

# Project Report of

## Aquaculture for nutrition and supplementary income for the rural poor in Sundarban, West Bengal, India

(January 2008 to December 2009)

July, 2010



**Supported by:**

Aquaculture without Frontiers (AwF)

Toleo Foundation, USA

(Co-finance by Indian Group Funen [IGF], Denmark)

**Implemented by:**

Joygopalpur Gram Vikash Kendra

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**Implemented by:**

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**Puti ( Barbs)**



**Puti, Morala & Ban (Barbs, eels, mola carplet)**



**Mola (Mola carplet)**



**Koi (Climbing perch)**



**Ban (eel)**

***These are indigenous Small fishes targeted for conservation***



**Tangra ( gangetic mystus)**



**Chanda ( Indian glass fish)**



**Sar Puti Indian swamp barb)**



**Mola (Mola carplet)**

***These are indigenous Small fishes targeted for conservation***



# Summary of the Report

## Context and Background

1. Over 50 % of (2001) Sundarbans population was living below poverty line. The proportion was more in Jaygopalpur and its surrounding villages of Basanti block, South 24 parganas district of west Bengal State, India. Here rural poverty was associated with limited access to land and livestock, poor education and health care, as also well paid occupations and social status. The rural poor here tend to depend on agricultural wages or casual non-farm jobs for income.

2. Joygopalpur Gram Vikas Kendra (JGVK) was set up in 2001 by few local youth to address the problems of local backwardness. During the initial six years JGVK devoted to promote and support rural development in the region with agriculture, animal husbandry, cottage industries and related activities. The region is full of water pond. Each poor household has at least one pond. However, the production and productivity of fish was low. This was due to : (i) poor capacity of the farmers in terms of scientific pisciculture (ii) lack of supply of good quality fingerlings. On the other hand, in the local area there is a high demand of fish.

3. During 2005-06, JGVK's study also shows that, different species of sweet water fish used to available fifteen – twenty years ago are rarely found now. This is due to (i) impact of excessive use of chemical fertilizers, pesticides and insecticides in the paddy and vegetable cultivation in the last two three decades. As the chemical laden water reaches the pond and pollute the water and damage, destroy the fish, (ii) in addition, unhealthy water quality and environmental condition of pond and lack of scientific knowledge in fish farming by the local people (iii) Maximum use of pond water for irrigation and the local practice is to draw all water from the pond in February March and then get refilled in the next monsoon (around July- August). Due to this practice many indigenous varieties of fish are lost as few of the adults survived.

## Pilot initiative “Community-University Alliance”

4. Based on the above analysis, a “**Community-University Alliance**” was established in 2006 among the JGVK (who are working with local community), Bangladesh Agricultural University and University of Copenhagen, Denmark. **The Alliance took as Pilot experimental** initiative ‘the role of fish on food and nutrition security in developing countries with a focus on combating micronutrient deficiency’. With support from DANIDA, the Pilot initiative developed, demonstrated and disseminated a rural aquaculture technology of integrated pond poly-culture of carp species, prawn and a small indigenous fish species, mola or morala (*Amblypharynx mola*). Experts from these two universities were actively involve and provided relevant orientation and training of JGVK staff, 33 farmers on basic pond management and monitoring the management, feeding and production performance for six months during 2007.

## The Project

5. Based on the encouraging result of pilot project, JGVK develop a two year partnership with Aquaculture without Frontiers (AwF) supported by Toleo

Foundation, USA with co-finance by Indian Group Funen (IGF), Denmark. The **goal** of the project was to alleviate poverty in the project area through expanded aquaculture production among the poor farmers. The specific **objectives** of the project are to : (i) improve the capacity of 10 JGVK staff and 100 beneficiaries (poor local farmers) for optimizing the pond management of semi-intensive integrated carp-mola ponds to reach a production of 3-4 ton per hectare (ii) establish a small local hatchery to secure local availability of quality carp fingerlings. (iii) secure supply of fingerlings to the local consumers through a number of local fish farmers. The project area covers 20 villages.

