Fishery Technology 54 (2017) : 209 - 214

Livelihood Option through Trout Seed Production in Jammu and Kashmir: An Economic Analysis

Stanzin Gawa*, Nalini Ranjan Kumar, Navghan Mahida and Vinay Maruti Hatte
ICAR-Central Institute of Fisheries Education, Versova, Mumbai - 400 061, India

Abstract

The present study was conducted during the period 2014-15 to understand the economics of trout seed production in the state of Jammu and Kashmir. It was observed that the trout seed production is a capital intensive business, with high cost involved in the establishment of fixed inventories. The study showed that 79.65% of seed produced in the state is used for culture purpose while 20.35% is utilized to stock the springs and streams for sports fisheries. The major capital investment was incurred in hatchery construction (around 90 lakh), which accounted 72.25% of the total capital investment. Cost and return analysis revealed fixed cost about ₹ 55.24 lakh and variable cost about ₹ 2.42 lakh which accounted about 95.63 and 4.37% respectively. The major constraints encountered in trout seed production was lack of skill labour and low demand for trout seed. Due to low demand for trout seed the trout hatcheries were running at a sub-optimal level but the demand for trout seed is expected to rise with increasing number of private trout farmers. With proper skill enhancement the trout hatchery business can transform into a viable livelihood option for entrepreneurs.

Keywords: Trout, cost and return, B-C Ratio, Jammu and Kashmir

Introduction

The Rainbow trout originated from the west coast of North America, was first described by Richardson in 1836 from specimens collected in the Columbia river. Initially, rainbow trout was native to the coastal areas of the United States and Canada extending from Alaska as far south as Mexico (Bromage & Cumaranatunga, 1988). Trout was first introduced in the state of Jammu and Kashmir by F.J Mitchell in 1905 (Mahanta et al., 2011; Basavaraja & Basavaraja, 2007) and has now well adapted in the state mainly in the Kashmir division. The main reason behind this species being so well adapted in the state lies in its favourable topographical, environmental and climatic conditions that prevail in the state (Hassan & Pandey, 2012). Rainbow trout (*Onchorynchus mykiss*) and Brown trout (*Salmo trutta fario*) are the two species found in the state. Rainbow trout is used for culture while Brown trout is stocked in open water for sports fisheries mainly in springs and streams of the state. At present, the trout seeds production and supply are carried out by state fisheries department owned Trout hatcheries located in Kashmir valley. The state is leading in trout production followed by Himachal Pradesh. Currently, there are six trout hatcheries in the state located in Kashmir region, which are Laribal, Bugdam, Panzath, Tchancer, khag and Kokarnag trout hatcheries (DoF, J&K, 2016). The Kokarnag trout fish farm project is the largest, known as mother trout fish farm in Jammu and Kashmir (Gawa et al, 2016; Gawa et al, 2017). This state of art trout hatchery facility was constructed with the assistance from European Economic Community (EEC) (Mahanta et al., 2011) and has large number of brood stock of both Rainbow trout and Brown trout. The full potential of rainbow trout hatcheries can be attained only if the hatcheries can provide producers with regular supplies of high quality eggs and fry every week of the year (Bromage et al., 1992). The breeding method followed in the state is artificial stripping method and breeding season starts from the month of November and continues till the end of February (Gawa et al., 2016). In the year 2014-15 about 9 million trout seed were produced (DoF, J&K, 2016) and since privatization of trout culture started in the year 2009-10, the

Received 26 April 2017; Revised 03 July 2017; Accepted 24 August 2017

**E-mail: gawa107@gmail.com*

demand for trout seed is expected to increase. So, it is very important to understand the production economics of trout seed production in the state, and this study is an attempt towards that.

Materials and Methods

The study was conducted during 2014-15 and the data was collected from both primary and secondary sources. The purposive sampling technique was followed and the data was collected from three main hatcheries Kokarnag, Laribal and Mammar trout hatcheries located in Anantnag, Srinagar and Ganderbal district respectively out of six based on their performance and importance in trout seed production in the state. To simplify the study based on fixed capital investment pattern sampled seed farms were classified as Large (₹ 2 crore), Medium (₹ 1-2 crore) and small (₹ 1 crore) for Kokarnag, Laribal and Mammar respectively. All the existing trout hatcheries are located in the Kashmir region due to its favourable environment and resource availability. The primary data was collected with the help of pre-tested open type structured interview schedule from the state fisheries department officials while the secondary data were collected from Jammu and Kashmir state fisheries department website, literature and other secondary sources available. Attempt was made to determine the utilization of trout seed by different stakeholders and also to understand the economic feasibility of trout seed production in the state.

