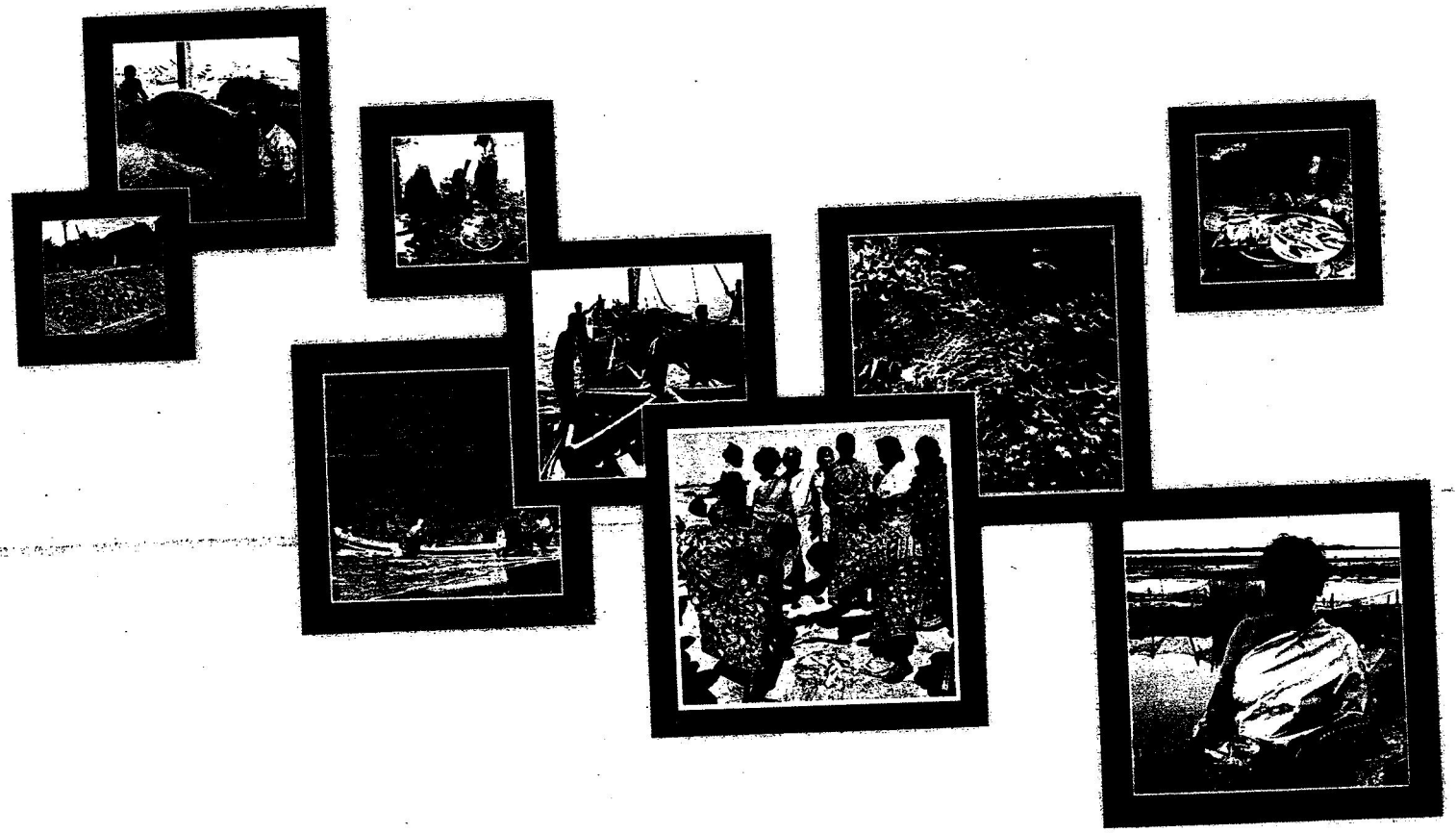
Workshop on Fisheries Resource Management

