25% will be given to the owner. The varieties of fish will be Rohu, Katla, Mrigal, Silver carp and Gold carp

Water charges – The water charges in Kharif are Rs. 100 per bigha whereas in Rabi season – Rs. 50 per bigha.

Besides the access to water through WUA, members need to get the services of private people who are providing pump for the water lifting. The rates are Rs. 100 per hour. Here the farmers have to pay for the services of the private players for pumping water and taking water from the source to their fields.

Keeping in view the dependency on private players, the WUA is planning to purchase two pumps (China Pumps).

Linkage of members with SHGs: Out of the 45 families in the WUA, 34 (75.55 %) families are already linked with one or the other SHGs. There are 8 SHGs in the area.

Financial services to the members

Credit: Out of the total 45 members, 15 are availing Kisan Credit Card (KCC) for getting credit for agriculture activities from banks and cooperative. Besides Kisan Credit Card, 2 members have also got credit services from cooperative and 20 from SHGs. All the 45 members of the WUA are also getting loans from Bandhan bank and Aarohan (MFI) for agriculture and fisheries activities.

Savings: Mandatory savings are going on through SHGs that covers 20 members. About seventeen members also do voluntary savings in banks directly and 20 in Post offices. Out of the members doing savings in banks and Post Office 8 members are common. Ten members are also doing savings in chit fund companies.

Insurance: As far as insurance services are concerned, 5 members are having crop insurance from banks. It is good to note that 45 (100%) members are having Health insurance under Rastriya Swasthya Bima Yojna. Fifteen members have also got insurance for their livestock from Panchayat.

Byelaws / Rules and Regulations of WUAs – WUA is having well defined, written, articulated Byelaws. Members are aware about their rights and duties.

Results of the project support and functioning of WUAs

Increase in cropping intensity and diversification of crops due to assured irrigation – Earlier farmers were mainly cultivating paddy but now they are growing cultivating variety of vegetables such as tomatoes, cabbage and cauliflower etc. in Kharif and Sweet pea, French beans and Bengal Gram in rabi season.

Productivity enhancement and quality improvement – Due to adequate and timely irrigation facilities productivity per acre has enhanced

Enhanced knowledge base on irrigation and agriculture practices – Due to the demonstration plots and guidance from project team and agriculture experts the knowledge of members has enhanced. It is seen that members are well aware about the new method of doing fisheries. New Livelihood opportunities – WUA has provided new opportunities of livelihoods to the farmers in the area of fisheries.

Problem Faced by WUA-

Problem - Members of the WUA have to hire the services of the private players who provide water pumping set and pipes to take water to the fields.

Suggestion - Innovative system of water like sprinklers, drip irrigation etc. can be used here as most of the farmers are doing vegetables in rabi season. Besides this arrangement of taking water from the source to the fields of the farmers are to be made.

Problem- Water is available in sufficient quantity during rainy season however in summers water availability is less

Suggestion – There is a need for more water harvesting methods. LPDE tanks at the field level wherever possible will be useful.

Future possibilities and plan

Fisheries activities can be up-scaled in an organized manner. WUA is also planning to introduce Cage fish culture of Koi carp (desi) by using 5 small cages.

Since marketing is a major problem therefore, a second level organization at the cluster level for aggregation and marketing is required.

WUA is planning to purchase two pumps and also pipes so as to provide water services at the field of the farmers.

WUA has also planned to create two small water bodies in the form of hapas in the downstream of the kandor to increase the actual command area and water availability

WUA is also planning to enhance the paddy cultivation using SRI technology to 40 Bighas and tomato cultivation in 40 bighas during Kharif season

Nursery raising using new technology - pluck tray and poly tunnels to be used

WUA is also planning to introduce – seed treatment technology with at least 50 % of WUA members; increasing the sweet pea and French beans area from 10 to 15 Bigha; Rhizobium culture for pulses cultivation; vermi composting; intercropping – coriander and bitter gourd; vegetable cultivation in poly houses

Case Study of a Successful WUA- Arrah –II Mini RLI WUA

Bhutsahar, Block – Simlapal, Bankura, West Bengal

Arrah – II Mini RLI Water Users' Association is a successful WUA due to the fact that it is changing the lives of the farmers by assuring water and therefore better and diversified crop production. For financial services, almost all the families of WUA are catered by a Primary Agriculture Cooperative Society (PACS) which was formed in 1962. Special aspect of the WUA is that Women play lead role in recovering the overdues of water charges. By promoting fisheries WUA has provided an additional livelihood option to 13 households who are member of fisheries interest group (FIG). Production and productivity has enhanced thereby providing better surplus to the farmers. It is a good cluster of Pumpkin cultivation now.

Composition of WUA in terms of membership – The members of Arrah-II WUA are predominantly small and marginal farmers. All the farmers are the landowners. Out of the total 94 members of WUA, 30 belong to Scheduled Caste, 5 Scheduled Tribe and 59 General category. Arrah – II WUA is having 2 women members. Around 70 women of the WUA households, are members of one or the other SHGs. WUA and SHGs work in close coordination so women participation is high.

Legal Status of WUA - Arrah –II, Water Users Association is a legal entity by virtue of its registration under West Bengal Societies Registration Act 1961. Arrah –II WUA was formed on 1st February 2013, however it got registered after six months on 1st August 2013. Since it has completed 3 years and 8 months of its functioning, therefore it can be considered as a mature WUA.

Area of operation of WUA – The command are of the WUA is 20 Hectare. The mini RLI structure was completed on 2-3-2015 at the cost of Rs. 19.73 lakh. The source of water for the WUA is Jayponda khal (Shilabati River). For providing irrigation to the farmers, WUA has managed to create 9 spouts.

Management of the Pump and irrigation: Arrah –II, WUA has engaged one pump operator. The pump used by the WUA has power of 20 HP. A total amount of Rs. 1500 per month is provided to the operator for his services to WUA for ten months in a year. While infrastructure related to the water in the form of pump and pump house is provided by the project, small implements and equipments such as sockets, pipes etc. are managed by the members themselves.

Financial condition of the WUA – The Association is having Rs. 97,992 in bank and Rs. 42000 in hand. Rs. 20000 is the water Tax which is due for Rabi season.

Special initiatives of Arrah WUA

Collection of Water charges through Women

For one bigha, the water charges are Rs. 500. Normally, one field is irrigated 9-14 times. One of the special initiatives is that for water collection especially when it is overdue, women associated with different SHGs put peer pressure and help in collection of dues. This has effectively been done. Women first try to understand the reasons of non-payment by the household and then help the household to become free from the water overdue. Women also help in sowing of potatoes and managing irrigation in their households. WUA women are actively helping in recovery of loans taken by members from the cooperative society.

Sharmdan for creating a dam – The members of the WUA has high level of cohesiveness. By putting collective labour, members have created a dam to harvest water. It is 80ft long and x 50 ft wide. Earlier the members were growing paddy in Kharif but not able to use rabi season well and growing some pulses only. Now, in rabi season they grow potato in 44 acre. The cluster is also known for Pumpkin as 30 acre of land is utilized to grow pumpkin.

Social Activities – WUA has organized two eye camps and cataract eye surgeries were done for 64 persons free of cost.

Purchase of extra water lifting pump – WUA has also purchased an additional water lifting pump from their own funds.

Equipments to operator as it is the area of snakes - WUA has decided to give long boots and charger light to the operator as the area has lot of snakes.

Spout-wise list of farmers- A spout-wise list of farmers is prepared so as to plan well in advance. Each farmer-wise irrigation schedule is planned well. Four spouts out of 9 can run simultaneously.

Innovative system of naming the spouts – WUA is having a good system of naming the spouts and they have demarcated farmer-wise command areas.

Meeting of the WUA – Meetings of the WUA is organized every month. Women found to be very vocal and participatory in nature.

Governing body and Sub -committees – There are 11 members in the governing body of the WUA. The WUA is having sub-committees for various specific purposes. There is a no conflict situation due to transparency and timely planning.

