

Fisheries Development in Bihar: An Action Plan



INDIAN COUNCIL OF AGRICULTURAL RESEARCH
New Delhi – 110 001

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1. Introduction

Despite abundant aquatic resources in terms of about 3,200 km of rivers, 100,000 hectares *chaurs* and floodplain wetlands, 9,000 hectares of oxbow lakes or *mauns*, 7,200 hectares of reservoirs and 69,000 hectares of ponds and tanks, fish supply is short of demand in the State of Bihar. Development of the resources with the adoption of the available technologies can bridge this gap, by at least doubling the production from the present level of 2.6 lakh tonnes.

Aquaculture and culture-based fisheries are the options for enhancing the productivity of more amenable waters such as ponds and the oxbow lakes (*mauns*) with immediate results. An analysis of the constraints brings out the inadequate availability of quality fish seed in terms of carp fingerlings as a major problem. The present fish production of 350 million fry would need to be tripled to cater to the seed requirements for doubling the fish production. Further, the weed infestations and silt accumulation in these waters, the latter due to frequent floods in northern Bihar, are the other concerns. Feed requirement in aquaculture has never been addressed in the past and would become an important ingredient for enhancing fish production from culture practices. Both the water resources and the high first sale price of fish in the State allow for increasing productivity in these waters, without reducing the profit margins. At the same time, it is essential to build the market linkages and infrastructure for fish marketing in terms of customised cold chains to reach fish to different parts of the State and beyond. In Bihar, fish culture is largely undertaken in waters given on lease basis and practised by fishers who were basically catching fish from rivers and lakes. In view of the fact that more and more agri-farmers are taking to aquaculture in the recent years, capacity building is critical for adoption of practices in a scientific manner.

While fisheries development is being undertaken in different water bodies with components of incentives for seed and other inputs, the meeting taken by the Chief Minister at Patna on 29th December, 2007 desired an Action plan for enhancing fish production in the State to about 4.5 lakh tonnes within a time frame of 4-5 years. The present document is a road map for increasing fish production in two of the resources, *viz.*, Ponds and *Mauns*. It takes into account the resources available in different Districts and the mapping that has been done for water bodies above 0.5 hectare in each and every Block of the State (Annexure-I). Major interventions proposed are clearance of weed infestations, renovation of ponds and desilting (with linkages with NREGP), establishment of brood banks and hatcheries to enhance seed production three-fold, provision of seed rearing space with buy-back arrangements, long-term leasing of water bodies, ensuring proper stocking of ponds with 6,000 fingerlings/ha and *mauns* at 2,000/ha, provision of post-harvest fish handling and marketing facilities.

2. Ponds

An estimate of District-wise pond resource in the State is given in Table 1. It is further suggested that the pond area is enhanced by 10,000 hectares every year, both for water harvesting and fish culture, in conjunction with schemes like NREGP.

Table 1. District-wise spread of ponds in Bihar

District	Pond area, hectares
Gopalganj	998
Siwan	948
Chapra	812
Vaishali	871
Muzaffarpur	1822
East Champaran	9153
West Champaran	4003
Sitamarhi	2000
Madhubani	3743
Darbhanga	3036
Samastipur	1386
Begusarai	1033
Saharsa	1057
Madhepura	1508
Purnea	3447
Katihar	4176
Bhagalpur	918
Munger	3163
Khagaria	4640
Sahebganj	1609
Patna	2176
Bhojpur	1096
Rohtas	925
Gaya	2758
Aurangabad	3511
Nawada	3184
Nalanda	3467

(Source: Department of Fisheries, Govt. of Bihar)

The present mean fish productivity in FFDA ponds in the State is about 2.2 tonnes/ha/year. Addressing 50,000 hectares of pond area for development on a mission mode, it is proposed to enhance the productivity to 3 tonnes/ha/year in 30,000 ha and 5 tonnes/ha/year in 20,000 ha area. Carps being the mainstay of pond culture, Indian major carps are suggested to be employed, along with Chinese carps wherever required, also

considering the prevailing market rates of up to Rs. 100/- per kg for the former and about Rs. 50/- per kg for the latter. The consumer preference in the State is mainly for the three Indian major carps, viz., Rohu (*Labeo rohita*), followed by Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*), Common carp (*Cyprinus carpio*), Grass carp (*Ctenopharyngodon idella*) and Silver carp (*Hypophthalmichthys molitrix*).