Compendium of presentations



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Content

Aquaculture based Sustainable Livelihood Development models for coastal farm families – CIBA's experiences in the Sunderbhan region of West Bengal

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Introduction

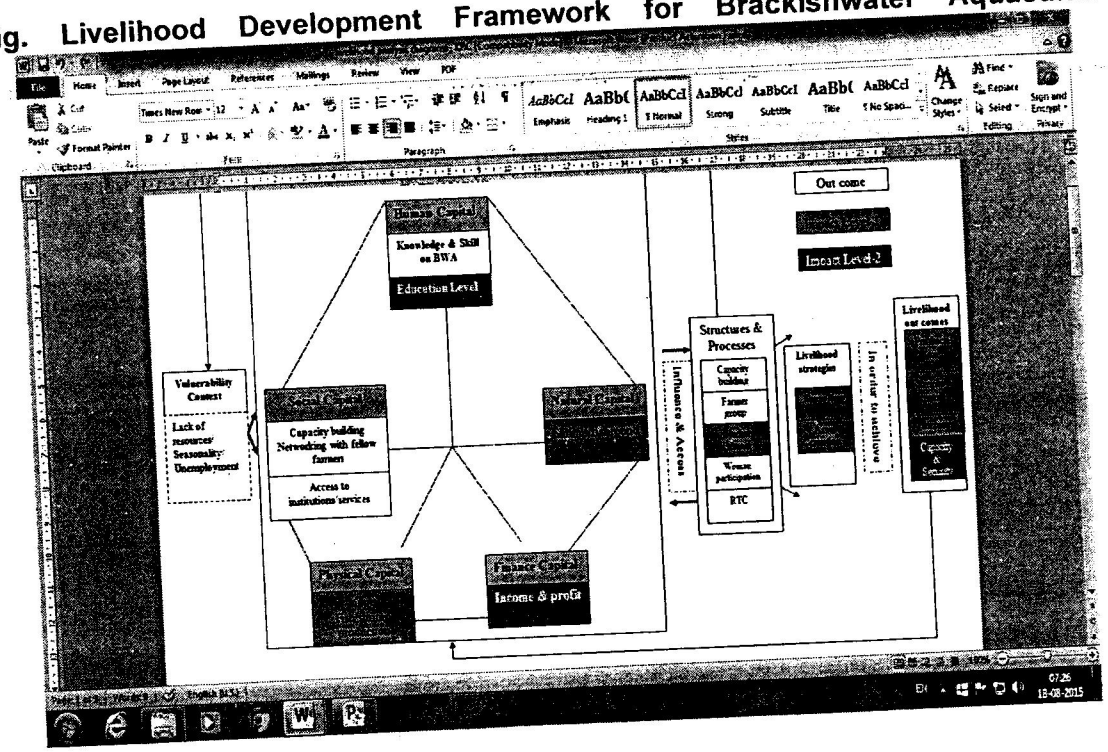
Fisheries and aquaculture is originally a resource poor family operated production system practiced mainly for poverty alleviation, elimination of hunger and reasonably low cost animal protein. The coastal farm families are vulnerable to natural and climatic hazards which most often affect their livelihood. Natural resource based alternative livelihood development models are the better fit and sustainable "living means" for the coastal farm families. Livelihood development is referred to as building "the capabilities, assets and activities required for a means of living. Coastal farm families operate under the complex-diverse-risk prone (CDR) agro-ecosystem and coastal agro-ecosystem is recognized as one of the most disadvantaged areas in the world dominated by marginal farmers. Low agricultural productivity and high unemployment among the rural people is the characteristic feature of the area. The degraded soil and water quality, together with extreme climatic adversities contribute to the poor livelihood security and low agricultural productivity in the fragile coastal ecosystems. The ground water is mostly saline and As there are no means for growing a second crop and being compelled to grow only low yielding rice, the financial condition of the people miserable. The farming is monsoon dependent and ground water is mostly saline and therefore the people are mostly unemployed during the post monsoon period. Due to this situation, about $1/3^{rd}$ of the total population in the locality is often forced to migrate elsewhere in search of their livelihood. It is important to develop sustainable livelihoods integrating the scarce resources available in the system and natural resource management. In this context the Sustainable Livelihood Development Framework (SLA) suggested by the DFID which include assessment of vulnerability, developing assets (human capital, social capital, natural capital, physical capital and financial capital), the transforming structures and processes which determine the access to the assets, livelihood strategies (activities and choices) and the livelihood

