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*STATUS AND ECONOMIC EFFICIENCY OF FISH SEED MULTIPLICATION FARMS IN BANGLADESH**

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ABSTRACT

The status and economic efficiency of Fish Seed Multiplication Farms are analysed based on production target and achievement, and net earnings of fish farms. Data were collected from government and private farms located in 10 different districts in Bangladesh. Most of the farms could not achieve the target of production due to some problems and constraints but all the farms, both government and private earned a reasonable profit.

I. INTRODUCTION

Culture fisheries mainly depends on the availability of quality fish seeds in time of need. To ensure this service government has given due emphasis on the production of improved fish seeds by establishing Fish Seed Multiplication Farms (FSMFs) in different areas of Bangladesh. In this context, the Directorate of Fisheries (DOF) established 93 FSMFs, including 7 incomplete farms, during the period from 1961-62 to 1974-75 against the target of 101 farms (DOF), 1982-83, p. 17). Besides Government Fish Seed Multiplication Farms (GFSMFs), there are some Private Fish Seed Multiplication Farms (PFSMFs) which are also producing fish seed and competing with the GFSMFs.

There is no actual estimate as to what amount of fish seed is needed every year for culturing in stocking ponds and other possible areas. But it has been observed that, the demand for fish seed is very high during stocking period and year by year both demand and price of it are increasing. According to the Annual Report of Directorate of Fisheries of 1982-83, 353.49 kg of fish hatchling and 258.84 lakh fish-fingerlings of different species were produced under various schemes/projects, including GFSMFs (DOF, 1982-83, p. 16). For PFSMFs, there is no record of the number and quantity of production but

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these farms are also partially meeting the demand of fish culturists. Some of the areas in Bangladesh such as Jessore, Gouripur and Comilla where PFSMFs have developed on the basis of high demand for fish seed have relatively better income from this source.

Generally, there are two types of fish seed farms-farms with and without hatchery. First type of farms produce spawn[1] through artificial breeding and spawn is raised upto fry[2] and fingerling[3] stages in nursery and rearing ponds in the same farm if these facilities are available. On the other hand, second types of farms collect spawn from the first one and/or from natural grounds and raise them upto fry and fingerling stages for selling to fish culturists. Every year a large amount of fish seed are collected by spawn collector from different rivers (MPO 1985, p. 21).

In recent years a few emperical studies have been conducted on pond fish production (Gill and Motahar 1982, Ali *et al.* 1982, and Islam and Dewan 1987). It has been observed from these studies that pond fish production is suffering due to shortage of fish seed. The FSMFs are the main source from where fish farmers can get quality fish seeds. Therefore, an economic study of FSMFs is most essential to understand the present production condition and prospects for increasing production to meet the demand of fish farmers but no study has been undertaken so far in this regard. Keeping this in view, this study considered only those farms which are provided with hatching facilities and can produce both spawn, and fry and fingerlings.

In the present study an attempt has been made to determine the economic efficiency of FSMFs. Both government and private FSMFs were taken into consideration to compare the efficiency between them. Each farm sets target of production in every season according to capacity which is based on facilities and resources endowed there in. Accordingly, status and economic efficiency of FSMFs are measured herein terms of two Indies-(i) production gap between the target and achievement, and (ii) economic return of the farm. Again, farm return may be measured in terms of per hectare, per farm or per unit of hatchery. Most of the farms have more than one hatching facility and these hatching facilities are of different- kinds and sizes with various ranges of production capacities. Therefore, it is not justified to measure on the basis of per unit of hatchery. On the other hand, measurement on per hectare basis will also not be accurate because fish seed production has two stages-spawn, and fry and fingerlings. Spawn is produced in the hatchery, and fry and fingerlings are raised in the nursery and rearing ponds. Farm production and income depends on proper use of both hatchery and farm ponds. In such a condition, it is difficult to measure production in terms of per hectare. Therefore, measurement on per farm basis is more accurate than other two methods because each farm produces according to its capacity depending on fish seed productions facilities available there.

