

7.15 Freshwater fish seed resources in Pakistan

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ABSTRACT

Pakistan is a diversified land mass, possessing vast plains in the Indus Basin, plateaus in the southwestern part and a series of high mountains in the north. The country covers an area of 796 096 km² with different types of climate and seasons in its four provinces (North West Frontier Province, Punjab, Baluchistan and Sindh). The natural water bodies of the country include the rivers Indus, Ravi, Sutlej, Jhelum and Chenab and some small rivers, streams and their tributaries. The water resources also comprise a network of canals, lakes, reservoirs, water-logged areas, saline waters, small dams, village ponds, etc.

These natural water bodies possess 184 species of freshwater fish belonging to warm, semi-cold and coldwater species. Fish seed is an essential requirement for the development of fisheries and aquaculture. Before 1970, the main source of fish seed was natural water. From 1974 onwards, fish seed are being obtained through successful induced spawning techniques. The fish seed production industry varies from province to province and Punjab Province contributed a significant proportion. There is no certification system. There is a wide gap between supply and demand of fish seed in other provinces except in the Punjab Province. There is no special fish seed market. Punjab Province is the largest producer, supplying to other provinces millions of seed of major carp, i.e. rohu (*Labeo rohita*), mori (*Cirrhinus mrigala*), thaila (*Catla catla*) and the Chinese carps such as silver carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenopharyngodon idella*). In addition, carp hatcheries also produce fish seed of carnivorous fish species like saul (*Channa marulius*), singhari (*Arichthys aor*) and mahseer (*Tor macrolepis*).