Fisheries promotion through Fisheries interest group (FIG)

WUA is promoting fisheries in an organized manner. There is a knowledgeable Fisheries Specialist catering to the technical needs of the fish farmers. A demonstration unit is established in 0.6 hectare community pond. In addition to this two ponds – 5 bigha and 3 bigha has been taken on lease. Fisheries Committee is comprised of 13 members. FIG has taken up the activity not purely as business activity but also a social activity out of the total income, 40% is used for next year's operation, 3% is given to WUA and remaining 57% is used for taking other ponds. FIG is provided with 5 nets, 3 vending boxes and 3 handies.

In this area, 24 WUAs have taken up fisheries activity so it has become a fisheries cluster. They prefer short term variety called 'Desi Magur'. Per kg rate of this fish is Rs. 600. Two hatcheries are being promoted by associating 42 tribal women. A demonstration of *desi magur* variety was done.

Operation and Maintenance Planning (O&M Plans)

A pump log book is maintained wherein the operator records day-wise details of the running of pump. The pump operator fills the register about the utilization of pump such as for whom the pump was used, area/ no. of plots for which the water was used. WUA is also maintaining the member register wherein spout details, plot no. and size, monthly fee, irrigation and production details are maintained.

Financial services to the members – cent percent needy farmers covered

It is a unique WUA wherein the credit needs of majority of farmers are met by Bhutsahar sambay Krishi Unnyan Samiti (PACS). Out of total 94 households associated with 90 are getting credit and savings services from the cooperative society. The cooperative society is getting funds from banks at the rate of 5% and lending to their members at the rate of 7%. If loan is repaid by April 31st, 7% is charged, however if delayed up to August 31st then 11% interest is charged. PACS has given loans worth Rs. 42.66 Lakhs to the members. There is also a case of

Term loan which is provided from Bangiyo Gramin Vikas bank. Three members do not take loan from any agency.

Savings in bank and Post office – Out of the total members, 70 are associated with one or the other SHGs and therefore doing mandatory savings ranging from Rs. 40-60. Out of the total members, 70 are also having their savings banks accounts in bank. Additionally 5 are having savings in Post offices.

Crop Insurance – Out of 94 members, 90 are having crop insurance from Bhutsahar Sambay Krishi Unnyan Samiti (PACS). As per the members, for the crop damage in 2013-14, members of the cooperatives got crop insurance benefits. It was 57.99 % of the total loans taken by them.

Transfer of money – Members of WUA are keen to opt for digital money transfer services however they want more awareness to be given.

Key Results of the project support in Aarrah -II WUA

Increase in cropping intensity and diversification of crops due to assured irrigation – Members started taking more than one crop. Shifted from pulses to Paddy Cultivation and also growing Pumpkin in a big way

Enhancement of Agriculture/ Horticulture Production – Timely supply of water has also resulted into increase production

Reduced risks - Availability of water has reduced risks of the farmers and therefore cooperative find it safe to loan to farmers

Alternative livelihood option of Fisheries in addition to agriculture – 13 farmers have formed a Fisheries Interest Group (FIG) and they are able to generate income out of the activity and also nutritious food for family

Enhanced knowledge base on irrigation and agriculture practices – The knowledge base of the farmers due to demonstration has enhanced in agriculture and fisheries.

A Case Study of Talpukur Udyog PDW Cluster-II, WUA

A newly formed WUA, Block- Rajnagar, Block – Rajnagar, Birbhum

Talpukur Udyog PWD Cluster-II - WUA is a relatively new Water Users' Association with 22 members and nine-member management board. One of the MC members is women.

*The members of the WUA are quite active. WUA is also having a good notice board where the information about meeting is communicated. Meetings are regular and on the set date. Details of the members are well depicted on the wall. All the **18 Households are associated with SHGs and therefore women participation in various activities is quite high.***

WUA is having hour-based system of water charges. Rs. 40 is charged for one hour. Members are quite aware about availing financial services for the business. Out of the total 18 members, 6 are availing Kisan Credit Card (KCC). Seven cases are also submitted for KCC. Besides Kisan Credit Card, 2 members have also got credit services from cooperative. All the 18 Households are also covered under crop insurance and health insurance support from Government schemes. The Sangha of SHGs is also formed here with participation of 10 SHGs of the area.

It is a good Tomato cluster; however, marketing of tomatoes is a problem. Farmers are not able to get good rates. There is high scope of small processing unit of tomatoes in the area. Since all the women of the WUA Households are in SHGs and actively participating in the activities of WUA therefore, WUA management, record keeping and communication within WUA is very high.

Under Talpukur Udyog PWD Cluster-II scheme, three dug wells are there. The scheme was handed over to the WUA on 29-08- 2016. The estimated cost of the scheme was Rs. 22.53 lakh. There was a provision of Sprinklers under the scheme so that the efficiency of the water use is maintained.

Formation and Legal Status of WUA - Talpukur Udyog PWD Cluster-II - WUA is a legal entity by virtue of its registration under West Bengal Societies registration Act 1961. Since it was registered on 27.05.2016, so it has yet to complete one year of its functioning and therefore considered as a new WUA.

Composition of WUA in terms of membership - Talpukur Udyog PWD Cluster-II - WUA is having a membership of 18 small and marginal farmers. Out of 18 members, 16 are men and 2 women. All the members are owners of the land so there are no tenant farmers in this WUA.

Membership Fee – The membership fee per member in the WUA is Rs. 10 per month. This is a meager amount so not much funds are generated out of it.

Participation of members: The members of the WUA are quite active. Good wall writing is seen about the project. WUA is also having a good notice board. Details of the members are well depicted on the wall. Meetings are regular and on the set date.

Water charges – The water charges are in terms of hours. Members are paying Rs. 40 per hour.

Details of the Governing body – There are 9 members in the Management committee including 2 women members. Details of the Governing body are also depicted on the wall so that members know that who are in the governing body.

Special initiatives of WUA

Changes in the agriculture after availability of water: After the arrangement of water, the cropping pattern has changed in the area:

Kharif – Now after the arrangement of water vegetables especially tomatoes are grown in 16 bighas. Paddy cultivation is taken up in 20 Bighas. Before the irrigation arrangements through the project only 20 Bighas was used for paddy cultivation.

Rabi – Before the irrigation arrangements rabi season was not used. After the irrigation arrangement, Rabi crop is cultivated in 33 bighas and Tomatoes in 8 Bighas.

Financial services to the members

Credit: Members are quite aware about availing financial services for the business. Out of the total 18 members, 6 are availing Kisan Credit Card (KCC). Seven cases are also submitted for KCC. Besides Kisan Credit Card, 2 members have also got credit services from cooperative. All the 18 Households are associated with SHGs and therefore women participation in various activities is quite high. The Sangha/ federation of SHGs is also formed here with participation of 10 SHGs of the area.

Savings: Mandatory savings are going on through SHGs that covers all the 18 members. All the members are doing voluntary savings in banks directly and 3 in Post offices.

Insurance: As far as insurance services are concerned, all the 18 members are having crop insurance from banks. All the 18 Households are also covered under crop insurance and health insurance support from Government schemes – PMFBY and Rastriya Swasthya Bima Yojna.

Byelaws / Rules and Regulations of WUAs – WUA is having well defined, written, articulated Byelaws. Members are aware about their rights and duties.

Results of the project support and functioning of WUAs

Increase in cropping intensity and diversification of crops due to assured irrigation – Earlier farmers were mainly cultivating paddy but now they are growing cultivating variety of vegetables especially tomatoes.

Productivity enhancement and quality improvement– Due to adequate and timely irrigation facilities productivity per acre has enhanced

Problem Faced by WUA

Problem – The production of tomatoes is high this year (2016-17). About 30 Quintal tomatoes are from the cluster itself. Members are getting Rs. 1 per kg of Tomatoes. Marketing is the major problem of the farmers here.