outcomes is an appropriate approach to build sustainable livelihoods for the marginal farm families.

Aquaculture based Livelihood models of CIBA

The Central Institute of Brackishwater Aquaculture developed brackishwater aquaculture driven livelihood modules viz., Land shaping to conserve rainwater for crop and fish cultivation, brackishwater aquaculture along the creeks and paddy cum fish culture and demonstrated them for the livelihood development of coast farm families of the Sunderbans region of India. As an example the model of livelihood development framework developed for the brackishwater aquaculture is given in the figure below.

Fig. Livelihood Development Framework for Brackishwater Aquaculture



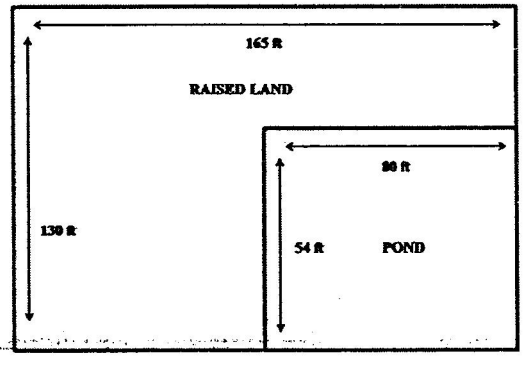
(Kumaran, CIBA)

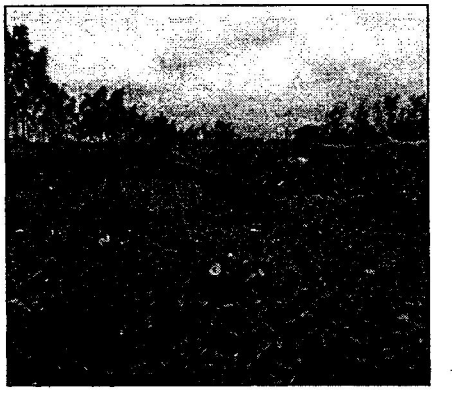
Module-1: Land shaping to conserve rainwater for crop and fish cultivation

Land shaping by definition is the alternation of the surface of the land to meet the requirements of the users. The term land shaping is related to any modification of the surface of the land primarily for harvesting rainwater for creating source for irrigation, reducing the effect of ground water salinity, reducing drainage congestion and growing multiple and diversified crops round the year. The land shaping module includes

excavation of 1/5th area of the low land up to a depth of 9feet, adjoining low land raised up to 1.5 feet, pond embankment-5feet wide and 4feet height, land embankment around the area-3feet wide and 3 feet height, 6-9 acre inch of rain water can be harvested and stored in the pond. By this technique, supplementary irrigation is possible for growing crops in a limited area in rainy season and high value vegetable crops can be grown during the off-season period. At the same time, rearing of fish in pond and growing of fruits and medicinal plants on the embankment developed by the dug up soil is also possible. Several models of land shaping can be adapted depending on the land situation and farmers need. The first model aims at excavation of pond at one corner side and the second model has a central position of the pond with provision of agricultural plots on two opposite sides of the pond for better irrigation coverage.

