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Livelihood improvement and empowerment of women through aquaculture technology interventions in Odisha

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ABSTRACT

Freshwater aquaculture technologies were disseminated to women as a means to improve their socio-economic status in three villages in coastal Odisha. The programme was carried out with 180 women belonging to self-help groups through scientific freshwater aquaculture interventions. Different extension methods were used to provide access to technologies, skill development and handholding support in aquaculture. Livelihood improvement of the beneficiaries was assessed in terms of changes in income, employment and household expenditure prior to and after the aquaculture technology interventions. The aquaculture technology interventions has resulted in 247 and 321% improvement in income and household expenditure on food and clothing respectively to the beneficiaries as compared to the pre-intervention period. The improvement in livelihood dimensions and empowerment was due to active participation in all phases of intervention. It is inferred that if a supportive environment is created, scientific aquaculture interventions could play a critical role in gender mainstreaming.

Keywords: Freshwater aquaculture technologies, Gender mainstreaming, Socio-economic status, Women empowerment, Women Self Help Groups

Introduction

The UN Development Program (1994) defines 'development' as processes that increase people's opportunity of choice. It is highlighted that the state of education and health in the society are important factors in meeting the basic needs. Development is thought of as an increase in well-being across the members of society between two points in time. Development can also be defined as improvement in human welfare, quality of life, social wellbeing satisfying the population's needs and wants and measured by a range of socio-economic indicators. The development of the nation cannot be determined based on income alone. The status of women in a country is observed by using various criteria, such as provisions for higher training, basic fields of health care, elementary education, economic independence, property rights and political participation (Sen, 1998). Development of the social sector along with technology absorption in agriculture could be considered as the primary objective of any economic developmental effort. Aquaculture, which is a major part of agriculture, plays a significant role in potential revenue generation for the country as well as the state of Odisha. The central and state governments have implemented several developmental programs in the aquaculture sector for the improvement of the rural people.

Aquaculture contributes to food security, employment generation, economic gains, optimum utilisation of resources and finally upliftment of the socio-economic status of those who are directly or indirectly connected with exploitation, production and processing of fish (Ninawe and Diwan, 2005). In recent times, more and more rural women are being associated with aquaculture due to its simplicity in management and production efficiency. With the objective of self-employment and empowerment of rural women, the Department of Fisheries, Government of Odisha, has intervened in providing Grampanchayat (GP) tanks to the Women Self Help Groups (WSHGs) on lease for 3-5 years. After the lease period was over, it was the task of the Fisheries Department for the skill upgradation of these members of the WSHGs so that they could practice pisciculture in their tanks adopting scientific practices to ensure better output both in terms of fish catch and incremental annual income. Backyard ponds could be of immense use for rearing sizable crops of fry, fingerling and even table size fish in succession, providing self-employment to rural women (Dehadrai, 2002). Though women constitute an important segment of the labour force, the unpaid economic activities of women and their contribution in the domestic sectors remain unreported and go largely unrecognised. To address gender bias, women need to be self-employed, economically self-reliant and should earn supplementary income for

their families. This would not only improve the status of women in the family but also within the community as a whole (Vimala *et al.,* 2004). For the past few decades, researchers have been evaluating the effect of self-help/ mutual aid groups on participants and their empowerment (Kyrouz *et al*., 1998).

The contribution of women in the farm sector remains invisible to some extent because the jobs they perform are considered to be part of their normal duty. In overall farm production, women's average contribution is estimated to be 55-66% of the total labour with much higher share in certain regions (Krishna, 2012). Fish farming by women provides the family with an additional source of income. Consequently, this gives women a voice in the household and also in the community (Bhujel *et al*., 2008). In carp culture, women are involved in various activities like pond preparation, weed clearance, control of predatory and weed fishes, lime application, pond fertilisation, fish feed preparation, sampling, fish harvesting and marketing. The present study was carried out to assess the improvement in livelihoods and empowerment of women through the intervention of aquaculture technologies of ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA) in Odisha.