Eleven GFSMFs from ten districts covering major areas of Bangladesh were selected where farms have hatchery facilities. This type of private farms are concentrated in Jessore

where more than 13 farms are located only in Jessore sub-urban areas. PFSMF with hatchery is very much limited in other areas of Bangladesh. Considering the availability, 6 PFSMFs were selected from Jessore district to compare the production efficiency with GFSNF. The data were collected for the year 1985.

This paper is organised as follows:-Section II discusses briefly the target and achievement of FSMFs. Section III analyses the economic returns and causes of its variation. Some conclusion on the basis of findings have been presented in section IV.

II. TARGET AND ACHIEVEMENT OF FSMF

Production season for producing fish seed starts from March-April and ends up by August-September in every year. The GFSMFs are supposed to produce large quantities of high quality seed for fish farmers. The present on going farms are trying to increase their production to meet the increased demand of fish farmers.

Spawn production depends on type of hatchery and its number and size. Circular type hatchery[4] is capable to hatch more fish seed than jar type hatchery[5]. Again production capacity of hatchery depends on its size and technology adopted. However, Table I represents the number of hatchery and related ponds, and on the basis of that, the target of production has been set by different FSMFs. From the Table 1 it is clear' that, with few exception none of the farms achieved the target fixed by them. Only Neemgachi farm achieved the target of production but some other farms such as Santahar, Natore and Jamalpur achieved partially i.e. either spawn or fry and fingerling production. Among all the GFSMFs, Chandpur farm exceptionally exceeded the target of production in case of spawn and fry production but for fingerlings, the real production was one lakh pieces less than the target. In Maltinagar, spawn production was higher than the target but fry and fingerling production target could not be achieved. However, considering all GFSMFs, the achievement of production both for spawn, fry and fingerling, were lower than the production target.

In PFSMFs, most of the hatcheries were jar type and small size, and accordingly, their production capacity was also low. Only Arabpur Fish Farm achieved the production target and produced 100 kg spawn through 15 hatcheries (Table 1). In this farm number of hatchery is maximum among all government and private FSMFs. But due to absence of nursery and rearing ponds, this farm did not produce fry an 3 fingerling. None of the other PFSMFs achieved the target production. Between government and private farms, GFSMFs are in a better position in achieving the target of production, because the gap between target and achievment is miaimum in case of GFSMFs.

Both in government and private FSMFs, some problems and constraints -were identified and they were the main barriers for not achieving the target of production. Problems of water supply, late fund release, non-availability of induced materials and

TABLE 1. TARGET AND ACHIEVEMENT OF FISH SEED MULTIPLICATION FARM, 1985

	Name of farms	Total area (ha)	No. of Ponds			No. of hatchery	Target of Production			Achievement		
			Brood	Nursery	Rearing		Spawn (kg)	Fry No. (000)	Fingerlings (No.) (000)	Spawn No. (000)	Fry No. (000)	Fingerlings No. (000)
	1	2	3	4	5	6	7	8	9	10	11	12
Government FSMF												
1.	Raipur	21.9	21	40	14	4c	277	—	6000*	248	—	2300*
2.	Jessore	2.0	3	6	—	1c	95	—	500*	85	—	317*
3.	Mashkanda	2.6	3	5	1	2c	40	700	200	29	550	108
4.	Neemgachee	12.5	4	30	9	3c	62	—	5000*	62	—	5000*
5.	Chandpur	19.0	8	6	5	3c	45	300	300	45	400	200
6.	Santahar	4.5	2	6	—	1c	5	300	—	4	300	—
7.	Maltinagor	2.8	1	3	1	1c	25	300	300	30	250	200
8.	Tongi	2.6	2	6	2	2c	27	400	200	9	300	120
9.	Natore	2.4	1	2	6	2j	15	200	200	6	200	80
10.	Nowgoan	4.0	1	6	4	4j	15	300	200	9	200	100
11.	Jamalpur	4.1	3	8	2	1c	10	700	400	10	500	100
	All farms	78.4	49	118	44	24	616	3200	13300	537	2700	8525

