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Impact of introduction of culture based fisheries on fish production in two perennial reservoirs in Sri Lanka

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Abstract
Sri Lanka is blessed with a large number of irrigation reservoirs. In this paper impact of introduction of CBF on fish production in two perennial reservoirs, namely Senanayake Samudra (7793 ha.) and Jayanthi wewa (1012 ha.) are assessed.

Average stocking rates were 192 and 804/ha./year in Senanayake Samudra (SS) and Jayanthi Wewa (JW) respectively. Introduction of CBF into SS resulted in a significant increase in fish production from 111.8 m. tons/annum to 614.9 m.tons in 2013. Similarly fish production in JW increased from 32.0 m.tons to 189.3 m. tons. Fish production per unit area in SS and JW increased to 78.0 and 187.0 kg./ha/yr/in 2013 from 14.3 and 31.6 kg/ha/yr. respectively.

Nile Tilapia was the dominant fish species contributing 80 – 90% to the total catch in both reservoirs prior to the introduction of CBF. Although landings of Nile Tilapia increased by 74.7% and 287.6%, contribution of Nile Tilapia decreased to 64.6% and 57.1% respectively in SS and JW. Contribution of stocked carp species to the total catch were 29.0% and 37.0% respectively in SS and JW. Biomass gain of fish obtained per 100 fingerlings of Nile Tilapia, Catla, Rohu and FWP in SS were 85.6, 26.2, 13.1 and 0.2 kg respectively, while that of JW 43.1, 45.2, 32.2, and 2.80 kg.

Role of CBO's in implementation of CBF and the fisheries management measures introduced are also discussed.

Keywords: Culture-based fisheries, perennial reservoirs, Stocking, fisheries management measures

1. Introduction

Sri Lanka is blessed with a large number of irrigation reservoirs. Some major reservoirs over 2000 years old. Depending on their hydrological regimes, they are broadly categorized into perennial and seasonal reservoirs. There are around 200,000 ha of perennial reservoirs in Sri Lanka. Perennial reservoirs are divided into three broad size categories, Minor (<200ha), Medium (200-800 ha) and major (>800ha). These reservoirs are secondarily used for inland fisheries. Government of Sri Lanka has recognized culture based fisheries (CBF) as an effective way of increasing fish supplies in rural areas, at affordable prices, while also providing employment and additional income to rural farmers, and thereby contributing towards alleviation of poverty.

Culture-based fisheries, where yield are based predominantly on the capture of stocked fish, can be effective in increasing yields where natural recruitment is lower than the environment carrying capacity. CBF are less resource intensive and require fewer technical skills at farmer level, allowing communities with relatively limited experience to engage in fish cuture.

CBF in seasonal reservoirs of Sri Lanka was initiated in early 1980'sand it's development was well documented [1, 2, 3, 4].

Introduction of CBF into perennial reservoirs is a recent development and Pushpalatha and Chandrasoma (2009) [5]. Reported on the introduction of culture-based fisheries in minor perennial reservoirs.

This paper evaluates the impact of introduction of CBF on fish production in Senanayake Samudra (SS.) and Jayanthi wewa (JW) two major perennial reservoirs situated in the Eastern Province of Sri Lanka.

2. Materials and Method

Two major reservoirs Senanayake Samudra (7793 ha at f.s.l.) and Jayanthiwewa (1012 ha at f.s.l.) situated in the eastern part of Sri Lanka (Fig. 01) was selected for this study.