### **Project Accomplishments:**

6. JGVK staff was trained on hatching, fish Juvenile nursing, brooder fish management, pond preparation by Dr. Mritunjay Kundu, Bangladesh Agricultural University, Dr. M.C. Nandeesha, Fisheries Adviser, Centre for Aquaculture Research and Development, Bishramgunj, Tripura and local experts. On site support (hatching and related area) also provided by Dr. Nandeesha and his team. Based on this training, JGVK staff organized orientation, trainings of local farmers.

7. **Twenty Eight farmers were specially trained on fish, Juvenile nursery, preparation of their pond for nursery. Another seventy two farmers have been trained on pond preparation,** fish Juvenile nursing, organic feed preparation and feeding, pond management, marketing etc. All of them are now involve in fish farming.

8.(i) **Mass awareness are conducted in the project area** through padyayatra by the SHG members, children (students). The basic focus was to preservation of small local fishes, better management of pond, scientific farming (ii) **Number of awareness posters were developed** and used in the rally (iii) **A manual was prepared in Bengali and disseminated among the local people, farmers,** (iv) **The trained farmers has mobilize with ten fishermen group, women members of self help group (SHG's) also involve. Ten such groups were formed and supported.**

9. **Small hatchery was set up with guidance and support from expert like Dr. Nandeesha and his team. The production started from 2008.** The formal inauguration took place in early 2009. Total renu spawn production from the hatchery was 303,396,418 batis (one bati contain 30,000 fish spawn (fish Pollen) of 72 horus) respectively during year 2008, 2009, 2010.

10. **Accomplishments also include** (i) local availability of good quality fish Juveniles (spawn) from hatchery (ii) growing fish production in the area. Poor farmers earn money by selling fingerlings, fries and fish (iii) nutrient deficient poor farmers family also consume more fish, (iv) JGVK campus developed as a training, demonstration cum production centre.

11. **There are many success stories which demonstrate the local poor farmers' ability to learn and practice scientific fish farming, strong potential and provide lessons for other regions. The case studies shows** (i) spread of fish farming, fish nursery and fish production in recent years (ii) availability of good quality renu pone (Spawn) form the new hatchery (iii) orientation, training and onsite

support on better pond management, fish farming are available from JGVK. (iv) The area having potential for more indigenous fish farming.

#### **Cost Benefit:**

12. Nursery fish farming undertaken by 28 poor farmers after systematic training orientation at JGVK (from JGVK staff and outside experts) **The cost benefit analysis of 11 nursery farmers** shown that on average they are getting Rs. 3000-4000 as net income within 25-30 days. In addition, they keep some fish to grow and sale these fish with a weight of 600-800 grams after 6-7 months. It is also interesting to observe that (i) all the farmers regular apply fertilizer, fed in the pond and observe the advice given by the JGVK staff, (ii) regular onsite guidance and advice from JGVK also contribute for better practice.

13. **The infrastructure facilities created through the project has help the poor pond owners from the surrounding area to encourage for better fish farming** with technical support, guidance as well as quality inputs from JGVK. Through the project **women are also mobilized and take care of their pond. They become more confident** as their effort help to supplement family income.

#### **Challenges:**

14. The project went well. Problem arises in the second year, Aila Cyclone (May 25th 2009) has inundated the large number of pond with saline water, thus reducing the demand for fish juveniles. Some nursery farmers also lost their fish. The problem continued for few months. Then farmers with support from JGVK and advice from expert clean their pond and started fish farming again. The year 2010 showed a growing demand from the farmers.

#### **Follow-up**

15. After December' 2009, the activities are going on in 2010 with the technical support of AwF and IGF support. JGVK also work with 100 trained farmers who have stocked fish.

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**Bata**



**Kalbose**



**Catla**



**Silvercarp**

**Production of fish varieties by the trained farmers**

# 1. Context and Background

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1.1 During the initial six years, Joygopalpur Gram Vikas Kendra (JGVK) devoted to promote and support rural developments in the Sundarbans region through agriculture, animal husbandry, cottage industries and related activities. The region; Basanti, Canning-I, Canning-II and other blocks of JGVK's working area are full of water pond. Each household has at least one pond. However, the production and productivity of fish is low. This, as per analysis of JGVK's due to : (i) poor capacity of the farmers in terms of scientific pisciculture and (ii) lack of supply of good quality fingerlings. On the other hand, in the local area there is a high demand of fish.

