

Fish Seed Industry of Assam

Introduction

The State of Assam has an excellent sub tropical climate for development of fresh water fish culture in a variety aquatic bodies. Aquaculture not only plays an important role in nutrition but also in the rural economy of the state.

Rice and fish are the two basic diets of the Assamese people. For 95% of the State's population of about 25 million, fish is an important protein rich food. The State currently produces about 1.55 lakh tonnes of fish from all sources annually as against an estimated annual demand of 2.5 lakh tonnes. It is expected that the demand is likely to reach 3.20 lakh tonnes by the 2000 AD. As reported by the State fisheries department, the deficiency is partially met by importing fish to the tune of around 0.25 lakh tonnes annually by private traders from other states like Andhra Pradesh, Uttar Pradesh, West-Bengal and Bihar causing a draining out of an amount of around Rs.1 00 crores annually from the State.

Despite the vast aquatic resources, the State has not been able to produce ample amount of fish to cater to the need of ever increasing fish eating population of the State. As the natural fish production is slowly declining, aquaculture has been now recognized as one of the alternatives to produce adequate amount of fish in the State.

The fish seed being the major input for fish farming, there is always a growing demand for quality fish seeds. The uncertainty in the quantity and quality of riverine fish seed collection led to development of many eco-hatcheries in the state. The department of fisheries, Govt. of Assam, in their recent report stated that the State produced 2245.57 million fry during the year 1997-98. This large-scale production of fry can be attributed to mushroom growth of eco-hatcheries in the private sector. Currently, more than 120 hatcheries are in operation. However, one of the major constraints experienced in expanding aquaculture industry in the State is the non-availability of quality fish seeds. As a result in recent past although a spectacular growth of carp seed industry has been taken place in the private sector; the State's market fish production has not increased significantly. This is an important issue which needs to be addressed by the fisheries scientists, policy makers & fish seed producers. There could be a large-scale mortality during the early stage of fish. The mortality may be due to unhealthy fish seeds or lack of proper care. in nursing the fish seeds to advanced fingerling size. In many parts especially in the Nagaon district alone about 40 Chinese eco-hatcheries have been constructed each costing a few lakhs of rupees. It is also high time that one needs to look into different types of low-cost hatchery designs suitable for different categories of farmers. A workshop was proposed for evaluating the prospects and problems of fish seed productions through these hatcheries and to allow the concerned authorities prepare proper policy instruments for sustainable development. A onetime financial grant was received from the ARIASP (World Bank) for organising this important.

Objectives of the workshop

1. To understand the wider implications of the role of eco-hatcheries to provide quality fish seeds to fish-culturists of the State.
2. To understand the currently adopted methodologies of brood stock management, selection for spawning, nursing, rearing, transportation and marketing.
3. To understand the various constraints faced by the seed producers, analyse and formulate redressal measures.
4. To discuss about various hatchery designs & investment package for development of small-scale fish hatchery for resource-poor/marginal farmers.
5. To advocate a network among the fish seed producers / growers in the interest of the entrepreneurs towards making the enterprise a sustainable industry. The proposed network shall help in exchange of newer ideas, interchanging of parental stocks to avoid inbreeding, careful introduction of hybrid fish, prediction of seed requirement, initiate participatory research with scientists, marketing, infrastructure etc.

Relevance

As fish breeding is no longer a complicated technique, fish seed production in Assam has been a lucrative business for many progressive farmers. But if the rapid increase in the number of privately operated hatcheries is uncontrolled, it may jeopardize the seed production industry itself. There is already a growing competition among the hatchery owners. The urgent need therefore is to educate the fish seed producers on a planned breeding programme that produces quality fish seed rather than large quantities of unhealthy fish seeds.

In Assam a large number of hatcheries estimated over 120, have already been established based on the Chinese design in the private sector and presently contributing to more than 95% of the total spawn production. Although, the State department of Fisheries reported that during 1997-98, the State produced about 2245 million fry-sized fish seeds from these hatcheries, the market fish production has not improved significantly. If 20% of the produced fry-sized seeds survived to the stage of market size (assumed: each fish grows to 500 gms in 1calendar year), the annual fish production would have gone upto about 2.24 lakh tons. However, the current fish production of the State from all sources is stated to be 1.55 lakh tons. It is assumed that either there is a large-scale mortality during the early stage of fish or slow growth of the produced seeds. Lack of quality fish seeds may be one of the primary reasons for the low fish production in the State, as the fish seeds of desirable quality is the basic input for aquaculture in tanks, ponds and for culture-cum capture fisheries.

Genetic deterioration has lately been reported in hatchery population. This may be due to poor brood stock management, unconscious negative selection of brood stock, mating female and male spawners from a finite population, unplanned cross breeding in hatchery stock, close mating of spawners (possibly brother and sister or parents & off spring)

resulting in inbreeding etc.

Neither the State fisheries department nor any research institutes has taken any initiatives to create an awareness on these issues and monitor the hatchery activities till date. If it is allowed to continue, it will jeopardize the seed production industry in the State. Already to some extent, the gene pools of our indigenous varieties of carps viz : Rohu, Catla & Mrigal have been contaminated. As a result, in near future the pure seeds of these indigenous carps, may gradually disappear from the culture system.

This workshop highlights the genetic erosion occurring within hatchery population and suggests measures to reduce its dangerous effect on aquaculture production in Assam. The workshop also recommends setting up of a State-level network among the farmer seed producers, Govt. officials and scientists concerned for development of a sustainable fish seed production industry in the State of Assam.

Inauguration of Workshop

The workshop was formally inaugurated by the hon'ble Vice-Chancellor of the Assam Agricultural University, Prof. A.N. Mukhopadhyay on April 08,1999. Mr. M.S. Rao, IAS, Secretary, Agriculture, Govt. of Assam and the Project Director, PIU, ARIASP (World Bank) attended as the Chief Guest who also released a Souvenir to mark the occasion. Dr. S.C. Pathak, Chief General Manager, National Bank for Agriculture & Rural Development (NABARD) and Dr. P.C. Mahanta, Advisor (Fish), North Eastern Council, Shillong graced the occasion as the guests of honour. The inaugural function was presided over by Dr. O. K. Dutta, O. S. D. & Chairman of the workshop and S. K. Das, Convenor of the workshop explained the objectives of the workshop. The invited guests and scientists Dr. B.K. Padhi; Calcutta & Dr. V. Sugunan, Head, CICFRI; Guwahati were felicitated by the workshop organizing committee in the inaugural function.

Publication of Souvenir

A Souvenir was released on the day of inauguration to spread the message "Produce quality fish seeds to increase fish production of the State of Assam". The publication included two messages from hon'ble Vice-Chancellor of A.A.U. & project director of ARIASP and a few abstracts of the papers presented in the workshop.

