

Naihati fish seed market as state-of-the-art for sustainable support services to fish growers, buyers and traders

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Naihati fish seed market of West Bengal was established in 1976 and is the largest seed market (and probably the only established and organised fish seed market) in India. With the advent of induced breeding technology and hatcheries, fish seed is now available almost year-round, catering to the need of Indian farmers. Known as a leading fish seed growing state, West Bengal produces seed through a network of established hatcheries and other small producers. Fish seed production starts in early March and continues through to early October every year. Although fish seed are produced in different parts of south Bengal, Naihati is their destination for sale. Situated in North 24 Parganas, Naihati wholesale fish seed market is a well-known establishment that provides multifaceted services to stakeholders including fish seed growers, retailers, sellers, and mediators. Over the course of its journey, the market has prioritised customer satisfaction by means of prompt sale-service, availability of a wide variety of fish seed in large quantity, quality products and reliability pertaining to customers' feedback. Established with a strong foothold as a 'fish seed market' to attract both buyers and sellers, it has prospered.

Naihati fish seed market is open from midnight until 6am, with fresh stock arriving from suppliers around open and being transported out towards close as buyers leave with their orders.

Status of fish seed sales

Fish species and size of graded seed

Fish seed available in the market are referred to mainly based on size (Jhingran 1986) such as spawn (up to 8mm), fry (Early fry >8-25mm; Fry >25-40mm) and fingerlings (fingerlings >40 -100mm; advanced fingerlings >100-150mm). A total of 27 fish species (Table 1) are sold in the market (Fig. 2). Of these, the Indian major carp (rohu, catla and mrigal) seeds fetch the highest price, with rohu seeds having the greatest demand and mrigal seeds somewhat less so. Across all species, around 80% of seed are spawn size, while the other 20% are fry and fingerlings. Fry is the most highly sought after size by customers, but its availability is lower compared to spawn because an additional 15-20 days of rearing time is required to produce it. Rearing of fry from spawn is a laborious task that requires careful management and poses an additional risk, as only 30-40% of spawn survive to be fry. The size and quantity of seed varies according to the time of year in which they are harvested, seasonal factors, the physical nature and scale of growing in the rearing areas such as pond food resources, water availability and soil type.



Figure 1: Midnight view of Naihati fish seed market.

Demand for fish seed in different states of India: A glimpse

Fish seed is supplied to different states of India (Fig. 3). The major receiving states include Andhra Pradesh, Uttar Pradesh, Bihar, and Assam; the medium receiving states are Punjab, Rajasthan, Haryana, Chhattisgarh, Maharashtra, Odisha, Madhya Pradesh and Telangana, and smaller receiving states are Karnataka, Himachal Pradesh and Uttarakhand apart from the North-eastern States of India such as Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh and Mizoram, which also receive a fair amount of seed. Fish seed is also transported to the Andaman and Nicobar Islands, and exported to Nepal and Bhutan.

Indian major carp seed have the highest demand. These species have the advantage that they can be reared in a closed enclosure like a cage placed into larger water bodies such as lakes, reservoirs, dams and rivers. With their suitability for cage culture, there is a huge scope to manage Indian major carp seed with different culture practices and to harvest them as and when required. Pangas (*Pangasianodon hypophthalmus*) is the second most sought after species and is mainly supplied to Andhra Pradesh, which is the main Indian state for pangas grow-out culture.

Estimate of fish seed sales – an important trading scenario

A total of around 1.0-1.2 million seed (700-800 kg) is sold daily during the peak season from May to September, and 0.3-0.5 million seed (200-300 kg) are sold per day in the rest of the year. An average of 400 licensed members sell seed daily; each is allowed to sell four hundi (a container made of

Figure 2: Fish seed of different sizes and species



Labeo catla.



Heteropneustes fossilis.



Chitala chitala.



Labeo rohita.



Heteropneustes fossilis (advanced fry).



Piaractus brachypomus.



Labeo calbasu.



Mystus gulio.



Mylopharyngodon piceus.



Ompok bimaculatus (advanced fry).



Anabas testudineus.



Pangasianodon hypophthalmus.



Lates calcarifer.



