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Social costs and its accounting of prawn farming in west Bengal

Dr. Taposh Kumar Paul

taposhtiyasa1973@gmail.com

Gour Mohan Sachin Mandal Mahavidyalaya, Madhabpur, West Bengal

ABSTRACT

Prawns have good domestic and international market. Prawns may be caught or cultured. Prawn culture is an aquaculture. Prawn culture is carried on three districts in West Bengal such as North 24 Parganas, South 24 Parganas and Purba Mednapore. Prawn culture in these districts plays a vital role in providing gainful employment in rural areas earning foreign exchange and improving economy. But prawn culture has some bad effects on environment. The externalities of prawn culture are reduction of cultivation work, threatening food security, ecological imbalance, diminishing fertility of land, environmental degradation, salination of drinking water, ill health, skin diseases, social pollution etc. These costs destroy the socio-economic balance of the coastal area. So these costs need to be accounted for in environmental Accounting. Primary data are used for this exploratory research. Some good management practices should be followed to make sustainable prawn farming reducing externalities.

Keywords: Shellfishes, Prawn Culture, Social Costs, Environmental Accounting, Sustainable Prawn Farming

1. INTRODUCTION

Prawns are the most valuable shellfishes having good domestic and international market. Demand of prawns may be satisfied partly by culturing prawns in brackish water. Juvenile prawns of different species are cultured in confined brackish water ponds or in 'bheries' or 'ghers' until they are marketable. Prawn culture is carried on three districts in West Bengal such as North 24 Parganas, (45%) South 24 Parganas (30%) and Purba Mednapore(25%). Prawns can provide adequate nutrition for the people of West Bengal. More over prawn culture may provide employment for four lakh rural people. Due to its heavy demand in the international market, the culture of prawns may become a lucrative vocation for earning foreign money and developing economy. The overall export of shrimps of India during 2019-20 was to the tune of 652253 MT worth Rs.34152.03 crores. West Bengal's share of export is about 19.65% (128150 MT and value in Rs.5308.02 crores)

But prawn culture has some bad effects on environment or externalities or social costs. Prawn fishery as an entity takes some environmental elements like air, water, sunlight, land, soil, fertility, seeds from natural sources, zooplankton, phyto-plankton etc. These are indispensable materials of prawn farming. A measure of the cost of environmental resources used by an entity during its activities may be considered as the social cost whether paid or not. Environmental pollution due to use of pesticides and discharge of dangerous wastes is the cost born by the society and not by the prawn fishery. Social cost of environment represents the cost of damage to the environment. Social costs arise from externalities. It can be sub divided into three major groups such as;

- i) Private expenditure to get rid of environmental damage
- ii) Public expenditure to avoid environmental damage
- iii) Welfare damage suffered due to non-prevention

Objectives of the study

This study attempts to highlight the environmental externalities caused by the prawn culture. It also tries to find out some good practices of prawn farming so that externalities may be reduced to some extent.

Research Methodology

This is an exploratory research. In this research study, 'Judgment Sampling' method is used for selecting prawn fisheries in three districts in West Bengal. Six prawn fisheries of different sizes (i.e. two large, two medium, two small) have been studied from each

of these three districts in West Bengal considering as representatives of the population. The primary data are collected from the Bheries of North, South 24 Parganas and Purba Mednapore through direct communication with prawn farmers and through personal interviews.

Results and Discussions: Prawn farming destroys the environment in the following ways:

2. REDUCING CULTIVATION WORKS AND THREATENS FOOD SECURITY

The people of West Bengal are cultivators by occupation. To make prawn fishery, the low-lying lands are surrounded by dams and salt water is let into the impoundments through cannels. Salt water, which is let into the impoundments, is not conducive to paddy culture and as a result, the paddy culture is reducing gradually in prawn culturing areas of West Bengal. The cultivators who used to engage in paddy cultivation are now losing their works. Prawn culture threatens food security as it has damaged paddy and vegetables cultivation. It has also been seen from a study that prawn farming creates less employment opportunities than agriculture.

Table: 1: Labour for paddy production and prawn culture

Type of labour	Paddy cultivation	Prawn Culture
Family labour	60	-
Hired Labour	115	144.55
Permanent Labour	5	-
Total	180	144.55

Source: Data collected by personal interview

On an average 144.55 person-days employment opportunities are generated per hectare per year from this prawn fishery against 180 man days for paddy culture (Table 1). It shows that 35.45 man-days per acre are required more in paddy cultivation than prawn culture.