Materials and methods

The study was undertaken in three villages namely Jaipur (19.9464ºN, 85.8138ºE) and Fakirpada (20.4183ºN, 85.9937ºE), both from Puri District and Paribasudeipur (20.2517ºN, 85.9586ºE) from Khordha District of Odisha during 2012-13 to 2016-17. A simple random sample of 180 women from nine Women Self-Help Groups (WSHGs) was selected as beneficiaries for disseminating ICAR-CIFA's aquaculture technologies and was trained in carp seed rearing, carp culture (grow out), post-harvest technologies with value addition of fish and fish hydrolysate. A total of 8 ponds with an area of 4 acres were under their possession of which two ponds were under lease and 6 others were privately-owned ponds.

Participatory Rural Appraisal (PRA) was carried out in all three villages to prioritise production problems. A baseline survey was also conducted to assess their socio-economic status before ICAR-CIFA's intervention. Cyclone *Phailin* had hit Odisha coast on 12 October 2013 and left a trail of deaths and damages. An assessment of post-*Phailin* damage in Jaipur and Paribasudeipur villages was done as aquaculture ponds were badly hit by the cyclone. Socio-economic status of the beneficiaries in terms of employment generation, household income, consumption of fish, access to and control over resources and decision-making power was measured.

Perception of women beneficiaries about constraints like water scarcity during summer, lack of quality fish seed, technical guidance, motivation, awareness meetings, on-site/farm demonstrations, poaching and other social issues in adopting aquaculture technologies was noted. Skill development training programmes were conducted to motivate, educate and develop the skill of the women beneficiaries in different aquaculture practices like pond preparation, manuring and fertilisation of pond before stocking of fish fry, feed and feeding at different stages during culture, grow-out culture and marketing of fish. Several hands-on trainings on post-harvest activities were also imparted, such as preservation of fish (as entire harvested fish could not be sold or used instantly) during the off-season as well as in value addition. To utilise fish waste and to maintain a clean environment, the beneficiaries were trained on the post-harvest technologies developed by ICAR-CIFA for preparing fish hydrolysate, a bio-fertiliser that can be used in multifarious ways.

The livelihood improvement of the respondent households was measured in terms of increase in income, household expenditure and employment generation and empowerment of women was assessed in terms of improvements in various empowerment dimensions before and after the aquaculture interventions (Pant *et al.*, 2010; Jayashankar *et al*., 2013). Various indicators of livelihood improvement and empowerment are mentioned in Table 1.

Results and discussion

Training and administration of the demonstration

The project team organised six day orientation training for 180 members of the 9 WSHGs on aquaculture management practices starting from pond preparation, pond fertilisation, seed stocking and rearing, feeding and

Table 1. Indicators of livelihood improvement and empowerment of women

Livelihood improvement	Empowerment
Income generation	• Literacy development
Employment generation	• Awareness about Government schemes
• De-weeding	• Access to banks
• Feeding	• Decision making
• Liming	• Access to property
• Harvesting	• Self-reliance
• Watch and ward	
• Post-harvest	
Increase in household expenditure	
• Food	
• Clothing	
• Health	
• Education	
• Social rituals	

grow-out culture. Seeds of Indian major carps (IMCs) *viz*. catla, rohu and mrigal were supplied to them in the ratio 1:2:1 (catla: rohu: mrigal). These seeds were stocked in the community ponds of the villages to enable the women to take initiative in grow-out fish production. Pond preparation including liming and weed removal was done by the WSHG members. Three ponds in Paribasudeipur, three ponds in Fakirpada and two ponds in Jaipur were stocked with carp fry. The project team organised an on-farm demonstration and hands-on training on pond preparation, de-weeding and fertilisation of ponds, seed rearing and feeding. Locally available materials like cow dung, groundnut oil cake, mineral mixture and single super phosphate were used to fertilise the ponds.