Clarias magur.

aluminum) of seed at a time, and after selling this allowed to refill the hundis again. Two types of hundis containing seeds are found in the market, a 60 cm hundi with a capacity of 10-15 kg carp seed, and 65 cm hundi with capacity of 20-25 kg of pangas or pacu (*Piaractus brachypomus*) seed. The number of fish sellers increases from April onward. Of the total seeds sold, 50% are Indian major carps, 25% are pangas or pacu, and the remaining 25% includes all other fish species in totality.

The market is also an important source of other seed including monosex tilapia (*Oreochromis niloticus*), chitala (*Chitala chitala*), climbing perch (*Anabus testudineus*), singhi (*Heteropneustes fossilis*), desi magur (*Clarias magur*), amur carp (*Cyprinus carpio haematopterus*), black carp (*Mylopharyngodon piceus*), bighead carp (*Hypophthalmichthys nobilis*) and grass carp (*Ctenopharyngodon idella*). Seed of these species, which are sometimes difficult to obtain elsewhere, are assured to be available in Naihati market, which is one factor in the market's popularity (Fig. 4).

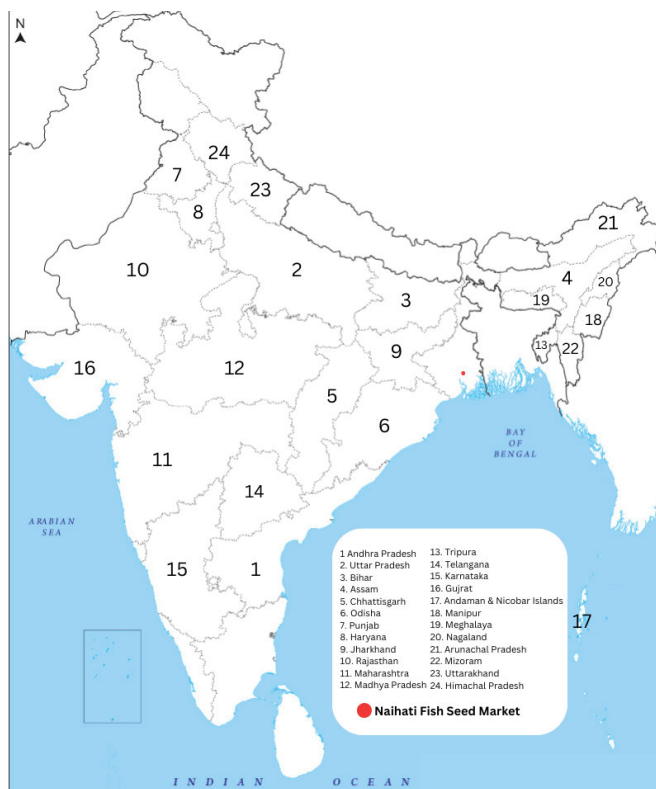
Procedure of fish seed sale

Only licensed members can sell seed in the market. Presently the market has 669 licensed members, but an average of 400 members are selling fish daily in the peak season. The market receives seed from around 1,000 producers from different areas within West Bengal. Usually, the business of the market comprises three groups: (i) wholesale fish producers known as golder, (ii) licensed members known as patil wallah, and (iii) middlemen/mediator known as dalal.

Wholesale fish seed producers with a hatchery set up produce a huge amount of spawn, often 1.0-1.5 million at a time, and sell to licensed members. There are number of seed producers, which may be large or small. All maintain a cordial relationship among themselves in the interest of business. When there is a shortage of available seed the required amount is collected from another producer. A good communication exists between seed producers and licensed members by middlemen who inform licensed members about which producers has how many available seeds and of what species. This allows buyers to get updated information. This procedure of selling seed involving producers, licensed members, middlemen and customers seems complex but makes it easy for all players to obtain the necessary information.

Middlemen who are involved in communication and connecting seed producers with licensed members/customers are paid commission in return for their efforts. The monetary benefit is not fixed and varies among individuals. Sometimes, the middleman earns a higher amount if the seed price increases. They used to collate information regarding the availability of different size grades of seed from different producers and the price of each grade. They also informed customers about which producer maintained the quality of seed in terms of the genetic purity and health. They try to convince licensed members/customers regarding the quality of products. The middlemen who negotiate the sale of fish seed to licensed members/buyers typically get one-third of the total price after seeds being sold. For instance, if seed is sold @ Rs.150/kg (1US\$ = Rs. 82.00), the owner will get Rs. 100 while a middleman gets Rs. 50, who is responsible for paying for transportation, water, and bears the loss of seed during transport.