Participants & target group

In cooperation with the Department of Fisheries, Govt. of Assam, all fish seed producers engaged in fish breeding activity were invited. About 100 participants including 57 number of farmers & entrepreneurs directly involved in fish seed production, officials from the State Department, banks, NGO's and scientists attended the workshop. The farmers took an active part in discussion held at the end of each presentation and made the workshop lively.

Resource Persons

Resource persons were drawn from the Assam Agricultural University, Department of Fisheries, Govt. of Assam, Central Inland Capture Fisheries Research Institute (Indian Council of Agricultural Research), Guwahati, National Bank for Agriculture and Rural Development (NABARD), Guwahati, North Eastern Development Finance Corporation Ltd. (NEDFi), Guwahati, Saha Research Institute, Calcutta and Gauhati University, Guwahati.

Dr. B. K. Padhi - A renowned fish geneticist of the country who was earlier with Bose Institute, Calcutta (now shifted to Saha Research Institute's Molecular Biology Division) attended as key resource person along with S. K. Das of College of Fisheries, Assam. Both spoke about demerits of mixed spawning of Indian major carps; Catla, Rohu & Mrigal and urged upon to stop this activity immediately.

Technical Session

A total of 4 technical sessions were conducted with a chairman of repute and two rapporteurs. Following is the list of papers presented by resource persons:

1. Fish seeds: quality Vs quantity - By S. K. Das
2. Status of fish seed production in Assam - By Dr. O. K. Dutta
3. Fish Seed production and strategy for marketing network in the N.E. Region - By Dr. P.C. Mahanta.
4. Role of NABARD in financing fisheries projects - By Dr. S.C. Pathak.
5. Quality assurance in fish seed production - By S.K. Das
6. Role of NEDFi in promotion of fisheries activities in the N.E. Region of India - By Dr. A. Sarma.
7. Magur breeding & hatchery management - By S. Borthakur.
8. Common diseases in fresh water carp hatchery - By Dr. B. Kalita.
9. Inbreeding in fish - By Dr. B. K. Padhi.
10. Fish seed production - An experience- By B. Goswami, progressive farmer.
11. An overview of fish seed production in Assam initiated by the Department of Fisheries, Govt. of Assam. - By A. Rahman & others.

Exhibition

An exhibition on different hatchery models, techniques of induced breeding, and publications, were organised by the students & scientists of the College of Fisheries, A.A.U. Raha which was formally inaugurated by Dr. S. C. Pathak, C.G.M., NABARD. Among the hatchery models, a low -cost portable hatching trough for a selected fish species attracted many participants. It is worth mentioning that this model was developed for trial in 1999 for the benefit of resource -poor farmers of a Amsoi tribal area in Nagaon district under another ARIASP supported innovative pilot project being implemented by the College of Fisheries.

Publication of proceedings

A proceeding containing the papers presented in the workshop is being published separately with financial support received from NABARD, Guwahati.

Plenary Session

The plenary session was chaired by Dr. O. K. Dutta, O.S.D. and was assisted by S.K. Das, convenor of the workshop. In the plenary session, several recommendations from each paper presented were discussed at length. S. K. Das, convenor, also presented several immediate and long-term measures which were thoroughly discussed with the participating fish seed producers, Govt. officials & scientists concerned and finally following recommendations were accepted by all. Scientists from the College of Fisheries; Central Inland Capture Fisheries Research Institute of ICAR, Guwahati; Gauhati University; Saha Research Centre, Calcutta; North Eastern Council, Shillong; Department of Fisheries, Govt. of Assam and the fish seed producers of Assam participated in the plenary session for giving a final shape to the recommendations suggested.

Recommendations

Immediate Measures

1. Hatchery operators must keep the brood fish under optimal conditions and choose the most appropriate well maintained young brood fish fed with nutritious diets for spawning to ensure better quality of seeds.
2. Breeding of small sized (both age & weight) brood fish must be avoided.
3. Hatchery operators must stop inbreeding (brother-sister and parents-offspring crossing) and avoid the tendency to cross breeding of different carp species. Mixed spawning of Catla, Rohu, Mrigal in a single breeding pool must be stopped.
4. Carp fingerlings and brood fish may be collected from the river and may be grown to supply as brood fish by periodically replenishing the old brood stock.
5. Hatchery operators should form a network for exchange of their brood stock, ideas, technologies, results etc. among themselves with supports from concerned scientists and Govt. officials.
6. Encourage more economically viable small-scale hatchery facilities for resource-poor / marginal farmers.
7. Breeding and culture of economically important indigenous fish should be encouraged.
8. Genetic awareness campaign should be launched to educate the fish seed producers on planned breeding programme.
9. Concerned authority should take appropriate actions to prevent unnecessary delay or harassment at police check post while transporting live fish seeds or brood fish from one place to another in the State.

10. All fish seed traders should register themselves and the concerned authority should issue license to them.
11. For measuring and counting of fish seeds, a standard perforated "bati" be used and the concerned department should supply such standard "bati" to all the fish seed traders.
12. Unplanned construction of hatchery should be avoided.
13. Catching of fish from natural waters during breeding season must be stopped.
14. Refreshers courses for Govt. officials and scientists concerned with fish seed production should be organised.
15. Fish seed marketing network be established with proper packaging and marketing technologies.
16. Actual data on fish seed production be procured.
17. Important information on quality fish seed production be published in local Assamese and English newspapers / magazines.
18. A directory of fish seed producers of the State of Assam be published.

Long term measures

1. Establish a live gene bank in Assam atleast initially for the IMC (Indian Major Carp, Viz Catla, Rohu & Mrigal) to supply pure strains of these indigenous carps. Government or any other appropriate agencies may support establishing such facilities.
2. Fish seed producers, hatchery operators should be trained on appropriate technologies concerning selective breeding, brood stock management, hatchery management, nursery management etc.
3. Initiate participatory research with farmer hatchery operators on induced breeding, selective breeding, hybridization, nursery management, transportation etc. The Government or financial institutes should help in establishing field laboratories for the purpose.

Follow-up actions

Many seminars, workshops, trainings are conducted from time to time, but without a follow-up action on the workshop held, the basic objective of helping the farmers help themselves remains unfulfilled. With an objective to create an awareness among the fish seed producers about the genetic deterioration of the fish seeds produced; a follow-up action was planned utilizing the savings of the workshop fund already sanctioned by the PIU, ARIASP (World Bank).

Objectives

1. To create an awareness among the farmer fish seed producers about the genetic deterioration of the fish seed produced in their hatcheries.
2. Demonstrate method for selection of spawners, use of tag etc.
3. Motivate farmer fish seed producers to form a network for their mutual benefits.
4. Gather primary data on the technology adopted for induced breeding, spawners selection, transportation, market demand & constraints faced.

Methods

Scientists visited selected individual fish seed producers of the State, organised small group discussion etc. to achieve the above mentioned objectives. In all cases the College of Fisheries involved officials of the State Department of Fisheries, Govt. of Assam for the follow-up action activities.