Suggestion – A system of procurement from the members and collective marketing is required. Market linkages are badly needed. With support from a technical agency, processing/ semi-processing can also be done.

Future possibilities and plan

WUA will initiate Seed treatment technology among all the members of WUA

Since marketing is a major problem therefore, a second level organization at the cluster level for aggregation and marketing is required.

WUA will introduce wheat cultivation through Zero Tillage Machine

Nursery raising using new technology - pluck tray and poly tunnels to be used

WUA will promote Composite fish culture in one pond

Skills training on Sauce making to the women members of SHGs is also planned by WUA

WUA is also planning to introduce – Rhizobium culture for pulses cultivation; vermi composting; vegetable cultivation in poly houses

A Case Study of a Successful WUA-Panchgachiya MDTW WUA,

Tarakeshwar Hooghly, Gram Panchayat – Naita Malpaharpur

Panchgachiya MDTW Water Users Association is an innovative type, multi activity Water Users' association due to the fact that it has initiated several new activities like vermi composting in HDPE bags, renting out agriculture implements and tools to farmers, and adopting a zero waste water approach by creating a pond near the Tube well using their own money and NREGA Support. The pond is used for various domestic purposes. WUA has also constructed a multipurpose room from its own funds to keep small implements and tools and agriculture inputs. It has also started giving services beyond its Command area and getting more revenue. Majority of the members are getting benefits of Kisan Credit Cards. It is a good example of a successful and sustainable WUA.

Production and productivity has enhanced thereby providing better surplus to the farmers.

Composition of WUA in terms of membership – The members of Panchgachiya WUA are predominantly small and marginal farmers, however the association has also given membership to Tenant farmers. Out of the total 88 members of WUA, 20 (22.72%) are tenant farmers. In Panchgachiya WUA, 3 are Scheduled Tribes, 23 OBC and remaining 62 general category members. Panchgachiya WUA is having 6 women members, out of which three are ST women. Around 35 women of the WUA households, are members of one or the other SHGs.

Legal Status of WUA - Panchgachiya MDTW Water Users Association is a legal entity by virtue of its registration under West Bengal Societies registration Act 1961. Since it was registered on 7th Nov. 2012, so it has completed 4 years of its functioning and therefore considered as mature WUA.

Land Size of members: The average size of the land in the village is 2.5 Bigha, however there are about 20 member who are having 7-8 Bigha of land. Since it is a water user association therefore the services of water cannot be denied to anybody who comes under the command area.

Area of operation of WUA and change in land utilization patterns - Out of 150 Bigha land which is under the command area of WUA, members are able to use 125 Bigha for the agriculture purpose. Earlier, members of WUA were able to use only 25 bigha of their land for cultivation but after irrigation arrangements under the project, it has increased to 125 Bigha. Crop intensity has also changed. Earlier they were growing paddy as a main crop, utilizing only 25 bigha of land. In rabi season, they were growing potatoes. Rest of the year, they were not able to use the land properly due to deficiency of water. After the arrangement of water, farmers are able to take even 4 crops in a year - Paddy, Potatoes, Groundnuts and other vegetables.

Management of the Pump and irrigation: Panchgachiya WUA has engaged two pump operators. The pump used by the WUA has capacity of 20 HP. There are 10 spouts. A total amount of Rs. 2500 per month is provided to two operators for their services.

While infrastructure related to the water in the form of pump and pump house is provided by the project, small implements and equipments such as sockets (11), Dual Nipple, pipes etc. are managed by the members themselves.

Special initiatives of Panchgachiya WUA

“Zero waste of water”: WUA members have constructed a pond with the help of NREGA scheme and their own contributions. This pond is created to utilize the water which is otherwise wasted due to overflow. The pond is used for multiple domestic purposes like bathing, washing of clothes etc. This is a good example of convergence with NREGA.

If the pond is compartmentalized into domestic purpose pond and fisheries pond then fisheries can also done systematically.

Room for keeping small implements and tools – WUA has also constructed a separate room from their own funds. Room is created by donation of money given by the members. An amount of Rs. 80,000 was collected to construct the multi-purpose room to keep small implements and tools and agriculture inputs. The donors are mostly those who are associated with WUA as tenant farmers.

Giving services beyond the Command area: Panchgachiya MDTW Water Users Association, based on the demand from outside the command area and availability of water, provides services to the farmers. The extended area is about 10 Bigha. About ten farmers are additionally benefited from WUA.

Vermi-composting in High-density polyethylene (HDPE) bags: WUAs has also initiated to provide HDPE bags to the members of SHGs for production of Vermi compost.

Linkage with ‘Sufal Bangla’ – The farmers of the WUA are enrolled with ‘Sufal Bangla’ initiative of Government however they are not the members of any Farmers Producer Company. There is an arrangement of selling the farmers’ produce to ‘Sufal Bangla’. In the cluster, there are two producer companies already in existence. In Dhania Khali, there is a market where the vehicle of ‘Sufal Bangla’ comes for collecting the farmers’ produce in the morning. The farmers of Panchgachiya give their produce to ‘Safal Bangla’ at the rates that are decided for the particular product and also publicly communicated. There is high level of transparency in the purchase system. From ‘Sufal Bangla’ farmers are able to get good rates. The arrangement of transport is informally done by group of farmers.

Operation and Maintenance Planning (O&M Plans)

WUA is preparing Operational and Maintenance/ irrigation plans. There is a pump log book wherein the operator records day-wise details of the running of pump. The pump operator fills the register about the utilization of pump such as for whom the pump was used, area/ no. of plots for which the water was used.

WUA is also maintaining the member register wherein spout details, plot no. and size, monthly fee, irrigation and production details are maintained. WUA is also keeping a crop register in which details of the crops in each plot is detailed out. The irrigation register is also maintained well. This register provides details of crop-wise irrigation.

Irrigation services

For the irrigation services, WUA members decided differential rate for water use democratically. For example, for paddy Rs. 300 per Bigha is charged. Similarly, for other key vegetables like point guard and ‘Arum’, they have fixed different rates of Rs. 15 and Rs. 35 per Kaththa. Besides water charges, WUA also collects Rs. 2 per month per member as management charges.

(*Land Measurement Formula in West Bengal : 16 Chhatank = 1 Kaththa = 2.5 Decimal; 20 Kaththa = 1 Beegha; 1 Acre = 3 Beegha 8 Chhatank = 3.5 Beegha)

Financial services to the members -

Farmers are using their Kishan Credit Cards and cooperatives to get production loans. Families associated with SHGs are getting emergency loans from their SHGs. Out of 88 members, 78

members have availed Kisan Credit Cards (KCC). Ten members have taken loans from cooperatives. About thirty households are linked with SHGs for credit as well as savings services. Besides government banks and cooperatives, 13 members have also taken loans from Microfinance institutions.

While 20 households are having bank accounts for doing voluntary savings, 10 are associated with the primary agriculture cooperative society of the area.

Insurance – 78 out of 88 households are having crop insurance from the bank, 69 are covered under health insurance from Rastriya Swasth Bima Yojna of government. In addition to this 35 have taken insurance for implements and tools.

The society has installed a motor with paddy thresher investing Rs.7000 of WUAs funds.

Custom Service – providing Agricultural implements on rent – Besides the supply of water for irrigation, WUA is also providing agricultural implements on rent for example – Paddy thrasher, power tiller etc. The activity provides services to the farmers and a good income for the WUA.

Some of the farmers have joined together to transport their produce to the cold storages or market.

Poly House – A poly house in a member's land was setup by WUA in 2016 from the support of the project. A clear protocol for the use of the poly house, generation of income utilizing poly house and also use of the surplus generated, is required. The size of the poly house is 96 sq. Meters.

Demonstration Plots – WUA has also established demonstrations plot to provide training and guidance to the farmers by showing the plots and final outputs. The plots of groundnut and Tomatoes exist for demo.