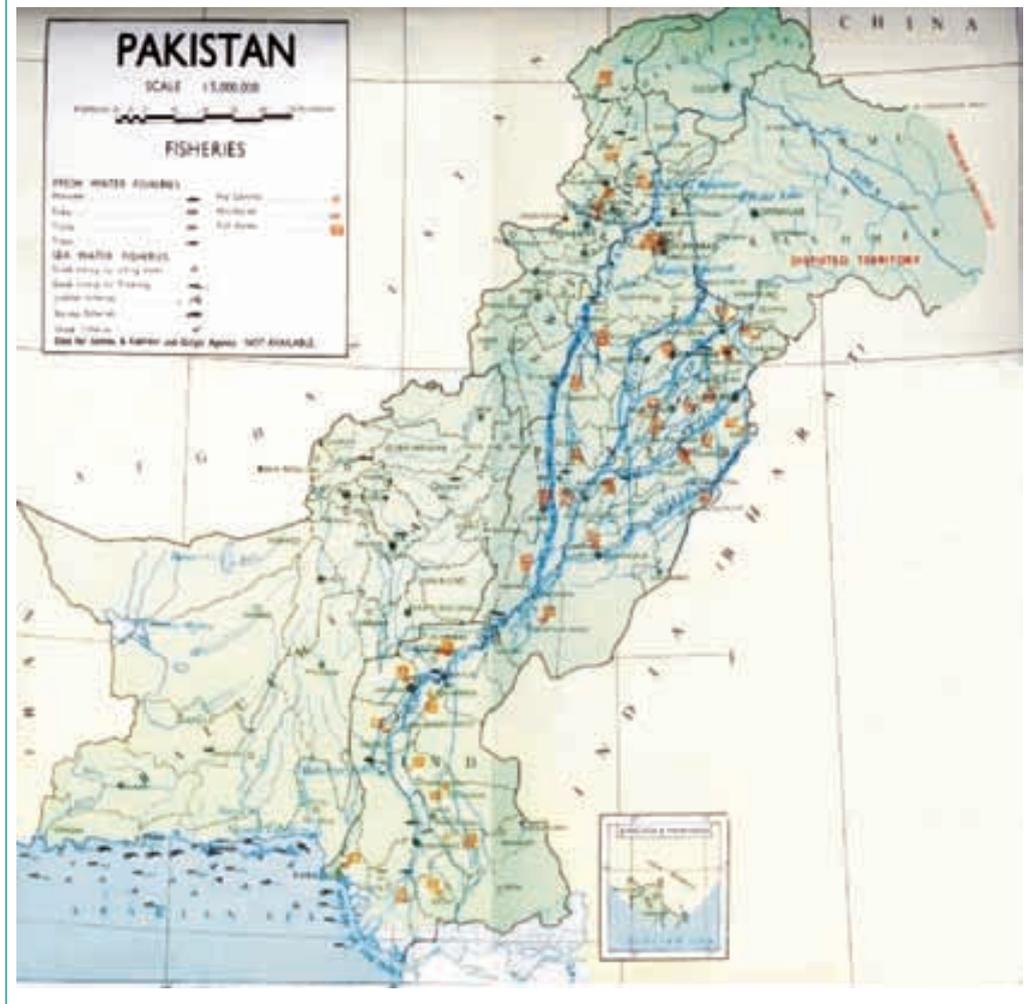
INTRODUCTION

Pakistan is surrounded by Afghanistan, China, Iran, India and in its south is located the Arabian Sea (Figure 7.15.1). The climate of Pakistan has the following five different types: (i) tropical semi-arid, (ii) tropical arid, (iii) cold semi-arid, (iv) snow forest climate and (v) extremely cold.

The country has four well-marked seasons, namely: (i) cold season (December to March), (ii) hot season (April to June), (iii) monsoon season (July to September) and (iv) post-monsoon season (October and November) (Survey of Pakistan, 1997).

Fish consumption in Pakistan is very low, i.e. 2 kg/capita/annum when compared to the world average of 11 kg/capita/annum (FAO, 2003). Fish is, however, the best

FIGURE 7.15.1
Map of Pakistan showing its neighbouring countries



alternate source to meet animal protein deficiency, since the livestock and dairy sub-sectors are not producing sufficient levels of the protein requirement. The nutritional value of fish is very high (protein content of 15 to 20 percent), it has low cholesterol content and many useful dietary supplements (NCA, 1988).

In Pakistan, fish has been depicted in objects excavated from Nal in Baluchistan, Mohanjodaro in Sindh and Harapa in Punjab. However, the history of the development efforts for fisheries along the scientific lines in the country is not very old (Ayub, 1985).

There are two major resources of fish in the country, i.e. marine and inland resources or freshwater fisheries resources.

TABLE 7.15.1
Data showing the importance of the Pakistan fisheries sector

Standard Protein Requirement	30 g/capita/day
Availability	17 g/capita/day
Fish Contribution	5 % of availability
Present Gap	13 g/capita/day
Growth Rate	
Fishery	4 % per annum
Population (Human)	2.10 % per annum
Net increase (Fish)	1.9 % per annum

The main natural water body of Pakistan is the River Indus and its tributaries. After originating from Tibet, the River Indus flows behind the Himalayan Mountains and after crossing the Northern Areas (NA) and Kashmir, it turns southwest. In the North West Frontier Province (NWFP), it receives small rivers (e.g. Kabul, Kuram and

Gomal). In Punjab, it receives the Haro, the Soan, the Jhelum, the Chenab, the Ravi and Sutlej. In the province of Sindh, near Karachi, the River Indus falls into the Arabian Sea. In Baluchistan, there are many small rivers and streams such as Lora-Pishin, the Mashkel, the Hub, the Purali, the Hingol and the Dasht.

Collectively, the freshwater resources of the country include Indus River basin, rivers, canals, man-made reservoirs attached to barrages, water-logged areas, natural lakes, saline waters, two large man-made lakes (Mangla and Tarbella) and more than 40 small dams, village ponds, etc. In total, the inland water bodies cover an area of more than 8 million ha.

There are about 184 species of freshwater fishes inhabiting the warmwater, semi-cold water and coldwater bodies lying in the four provinces of the country. Among the said fish fauna, *Labeo rohita*, *Cirrhinus mrigala* and *Catla catla* are being cultured successfully along with Chinese carps (*Ctenopharyngodon idella* and *Hypophthalmichthys molitrix*). In suitable areas in the province of NWFP and in NA of the province of Punjab, rainbow and brown trouts are also being cultured successfully. Mahseer (*Tor putitora*) is another important fish found in semi-cold sub-mountainous areas of the country. An anadromous fish, *Tenualosa ilisha*, is also found in the River Indus.

