

## **Determinants of Pangas Catfish Production in Jharkhand**

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### **Abstract:**

Fisheries occupy a prominent place in the economy of the world as the fish is one of foods of vast majority of people. Fish not only provides long chain omega -3 fatty acids, fat soluble vitamins, proteins, but also contains fat, inorganic substances and vitamins. Fish protein is easily digestible and it contains considerable proportion of soluble proteins. It is more valuable for human especially for a population whose staple food is rice. Besides, fisheries help in generating employment and revenue and raising nutritional level.

The article models the structure of Pangas catfish (*Pangasius pangasius*) (Hamilton, 1822) production to present the determinants of production and estimate costs and return in *Pangasius* farming in Jharkhand Farm business analysis was performed for computing costs and return and for determining factors of production The major determinants of *Pangasius* production were feed, seed, area, experience in *Pangasius* culture and days of culture. Coefficients indicate increase in production can be attained by increasing the inputs. The overall estimate of return to scale was larger than unity implies *Pangasius* production can be increased from scale economies.

**Keywords: *Pangasius*, farm-business analysis, scientific production function, production by cage culture.**

### **Introduction:**

Jharkhand came into existence in November 2000. The state has advantage of having a sizeable number of medium and large reservoirs as well as substantial number of ponds and tanks of different sizes. But the resources are largely untapped and thus, the state depends on the supply line of Andhra Pradesh and West Bengal, which usually met nearly half of its annual fish

demand. However, the state also exports fishes to West Bengal particularly from the districts/regions nearer to Kolkata market. The annual consumption of fish within the state is nearly 83 thousand MT, against the present annual production of around 62 thousand MT, having a shortfall of nearly 21 thousand MT annually. The aquaculture resources in the state are mainly reservoirs and tanks. The cumulative area of nearly 252 big and small reservoirs is 1,15,000 ha. The number of check dams is 1184 having an area of nearly 4570 ha. Main rivers are Swarnrekha, Damodar, Koyal, Sankh, Ajay, Kanchi and Brahmi . Most of the rivers are seasonal in nature. Jharkhand is a landlocked state of India endowed with resources such as Ponds, reservoirs, lakes and rivers. The fisheries of all these resources are waiting for concerted efforts aimed at well-planned development. As far as ponds are concerned, rigorous efforts have been initiated to develop them wherever possible for the purpose of development of fish culture and providing sustainable livelihood to the stakeholders.

Aquaculture is one of the fastest growing sector in India which has grown at 6-7% per annum in recent past due to the species diversification (introduction of new species) and new culture system e.g. cage

Determinants of Pangas catfish Production in Freshwater aquaculture in Jharkhand contributes more than 60-75% of total aquaculture production; marine aquaculture is limited to few species and contributes lesser.

Recently, catfish has started playing a very significant role in world aquaculture. Pangasius, a catfish with its qualities like fast growth, air breathing, tolerance to low dissolved oxygen and compatibility to polyculture has gained popularity in many Asian countries.

It has been promoted in Bangladesh over the years to ensure food security and income generation for rural communities (Ahmed & Hasan, 2007). Keeping in view its attributes, Pangasius was introduced in India during 1995-96 from Thailand through Bangladesh (Ahmed, 2007; Rao, 2010).

**Purpose of the study:**

- ❖ Culture of Pangasius spread very fast in India and the country emerged as one of the largest producers of pondcultured Pangasius .
- ❖ This is a type of catfish which is native to Vietnam, Cambodia, and Thailand. Its speciality is that in six months' time, its weight increases to 1 kg. The cost of production for 1 kg of Pangasius is Rs 35-40 and the selling price is Rs 70-80.
- ❖ For Indian conditions, this variety of fish is good for cultivation in open aquaculture ponds or in dam reservoirs. The fish is cheap, high in demand, easy to cultivate and can yield high profits in a short span of time.
- ❖ The production of fish in one cage varies from four to five tons every six months.

The Government of Jharkhand, through Department of Agriculture, Animal Husbandry & Co – operative (Directorate of fisheries), Ranchi is promoting cage-culture of Pangasius for quality production and has sanctioned a few projects for its promotion. On the other hand, local newspapers reported the price crash and declining profits in Pangasius culture, a cause of concern for policy makers (Anon, 2011). The price crash led to loss in Pangasius culture and many farmers thus, withdrew from its culture, which reduced a grave situation. However, due to lack of systematic studies on economics of Pangasius production, appropriate advisories are lacking on the part of decision makers to overcome these situations. Although there are a number of studies related to economics of carp culture and shrimp aquaculture (Jayaraman, 1997; Sharma & Leung, 2000a;b; Dey et al., 2005; Singh et al., 2009; Debnath et al., 2013). There is hardly any study available on economics and factors affecting production of Pangasius in Jharkhand.

