



Integrated Rice Fish Culture

Climate Change Adaptation Option

Paribartan Project in Kendrapara and Jagatsinghpur



Regional Centre for Development Cooperation

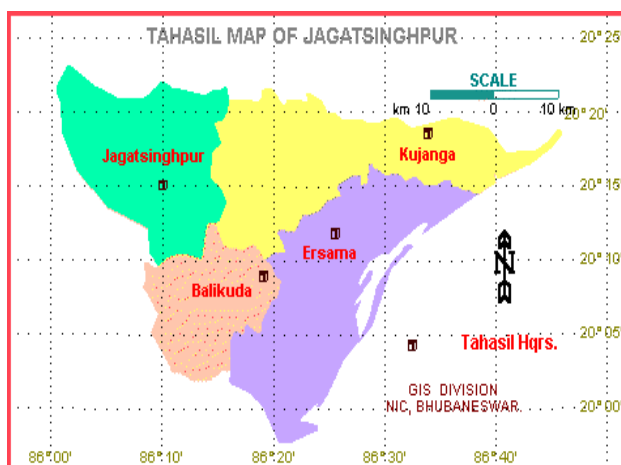
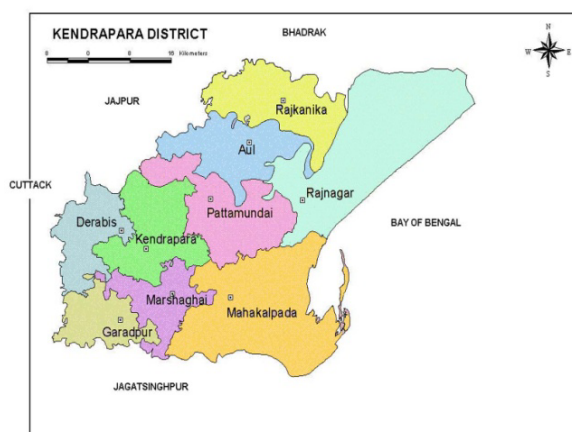
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1. Introduction

The “Paribartan” programme, a multi-country initiative involving the coastal districts of India and Bangladesh, was launched in February 2011 being implemented by RCDC in India and JJS and Sushilan in Bangladesh. The programme is facilitated by Concern Worldwide in both the countries and financed by the European Union. It is a five year programme that is expected to end its first phase in 2016.

Titled “A multi-country initiative on increasing resilience and reducing risks of coastal communities to climate change and natural hazards in the Bay of Bengal” the programme involves both Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) aspects and seeks to make communities resilient to disasters and also reduce poverty by introducing climate change adaptable livelihood options. In India the coastal regions of Kendrapara and Jagatsinghpur districts of Odisha were chosen because of their vulnerability to disasters.



The maximum impact of the Super Cyclone of 1999 that took an unprecedented toll in terms of both lives and property was felt in these regions. The region also faced the fury of the very severe Cyclone Phailin in October 2013. RCDC has chosen to implement the programme in 74 villages of 6 GP’s of Rajnagar Block in Kendrapara districts and 10 villages of 2

GP’s of Balikuda Block of Jagatsinghpur district. The programme has been launched in 84 villages of 8 GP’s of 2 Blocks in 2 coastal districts of Odisha.

1.1 Livelihood Vulnerability

The community led Community Risk Vulnerability Assessment (CRVA) analysis at the beginning of the programme revealed that both the major livelihood options of the region; agriculture and fishery, have been severely affected due to climate change

and restrictions within the National Park area of Bhitarkanika rendering the population extremely vulnerable.

The main occupation of the coastal community is paddy cultivation. Paddy is a Kharif crop and is dependent on timely rainfall. However since the last decade or more the climate has played truant and rainfall patterns have changed in tune with the rest of the state. (Disaster Dossier: The impact of climate change on Orissa, Richard Mahapatra, Infochange News & Services, March 2006. <http://infochangeindia.org/environment/features/disaster-dossier-the-impact-of-climate-change-on-orissa.html>) Moreover sea ingress has resulted in salinity of soil again adversely affecting cultivation. This has resulted in frustration among farmers and they have more or less abandoned agriculture.