Follow-up Action Programme

With a limited fund saved out of the workshop budget, follow up action programmes, demonstrations and group discussions were conducted at 20 different locations covering 10 districts of Assam in collaboration with the Department of Fisheries, Govt. of Assam. Some of those fish seed producers who could not attend the workshop for various reasons were also reached through the follow up action programmes. Altogether 124 nos. farmers, 45 nos. Department officials and 5 nos. scientists were associated with the follow up action programmes under the leadership of S.K.Das, Associate professor, College of Fisheries, Assam Agricultural University, Raha, Nagaon, Assam.

Background and Current status of fish seed industry

Although in India induced breeding technique of Carp was developed way back in 1957, the actual momentum of hatchery seed production began in Assam from mid 80's, when two progressive fish farmers established Chinese hatchery at Mourajhar (padumoni) and Nilbagan in Nagaon district. Seeing the success of these two hatcheries, many progressive farmers who were earlier engaged in hapa breeding & nursing, started establishing carp hatcheries in several districts of Assam in early parts of 90's. Interestingly, in Nagaon district alone within a span of just 5 years more than 35 new hatcheries were established. With increasing number of hatcheries in the private sector, the Nagaon district soon became the nerve centre for hatchery produced carp seeds. Initially, the technology of Carp Seed production employing Chinese hatchery was brought to Assam from neighboring State, West Bengal. In addition to the Government support, successful fish seed producers of West Bengal (especially from 24 paragonas) were contacted to seek technical assistance in hatchery construction, induced breeding and hormone supply (mostly pituitary gland) by a few progressive fish farmers. These farmers also visited many successful fish seed

production centres in West Bengal before venturing into this new business in Assam.

The enterprising fish seed producers of Nagaon district almost monopolized the fish seed production business during late 1980's. Later, realizing its profitability, many others in the private sector established similar type of hatchery and as a result most hatcheries are similar in design and capacity. This, rapid development resulting in mushroom growth of hatchery in private sector undoubtedly contributed to significant increase in total quantity of hatchery produced fish seeds in Assam. As the initial investment for establishing a carp hatchery is more, the fish seed producers, often concentrated only on quantity offish seeds for quick return. They never considered the qualitative aspect of the fish seeds they produce. Therefore, although the State produces a large quantity offish seed annually, the fish production has not increased significantly.

During the workshop and later through the follow up activities it was found that most fish breeders of the State are ignorant about the qualitative aspect offish seed. The poor quality fish seed production may be due to following reasons:

1. "Seeing is learning "- Most fish breeders of the State have learnt the art of only" hormonal injection" through farmer to farmer contact. Although the Department of Fisheries and various institutions conduct farmers training from time to time, by and large the concerned Government departments and scientists have earlier failed to create an awareness on the quality fish seeds production among the farmers due to lack of expertise.
2. Most fish breeders have very limited resources interms of number offish ponds, brood stock and fish breeding pool in their farms. As a result, the brood fishes are selected from a finite population. The fish breeder~ have failed to realise that production of offspring from a undersized fish and from the same stock every year might result in deterioration of quality. In many private hatcheries it was observed that matured fish weighing below 300-400 gms are also injected for egg production. Some farmers donotprefer large size brood fish as the hormone requirement shall be more for a larger brood fish. Due to non-availability of reliable sources for pituitary gland, many breeders now prefer to "Ovaprim" - an expensive new spawning agent. Ovaprim was commercially made available in India by Glaxo (India) Ltdd in early 90's based on a nation-wide Asian Fisheries Society (Indian branch)'s field research conducted by a team of scientists namely M.C. Nandeesh, S.K. Das, E. Nathaniel & T.J. Varghese. A 10 ml vial of ovaprim is sufficient to breed about 20 kg of fish. Since this hormone is very expensive (10 ml vial of Ovaprim costs about Rs. 495) farmers often prefer smaller sized matured fish so as to breed more number and different varieties offish at one time to meet the demand. Recently, in a preliminary trial another new hormone "Ovopel" was also tested successfully to induce breed few carp fish for the first time in Assam (S.K. Das personal communication, 1999).
3. Most fish breeders have only one breeding pool for operation and to run the hatchery

economically, they release about 40-60 kg of matured fish in one breeding pool according to its capacity. Inadequate quantity of single species brood fish for each operation has forced many hatchery owners to breed several species together. The resultant seeds are the mixture of various carp species, some of which are hybrids between closely related species. A study conducted during the follow up actions, revealed that almost all hatcheries in Assam are producing mixed carp spawn out of which 10-30% produced seeds are the hybrids of two species. A hatchery owner of Jatrapur in Karimganj reported that when 6 nos. silver carp males and 8 nos. Bighead carp males were induced bred with 2 nos. Silver carp females and 5 nos. Bighead carp females in a breeding pool; 80-90% resultant seeds were hybrids between these two species. Only 10-20% seeds were reported to be pure Big head carp. If this trend continues as revealed by farmers, pure strains of important species shall soon disappear from our aquatic system. The concerned Department must take appropriate measures to stop the unconscious breeding of different varieties in the same breeding pool to prevent contamination of genepool before it is too late. It should be remembered that unless a multigenerational study is conducted, it shall be difficult to assess a particular new hybrid. Various crosses were reported by fish breeders. For eg. Rohu x gonius, Rohu x catla, Mrigal x gonius, Rohu x calbasu etc. In a mixed spawning trial conducted by a farmer reported that when injected Rohu, Mrigal and Gonius were released in a single breeding pool, about 75% resultant seeds were hybrid one and only 25 % were pure. As these are only the reports of the farmers, further investigation by competent authority should be initiated before it is too late. These hybrids are mostly reported from nursers of a particular hatchery in the locality. In a random netting conducted with a cast net at village Nankarbhoira in Nalbari district, all the fish species harvested were found to be hybrid. The netting was conducted by the principal investigator in presence of fish pond owner, seed producer and a departmental officer. If some of the fertile hybrid fishes escape to natural waters, it will have a dangerous effect on the future stock.

4. Most fish breeders have the tendency to select brood fish from the unsold seeds of the previous year when they attain maturity. Therefore, in most hatchery often crossing between parents & offspring and brothers & sisters take place. This results in inbreeding and production of poor quality fish seeds.
5. Very few hatchery owners take proper care of brood fish. Only a strong, healthy and fully matured brood fish can produce quality seeds. Neither a hatchery nor a hormone can produce quality seeds unless the brood fishes are good in condition.