1.2 People of Sundarban are mostly non-vegetarian and the main source of protein intake is from fish. There are two sources of fish at Sundarban i.e. from saline water and sweet water fish. Sweet water fishes are from two sources: (i) shallow water bodies and (ii) ponds, rivers and ditches. In recent years, it was observed that the different species of sweet water fish used to available fifteen-twenty years ago are rarely found now. This is partly due to: (i) impact of excessive use of chemical fertilizers, pesticides and insecticides in the paddy and vegetable cultivation in the last two-three decades. The chemical laden water reaches the pond and pollute the water and damage, destroy the fish (ii) in additions, unhealthy water quality, poor environmental condition of pond and little scientific knowledge in fish rearing by the local people (iii) maximum use of pond water for irrigation and the normal practice is to lift all water from the pond in February – March. Then get refilled in the next monsoon (around August). Due to this practice many indigenous varieties of fish are lost as few of the adults survived (iv) intensive and wrong measures of catching and selling of fingerlings primarily of shrimp, prawn had led to decrease of fingerlings of the small fish variety.

1.3 These are the factors responsible for disappearance of about 150-200 Small Indigenous Species (SIS) from the area.

1.4 Therefore, fish being an appropriate source of protein in the local area, fishery possesses a high potential for development in the region. However, till early 2006, JGVK was not initiated any intervention for fishery based development.

## 2. Past Initiative – A pilot project

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2.1 Based on the above analysis, in 2006, in collaboration with Bangladesh Agriculture University and University of Copenhagen, Denmark, JGVK initiated a small experimental aquaculture programme. The activities were a sub-component of a research project in Bangladesh (Research and capacity building project “the role of fish on food and nutrition security in developing countries focus on combating micronutrient deficiency”. Supported by Danida, Denmark) aimed to develop and disseminate a rural aquaculture technology of integrated pond poly-culture of carp species (silver carp, catla, mrigal, rui), prawn and a small indigenous fish species, Mola or morala (*Amblypharyngodon mola*). Mola or morala has a very high content of important nutrients such as vitamin A, calcium and iron. The integrated production can therefore provide income as well as nutrition's complement to the household diet. The research team comprising Dr. Mritunjoy Kundu from Bangladesh Agricultural University and Dr. Nanna Roos, Department of Human Nutrition, University of Copenhagen, Denmark provided relevant orientation and training of JGVK staff and few farmers on basic pond management and in monitoring the production performance.

*The pilot project covering 33 local farmers, 33 pond having total water area of 3.86 acres. The project provided: (i) **orientation to the farmers about the pond preparation** through use of lime and fertilizer (lime, urea, SSP, cow dung etc.) (ii) **demonstrate proportionate use of lime, fertilizer** in pond preparation (iii) **demonstrate treatment area wise requirement of like catla, silver, rui, mrigal, prawn and mola** (iv) **demonstrate use of post-stocking lime and fertilizer requirement** in every 10 day interval (v) **demonstrate post stocking feed requirement** (feed in gram per day in each pond based on their size and concentration, growth of fry). The experimental pilot project was undertaken during July to December 2007.*

### **Methodology and key findings**

*Mola (*Amblypharyngodon mola*), a nutrient dense fish indigenous to Bengal, which was once abundant in both open waters and closed water bodies, declined drastically in recent years depriving poor people from getting vitamin A and other essential micronutrients. In order to revive its population to improve household nutrition, an on-farm trial was carried out to accommodate mola in carp-prawn poly-culture in the Sunderbans region, West Bengal, India from July to December 2007. There were three treatments with eleven replications each. Mola, mrigal (*Cirrhinus cirrhous*), rohu (*Labeo rohita*), and fresh water prawn (*Macrobrachium rosenbergii*) were stocked at 20,000 ha, 1,000 ha, 3,000 ha and 3.750 ha in all treatments. Catla (*Catla catla*) was stocked at 1,000 ha, 1,750 ha and 2,500 ha and silver carp (*Hypophthalmichthys molitrix*) at 2,500 ha, 1,750 ha and 1,000 ha, in treatment I, treatment II and treatment III, respectively. Before stocking of the fish fingerlings, fertilization was done at the rate of urea : 50 kg ha, TSP : 50 kg ha and cowdung : 1500 kg ha. Prawn and fishes were fed with mustard oil cake and rice bran (1:2 ratio) at the rate of 3% body weight. Two thirds of the total feed were spread in the morning and one third in the evening. Water quality parameters such as water*