Byelaws / Rules and Regulations of WUAs – WUA is having well defined, written, articulated Byelaws however, communication to the members about the rules and regulations incorporated in the byelaws is a question mark.

Governance System – elected / nominated office bearers; area wise representation, Conduct of meetings, AGM, Management committee meetings, decisions making process, sub - committees

There are 9 MC Members who are nominated by the members of WUAs. These members were first nominated by the all the members of the WUAs. In the year 2014, the management committee of the WUA was first nominated. Now, the Management Committee is elected in AGM. Out of the total members of MC, 80% can be changed whereas 20% remain the same. Earlier 5 subcommittees were formed for various purposes. Out of 9 governing body members, 3 are women.

Cash inflow and outflows for different activities:

2016:

Kharif

Water Charges – Rs. 38620;

Rs. 522 Monthly subscription Collection (@Rs.2);

Voluntary contribution – 13000

Income from Agriculture implements – Rs. 55940

Expenditures – Rs. 72670

Surplus – Rs. 37775

Rabi

Water charges – Rs. 46885.00

Membership – Rs. 495

Income from Agriculture implements – Rs.20145

Expenditure – Rs. 44990

Expenses Agriculture Implements procurements and running - Rs. 21350

Relationship of WUA and their members with other collectives – Women members of some households associated with WUAs have created SHGs. About 30-35 women are member of one or the other SHGs. Through this, they are doing mandatory savings and also get emergency as well as small productive loans.

Results of the project support and functioning of WUAs

Increase in cropping intensity and diversification of crops due to assured irrigation – Earlier farmers were mainly cultivating paddy and to some extent potatoes but now they are growing groundnuts and also different vegetables due to availability of water.

Enhancement of Agriculture/ Horticulture Production – In the area 15 Bigha was the fallow land which was not utilized earlier but after the availability of water, it is used for cultivation of vegetables.

Value of land enhanced – The value of land is also increasing in the area due to irrigation facilities. Earlier the value of 1 Bigha land was Rs. 60,000 but now it is Rs. 3- 4 Lakhs. (Example: One member Kashinath Bera is having 10 Kaththa of land. Earlier the value of the land was 1.00 lakh but now it is 3.5 lakh)

Productivity enhancement and quality improvement – Due to adequate and timely irrigation facilities productivity per acre has also enhanced

Enhanced knowledge base on irrigation and agriculture practices – Due to the demonstration plots and guidance from project team and agriculture experts the knowledge of members has enhanced

Sufal Bangla

Kolkata Fresh Fruit and Vegetable Project was initiated in Kolkata and its suburb as 'Sufal Bangla' in September 2014. Paschim Bangla Agri Marketing Corporation Limited was declared as the Nodal Agency of the project.

Basic objectives of this project are 1) to help the farmer's get premium price and have rational share in consumer's price, 2) To supply quality produce at less retail price and have rational share in consumer's price and 3) Make fruit and vegetable producer's retail market competitive.

Sufal Bangla, a competitive retail daily use prime vegetable outlet - is significantly important for ensuring food and nutritional security for the hundreds of millions of people that still live below the poverty line in our state besides it also help for raising rural incomes and generating millions of on-farm and non-farm employment opportunities, eradication poverty and usher in a prosperity movement throughout beautiful rural Bengal. Initially the vegetables were procured only from Koley Market, however, now some farmers surrounding Singur in Hooghly District have been supplying fresh vegetables at Tapasi Mallick Singur Krishak Bazaar.

Sufal Bangla is also making fruit producer's retail market competitive. Different Hubs at various Agro Climatic Zones of West Bengal will be set in motion for procurement of fruits at different seasons in future days. The project also aims to provide benefits to the farmer through arrangement of procurement by the Government. Another aspect of this initiative is to provide employment opportunities to the unemployed who would be associated with this programme.

A Case Study of a Successful WUA- Naskarpur Ghatipur WUA

Block- Tarkeshwar, Gram Panchayat – Talpur, Hooghly

Naskarpur Ghatipur- WUA is a vibrant Water Users' Association with 136 members and very active management board. It is one of the selected WUAs that has published its Annual report so as to maintain high level of transparency.

Keeping in view the long term sustainability of the organization, the members of Naskarpur Ghatipur WUA have taken up several new initiatives to generate income and provide services to the members.

Besides undertaking the activity of renting out agriculture implements to their members, Naskarpur Ghatipur- WUA also decided to purchase agriculture inputs and distribute the same to the members as per their demand. This has reduced the cost of inputs for the members. Moreover, WUA is also promoting vermi composting and constructed a permanent chamber of vermi composting by investing Rs.35000.

Decision of investing Rs.10,000 as fixed deposit to create a corpus for future is a good idea of WUA. This money was generated out of the business of renting Agri. Implements.

Members feel that for marketing of paddy and other produce collective efforts are important and therefore a second level institution in the form of federation or Producer Company is needed. They feel that 4 WUAs of nearby area can join together and a federation of 300- 400 farmers can be formed. Women members feel that they can make potato chips if some financial and technical support is provided to them. Naskarpur Ghatipur WUA members also want a tractor and an automatic potato harvester. The members of WUA are enrolled with 'Sufal Bangla' for marketing their produce.

Naskarpur Ghatipur WUA is promoted by Ramky Foundation (Support Organization).

Contribution for Collective Inputs purchase Repairing distribution channel by WUA. Majority of the members are getting benefits of Kisan Credit Cards. It is a good example of a successful and sustainable WUA. Production and productivity has enhanced thereby providing better surplus to the farmers.

Before 2012, Farmers of Naskarpur Ghatipur were cultivating paddy in Kharif and potatoes (in about 15 bighas) in Rabi as there was no assured water and the area was rainfed. Now, after the project, farmers are able to use 20 Hectare of land that is in the command area. The farmers are now cultivating variety of vegetables tomatoes, Chilly, Cucumber, Groundnut etc. and also utilizing the lean period. As a result of the project, the cropping pattern in Rabi, Pre-Kharif and Kharif season has changed. In the changes scenario following crops are taken up -

Pre-Kharif- Groundnut, Sesame, okra, cucumber, bitter gourd,

Kharif – Paddy, Cauliflower cabbage, Pointed Gourd

Rabi - Mustard, Brinjal, cabbage, Cauliflower, potatoes

This shows that there is major difference in diversification of crops and also number of crops taken up by the farmers in a year.

Composition of WUA in terms of membership – The members of Naskarpur Ghatipur-WUA are predominantly small and marginal farmers. Out of the total 136 members, 32 are Scheduled Caste members. WUA has 5 women members. There is high level of cohesiveness amongst the members.

Legal Status of WUA - Naskarpur Ghatipur Water Users Association is a legal entity by virtue of its registration under West Bengal Societies registration Act 1961. Since it was registered on 7th Nov. 2012, so it has completed 4 years of its functioning and therefore considered as a mature WUA.

Land Size of members: The average size of the land in the village is about 1.5 Bigha. Majority of the farmers are having small land holdings, however, there are 3 members with 2 acre of land. Since it is a Water User Association therefore the services of water cannot be denied to anybody who comes under the command area.

Management of the Pump and irrigation: Naskarpur Ghatipur WUA has engaged two pump operators and paying to them Rs. 37000 per year. The duties are distributed between the two operators with mutual consent. No conflict related to duties has ever emerged.

Special initiatives of WUA

Investment for creating a corpus fund: Naskarpur Ghatipur - WUA has taken a good decision of using the surplus generated out of the activity of renting out agriculture implements and tools to the members. WUA has done a fixed deposit of Rs.10,000 in bank. This will help in strengthening the sustainability of WUA.

Promoting Vermi Compost production: In order to promote vermi composting in the command area, members of Naskarpur Ghatipur – WUA have decided to construct a permanent structure for producing vermi compost. WUA is able to produce vermi compost utilizing two pits created for the purpose by investing Rs. 35000. The output in the form of vermin compost is marketed by the women. This activity is taken up by 10 women who are member of the SHG.