3. DESTRUCTION OF UNWANTED SEEDS

The people of coastal areas where prawn culture is done are mostly economically backward and most of them are involved in fishing and prawn seed collection practices. At the time of prawn seed collection, the seed collectors developed the practice of killing of unwanted finfish and selfish due to ignorance. The seed collectors when operating nets, the various seeds of fish and other water biotics are gathered (fig 1). After separating the economic seeds, they just throw out the rest ones. Separating prawn seeds from the gathered varieties takes some time when other unwanted seeds such as seeds of less valuable fishes, frogs, crabs and other insects die without care. It is estimated that for every kilo of prawn larvae collected from the wild to stock prawn ponds, between 15 and 20 kilos of other types of fish fry are killed and thrown away as waste (Eileen Maybin & Kevan Bundell et. al. 1996). These are fishes, which could become food for people. This practice results in an ecological imbalance of biotic community.



Fig: 1: Net set by bank of the River Ichhamati (Hasnabad, North 24 Parganas) to collect prawn seed (Source: R. Arthur)

A sample survey was done at Goureshwar river near Vill: Barunhat, P.S: Hasnabad, Dist: North 24 Parganas for a week during May 2019 to count the killing of unwanted seeds at the time of collecting prawn seeds (fig.2). The result of the survey is shown in Table 2.

Table: 2: Sample counting of prawn seed collection and unwanted seed destruction on the bank of Goureswar River, Barunhat

Days	Prawn Seeds /collector	Unwanted seeds (Avg.)/collector	Unwanted seeds killed(Avg.)/collector	Average Rate (%)	Death
Day 1	23	205	75	36.58	
Day 2	18	1000	180	18	
Day 3	30	700	135	19.28	
Day 4	32	610	101	16.55	
Day 5	46	900	187	20.77	
Day 7	37	750	201	26.8	
Total	200	4965	879	17.70	

Source: Data collected by personal interview

It is seen that unwanted seeds are collected at twenty to twenty five times than prawn seeds collected and the collectors though throw the unwanted seeds to the river after separating the prawn seeds at least 17% of the seeds are killed at this collection process. It is seen from the table 2 that the ratio of destruction of seeds is: $1079/5165 \times 100 = 20.89\%$ of the total collection and $879/200 \times 100 = 439.5\%$ of prawn seed collection. The prawn seeds are also reduced day by day and its prices are increasing at higher rate due to non availability of prawn seeds in the Sundarbans Rivers (Goutam Kumar Das, Sundarbans, Man & Environment, P.50)



Fig: 2: Segregation of prawn larvae from other larvae

(Source: Self collection from Lebukhali River, Hingaljanj, North 24 Parganas)

- 1. Diminishing fertility and degradation of fishery lands:** During preparing soils of the prawn fisheries limes, pesticides, insecticides are applied to kill the insects. Salty water for prawn culture gradually diminishes the fertility of the lands of the prawn fisheries and the lands are being degraded. Where ever prawn farms were formed did not continue for long period for pollution, prawn diseases etc. The abandoned prawn farms may not be usable for agricultural or other production purpose. For the reason the prawn culture is called 'Rape and run industry' (source: C.A.S.I-1997). The percentage of degraded lands in North and South 24 parganas (excluding forestlands) is maximum i.e. 69.2%, next comes to Purba Medinipur i.e.65.9%. These degradation rates are much more than the average degradation rates of West Bengal (28.77%). 3% of the total land of 24 parganas and Purba Medinipur are being degraded due to salinity.
- 2. Salination of drinking water:** The pumping of river or creek's saline water into prawn fisheries has caused salination of the water table in many places of North and South 24 pgs. Agricultural land is being ruined, trees are dying and village well water is becoming undrinkable. For bringing good drinking water, the villagers of sundarban areas have to travel 3 to 5 kms.
- 3. Ill health and skin diseases:** The workers who work in the prawn processing section is liable to get certain lesions and skin eruptions and diseases due to constant contact with prawn, ice and water where the prawns are processed for export. Continuous bad smell emitting along with flies, rat create an unhealthy environment.

The prawn factories of West Bengal are situated near Madhyamgram, Barasat, Ganganagar, Rajarhat, Basirhat, Kharibari, Haroa area of North 24 Parganas and Garia, Narendrapur, Bye-pass area of South 24 Parganas and Ramnagar, Khejuri and contain area of Purba Midnapore. Harvested prawns of different prawn fisheries are purchased by different local factors (Aratders) and these are brought to the prawn processing factories for head and claw less. After headless, the prawns are washed by different chemicals and then packed in boxed for export. The wastes of these chemicals along with the disposable portion of prawns make such a bad odor that cannot be tolerated side by the population. It also spreads diseases. During an examination by the Pollution Control Board, Govt. of West Bengal, the solid wastes of prawns contain chlorine, fluoride, cyanide, ammonia, sulphur etc that are harmful to the environment.