(Continued)

TABLE 1. (CONTINUED)

1	2	3	4	5	6	7	8	9	10	11	12
Private FSMF											
1. Sobjeebag Agri & Fish Farm	4.0	1	8	1	3j	37	1500	100	23	1000	50
2. Arabpur Fish Farm	2.8	5	—	—	15j&c	100	—	—	100	—	—
3. Shapla Fish Breeding Project	6.1	3	6	—	4j	47	—	2000*	21	—	1200*
4. Ideal Fish Dev. Marketing Farm	16.2	3	8	5	5j&c	47	350	—	28	200	—
5. Chachra FSPF	2.8	1	6	2	1j	33	300	250	23	150	100
6. Maich Vandari Fish Farm	2.8	2	3	3	1j	24	1000	500	20	600	500
All farms	34.7	15	31	11	29	298	3150	2850	215	1950	1850

Note : *Targeted and achieved of fry and fingerling together.

C = Circular type. j = Jar type.

TABLE 2. NET EARNINGS OF FSMFs

('000' Tk.)

	Name of FSMF	Spawn	Fry and fingerling	Other income	Gross income	Total cost	Net return
1.	Raipur	1390.0	722.2	135.7	2247.9	1109.8	1138.9
2.	Jessore	452.5	120.0	—	572.5	173.6	398.9
3.	Mashkanda	145.0	325.3	—	470.3	122.0	348.3
4.	Neemgachee	248.0	225.4	35.0	508.4	219.2	289.2
5.	Chandpur	180.0	259.0	10.0	449.0	268.6	180.4
6.	Santahar	15.0	120.1	—	135.1	21.0	114.1
7.	Maltinagar	176.2	200.0	—	376.2	80.1	296.2
8.	Tongi	46.0	180.0	—	226.0	122.6	103.4
9.	Natore	47.5	86.2	—	133.7	76.3	57.4
10.	Nowgoan	45.3	180.0	15.0	240.3	95.9	144.4
11.	Jamalpur	48.0	235.2	5.0	288.2	136.1	152.1
	All Farms	2793.5	2653.4	200.7	5647.6	2425.2	3222.4
Private FSMF							
1.	Sobjeebagh Agril. and Fish Farm	317.8	211.3	—	529.1	106.7	422.4
2.	Arabpur Fish Farm	1480.0		—	1480.0	274.2	1205.8
3.	Shapla Fish Breeding Project	218.2	184.4	—	402.6	121.9	280.7
4.	Ideal Fish Dev. & Marketing Farm	250.3	155.2	—	405.5	231.1	174.4
5.	Chachra Fish Seed Production Farm	188.4	155.0	—	343.4	106.9	236.5
6.	Maich Vandari Fish Farm	176.0	320.1	—	496.1	72.8	423.3
	All Farms	2630.7	1026.0	—	3656.7	967.6	2689.1

theft of fish from the pond were the main constraints in GFSMFs. Last two problems were common also in PFSMFs, but in addition to that, most of the farms did not get cooperation from Upazilla Fishery Officer and bank loan in time.

III. PROFITABILITY OF FSMFs AND CAUSES OF ITS VARIATION

Both government and private FSMFs produced mainly Rui, Catla, Mrigal and Silver Carp. These are the species which have high demand in the study areas. Net earnings of FSMFs depends mainly on three factors :—(i) actually, how much achieve the production target, (ii) cost of production and (iii) sales prices of spawn, fry and fingerling. Furthermore, some of the government farms earned additional income by selling induced brood fish, and fruits and vegetables produced in the farm areas. Table 2 shows the net earnings of different FSMFs. From this Table it can be observed that none of the farms, either government or private, incurred loss but the profit margin differed in different farms.

There are some basic differences between government and private FSMFs in respect to measuring the profitability. GFSMFs are supposed to maintain the permanent official staffs over the year and incur considerable amount of expenditure in this regard. Again, almost all the GFSMFs provide training facilities for the government people and private organizations which consequently raise the farm expenditure.