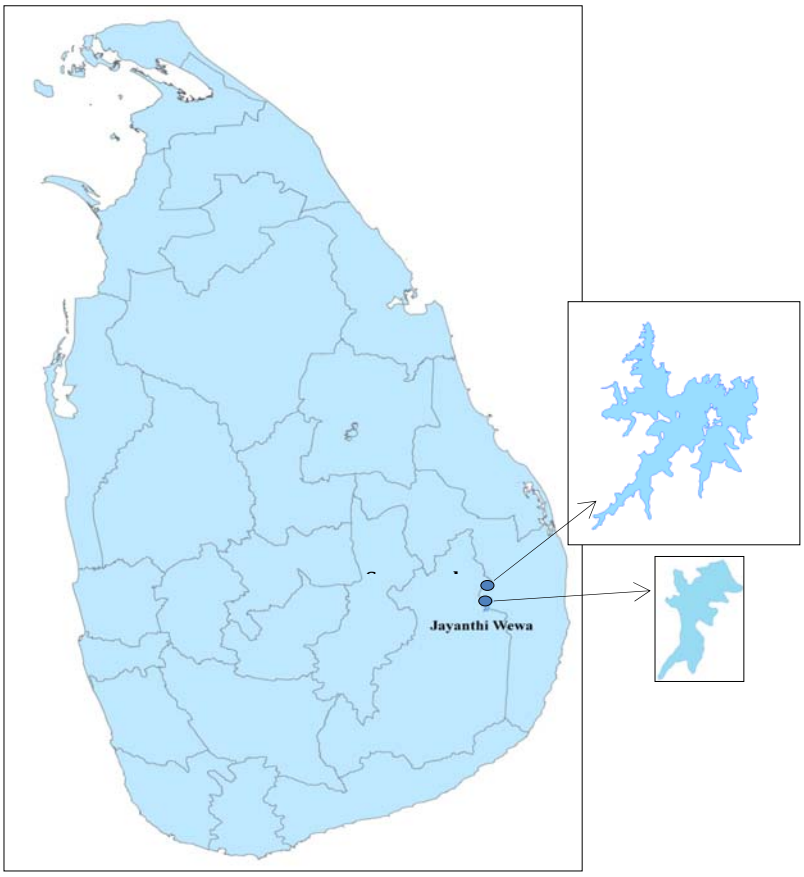

Fig 1: Location of Senanakaye Samudra and Jayanthi wewa reservoirs in Sri Lanka

2.1 Introduction of CBF

Main activities involved in the introduction of CBF in perennial reservoirs are strengthening of fisher community based organization, stocking with suitable varieties of fish fingerlings, introduce fishery management measures with the participation of fishers, harvesting and data collection.

2.2 Fisher community –based organization

As a pre-requisite to undertake CBF fisher community based organizations (CBO) was reorganized and strengthened with the participation of fishers and would be fishers. Members of the CBO were given training in basic aspects of CBF. Further, they were provided with training in CBO management, leadership, simple accounting, record keeping etc.

2.3 Reservoir Stocking

Stocking has been a continuing activity commencing in 2009 with stocking hatchery produced Nile Tilapia (*Oreochromis niloticus*), Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*) and Freshwater Prawn (*Macrobrachium rosenbergii*) (FWP). Tese species were selected for stocking by CBO members in consultation with fisheries extension personnel. Average stocking rates were 192 and 804/ha./year in Senanayake Samudra (SS) and Jayanthi Wewa (JW) respectively. Average total length at stocking was 5-6 cm for a carp species and 6-8 cm for *Nile tilapia*. Freshwater prawn post larvae (PL) of day 45 were used for stocking.

2.4 Fisheries Management Measures

Respective fisher CBO's was actively involved in implementation of fisheries management measures. Regulation of the Fisheries and Aquatic Resources act (FAR Act) of 1996 was strictly adhered to (Gill nets only; no mono filament nets; no trammel nets; surrounding nets; no sieve nets). Although minimum mesh size in gill nets allowed is 85 mm; CBO members collectively agreed and used gill nets with mesh size of 115 mm and above. A fixed time period for carrying out fishing operations (5.00 pm to 7.30 am) was implemented. The numbers of landing sites for harbouring of fishing crafts have been reduced to one, from seven and two respectively in SS and JW. Further, surveillance of the reservoir to observe any unauthorized fishers were carried out by CBO members as a routine.

2.5 Harvesting

Harvesting of fish is a year round activity. Non mechanized fiber glass outrigger canoes are used for fishing. Fishing gear are gill nets with stretched mesh sizes ranging from 115 mm to 200 mm. In general each boat is operated by two fishers who place their nets in the evening and haul them in the next morning.

2.6 Collection of data on fish catches

Species wise fish catch data was recorded by the CBO on a daily basis and maintained in a computerized database.