A Study on Rangiya fish seed market

Rangiya in Kamrup district has in recent years become the hub of fish seed trade. Like table fish, fish seeds are also being imported to Assam from neighboring States like

West Bengal. The Rangiya fish seed market which started in the year 1992 became the trading place for many of the West Bengal based seed producers and agents. The seed producers of West Bengal have been able to capture the seed market in Assam as they bring in fish seeds of size 1-1.5 inch long from the last part of March when the seed producers of Assam are unable to supply. The import of fish seeds slowly decline from the first part of June when local seeds of size 1-1.5 inch long become available. It is estimated that about 3-4 truck loads of fish seeds each carrying 400 kg of seeds arrive at Rangiya from West Bengal every day from last week of March to early June. Since the demand for fish seeds at that point of time is very high to stock the perennial water bodies, the seeds are sold at an average price of Rs. 140 per kilogram. Although the price varies depending on the supply, demand and variety, on an average it is estimated that more than 20 million fish seeds are being imported from neighboring states annually by the local traders causing a draining out of an amount around Rs. 1.8 crores annually from the State of Assam.

Mixed carp seeds of Rohu, Mrigal, Catla, seeds of Common carp, Silver carp, Bighead carp, Grass carp and African cat fish (locally known as Thai magur) etc. are sold in this market. When visited this market on two occasions the carp seeds were found to be of inferior quality, most suffering from pinhead disease (-a nutritional disorder). Further, in a sample collected randomly on 31.05.99; 30% of the seeds were found to be the seeds of Tilapia. When contacted Mr. A. Hassan- a seed producer from Murshidabad, confessed that his nursery ponds were infested with Tilapia and could not eradicate them fully prior to dispatching.

It is also assumed that most carp seeds which arrive during the earliest part of the season are the produce of previous year; as these seeds appear to have suffered from malnutrition. As soon as the seeds are arrived they are kept in hapas fixed in a nearby rivulet. The seeds are also fed with antibiotic mixed locally prepared feed. In general, use of antibiotics in aquaculture is always discouraged. In West Bengal, it is a common practice for many hatchery owners to stock the unsold seeds of the season at a very high density in their nursery ponds due to lack of sufficient number of ponds. These seeds are underfed to check the growth and released in the early part of the next season. Many farmers in the Burha gaon Panchayat areas, Darrang, Assam have complained that these seeds are of poor quality and thus do not grow to their expectation.

Fish seeds from Rangiya are transported live in "hundi" (-an aluminium pot) to various places in Assam, Arunachal Pradesh, Nagaland, Meghalaya etc. It is also reported that about 2000 numbers of local vendors are dependent on this market for their livelihood. These vendors carry the seeds live in "hundi" on bicycle to sell in the nearby villages.

Measures to be adopted

1. Rangiya fish seed market should be brought under the control of Department of immediate effect to closely monitor the seed quality and varieties.

2. The Government should take up appropriate measures to stop sale of mixed carp seeds, Tilapia, Bighead carp, African cat fish and any other new exotic varieties.
3. All fish seed vendors should be registered with the concerned Governmental department / agency.

Out come of the follow up action

1. Based on the recommendations made during the workshop several awareness camps organised jointly with the Department of Fisheries, Govt. of Assam in various villages covering 10 districts had succeeded in educating a large group of fish seed producers, nursers and field level Departmental staff associated with fish seed production. As recommended, the fish seed producers directory of Assam has also been brought out.
2. As recommended during the workshop. several news, articles were published in local English and Assamese daily news papers including a report in the Fishing chimes (the largest circulated monthly journal on Fisheries published from Andhra Pradesh) to create an awareness on the issue. A slogan coined during the workshop *produce quality fish seeds to increase fish production of the State of Assam* was given wide publicity.
3. By and large, fish seed producers have felt necessity of a local network as suggested and the process has already begun in Sonitpur, Nalbari, Karimganj, Barpeta and in Tuktuki & Mourajhar of Nagaon districts. In some parts of Nagaon & Karimganj districts not much progress could be made in convincing the seed producers to form a network due to their internal conflict and competition.
4. Through follow up action it was found that
 - a) Most hatchery owners breed various carp species together in one breeding pool giving rise to various hybrid fish. However, the extent of hybridization in a hatchery is not clearly known.
 - b) Most hatchery owners have not realized the dangerous effect of hybrid fish in the culture system as their responsibility is confined to production of 3 day old spawn.
 - c) Most nursers who grow spawn to fry and fingerling size have reported hybrid fish and slow growth & mortality of nursed seed.
 - d) In many rural areas transporting fish seed in open aluminium pot (hundi) on bicycle is a common practice: In a hundi of 27 litre capacity, with 23 litres of fresh water, nearly 2000 number 00-4 cm long seeds are transported for a distance lasting less than 5 hours. Mortality recorded was 2% (S.K. Das, personal communication)
 - e) Hatchery owners rarely collect riverine fish to replace old farmed brood fish.

5. Fish seed producers were educated on brood fish care, selection, feed formulation and on use of tag etc. Small group discussions were held to find out the major constraints faced by the seed producers & nursers. They are as follows –
- a) Police harassments while transporting seeds from one place to another.
 - b) Difficulties in collecting riverine stock.
 - c) Imported seeds from neighboring States have badly affected the local fish seed producers. Lack of infrastructure facilities to rear brood fish and to breed fish species wise.
 - d) Lack of suitable feed for brood fish and juveniles in nursery.
 - e) Low survivality in nursery ponds.
 - f) Slow growth of hatchery produced Indian carps seeds.
 - g) Lack of technology for small-scale hatchery and to advance the breeding programme.
 - h) Lack of Government supports- the support needed may be classified as technical & financial. Lack of appropriate technology to eradicate predators from the nursery pond so as to increase the survivality of juvenile fish.
6. Some farmers have raised doubts over the carry over seeds. The concept of carry over seeds is not clear. One farmer seed producer of Sibs agar district who conducted experiment at his farm; revealed that growing to market size fish is more profitable than selling them as carry over seeds. These seeds showing stunted growth do not always perform well as reported by many fish farmers. An NGO who conducted a trial with carryover seeds of Rohu, Mrigal and Catla did not grow beyond 100-200 gms in a rearing period of 10 months near Jalukbari, Guwahati.
- A detailed study has to be conducted whether these carry over seeds can really increase the fish production of the State significantly.
- As most ponds in the State are seasonal in nature, the actual demand for fish seeds by majority of the fish farmers start from early part of May depending on the rainfall, when the local seed producers can market their produce. Another problem is-most hatchery owners do not have sufficient number of ponds to stock surplus seeds of a season to sell as carry over in the next season. When one can sell all their produce in one season, they will certainly not retain seeds for the next season to sell as carry over, since it may be a risky job to do. Seed producers may not be able to make desired profit due to increasing cost of feed, fertilizers, labour and above all mortality in the nursery ponds.
- However, if the carry over seeds are nursed with proper care, farmers possessing perennial water bodies may be benefited.
- It is a universal fact that every living organism needs proper care at the juvenile stage so that they grow healthy & strong. Instead, if they are stocked at high density

and underfed with little or no care, it is difficult to understand whether these stunted seeds shall grow to bigger size in the farmers ponds when released in the next season.