Carp culture

In Jaipur Village, five harvests were performed during 2013-14 accounting for a yield of 675 kg of carps from 2 acre pond. The size of carps varied from 500 g to 2 kg and total fish were sold at ₹50,000/-. The net income after deducting labour charges and other input costs was ₹28,000/-. Out of ₹28,000/-, ₹16,200/- was distributed equally among the members each taking ₹200/-. The remaining ₹11,800/- was deposited in the group's bank account for reinvestment in aquaculture activities. The members spent the distributed amount for household purposes, like the purchase of medicines, clothes and educational material for their children. Others paid children's tuition fees and spent on social functions.

In the year 2014-15, a total of three partial harvests were made in Jaipur Village and a total of 216 kg of fish were harvested, generating a net income of ₹7,232/- after deducting an expense of ₹10,000/- towards labour charges. Hands-on training programme on "Post-harvest technologies of freshwater fish" was conducted for 30 rural women from three different villages of Puri and Khordha districts of Odisha. The programme imparted skills like preparation of fish pickle, dry fish and fish hydrolysate (Fish Plankto-fert and Fish Biofert) from fish wastes.

In one pond (0.6 acre) of Paribasudeipur Village, Balianta Block, Khurda District, there was fish mortality due to poisoning. However, they could manage to harvest 200 kg of fish during 2013-14. A part of the harvest was distributed among the members and the rest were sold for ₹8,000/-. The body weight of fish varied from 0.5 to 1.4 kg. During 2013, ornamental fish rearing in small tanks with Platy and Molly species was initiated among the WSHG members of Jaipur Village. The stocking of ornamental fish in cement tanks and their rearing were also demonstrated in the Village.

In 2014, in Paribasudeipur Village, 112 kg of fish was harvested and a net income of ₹8,960/- was realised. A part of the income was distributed to the members and the rest was utilised for purchasing fish seed and feed. In Fakirpada, in 2014 there were six harvests and 360 kg fish was harvested and sold @ ₹50-70 per kg. A net profit of ₹21, 600/- was earned which was partially distributed among the group members and the rest was deposited in the SHG bank account. Successful aquaculture interventions through active participation of women were reported from various countries. The project 'Women in aquaculture in Nepal', encompassing social, economic and agro-ecological and institutional aspects successfully developed a model for homestead pond aquaculture development (Shrestha *et al*., 2009). In the initial years, concurrent to aquaculture intervention, savings groups involving women members of the households were formed. In general, half to two-thirds of the production was used for household consumption while the surplus was sold, generating an average income of USD 103 per household (Pant *et al*., 2009).

Womenfolk in Jaipur were empowered to the extent that they chose to impose penalties in case any male counterpart interfered with their aquaculture activities (Jayasankar *et al*., 2013). In Thailand, menfolk leave their female counterparts to carry out a variety of aquaculture related activities including the purchase of fingerlings, while they migrate to cities (Suntonratana, 2001). Minh *et al*. (1997) reported that in Vietnam, large share of the family income was contributed by women by taking up fish seed rearing activity. Goddard *et al*. (1994) reported that Cambodian women had an active involvement in all aspects of integrated aquaculture. Women were involved in all activities that included pond preparation, buying fingerlings, feeding, managing fish health and marketing. Performance management of the WSHGs was evaluated in Jaipur Village of Puri District and relative performance evaluation was made for each group and comparison was made amongst five groups namely Pragati, Saraswati, Mahalaxmi, Kshetrapali and Mahamaya. Pragati led with absolute performance of 88% followed by Mahalaxmi (69%) (Jayasankar *et al*., 2013).

Value addition

In the year 2015, hands-on training was imparted to women SHGs on the preparation of bio-fertiliser using fish waste and molasses (50:50, W/W) adding a very small quantity (1%) of yeast using an old plastic drum or any wide-mouth container. The project team in consultation with the beneficiaries identified a suitable place near their ponds/farm where a small unit may be installed for bio-fermenting of the fish wastes collected from nearby fish markets and households. Three such units were established at Jaipur, Fakirpada and Paribasudeipur. During installation, a stakeholders' meet was also

organised in which farmers, state department officials and NGOs participated.