To estimate the costs and return in trout farming, farm business analysis was carried out. To arrive at different efficiency measures different cost and income measures were estimated as below:

Fixed cost includes following items:

i. Depreciation on fixed assets: calculated using straight line method.
ii. Interest on fixed capital: It was calculated @ 12% per annum on fixed capital.
iii. Expenses on repair and maintenance of fixed assets: estimated based on the information collected from sample households.
iv. Rental value of land: lease amount per year was used as rental value for land for trout culture.
v. Salary of permanent human labour.

The operating expenses incurred like seed cost, feed cost, medicine and chemical cost hired labour cost, miscellaneous cost, transportation cost and interest on working capital (8.75%) were considered for variable cost.

Gross income worked out by multiplying the quantity of produce with respective prices.

Gross income = Q*P

Where,

Q = quantity of trout produced (kg)

P = Selling price of trout (₹ kg)

Net income, the return left after deducting all the expenditure such as fixed cost and variable cost from gross income.

$$\text{Net income} = GI - TC$$

Where,

GI = Gross income

TC = Total cost

$$TC = TFC + TVC$$

Where,

TFC = Total fixed cost

TVC = Total variable cost

To analysis the constraints faced by trout seed producer Rank Based Quotient (RBQ) was estimated to quantify the severity of the constraints in trout seed production as given by (Sabarathnam & Vennilla 1996). The responses in addition to sampled farms were also collected from other 2 major farms from the staffs who were earlier posted in those farms and those who pay regulars visit to those farms.

$$R.B.Q = \frac{\Sigma f_i\ (n+1-i)}{N \times n} \times 100$$

Where,

f_i = Number of respondents reporting a particular problem under i^{th} rank

N = Sample size

n = Number of rank or number of problems identified

Results and Discussion

The trout hatchery is capital intensive in nature and for successful operation it is important that the hatchery is well equipment with modern technology. The resource availability on the sample trout hatchery is presented in Table 1.

The study found that the size specification, design of equipments and structure were similar in all the farms and differ only in quantity. The Kokarnag trout fish farm project was the largest in terms of capital assets such as troughs, trays, tanks, nursery pond, rearing pond, and stocking pond. Laribal trout fish farm was the second largest trout fish farm in Kashmir and was responsible for breeding and stocking of brown trout seed in different trout stream for sports fisheries in addition to breeding and supplying of rainbow trout seed to nearby districts. Mammar trout seed farm found to be smallest in terms of resource availability and it supplies seed to different government and private trout farms located in Ganderbal district.

The trout seeds are produced either for culture or ranching in the springs and streams for sports fisheries. The study showed that 79.65% of the total seed produced was used for culture purpose, out of which government and private farms shared was 54.27 and 25.38% respectively. The remaining 20.35% of the produced trout seed was used for ranching to aid sports fisheries. Trout production in the state was increasing in a steady manner due to increased area under trout production, increase in the number of private trout farms and also with the increased trout seed production. On the other hand sports fisheries has come up as an important revenue source for the department of fisheries as the number of anglers coming to state has increased. For each rod they charged ₹ 1000 for locals and ₹ 2000 for foreign nationals and maximum catch in a day is limited to 6 numbers (Fig.1)

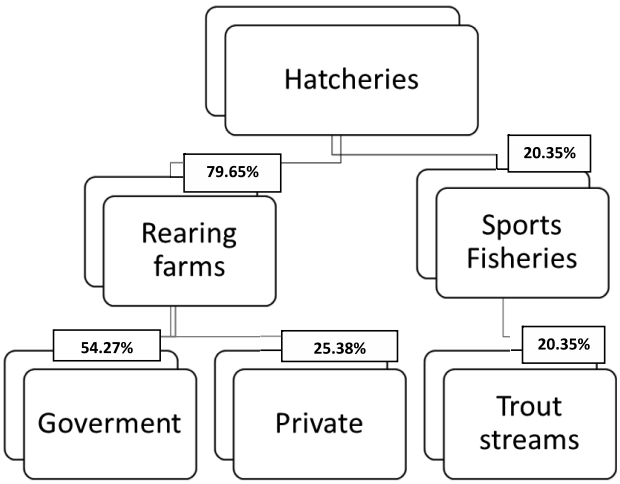

Fig. 1. Flow of volume of trout seed

The fixed investment pattern of sample trout seed farm was estimated and presented in the Table 2.