Keeping in mind the importance of the fisheries sector in Pakistan, the work of developing potential water resources for aquatic food production has seriously been undertaken during the last three decades. As a result, an area of 40 000 has been dedicated to fish culture with an annual growth of 8 to 10 percent during the last decade. Presently, the contribution of fisheries to the country's economy is presented in Table 7.15.2.

Availability of quality fish seed is a key concern for the proper development of fisheries and aquaculture in the country. The main sources of fish seed for stock enhancement comprise of fish hatcheries, nurseries, wild spawning grounds, etc.

FIELD SURVEY

To collect information required for the country case study, various fish hatcheries in the provinces throughout the country were visited in addition to personal interviews and communication via telephone. In the province of Sindh, the following persons were contacted: (1) Mr Ghulam Muhammad Mehar, Director Fisheries, (2) Mr Khawar Pervez Awan, Deputy Director Fisheries, (3) Mr Habib ur Rehman, Assistant Director Fisheries. In the Province of NWFP, the following persons were engaged: (1) Mr Omar Hayat Khan, Director Fisheries, (2) Mr Muhammad Ayub, Deputy Director Fisheries and (3) Mr Shaukat Ali, Assistant Director Fisheries, Madyan; while in the province of Baluchistan, the following persons provided information: (1) Mr Sher Khan, Director Fisheries, (2) Mr Noor Khan, Deputy Director Fisheries and (3) Mr Abdul Malik, Assistant Director Fisheries.

SEED RESOURCES SUPPLY

Before 1970, the main sources of fish seed were the natural water sources. From 1974 onwards, successful experiments on induced spawning gave an impetus to promote fish culture. As such, both warmwater and coldwater aquaculture have been developed through the establishment of fish hatcheries and nurseries in the country as shown in Table 7.15.3.

TABLE 7.15.2

Contribution of fisheries to Pakistan's economy

Share in GDP	1 %
Share in Agriculture	3.5 %
Fish Production (tonnes)	
Marine	400 700
Inland	163 400
Employment Opportunities	365 000
Fisheries Products exported	84 000 tonnes
Foreign exchange contribution	US\$ 156 254 000

Source: Anonymous (2003); Economic Survey of Pakistan (2002-2003)

TABLE 7.15.3
Number and distribution of freshwater fish hatcheries in Pakistan

Type of hatchery	Provinces				AJK and others
	Punjab	Sindh	NWFP	Baluchistan	
Government hatcheries	14	5	6	1	2
Private hatcheries	76	31	10	-	-
Trout hatcheries	1	-	8	1	7

SEED PRODUCTION FACILITIES AND SEED TECHNOLOGY

The main seed production resources in the country are fish hatcheries operated by both government and private sectors (Table 7.15.4). Fish hatcheries can further be categorized on the basis of the types of cultured fish, i.e. carp hatcheries, trout hatcheries, mahseer hatcheries, etc.

Presently, there are 28 carp hatcheries in the government sector whereas 117 hatcheries exist in the private sector (Table 7.15.5). With regard to cold water fish culture, there are 17 trout hatcheries. One mahseer hatchery exists in the semi-cold

PLATE 7.15.1 Freshwater fish species used for seed production in Pakistan			
No.	LOCAL NAME	SCIENTIFIC NAME	
1.	brown trout	<i>Salmo trutta/fario</i>	
2.	rainbow trout	<i>Salmo gairdneri</i>	
3.	rohu	<i>Labeo rohita</i>	
4.	mori	<i>Cirrhina mrigala</i>	
5.	thaila	<i>Catla catla</i>	
6.	mahseer	<i>Tor putitora</i>	
7.	silver carp	<i>Hypophthalmichthys molitrix</i>	
8.	grass carp	<i>Ctenopharyngodon idella</i>	
9.	common carp	<i>Cyprinus carpio</i>	
10.	bighead carp	<i>Aristichthys nobilis</i>	

water area of Malakand in NWFP, another full-fledged Mahseer fish hatchery is being established under a development project in District Attock in the province of Punjab.