Carp polyculture is undertaken with the standard practices of liming, stocking with fish fingerlings (varied proportions of catla, rohu and mrigal depending on the market preference and the seed availability along with common carp and grass carp to the levels of 15-20%), manuring with cowdung at 10-15 tonnes/ha/year, application of urea at the rate of 200 kg/ha/year and single superphosphate at the rate of 300 kg/ha/year, applied at fortnightly doses, provision of supplementary feed comprising mixtures of rice/wheat bran and groundnut/mustard oilcakes daily and pond bund and water quality checks at regular intervals. With monthly monitoring of growth rates, fish harvest could be initiated after six months of culture for culling fish of over 600 g and completed in 8-10 months of culture period. Carp culture can also be taken up through integrated farming along with 500-600 poultry birds, 200-300 ducks or 30-40 pigs per hectare. The details of requirements of seed and feed for carp culture with production targets of 3 t/ha/year and 5 t/ha/year are presented in Table 2.

Table 2. Input requirements for enhancing productivity in ponds

	Yield rates		Total
	3 t/ha/year	5 t/ha/year	
Proposed area to be brought under culture, hectares	30,000	20,000	50,000
Envisaged annual fish production, tonnes	90,000	100,000	190,000
Stocking density, fingerlings/ha (@ 800 g harvest size and 80% survival)	5,000	8,000	
Annual fingerling requirement, lakhs	1,500	1,600	3,100
Annual fry requirement (@ 50% survival from fry to fingerling), lakhs	3,000	3,200	6,200
Annual spawn requirement (@ 30% survival from spawn to fry), lakhs	10,000	10,700	20,700
Feed requirement, tonnes/hectare (FCR – 1.2:1 for 3 t/ha/yr and 1.5:1 for 5 t/ha/yr)	3.6	7.5	
Annual feed requirement, tonnes	108,000	150,000	258,000
Annual input costs (including lease amount, costs of seed, feed, fertilizers, wages, etc.), Rs./ha	95,000	150,000	
Annual value of fish produced (@ Rs. 50,000/t at farm gate), Rs./ha	150,000	250,000	
Net returns, Rs./ha/year	55,000	100,000	
Annual input costs, Rs. in crore	285	300	585
Annual value of fish produced, Rs. in crore	450	500	950

3. *Mauns*

Mauns or Ox-bow lakes, which are the cutoff portions of river meanders, form an important fishery resource in Bihar, with annual fish yield potentials ranging from 1,500 to 2,000 kg/ha. The distribution of *mauns* in different Districts of the State proposed for development is given in Table 3. Apart from directly providing fishing grounds, the oxbow lakes of Bihar also facilitate auto-stocking of riverine fish due to their connectivity to rivers. However, currently these water bodies are in various stages of eutrophication, on account of natural and anthropogenic factors, as evidenced by the presence of thick stands of macrophytes (3 to 20 kg/m²). Most of the lakes also remain unconnected to rivers as the connecting channels have become non-functional. Construction/repair of inlet and outlet channels would be essential to restore connectivity of oxbow lakes with rivers.