3. Results

3.1 Fish production

Introduction of CBF in both reservoirs under consideration has resulted in higher fish production (Fig. 02). Introduction of CBF into SS resulted in a significant increase in fish production from 111.8 m. tons/annum during pre-culture based fisheries period (pre-CBF) to 614.9 m.tons in 2013. Similarly fish production in JW increased from 32.0 m.tons during pre-CBF period to 189.3 m. tons in 2013.Similarly Fish production per unit area in SS and JW increased to 78.0 and 187.0 kg./ha/yr/in 2013 from 14.3 and 31.6 kg/ha/yr. during pre CBF period respectively (Fig 03).

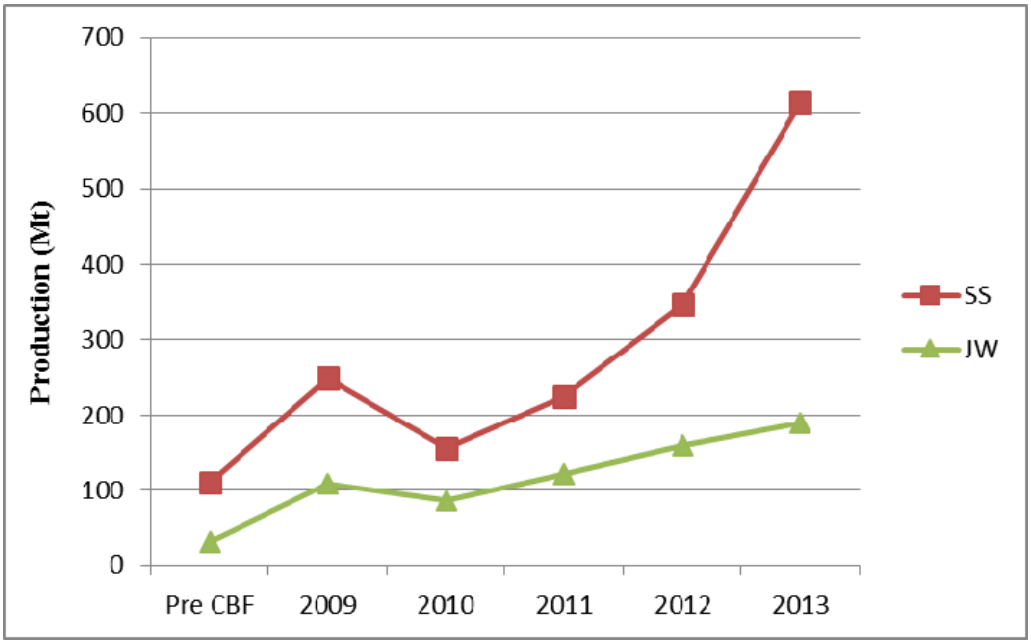

Fig 2: Total fish production (kg) in SS and JW prior to introduction of CBF and after introduction of CBF.