Giving services beyond the Command area: Based on the demand from outside the command area and availability of water, Naskarpur Ghatipur Water Users Association, provides services to the farmers beyond command area. The extended area is about 3 Bigha.

WUA functions as a bridge between farmers and ‘Sufal Bangla’– Based on the special initiatives from the project, the farmers of the Naskarpur Ghatipur WUA got associated with ‘Sufal Bangla’ initiative. The farmers are enrolled under the project and therefore they can market their produce through Sufal Bangla. The farmers of WUA are able to sell their produce to ‘Sufal Bangla’. The rates given to the farmers are better than the local market. There is high level of transparency in the purchase system of ‘Sufal Bangla’. The arrangement of transport is informally done by group of farmers. In the whole process, capital of WUA is not involved in transporting or purchasing the produce however, WUA functions as a bridge between the farmers and ‘Sufal Bangla’.

“Song on water” by a member: In the WUA, one member has composed a ‘song on water’ which is used to motivate the members and to give realization about importance of water.

Custom Service – providing Agricultural implements on rent – In last three years, the Association is provided with various implements like one power tiller, three Paddy Threshers, two knapsack mist blower, two High tech Sprayers, three seed drills, five cano weeder, five wheel hoe, three groundnut decorticator, one paddy decoder and also a paddy reaper. Using the implements received from the project, Naskarpur Ghatipur - WUA provides agricultural implements on rent. In 2016 pre-Kharif and Kharif season, WUA has earned Rs. 22,230 by renting out the implements. Power Tiller was used by 52 farmers and sprayer by 16 farmers.

Providing Agriculture inputs: WUA is providing seeds and other inputs to the farmers based on the demand. These inputs are purchased collectively and distributed to the members who have demanded for the same. This is done voluntarily and therefore Rs. 10000 is deposited by the farmers for this purpose. Collective purchase for the farmers reduces the cost of inputs as it enhances the bargaining power of farmers.

Operation and Maintenance Planning (O&M Plans)

WUA is preparing Operational and Maintenance/ irrigation plans well in advance. There is a pump log book wherein the operator records day-wise details of the running of pump. The pump operator fills the register about the utilization of pump such as for whom the pump was used, area/ no. of plots for which the water was used. WUA is also maintaining the member register wherein spout details, plot no. and size, monthly fee, irrigation and

production details are maintained. WUA is also keeping a crop register in which details of the crops in each plot is detailed out. The irrigation register is also maintained well. This register provides details of crop-wise irrigation. The maintenance and cleaning of pump is done regularly and therefore the machine and meter are in good condition.

Financial services to the members

Credit: Out of the total 136 members, 85 are availing Kisan Credit Card (KCC) for getting credit for agriculture activities from banks and cooperative. Besides Kisan Credit Card, 10 members have also got credit services from SHGs.

Savings: Mandatory savings are going on through SHG that covers 10 members. Members also do voluntary savings in banks directly.

Insurance: As far as insurance services are concerned, 85 members are having crop insurance from banks. It is good to note that 105 members out of total 136 members are having Health insurance under Rastriya Swasthya Bima Yojna. Five members have also got insurance for their livestock from Panchayat.

Demonstration Plots – WUA has also established demonstrations plot to provide training and guidance to the farmers by showing the plots and final outputs. Five plots of groundnut and one plot each of sesame, okra and ridge gourds are organized to guide farmers about the whole process of cultivation and getting good results.

Byelaws / Rules and Regulations of WUAs – WUA is having well defined, written, articulated Byelaws. Members are aware about their rights and duties.

Governance System – There is an active management board of the WUA. High level of transparency is maintained in the association. The board has published the Annual report of last year.

SHGs in the WUA area - Women members of some households associated with WUAs have created SHG. Only 10 members are there in the SHG.

Problem Faced by WUA- The operator of WUA make attempt to use the timing when there is rebate in the rates so the total cost of running can be reduced. Further, during lean period (July- Oct) limited use of motor is there, however electricity department sends the bill based on the average running. This problem is solved after due persuasion with the department.

Future possibilities

It is a good potato cluster and therefore post harvesting support in the form of good storage, and processing can give mileage to the members.

A second level organization at the cluster level for aggregation and marketing will help the members of WUA.

Results of the project support and functioning of WUAs

Increase in cropping intensity and diversification of crops due to assured irrigation – Earlier farmers were mainly cultivating paddy and to some extent potatoes but now they are growing cultivating variety of vegetables tomatoes, Chilly, Cucumber, Groundnut etc. and also utilizing the lean period

Productivity enhancement and quality improvement – Due to adequate and timely irrigation facilities productivity per acre has enhanced

Enhanced knowledge base on irrigation and agriculture practices – Due to the demonstration plots and guidance from project team and agriculture experts the knowledge of members has enhanced

New Livelihood opportunities – WUA has provided new opportunities of livelihoods to the farmers in the area of vermin compost production.

Case Study: Solar based hybrid Light Duty Tube Well (LDTW) Scheme, Uludanga village in North 24 Parganas District

Introduction: Uludanga is a small mouza / village (272.4 ha) of North 24 Parganas district located under Sadhanpur gram panchayat of Amdanga block. 448 households are there in the village including 264 from backward (SC) class. The nearest police station is Amdanga, 6 km far from this village. Administratively the village is under Barasat Sub-Division.

Agriculture is the main occupation of the villagers. All the households belong either in BPL or poor class as per economic profile of the village. Most of the farmers are in small and marginal group. Very few of them are land owner; most of the farmers are actually agricultural labour.

In Uludanga mouza WRID Dept selected 36 ha command area for implementation Light duty tube well (LDTW) of West Bengal Accelerated Development of Minor Irrigation Project (WBADMIP). There are 6 pump houses in each 6 ha. Before implementation of this



Salient Features of the Scheme

Name of the Scheme	Uludanga 2 LDTW Cluster
Block	Amdanga
Gram Panchayat	Sadhanpur
Cultivable Command Area (ha)	36 Ha
Cost of Scheme	45,94,873 INR
Cost of Solar system	9,49,000 INR
Members of WUA:	216 (female Member-49)
Members in Governing body	7 (02 women)
Source of Water	Under Ground water
Source	Perennial
Location of Pump House	Lat-22°50'24.08"N Long- 88°31'9.19"E
Prime Mover Used	Submersible Pump Motor Set
No. of Pump Sets	1
Pump Discharge	30 cubic meter per hour
Crops (After Installation of the Scheme)	Kharif: Amon Paddy, Vegetables etc. Rabi: Mustard, Banana, sugarcane, potato, cabbage, cauliflower, other Vegetables etc. Pre Kharif: Jute, Til, Vegetables, Sugarcane, sesame, chilli etc.

project, very few private shallow tube wells were there and all those were being used commercially. It was not cost effective for small & marginal farmers due to high cost of water. They could not get the expected yield, which affects their livelihood. During kharif season, farmers depend on rain for paddy cultivation. In rabi season a very little land was cultivated; produces vegetables like brinjal, mustard, okra etc.

Intervention: The governing body of Uludanga LDTW Water Users' Association was formed on 9th November'12 with seven members, two of them were female. The committee got their registration on 20th December'14. Six farmers donated their land (two decimal) where project has been implemented. This year on 18-7-14 the registration of governing body has been renewed. 4 Sub-committees were also formed on 25/6/14. Number of beneficiaries is three hundred and twenty nine 329 households (320 male headed & 9 female headed families).

On 4th March'14, the scheme was officially handed over to the committee.

One solar plant has been installed in one point (plot no. 2322) of the scheme to reduce electric cost.

To introduce better quality of cropping pattern total 21 Demonstrations were conducted Demonstrations (kharif-3 agriculture, Rabi-4 agriculture & 14 horticulture) in the scheme command area.

Awareness programmes, Exposure visit, meeting with farmers, field level WUA trainings were conducted at Uludanga before and during implementation of the sub-projects to strengthen the WUA members before handing over the scheme to committee.