Table 3. District-wise spread of *mauns* in Bihar proposed for development

Sl. No.	District	Number and area of <i>mauns</i> in different area ranges							
		10-50 ha		50-100 ha		100-500 ha		Total Number	Total Area (ha)
		Number	Area (ha)	Number	Area (ha)	Number	Area (ha)		
1	Katihar	21	507	3	212	1	156	25	875
2	East Champaran	10	276	8	586	7	1130	25	1992
3	Muzaffarpur	21	436	3	185	0	0	24	621
4	Samastipur	4	143	1	98	3	702	8	943
5	West Champaran	3	83	1	52	2	626	6	761
		59	1445	16	1133	13	2614	88	5192

(Source: CIFRI, Barrackpore)

The essential pre-requisites to develop this resource are restoration of the ecosystem by clearing weeds, restoring riverine connectivity wherever needed and feasible, adopting fisheries enhancement strategies and tools to enhance fish yields. By weed clearance, stocking and adoption of cage/pen culture technologies, the fish yields from Oxbow lakes of Bihar can be increased up to 1,000 kg/ha, from the current level of 160 kg/ha. In the first phase, 5,000 hectares of ox-bow lakes may be developed with weed clearance/desiltation and restoration of inlets and outlets, stocking with quality fish seed and cage/pen culture in selected areas of the *mauns*. It is suggested that the weed clearance and desiltation work is undertaken under the ongoing schemes such as the NREGP or special provisions are made for the purpose.

The suggested rate of stocking fish seed in these waters is 2,000 advanced fingerlings (5" to 6") per hectare, with a species mix of catla, rohu, mrigal and grass carp of 30%, 30%, 30% and 10% respectively, that could be varied depending on market preferences and seed availability. Considering that 10 million advanced fingerlings will be required to stock 5,000 ha of oxbow lakes, it is suggested that they are produced *in situ* in pens or cages set up in the

lakes. The number and size of the cage/pen units would vary depending upon the quantity of stocking materials to be raised to stock the oxbow lakes concerned or a cluster of them in the vicinity. The seed rearing in pens involves construction of pen structure and its installation, de-weeding and liming of pen area, stocking of fish fry @ 10 lakh per ha and maintenance for a grow-out period of 60 days to attain the desired size of stocking materials. The proposed model for a unit area of 100 ha of *mauns* and the seed production units in terms of pens for the purpose is presented in Tables 4 and 5.

Table 4. Proposed model for a unit area of 100 ha of *mauns*

	Cost per hectare, Rs.	Total cost, Rs.
A. Initial expenditure		
Weed clearance (30% of the surface area)	10,000	300,000
Desilting (20% of area)	30,000	600,000
Sub Total A		900,000
B. Recurring		
Lease rent	4,000	400,000
Stocking @ 2,000/ha); Fingerlings will be raised from 4 pens each of size 0.1 ha, with details given in Table 5	11,700/- x 4	46,800
Sub Total B		446,800
C. Fixed cost		
Sluice gate (inlet and outlet)	100,000/gate	200,000
Boat, 2 nos, (15' OAL) for management	25,000/boat	50,000
Pens, 4 nos.	25,000/pen	100,000
Nets, 20 units	10,000/unit	200,000
Sub Total C		550,000
Grand Total (A+B+C)		1,896,800
Returns: Fish harvest @ 80% survival and mean individual weight of 600 g	960 kg/ha/year; 96 tonnes for the unit area of 100 ha; @ Rs. 50,000/tonne = Rs. 4,800,000	

Net Return during a period of three years

1 st year:	Expenditure:	Rs. 1,896,800
	Gross Return:	Rs. 4,800,000
	Net Return	Rs. 2,903,200
2 nd year:	Expenditure:	Rs. 801,800 (Rec. costs, weed clearance, desilting and 10% depreciation of fixed costs)
	Gross Return:	Rs. 4,800,000
	Net Return	Rs. 3,998,200

3rd year:

Expenditure:	Rs. 801,800 (Rec. costs, weed clearance, desilting and 10% depreciation of fixed costs)
Gross Return:	Rs. 4,800,000
Net Return	Rs. 3,998,200