**Under this background, the study was conducted with following specific objectives in the state of Jharkhand:**

- ❖ To estimate costs and return in Pangasius culture;
- ❖ To determine the factors affecting Pangasius production and
- ❖ To estimate the returns to scale and resource use efficiency in Pangasius production. The results of the study will help in taking policy decisions to improve Pangasius culture.

**Hypothesis of the study:**

- ❖ There is no significance difference between in both male and female at the period of training.
- ❖ There is a difference between large farmers and small farmers in the culture of fish.
- ❖ Production varies in between town and village

**Descriptive study:**

Fish lovers in Jharkhand will soon be getting one more variety to feast on. The Thai fish; pangasius will be produced in the state. The state fishery department has started preparations for its production after they found that there was a growing demand for it in other fish producing states like Chhatisgarh and Andhra Pradesh.

**Gomia block, a moist-hit- area in the Bokaro district;** has become a production centre for pangasius with government spending several crores of rupees for cultivating its seeds in reservoirs and waterbodies here. This has also bought a reason to rejoice for the residents as it has generated earning opportunities for them. Besides, the district fishery department is also facilitating pangasius production in private and government ponds in the area. The officials in the fishery department plans to take pangasius culture to every pond, reservoirs and check dams in this Red zone.

Pangasius belongs to a family of catfish, which is native of Vietman, Cambodia and Thailand. The fish is bred in floating cages or in open aquaculture ponds. The fish is farmed for six months so that it weight 900 gm to 1 kg.

Shambhu Prasad Yadav, district fishery officer, said they got the idea of pangasius breeding from Chhatisgarh which at present has grown to be one of its largest producers in the country. "We have observed a growing demand for pangasius for which we have started its cultivation here," he said.

Yadav said they have primarily cultivated pangasius seed in Tenughat dam, Konar dam and more than 10 private ponds in the area. There are 28 government ponds and 120 private ponds in Gomia. Besides; they have sought details from district administration about ponds and check dams constructed under MGNREGA so that these can also be used for pangasius cultivation

He said these will be 72 cages installed in the Tenughat dam of which 56 cages have been placed while rest will be set up soon. One cage contains a production capacity of five tones pangasius fish. They have also brought motor boat indeed for farming. “These cages contain a net tied to it inside water. Seeds cultivated will grow in the net to pangasius weighing 1 kg. It will take six months.” said Yadav.

Similarly, two cages have been installed in Konar dam too. Besides government has also sanctioned funds to the fish farmers in Gomia for production of pangasius under National Mission For Protein Mission (NMPM). “In six months time, the fish will be ready to be sold in market. Pangasius production would improve financial condition of the fish farmers in the area it is considered as Any Time Money (ATM) for them” said Yadav.

The development has bought the fish for pangasius from chhatishgarh. This feed contains 32% protein which is suitable for its growth. It is costly as one kilogram of feed cost rs 38. “However we believe that, pangasius farming would boost pisciculture in Jharkhand and Gomia will definitely play an important role in its production.” Said another fishery officer.

**The Chandil dam** reservoir is located 30 km from Jamshedpur on the Subernarekha River in Jharkhand. While this dam is a 'tourist hotspot', its construction has resulted in the displacement of more than 20,000 families from 116 surrounding villages. “We lost our farmlands because of the project and now to support our families, we have to take any job available,” says Narayan Gope.

In 2007, the Jharkhand government initiated a project to help address the problem of displacement—the 'cage fish farming project'. This pilot project was funded by the National Mission for Protein Supplement Scheme. The goal of this initiative was two-fold: to fulfil the protein requirements of the people at a low cost and to create livelihood opportunities for the displaced farmers. In 2011, the government provided a 100 percent subsidy to Chandil Bandh Visthapit Matsyajibi Swabalambi Sahakari Samiti (CBVMSSS), the fishing cooperative of the displaced farmers, to buy 70 cages for cage fish farming. They further provided 126 modular cages to CBVMSSS with a 90 percent subsidy in 2013. The state Fisheries Department provided the technical support and training to the CBVMSSS so that the farmers would get the required knowledge to manage and run these fish farms.

### **What is cage fish farming?**

It is a method of nurturing small fish in modular iron cages that are 6 x 4 x 4 metres in dimension. These water-resistant cages float in the water bodies surrounded by nylon nets to hold the fish within.

Needing very little maintenance, these cages cost around Rs 2.5 to 3 lakh.

### **What type of fish can be reared?**

The fish cultured in the Chandil reservoir belongs to a variety called Pangasius. This is a type of catfish which is native to Vietnam, Cambodia, and Thailand. Its speciality is that in six months' time, its weight increases to 1 kg. The cost of production for 1 kg of Pangasius is Rs 35-40 and the selling price is Rs 70- 80.