Figure 3: Fish distributed to different states of India



Licensed members who are eligible to sell fish seeds in the market bring them in aluminum hundi. Customers who require a small amount can purchase the whole/part of the amount in the hundi, while those who require a large amount of seed may use it as a sample before purchase. When buyers are satisfied, they order the required quantity from the licensed members. In such cases, licensed members purchase the required quantity from a producer prior and hold them in hapa (nylon nets) fixed and set in small ponds nearby. The hapa in which seeds are held temporarily cost Rs. 500 per hapa/day. The longer the seed are held into hapa, the lesser is shelf life of the seed. Seed that have been kept in hapa longer are usually sold at a lower price than fresh ones. Licensed members maintain a distinct identity in selling fish seed: A persons who sell carp seed will not switch into selling other species; likewise sellers of catfish or exotic seed sellers and others bear their distinct identity.

Supply and trade of fish seed

A bidirectional trade

Two distinct directions of business exist. The market acts as a hub that attracts seed producers for sale of produce. The market also attracts buyers and traders that carry seed to the field or to other parts of India.

In the first case, around 60% of fish seed in the market are estimated to originate from Bardwan, Hooghly, Nadia and North 24-Parganas districts, 35% from other districts altogether, and the rest 3-5% seeds from Ramsagar, Bankura District. Fish seed from Ramsagar are sold outside Naihati market and transported to outside West Bengal via Naihati traders. Seed producers to not usually come to the market for

Table 1: Number of fish seed sold in Naihati market.

Scientific name	Local name	Status of seeds sale			Status
		Spawn	Fry	Fingerling	
<i>Anabas testudineus</i> *	Koi	-	++	++	Indigenous / exotic
<i>Barbonymus gonionotus</i>	Japani punti	+	+	+	Exotic
<i>Chitala chitala</i>	Chitala	-	+++	++	Indigenous
<i>Cirrhinus mrigala</i>	Mrigal	+	+++	+	Indigenous
<i>Clarias magur</i>	Magur	+	++	++	Indigenous
<i>Clarias gariepinus</i> **	African magur	-	-	+	Exotic
<i>Ctenopharyngodon idella</i>	Grass carp	-	+	+++	Exotic
<i>Cyprinus carpio</i>	Common carp	-	+++	++	Exotic
<i>Cyprinus carpio haematopterus</i>	Amur carp	-	+++	++	Exotic
<i>Heteropneustes fossilis</i>	Singi	+	++	-	Indigenous
<i>Hypophthalmichthys molitrix</i>	Silver carp	+	++	-	Exotic
<i>Hypophthalmichthys nobilis</i>	Bighead carp	+	++	-	Exotic
<i>Labeo calbasu</i>	Kalbose	+	++	++	Indigenous
<i>Labeo catla</i>	Catla	+++	+++	++	Indigenous
<i>Labeo rohita</i>	Rohu	+++	+++	++	Indigenous
<i>Labo bata</i>	Bata	+++	+++	++	Indigenous
<i>Lates calcarifer</i>	Bhetki	-	++	+++	Indigenous
<i>Macrobrachium rosenbergii</i>	Golda chingri	+	+	+	Indigenous
<i>Mylopharyngodon piceus</i>	Black carp	-	+	+	Exotic
<i>Mystus cavasius</i>	Gulsa tangra	+	++	+	Indigenous
<i>Mystus gulio</i>	Nona tengra	+++	++	+	Indigenous
<i>Ompok bimaculatus</i>	Pabda	+++	++	+++	Indigenous
<i>Oreochromis niloticus</i>	Monosex tilapia	+++	++	+++	Exotic
<i>Osteobrama belangeri</i>	Pangba	-	+	+	Indigenous
<i>Pangasianodon hypophthalmus</i>	Pangus	+++	++	+++	Indigenous
<i>Piaractus brachypomus</i>	Pacu	+++	++	+++	Exotic
<i>Systemus sarana</i>	Sar punti	+	+	+	Indigenous

Legend

- Seed unavailable.
- + Indicates relative availability of seeds.
- * Both Indian & Vietnamese (more common) strains available.
- ** indicates banned fish in India.

selling seed, while licensed members who transport and sell seed reach the market carrying hundi by foot or by a variety of conveyances such as train, bus, bicycle, rickshaw van, and paddle van as per individual circumstances and convenience. In the second case, Midnapore (both east and west) District receives 50% of the locally distributed seed supply, which is approximately 2.0 million seed/ seed/day. Of the rest, 15% reaches Murshidabad, 10% to North-24-Paraganas, 5% each goes to Maldah, Bardwan and Howrah, and 10% is distributed to northern parts of West Bengal comprising North and South Dinajpur, Jalpaiguri, Siliguri (sub-division of Darjeeling District), Cooch Bihar and Alipurduar districts.