Achievement: Since that month of March, farmers of Uludanga LDTW Water Users' Association started to get water for irrigation.

WUA members have collected approx.Rs.80,000/- from membership amount & water charges.

They arranged the registers, stamps, prepare bill-books by their own fund & they also did yearly audit and renewal of their registration (18th July'14) all by themselves.

Six flexible hose pipes were bought by the committee to irrigate properly by all the farmers particularly tail enders. They have paid Rs.50, 000/- for 9 months electric bill.

WUA members



Hybrid Solar cum Electric MI scheme



Google Map of command area

Pump house



Enhancement of production of crop:

S No	Name of the scheme	Name of Crop	Before installation of T/W 10/ha Paddy area (Average)	After installation of T/W 30/ha Paddy area (Average)	Before installation of T/W % increase in yield	After installation of T/W % increase in yield	Command area increased after installation of T/W	Increase in crop production after installation of T/W
1	Uludanga -II-LDTW	Paddy	27 Q/Ha	37.50 Q/Ha	2.70%	11.25%	200%	38.88%

Uludanga 2 LDTW Water Users Association Governing Body List for 2016-2017

S No	Name	Designation
1	Fazar Ali	President
2	Ariful Biswas	Vice-President
3	Swapan Ghosh	Secretary
4	Abdul Hakim Darji	Asst. Secretary
5	Amirun Bibi	Treasurer
6	Khadija Bibi	Member
7	Sukumar Ghosh	Member

Basic Information regarding WUA

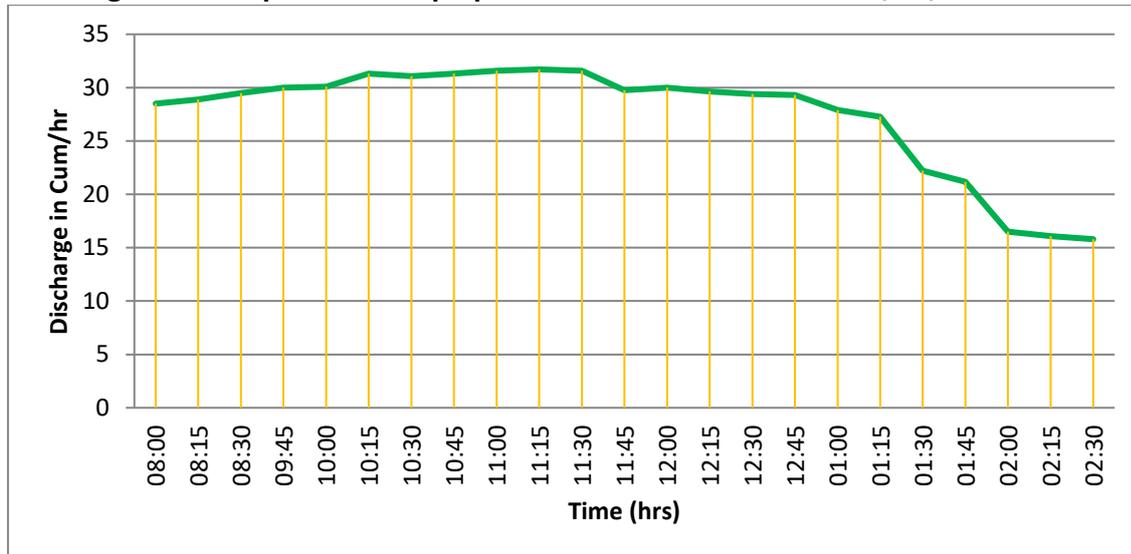
S No	Basic Information regarding WUA			
1	Name of WUA:	Uludanga-2 Water Users Association		
2	WUA Registration NO:	S/M/205		
3	Date of Registration:	20.12.2012		
4	Date of Handover	04. 03.2014		
5	WUA Bank Account No & Bank Name:	State Bank of India, Awalsiddhi Branch ; Account No-33829692111		
6	Name of the President	Fazar Ali		
7	Name of Operator(s):	Plot No-	1541	Fazar Ali Biswas(Solar)
		Plot No.-	2322	Asad ali Biswas (Solar)
		Plot No.-	NA	Abdul Hakim Darji
		Plot No.-	2294	Ariful Biswas (Solar)
		Plot No.-	2180	Rezaul Mandol (Solar)
8	Total Members of WUA:	216 (female Member-49)		
		7 (02 women)		
9	Total no. of members of WUA in Governing body	7 (02 women)		

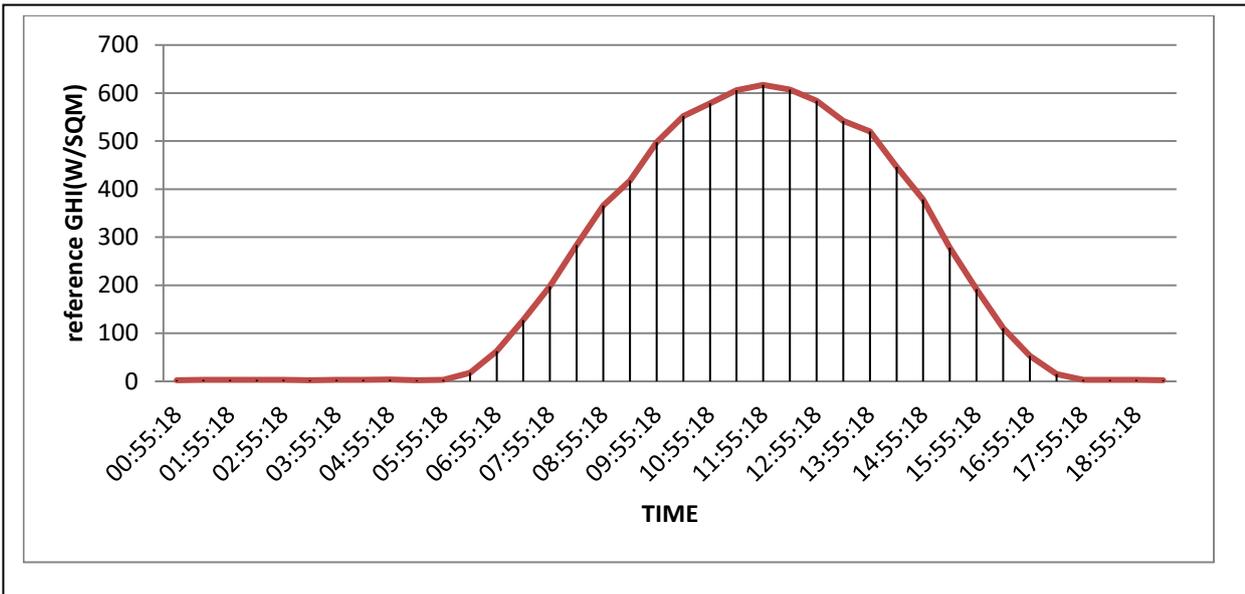
Solar system- The Hybrid Solar Photovoltaic (SPV) solar scheme to retrofit SPV with running grid electricity based 3.75 KW AC Induction motor driven centrifugal submersible pump set

operating at 415 Volt(+10%), 3 phase 50 cycles per second(+/-5%) AC supply with dual axis manual tracking system has been installed.