Table 5. Seed raising in pens in *mauns* with a unit area of 0.1 ha to produce 50,000 fingerlings in one cycle

	Unit cost, Rs.	Total cost, Rs.
A. Initial expenditure		
Bamboo, 125 nos.	80/pc	10,000
Velon screen net, 600 m	10/m	6,000
Black paint, 20 lt	100/lt	2,000
Nylon thread, 20 kg	100/kg	2,000
Labour for construction, 50 mandays	100/manday	5,000
Sub Total A		25,000
B. Recurring		
Seed, 100,000 fry	80/1000 fry	8,000
Feed, @ 1% of body weight		3,200
Medicine, etc.		500
Sub Total B		11,700
Grand Total (A+B)		36,700

Each pen would yield 50,000 fingerlings. 200,000 fingerlings from a set of four pens in once cycle are adequate for stocking 100 ha of *mauns*. As the life of pen enclosure is three years, there would be no costs on the pens during the second and the third year.

Mauns, being common property resources, are better managed under a co-management regime through participation of all stakeholders including the fishers, community organizations and the Government agencies. Participation of the Government will ensure compliance with national policies and norms of environmental sustainability and equity. Right to erect pen enclosures can be leased out to individuals, if found necessary and feasible. However, outright auctioning of lakes to individuals needs to be discouraged in order to ensure that the fruits of higher productivity achieved through development initiatives are shared equitably by the fishers, who constitute the main stakeholders. As poor governance and institutional arrangements have been identified as one of the major retardants to oxbow lake productivity, this needs to be addressed on a priority basis.

4. Support systems on a PPP mode

From the above account on development of 50,000 hectares of ponds and 5,000 hectares of *mauns*, it is evident that there are three critical aspects that need to be addressed, viz., (i) provision of quality seed; (ii) cost-effective supplementary feed; and (iii) market infrastructure for enhancing productivity as well as ensure profitability. It is suggested that

the Government takes up these support systems on a public-private partnership mode, may be with initial establishment of facilities and leasing them to the private sector/fishermen cooperatives/Self Help Groups.

4.1 Brood banks

The total annual carp fry requirement for developing the ponds and *mauns* as indicated above works out to 64 crore fry, apart from the need for other culture practices presently going on in the State. Considering the market preferences for different species of carps in the State, the following seed production plan is suggested to cater to the new plan of development of ponds and the *mauns* (Table 6):

Table 6. Projected plan for carp seed production

Species	% of total	Quantity of seed, crore			Quantity of broodstock, tonnes	
		Fingerlings	Fry	Spawn	Female	Male
Catla	30	9.6	19.2	63.4	12.7	12.7
Rohu	30	9.6	19.2	63.4	12.7	12.7
Mrigal	20	6.4	12.8	42.2	8.5	8.5
Grass carp	10	3.2	6.4	21.2	4.3	4.3
Common carp	8	2.6	5.2	17.2	3.4	3.4
Silver carp	2	0.6	1.2	3.6	0.9	0.9
Total	100	32	64	211	42.5	42.5

* Assuming spawn production of 50,000/kg body weight of female fish

As indicated above, in order to meet the fry requirements for aquaculture in ponds and *mauns*, about 100 seed production units, including a hatchery, are required to be set up in different parts of the State. These may be located in the fish seed farms of the Government of Bihar and those of the farmers. The hatcheries could be the portable fibreglass reinforced plastic (FRP) units, comprising one spawning pool and four hatching pools, available at a cost of about Rs. 1.5 lakh per unit. For the seed production unit, pond facilities for keeping the broodstock and the spawn would be required (to an extent of one hectare for 3-4 brooder ponds and nursery ponds) and the investment in each unit for a breeding season would be in the order of Rs. 3 lakhs. This can produce about two crore spawn in 20 cycles during the breeding season. It is suggested that about 0.8 crore spawn is reared to fry stage in the seed production unit and the rest is distributed to farmers in the area, for rearing, with a buy-back arrangement. This practice is becoming common in several parts of the country including Bihar. The economics of the seed production units with only spawn production and both spawn and fry production are presented in Tables 7 and 8.