temperature, dissolved oxygen, transparency and pH were measured fortnightly. There were no significant differences in water quality parameters among the treatments. The highest yields of mola and prawn were observed in treatment I. The mola production was not affected by the presence of catla and silver carp. The lowest density of catla (1,000 ha) with highest density of silver carp (2500 ha) resulted in the highest mola production. There was no significant different in total production among the treatments, but comparatively better production was found in treatment I. Higher benefit-cost ratio was also obtained in treatment I. **It may be concluded that mola-carp-prawn poly-culture may be a good option for rural farmers of the Southern region of West Bengal to reduce poverty and improve household nutrition.**

**Table :1 Production ( $\pm$  SE) and economics of different treatments over a 155 days growth period July – November 2007**

		Treatment-I	Treatment-II	Treatment-III
Production (kg ha)	Mola	286.77 $\pm$ 25.30	217.99 $\pm$ 27.90	193.14 $\pm$ 21.96
	Catla	297.31 $\pm$ 33.76	339.61 $\pm$ 44.47	399.07 $\pm$ 48.72
	Mrigal	310.90 $\pm$ 32.32	283.80 $\pm$ 37.84	295.84 $\pm$ 31.42
	Rohu	665.18 $\pm$ 88.45	629.13 $\pm$ 83.93	531.09 $\pm$ 59.99
	Silver carp	712.77 $\pm$ 123.4	525.10 $\pm$ 70.18	318.67 $\pm$ 56.67
	Prawn	184.47 $\pm$ 9.73	144.68 $\pm$ 7.86	145.69 $\pm$ 9.62
	<b>Total</b>	<b>2457.42 <math>\pm</math> 243.96</b>	<b>2140.31 <math>\pm</math> 193.39</b>	<b>1883.51 <math>\pm</math> 161.24</b>
Economics	Total cost (INR)*	62,759.00	59,740.00	57,771.00
	Total return	135,455.00	114,260.00	103,835.00
	<b>Benefit-cost ratio</b>	<b>2.16:1.00</b>	<b>1.91:1.00</b>	<b>1.80:1.00</b>

\* 40 INR = 1 USD

**Source: Proceedings of the workshop *small indigenous fresh water fish species: food security and conservation of bio diversity*, held at Central Inland Fisheries Research Institute, Kolkata, India, February 23-25, 2010.**

### 3. The Project

#### Aquaculture for nutrition and supplementary income for the rural poor in the Sundarbans, West Bengal, India

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3.1 **The goal of the project** is to alleviate poverty in the project area through expanded aquaculture production among poor farmers.

3.2 **The specific objectives of the project** are to : (i) improve the capacity of 10 JGVK staff and 100 beneficiaries (poor farmers) for optimizing the pond management of semi-intensive integrated carp-mola ponds to reach a production of 3-4 ton per hectare (ii) establish a small local hatchery to secure local availability of quality carp fingerlings (iii) secure supply of fingerlings to the local consumers through a number of local fish farmers.

3.3 **Project strategy:** The strategy being a consumer based local organization JGVK undertaken responsibility of the improvements in technical, economical and social issues among the local poor people. The project contributes with **capacity building of the local organization** along with related facilities and logistics (infrastructure). The project strategy and the activities are organized in five areas where efforts are applied. These are: (i) **capacity building of JGVK staff**, so the organization can work with (ii) **building up the infrastructure facilities at JGVK** (like set up a hatchery, brooder pond etc.) necessary to support the activities (iii) **planning, organizing awareness and capacity building of the local poor farmers i.e. beneficiaries**, enabling them to participate in the project for better livelihood (iv) implement the activities by utilizing the abovementioned elements. Thus secure a successful implementation (v) **application of a management and monitoring system** to ensure affectivity of the project.