Province-wise list of fish hatcheries in the government sector using carp, trout and mahseer fishes is attached as Annex 7.15.1.

Available Technologies

The breeding of various culturable species is undertaken through a series of scientific operations from broodstock management to induced spawning activities using synthetic hormones (LH-RH Analogue) and other relevant chemicals up to hatching using the Chinese system, glass jar and incubation troughs techniques.

In most cases, the dry method is used for fertilization of eggs. Rearing, up to stockable size of fish seed, is undertaken through proper natural and artificial feeding using formulated diets in well-fertilized tanks/ponds with suitable water quality.

Breeding. Breeding commonly takes place by injecting the hormone Ovaprim to mature female and male fish keeping in view the climatic conditions, temperature and maturity of the broodfish. The spawning period of carps extend from April to late July. It cannot breed except through induced spawning. Pairing occurs during the period of spawning. There is external fertilization and no parental care. The temperature range required for reproduction is between 20 °C to 27 °C. The latest applicable techniques used in Pakistan for hatchling are: (i) glass jars, (ii) circular cemented tanks and (iii) rectangular cemented tanks.

Fertilization. The objective of fertilization and manuring is to produce an abundant supply of zooplankton, a cladoceran, a copepod, a rotifer or a protozoan regardless of size. Organic manure such as cattle or chicken manure alone and/or with inorganic fertilizer such as NPK mixture are used. If both organic and inorganic fertilizers are used, they may be applied either one following the other or as a mixture.

Nursing. To avoid any abrupt change in quality and temperature between water of the hatchling tank and that of nursery pond, the post-larvae are kept in a suitable container having water initially from the hatchery tank and to which water from the nursery pond is gradually added in stages eventually substituting almost the entire hatchery water. The container is then slowly dipped and tilted in the nursery ponds so that the post-larvae are free to swim out of the container into the nursery pond. Soon after being stocked in nursery ponds containing rich zooplankton, carp post-larvae start grazing voraciously on natural food. At this time feed requirements of spawn are so large that within two or three days of stocking, the plankton initially present in the pond gets exhausted and steps are taken not only to generate more natural food but also to administer artificial feeds. Artificial feeds are always given to carp post-larvae in finely powdered form. The fry taken from nursery ponds are transferred to rearing ponds which are prepared in the same manner as the nursery

TABLE 7.15.4
Fish seed production capacity in the four provinces of Pakistan

Province		Production capacity
Punjab	Government hatcheries	52 000 000
	Private hatcheries	22 500 000
Sindh	Government hatcheries	18 500 000
	Private hatcheries	-
NWFP	Government hatcheries	11 750 000
	Private hatcheries	-
Baluchistan	Government hatcheries	0.080
	Private hatcheries	-

TABLE 7.15.5
Information on fish hatcheries in Pakistan

Number of Carp Hatcheries (Government) including AJK and others	28
Number of private hatcheries	117
Trout hatcheries (government)	10
Trout Hatcheries (private)	7

PLATE 7.15.2
Hatchery facilities in Pakistan



Fish seed hatchery in Lahore, Punjab



Raceways at trout hatchery in Muree, Pakistan



Chinese system of breeding fish



Trays and tanks used for fish breeding at a trout hatchery in Madyan, NWFP



Breeding troughs for mahseer



Circular breeding tanks at a carp fish hatchery in Charbanda, Mardan District

PLATE 7.15.3
Breeding process



Stripping process in fish breeding



Mixing of milt and spawn in fish breeding operation

ponds. Ongoing activities in the rearing ponds include: (i) elimination of predatory and weed fish, (ii) manuring with organic and inorganic fertilizers, (iii) weed control and (iv) supplementary feeding.