The population depending on fishery has been hit by the directives of the National Park at Bhitarkanika, adjacent to the area, not to fish in its waters. The directive is strictly enforced by regular patrolling. The fishermen have no option but to totally stop fishing in the



area. The rivers of the region are well known for the diversity of their catch but fishermen can no longer benefit from them.

Bereft of its main livelihood options the region has been impoverished and the people have to struggle to meet the triple impacts of poverty, loss of livelihoods and frequent natural disasters in the form of heat waves, cyclones, sea surges and tornadoes.

2. IRFC Option to Augment Livelihood

Facing such seemingly insurmountable problems, the India Bangladesh joint operational team designed adaptation models called “pilot options” to help the community adapt to climate change. The community was asked to come forth with options that would solve their livelihood problems and also be climate resilient. After considering many options the system of Integrated Rice Fish Culture (IRFC) was chosen as a viable risk diversified and climate resilient livelihood option by the

community members that would satisfy both the rice and fish needs of a family and, to an extent, those of the village. The integrated model combines pisciculture, paddy cultivation, vegetable cultivation, horticultural trees, fuel wood trees and duckery. This diversity ensures that not all components will be affected by climatic aberrations. The raised bunds and horticultural and fuel wood trees planted along it provides a measure of protection against cyclones and flooding.

3. Support from Government Institutions

Help was sought of the Central Rice Research Institute (CRRI), a Government of India institution, at Cuttack. This was consequent to its selection in an open bid and a MoU being signed between RCDC and CRRI. The Senior Scientist of CRRI, Dr Sinhababu was instrumental in designing various models for IRFC units, provide technical support, and training to the community members and staff. The institute also helped in identifying and providing appropriate saline tolerant rice varieties. The Fisheries and Animal Husbandry Department of the Government of Odisha provided support in the way of providing information about fingerlings and their management.

4. Implementation Strategy

The Paribartan team in India decided to encourage demonstration IRFC units. The target villages would need models tested in their own region for future replication. The farmers initiating the process and venturing for the IRFC units would gain experience, innovate, share their learning and later become Community Resource Persons (CRP's) to propagate its techniques and use. These models would be used for experimental purposes like introduction of saline tolerant varieties, experimenting with different types of plant and fish varieties etc. Proper documentation of this model would also serve as an advocacy tool for further replication by other agencies, local administration, and the state government.

The process of selecting the persons who would own the IRFC units was selected by the community by passing resolutions in the Gram Paribartan Committee. According to their selection the team then inspected the sites, discussed with the potential owners, checked the land ownership of the plots and approved the selection when found appropriate. The Central Rice Research Institute (CRRI), a Government of India agricultural research institute based in Cuttack was chosen by an open process by inviting applications and after being selected a MoU was signed between RCDC and the organisation. As per the MoU, a senior scientist from the institute visited the field areas, suggested relevant designs, type of earth work, decided on the IRFC components and also provided training to both the owners as well as staff.

5. Financial Support

Monetary support, according to the design adopted, was provided initially to owners of land by way of cash and kind who were selected by the Gram Paribartan Committee (GPC) in terms of their vulnerability. The GPC is one of the three tier community led institutions facilitated by RCDC at hamlet, field and Panchayat level. The committees take the decisions, participate in and oversee the program work.

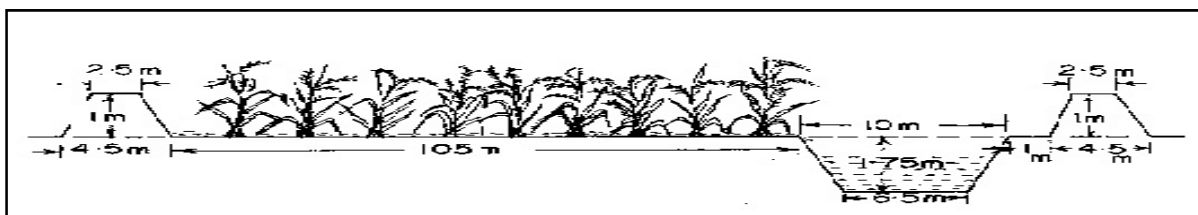
While money was paid in part for earth work, fingerlings, fish feed, fencing material etc were provided in kind. The components of the IRFC are pisciculture, paddy cultivation, vegetable cultivation, horticultural trees, fuel wood trees and duckery. In the first phase 8 vulnerable families in 8 Panchayats of 2 blocks were covered. The criteria were that the farmer should own at least 1 acre of land and preferably should have a pond in her/his field. Owners already having ponds and ongoing farm activities were given preference in this stage of selection.