#### Log frame of the project

Objectives	Strategy	Expected output	Activities
1. <b>Improve the capacity</b> of 10 JGVK staff and 100 beneficiaries (poor farmers) for <b>optimizing the pond management</b> of semi-intensive carp-morala ponds <b>to reach a production of 3-4</b>	<ul style="list-style-type: none"><li>● Capacity development of JGVK staff</li></ul>	<ul style="list-style-type: none"><li>● The project staff are trained in skill development, aquaculture management, on site support (servicing) to the farmers</li><li>● Manual prepared and shared among the trained farmers</li><li>● Printed manual</li></ul>	<ul style="list-style-type: none"><li>● The training of project staff and</li><li>● The training of poor farmers</li><li>● preparation and printing of fish farming manuals</li><li>● Awareness on hygienic habits, intake of nutrients and vitamins etc.</li></ul>



ton/hectare		used by the farmers	<ul style="list-style-type: none"> <li>● Preparation of printed manual</li> </ul>
2. <b>Establish a small local hatchery to secure local availability of quality carp fingerlings</b>	<ul style="list-style-type: none"> <li>● <b>Building up infrastructure at JGVK</b> to support fishery activities</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Hatchery set up</b> and hatching (production) started</li> <li>● Brooder ponds are ready</li> <li>● The fish juveniles are supplied to nursery farmers</li> </ul>	<ul style="list-style-type: none"> <li>● Construction of hatchery</li> <li>● Hatching and production of fish juveniles</li> <li>● The juveniles are supplied to the nursery farmers</li> <li>● Brooder ponds are acquired and developed</li> </ul>
			<ul style="list-style-type: none"> <li>● Brooding fish acquired</li> <li>● Orientation of nursery farmers, preparation of their ponds</li> <li>● On site support</li> </ul>
3. <b>Secure supply of fingerlings to the local consumers</b> through a number of local fish farmers	<ul style="list-style-type: none"> <li>● Identify nursery ponds, brooder ponds</li> <li>● Orientation of farmers</li> </ul>	<ul style="list-style-type: none"> <li>● Increased production of fish</li> <li>● Linkage established with National and state level organization</li> </ul>	<ul style="list-style-type: none"> <li>● Orientation and on site support to farmers</li> <li>● Public announcement for availability of quality fingerlings</li> <li>● A 16 minute documentary on the project prepared</li> </ul>

### 3.4 Project Area

The project area covering two neighbouring coastal districts viz. 24 Parganas South and 24 Parganas North, three development blocks from these districts, nine gram panchayats and 20 villages. The table 2 provides the details.

**Table - 2 : Project Area**

Sl. No.	District	Sl. No.	Block	Sl. No.	Name of GP	Sl. No.	Name of village (Mouza)
1	24 Parganas (South)	1	Basanti	1	Jyotishpur	1.	Ranigarh
						2.	Joygopalpur
						3.	Radharanipur
						4.	Harekrishnapur
						5.	Jyotishpur
		2	Gosaba	2	Bharatgarh	6.	Goranbose
						7.	Maheshpur
						8.	Ahandabad
						9.	Kumirmari
2	24 Parganas (North)	3	Sandaskhali-2	3	Nafargunj	10.	Hiranmoypur
						11.	Nafargunj
						12.	Birinchibari
				4	Masjidbati	13.	God Khali
						14.	Dakshin
							Kokamberia
				5	Bssanti	15.	Basanti
						16.	Kalidanga
				6	Sambhunagar	17.	Sambhunagar
				7	Bali – I	18.	Amiamalhi
				8	Bermajur-I	19.	Bermajur
				9	Barmajur-II	20.	Jhupkhali

Source : Data base of Fishery Project, JGVK



**Fingerlings sold from Nursery Pond**



***Hatching and follow-up activities***





**Proud Fish Farmers**



**Catching of Fish from their pond**



**Fish ready for sale**

## 4. The Activities and Key Achievements of the project

### 4.1 Objective one : Training of JGVK staff and fish farmers to improve their capacity for optimizing the pond management of semi-intensive carp-mola ponds

4.1.1 JGVK staffs were trained on fish hatching, fish juvenile nursing, brooder fish management, pond preparation by Dr. Mrityunjoy Kundu, Bangaladsh Agricultural University and Dr. Nandeesh, Fisheries Adviser, Centre for Aquaculture Research and Development, Bishramganj, Tripura, (trained staff list in Table - 3).