SEED MANAGEMENT

In fish hatchery operations, management of broodstock is a key concern for the success of induced spawning of major carps and Chinese carps as proper development of gonads, rate of ovulation, fertilization, etc. are all dependent on proper broodstock management. This involves preparation of suitable sizes of broodfish ponds as per size and type of fish, maintaining optimum physico-chemical conditions of pond water and proper feeding of stocks with regular monitoring of general and gonadal development of brood fish.

In carp hatcheries, fish seed management involves two distinct phases, namely: (i) rearing of post-larvae to the fry stage which mostly takes place in nursery ponds and (ii) rearing of fry to fingerling stage which takes place in rearing ponds.

Under both conditions, preparation and maintenance of nursery, rearing and stocking ponds are very important functions which actually ensure the removal of the causes of poor survival, growth and health of the fish seed stocks.

As a whole, management of fish seed covers the following main considerations:

- physico-chemical compatibility of water in ponds;
- adequate quantity of fish food in nursery and rearing ponds;
- eradication of predatory aquatic insects;
- monitoring of pond conditions like excessive vegetation, seepage, etc.;
- elimination of factors causing toxicity of certain algal blooms;
- protection from parasitic, bacterial and fungal infections causing different diseases; and
- maintenance of wholesome fish husbandry conditions to avoid any abnormality or ill-health problems in seed stocks.

Feed management is another important concern in fish hatchery operations and plays a key role in good survival and maximum growth of fish fry. Fish seed are reared in tanks/ponds where food can be provided in adequate quantities (both living and non-living food items). Starter feeds used for fry are dense cultures of rotifers. Micro-encapsulated egg diet and powdered formulated feeds are also used for proper rearing of fish fry. For maximum uptake by the fish, the ration is supplied three to five times a day in parts.

SEED QUALITY

The most important objective of the fish hatcheries and seed production units in the country is to raise healthy and disease-free stocks of different species of culturable fish in hygienic and conducive conditions.

In this regard, the parental stocks or brood fish are meticulously selected based on proper weight, proper maturity, good health and feeding with particular brood fish diet.

Hatchery managers monitor the growth, survival and health conditions of the seed stocks during various stages of rearing, observing the weight/length ratios and general status of health.

Good husbandry, proper nutrition and compatible physico-chemical conditions of water are very important to avoid any health problem or occurrence of disease in fish seed. As such, strict hygienic measures are observed in seed production facilities.

Potassium permanganate (10 mg/l solution) and formalin (200-250 mg/l) are commonly used to clean and disinfect hatchery tanks, nets and other equipments used in seed production.

Prophylactic measures and treatment of fish diseases are also done depending on the situation and conditions of seed stocks. Dip, bath and flush treatments using suitable chemicals are commonly practiced in fish hatcheries.

To judge the quality of fish seed, proper monitoring is done by assessing the growth rate, survival and general health conditions of the stock. Another common practice of good hatchery managers is the proper segregation of different species since mixing of similar species causes problems to the farmers who have to stock their polyculture ponds in accordance with a specified species ratio.

SEED MARKETING

There are no special markets organized for fish seed sale in the country. Fish seed in hatcheries and other production units are either supplied directly to the farmers at the production points or transported to the farms. In case of transportation by road or by air, proper packing of seed in polyethylene bags with sufficient amount of oxygen is the normal practice.

The prices of seed are fixed as per species of fish and sizes of seed. The availability of seed of various species of fish and other relevant information are advertised through print media to promote sales. Almost all seed production points are easily accessible and transportation is always available.

