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Impact of Carp Fish Hatchery on Fish Production and Livelihood of Tribal Communities of Raigad District, Maharashtra

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Abstract: After the disastrous floods in coastal area of Maharashtra in July 2005, a number of developmental interventions have been started after the complete relief and rehabilitation activities. The work was initiated for the benefit of tribal community in two blocks of Raigad district, viz Poladpur and Mahad focusing on their socio-economic empowerment and addressing their livelihood issues. The inland fishing is one of the major sources of livelihoods for *Katkari*, *Bhoi*, *Koli* tribal communities. Considering the dearth of fish-seedlings to stock the inland water bodies of the region, a comprehensive carp fish hatchery production unit was established in the year 2011 with an annual capacity of 50 million of fish spawn. This fish hatchery is fulfilling the fish fingerling requirement of the cooperatives and private traders. It is providing quality fish fingerlings of catla, rohu, mrigal and common carp to the tribal inland fishing cooperatives. Several years of intervention by way of technical and financial help, it has helped to enhance the fish production from the reservoirs up to 285 to 385 kg ha⁻¹ from initial fish production of 11 kg ha⁻¹ during 2006-07. This increased production was because of regular stocking of fish seed at fingerling stage in the reservoirs and adoption of proper fish harvesting methods. Because of enhancement of fish production per unit reservoir area, there is an increase in annual household income of cooperative members. The average annual household income was Rs. 42,415/- by all sources during the period between 2013-14 to 2016-17, which mainly included fishing activity near dam and river (Rs. 39,011/-); and 56% of 4,774 household i.e. 2,680 have stopped migration totally and from the remaining, the migration has been reduced partially by 400 household, who were otherwise used to migrate after the harvest of agricultural crops.

Keywords: Tribal community, *Katkari*, Fish hatchery, Fish seed, socio economic transformation

1. Introduction

Maharashtra State offers an excellent opportunity in the fisheries sector as compared to other states of India mainly because of the vast water resources at its disposal. Production of fish from marine capture fisheries of the state has stagnated or showing a declining trend and hence increasing demand for fish in the markets will have to be met from enhanced production from inland fisheries resources. During 2016-17, the total fish production of the state was 6.63 lakh tonnes (4.63 lakh tonnes marine and 2.0 lakh tonnes inland) with the export of 1.47 lakh tonnes amounting to Rs. 4116 crore. The inland fisheries resources of Maharashtra include 19456 km rivers, canals and 3,09,557 ha ponds and reservoirs. Altogether, there are about 2261 reservoirs covering an area of 2,73,750 ha. Most of these are made mainly for irrigation purpose but has good potential for fish culture. Even though there is a lot of potential for fish production through the reservoir resources of Maharashtra, the average productivity is very less i.e. less than 20 kg/ha which can be enhanced to 10 to 20 times more if proper and scientific management measures are employed [1].

The major objective and very theme revolves around the “sustainability” of rural beneficiaries. Status and future prospects of fish culture in various types of reservoirs in India has been reported [2,3,4]. Some examples of Indian reservoirs, where research and scientific management were bridged-up with launching of the AICRP project, CIFRI, Barrackpore [1]. The fish production per unit area of reservoir has been increased after implementation of scientific management practices which includes stocking of fish seed at fingerling stage (> 70 mm) with appropriate numbers in some of the reservoirs [1]. Such interventions and its awareness are required in Maharashtra to enhance the fish production per unit area of reservoir.

2. Materials and Methods

After the disastrous floods in July 2005, an NGO named the Shramjivi Janata Sahayyak Mandal (SJSM) started work for the development of the *Katkari* tribals of Raigad district in the Konkan region of Maharashtra. A number of development interventions have been started after the complete relief and rehabilitation activities. The fisheries work was initiated for the benefit of this community in all the hamlets of the two blocks of Raigad district, viz Poladpur and Mahad focusing on their socio-economic empowerment and addressing their livelihood issues. The technical help needed for the said work was extended by the College of Fisheries, Ratnagiri, a constituent of Dr. B.S. Konkan Krishi Vidyapeeth, Ratnagiri Maharashtra state. The work with *Katkari* community was focused on establishing their identity as citizens by mobilizing caste certificates, ration cards and voting cards. Due to the availability of these certificates/cards, tribals were able to access their rights such as housing, *Ghurukul Yojana*, land rights from Forest Department and rights over water bodies for inland fishing and development schemes from ITDP, Department of Fisheries etc., which otherwise would have been a distant dream for many of them. The inland fishing is one of the major sources of livelihoods for *Katkari*, *Bhoi*, *Koli* communities. It has a vast potential of providing nutritious food to society in a reasonable cost and more importantly to create large employment opportunities for people and youths.