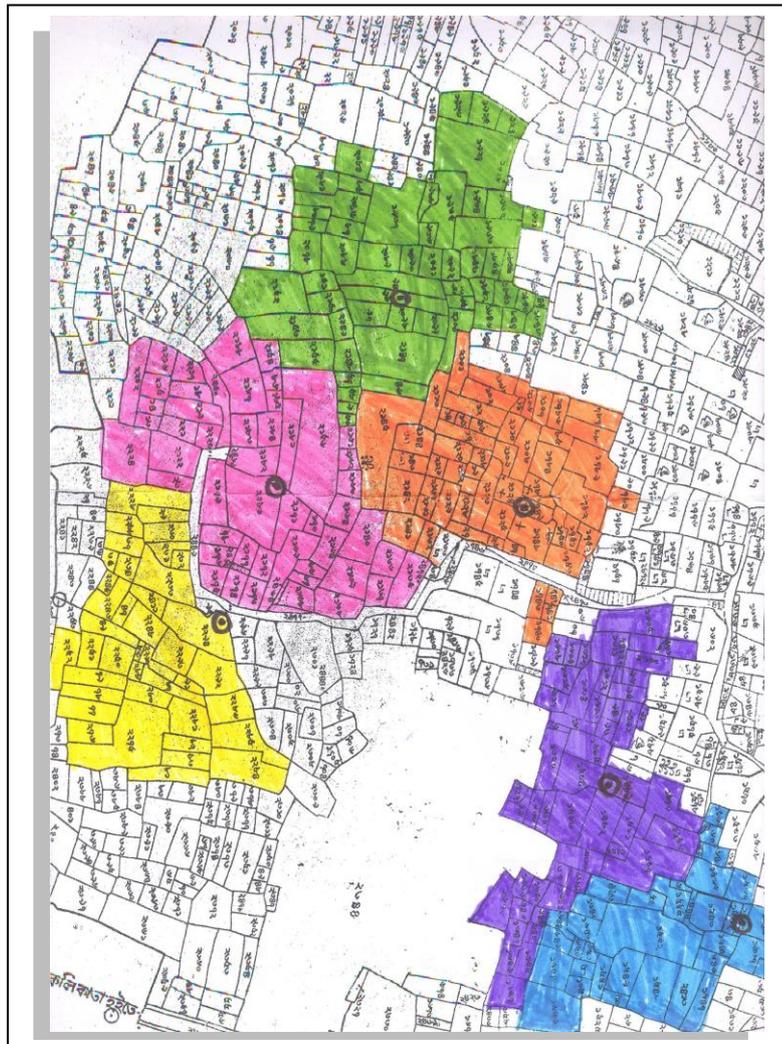
The data logger has been installed in the scheme for acquiring the solar radiation data, voltage data Inverter voltage frequency etc. Water meter has been installed for getting the discharge of the LDTW. The Discharge Vs time graph has been given for a particular day.

Discharge time Graph of the 5 hp operated Solar Scheme as on 14/02/2015 shown below





Pointwise Command area map of light duty tube well cluster



Uludanga II LDTW

Plot No. 2294				Season -RABI			
Before Scheme 2012				After Scheme 2016			
S No	Name of Crop	Cultivated Area (Bigha)	Production (in Qt)	Name of Crop	Cultivated Area (Bigha)	Production (in Qt)	Remark
1	Mustard	3	3	Mustard	5	8	
2	SugarCane	10	100	SugarCane	16	192	
3	Potato	3	75	Potato	2	70	
4	Cabbage	2	32	Cabbage	2	36	
5	cauliflower	2	36	cauliflower	2	40	
6	Lentil	3	4.5	Tomato	1	40	
7	Coriander	2	4	Lentil	2.5	37.5	
8				Coriander	2	5	
9				Onion	1	50	
10				Radish	1	20	
11				Cucumber	1	8	
12				Bitter Gourd	2	16	
	Total	25			37.5		
Before Scheme 2012				After Scheme 2017 Season Pre Kharif			
Sl No.	Name of Crop	Cultivated Area (Bigha)	Production (in Qt)	Name of Crop	Cultivated Area (Bigha)	Production (in Qt)	Remark
1	Jute	4	12	Jute	8		
2	Sugarcane	10	100	Sugarcane	16		
3	Sesame	2	4	Sesame	2		
4	Brinjal	1	25	Napier	1		
5	Okra	1	12	Parwel	1		
6				Chili	1		
7				Brinjal	1		
	Total	18	153		30		

Uludanga II LDTW

Plot No. 2180				Season -RABI		
Before Scheme 2012				After Scheme 2016		
S No	Name of Crop	Cultivated Area (Bigha)	Production (in Qtl)	Name of Crop	Cultivated Area (Bigha)	Production (in Qtl)
1	Mustard	3	3	Mustard	4	4.8
2	Sugarcane	15	150	Sugarcane	15	180
3	Potato	5	125	Potato	10	350
4	Radish	2	36	Cabbage	5	90
5	Onion	3	66	Cauliflower	5	100
6	Cabbage	3	48	Tomato	2	40
7	Cauliflower	1	18	Red Amaranth	0.5	7.5
8	Mango Garden	2		Coriander	1	2.5
9				Onion	1	50
10				Spinach	1	20
11				Radish	1	20
12				Cucumber	1	20
13				Bitter Gourd	1	8
14				Mango Garden	2	
	Total	34			49.5	
Plot No. 2180				Season -Pre-Kharif		
Before Scheme 2012				After Scheme 2017		
Sl No	Name of Crop	Cultivated Area (Bigha)	Production (in Qt)	Name of Crop	Cultivated Area (Bigha)	Production (in Qt)
1	Jute	5	14	Jute	10	
2	Sugarcane	15	150	Sugarcane	15	
3	Sesame	1	2	Sesame	2	
4	Brinjal	1	25	Brinjal	2	
5	Okra	1	12	Okra	3	
6	Mango Garden	2	16	Napier	2	
7				Parwel	2	
8				Chili	2	
9				Mango Garden	2	
	Total	25	219		40	

Scheme Name: ULUDANGA LDTW

Discharge of Solar energy operated LDTW unit :-

Average Running Time: - 9.30 a.m. To 2.30 p.m. = 5 hours

Discharge of 1st 1 hour = 17 m³/Hour X 1 = 17 m³

Discharge of 2nd 2 hour = 24 m³/Hour X 2 = 48 m³

Discharge of last 2 hour = 20 m³/Hour X 2 = 40 m³

Total = 105 m³

Discharge of Electric energy operated LDTW unit :-

Discharge of 5 hour = 27 m³/Hour X 5 = 135 m³

Cost of energy Saving

= Rs 5 X 5 15.5 ₹ 77.50

Charge of Water = 5 60 ₹ 300.00

Total Benefit in Amount =

₹ 377.50

**Per unit of LDTW
pump per day of
Irrigation**

Irrigating the fields with Climate Smart Interventions - Solar powered Pump Dug Wells in Jalpaiguri district of West Bengal

Success Story of Participatory Ground water scheme under WBADMIP



Ganesh Barman, a resident of Salbari Barmanpara village in Matiali block of Jalpaiguri district, is a happy man now. The village, which faced increasing water crisis over the years, is now water sufficient because it manages its water resources well and shares it equitably. Ganesh is a member of SalbariBarmanpara Water User Association, formed to maintain, operate and manage the Solar powered Pump Dug Well Scheme installed under West Bengal Accelerated Development of Minor Irrigation Project (WBADMIP), a Govt. of West Bengal and The World Bank initiative.

Before the implementation of the scheme, due to poor water holding capacity of the soil and scanty rainfall in Rabi season, the farmers of the village had to resort to cultivation only during Monsoon season. But, even during the monsoon season, weak agricultural extension services and lack of assured irrigation restricted crop production only for domestic consumption. To earn their livelihood farmers had to move to other labor job options such as pebble collections during winters (Rabi season).

“Water issues resulted in migrations, conflicts and vulnerability to many socio-economic problems,” Ganesh Barman, WUA member

Agriculture is the main source of livelihood in the area, and it is dependent on rainwater. When rainwater is insufficient to support the crops, the dug wells are the only hope of these

vulnerable farming communities. The irrigation of crops through these dug wells was labor-intensive, and time-consuming. Though still operational at a few places, they are now being considered old-fashioned and outdated options, because pumping water through them is uneconomical. As an adaptation option, farmers had been going for electrical/diesel pumping systems for these dug wells. But, due to electricity shortages for electric pumps and high operational costs of diesel pumps, alternate options needed to be explored.