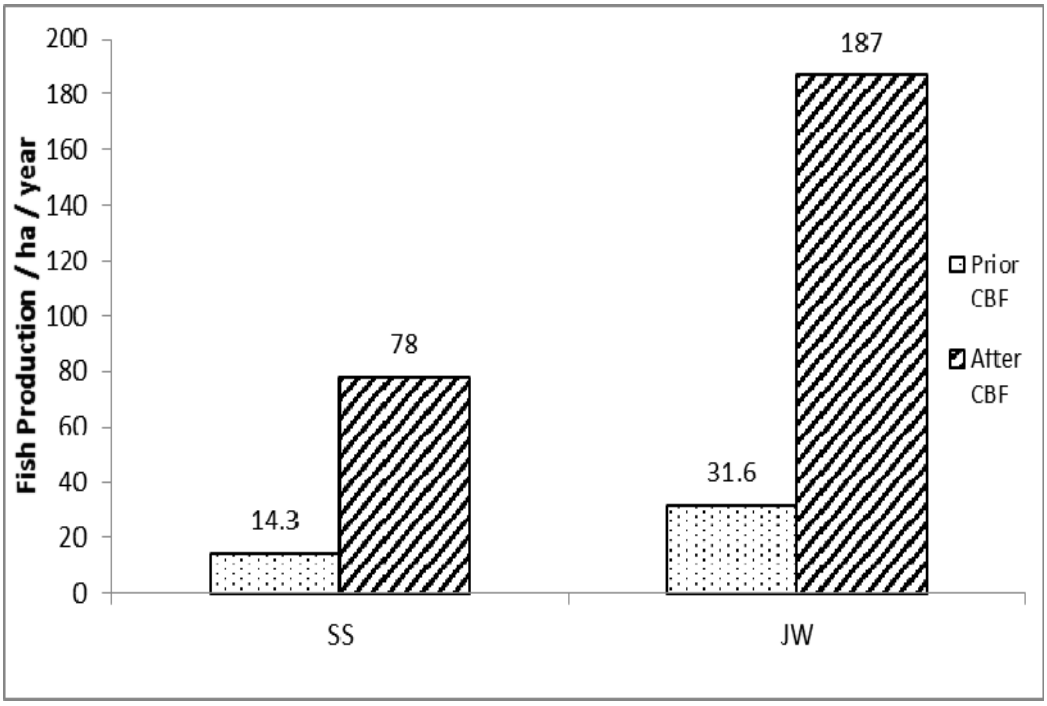

Fig 3: Fish production per unit area per annum prior to introduction of CBF and in 2013 after the introduction of CBF

3.2 Species composition

Nile Tilapia was the dominant fish species contributing 80 – 90% to the total catch in both reservoirs prior to the introduction of CBF. Although landings of Nile Tilapia increased by 74.7% and 287.6%, contribution of Nile Tilapia, to the total fish catch decreased to 64.6% and 57.1% respectively in SS and JW. Stocked carp species contributed significantly to the fish catch of the reservoirs with contributions of 29.0% and 37.0% respectively. Catla was the dominant species among carps. Changes in the species composition of fish species is given in Fig 04.