6. IRFC Design & Management

The multi-tier pond model IRFC unit was designed as a composite unit involving a pond/water hole adjacent to a patch of land. The structure involves building a trench around the plot. The pond/water hole would serve as a pisciculture unit and the patch of land would be used for cultivating paddy. The water needs for the land would be met from the pond and the fish released in it would be channelized through the trench to feed on insects and other pests on the water covered paddy field and would also fertilize the field with its droppings.

The edges of the plot would be used to plant horticultural and fuel wood trees. Unutilized land portions would also be used for vegetable, greens, and creepers. Duckery would complete the picture and also help in serving the nutrition needs of the family by way of eggs and meat. The ducks would help in pest reduction and benefit the field with their droppings. Each IRFC unit would also have a vermi-compost unit to provide its organic manure needs.

Sample design of an IRFC unit (suggested by CRR)



The other model, called the trench model involves a water filled trench around the field. The mud excavated while preparing the trench is used to raise the bund and prepare the bed for planting of vegetables and horticultural trees. This model requires less initial investment and the digging can be done by the family of the owner thus further bringing down costs. This model may appeal to those with very less economic strength.

7. Mr Ashok Das – Story of a Successful IRFC Adaptation



While describing how the IRFC units fared after implementation the case of Mr Ashok Das, aged around 52, of Junupangara village in Dera GP of Rajnagar block may be considered. Mr Das owns around two acres of land, including homestead land, with a pond. He has a family of five; self, wife, two daughters and a son, to support. Of the two

acres he has devoted an acre to IRFC unit. Mr Das is a farmer but his initial foray into agriculture was not very satisfactory. The rising expenses of chemical agriculture coupled with reduced yield disheartened him. He left agriculture to take up trade.

However his roots as a farmer always bothered him and he longed for a way to return back to the soil. The Super Cyclone of 1999 shattered his dreams. The roof of his thatched house was blown away at midnight. He could somehow manage to save himself and his family guided by a dog and wading through neck deep water in the middle of a ferocious storm, he succeeded



in reaching high land. He lost everything in the cyclone and turned a pauper. Once again he had to turn to non-farm efforts to sustain himself.

His land is more affected by cyclones than by floods. In the years 1971 and 1982 which witnessed cyclones and floods there was saline ingress in his field. The Super Cyclone of 1999 totally destroyed his field. The danger period for agriculture is October to December every year when low pressures tend to form followed by untimely floods. The monsoon floods occur during August and September. Post Super Cyclone temperatures have risen and rainfall pattern has completely changed for the worst. At times of cyclones there are possibilities of sea surges.

In the year 2012 he was introduced to the IRFC livelihood option while attending a GPC meeting at Junapangara village of which he is a member. He became interested. The logic behind the composite unit appealed to his farmer instinct and knowledge about local challenges. He placed his case before the GPC and was selected by the body for owning an IRFC unit. The Paribartan team visited his field and after ensuring that all formalities have been met approved the choice. He was then provided financial support (as per adjacent table). Guided by RCDC and the CRRRI scientist he set about doing the earth work. Other farmers of the locality tried to dissuade him pointing out the futility of agriculture in the changed circumstances but Ashok refused to heed their advice. He was then left to his fate as his friends laughed at his new found fancy.

| Components | Input Cost Support (Rs) |
|----------------------|-------------------------|
| Land Shaping | 5,000.00 |
| Paddy Seedlings | 3,000.00 |
| Fingerlings | 4,000.00 |
| Vegetable Seeds | 200.00 |
| Fruit Bearing Plants | 1,000.00 |
| Fish Feeds | 10,000.00 |
| Vermi Compost | 5,000.00 |
| Duckery | 1,500.00 |
| Fencing | 2,000.00 |
| Total | 31,700.00 |

Ashok says that he is happy that the Paribartan programme has introduced him to IRFC which combined pisciculture, paddy cultivation, vegetable cultivation, horticultural trees and duckery. According to him, “I at once saw the benefit of having a diversified basket. It was there in my mind but hard pressed for various reasons involving both family and funds I could never get myself to do it. I was also looking for a model that would provide me insurance against natural calamities.” He started out with the multi-tier pond model design and was well rewarded with the produce of fish, paddy, vegetables and fruit in the first year. That year he cultivated *Pooja*, the saline resistant CRRRI variety as suggested. The next year he adopted an indigenous variety, also saline resistant, called *Panianla*. He did so because the CRRRI scientist advised him to change rice varieties every year pointing out that changing variety every year ensures fertility of soil and thus leads to better yield.