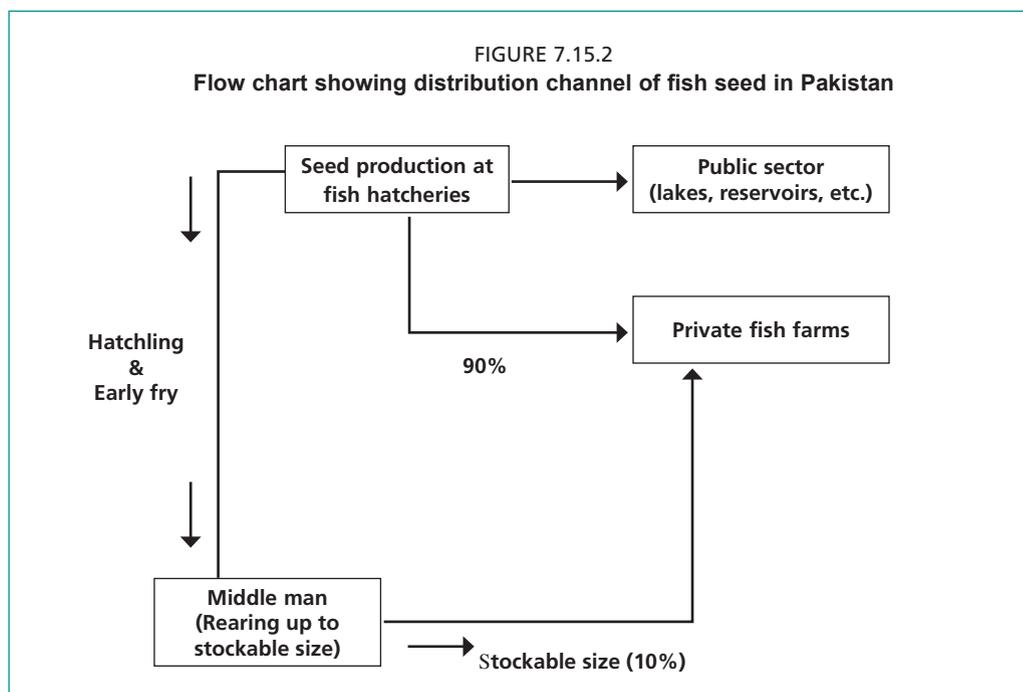
The province of Punjab is the biggest producer of fish seed. From this province alone, millions of fish seed of major carps and Chinese carps are sold to other provinces. The largest buyer is the Sindh Province followed by NWFP and Baluchistan. Fish seed sold to other provinces come from both private sector and public sector hatcheries.

As a whole the marketing system of fish seed is rather simple mostly involving producers and buyers, as shown in the figure below.

Some of the private fish farms possess seed production facilities as well which fulfill the seed requirements of those farms and in some cases the extra seed are sold to other private fish farms.

Post-larval marketing

In some cases, the post-larval stage of fish seed are purchased at low prices from hatcheries by the nursery owners who also rear them up to fingerling size. This stockable size of seed are then marketed to fish farmers for profit. The seasons of fish seed sale relate to the production period of different species of fish, mostly peaking in May for exotic fish and from September onward for major carps.



SEED INDUSTRY

The level of fish seed industry varies from province to province. Seed production in the Punjab Province dominates the industry and can be categorized as a medium-sized industry. The provinces of Sindh, Baluchistan and NWFP have no significant contribution to seed production activities.

The seed production business is affected by a number of risks like climatical hazards, power failure and outbreak of some diseases which can cause economic losses.

SUPPORT SERVICES

Technical advisory services with regard to various fish culture operations are being provided by the government sector. These include preparation of feasibility reports, ponds design and construction, financial and economic analysis, farm management, fish stocking, culture ratios, feed, fish health, disease prevention and control, etc.

Communication through radio and television are arranged alongside with distribution of pamphlets and brochures on various aspects of fisheries and aquaculture as a way of raising awareness about the sector and informing other relevant sectors. Information about availability of fish seed and its sale are advertised through print media.

Training workshops at district level are also organized with special emphasis on extension of relevant services.

The annual fish farmer conventions, workshops, seminars and such other fora help farmers to present their problems and discuss ways of finding solutions to the specific technical and management problems experienced by their respective farms to enhance fish production.

SEED CERTIFICATION

At present, there is no system for certification of seed of any species of fish in the country.

POLICY FRAMEWORK

The draft Pakistan Fisheries and Aquaculture Policy Framework consists of a strategy to increase national fish supply based on sustainable production and improved marketing of aquaculture products.