For Indian conditions, this variety of fish is good for cultivation in open aquaculture ponds or in dam reservoirs. The fish is cheap, high in demand, easy to cultivate and can yield high profits in a short span of time. The production of fish in one cage varies from four to five tons every six months. The average fish produced from 2011 to 2013 was 134.33 tons and the net income of CBVMSSS in 2012-13 was around Rs 25 lakh.

### **Problems with this plan:**

Only 2,000 of the 20,000 displaced families took to this type of fishing as their primary occupation. The remaining 18,000 families could not cope with it and hence migrated to nearby places as labourers. But Shyamal Mardi, another displaced farmer, says, "The initiative of cage fish farming has solved the livelihood problems of the displaced to some extent. The workers working with the fishing cooperative are quite happy about their progress. They don't want to shift to any other job". It's hard to tell whether he truly believes his words or if he is saying it out of a lack of option. The other problem with this initiative is the lack of a regulatory body to keep the fish production in check. "In 2011, the haphazard growth of Pangasius fish culture in Andhra Pradesh, led to a price crash resulting in losses for growers of this fish", says V. Vasudevappa, a senior executive of the National Fisheries Development Board (NFBD). In the last two decades, there has been a sharp decline of local varieties of fish like sol, bata, bada tengra and others due to pollution in the Subarnarekha river. So, the larger concern is the sustainability of the

production of Pangasius. Also, if the demand is not constant throughout the year, the risk has to be borne by the fish producers. Without regulating fish production, it is difficult to attain economic stability in the long run.

### **Has cage fish culture worked at Chandil?**

It's not a very clear answer just yet. The temporary improvement in the income of 2,000 displaced families is a matter of relief for the government but generating employment for the 18,000 that are still displaced is a big challenge. If a person's livelihood is taken away, efforts must be made to replace it in the same, if not a similar form.

### **Materials and Methods:**

Jharkhand has largest area under Pangasius culture in the country and hence it was selected for the study. Multistage stratified random sampling was used to select sample for the study. Two districts namely Ranchi and Bokaro from Jharkhand were selected on the basis of highest area under Pangasius culture. From a prepared list of all the Pangasius farmers of selected villages, a sample of 30 farmers was selected randomly from each of the selected villages. Thus a total of 120 fish farmers were selected for the study from four villages of the two districts in the state. The sample farmers were classified into two categories i.e. small farmers (having ponds area < 4 ha) and large farmers (having ponds area > 4 ha) on the basis of their pond area. It was found that 63 farmers were small and 57 large. It should not be cultured from 5 ha big pond areas.

All these farmers are trained by training center Doranda and Shalimar Dhruva Ranchi.

### **Table - 1**

Sampling Plan at Farm level:

SL. NO.	DISTRICTS	VILLAGES/TOWN	SAMPLE FARMERS		
			SMALL	LARGE	TOTAL
1.	Ranchi	Khunti	18	12	30
		Ormanghi	16	14	30
2.	Bokaro	Gomia	15	15	30
		Balidih	14	16	30
			120		

## Management of Quality of Water:

The management of quality of water keeps most important role for good survival and growth of pangasius. These are the following properties should be in ponds water in the culture of pangasius:-

**Table - 2**

PARAMETER	RANGE
PH	6.5 -7.5
DISSOLVED OXYGEN	> 4 p.p.m
TEMPERATURE	25 – 30 degree centigrade

## Physical Condition of Pond:

DEPTH	1.5 – 2.5 M
SOIL	ACIDIC /BASIC / ARID
COLOUR OF WATER	GREEN /BROWN
TEMPERATURE	22 – 32 degree centigrade

**Table - 3**

## Production of Pangasius Fish from Scientific Method:

1.	Area	4000 square m ( 1 acre )
2	Depth	1.5 m / 5-7 feet
3	No of days of culture	180 days / six months
4	Wt of given fishes gm /piece	10
5	No of fishes	12000 piece / acre
6	Density	3 piece /square m
7	Goal /fish (gm )	800 – 1000 gm
8	Survival rate ( % )	60 – 75 %
9	Percentage growth rate / fish /days	5.5 gm
10	Fish feed ( at the weight of fishes )	3.5 gm
11	Feed / days kg	26 kg
12	Total fish feed in 180 days	4725 kg
13	Estimated production 9 in kg )	7000 kg
14	F.C.R	1.5