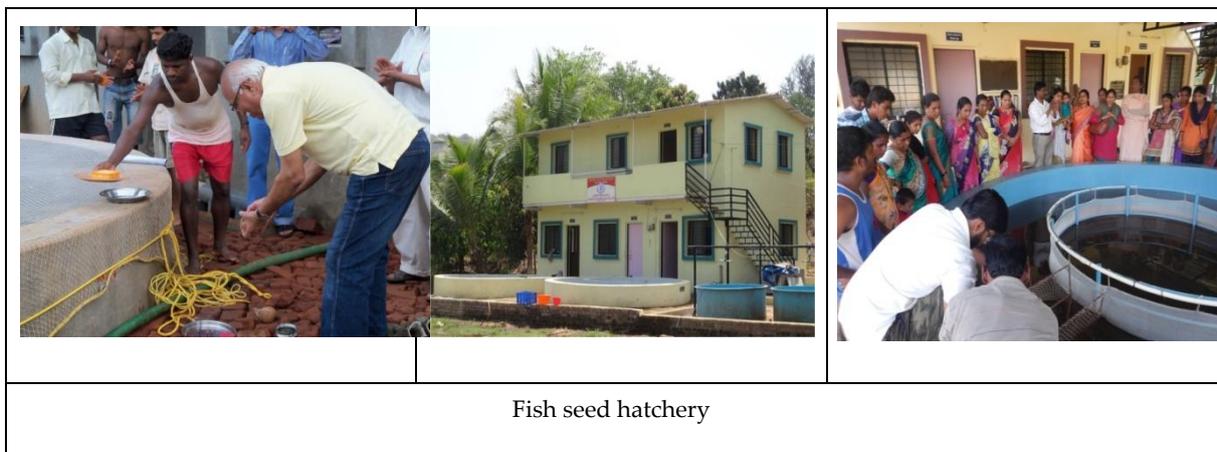
In the beginning at Poladpur block, SJSM and other members procured preferential allotment of fishing rights to registered cooperatives of fishing communities at the government rates through the

Maharashtra Government Resolution of 2009. A total of twenty two NGOs have promoted 18 cooperatives and helped tribal fishermen to establish fishing rights on 31 water bodies. The process got consolidated with inputs for improved agriculture and substantial incomes from fishing activity for at least six to eight months in a year restraining seasonal migration of *Katkari*. In the beginning, fish spawn from the state government used to be procured but the quantity supplied was limited, and hence alternatively tried to obtain from Kolkata through private trader. However, the seeds obtained from Kolkata were of very poor quality, either of mixed varieties and/or having lower survival rate. To cope-up with these hurdles, a hatchery unit was established with a capacity of 5.10 crore production of spawn per year under the technical guidance of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth with a financial support from Ford Foundation, Tata Trust and Department of Biotechnology.

This fish hatchery is fulfilling the fish fingerling requirement of the cooperatives and private traders. It is providing quality fish fingerlings of catla, rohu, mrigal and common carp to the tribal inland fishing cooperatives. Breeding of fish, fish seed rearing in earthen ponds, cages and pens were undertaken.

The salient features of the hatchery are as follows;

- First of its kind in Maharashtra working on gravity-fed water supply.
- No Electricity or standby power supply necessary for water supply which in turn reduces the cost of operation and maintenance too.
- Easy operation with 80 to 90 percent success.
- User friendly and can be operated by layman after brief training of two weeks.
- Simplest and cost effective design. Cost of construction is approximately Rs.12 to 15 lakhs against the present circular hatchery construction cost of Rs. 60 to 80 lacs.
- Can be adopted anywhere at the downstream of the irrigation tanks.
- Eliminate loss of eggs and spawn during the transfer of from breeding tank to incubation and harvesting tank. (Fig.1)





Pond preparation



Fry sampling for growth study



Fish fry



Harvesting of fish fingerlings



Cage & Pen cultures



Fishing activities of tribal fishermen



Fig.-1 Photographs of activities

The quality seeds produced in this hatchery were supplied to the inland co-operative societies of tribal fishermen in order to promote fish culture activities and over all development of tribal communities who are living around the reservoirs area. Simultaneously, an in depth study on hydrobiological parameters of the five reservoirs viz. Khaire, Kothurde, Ambavade, Warandh and Vinhare was carried out to create a baseline data and find out their suitability for fish production [5,6,7].