7. A fish seed producers Md. A Matin, at Katahaguri in Nagon district has been able to breed *Notopterosus chitala* (-a highly priced indigenous fish) in his pond based on the technical support provided through follow up actions. Another farmer, S.A. Haque of Sibsagar district has taken technical support to breed fish little earlier in the next season so as to capture the market before the imported seeds arrive in his locality.
8. Many hybrid carps of size (100-500 gms) were detected in the Sibsagar central market. The fish sellers reported that these hybrid fishes were caught from nearby beels. This confirms that during rainy season when fish ponds get inundated some of these hybrid fishes escape to natural water bodies. While surveying local fish markets in various places it was observed that most local species especially Rohu & Mrigal weighing below 500 grams were sold. In recent years these two fish have failed to perform well in farmers ponds. Genetic deterioration may be one of the causes.
9. In Katahaguri, Nagaon, 5 hatchery owners have expressed their willingness to co-operate with the Department officials & scientists for production of pure strain quality fish seed. Likewise a sizeable number of fish seed producers from Sonitpur, Sibsagar, Nalbari, Barpeta, Karimganj have expressed their willingness to produce quality seeds provided there is technical support & monitoring from the concerned authority. A few hatchery owners have already started breeding Catla brood fish separately and some have even collected Carp fingerlings from nature to rear as brood fish.

Actions to be taken

1. All hatchery owners must be registered with the department of Fisheries. Fish seed traders including the vendors should procure license from the concerned authority and specify the origin of seeds they sell.
2. Mixed spawning of carps by the hatchery or hapa breeders should be declared illegal and an offence. Mere imposition of ban or fine on the hatchery operators and breeders may not solve the issue, more stem actions such as cancellation of registration etc shall certainly make the hatchery operators aware of the offence. The department of Fisheries may be empowered to deal with such situation. In addition, farmers should be restricted to breeding of only legal varieties of fish.
3. The department of Fisheries should exercise necessary actions to collect data on fish seed production. Excepting a very few educated hatchery seed producers; none have any records. Although the department reports that the State is near sufficient in seed production, every year more than 20 million fish seeds are imported to Rangiya

market alone. A few enterprising fish seed traders also import fish seeds directly from West Bengal. For example 5 truck loads of fry sized fish seeds carrying about 30 lac in number were brought to Nazira in Sibsagar district in 1999. Fish seed producers and nursers may be given certain proforma to record their production every year by the Department of Fisheries. A farmer from Karimganj reports that a small quantity of Indian carp spawns are also exported to Bangladesh.

4. Initially a separate cell with competent persons may be created within the State Fisheries Department to look into and monitor the quality fish seed production. Budgetary provision may be made to execute the planned activities.
5. Any farmer who desires to construct a new hatchery must seek prior permission from the Department of Fisheries. The officials may justify whether there is any need of a hatchery in the locality. If needed, type of hatchery, local demand etc. must be studied in advance.
6. Major emphasis be given to small-scale seed producers who desire to construct small-scale hatchery. In general, a newly constructed large-scale hatchery unit starts making actual profits from year 4 onwards (Das. S. K., 1997). Whereas a small-scale hatchery can be made profitable from the year 1 itself. Unlike large-scale hatchery, the small-scale hatchery can be operated with less number of brood stock. Therefore, it shall enable the farmer to induce breed fish species wise without loss. The small-scale hatcheries of Mr. Bhairab Daimari of Sonitpur district and S. A. Haque of Sibsagar district in Assam are two good examples. Currently the College of Fisheries is also working on the development of low-cost hatcheries for resource poor farmers.
7. The department of Fisheries must take initiatives as desired by most of the fish seed producers to collect riverine fish seeds for distribution. The state fish seed farm at Ulubari, Guwahati may be transformed into a stocking centre for riverine seeds. Riverine pure seeds from the river Brahmaputra may be collected from Dhubri area and transported to Ulubari by the department of Fisheries. Fish seed producers may be informed to collect the riverine seeds to grow as brood fish at reasonable price fixed by the department. Similar such units may be developed in other districts of Assam.
8. As discussed during the follow up action camps, the Department officials should take necessary actions to form network of seed producers in their respective areas.

Benefits of a net work

- a. Exchange of ideas and information among the fish breeders.
- b. Exchange of brood fish to avoid inbreeding and to improve quality of the seeds produced.
- c. Help each other in collecting riverine fish for periodic replenishment of old brood

fish. Through net work, cost of collecting riverine stock can be shared and thus reduced substantially for an individual.

- d. Network members may share responsibility of breeding certain varieties of pure strains individually without affecting ones business.
 - e. Unitedly prevent the entry of imported and exotic fish seeds in their locality.
 - f. Through network, the concerned authorities, (District office of Department of Fisheries, Deputy Commissioner, Superintendent of Police) may be contacted for free movement of live fish & fish seeds from one place to another within the North Eastern region as many hatchery owners have reported police harassment while transporting their produce.
 - g. Through network, local fish. seed market be established for mutual benefits of producers & buyers.
9. Fish farmers who are dependent on hatchery produced seeds must be warned about the danger of hybrid fish as there is no known technology available for culturing such strange created varieties. The common polyculture of carp technology is based on pure strains of carps. The farmers be educated to grow only pure strains of cultivable varieties as recommended by the Department of Fisheries and scientists for maximising their production.
10. The research as well as the extension wings of the Department of Fisheries be strengthened with competent persons and resources. The department can collaborate with concerned scientists to conduct research on early maturity offish, nursery management, small- scale hatchery, seed transport etc. Unless the farmers are able to breed fish little earlier than the actual breeding season, the import of fish seeds from neighboring States shall continue in the years to come.
11. Many experienced hatchery seed producers revealed that they earned a profit of Rs. 1-2 lac in one season lasting from April to August. Those seed producers who sell bulk of their produce to neighboring States, their profit margin is much higher than this. However, the Government should consider providing tax holiday for a newly constructed hatchery to attract more entrepreneurs. Registration fees may also be collected from the seed merchants of neighbouring states who bring truck load offish seeds to sell in Assam.
12. The fish breeding hormone -Pituitary gland is often imported to Assam from West Bengal. Like in Sealdah & Howrah fish markets of West Bengal, some enterprising persons may earn their livelihood from. the sale of pituitary gland to fish breeders. Paltanbazar whole sale fish market at Guwahati may be the source of pituitary 'gland. A fish breeder near Dhekiajuli, Sonitpur district collects pituitary gland from little fresh & matured fish imported from Andhara Pradesh by paying Rs.1 to Rs 2 per gland to the fish sellers in the local market. It is estimated that a successfully operated hatchery in Assam requires about 5,000 -10,000 nos. of pituitary glands in each

season. It is roughly estimated that more than Rs. 20 lac is drained out annually from the State of Assam for importing pituitary gland besides Ovaprim.