Total fixed investment on sample trout seed farms ranged from ₹ 19.1 lakh for small to ₹ 2.47 crore for large and ₹ 1.08 crore for Medium trout seed farm with an average of ₹ 1.25 crore per seed farm. It was observed that trout seed farm building accounted for a major share in total investment per seed farm which ranged from ₹ 5 lakh to ₹ 1.8 crore for large and small seed farms and 85 lakh for medium farms respectively having an average share of 72.25% in the total fixed investment on seed farm. Other fixed investments were tanks, nursery pond, transport vehicle, trays, troughs, cabling and lighting, and generator set having an average share of 8.64, 8.56,

Table 1. Resource availability on sampled trout seed farms

Particulars		Trout fish seed farm			
	Size	Large	Medium	Small	Overall
Trough (No.)	(200×33×10) cm^3	60	11	24	31.67
Trays (No.)	(34×32×8.5) cm^3	240	44	108	130.67
Capacity of trays					
(No. eggs reared)		7000	7000	7000	7000
Tanks (No.)		21	17	6	14.67
Capacity of hatchery					
(Lacs of eyed ova)		16.8	7.5	0.42	8.24
Nursery Ponds (No.)	(10×2×1) m^3	24	8	0	10.67
Rearing Ponds (No.)	(20×2×1.4) m^3	32	11	6	16.33
Stocking Ponds (No.)	(20×2×1.4) m^3	15	4	4	7.67

7.23, 4.17, 3.34, 0.48 and 0.13%, respectively to the total fixed investment. The result showed that hatchery building incurred major investment on all trout seed farms as these building were constructed with high quality materials and well-furnished interiors. Hence this shows trout seed production is capital intensive enterprise and need high investment in the initial stage of establishment.

Cost and returns has been worked out separately for different categories of seed farm and presented in Table 3.

The perusal of Table 3 explain the fact trout seed production is capital intensive business where total fixed cost accounts 95.63% while variable cost accounts only 4.37% respectively in the total cost of

Table 2. Fixed investment pattern on the sample trout seed farms

Particular	Investment on trout seed farm (₹ /farm)				
	Large	Medium	Small	Overall	% Share
Hatchery building	18000000	8500000	500000	9000000	72.25
Trough	700000	250000	300000	416667	3.34
Trays	960000	200000	400000	520000	4.17
Tanks	1600000	1000000	630000	1076666	8.64
Nursery pond	2400000	800000	0	1066666	8.56
Cabling and lighting	100000	50000	30000	60000	0.48
Generator set	0	0	50000	16666.67	0.13
Transport vehicle	900000	0	0	300000	7.23
Total investment	24660000	10800000	1910000	12456667	100

Table 3. Cost and return in trout seed production

Particulars	Cost and return in trout seed production (₹ /farm/annum)				
	Large	Medium	Small	Overall	% Share
A. **Variable cost**					
Brood feed cost	262800	132130	16060	136997	2.48
Chemicals and medicine	100000	25000	12000	45667	0.83
Electricity	12000	12000	12000	12000	0.22
Transportation	15000	5000	10000	10000	0.18
Hired human labour	15000	7500	3000	8500	0.15
Miscellaneous	30000	5000	20000	18333	0.33
Total working capital	434800	186630	73060	231497	4.19
Interest on working capital	19023	8165	3196	10128	0.18
Total variable cost	453823	194795	76256	241625	4.37
B. **Fixed cost**					
Depreciation	676230	298723	46216	340390	6.16
Interest on fixed capital	4711200	1872000	238800	2274000	41.16
Annual repair and maintenance	2252000	922000	271000	1148333	20.79
Salaries of permanent staff	2100000	1500000	960000	1520000	27.51
Total fixed cost	9739430	4592723	1516016	5282723	95.63
Total cost (A+B)	10193252	4787518	1592272	5524348	100
Total seed production (No.)	1400000	600000	150000	716667	
Price (₹ /fingerling)	7.17	7.17	7.17	7.17	
Cost of production (₹ /fingerling)	7.28	7.98	10.62	7.71	
Gross return	10038000	4302000	1075500	5138500	
Return over variable cost	9584177	4107205	999243	4896875	
B-C ratio	0.98	0.90	0.68	0.93	

production. Since all hatcheries are run by state fisheries department, it involves high management cost which is quite visible from share of salaries of permanent staff (27.51%) in the total cost. This is due to fact that these hatcheries also provide training and technical assistance to other government and private trout farms which involves high management cost. All the categories of hatcheries were running at suboptimal level which is quite evident from B-C ratio. But it is important to notice that all hatcheries are able to meet their variable cost giving good indication of economics feasibility in long run. At present due to low demand the existing hatcheries are not able to run at their full capacity but this trend is expected to change as young entrepreneurs are taking up trout culture as source of livelihood under RKVY scheme. The economic performance of these hatcheries will improve if these hatcheries are under private sector as they run with profit motive unlike public sector whose main aim is development and welfare.

The constraints faced in trout seed production has been analysed and presented in the Table 4.