The women beneficiaries of Fakirpada and Paribasudeipur villages were imparted hands-on training on fish pickle preparation. Pickle preparation was done by the members under the technical supervision and guidance of the team at the project site too with their available resources in a scientific manner. The women picked up the skill and learned the technology of value addition. Vacuum packaging and branding are few measures suggested by the team for better marketing. The project provided them better access to aquaculture technologies thereby paving the way for uplifting their socio-economic condition.

Income generated from aquaculture activities

Though the area under fish culture in three villages remained constant throughout the study, the average fish production increased from 308.8 kg acre^{-1} in 2013-14 to 422.5 kg acre^{-1} in 2016-17 (Fig. 1). This was made possible through the adoption of scientific technologies of ICAR-CIFA by the women beneficiaries of three villages. Thus a net profit of ₹74,900/- was generated during 2016-17 which was used for the social development of the beneficiaries and their families. The profit earned from aquaculture activities was used for paddy and mushroom culture and coir work in Jaipur Village when cyclone *Phailin* hit during 2014-15 and affected aquaculture activities.

From the insights of economists, it can be shown that how access to resources, another way of saying consumption opportunities is distributed across individuals and their expectations of how they will benefit from that access are at the heart of welfare. An increase in consumption/expenditure is an indication of rising social development (Dasgupta, 2001). Table 2 presents data on livelihood dimensions and empowerment of women beneficiaries before and after our interventions. Impacts of aquaculture technologies on livelihood improvement and empowerment of women beneficiaries before and after interventions are evident.

The intervention of the project team in the three villages has increased household consumption of fish to a level of average 1.5 kg month^{-1} family^{-1} to maintain and improve nutritional security at the family level. The additional income per household from fishery-related enterprises has increased approximately by 2%. The project had extended technical support in establishing three pilot plants in these villages for Fish Biofert and Hydrolysate preparation. Employment generated by the women from fish farming includes de-weeding, liming, feeding, watch and ward in 8 ponds (4.0 acre in total water area) in three villages was about 560 man-days year^{-1}. Thus a total of 180 women beneficiaries in nine WSHGs of three villages were empowered economically and