Transport – an essential support system

Spawn and fry are convenient commodities for packaging and distant transport because they can maintain a good condition after 1-2 days of transport. Usually, each producer transports 500,000 (100 kg) of fry per 1,460 litre tank (2-4 tanks per truck). Some producers used to transport hundies (50-60 per truck) for spawn and 30 transports are used a day each of which carries between 20,000 and 50,000 spawn. Each licensed member (patil wallah) usually stocks an average of 12 kg of 0.2g fry per hundi for local transport. For short distances (4-6 hours journey) (Fig. 5), spawn are transported

on demand to those who rear seed in nursery ponds. Close districts such as Hoogly, Bardhaman, Howrah, North 24 Parganas, South 24 Parganas, Nadia, East Midnapore, West Midnapore and Bankura receive fry and fingerlings because transportation time is less than eight hours. Birbhum and Purulia districts (poor culture practices) usually get seed from Bardhaman and Bankura districts respectively. Fish seed that are contained in tanks are transported by truck for up to 1-2 days to north Bengal districts as the longest journeys within West Bengal. Fish seed stocked in containers for long range transport may be stocked at a lower density than the relatively high numbers stocked for short distances. About 40 ml of spawn are stocked for journeys lasting up to 24 hours, 30 ml for journeys up to 48 hours and 20 ml for journeys up to 60 hours to improve survival.

Distant transport - a journey outside West Bengal

Distant distribution refers to the transportation of fish seed to other states of India. The size of fish seeds transported is generally smaller, being spawn and fry ranging from 0.02g to 0.5g. Assam, a north-eastern state of India, receives seed early due to its earlier rainy season in comparison with other regions of India. Some 50-62 million fry kept in the tank are taken by truck every day (45 trucks/day) from mid-March

Figure 4: Market activities.



Sellers counting fish seed before sale.



Sample fish seed put into a dish to display for customer.



Customer observing condition of fish seed before sale.



Interaction between a seller and a buyer.



Sample fish seed put into a net to show customer.



Sorting of fish seed before sale.

Figure 5: Transport.



A motor van ready to transport fish seeds for customers.



A tempo car to transport fish seeds to customers' areas.

to mid-May, which accounts for approximately 37% of the distant distributed stock. By contrast, seed transported to Andhra Pradesh may involve six-wheeler trucks, which carry 580 kg seeds with 1,800 pieces/kg, and four-wheeler Bolero which carry 280 kg seeds with 2,500-3,000 piece/kg. Uttar Pradesh and Bihar receive the second largest quantities of stock (14% each). The other states receive less than 10% of the distributed stock and Rajasthan and Punjab being the lowest receiver. Punjab, Rajasthan and Haryana receive smaller average size of spawn than the spawn received by other States. For high altitude states as Himachal Pradesh and Uttarakhand, one six-wheeler truck carries 1,500 kg and 1,200 kg seed for 2 and 4 days transport respectively. They exchange water at 4 hour intervals. The seeds of catla (*Labeo catla*) and rohu (*Labeo rohita*), silver carp (*Hypophthalmichthys molitrix*), grass carp and bighead carp are transported either by air or by truck. The two catfish species such as pangas and magur were only species sent to Andhra Pradesh and only the latter one to Punjab and Haryana. Karnataka receives grass carp and common carp, whereas Uttar Pradesh and Bihar receive only the latter species.