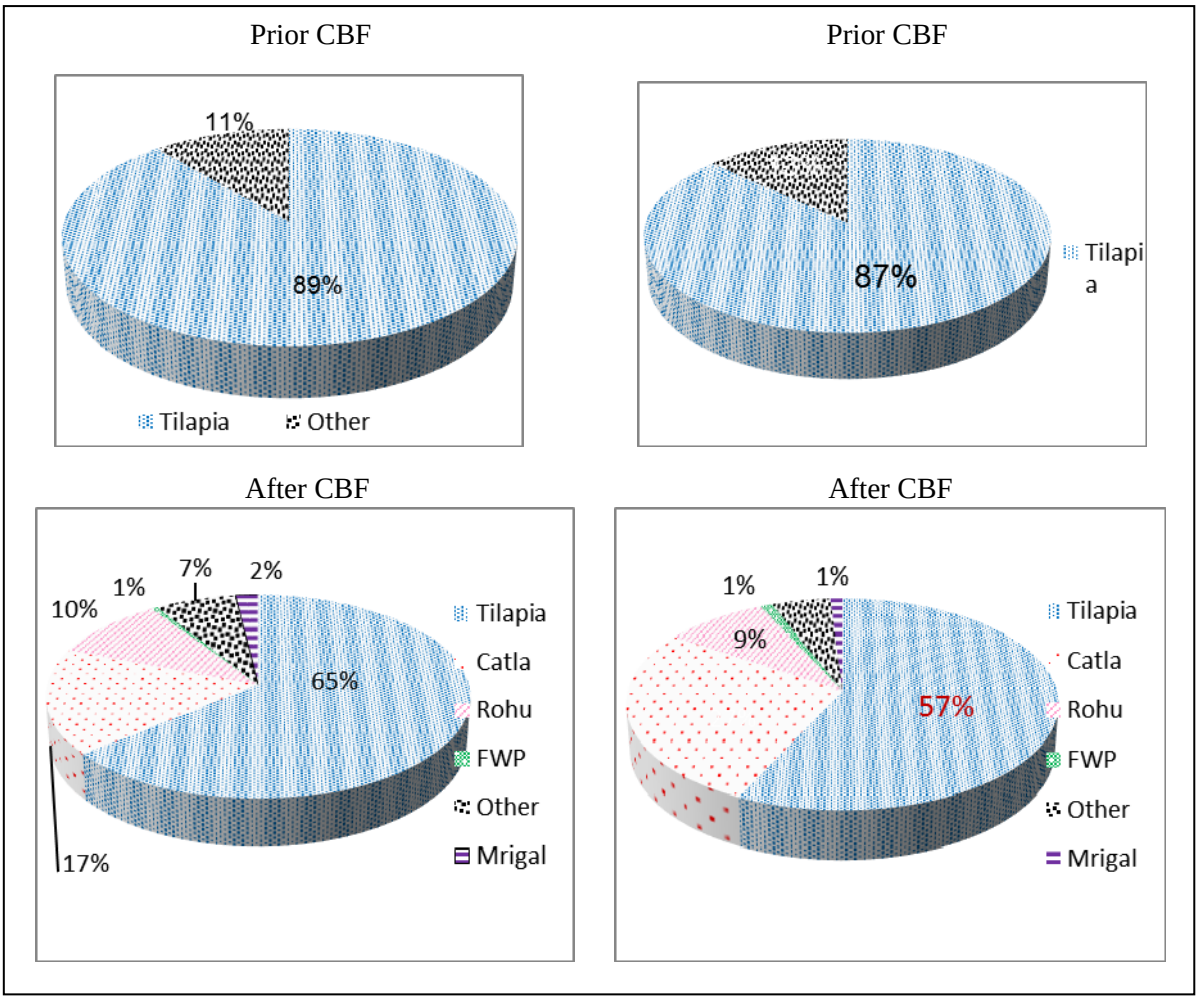

Fig 4: Species composition of fish catches prior to introduction of CBF and after introduction of CBF in *Senanayake Samudra* and *Jayanthiwewa.*

3.3 Biomass gain and Monetary gain

Biomass gain of fish obtained per 100 fish fingerlings stocked and monetary gains of stocked fish species are given in table 01 and 02. Biomass gain of fish obtained per 100 fish fingerlings of Nile Tilapia, Catla, Rohu and FWP stocked in SS were 85.6, 26.2, 13.1 and 0.2 kg respectively, while that of JW were 43.1, 45.2, 32.2, and 0.29 kg. Stocking of Nile Tilapia, Catla, Rohu and FWP has positive monetary gains. Monetary gains of stocking of fingerlings of Nile Tilapia, Catla and Rohu in both reservoirs and stocking of FWP in JW found to be very attractive.

4. Discussion

Development of CBF I perennial reservoirs is a recent development in Sri Lanka. Stocking coupled with proper management of fisheries in SS and JW have resulted in significant increase in fish production. Pushpalatha and Chandrasoma (2009) [5]. Reported production increase of 42.8% to 1344% after the introduction of CBF in 15 minor perennial reservoirs. Annual fish production per unit area increased to 78.0 kg to 187.0 kg/ha/year during 2013 in SS and JW respectively. Pushpalatha and Chandrasoma (2009) [5]. Reported an average fish yield of 208.10 kg/ha/year (ranging from 81.3 to 533.0 kg/ha/year) in minor perennial reservoirs after introduction of CBF)

Although the percent contribution of Nile tilapia to fish catches of both reservoirs decreased, it is interesting to note a significant increase in landings of Nile Tilapia 74.8% in SS and 287.6% in JW). Stocking of carp species has resulted in significant contribution of carp species in both reservoirs, indicating availability of underutilized natural food resources in these reservoirs. Mrigal, which was stocked in these reservoirs have started to appear in fish catches in significant numbers in 2014 (personnel observations) and it is expected that this will further facilitate increase in contribution of carps in fish catches.

Monetary gain of stocking of Nile Tilapia, Catla and Rohu are very attractive. Although the biomass obtained per 100 post larvae of freshwater prawn stocked is low, monetary gain is found to be satisfactory. Fishing gear used is gill nets. It is not an efficient fishing gear for catching freshwater prawns. Introduction of new fishing gear, such as traps may facilitate increase in landings of freshwater prawns.