Table 7. Unit Cost for Seed Production Centre (Only spawn production)

(Rs. in lakhs)

Particulars	Amount
A. Non-recurring	
Hatchery Unit (1.5 Lakh/Unit)	1.50
Water pumps (1nos)	0.25
Net and Hapa	0.50
Brood holding pond (0.6ha)	0.90
Sub Total A	3.15
B. Recurring	
Procurement of raised brood (800 kg)	0.80
Feed and fertilizer	0.25
Hormone and chemicals	0.10
Wages	0.10
Miscellaneous	0.05
Sub Total B	1.30
Total	4.45

Income	Rs. in lakh
From sale of Spawn 2 crore @Rs.500/- per lakh	Rs 1.00
From sale of spent brood fish (@80/- per kg)	Rs. 0.64
Total Income (Rs)	Rs. 1.64
Recurring Expenses (-)	Rs. 1.30
Net Profit	Rs. 0.34 (3 months)

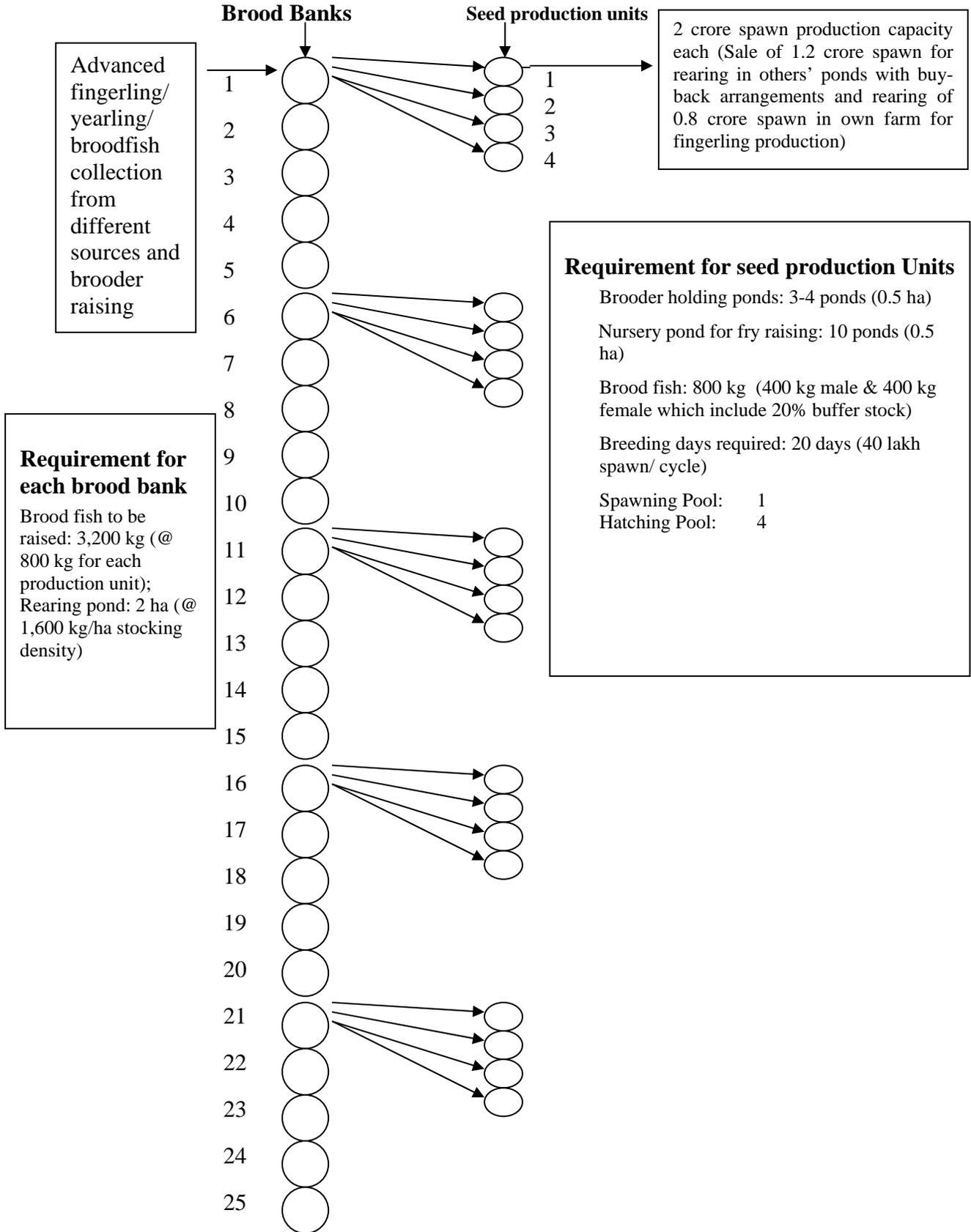
Table 8. Unit Cost for Seed Production Centre (spawn 1.6 crore and 0.12 crore fry production)