He appreciates the vermi-compost unit which comes as a part of the IRFC. He recalls the time when he went bankrupt trying to provide the growing needs of chemical fertilizers and pesticides in his paddy field. At that time he had no faith on organic farming. However now after experiencing the benefits of organic inputs he is overjoyed.

He has also learnt different techniques of organic vegetable cultivation from the resource persons and Krishi Vikas Kendra (KVK) scientists arranged by the Paribartan programme. "I have learnt the technique of *patali chasa*. This is a method of bed preparation with available material that ensures an extremely fertile base for the vegetables cultivated on it. The demonstration and training was conducted in my field by Sabarmati Madam of Sambhav," he proudly says. He has also been trained for other organic practices and preparation of organic manure and pesticides made from locally available material. He reports that using organic fertilizers and methods has returned the fertility of his land and non pesticidal pest control methods have very effectively reduced the incidence of pests. He now understands the role of

chemical fertilizers and climate change. "We used to wonder about the rising heat and also the increased incidence of powerful lightning strikes. I now know the role of chemical inputs and their contribution to these calamities. I wish to thank the Paribartan team for increasing my awareness of climate change issues," he says.



He had adopted ducks and they were always frolicking and swimming in the pond. His children were particularly fond of the ducks. Calamity struck when one morning all the ducks were found dead in the shelter that had been built for them. They had been bitten by a snake. "Next time," he says "I will cover the shelter with a fine mesh so that snakes cannot enter." Ashok rues the loss as the eggs laid by the ducks fetched a good amount in the market.

The vegetables, fruit bearing and other trees planted by him are;

| Fruits | Vegetables | Nuts | Fuel Wood Trees |
|---------------|------------|-----------|-----------------|
| Cashew | Drumstick | Betel Nut | Bamboo |
| Guava | Jackfruit | | Acacia |
| Orange | Tubers | | Eucalyptus |
| Cucumber | Greens | | Karanjia |
| Papaya | Mushroom | | Jatropha |
| Coconut | Pumpkin | | |
| Karmanga | | | |
| Mango | | | |
| Banana | | | |
| Custard apple | | | |
| Pomegranate | | | |
| Lemon | | | |



Mr Das likes to innovate and he has raised the height of the bund around his field and made it thicker so that crabs do not make holes and enter his field to eat the fish fingerlings. He has planted medicinal trees and flowering plants to augment his income and meet the needs of his family. He has also planted creepers on the wall of his

house for effectively utilizing the entire space.

He has cut down some trees around the IRFC unit to allow more sunlight for various plantations and to maintain the ground water levels affected by eucalyptus trees. His pond has been constructed with a wavy bottom to discourage thieves from stealing the fish. When he wishes to harvest he will empty the pond using the canals and then catch the fish, he said.

He is an active member of the GPC and attends all meetings. He says it was the GPC which introduced him to the Paribartan programme's aims and objectives. Besides the climate change adaptation options he has also received training on DRR, and Early Warning System (EWS).

He enjoys his role as a Community Resource Person. He is always there for the farmers who come to his unit everyday and inquire about its methods. He attends GPC meetings to share his knowledge and learning on integrated farming, preparation of organic fertilizers and pest control methods, and cultivation of medicinal plants. He said he could recognise the signs of impending cyclones by observing cloud formations and wind direction from his own experience of such events.



That he has increased his income from the unit is evident from the fact that his thatched house is now a permanent one with brick walls and a corrugated roof. There is a TV in his house. Upon questioning he revealed that his income has increased after the Paribartan programme intervention. This he attributes to the trainings received and his own efforts and innovations helped by his family members.

| Sl | Component | Income (after Cyclone Phailin in October 2013) in Rs. |
|----|--------------|---|
| 1 | Paddy | 7200.00 |
| 2 | Fish | 23000.00 |
| 3 | Vegetable | 5000.00 |
| 4 | Fruits | 200.00 |
| | Total | 35400.00 |

He says farmers cannot now routinely continue with agricultural activities, they have to apply their minds and build systems that would help them cope with emerging problems.