13. Fish seed market should be established in each district through seed producers network for benefits of both producers & buyers. The Government may assist in creating minimum infrastructures like a low-cost shed, few tanks & water supply etc. Seeds may also be certified by the competent authority before they are sold at the seed market.
14. Till date there is no standard method to count fish seeds (spawn/fry/fingerling). The department of Fisheries should instruct all seed producers to use a standard method. Further, the department may supply a standard size" perforated steel bati" to seed producers indicating approximate quantity of different age group of seeds it can hold.
15. Entrepreneurs in the private sector may be encouraged to establish fish feed plant to produce pellet feed for brood fish and feed for juveniles so as to improve the quality of brood fish and fingerlings. The formulated diet should contain recommended composition of protein, fat, carbohydrate, vitamin & minerals and amino acids. In addition, before recommending a particular feed, laboratory studies must be conducted on FCR (Food conversion ratio) total energy, digestibility, stability etc. In general, use of prepared diet in traditional pond fish culture may not be cost effective. Locally available feed ingredients such as rice bran, mustard oil cake, dry fish, termite, kitchen wastes etc may be used for feeding cultured fish in village ponds. As the carps at the early stage depend primarily on plankton, zooplankton production in the nursery ponds should be maintained at an optimum level through application of manures.
16. Several hatcheries developed under DRDA schemes were found to be nonfunctional. Such hatcheries may be leased out to technically qualified persons or NGOs to operate profitably.
17. Utmost care must be taken while releasing hatchery produced carp seeds in natural water bodies like beel etc. for culture based capture fisheries, as most hatchery operators are engaged in mixed spawning.

Directory of Fish seed Producers of Assam

1. Barpeta District

Sl. No.	Name	Address
1.	Bhupen Bharali	P.O. & Vill.: Amdoh, Distt.: Barpeta.
2.	Phulen Das	P.O.: Bongaon, Vill.: Debra, Distt.: Barpeta.
3.	Sahjahan Ali	P.O.: Galibandha, Vill.: Nijbarala, Distt.: Barpeta.
4.	Nur Mohammad	P.O.: Howly, Vill.: Mairamara, Distt.: Barpeta.
5.	Hajarat Ali	P.O.: Dabliapara, Vill.: Jugirpam, Distt.: Barpeta.
6.	Jain Ali	P.O.: Kurubaha, Vill.: 1No. Katala, Distt.: Barpeta.

2. Bongaigaon District.

Sl. No.	Name	Address
7.	Md. Abu Bakkar Siddique	P.O. & Vill.: Goraimari, Distt.: Bongaigaon.
8.	Sri Samulya Das	P.O.: Bongaigaon, Vill.: Khorija Dolaigaon (Kishanbazar), Distt.: Bongaigaon.
9.	Sri Guneswar Basumatari	P.O.: Gorukabari, Vill.: Nadiapara, Distt.: Bongaigaon.
10.	Md. Abdul Rahman Sikdar	P.O.: Kawatika, Vill.: Dutari, Distt.: Bongaigaon.

3. Darrang District.

Sl. No.	Name	Address
11.	Sri Bhupen Bania	P.O.: Hazarikapara, Sipajhar, Vill.: Pithakhowa, Distt.: Darrang.
12.	Sri Parimal Das	P.O.: Barjhar Bazar, Vill.: No.2 Darrang Bazar, Distt.: Darrang.
13.	Sri Nagenbahi Karimia	Darul Ullam Min Mahal, P.O.: Nagarabahi, Distt.: Darrang.
14.	Upahupara Fish Seed Farm	Department of Fisheries, Government of Assam, Mangaldoi, Distt.: Darrang.

4. Dhubri District.

Sl. No.	Name	Address
15.	Sri Ataur Rahman	Fazila Fish Seed Farm, Vill.: Jhagarpar, P.O.: Jhagarpar, Distt.: Dhubri.
16.	Sri Ramesh Chandra Roy	Vill.: Debattar Hasdaha, P.O.: Debattar Hasdaha, Distt.: Dhubri.

5. Golaghat District.

Sl. No.	Name	Address
17.	Mr. Girish Gogoi	Jarpai Barna Gaon, P.O.: Golaghat.
18.	Mr. Aban Basumutary	Mitinga Meen Pona Utpadan Kendra, Vill.: Bishnupur, P.O.: Telisal, Merapani, Golaghat-785610.

6. Hailakandi District.

Sl. No.	Name	Address
19.	Sisir Ranjan Nath	Vill.: Muktachera, P.O.: Umednagar, Distt.: Hailakandi, Pin: 788163.
20.	Jamal Ahmed Choudhuriy	Vill.: Lala, P.O.: Monachera, Distt.: Hailakandi.
21.	Shri Nishikanta Deb	Vill.: Alexanderpur, P.O.: Katlicherra, Distt.: Hailakandi.

7. Kamrup District.

Sl. No.	Name	Address
22.	Sri Kabin Das	Hajo, Pakhalemela, P.O.: Hajo, Distt.: Kamrup.

23.	Sri Jagdish Bora	Madhab Bora Composite Fish Farm, P.O.: Khanapara, Distt.: Kamrup.
24.	Sri Jagot Deka	Vil.: Dakhin Singra, P.O.: Dakhin Singra, Distt.: Kamrup (Assam).
25.	Ulubari Fish Seed Farm	Department of Fisheries, Govt. of Assam, Ulubari, Guwahati- 8, Distt.: Kamrup.

8. Karimganj District.

Sl. No.	Name	Address
26.	Haji Abdul Kalam	C/O.: Late Rahman Ali, Vill.: Jatrapur, P.O.: Nilambazar, Distt.: Karimganj.
27.	Fakar Uddin	C/O.: Mobarak Ali, Vill.: Jatrapur, P.O.: Nilambazar, Distt.: Karimganj.
28.	Haji Faizul Rahman	C/O.: Haji Raiyab Ali, Vill.: Jatrapur, P.O.: Nilambazar, Distt.: Karimganj.
29.	Kudrat Ali	C/O.: Haji Arab Ali, Vill.: Jatrapur, P.O.: Nilambazar, Distt.: Karimganj.
30.	Nur Uddin	C/O.: Late Armoj Ali, Vill.: Jatrapur, P.O.: Nilambazar, Distt.: Karimganj.
31.	Tanu Khan	Vill.: Kanakpur, P.O.: Nilambazar, Distt.: Karimganj.

9. Kokrajhar District.

Sl. No.	Name	Address
32.	EAS Ecohatchery	Vill.: Dotma, Distt.: Kokrajhar.

10. Lakhimpur District.

Sl. No.	Name	Address
33.	Sri Bikul Goswami	C/O, Lakhimpur Fish Seed Farm, Bazarpati, North Lakhimpur.
34.	Md. Nurul Islam	Vill.: Tinthengia, P.O.: Bangalmara (Doulatpur), Dist.: Lakhimpur.
35.	Sri Mohendra	Vill.: Tinthengia, P.O.: Bangalmara (Doulatpur), Dist.: Lakhimpur.
36.	Md. Inul Haque	Vill.: Tinthengia, P.O.: Bangalmara (Doulatpur), Dist.: Lakhimpur.