(Rs. in lakhs)	
Particulars	Amount
A. Non-recurring	
Hatchery unit (1.5 Lakh/Unit)	1.50
Water pumps (1nos)	0.25
Nets and hapas	0.50
Brood holding pond (0.6ha)	0.90
Nursery pond 1ha (@Rs.1.5 Lakh/ha)	1.50
Sub Total A	4.65
B. Recurring	
Procurement of raised brood	0.80
Feed and fertilizer	0.35
Hormone and chemicals	0.10
Wages	0.15
Miscellaneous	0.10
Sub Total B	1.50
Total	6.15

Income	Rs. in lakh
From sale of 1.6 crore spawn @Rs.500/- per lakh	Rs 0.80
From sale of 0.12 crore fry @Rs.100/- per thousand	Rs 1.20
From sale of spent brood fish (@80/- per kg)	Rs. 0.64
Total (spawn, fry and fish)	Rs. 2.64
Recurring Expenses (-)	Rs. 1.50
Net Profit	Rs. 1.14 (5 months)

A critical input for the hatcheries is the quality broodstock of carps. The Government can play a key role in provision of broodstock to the hatcheries in terms of its collection and maintenance. A schematic representation of the brood banks and seed production units is given in Fig. 1. It is suggested that 25 brood banks are set up in the potential areas of seed production, with provisions for transport of broodstock, prior to the breeding season. The bank could collect riverine fish stocks or procure from other farms. Each brood bank would maintain about 3 tonnes of broodstock that would suffice for four seed production units.

Fig. 1. Schematic Representation of Brood Bank and Seed Production Centres



Facilities like electricity, road and water will be needed to be provided. The unit cost of establishment and operation of brood banks works out to about Rs. 5.05 lakh per bank, as given in Table 9.

Table 9. Unit cost for Brood bank

(Rs. in lakhs)	
Particulars	Total
A. Non-recurring	
Excavation of pond with 2 m depth (@Rs 1.5 lakh/ha) for 2 ha	3.00*
Water pumps (1 no.)	0.25
Nets and hapas	0.50
Sub Total A	3.75
B. Recurring	
Cost of seed	0.10
Feed and fertilizer	0.50
POL	0.10
Wages	0.50
Miscellaneous	0.10
Sub Total B	1.30
Total	5.05

*If not available in the unit

Income	Rs. in lakh
From sale of brood fish 3200 kg (@Rs.100/- per kg)	Rs. 3.20
Recurring Expenses (-)	Rs. 1.30
Net Profit	Rs. 1.90 (18 months)

4.2 Feed production units

The annual requirement of supplementary feed for aquaculture in ponds and seed rearing in *mauns* as indicated above is about 3 lakh tonnes. The main ingredients are mostly rice bran or wheat bran, groundnut or mustard oilcake. While ready formulated fish feeds are available from private manufactures from other States, animal and fish feed manufacturers could be invited to establish fish feed plants in two places in the State.