One of the strategy axis for strengthening aquaculture production is to produce maximum fish seed and attract the private sector in seed/fingerling production of commercially important freshwater species of fish through appropriate investment incentives.

ECONOMICS

Since the fish farming sector is growing rapidly at about 8-10 percent, the demand for fish seed as a major input in the production system is also increasing rapidly.

Presently, there is a wide gap between supply and demand of fish seed particularly in Sindh, NWFP and Baluchistan provinces. In Punjab, even as government hatcheries are contributing significant quantities of fish seed for stocking from both public and private sectors, there is still a gap in supply and demand. Consequently, the prices of fish seed are reasonable and opportunity for some profit margin in the seed production industry are also there. The cost of fish seed for stocking by farmers is minimal. The prices of fish seed supplied for stocking in the Province of Punjab are given in Annex 7.15.2.

Seed production at public fish hatcheries involves expenditures on staff and other operational costs to produce and supply seed to private and public sectors. As per average unit price, seed supplied as such, give a net profit ranging from 20 percent to 30 percent and sometimes higher under much better conditions.

A summary of data regarding fish seed production economics at the Fish Hatchery Chhenawan, District Gujranwala, province of Punjab, for 2004-2005 is given below:

Expenditure 2004-2005		Fish Seed Supply		Price/Income from fish seed production (in millions)	
Staff:	Rs. 3.246	Private sector:	1.260	Rs. 0.725	
Others:	<u>Rs. 0.733</u>	Public sector:	<u>3.670</u>	<u>Rs. 5.872</u>	
Total: production cost	<u>Rs. 3.979</u>	Total:	<u>4.930</u>	<u>Rs. 6.597</u>	
Unit production cost:	$\frac{3.979}{4.930}$	= Rs. 0.807	Unit Price:	$\frac{6.597}{4.930}$	= Rs. 1.338

Unit Benefit : (Unit Price –Unit Cost) = Rs.0.531

Percentage benefit = 66 percent

Note: The price figures for 3.670 million fish seed stocked in public waters, have been obtained as per the average rate of Rs.1 600/1 000 fish seed

INFORMATION OR KNOWLEDGE GAPS

Fish seed production technologies, while well-developed in the province of Punjab, should be developed to the required level in other provinces. Training facilities on seed production and allied technical aspects are also not available for the private sector in the provinces of Sindh, NWFP and Baluchistan, unlike in Punjab where there is a Fisheries Research and Training Institute at Lahore which imparts such training to the private sector. This facility, nevertheless, needs further strengthening as per growing demands.

STAKEHOLDERS

At present, fish seed production activities in the country are generally carried out by large-size government hatcheries who are supplying quality fish seed to the private sector as well as for stock replenishment in natural water bodies. About 117 private hatcheries have very little production capacity. There is no proper marketing system regarding fish seed sale.

It is pertinent to mention here that there is so far neither any NGO nor producer association established in the seed production sector.

As far as research activities are concerned, at present, no significant research work is being carried out in the private sector. In the government sector, research activities regarding fish breeding, nutrition, soil and water chemistry, fish biology, fish pathology, management of natural resources and all relevant aspects of fisheries and aquaculture are being carried out.

FUTURE PROSPECTS AND RECOMMENDATIONS

Keeping in mind the importance of fish and recognizing that increasing demand for fish seed is a vital input for aquaculture, it is evident that the future prospects for the seed production sector in the country are bright.

The technical advancement and growing needs for quality fish seed to enhance fish production calls for development of fisheries resources to a level which can meet up the said requirements.

To come up to the required level of seed production, the following issues need to be addressed:

- introduction of new species having the qualities of fast growth, market value, taste, etc.;
- introduction of intensive breeding system of fish in the country;
- introduction of carnivorous fish species for aquaculture in Pakistan;
- enhancement of seed production area;
- development of suitable starter's diets as per species of cultured fish;
- research work on controlled production of live food for fish fry;
- development of suitable strains of cultured fish with characteristics such as fast growth and resistance to unfavourable environmental conditions; and
- studies on production of seed beyond routine breeding seasons of fish.