When the seasonal demand for fish seed from Assam decreases, demand from other states of the west, north and south parts of India increases and is maintained until early October. The nearer states such as Odisha, Bihar, Jharkhand, and Chhattisgarh get seeds through transport by truck or by hundi on train, whereas distant states such as Punjab, Haryana, Maharashtra, Karnataka, Andhra Pradesh, Telangana, Madhya Pradesh, Uttar Pradesh, Rajasthan, Gujarat, Uttarakhand, and Himachal Pradesh usually receive seed by air. The north-eastern states of India such as Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh and Mizoram have started receiving amur carp seed recently, as it grows and survives well. The only island state receiving major carp seeds is the Andaman and Nicobar Islands.

Priorities before transport – an essential health check-up

Distribution from the market by air takes no longer than one and a half days while truck transports take from one day to neighboring Bihar and up to 4 days for Karnataka and Maharashtra. Spawn are transported by air to other states, either

directly from nursery operators or fish seed traders. Seed are put into polythene bags containing oxygen-saturated water and then each polythene bag is packaged into cardboard (Fig. 6). Prior to dispatch seed quality and fitness is assessed according to their mobility. As much as 500 million seed are distributed by air to other states within the country each year.

Administration

The market has the registered administrative office known as 'Matsya Society' controlled by a board of 51 members including one secretary, one treasurer and other general members. However, a three-member committee handles monetary transactions and is responsible for submitting the financial report to the general body meeting. The board committee comprises 51 members and is fixed and supposed not to be extended further. If any member resigns or dies, another person among licensed members will occupy the position. However, presently the general committee has 669 licensed members entitled to do business who were 300 persons from initial enrollment as licensed traders. The secretary who is selected among the registrar members performs overall management of the market, following the 'By Laws', a legal guideline to execute market administration. Each person of the society has to deposit Rs. 500 as an annual membership fee; this is used for electricity bills, cleaning market and all other essential services required for the benefit of the market. After five years, the committee is reconstituted for better performance necessary for market administration.

State-of- the-art

Naihati fish seed market has many attributes that have contributed to its success as a state-of- the-art market:

- **Aims and scope:** The market facilitates seed growers, sellers, and buyers by adjusting the price suitable for all parties thereby encouraging business development.
- **Execution:** An effective execution and co-ordination exists to facilitate exchange and allocation of fish seed and services among all market stakeholders.

Figure 6: Packing.



Packing seed for air transport.



Filling packed seed bags with oxygen.

- **Transportation:** A well connected road and rail network beside the market and nearby airport provide good options for transportation of seed to both near and distant locations.
- **Ancillary businesses:** A versatile system of marketing set up comprising small to medium businesses has been developed around this market. Shops keeping aquaculture and fishery related

goods and items are available to facilitate requirements of all the parties involved in this market.

- **Service provision:** About 500,000 people are engaged in pond preparation, net preparation, hapa setting, netting, fish catching, packing, oxygen filling, packaging, labeling, carrying, loading, unloading, and transporting are earning and thus running their livelihoods based on this market. In one night, about 400 paddle vans reach the market to sell fishes, and every paddle van has an average of five people who stay at the market during business hours. A total of around 2,000 come to the market every day.
- **Quality assurance:** Fish seed are quality assured as much as possible and are well processed under the guidance of experts, with maintenance of experienced professionals, fishery experts, chemists and other employees to check quality assurance of seeds for sale and transport. That is why the market has been advanced as a reliable centre in India. The ability to efficiently meet the demands of fish farmers has helped the market in achieving an outstanding position growing day by day.
- **Relentless efforts:** This business employs individuals who are dedicated to their respective roles and put in a lot of effort to achieve the common vision and larger goals of the market for its sustenance. Importantly, this market seems to expand daily with modernity in every aspect including products and services dealing with customers' satisfaction. The market is facilitated by access to readily available transportation services, provision of food round the day, and short stay shelters, which satisfy the requirements of all stakeholders.

End note

Since its journey nearly five decades, the growth and development of Naihati market seems promising, vibrant and sustainable. The market is unique because a diverse group of professionals including fishery, management, research, academics, traders, to name a few are directly or indirectly involved vis-à-vis resources of the market are catered as potential input for their

Figure 7: Ancillary shop with relevant equipment for sale.



growth by any means. However, aquaculture, which is one of the fast growing sectors has been extended in India, for which the contribution of Naihati seed market is worth mentioning. Fish seed is an essential input for aquaculture and is available for as many as 27 fish species of culture potential. More and above, the facilities and amenities that Naihati market maintains are both attractive and customers and trader friendly.

Acknowledgment

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