Two types of cost are generally involved for producing fish seed—material cost and and labour cost (Appendix 1). But in case of PFSMFs, all the farms took loan from commercial banks and some of them took the nursery and rearing ponds on lease, which involved 25 percent of total cost. On the otherhand, almost all the GFSMFs are provided with necessary nursery and rearing ponds and did not take any loan from the commercial bank to meet up the farm expenditure. Accordingly, lease hold free and interest charge were not included in government farms. Material cost included the cost of brood fish, induced breeding materials, supplementary feeds, fertilizers, medicines, equipment, and fuel and water charge, and all these items represented 42 and 33 percent of total cost in case of private and government FSMFs respectively. For labour cost, GFSMFs covered 67 percent which was more than double than that of PFSMFs considering all farms in private and government. Some of the fixed costs such as installation of DTW, construction of farm buildng and excavation of ponds were not considered in this analysis. Due to uncertainty it is very difficult to estimate the longivity of these items and their consecutive use in different years. On the otherhand, a particular cost was incurred for repairing the DTW and farm building, and reexcavation of the pond., These recurring costs are accurately estimatable and were included in the analysis.

Level of farm profit was measured in terms of net earnings of each farm which was calculated by deducting total cost from gross income. From Table 2 it appears that both

gross and net earning were highest in Arabpur Fish Farm and the corresponding values were Taka 1480000 and 1205800 respectively. This farm has got the advantage of higher market price of spawn and lower production cost and these two factors ensured highest net earning. In GFSMFs, the net earnings was higherst in Raipur (Tk. 1390000) and lowest in Natore (Tk. 57400).

It may be noted from the Table 2 that the average level of profit is high in PFSMFs than that of GFSMFs. In GFSMFs, per farm production was comparatively high but the cost of production was also high due to payment of salary for the permanent staff. The average sale price of spawn in government farms was Tk. 5202/kg while in private farms it was Tk. 12235/kg. In case of fry and fingerlings, selling price was also high in PFSMFs. All these factors ensured higher profit in private farms than that of the government farms.

IV. CONCLUSIONS

The Directorate of Fisheries established 93 FSMFs to supply the fish seed to the fish farmers but the total amount supplied by these farms is not sufficient at all. In stocking period there is high demand of fish seed and accordingly many private entrepreneurs already established FSMFs in different areas of Bangladesh as a new broad dimension of farm business. Both government and private farms are trying to increase the production but very few of them achieved the target.

From emperical study it was found that fish seed production per farm was comparatively high in government farms but net income was higher in private farms due to higher rate of sales price and lower production cost. All government farms are supposed to sell fish seed at a fixed rate which is estimated by DOF but the private farms can charge higher price according to the demand and the usual sale price of fish seed in private farms is very much high or in comparison to government farms. In this study, the average sale price of spawn in PFSMFs was Tk. 12,235/kg which was more than double that of the government farms. However, all the farms, both government and private, earned reasonable profit which is possibly even higher than the other farm business.

Policy Implication :

Among the 93 GFSMFs, many of them have not hatching facilities and hence can not produce spawn through induced breeding. Once these farms are established by the DOF with huge amount of expenditure and maintaining government staff, all these farms should be well equipped to use them potentially to increase the fish seed production at a higher level. On the otherhand, government can also encourage the people to establish FSMFs to ensure availability of seed during stocking period. All these farms will have two broad objectives with the aim of boosting up the production in fishery sector : (i) to increase the total fish seed production, and (ii) to decrease the sale price, so that the fish farmers/culturists can easily afford to buy and get fish seed in right time.

APPENDIX-I. FACTORS INVOLVED IN PRODUCING SPAWN, FRY, AND FINGERLINGS/FARM/YEAR

(In 000' Tk.)