Land shaping models Model-1 (0.20 ha)

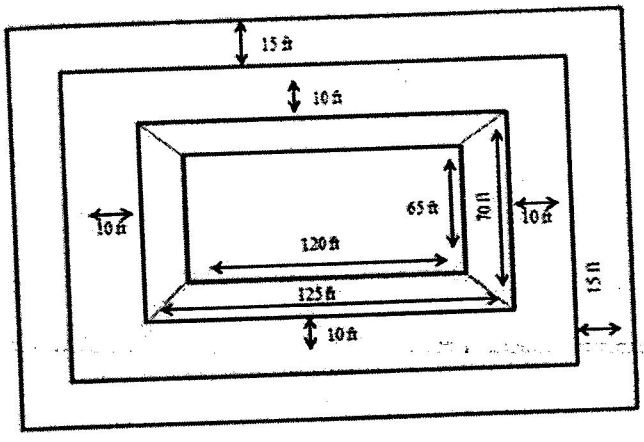


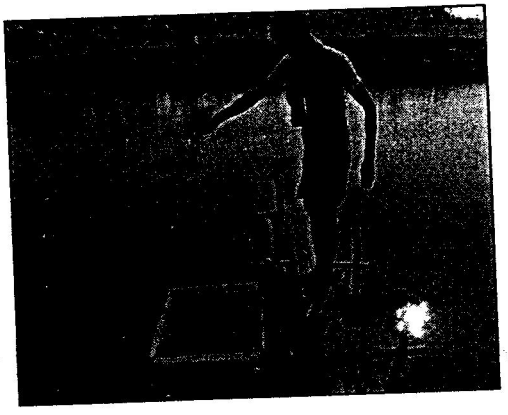


Module-2: Brackishwater aquaculture

Brackishwater aquaculture is an economically viable livelihood option for the people who have a piece of land along the brackishwater creeks. The height of the embankment is determined by the tidal height occurring in the area, generally about 30 cm above the maximum flood level. The slope of the pond bottom is so adjusted that it drains readily towards the outlet and, in large ponds, channels are dug to facilitate the draining. The brackishwater aquaculture module includes excavation of 14000 CFT soil from 1300 Sq M area (0.133 ha area)and excavation of about 26000 CFT (1.5 bigha) soil from 2000 Sq M area, pond embankment-5 feet wide and 4feet height and sluice gates are constructed in the deepest portion of the farm.

Brackishwater aquacultureModel - 1 (0.20 ha)





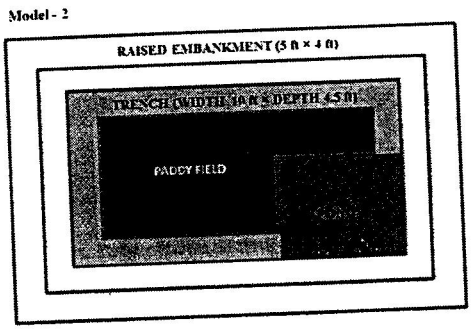
Proper selection of species is very important consideration for culture in brackishwater ponds. Tiger shrimp, *Penaeusmonodon*was cultured at a low stocking density of 3post larvae /m^2. Besides, fin fish species, *Mugil cephalus* and *Liza tade* were also stocked in1:3 ratio at a rate of 0.6 nos/m^2.Farmers also stocked other available brackishwater species like *Mystusgulio*, *Liza parsia* and *Scatophagusargus*on their own to realize better production from the unit area.

Module-3: Paddy cum fish culture

Paddy-cum-fish culture involves simultaneous production of paddy and fish in irrigated paddy fields so as to obtain an added production of fish with paddy. In this case, the paddy fields inundated with water are used for cultivation of fish. The module involves excavation of 1/10^{th} area of the low land up to a depth of 6-7 feet or peripheral canal with top-6ft*bottom-4ft*hight-4ft, pond embankment-5feet wide and 4feet height, land embankment around the area -5 feet wide and 4 feet height and about 2-3 acre inch of rain water can be harvested and stored in the pond/canal from an area of 1 acre. The Indian Major Carps (*Labeorohita, Catlacatla, Cirrhinusmrigala*) and freshwater prawn (*Macrobraccium rosenbergii*) were grown in the pond. It was a truly integrated system wherein the effective utilization of natural water and use of minimum fertilizers