11. Morigaon District.

Sl. No.	Name	Address
37.	Md. Nurzaman Fakir	Vill.: Silpukhuri, P.O.: Silpukhuri, Distt.: Morigaon.
38.	Md. Abdul Mannan	Vill.: Laharipam, P.O.: Nagabandha, Distt.: Morigaon.
39.	Md. Ali Akbar	Vill.: Tumukabari, P.O.: Rowmari Beel, Distt.: Morigaon.

12. Nagaon District.

Sl. No.	Name	Address
40.	Md. Abdul Hannan	M/S, Padumani Fish Seed Breeding Plant, S/O, Haji L. Ismail Ali, Vill.: Padumani, P.O.: Murajar, Distt.: Nagaon.
41.	Md. Lutfur Rahman	M/S, Nilbagan Fish Seed Farm, S/O, L.Haji Mustakin Ali, Vill.: Methigaon (Nilbagan), P.O.: Nilbagan, Distt.: Nagaon.
42.	Md Fariz Uddin	S/O, Tara Mian, Vill.: Sabaspur, P.O.: Murajar, Distt.: Nagaon.

43.	Md. Fariz Uddin (Total Mian)	S/O, Haji Riaz Ali, Vill.: Singripar, P.O.: Joyanagar, Distt.: Nagaon.
44.	Md. Abdul Rahman	M/S, Padumani Fish Seed Farm, S/O, Haji L. Ismail Ali, Vill.: Padumani, P.O.: Murajar, Distt.: Nagaon.
45.	Md. Abdul Mannan	M/S, Ankur Fish Seed Farm, S/O, Kuti Mian, Vill.: Subaspur, P.O.: Murajar, Distt.: Nagaon.
46.	Ohiur Rahman	S/O, Haji L. Mustakin Ali, Vill.: Terakata, P.O.: Kapahbari, Distt.: Nagaon.
47.	Md. Abdul Subahan	M/S, Ajhar Enterprizes, S/O, Haji Ismail Ali, Vill.: Padumani, P.O.: Murajar, Distt.: Nagaon.
48.	Md. Anuar Hussain	M/S, Hussain Enterprise Fish Seed Farm, S/O, L. Haji Mustakin Ali, Vill.: Methigaon (Nilbagan), P.O.: Murajar, Distt.: Nagaon.
49.	Ohiur Rahman	S/O, L. Amzad Ali, Vill.: South Nilbagan, P.O.: Nilbagan, Distt.: Nagaon.
50.	Faijul Haque	S/O, L. Haji Musarat Ali, Vill.: Singripar, P.O.: Joyanagar, Distt.: Nagaon.
51.	Abdur Rofe	S/O, Haji L. Esub Ali, Vill.: Sabaspur, P.O.: Murajar, Distt.: Nagaon.
52.	Md. Siraj Uddin Ahmed	Milan Enterprise Centre S/O, Abdul Mannan, Vill.: Sabaspur, P.O.: Murajar, Distt.: Nagaon.
53.	Md. Khalil Rahman Choudhuri	M/S, Sonai Fish Seed Fram, S/O, Haji L. Fayaz Ali, Sonai, Nagaon.
54.	Md. Tajul Islam	S/O, Lt. Abdul Samad, Vill.: Sabaspur, P.O.: Murajar, Distt.: Nagaon.
55.	Sri Girindra Das	Vill.: Sundargaon, P.O.: Mailmala, Via- Lumding, Distt.: Nagaon.
56.	Sri Nitai Das	Vill.: Maira Basti, P.O.: Liumding, Dist.: Nagaon.
57.	Md. Abdul Hanan Choudhury	M/S, Digalzar Treding Enterprrie, S/O, Haji L. Malasin Ali, P.O. & Vill.: Digalzar. Distt.: Nagaon.
58.	Md. Asiqur Rahman	Vill.: Trakata, P.O.: Kapasbari, Distt.: Nagaon.
59.	Md. Daulat Khan	D.J.Fish Seed Farm, Vil.: Katahguri, P.O.: Tuktuki, Distt.: Nagaon.
60.	Md. Abdul Kuddas	Joy Joy Fish Seed Production Centre, Vill.: Katahguri, P.O.: Tuktuki, Dist.: Nagaon.
61.	Md. Muktar Hussain	Anand Fish Farm, Vill.: Rowmari, P.O.: Rowmari Beel, Distt.: Nagaon.
62.	Abdul Matlib	P.O. & Vill.: Tuktuki, Distt.: Nagaon.
63.	Md Abdul Gaffar Hatchey	Vill.: Katahguri, P.O.: Tuktuki, Dist.: Nagaon.
64.	Md Abdus Sattar	Vill.: Katahguri, P.O.: Tuktuki, Dist.: Nagaon.
65.	Batadrava Dev. Block Hatchery under DRDA	Batadrava Dev. Block Hatchery under DRDA Vill.: Katahguri, P.O.: Tuktuki, Dist.: Nagaon.
66.	Md. Nijamuddin	Vill.: Katahguri, P.O.: Tuktuki, Dist.: Nagaon.
67.	Md. Rustam Ali	Katahguri Madrasa Hatchery, P.O. & Vill.: Tuktuki, Distt.: Nagaon.
68.	Md. Rafiqul Haque	P.O. & Vill.: Tuktuki, Distt.: Nagaon.
69.	Md. Abdul Kadir	P.O. & Vill.: Tuktuki, Distt.: Nagaon.
70.	Md. Abdul Rashid	Vill.: Katahguri, P.O.: Tuktuki, Dist.: Nagaon.
71.	Md. Rowsan Ali	Vill.: Rowmari, P.O.: Rowmari Beel, Distt.: Nagaon.
72.	Md. Abdul Mutalit	M/S, Milan Seed Farm, Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.
73.	Idrish Ali	Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.
74.	Abdul Rahman	Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.