The people, who catch prawns, including children and women, spend many hours immersed in polluted water of the fisheries. Children remove the delicate prawn seedlings from their nets by sucking them into their mouths along with the dirty water before splitting them into a container. The use of antibiotics on prawn fisheries creates resistance in diseases organism affecting humans.

Accounting for Social Costs:

Social costs do not usually appear in calculating monetary profit and the fact that the business is not incurring any expenditure towards it. If fines are imposed on a prawn fishery for destroying the ecological balance of the surrounding environment, this is not reflected in expenditure. Therefore, the social cost is a function of social perception of what is bad about business capital. Social costs diminish the value of natural capital.

Simply Environment Accounting is the process of recording and summarizing the value of environmental goods and services in monetary units. It is a part of social accounting and it attempts to evaluate the impact of organizational activities on environmental resources.

4. GUIDELINES ON "GOOD MANAGEMENT PRACTICES IN PRAWN FARMING"

1. Traditional and improved traditional prawn farming only: The aquaculture authority of India should approve only traditional and semi-intensive prawn farms. Prawn farming in an intensive method should not be permitted. However, the farmers practicing traditional and improved traditional methods of prawn farming may adopt improved technology for increased production, productivity and returns with the prior approval of the authority. The improved technology should be formulated with the objective of optimizing production on sustainable basis and to ensure long term sustainability of the farming practices. A footprint of ecological and sustainable semi-intensive prawn farming is shown in fig 3.

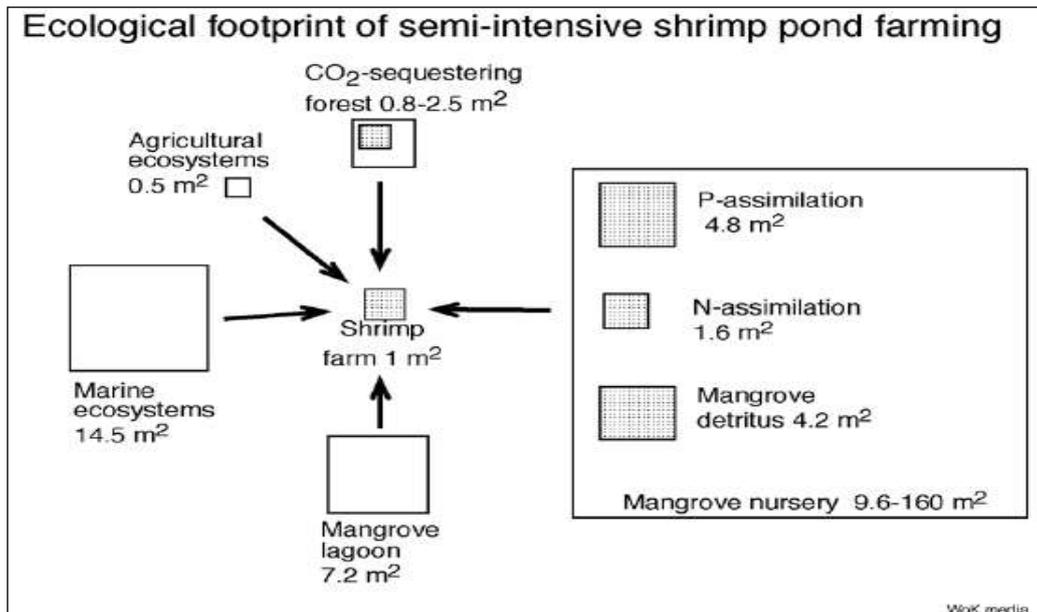


Fig. 3: Ecosystem support areas required to sustain a semi-intensive prawn farm in coastal mangrove area (assuming that 10-50% of prawn seed are wild caught and m² of support area needed per m² of pond area) (Source: Kautshy et. al , 1997 quoted from Report I, Swedish University Agricultural Sciences, SLU p.30)

2. Effluent Treatment System in Shrimp Farms: The wastewater of the prawn fisheries comprises both living and dead plankton, feed waste, feces matter and other excretory products of the prawns. All these nutrients and organic waste are biodegradable. However, after a reasonable limit they can result in nutrient enrichment in the nearby canals, creeks, estuary or the river where the fishery wastes are generally released. Therefore, it is very much essential to follow the Effluent Treatment System (ETS: Table: 3), which can be integrated with the shrimp farm to assist the farmers to improve the wastewater quality before it is released in to the open waters. The standards for shrimp aquaculture waste water is prescribed by the Ministry of Agriculture, Government of India (Table:4)

Table: 3: Common methods of effluent treatment

Method	Benefits
Settling ponds	Removal of particulate organic matter denser than water but not efficient with phytoplankton
Mussel, Oyester and sea cucumber	Removal of particulate organic matter and phytoplankton from water column
Sea weeds	Removal of dissolved nutrients (Nitrogen and Phosphorus) from water column
Mangrove	Removal of particular organic matter and nutrients