3. Results and Discussion

The details of year-wise fish spawn production in the hatchery are given in Table-1. The maximum capacity of the said hatchery is of 5.10 crores spawn production per year. However, during the period under report, 80 to 90 % success has been achieved (Table-1). Fish seed rearing (spawn to fry and fry to fingerlings) trials were undertaken in earthen ponds and cages. The said trials were also demonstrated to the fishermen. More than 80 % survival of seed from fry to fingerling in cages during 36 days of rearing period was obtained. Initially, the average fish production from each reservoir was 11 kg ha⁻¹ during the year 2006-07. The selected reservoirs were stocked with fish fingerlings at a standard stocking density of 4000 to 5000 nos. per hectare every year (2013-14 to 2016-17). An observation on total harvested fish from each reservoir was done every year. The details of fish fingerling stocked and fish harvested are given in Table-2. The average fish production has increased up to 285 to 385 kg ha⁻¹ from initial of 11 kg ha⁻¹. The enhancement of fish production per unit reservoir area resulted in active involvement of 526 members out of 887 with full time fishing activity and an average income of Rs. 39,011 per member per year.

Table-1. Year-wise fish spawn production in the hatchery (nos in crores)

Sr. No.	Species	2013-14	2014-15	2015-16	2016-17	Total
1	Catla	0.85	0.89	2.15	1.95	5.84
2	Rohu	0.83	1.10	1.93	0.36	4.22
3	Mrigal	1.16	1.13	0.68	1.29	4.26
4	Cyprinus	0.33	0.53	0.39	0.55	1.80
	Total	3.17	3.65	5.15	4.15	16.12

Table-2. The details of fish fingerling stocked and fish harvested of the selected reservoirs.

Reservoir name	Water spread area (ha)	Total members	Year-wise Stocking of fingerlings (nos)				Year-wise fish harvested (kg)			
			2013-14	2014-15	2015-16	2016-17	2013-14	2014-15	2015-16	2016-17
Kothurde	22.60	143	90,000	90,000	90,000	1,00,000	7,590	8,476	6,380	8,701
Khaire	14.50	172	60,000	60,000	60,000	75,000	4,181	4,969	6,586	5,578
Varandh	16.90	78	65,000	65,000	65,000	85,000	5,388	5,874	6,789	6,505
Savitri	149.10	45	5,50,000	5,00,000	5,25,000	7,00,000	40,970	38,840	42,585	42,260
Vinhere	31.30	49	1,25,000	1,25,000	1,25,000	1,55,000	8,516	7,343	9,141	11,740

Impact of inland fisheries activities:

➤ There is an increase in annual household income of cooperative member. The average annual household income was Rs. 42,415 by all sources during the period 2013 to 2017, which included Rs. 39,011 from fishing activity only.

➤ The male groups take their responsibility by active involvement in fishing activity, while female groups contribute their share by involving in marketing process, decision making process in the family/community etc. reflecting gender equality.

➤ The awareness generated among the tribal community about various government schemes as well as due to the Food Security Programme (FSP) of SHG's resulted in coping-up of reduction in food shortage particularly in the months of June-July.

➤ 56% of 4,774 household i.e.2,680 households have stopped migration totally and from the remaining, the migration has been reduced partially by 400 households, who are otherwise used to migrate after the harvest of agricultural crop.

➤ A strong team of local adivasi (*Katakri*) comprising 30 men and women are now working hard on livelihoods and rights of the *Katkari*'s.

The multi-dimensional development of Indian tribal-policy of isolation, policy of assimilation and policy of middle path have suggested a new approach for integrated development of tribal without destroying the essential ethos of tribal culture [8]. The NGOs play an important role in the development, implementation, and reform of public health service [9]. Capacity building of the beneficiaries is one more goal for many of NGOs. NGOs have played a significant role in the last few decades by creating low cost replicable models of health care. Their activities include treatment, rehabilitation, community care, research, training and capacity building, awareness and lobbying [10].

4. Conclusion

Optimum fish stocking at appropriate time combined with some minimal management measures at some reservoirs have given encouraging results. Therefore, adequate attention needs to be given to ensure that the fish seed is grown to appropriate size and stocked into the reservoirs in adequate numbers. Proper stocking size and numbers is the key to improve reservoir output thereby increasing the fish production from inland area up to the expected level. The activities of propagation of culture-based-capture fisheries in selected reservoirs resulted increased fish production per unit reservoir area and income enhancement thereby reduced migration of tribal fishermen.

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Conflicts of interest: The authors declare no conflicts of interest.

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