75.	Abdul Hashim	Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.
76.	Abdul Jabbar	Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.
77.	Md. amser Ali	Vill.: Dighali, P.O.: Rupahi, Distt.: Nagaon.
78.	Abdul Rahman	Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.
79.	Md. Jafar Ali	Vill.: Dighali, P.O.: Rupahi, Distt.: Nagaon.
80.	Md. Asgar Ali	Vill.: Ghehua Chalchali, P.O.: Chalchali, Distt.: Nagaon.
81.	Md. Jabbatul	Vill.: Dakhin Khataul, P.O.: Khataul, Distt.: Nagaon.
82.	Abdul Salam	Rausanara Fish Seed Farm, Vill.: Singia Pajhar, P.O.: Dagaon, Distt.: Nagaon.
83.	Md. Abu Sayeed	Sahin Fish Seed Farm, Vill.: Garaimari, P.O.: Dagaon, Distt.: Nagaon.
84.	Md. Rahul Amin	Saphina Fish Seed Farm, Vill. & P.O.: Dagaon, Distt.: Nagaon.
85.	Md. Jahirul Islam	Nargis Fish Seed Farm, Vill.: Simdu Ali, P.O.: Alitangini, Distt.: Nagaon.
86.	Md. Samsul Afrin	S/O, L.A.Mannan, Vill. & P.O.: Moamari, Distt.: Nagaon.
87.	Md. Hoson Ali	S/O, Khuda Nowaj, Vill. & P.O.: Moamari, Distt.: Nagaon.
88.	Md. Jallal Uddin	S/O, Abdul Mannan, Vill.: Rowmari, P.O.: Salapara, Distt.: Nagaon.
89.	Md. Asraf Ali	S/O, L.Atash Ali, Vill. & P.O.: Hatigusua, Distt.: Nagaon.
90.	Pancharatna Fish Seed Farm under DRDA (Nagaon)	Vill.: Majputani, P.O.: Barhampur, Distt.: Nagaon.
91.	J.B.Garh Fish Farm, Department of Fisheries, Govt. of Assam.	Vill.: Bagariguri, P.O.: Raha, Distt.: Nagaon.
92.	Md. Abdul Zalit Khan	Vill.: Katahguri, P.O.: Tuktuki, Via- Dhing, Distt.: Nagaon.
93.	Md. Innar Ali Khan	Vill.: Katahguri, P.O.: Tuktuki, Via- Dhing, Distt.: Nagaon.
94.	Md. Suraj Ali	Vill.: Katahguri, P.O.: Tuktuki, Via- Dhing, Distt.: Nagaon.
95.	Md. Sirajul Khan	Vill.: Katahguri, P.O.: Tuktuki, Via- Dhing, Distt.: Nagaon.
96.	Md. Moulam Md. Kaynuddin	Vill.: Katahguri, P.O.: Tuktuki, Via- Dhing, Distt.: Nagaon.
97.	Md. Abdul Hekim	Vill.: Katahguri, P.O.: Tuktuki, Via- Dhing, Distt.: Nagaon.
98.	Md. Nur-Zamal Fakir	M/S, Fakir Fish Farm, Vill.: Silpukhuri, P.O.: Dhing, Via- Morigaon.
99.	Md. Ali Akbar	Vill.: Jono Kabori, P.O.: Dhing, Via- Morigaon.
100.	Md. KASIM Ali	Vill.: Behaigur, P.O.: Silpukhuri, Via- Morigaon.
101.	Md. Abdul Qudir	Vill.: Behaigur, P.O.: Silpukhuri, Via- Morigaon.

13. Nalbari District.

Sl. No.	Name	Address
102.	Manohar Burma	Vill.: Dihjari, P.O.: Nankarbhoira, Pin: 781369, Distt.: Nalbari.
103.	Arup Tamuli	Vill.: Tilana, P.O.: Mugkuchi, Distt.: Nalbari.

104.	Debajit Barman	Vill. & P.O.: Nankarbhoitra, Phone: 221194, Distt.: Nalbari.
105.	Sukleswar Brahma	Vill.: Barbhag, P.O.: Khatikuchi, Distt.: Nalbari.
106.	Bisnu Basumatari	Vill.: Madhapur, P.O.: Barama, Distt.: Nalbari.
107.	Lakhi Kalita	Vill.: Madhapur, P.O.: Barama, Distt.: Nalbari.
108.	Sambhu Das	Vill.: Madhapur, P.O.: Barama, Distt.: Nalbari.
109.	Phani Barman	Vill.: Pakhra, P.O.: Solmara, Distt.: Nalbari.
110.	Praneswar Boro	Vill. & P.O.: Masalpur, Distt.: Nalbari.
111.	Dhaneswar	Vill. & P.O.: Masalpur, Distt.: Nalbari.
112.	Jogeswar Daimari	Vill.: Sontala, P.O.: Tamulpur, Distt.: Nalbari.

14. Sibsagar District.

Sl. No.	Name	Address
113.	Sri Janaki Handique	Vill.: Sapekhati, P.O.: Sapekhati, Sub-Div.: Charaideo, Distt.: Sibsagar.
114.	Sri Pradip Phukan	Vill.: Charing Kakoti Gaon, P.O.: Charing, Sub-Div.: Sibsagar, Distt.: Sibsagar.
115.	Sri Syed Abdul Haque	Nazira Amolapatty Sayed Habibur Rahman Path (Near Daily Market), Sub-Div.: Nazira, Distt.: Sibsagar, Pin- 785685, Phone: 03773-251644.

15. Sonitpur District.

Sl. No.	Name	Address
116.	Sri Sidhartha Rajkhowa	S/O, Indeswar Rajkhowa, Vill. & P.O.: Borangabari, Distt.: Sonitpur.
117.	Dr. Hemen Dutta	S/O, L. Lakhiprasad Dutta, Vill. & P.O.: Pabhoi, Biswanath Chariali, Distt.: Sonitpur.
118.	Sri Biren Bhagawati	S/O, Bholanath, Pabhoi Fish Farm, Vill. & P.O.: Pabhoi, Biswanath Chariali, Distt.: Sonitpur. Phone: 222256.
119.	Sri Keshab Narayan Chetri	S/O, L. Dalbahadur Chetri, Vill.: Jorabari, P.O.: Jamugurihati, Distt.: Sonitpur.
120.	Sri rajiv Hazarika (President)	Sonitpur District Eco-Hatchery Management Samittee, Vill.: Barbhagaia, P.O.: Jamugurihat. Distt.: Sonitpur.
121.	Sri Milan Chandra Bhuyan (Secretary)	Tarajan Fishery Co-operative Society (Fish Farmers), S/O- Late Rasadhar, Vill. & P.O.: Keherukhanda, Dhekiajuli, Tezpur.
122.	Sri Babul Das	S/O, Sri Jiten Das, Vill.: Dhekiajuli Weekly Market, P.O.: Dhekiajuli, Distt.: Sonitpur.
123.	Sri Sapan Neog	S/O- Sri Suren Neog, Vill. & P.O.: Dipota, Distt.: Sonitpur.
124.	Sri Bhairab Doimari	S/O- L. M. Doimari, Vill.: Nalbari, P.O.: Kacharison, Distt.: Sonitpur.

16. Tinsukia District.

Sl. No.	Name	Address
125.	Sri Krishna Chakraborty (Lohit Fishery)	Makum Road, Tinsukia, P.O.: Tinsukia, Distt.: Tinsukia.
126.	DRDA Tinsukia	P.O.: Tinsukia, Pin: 786125, Distt.: Tinsukia.

(Source : College of Fisheries, Assam Agricultural University, Raha, Nagaon, Assam, India-782103)