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Current status of Trout farming in Himachal Pradesh

Madhu Sharma

Department of Fisheries, CSKHPKV, Palampur, Himachal Pradesh

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ABSTRACT

The mountainous regions in the Himalayan states of India is endowed with copious amounts of highly oxygenated pristine freshwater highly suitable for culturing rainbow trout. Himachal Pradesh is a state with numerous streams and reservoirs and has a big potential for fish production. Estimated fisheries water resources of the state are around 3000 km out of that 600 km of coldwater streams are conducive for trout farming and classified as trout water which can be judiciously trapped for trout culture. Trout is a cold water fish and well flourishes in water temperature ranges from 5°C to 15°C. Trout fish, both brown (*Salmo trutta fario)* and rainbow (*Oncorhynchus mykiss)* are found in the snow fed Beas, Sutluj and Ravi rivers in the highest reaches of the state where temperature of water hover around freezing point. The state has around 512 trout farms including seven that are run by the government mainly in Kullu, Chamba, Shimla, Kinnaur and Mandi district. Out of five zones, zone II and III of Himachal Pradesh have vast potential for the culture of high prized fish "Rainbow trout". Total production of trout in the state was 0.54 tonnes in the year 1996-97 and increased to 25 tonnes in 2005-06 while it reaches to 456.73 metric tonnes in the 2017-2018. Availability of technical know-how of trout farming, breeding and artificial diets has immensely helped in promoting aquaculture of trout in the state. Research and development efforts to expand and intensify rainbow trout production leads to overall increase in production of trout fish but still there is a huge gap between the actual and potential trout production. In this paper trout production, current situation and its potential for future expansion in Himachal Pradesh were reviewed.

1. Introduction

Historic perspective of trout introduction in Himachal Pradesh

Rainbow trout is native to the cold water rivers and lakes of the Pacific coasts of North America and Asia. It has been introduced to about 82 countries practically everywhere the conditions are favourable for its culture, because rainbow trout tolerates a wide range of environmental and production conditions better than other trout species. The First successful shipment of rainbow trout outside of North America was realised in 1877 (Canyurt and Akhan, 2009). Brown trout *Salmo trutta fario* and rainbow trout *Oncorhynchus mykiss* were transplanted from Europe to India primarily to develop sport fishing or recreational angling (Jhingran and Sehgal 1978; Singh and Lakra 2011). The introduction of brown trout (*Salmo trutta*) in 1860s and rainbow trout (*Oncorhynchus mykiss*) in 1909 by British anglers in streams and rivers of the Himalayas and Western Ghats served to further popularity of this leisure activity (Mitchell 1918). First entry of trout fish in Himachal Pradesh has been reported to be in Kangra and Kullu Districts in 1905 from Jammu and Kashmir (Sehgal 1974). In Himachal Pradesh, the Trout farming was initiated during 1909 with the transportation of eyed ova from Srinagar to Kullu Valley. Till 1980, the culture was limited to the production of fish fingerlings and their stocking in rivers and their tributaries. Trout was considered only a game fish and hardly any interest was evinced in its culture or large scale farming (sehgal 1999).

*Corresponding author: madhu.srma@gmail.com

The commercial sale of trout, which was a distant dream till 1980 in the state, became a reality with Indo-Norwegian trout farming project in 1990 in Kullu valley with an aim of transferring successful technology for breeding and farming of the rainbow trout (Sehgal and Sehgal 1999). The state again took the lead during 1997 when it opened the imbibed technology to the private sector and unemployed youths of the state for investment in trout farming units. The private sector has emerged as a major player in fresh water fishery culture, particularly trout farming in Himachal Pradesh. After Jammu and Kashmir, Himachal Pradesh is the next leading states in rainbow trout farming and seed production in India with the assistance of Norwegian Government during 1989 - 91. The project, initiated in 1989, was executed in two phases with specific objectives for transfer of technology and boosting production. The transfer of technology stipulated setting up of model trout farm with latest hatchery techniques, formulation of pelleted trout feed and demonstration of large scale table size trout farming technology. Further activities included import of quick growing, disease resistant eggs, and development of economically viable palletised feed with locally available ingredients, training of local staff and farmers, and production of economically viable fingerlings to encourage local farmers to adopt trout farming. The trout culture has very high potential but this venture has not developed as fast as can due to various technical, social and environmental constrains such as availability of high quality seed at an affordable price, good quality low cost feed, control of diseases and health management practices, suitable culture system for efficient use of water resources and development of market channels. But with continue pro-active government policies, adequate advance planning, scientific designed production technologies, sound management will lead to stable, sustainable and profitable trout culture in Himachal Pradesh and is key to a more responsible and prosperous aquaculture.