	Name of FSMF	Major elements of material cost: Brood fish	Induced materials	Artificial feed	Fertilizer	Medicine &insecticides	Equipment and repairing	Fuel & water charge	Material cost	Human labour cost	Interest charges & lease hold fee	Total cost
	1	2	3	4	5	6	7	8	9=(2+…+8)	10	11	12
Government FSMF												
1.	Raipur	33.0	27.0	175.5	24.2	5.5	6.0	38.6	309.8	800.0	—	1109.8
2.	Jessore	34.5	9.0	14.6	4.9	—	2.6	20.0	85.6	88.0	—	173.6
3.	Mashkanda	8.0	9.5	19.7	4.8	—	—	8.0	50.0	72.0	—	122.0
4.	Neemgachee	—	—	63.4	1.4	—	2.6	10.0	77.4	141.8	—	219.2
5.	Chandpur	—	—	43.6	—	—	10.0	5.0	58.6	210.0	—	268.6
6.	Santahar	—	4.0	—	11.5	—	—	—	15.5	5.5	—	21.0
7.	Maltinagar	—	8.0	48.0	—	5.0	0.8	10.0	71.8	8.3	—	80.1
8.	Tongi	9.7	1.0	12.9	5.6	—	0.4	—	29.6	93.0	—	122.6
9.	Natore	9.1	—	6.1	4.7	—	0.4	1.0	21.3	55.0	—	76.3
10.	Nawgoan	13.7	2.0	4.6	4.7	1.0	0.5	2.2	28.7	67.2	—	95.9
11.	Jamalpur	12.6	15.0	2.8	6.8	—	11.9	9.0	58.1	78.0	—	136.1
	All Farms	120.6 (5)	75.5 (3)	391.2 (16)	68.6 (3)	11.5 (0)	35.2 (2)	103.8 (4)	806.4 (33)	1618.8 (67)	—	2425.2 (100)

(Continued)

APPENDIX—I(CONTINUED)

1	2	3	4	5	6	7	8	9 (2 + ... + 8)	10	11	12
Privat FSMF											
1. Sabjeebag Agril. & Fish Farm	31.5	15.0	7.0	14.2	1.2	3.5	8.0	80.4	54.8	25.5	160.7
2. Arabpur Fish Farm	—	15.0	25.6	—	1.2	2.9	29.8	74.5	95.7	104.0	274.2
3. Shapla Fish Breeding Project	2.7	10.0	5.6	26.3	1.0	4.1	9.0	58.7	33.2	30.0	121.9
4. Ideal Fish Dev. & Marketing Farm	26.8	60.0	17.7	18.3	0.5	3.0	13.6	139.9	41.0	50.2	231.1
5. Chachra Fish Seed Prodn. Farm	3.8	—	2.8	4.6	2	1.0	2.0	16.2	78.7	12.0	106.9
6. Maich Vandari Fish Farm	9.6	8.0	6.0	6.8	1.0	2.2	3.7	37.3	15.5	20.0	72.8
All Farms	74.4 (7)	108.0 (11)	64.7 (7)	70.2 (7)	6.9 (1)	16.7 (2)	66.1 (7)	407.0 (42)	318.9 (33)	241.7 (25)	967.6 (100)

Note :—Figures in the parenthesis indicate the percent of total cost.

NOTES :

1. Spawn : It is the newly hatched fish larva upto the stage so long it derives food from the yolk sac attacked to body.

2. Fry : It is the fish larva when it starts feeding upon the natural food from water body after the absorption of yolk sac and takes the actual shape of a baby fish. Fry length varies from 15—30 mm.

3. Fingerling : Fish larva which take the size of a finger i.e. fish larvae above the length 30—40 mm in size are regarded as fingerling.

4. Circular hatchery : It is also known as chinease type hatchery. It is a circular shaped hatchery. It is of variable sizes, its diameter ranges from 2—5 metres and height from 1—1.3 metre. Here water ciculates horizontally within the hatchery.

5. Jar type hatchery : This is cyclindrical type earthen hatchery of variable sizes. It has a gradual tapering end at the bottom through which water flow is given. Here water circulates vertically.

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