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FINAL REPORT

International Research and Training Centre for Below Sea Level Farming (IRTCBSF), Kuttanad

Thottappally P.O Alappuzha-688561

Department of Agriculture & Farmers Welfare

Eco-restoration of Vembanad Wetlands Mainstreaming Operations of Thaneermukkom Barrage by Devising Crop Calender for Kuttanad

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ECORESTORATION OF VEMBANAD WETLANDS MAINSTREAMING OPERATIONS OF THANNERMUKKOM BARRAGE BY DEVISING CROP CALENDAR FOR KUTTANAD

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Summary Findings

- The Thaneermukom Barrage was designed to prevent salinity ingress in the dry season and retain freshwater from the inflowing rivers into Kuttanad region so as to enable safe punja crop and intensify viruppu crop of rice.
- The barrage has been relatively successful in ensuring freshwater conditions in Kuttanad and enabling cropping additional areas during dry seasons. However, ecological consequences triggered by changes in salinity regimes and impeded circulation and mixing patterns has been disastrous. There has been a precipitous decline in brackish water fisheries.
- Elimination of tidal flushing has impacted pollution levels in Kuttanad, further aggravated by increased use of fertilizers and pesticides which also contributed to proliferation of invasive aquatic weed, Salvinnia initially and now water hyacinth.
- The shutters have remained closed for a period up to six months, invariably creating conflicts between farmers and fishers.
- The barrage has created a situation wherein farmers were at liberty to choose rice varieties of a longer crop duration as opposed to conventional systems where in only farming of varieties of a shorter duration of appropriate duration in tune with the natural environment of the region was possible. The introduction of rice crop varieties, having longer maturity period, 120-130 days duration in consideration of its high yield as compared to a the traditional varieties of 100-105 days duration has led to changes in the cropping schedules evolved over a long time . This has in effect forced closure of the Thaneermukom Barrage for longer periods. This is a technology malady. In actual practice, this resulted in closure period to extend from the promised three month period, up to even May and June.
- As observed in the study , extended closure of barrage has brought the farmers in conflict with fishers, as it led to interference in migratory pathways and decline in catch and production of fish and prawn species from the lake.
- Extensive use of polders for farming during rainy season has in effect augmented floods, with reduced as reduced physical space for accommodating floodwaters.

- Economically, the increased costs of production of rice, recurring costs of maintenance of embankments, water pumping charges and the unprecedented increased cost on weedicide and weeding which flourished with cutting off salinity after the construction of the barrage and pest control with the cutting of salinity, and indiscipline in cultivation crept in with the operation of barrage, presumably to increase rice cropping intensity, have in fact increased cost of production and reduced profitability in farming rendering the developmental intervention positively counterproductive to rice farming.
- With disruption of connectivity between riverine and marine environments the recorded fish diversity within wetland complex which has come down toaround 80 species consequent to commissioning of the barrage.
- The Indo-Dutch study mission in 1988-1989 as 7200 MT Fish yield from Vembanad area was estimated by, almost less than 50 percent of the original fish yield reported pre barrage period, 26,858 t .Over 93 percent of the production is from downstreams the barrage , north of Thaneermukom Barrage. In 2000- 01 the catch was reported to be only 687 MT which occupy almost 50 % of the area on upstream the south 4387.31 tons during 2014 and 762 tons on the south.
- *M. rosenbergii* , Kuttaadan Konchu is a prime prawn species that carry the name of the land. With the commissioning of Thaneermukom Barrage, the upstream and downstream migration of the giant prawns, *M. rosenbergii*, was disrupted leading to near decimation of its fishery in the estuary. The annual catch of this species during the pre barrage period was 429 tons ,has now declined to the less than 27 tons per annum on the southern part of the barrage and as per this study the annual production is 128. 648 tons per annum.
- This decline is mainly attributed to the physical obstruction inflicted by the barrage on the breeding migration of the spawners, downstream to brackish water locations and the reverse migration of post larvae to their home grounds in Kuttanad.
- Vembanad estuary is also a rich source of live as well as sub fossil deposit of clam, which forms the basis of livelihoods for around 12,000 households. Declining availability of clams within the lake has created immense hardships for the clam collectors.
- Owing to significant changes in fisheries after construction of Thaneermukom Barrage, the overall importance of this livelihood system has declined, with a sizeable proportion moving out to alternate sources of employment, for example, clam collection.

- Agriculture in Kuttanad alone provides sustenance to 90,000 farmers. While the total number of fisher households in and around Vembanad was estimated to be 17,369 in 1992, it has been reportedly reduced to less than 5,000 in 2012, as fishing is no more a sustainable livelihood.
- More people are moving out of traditional occupations, and the region is experiencing a great threat of labour shortage. This is in contrast to the excess labour that was available in the past, when there were no other occupational options before the inhabitants.
- At present there are conflicting interests. These conflicts are to be resolved by helping all of them to improve their livelihood by adopting more suitable cropping patterns than religiously sticking on to paddy.
- As the fish need transparent , tranquil clean waters for breeding and survival the deterioration of water quality has impacted this species drastically .
- The average fish catch per fisher group (of 6 fishers) has also reduced to 7-8 kgs per day (for 200 days per annum) as against 20 kg reported earlier.
- Increased siltation and sedimentation of the lake beds after the commissioning of the barrage has led to and a concomitant loss of water holding capacity of the estuary the loss in volume by $1/4^{th.}$
- It has been demonstrated in this study that with the climate change effects, there shall be further decrease of summer flows and increased ingression of salinity consequent to sea level changes.
- Human interventions in the estuary like deepening of the estuarine bed for longer periods for construction of huge shipping terminal at Vallaarpadam, etc promote ingress of high saline waters during the dry season.Tidal propagation of high saline water is reportedly changing that salinity level to distressing level year after year, in the Kuttanad area north of the barrage.
- Enhncement of fresh water flow in to Kuttand area through inter basin transfer is considered a way forward to deter the incursion of salinity for which possibility of diversion of a minimum desirable quantum water from the Ithipuzha tributary of the Muvattupuzha river system is suggested as this river system has a perennial summer flow, being fed by the tail waters of the Idukki hydel project.