Water conditions required for trout farming-

1. **Temperature-**Natural habitat of trout is fresh water with temperature about 12^{o}C. Species can tolerate 0-25^{o}C but best temperature is 10-12^{o}C. Appetite of trout is optimal in temperature range of 7-18^{o}C. Further feeding intensifies up to 18^{o}C but decrease after that and then stop with further increase in temperature. Growth of trout more or less stop at temperature less than 4^{o}C
2. **pH-** The pH range required for trout farming is 4.5-9.2. But for developing embryo and fry the range get narrower – 6.5-8.
3. **Dissolved Oxygen**-The range for dissolved oxygen to grow trout is 4.5-9.5 mg/l. Acceptable range of O_2 content in water during incubation of eggs and 1st developmental stage of fry is 5-6 mg/l while for older age group O_2 content of water may be 4-5 mg/l. Water from sluggish streams, swamps, bogs and wells are often low in dissolved oxygen. Water from spring is always considered ideal provided its temperature does not exceed 15^{O} C. River water is also desirable provided it remain clear during maximum days in year.
4. **Turbidity-** Turbidity of water should not be more than 25 cm.
5. Flowing water is required for trout and it is estimated that suitable flow rate for water is 1000 m^3 per day (10 litres/sec) is needed for the production of 1 tonne of trout.
6. Trout eggs are susceptible to 0.1 mg/l of chlorine and adult rainbow to 0.3 mg/l. Trout eggs are also susceptible to Zn concentration of 0.4 ppm.

Current status of trout farming in state-

Rainbow trout is a highly commercial sport and market fish of the state. Trout farming has progressed steadily during last decade in the state. After its introduction to the state it has become most remunerative cold water fish. The reported information suggested that higher temperature in mid altitudes of Himalayas can help better yield of rainbow trout, provided farm management practices are optimized (Pandey and Ali 2015). Dhanze and Dhanze, 2002 reported that rainbow trout farming is possible even in the foot hills (1120 msl) of the state.

It is evidence from the table.1 that fish production is gradually increased year after year in the state. The present production is not enough and sufficient to meet the demands of the local people as trout fish is highly valued fish in the state due to its nutritive value, less spines and easy to cook. Trout fish has also very high demand outside the state but the production is not enough to supply it outside the state. Now a day's people have become health conscious so they prefer trout fish as it is rich in proteins, vitamin A, B, B1, C2, D, Omega 3 polyunsaturated fatty acids and low in Sodium and forms the basis for healthy low fat diet. Trout is regarded by some gourmets (food experts) as one of the most delicious types of fish in the world. The trout is put to sale when it reaches to the growth of 250 grams a this weight is preferred as table size of trout fish to cook it into delicious recipes.

Table 1. Trout hatcheries in Himachal Pradesh

S. No.	Trout Farm	District	Year of establishment	Raceways	Hatchery	Capacity fish in tonnes	Capacity eyed ova in lakh
1.	Patlikulh	Kullu	1909	4 Nursery 12 Brooder	1	10	8.5
2.	Barot	Mandi	1959	19	1	5	3.5
3.	Sangla	Kinnaur	1965	14	1	5	1
4.	Holi	Chamaba	2000	6	1	2	1
5.	Dhamwari	Shimla	2005	11	1	5	1
6.	Hamini	Kullu	2006	20	1		1
7.	Bharmaur	Chamba	2014	10	1		2

Year wise trout production in the state from 2005-2016

S. No.	year	Production in Metric tones
1.	2005-2006	25.60
2.	2006-2007	47.59
3.	2007-08	11.44
4.	2008-09	63.99
5.	2009-10	64.90
6.	2010-11	75.91
7.	2011-12	76.94
8.	2012-13	205.44
9.	2013-14	233.49
10.	2014-15	417.23
11.	2015-2016	490.74

State Fisheries Department reports.

State has 7 govt. trout farm which are also have hatcheries. Largest one is at Patlikulh, Kullu district this is also having the only two feed mill in the state. Annual production of feed mill is about 50 tonnes.

No of trout farms in different districts of Himachal Pradesh

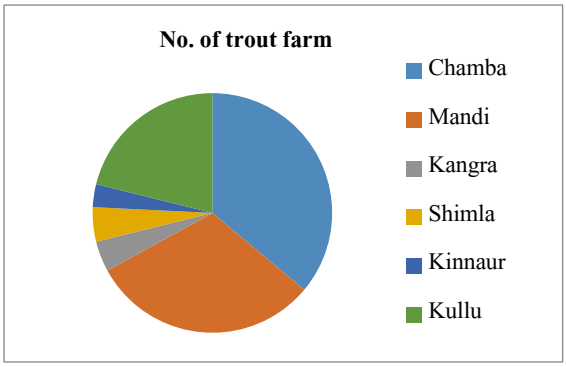

Figure 1. Number of trout farms in different districts of Himachal Pradesh

https://www.nabard.org/demo/auth/writereaddata/ModelBankProject/1612162213Trout_farming_-E.pdf

According to a report there are total 526 trout farms in different districts of Himachal Pradesh. Chamba, Mandi and Kullu districts have more trout farms as compared to other districts. Kullu district is having largest trout farm at Patlikul along with the only feed mill.