He earned an income of around Rs. 100,000/- per annum from his IRFC unit in terms of fish, paddy, fruits, vegetables, sale of organic fertilizers and firewood in the year

2012. He also donates some trees, flowers, and fruits to a nearby temple. The fish component provides him Rs. 35,000/- every year. Mr Das is very confident that if the IRFC units are sufficiently replicated, the area would again become rich in fish and stop depending upon imports from Andhra Pradesh. “Currently the entire fish needs of the block are met by imports from Andhra,” he says, “However if the farmers of the region take up the IRFC seriously the day is not far off when a variety of local fish will flood the market rendering imports irrelevant.” It is interesting to note that Mr Das and family practice pisciculture and duckery despite being strict vegetarians.

8. Lessons Learnt

The IRFC owners maintain that the units emerged almost unscathed from the very severe Cyclone Phailin that hit the area on 12th October 2013 thus proving that the units are disaster resilient. This aspect and increased productivity is now encouraging other farmers to replicate the model in their fields.

According to Dr Sinhababu, CRRRI scientist, the benefits of an IRFC unit, besides being climate and disaster resilient, are; “Rice-fish farming systems increase farm productivity by about fifteen times and income by around twenty folds over traditional rice farming, besides two folds enhancement of farm employment. Rice-fish farming also has many other advantages, including control of weeds and insect pests in the rice field resulting increase in rice yield. This system is also environment friendly since harmful chemicals like insecticides, fungicides, herbicides are avoided and comparatively safer inorganic fertilizer is used. In the events of sudden drought, the rain water harvested in the refuge pond can be used for life saving irrigation for the rice and other crops. This way the disaster can be minimized. The cop canopy on the platforms over the water on the pond as well as side of the rice field will reduce the high temperature of the water during summer.” All these benefits have been noticed in IRFC units practiced by community persons in Paribartan programme area.

8.1 Expansion of IRFC Units

The success of the IRFC units encouraged the Paribartan programme to expand the number of IRFC demonstration units to 24 in the year 2013. Some of the earlier demonstration units were also up-scaled upon observing the need and innovativeness shown by the farmer. The amount of support was increased to Rs. 50,000/- to prepare demonstration units and as the economically weak vulnerable owners could not afford the digging of pond and trenches, the entire amount of earth work was supported by the project. The process of selection was the same as

before. The GPC made the resolution and recommended the farmer. The Paribartan team then visited the field, checked and approved the plot as suitable. The process of payment, in cash and kind, was maintained. There was a central Bhubaneswar Head Office based procurement of items to maintain transparency and ensure optimum utilization of funds. Currently the IRFC farmers are also cultivating pulses and other Rabi crops in their fields.

9. Challenges

The initial investment by the owners of the farm is high considering that a pond has to be dug/renovated and land work to shape the land and cut trenches is required. This is expensive and it is very difficult for a vulnerable family to take up the work without support. To keep down costs the owners supported by the programme were advised to take the support of the MGNREGA scheme. However the system of delayed payment under the scheme led to the labourers demanding instant payment from the owners of land. This unit is labour intensive and requires

- **High initial investment**
- **Problems with MGNREGA**
- **Labour intensive**
- **Requires diversified farming skills**
- **No single window scheme.**

diversified farming skills that cannot be expected from one and all. As there are various components in the IRFC one has to run from department to department to get support from government institutions. There is no one window clearance.

10. Conclusion

There is no doubt that the IRFC unit has emerged as a potent tool for the community to ensure its livelihood and nutrition needs in these troubled times of climate change and increased frequency of natural disasters. During the Cyclone Phailin and the subsequent floods, communities in many parts have survived on the vegetables and greens they had plucked from the units and stored. The programme needs to advocate for various integrated schemes to popularise this very successful climate change adaptation option. Taking a look at the lack of financial strength among the very vulnerable, communities can be encouraged to set up community units. This will also help the communities bond together and be more effective in tackling disasters. Replication of these units in the target area has already started and the adaptation of one or more of the systems incorporated has also been observed. The community has welcomed and embraced this successful model.