Legal framework exists under Fisheries and Aquatic Resources act of 1996 facilitated the implementation of activities related to CBF. These provisions in the Fisheries and Aquatic Resources Act included registration of fishing craft, need to obtain a license to engage in fishing operations and prevention of the use of fishing gear specified as illegal etc. The requirements for obtaining a license for fishing operations prevent open access to fishing and ensure the ownership of the fish catch to a group of fishers, who has organized into a fishing CBO. In addition there are provisions to limit the number of units of fishing gear (number of gill nets) that can be used by a fisher, when fishing in a reservoir.

Strong and active CBO is important for successful implementation of CBF. A good cooperation existed between the CBO and fisheries extension officers in the area. Fisher

CBO was involved in decision making in respect of all aspects of CBF and actively involved in management of CBF. CBF members no only refrained from using illegal fishing gear but also prevented any unauthorized fishing in reservoirs, through implementation of surveillance.

Funds required for stocking was generated by levying a fee for every kg of fish landed. CBO's involvement in collection and maintenance of stocking and catch data has resulted in availability of very accurate data, which are useful for the CBO as well as for fisheries authorities for planning purposes.

It is evident that the introduction of CBF in SS and JW has resulted in significant increase in fish production, in turn enhancing income of fishers, availability of fresh fish to rural communities and livelihood opportunities. An active CBO's and their active involvement, availability of legal framework for ensuring ownership of the harvested fish and for sustainable management of CBF and adequate socking of reservoirs with suitable fish species are the key factors for success in introduction and implementation of CBF.

Table 1: Details on monetary gain from stocking of Nile Tilapia, Catla, Rohu, and Freshwater prawns in Senanayake Samudra

Fish Species	Weight of fish obtained per 100 fingerlings/PLs stocked (kg)	Market value of fish obtained per 100 fingerlings/PL's stocked (Rs)	Market value of harvested fish – 100 fingerlings cost (Rs.)
Nile Tilapia	85.60	13,692.00	13,496.00
Catla	26.20	2,359.00	2,158.00
Rohu	13.10	1,182.00	979.00
FWP	0.20	173.53	80.60

Notes. Selling price considered at SL Rs. 160 per kg for Tilapia, Rs. 90 Rohu, Catla and Mrigal and at Rs. 850 per kg for Freshwater Prawn. Cost of Fingerling = SL Rs. 2.00 and Cost of Freshwater prawn Post Larvae = SL Rs. 1.00. (1 US $ = SL Rs. 132)

Table 2: Details on monetary gain from stocking of Nile Tilapia, Catla, Rohu, and Freshwater prawns in Jayanthiwewa

Fish Species	Weight of fish obtained per 100 fingerlings/PLs stocked (kg)	Market value of fish obtained per 100 fingerlings/PL's stocked (Rs)	Market value of harvested fish – 100 fingerlings cost (Rs.)
Nile Tilapia	43.14	7,333.18	7,133.18
Catla	45.15	4,063.73	3,863.73
Rohu	32.17	2,894.96	2,694.96
FWP	0.29	248.27	148.27

Notes. Selling price considered at SL Rs. 160 per kg for Tilapia, Rs. 90 Rohu, Catla and at Rs. 850 per kg for Freshwater Prawn. Cost of Fingerling = SL Rs. 2.00 and Cost of Freshwater prawn Post Larvae = SL Rs. 1.00. (1 US $ = SL Rs. 132)

5. References

1. Chakrabarty RD, Smaranayake, RADB, Fish culture in seasonal tanks in Sri Lanka. Journal of Inland fisheries in Sri Lanka 1983; 2:125-140.
2. Chandrasoma, J. Primary productivity and fish yield in ten seasonal tanks in Sri Lanka. Journal of Inland fisheries in Sri Lanka 1986; 3:56-62.
3. Chandrasoma J, Kumarasiri, WSAAL. Observations of polyculture of fish in seasonal tanks in Ratnapura and Monaragala districts in Sri Lanka, Journal of Inland fisheries in Sri Lanka 1986; 3:49-55
4. Silva DSS, Amarasinghe US, Nguyen TTT (eds). Better practice approaches for culture based fisheries development in Asia. ACIAR Monograph 2006; 120:96.
5. Pushpalatha KBC, Chandrasoma J. Culture based fisheries in minor perennial reservoirs in Sri Lanka: Variability in production, stocked species and yield implications. Journal of Applied Ichthyology 2009; 1-6.