Trout in private sector-

Comparison in performance of trout fish production in public and private sectors. The private sector is a major contributor in trout fish production and it has gained a momentum in progress whereas the government sector has contributed only 9 percent in total trout production. The graph of the private sector has shown a sharp upward direction. At present private sector is contributing major share (96%) of the total trout production in the state (Singh et al 2017).

Trout harvesting and marketing-

According to a survey conducted by Agro- Economic Research Centre (AERC) Shimla, out of total produced trout 57 % is sold to the hotels of Delhi and State, 22% is sold to local contractor and 19 % is sold directly to the consumer. The largest one is located in Patlikuhal in Kullu district. At present, the total fish production through trout farming in the area is around 19.19 tonnes which is valued about Rs. 90 lakh during 2012-13. Although from last three to four decades, however, a sharp decline was observed in the catches on account of multiple factors such as large scale road construction in the valleys followed be destruction of breeding and feeding grounds of the fishes, emergence of river-valley projects, rapid urbanization, fishing pressure and of course illegal and destructive means of fishing *etc.*

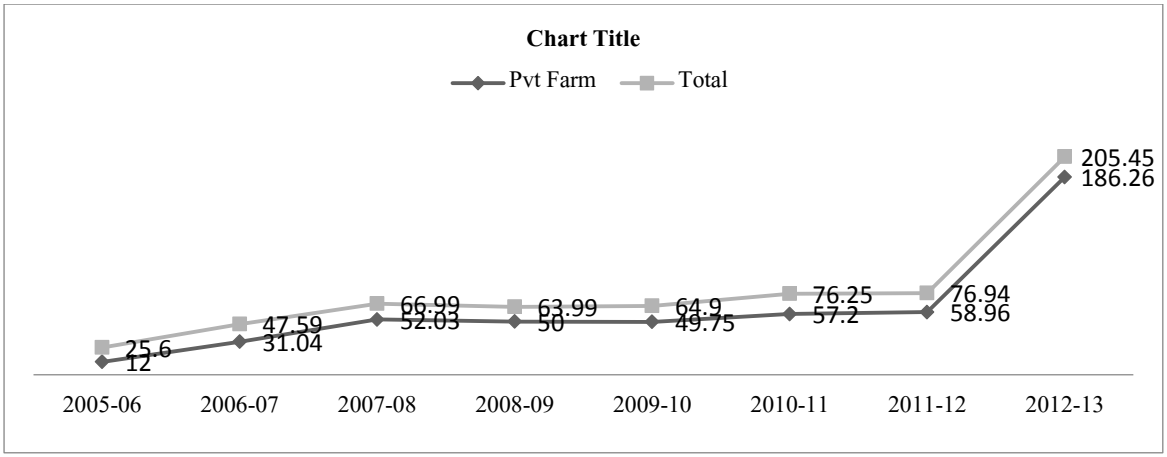

Figure 2. Trout production in private farm in Himachal Pradesh from 2005-2013
https://www.nabard.org/demo/auth/writereaddata/ModelBankProject/1612162213Trout_farming_-E.pdf

Trout and ecotourism-

Himachal Pradesh's massive variety and quality of angling have given the state an enviable reputation. The angler from different parts of the country as well as abroad visit in the trout zones of the state. The license fee for the trout fish water area is Rs. 100/ per day and Rs. 8000/ per annum charged by the department. Different stretch of trout in himachal Pradesh are, 1. River Pabbar from village Mahia to village Hatkoti in Shimla district. 2. River Beas and its tributaries from its source to its confluence with Sarvari stream in Kullu district including Sarvari stream. 3. Sainj and its tributaries in Kullu district. 4. Kurpan stream and its tributaries in Satluj river system in Kullu district. 5. Parvati River, Gadsa streams and their tributaries in Kullu district. 6. Tirthan streams and its tributaries above the area of its confluence with river Beas in Kullu district. 7. Uhl River and its tributaries in Mandi and Kangra district including balancing reservoir and feeder channels at Barot. 8. Baspa River, Bhawa streams and Chisso stream in Satluj river system in Kinnuar district. 9. Bhandal Nallah and its tributaries up streams Chakoli bridge in Chamba district. 10. Neugal stream and its tributaries up streams Mainjha Bridge and 10km stretch of Baner khad up stream suspension bridge at Tikker Doli in Kangra district. Fishing in these streams is regularized under the state fisheries Act. In trout water licences only for rod and line are permitted. Fishing is banned in trout water of Himachal Pradesh from 1st November to the last day of February each year to facilitate the fish to spawn and propagate.