Efforts would be required at assessment and collection of agro-by products such as brans and oilcakes, for providing ready access to fish farmers. It is suggested that the feed outlets are established at the seed production units, from where the farmers could draw both the seed and feed. Customised feed mill designs are available at a cost of around Rs. 8 lakh, for producing about 100 kg feed in a day (about eight hours). This would suffice for a cluster of about 10 hectares, without adding much to the overhead costs. On a pilot basis, 50 units could be set up near the respective District Headquarters. On-farm preparation of feed

mixture is a common practice in other States, that could be propagated with some training in storing of feed ingredients, mixing and dispensing in gunny bags or trays in the ponds.

4.3 Post harvest and marketing infrastructure

Consumer preference for fish is in the form of fresh fish in most parts of the State and fish commands a high price as compared to other States. Hence, the emphasis would need to be laid on speedy transfer of fish from production to consumption centres, without adding much to the costs. Good roads have been emphasised as a necessity for the purpose, as in the case of other agricultural commodities.

With almost uniform demand for fish across the State, it is necessary to build cold chains from those places where fish production is expected to increase by several folds in the coming years, for linking to major markets. Possibilities of sending fish outside Bihar from bordering Districts to neighbouring States like West Bengal and Orissa may be explored. Simple cold chains, with tricycle rickshaw as developed by ICAR (Fig. 2) to carry about 80 kg fish to a distance of 30 km, would be suitable for production centres in rural areas.

Fig. 2. Tricycle rickshaw designed for short cold chain

In places where around a tonne of fish is expected every month either from *mauns* or from ponds, it is suggested that collection centres are set up and fish transported over a distance of 150-200 km, packed in bamboo basket or PVC boxes, in four wheelers such as mini-trucks. A model for handling fish landing to the extent of 10,000 tonnes/year is given below.

The model envisages setting up common collection centres and transportation of the collected fish in chilled condition to 30 retail centres for sale. There will be adequate facility for storing the chilled fish, display of the chilled fish and sale. The basic infrastructure required for a fish collection centre is transportation and chilled storage. The transportation component comprises five insulated vehicles, either three wheelers or four wheelers with insulated cabin capacity of 250-500 kg. The insulated vehicles shall bring ice and transport chilled fish (iced) from landing centre to the collection centre. Alternatively, there can be two insulated vehicles with higher capacity (2 tonnes) depending on the extent of area to be covered.

The Collection centre (Fig. 3) will have facilities for producing ice (10 tonnes per day), ice storage (2.5 tonnes), insulated storage (5 tonnes), fish display area (500 sq. ft), change room, store for insulated boxes, etc., along with water purification and effluent treatment provisions. Alternatively, fishes collected can be chilled to ensure better shelf life for the chilled fish as well as additional income for the fishers.

Fig. 3. Layout of fish collection centre

D - Door
CD - Chute Door
W - Window
ETP - Efficient Treatment Tank
WPS - Water Purification System

The Retail centre (Fig. 4) will consist of a kiosk of 80 sq. ft. built in area with an insulated display box, which can display fish in chilled condition to the consumers. There will also be provision for a soak-pit to sanitarily dispose the waste water generated in the retail centre. Each retail centre will be costing around Rs.60,000/-. Thirty such retail centres are planned in selected locations for selling the riverine fish received in the Collection centre. The budget for the model is given in Table 10.