Table 4. Constraints faced by seed suppliers

Sl. No.	Constraints	RBQ Score	Rank
1	Quality brood availability	29.09	IX
2	Low survivability of seed	25.79	X
3	Lack skill labour	98.18	I
4	Poor seed demand	78.18	II
5	Unavailability of equipment	74.21	III
6	Difficulty in winter season	32.73	VIII
7	Power supply	60.00	VI
8	Poor road and transportation	63.64	V
9	Scarcity of specified medicine for trout	69.09	IV
10	Outbreak of disease	9.09	XI
11	Lack of infrastructure	52.73	VII

The results revealed that lack of skilled labour was found out to be to rank first with RBQ score of 98.18%. Hence there is a strong need for skill development through training by the department. The second most constraint faced by seed producers was poor seed demand with RBQ score of 78.18%. Currently there is low demand for seed due to fact that privatization of trout production was introduced only 2009-10 but it is expected to increase in future as more and more private farms are coming up in the valley. Scarcity of equipment was found third most sever constraints with RBQ score of 74.21%. Since trout production carried out in Himalayan region, it is very difficult to find equipment specially required in trout culture. Scarcity of medicine for trout is found fourth most important constraint and it was found that farmers purchase medicine which are recommended for livestock. Poor road and transportation was found to be fifth constraints for seed farms. This was due to the location of the feed farms and as in the case of feed mills road and transportation was found out to be not sever. Other constraints faced by feed supplier are power supply, infrastructure and difficulty in winter season, quality of brood, low solvability and outbreak of disease being the least severe. For the successful and efficient operation of trout seed production in the state, it is very essential to address these constraints.

The B-C ratio indicates that hatcheries were running at suboptimal level but it was important to notice that they were able to meet their variable cost indicating economic feasibility in long run. Due to capital intensive nature, high cost involved in building up fixed inventories which range from 19.10 lakh to 2.46 crore for small and large hatcheries respectively. Poor demand for seed and lack of skill labour was the major constraints faced by trout seed producers. There is need to run hatcheries to their full capacity and export the surplus seed to neighbouring states like Himachal, Sikkim and Arunachal Pradesh which will earn them extra revenue. There is a great scope of trout culture in the state and the demand for trout seed is expected to rise due to increasing number of young entrepreneurs taking up trout culture. Hence this provides a great opportunity for young entrepreneurs to take up this business as a livelihood option.

Acknowledgments

The authors would like to acknowledge Directors ICAR-CIFE for providing the necessary support during the research. The author is also grateful to Mr. R.K Dogra, former Directors of Fisheries Department Jammu and Kashmir for providing valuable input and support during the field visits.

References

Basavaraja, N. and Basavaraja, N. (2007) 7.11 Freshwater fish seed resources in India. Assessment of freshwater

fish seed resources for sustainable aquaculture, 24(501): 267

Bromage, N. and Cumaranatunga, R. (1988) Egg production in the rainbow trout. In Recent advances in aquaculture (Muir, J. F. and Roberts, R. J., Eds) Springer Netherlands. pp 63-138

Bromage, N., Jones, J., Randall, C., Thrush, M., Davies, B., Springate, J., Duston, J. and Barker, G. (1992) Broodstock management, fecundity, egg quality and the timing of egg production in the rainbow trout (Oncorhynchus mykiss). Aquaculture. 100(1-3): 141-166

Department of Fisheries (DoF) (2016) Official website of Department of Fisheries, Jammu and Kashmir. Hatcheries of the department, http://jkfisheries.in/Hatchery.htm (Accessed on 19 october 2016)

Gawa, S., Kumar, N. R., Wani, G. B., Hatte, V. M. and Vinay, A. (2016) Mapping the Core Processes and Identifying Actors along with Their Roles, Functions and Linkages in Trout Value Chain in Kashmir, India. WASET, Int. J. Biol. 10(6): 353-357

Gawa, S., Kumar, N. R., Tiwari, V. K., Prakash, S., Yadav, V. K and Wani, G. B. (2017) Trout Culture in Kashmir-An Opportunity for Profitable Enterprise. In: Social Entrepreneurship in Aquaculture (Sinha, V. R. P., Krishna, G., Keshavanth, P. and Kumar, N. R., Eds), pp 381-389, Narendra Publishing House, Delhi, India

Hassan, N. U. and Pandey, D. N. (2012) Present status of trout fisheries in Jammu and Kashmir. IOSR J. Pharm. 2(5): 35-37

Mahanta, P. C., Moza, U and Joshi, R.D. (2011) Coldwater Fisheries and Aquaculture. In Handbook of Fisheries and Aquaculture (Ayyappan, S., Moza, U., Gopalkrishna, A., Jena, J. K and Pandey, A. K., Eds), pp 302-325, Indian Council of Agricultural Research, New Delhi

Sabarathnam, V. E. and Vennila, S. (1996) Estimation of technological needs and identification of farmers problems to formulate research and extension programmes in agriculture entomology, Experimental Agriculture. Cambridge University, UK. 32(1): 87-90