Strategies and considerations required for further development-

Success of trout breeding, rearing and production show gradual development in the state but trout farming is still confronted with various challenges. This venture has not developed fast enough due to various constraints, which includes difficulties in constructing circular ponds, fingerlings production, and evolvement of artificial feed, water supply system, marketing and lack of market access.

1. **Lack of proper water recourses**- Trout farmers in the state depended upon water from small streams from the surrounding hills or traditional irrigation streams (Kuhls).
2. **Trout Seed**-The farmer depended up fingerlings and fish feed from the government hatcheries and fish farms.
3. **Feed**- Trout feed in the state is a major constraint as only feed mills at the government owned Patlikuhl fish farm in Kullu had an annual production of 64.3 tons in 2006-07, which was not enough to meet the demand of farmers from the state. Feed is costly and not available at desired places. So more feed mills are required in the state to full-fill the demand.
4. **Lack of proper market**-The study carried out by Agro-Economic Research Centre (AERC) Shimla on fish farms in Kullu, Mandi, Shimla and Kinnaur districts revealed that there is need to strengthen the market channels due to lack of proper market in the region, transportation and market intelligence were some of the problems faced by the farmers
5. **High cost for construction of raceways**: Due to geographical conditions usually the farms are away from the house of farmer. Cost for construction of raceway is high and about 65 % of farmers had constructed raceway with their own resources.

Conclusion

Hill state is blessed with huge water resources. Utilization of available water resources for trout production is an obvious possibility for both increasing employment and opportunities and generating income provide livelihood and food security to hill people. Adoption of aquaculture will therefore open up new avenues for employment in rural areas by increasing self-employment opportunity, employment opportunity to work in aquaculture farms that use hired labour and also help in meeting the nutritional needs of the people. The development of aquaculture subsector will increase full use of the resources, create employment for the youth and women and also increase rural incomes. The level of adoption of this technology remains relatively low so for wider adoption of trout farming in the state further investment and extension activities like training to trout grower is imperative. Further strengthening of market channels will be helpful in management and expansion of trout farming in Himachal Pradesh. GIS mapping for trout resourse in the state can be used for sustainable utilization and management. Genetic management of existing stock of trout can be done.

References

Annual Reports published by the Department of Fisheries Himachal Pradesh State.

Canyurt MA, and S Akhan (2009). development and situation of trout culture in Turkey. Agricultural Sciences (Crop Sciences, Animal Sciences). 90-94

Dhanze JR, and R Dhanze (2002). Potential and constraints of rainbow trout *Salmo gairdnerii* (Richardson) farming in Himachal Pradesh. Coldwater Fish Genetic

https://doi.org/10.1111/j.1753-5131.2010.01039.x

https://www.nabard.org/demo/auth/writereaddata/.../1612162213Trout_farming_-E.p.

Jhingran VG, and KL Sehgal (1978) Coldwater fisheries of India, Inland Fisheries Society of India, Barrackpore, 238p

Mitchell FJ (1918) - How trout were introduced in Kashmir. *Bombay Natural History Society*. 26(1): 176-79 and 295-99

Pandey NN, and S Ali (2015) Rainbow trout farming in India: R & D Perspectives, Bulletin No. 23, DCFR, 28p Resources and their conservation. Natcon. Pub. **7**: 65-74.

Sehgal K.L, (1999b), Coldwater fish and fisheries in the Indian Himalayas: rivers and streams, In: Petr, T. (Ed.), Fish and fisheries at higher altitudes: Asia, *FAO Fisheries Technical Paper* No. 385, FAO, Italy, Rome, pp. 41-63

Sehgal KL, (1974). Trout culture in India, Its present status and future scope. *Journal of the Inland Fisheries Society of India,* 6: 185-193.

Sehgal (1999) Sehgal, K. L. Coldwater fish and fisheries in the Indian Himalayas: Rivers and streams. In: Fish and Fisheries at Higher Altitudes*: Asia*. FAO Fisheries Technical Paper. No. 385. Rome:

Sehgal KL, (1999). Coldwater fish and fisheries in the Western Ghats, India. In: Fish and Fisheries at Higher Altitudes: Asia. FAO Fisheries Technical Paper. No. 385. Rome: FAO.

Singh AK, and WS Lakra (2011). Risk and benefit assessment of alien fish species of the aquaculture and aquarium trade into India. *Reviews in Aquaculture,* 3: 3-18

Singh AK, Pandey NN, and S Ali (2017), Current status and strategies of rainbow trout *Oncorhynchus mykiss* farming in India, *International Journal of Aquaculture,* 7(4): 23-30 (doi: 10.5376/ ija.2017.07. 0004)