Fig. 4. Layout of fish retail kiosk

Table 10. Budget for a Collection centre and 30 retail centres to handle 10,000 tonnes fish per year

Item	Cost, Rs.
Transportation facility	800,000
Collection Centre: 1,500 sq. ft. building, Ice Unit, Water purification system, Effluent treatment plant	4,800,000
Retail Centre (30 nos.)	1,800,000
Others	200,000
Total	7,600,000

5. Framework for action plan

A step-wise framework for implementation of the action plan for development of ponds and *mauns* is given in Table 11.

Table 11. Framework for implementation of action plan

A. Fish productivity enhancement

Sl. No.	Resource	Target productivity	Area, ha	Output, tonnes/year
1	Ponds	3 t/ha/year	30,000	90,000
	Ponds	5 t/ha/year	20,000	100,000
2	<i>Mauns</i>	960 kg/ha/year	5,000	4,800

B. Steps proposed for action plan

Sl. No.	Steps	Agency	Time frame	App. budget (Rs. crore)* for the first year
1. Ponds				
a	Leasing; Renovation (Provision: Rs. 60,000/ha for renovation; 80% from banks and 20% subsidy = Rs. 60 crore for 50,000 ha; @ 25% with 75% from Central funds or 10% and 90% from NFDB)	Government; Farmers (with FFDA / assistance from NFDB)	June, 2008	25.0 (including contingencies)
b	Seed stocking and culture operations (Provision: Rs. 30,000/ha for inputs: 80% from banks and 20% subsidy = Rs. 30 crore for 50,000 ha; @ 25% with 75% from Central funds or 10% and 90% from NFDB)	Farmer groups (with FFDA/assistance from NFDB)	2 phases: Aug.-Sep. 2008; Aug.-Sep. 2009	

* With implementation under the existing Central Sector Schemes, contribution of the State Government towards subsidy component is indicated

2. Mauns				
a	Desilting, weed clearance, sluice gates & organizing lessees	Government; Farmer groups (with funds from RKVY)	2 phases: Through 2008 (I in <i>mauns</i> with ongoing activities and II in new <i>mauns</i>)	10.0 (including contingencies)
b	Setting up pens	Farmer groups	After Sep. 2008	
c	Seed stocking and culture operations	Farmer groups	2 phases: Aug.-Sep. 2008; Aug.-Sep. 2009	
3. Brood banks				
a	Setting up brood banks (25)	Government; in the existing farms and leasing out to entrepreneurs)	2 phases: 2008 and 2009	10.0 (including contingencies)
b	Setting up seed production units (100)	Government; in the existing farms and leasing out to entrepreneurs)	2 phases: 2008 and 2009	
4. Feed production units				
a	Community feed units (50)	Government; leasing out to entrepreneurs	Through 2008	5.0 (including contingencies)
b	Feed mills in private sector (2)	Facilitation by Government	Through 2008	
5. Post-harvest infrastructure				
a	Collection centres (4) and transportation arrangements	Government; leasing out to entrepreneurs	Through 2008	6.0 (including contingencies)
b	Tricycle rickshaws for fish transport (50 nos. @ Rs. 20,000 each); 5 ice plants; containers for transport	Government; leasing out to entrepreneurs	Through 2008	
6. Laboratory				
a	Laboratory for soil-water testing and fish diseases	Government (with funds from Central Government with FFDA)	Through 2008	
7. Capacity building				
a	Training of officers of the State Fisheries Department and farmers	Government (with funds from Central Government with NFDB and FFDA)	Continuous process through 2008-2010	

The document provides a framework for fisheries development in Bihar with specific references to ponds and *mauns*, beginning with seed up to retail outlets. Some of the components could be addressed through the ongoing schemes, while in others, appropriate mechanisms including public-private partnerships would need to be put in place. The role of the Government could be facilitatory, with setting up models in different areas and the staff of the Department of Fisheries assigned the work. If the area, approach and action line indicated are agreed in principle, then an early meeting be convened for finalization of the document and drawing of an implementable schedule of operation in a Mission mode including identification of agencies and schemes, on-course correction measures, output, outcome and impact.