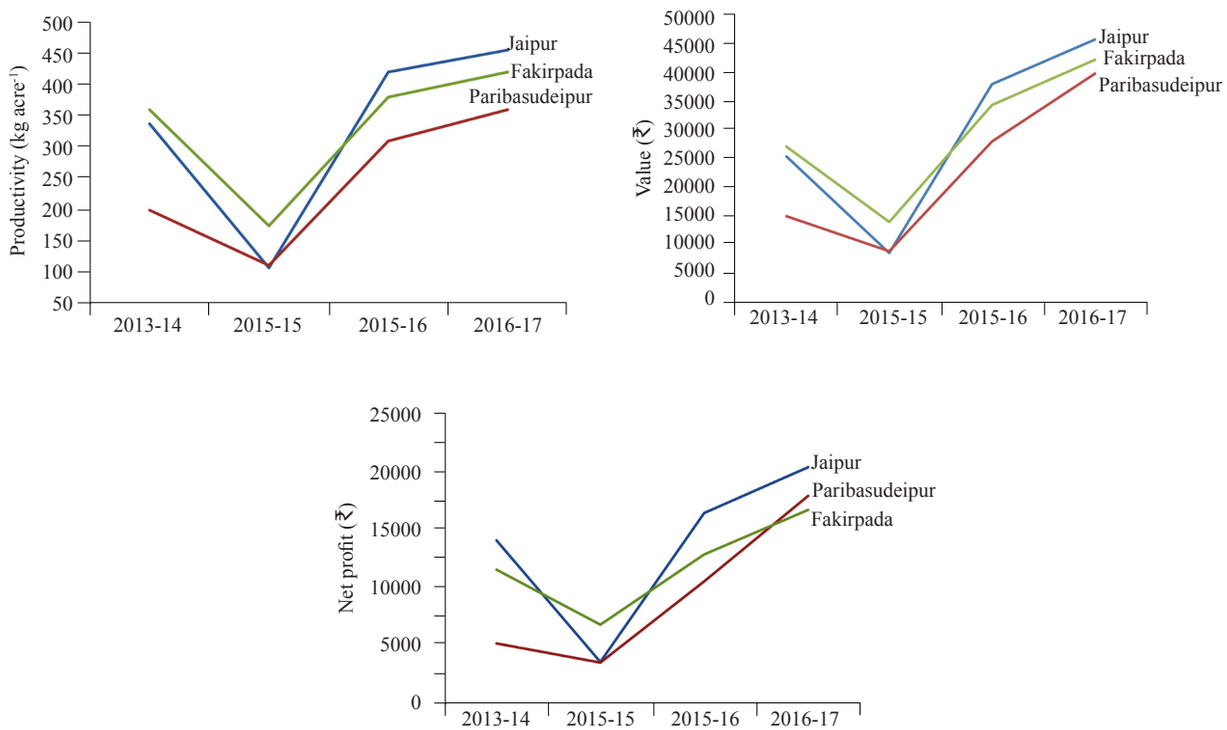

Fig. 1. Productivity, value and net profit in carp culture obtained by women folks of three villages in Odisha during 2013-14 to 2016-17

Table 2. Impact of aquaculture technologies on socio-economic status of women beneficiaries in Jaipur, Paribasudeipur and Fakirpada villages

Before intervention (2012-13)				After intervention (2016-17)				% Change	% Change
Livelihood dimensions	Amount (₹)/No.	Empowerment	No.	Livelihood dimensions	Amount (₹)/No.	Empowerment	No.	Livelihood dimensions	Empowerment
Income generation (₹)	21,600/-	Literacy development	107	Income generation (₹)	74,900/-	Literacy development	176	247	64
Employment Generation (man days)	1047	Awareness about Govt. schemes and plans	150	Employment Generation (man days)	1607	Awareness about Govt. schemes and plans	180	53	20
De-weeding	80	Access to banks	78	De-weeding	180	Access to banks	180	125	130
Feeding	85	Decision making	90	Feeding	101	Decision making	168	19	87
Liming and manuring	02	Access to property	75	Liming and manuring	06	Access to property	140	200	87
Harvesting	105	Self-reliance	88	Harvesting	120	Self-reliance	138	14	57
Watch and ward	775			Watch and ward	140	-	-	-82	-
Post-harvest value addition and waste recycling	01			Post-harvest value addition and waste recycling	60	-	-	5900	-
Increase in household expenditure (₹)				Increase in household expenditure (₹)		-	-		-
Food and clothing	8,500/-			Food and clothing	35,800/-	-	-	321	-
Health	4,200/-			Health	18,000/-	-	-	328	-
Education	2,100/-			Education	8,700/-	-	-	314	-
Social rituals /functions	6,800/-			Social rituals/ functions	12,400/-	-	-	82	-

socially through aquaculture practices, exposure visits, attending meetings, participating in various exhibitions and agricultural fairs. Sheheli *et al.* (2014) reported that food intake, housing condition, physical assets, sanitation and income of fish farmers increased significantly through fish farming in Bangladesh. Adhikary *et al.* (2018) in their study to analyse the contribution of aquaculture on livelihood status of fish farmers at Noakhali Sadar Upazila in Bangladesh also revealed that the average monthly income and basic needs like food, cloth, house, education and medical facility had changed after fish farming.

Women play an important role in small-scale aquaculture in India as well as in south-east Asian countries. Research in India and elsewhere lend credence to the fact that aquaculture is a potent tool to empower women, especially those at the bottom of the pyramid. From seed production to grow-out carp culture and value addition women are actively engaged and this has resulted in socio-economic improvement of their lives. More and more women must get involved in aquaculture. However, to make that happen immediate attention need to be paid in enabling policy to reduce gender discrimination and provide better access to technology; resources and market; appointing more women trainers; documenting and sharing success stories of women. It is argued that organising women into groups and linking them with microfinance institutions will go a long way in empowering women in aquaculture.

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