- The study illustrate that much more water can be and need to be stored and saved in the upstream catchment areas of the four rivers draining to Vembanad. More monsoon water can be stored by expanding the water spread area and/ or deepening so as to contain as much of the monsoon water as possible within Kuttanad itself .
- Another alternative suggested to enhance summer flow, is to create additional fresh water storage within Kuttanad area itself. The uncultivated fields are suggested to maintain high water level on the southern side of TMB.
- Saline water is a good remedy for aquatic weed, water hyacinth. They are destroyed when salinity reaches 2.4 ppt 1/8 th of the sea water salinity.
- Floods that come as a curse, that create disaster in the region, at the same time blesses this low-land with silt, making the region fertile for rice cultivation .
- In order to reduce the detrimental effects of pollution, one of the solution suggested is a proposal for snap opening of the barrage for short periods, during the closure period of the barrage when salinity is limited to 2ppt.
- However, serious apprehensions are raised to such a proposition of draining of freshwaters from Kuttanad out in to the sea during low tide, when the inflows from rivers is too low as rapid lowering of water levels in the lake at periodic intervals is apprehended to enhance subsurface incursion of saline seepages from the coastal seas.
- In order to give more room for holding water within Kuttanad and for protection to paddy lands, as part of the post flood Kuttanad package, one of the project suggested is compartmentalization and by clustering of padasekharams by designating the canal and water system in to a hierarchy of primary, secondary and tertiary systems as a single group of cluster with in a stronger outer bund .
- However, It is apprehended that the suggestion do not recognize the fact that padasekharams are not merely polders at below sea level farms, but a high density settlement zones and the water courses or tertiary canals connected to the primary and secondary canals as named are not mere irrigation canals but the very life lines and navigational arteries for the residents.
- Over 70 % of the citizens of Kuttanad, have no access to clean drinking water. The project suggest to bring in piped water from the rivers.The uncultivated polders can be developed for storing and harvesting of rainwater and for utilization as drinking water

source, after treatment and hence could be developed as a highly reliable and inexpensive community water supplies system.

- A Management body comprising representatives of farmers, fisher man, officials of concerned departments, scientific experts and elected representatives shall be formed for coordinated management of the wetland ecosystem including Thanneermukkom barrage.
- The decline in fish production in Lake Vembanad after the commissioning of TMB is principally attributed to the physical obstruction to migration of fishes across barrage. partial solution to habitat fragmentation is developing fish passage 'fish ways' facilitates 'fish passage' for migrating fish to enable target species to pass barriers on fluvial systems .
- The developmental activities in Kuttanad have helped to some extent increase the area and production of rice and improve the life conditions in the region. However, on a closer analysis, these positive aspects turn out to be only marginal.But the present study resolutely hold that it has not benefitted rice farming the ways it was envisaged.
- Kuttanad is a lowland region filled with water according to the laws of nature.Water abundance and tidal effects through proximity to coastal seas are blessings which have been turned in to curses by short sighted human interventions.
- In the context that the per capita land availability is too low, the essential approach therefore shall be to promote a biodiversity based Integrated Farming system that will ensure high productivity, profitability and sustainability. Paddy cultivators in Kuttanad need to adopt cropping patterns with assured increase in income and reduced risk, with out compromising their role of water function from the perspective of livelihood and quality of life of the people.
- With this approach , Kuttanad can and has to produce more food- calories, proteins and fat- because it receives more than a proportionate share of water which is a scarce resource. This cannot be, however, from paddy alone, but from a combination of fish, fruits and paddy.Rehabilitation one of the rich inland fisheries of the Vembenad estuarine system calls for massive development and Popularization of Open Water Aquaculture Systems.

- Fish Ranching and Open Water Fishery Enhancement and establishment of Fish Reproduction Protection Zones and Fish Sanctuaries established at Kumarakm, first of its kind in Vembanad lake are valid approaches to enhance livelihoods in fisheries .
- In the context that the increased maturity duration of varieties has encouraged a non-rhythmic punja season stretching from November to May, replacing the earlier stringent punja crop calendar which compelled the closure of TMB for prolonged period, from December to May or even up to June, promoting appropriate short and medium duration rice varities in combination with a scientific crop calendar and its enforcement are suggested to bring in discipline in cultivation.
- The study recognizes that the role of flood cushioning Kuttanad paddy fields are different from paddy fields in other areas. While reduction in paddy area in other laces adversely affect flood cushioning, Kuttanad, where below sea level farming is practiced, it is the increase in farmed area especially during rainy season that reduces the flood cushioning function of the paddy lands.