As an initiative to demonstrate improved agricultural productivity and enhance farmers' resilience by introducing climate-smart interventions, two cluster based Solar Powered Pump Dug Well with 1500 mm X 300 mm X 75 mm (diameter x height x thickness) ring sizes were constructed in 2015 from the Project in Salbari Barmanpara village, with an expenditure of INR 14,78,017. A 2 HP submersible pump was attached with a capacity to drag out 1, 20,000 to 1, 35,000 liters of underground water daily. A day in Jalpaiguri refers to 5.5 hour as the maximum intensity of sunlight is between 9 am to 3pm. This kind of use of energy efficient pumping and high-efficiency irrigation system not only reduces energy costs and improve productivity, but also helps in water conservation.

"After the Solar powered PDW installation, there is very less added expense unlike in the case of electricity based structure where the chances of a transformer burning are very high. Moreover, farmers get 5 hours of assured irrigation", Mr S. Mitra, Executive Engineer, Jalpaiguri DPMU.

Watering down the agriculture land:

With a command area of 10 Ha (Each PDW have the Command area of 5 ha), the structure is providing assured irrigation to 17 farmers which formed the Salbari Barmanpara Water User Association with guidance and support from Institutional Development experts of Jalpaiguri DPMU. Apart from providing assured irrigation during the much needed Rabi season, the project also disseminating agricultural technologies for adoption to enhance the income of these small and marginal farmers. Agriculture experts in the SPMU and DPMU conducts various trainings and exposure visits for the farmers to empower their agricultural knowledge and skills. Reflection of these interventions appeared in the following Rabi season with an expansion of almost 5 Ha cropping area against almost none in the preceding seasons. Crops such as tomato, brinjal, cauliflower, cabbage, mustard, potato etc. were being extensively grown thus bringing a good economic return for the farmers. This is where the story of Ganesh Barman starts.

Story of Ganesh Barman:

Nearly two years ago, when 30-year-old Ganesh Barman saw the installation of solar-powered pump Dug Well, little did he know that arrival of the WBADMIP Engineers in the village will reap rich dividends one day. He had to wrap up his school education by 4th standard to join his elders in the field and earn for his family. Currently he is looking after his own 4 bighas plot of agricultural land and another 8 bighas belongs to his family members.

Earlier, Mr. Barman earned hardly INR 48000 in a year as he was largely dependent on Monsoon rains for his kharif paddy cultivation which was not enough to sustain in an economy with persistent inflation. However, little bit of additional income from livestock helped him somehow to sustain through the lean period.

Empowered with assured irrigation from the installation of the Solar Powered Pump Dug Wells, Mr Barman cultivated 3 bighas of land in the following Rabi season for the first time and earned a net profit of INR 39000. The economy of return was as follows:

Crop	Area in Bigha*	Cost of Cultivation (INR)	Yield Kg/bigha	Value of the produce (INR)
Brinjal	1.0	5,000	3,600	18,000
Tomato	1.0	7,000	4,000	20,000
Cauliflower	0.5	2,500	6,000	15,000
Leafy Vegetables	0.5	500	Na	1,000
Total	3.0	15,000		54,000

*1 Bigha= 0.33 Acre

Net Profit= Value of Produce – Cost of Cultivation

= INR 54,000- INR 15,000

= INR 39,000

Mr Barman is expecting his annual income would go beyond INR 100,000 with the inclusion of earnings from the other 2 upcoming season's i.e Pre Kharif and Kharif. Earlier his agricultural activities were restricted to one season fetching him an annual income of hardly INR 48,000, now with the availability of water round the year he is shifting from mono cropping to multiple crop cultivation which is one of the main mandates behind selection of schemes under WBADMIP. The Solar Powered structures has able to bring a paradigm shift to the socio-economic scenario in the area thus giving a crucial contribution towards the achievement of United Nations Sustainable Development Goals (UNSDGs).

Solar operated Tube well- A WRIDD initiative in Kochbehar

A dream of big jump towards use of renewable resources has become true when 150 nos Solar operated STW has been set up successfully in Tufanganj-I & Tufanganj-II block of Coochbehar District where installation of tubewell is difficult due to hard strata below ground level.

This is the first project which is Solar Operated and totally different from the conventional diesel & electric operated schemes. As it is to be run by the solar power only it is totally free towards the cost of operation and farmers are very happy to use this opportunity at *Balarampur SOLAR Operated STW Scheme*

- Balarampur is a village situated in Tufanganj-I Block in the District of Coochbehar
- Six Nos Solar Operated STW with 3 HP centrifugal solar pump having discharge 23.8cum/hr (Measured at peak solar hour) powered by 3000wp solar cell and installation started on 1st February'2016 and took very short time of installation & that has been handed over to beneficiary within one month.
- WUA immediately started irrigation on standing Boro Crop in 13 ha.
- Major part of the village was non irrigated. Farmers were mostly dependent upon monsoon. Rainfed crop cultivation was the main source of income of the farmers. Kharif



**SOLAR OPERATED SHALLOW TUBEWELL AT BALARAMPUR MOUZA UNDER RKVY PROJECT, INSTALLED IN 2015-16
BOCK TUFANGANJ I, PLOT NO : 12225, JL NO: 88
ESTIMATE COST: 8.53 LAKH PER SHALLOW TUBE WELL**

Paddy is the main crop of the village, yield was very low, it was about 3ton/ha

- Now there are Six nos of Solar Operated STW giving continuous flow of water during day time.
- Farmers now planning to raise the Cropping intensity from 120% to 200%
- The farmers got 4.2-4.5-ton paddy per hectare which satisfies farmers immensely. And also they are very happy with the Yield of vegetable as this is the first time farmers got marketable surplus of vegetable. Main vegetables are Potato, Brinjal, cucumber and chilli. This Year they planned to grow Boro paddy in 20-hectare, vegetable in 30 hectare and

maize, mustard in 12 ha. at least. Rest of the land will be kept for Jute as Jute is also one of the essential crop for the village.

- It is felt necessary to run the system beyond daylight as boro paddy demands more water than other crop but as there is no scope to run it during night farmers had to cut off areas of boro by 5 ha.
- Now they are planning to add systems by which it can be run electrically.

With this learning from the RKVY project HYBRID system introduced in Enclave development project in 51 nos former enclave and 227 nos HYBRID solar operated LDTW has been installed in March 2017 and started operation successfully. Although the energisation of the project is still pending farmers already started irrigation in boro paddy as much as 2 ha per tubewell on an average. As the project started irrigation in early March and boro cultivation already started farmers could not avail the full potential. In this project 3 HP more efficient oil lubricated stainless steel body submersible pump has been used to get more water from the same energy. Now the farmers are getting 30cum/hr discharge in peak hour and on an average 22 cum /hr discharge from 150X100mm LDTW with 12m 100mm strainer, powered by 3000wp solar cell and farmers are expecting to cover as much as 4ha or slightly more when it can be supplemented by electrical operation. The discharge is variable in day time owing to the intensity of sunlight. It is insufficient to cover 6 ha command area in daytime (8:20 am to 4:30 pm) unless and until the pump is 5 hp with 4800wp solar cell with dual operation mode which will give 50cum/hr peak discharge and 34-40cum /hr average discharge during day time. However a 3000wp system save 1200 unit electricity per ha during boro season which costs ₹6000.00.

Included Five years comprehensive maintenance and insurance for free. Oil lubricating pumps 10% more efficient.



OPERATION OF LDTW BY SOLAR ENERGY AT KISMAT BHATRIGACH FRAGMENT DINHATA- I,
NAME OF ENCLAVE: KISMAT BHATRIGACH
PLOT NO NA, JL/CHIT NO 82
ENCLAVE DEVELOPMENT PROJECT, YEAR 2016-17
CCA@ 6 HA PER LDTW (Target)
NOS OF LDTW INSTALLED: 227 NOS. PROJECT COST: 2099.00 LAKH