Source: Macintosh and Philips (1992)

Table: 4: Standards for shrimp aquaculture waste water

Sl. No	Parameters	Guidelines issued by the Ministry of Agriculture		General standards for discharge of environ-mental pollutants
		Coastal marine waters	Creeks	Marine coastal areas
1	pH	6.0-8.5	6.0-8.5	5.5-9.0
2	Suspended solids	100	100	100
3	Dissolved Oxygen	Not less than 3	Not less than 3	-
4	Free Ammonia (mg/l)	1.0	0.5	5
5	Biochemical Oxygen demand – BOD (5 days @ 20c)	50	20	100
6	Chemical demand –COD (mg/l)	100	75	250
7	Dissolved Phosphate (mg/l max)	0.4	0.2	-
8	Total nitrogen (mg/l)	2.0	2.0	-

Source: Guidelines for sustainable development of Brackish water Aquaculture, Ministry of Agriculture, GOI

3. Regulations on the use of antibiotics: The use of antibiotics, drugs and chemicals in prawn farms should be such that make the farming practices sustainable and environment-friendly. Most of the Indian prawns importing countries do not permit any residue level of banned antibiotics and chemicals (Table 5). We must ensure that shrimp farmers do not use antibiotics etc having the possibility of harming human health. A list of 20 antibiotics drugs banned by the Marine Products Export Development Authority (MPEDA) is given below.

Table 5: List of Antibiotics and other Pharmacologically Active substances Banned By Aquaculture Authority

Sl. No	Antibiotics and other Pharmacologically active substances	Maximum permissible Residual Level (in ppm)
1	Chloramphenicol	Nil
2	Nitrofurans	Nil
3	Neomycin	Nil
4	Nalidixic acid	Nil
5	Sulphamethoxazole	Nil
6	Aristolochia spp and preparations thereof	Nil
7	Chloroform	Nil
8	Chlorpromazine	Nil
9	Colchicine	Nil
10	Dapsone	Nil
11	Dimetridazole	Nil
12	Metronidazole	Nil
13	Ronidazole	Nil
14	Ipronidazole	Nil
15	Other nitroimidazoles	Nil
16	Clenbuterol	Nil
17	Diethylstilbestrol (DES)	Nil
18	Sulfonamide drugs	Nil
19	Fluroquinolones	Nil
20	Glycopeptides	Nil

Source: Aquaculture Authority website

4. Seed and Feed management: Proper seed and feed management is necessary for sustainable prawn farming.

Seed quality: Good quality pathogen free hatchery prawn seed should be used. Capture of wild shrimp larvae for stocking should be strictly prohibited. This will prevent indiscriminate killing of fish and shrimp seed caught as by-catch along with the shrimp post larvae.

Feed Management: Proper feeding management can effectively reduce the nutrient load in the wastewater and reduce the feed cost.

5. Poly culture: From the economic and ecological point of view, polyculture of prawns with other fishes like *Telapia*, *Parsia*, and *Bhangan* is an effective alternative in comparison to monoculture systems of prawns. Polyculture helps in complete utilization of ecological niches. During polyculture when diseases outbreak of prawns and prawn productions are lost, fish production returns and compensate partly. Monoculture of prawns is now facing virus problem.

6. Providing GIS & Remote Sensing facility: The Government should take steps for providing Geographical Information and Remote Sensing Services to the farmers through Panchyets. Through this latest technology, the fertility of the soil, fishing fertility areas can be judged. The more or less fertile areas can be segregated through GIS. The more fertile areas for agriculture may be left for agriculture only. The prawn culture or the prawn industry may be made at those lands which are less fertile for agriculture.

7. Mobile Laboratories: The government should take steps to set up mobile laboratories in the districts of Sunderbans area and coastal regions of Purba Midnapore to assist the prawn farmers in management of prawn health and water quality in fisheries. Testing antibiotic residue in farmed prawns more modern laboratories should be established.

8. EIA Report: It is to be compulsory that an Environment Impact Assessment Report must be obtained from an independent authority about the effect on the environment of the shrimp culture and the report should be submitted to the Government for evaluation.

5. CONCLUDING OBSERVATIONS

It will not be wise worthy to stop prawn farming immediately due to above environmental problems rather the Government or the entrepreneurs should take some 'precautionary measures' so that prawn farming ensure a sustainable development. However, the days of intensive and production oriented prawn farming should be made good-bye. Prawn farms should not be recognized as a greedy, profit making and export oriented project rather farms should be taken as employment generating, rural economy developing project. If prawn-farming practices become sustainable, then it will be a million dollar industry in future.

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