In this regard, establishment of two hatcheries, i.e. one for carnivorous fish and another hatchery for mahseer is in progress in the province of Punjab. Similarly, two pilot-level intensive seed rearing units are under construction.

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ANNEX 7.15.1 Province-wise list of fish hatcheries in the government sector of Pakistan

1. PUNJAB PROVINCE

Trout Hatchery

S. No.	Name of Hatchery	District
1.	Trout Fish Hatchery Murree	Rawalpindi

Pilot Mahseer Projects

S. No.	Name of Hatchery	District
1.	Hattian	Attock
2.	Kotli Arian	Sialkot

Mahseer Hatchery

S.No.	Name of Hatchery	District
1.	Mahseer Fish Hatchery Attock	Attock

Carp Hatcheries

S.No.	Name of Hatchery	District
1.	Central Fish Seed Hatchery	Lahore
2.	Fish Seed Hatchery Chhenawan	Gujranwala
3.	Fish Seed Hatchery Rawal Town Islamabad	Rawalpindi
4.	Fish Seed Hatchery Faisalabad	Faisalabad
5.	Fish Seed Hatchery Mianchannu	Khanewal
6.	Fish Seed Hatchery, Bahawalpur	Bahawalpur
7.	Fish Nursing Unit, Kotli Arian	Sialkot
8.	Fish Nursing Unit, Farooqabad	Sheikhupura
9.	Fish Nursing Unit, Shahpur	Sargodha
10.	Fish Nursing Unit, Fateh Jang	Attock
11.	Fish Nursing Unit, Pir Mahal	T.T. Singh
12.	Fish Nursing Unit, Hasilpur	Bahawalpur
13.	Fish Nursing Unit, Rakh Khanpur	Muzaffargarh
14.	Fish Nursing Unit, Pirowal	Khanewal

2. NWFP

Trout Hatcheries

S. No.	Name of Hatchery	District
1.	Shinu	Mansehra
2.	Madyan	Swat
3.	Alpuri	Swat
4.	Dubair	Kohistan
5.	Kalkot	Dir
6.	Jaghoor	Chitral
7.	Bombret	Chitral
8.	Allai	Batgram

Carp Hatcheries

S. No.	Name of Hatchery	District
1.	Ichrian	Mansehra
2.	Charbanda	Mardan
3.	Tanda	Kohat
4.	Ratta Kulachi	D.I. Khan
5.	Sher Abad	Peshawar
6.	Badakhel	Bannu

Mahseer Hatchery

S. No.	Name of Hatchery	District
1.	Mahseer Hatchery	Malakand Agency

3. SINDH PROVINCE**Carp Hatcheries**

S. No.	Name of Hatchery	District
1.	Chilia	Thatta
2.	Mando Dero	Sukhar
3.	Boobak	Jam Shoro
4.	Badin	Badin
5.	Dhokari	Larkana

4. BALUCHISTAN PROVINCE**Trout Hatchery**

S. No.	Name of Hatchery	District
1.	Quetta	Quetta

Carp Hatchery

S.No.	Name of Hatchery	District
1.	Dera Murad Jamali	Dera Murad Jamali

ANNEX 7.15.2

Prices of fish seed of various fish species in Punjab for 2005-2006

I. Major Carp/Chinese Carps

S. No.	Size	Prices (in Rs.)
1.	post-larvae	50/1 000
2.	up to 4 cm	500/1 000
3.	above 4 cm upto 6 cm	800/1 000
4.	above 6 cm upto 10 cm	1,600/1 000
5.	above 10 cm upto 15 cm	3,000/1 000
6.	above 15 cm	75/kg

II. Sol/Singhari and Mahaseer Rs. 5/piece up to 10 cm

III. Trout Rs. 5/piece up to 5 cm

Rs. 10/piece > 5 cm

(Conversion rates used: Rs. 60 approx. = 1 US\$)