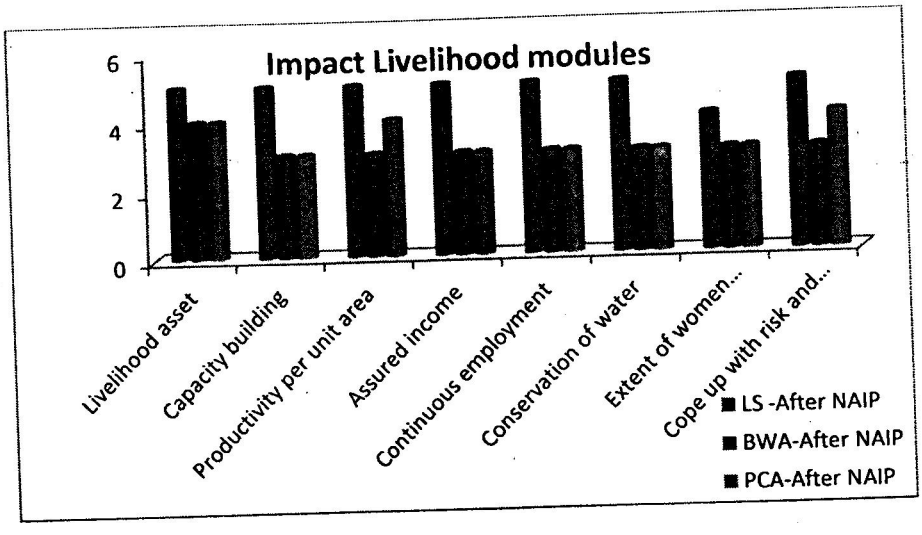
for natural productivity was done. The fishes could able to move through the fields helping the paddy crop in integrated nutrient and pest management.

Paddy cum fish culturemodel



Impact of the Livelihood modules

CIBA had demonstrated these three modules for the coastal farm families, creation of livelihood assets was the key intervention in these modules. The institute provided on farm capacity building, helping in making right decisions in crop selection and species selection and facilitated them to access the development institutions and market. The evaluation of the livelihood modules using qualitative and quantitative methods have clearly shown that these modules have brought livelihood security to the farm families in terms of livelihood asset (Land/Pond/AH), conservation of natural water for productive purpose, effective utilization of land space, knowledge and skill capacity, employment generation for the family/ others, improved production from the land/pond, self-sufficiency in food consumption, family health status, adequacy of income from farming, access to better market price, access to development institutions, access to institutional credit, minimised the migration during off-season, additional production system (crop/pond), economic self-reliant (free from debt) self-esteem and social prestige of the farm families.



Conclusion

The aquaculture based livelihood development modules viz., land shaping for integrating aqua-agriculture systems, polyculture of fishes and paddy-cum-fish farming were proved to be economically viable systems adhering to the principles of location specificity, techno-economic viability, social acceptability and environmental sustainability. These modules provided them viable livelihood assets, conservation of rain water for productive purposes, capacity building, increased productivity per unit area (20-60%), assured income (80-150%), continuous employment (40-200%), enhanced women participation (30-90%) with minimization of their livelihood risk and vulnerability to the level of 60-80%. The real-time assessments have strongly indicated that the aqua-agri Integrated Family Farming Systems (IFFS) provided significant improvements in the livelihood security farm families. Fine-tuning of these modules as per the capacity and resources of small and marginal farm familiescould transform them as resilient farming systems against biological, climate and market related risks. Appropriate institutional interventions and entrepreneurial extension focus are crucial to nurture these farmers as producers of 'organic fishes' that could give them a unique niche, and economic benefits. Further, mobilising these farm families in to producer groups could give them an own standing in the market driven future scenarios. Ecosystem based viable farming systems could alone retain the younger farmers in farming and provide sustainable livelihood security and economic prosperity to coastal farm families.