## Results and Discussion:

Socio-economic status of an individual plays vital role in overall production activities of the same. Socioeconomic details of sample farmers are presented in **table** .Both male and female come in training centre. Almost male are literate but some women are illiterate. Agboola et al. (2011) emphasized on logical relation between the level of education and its effect on various facets of characteristics associated with human behavior i.e. the knowledge level, skill development, exposure to production technology, marketing and adoption of improved technology. Onumah & Acquah (2010) found that high level of formal education lead to better technical efficiency. It indicates better learning and decision making ability in sample farmers. Fish farmers had experience of about 12 years in aquaculture and 5 years in Pangasius culture, which indicate their expertise in aquaculture practices. The years of experience in aquaculture and expertise makes Andhra Pradesh fish farmers more accomplished in taking challenges in aquaculture sector of India. Aquaculture experience for fish farmers in Jharkhand was in the range of 5 to 12 years.

## Economics of Pangasius Production (Per Acre):

**Table - 4**

1. Fish seed / price of fingerlings (@ 3 ru per seed )	36,000 Rs
2. Supplement fish food 4725 kg (floating feed @ 23 Rs /kg )	1,08,675 Rs
3. Management and transporting expense	8000 Rs
4. Lime /Cow dung /medicine	10,000 Rs
5. Rent of pond	5,000 Rs
6. Labour payment (six month )	25,000 Rs
7. Expense of net	15,000 Rs
8. Other accidental expense	5,000 Rs
9. Total estimated cost	2,12,675 Rs
10. Estimated production 6 – 7 ton (sales rate @ 55 Rs/kg)	3.5 lac to 3.85 lac
11. Pure profit In six months )	1.52 lac to 1.72 lac

The farmers were using two kinds of feed; farm based (rice bran) and commercially available feed (pelleted feed). Small farmers had spent more on rice bran in comparison to pelleted feed

whereas; large farmers had spent more on pelleted feed as compared to rice bran. Commercial feed was costly in comparison to rice bran. Larger pond area was taken on lease by the large farmers as compared to small farmers. This may be due to the better financial capacity of the large farmers, as they can afford to lease in more pond area. On an average size of operational fish farm was 5.05 ha, where as that of large farmers was 8.17 ha and of small farmers, 2.23 ha.

Pangasius farmers in Jharkhand, pre-dominantly use rice bran and pelleted feed. The high price of pelleted feed in comparison to rice bran had raised the overall feed cost. Therefore, considerable reduction in the use of pelleted feed, with replacement of rice bran may reduce the feed cost. Hence, in order to increase profitability and efficient use of resources, use of pelleted feed must be reduced, more area should be brought under Pangasius culture and stocking density should be increased.

Pangasius culture was found profitable on both the category of farms. ‘Large farms’ can cut down their cost through reduced use of pelleted feed. Major factors contributing to the yield were feed, seed, fish farm area, days of culture and experience in Pangasius culture. To obtain better production figures, these inputs need to be efficiently used. Except the feed in case of small farms, both the categories of farms can increase the yield/production through increased use of feed and seed. Increased farm area, days of culture and experience in Pangasius culture will increase the yield and profitability.

Unavailability of local Pangasius seed creates the opportunity for local fish breeders to learn the breeding of Pangasius and establish hatcheries to cater the need. Pangasius culture in the region exhibited increasing returns to scale. The overall estimate of the returns to scale was larger than unity implies Pangasius production can be increased from scale economies. There is a need to find alternative feed to reduce cost in production. Pangasius being an omnivore gives opportunity to find alternative feed. Enhancement of technical capacity in Pangasius breeding is of prime concern to harness its full potential. Government through department of fisheries should guide and encourage the farmers to culture Pangasius on the line of ‘Pangasius Aquaculture Dialogue’. Intensifying the production with the efforts mentioned above will keep ‘Pangasius’ profitable.

Generally most farmers of Jharkhand and its near states use the feed of “ABIS FEED Company” as a supplement food.

**Table - 5****Ways of Feeding:**

<b>BOBY WEIGHT OF FISH</b>	<b>SIZE OF FLOATING FEEDS SEED</b>	<b>% FEED ( OF BODY WEIGHT )</b>	<b>AMOUNT OF PROTEIN (IN FEED)</b>
5 – 10 gm	1.5 mm	7 %	32 %
10 – 20 gm	2 mm	6 %	32 %
20 – 30 gm	2 mm	5 %	32 %
30 - 40 gm	3 mm	4 %	28 %
50 -100 gm	3 mm	3.5 %	28 %
100 – 200 gm	4 mm	2.5 %	28 %
200 - 300 gm	4 mm	2 %	28 %
300 -400 gm	4 mm	1.5%	28 %
600 – 700 gm	4 mm	1.5 %	28 %
800 - 900 gm	4 mm	1 %	28 %
900 – 1000 gm	4 mm	1 %	28 %

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