4.1.2 72 farmers have been trained (some of them are JGVK staff) on pond preparation, fish juvenile nursing, organic feed preparation and feeding, pond management, marketing etc. The list of trained farmers provided in Table – 4.

4.1.3 Twenty eight farmers were especially trained on fish, juvenile nursery, preparation of their pond for nursery. Detail list of farmers is provided in Table – 5.

#### 4.1.4 Mass Awareness

4.1.5 Mass awareness are conducted in the project area through padyayatra by the SHG members, children. The basic focus was to preservation of small local fishes, better management of pond, scientific farming.

4.1.6 Number of awareness posters were developed and used in the rally.

4.1.7 A colourful manual was prepared in Bengali and disseminated among the local people, trained farmers.

4.1.8 The trained farmers were mobilise into few fishermen group. Women member of SHG's also involve. 10 such groups formed and supported.

**Table – 3 project staff trained**

Sl. No.	Name	Sex (M / F)	Position
1	Ramprasad Pramanik	M	Co-ordinator
2	Uma Kanta Gayen	M	Field Worker
3	Prasad Mondal	M	" *
4	Tajjua Laskar	M	" **
5	Pradip Patra	M	Trainer / Expert ***
6	Shankar Maity	M	Field Worker
7	Uday Mondal	M	"
8	Tapan Giri	M	Asst. Coordinator
9	Amirul Gazi	M	Expert

\* Left in August 2009

\*\* Left in August 2009

\*\*\* Left in December 2008

**Source : Data base of Fishery Project, JGVK**

**Table : 4 Farmers trained under the project : 2008-2009**

<u>Sl. No.</u>	<u>Name of Farmer</u>	<u>Village</u>
1.	Kamadhar Sardar	<b>Harekrishnapur</b>
2.	<b>Binod Das</b>	"
3.	Amal Burman	"
<hr/>		
1.	Gopal Das	<b>Radharanipur</b>
2.	Amjad Gazi	"
3.	Mukunda Murari Das	"
4.	Adam Molla	"
5.	Shambhu Guchait	"
6.	Shantirajan Dua	"
7.	Ranajit Bhowmik	"
<hr/>		
1.	Rahul Alam	<b>Bharatgarh</b>
2.	<b>Madhusudan Mondal</b>	"
3.	Anup Mondal	"
4.	Mahananda Sardar	"
5.	Prabir Naik	"
6.	Gopal Bar	"
7.	Ashok Das	"
<hr/>		
1.	Achinta Gayan	<b>Ranigarh</b>
2.	Tajrul Moral	"
3.	Narayan Biswas	"
4.	Dayal Mondal	"
5.	Sanatan Naskar	"
6.	Shephali Naskar	"
<hr/>		
<u>Sl. No.</u>	<u>Name of Farmer</u>	<u>Village</u>
1.	Ashutosh Bera	<b>Maheshpur</b>
2.	Paresh Sardar	"
3.	Haradhan Bera	"
<hr/>		
1.	<b>Saheb Ali Molla</b>	<b>Joigapalpur</b>
2.	Swadhin Baidya	"
3.	Archana Baidya	"
4.	Biswajit Mondal	"
5.	Dhara Adhikari	"
6.	Monoranjan Mondal (wife)	"
7.	Dilip Sardar	"
<hr/>		



<u>Sl. No.</u>	<u>Name of Farmer</u>	<u>Village</u>
1.	Bijan Panda	<b>Nafargunj</b>
2.	<b>Murari Mondal</b>	"
3.	Subhas Hazra	"
4.	Mrinal Jana	"
5.	Tapan Giri	"
<hr/>		
1.	Arabinda Sardar	<b>Natun Hat</b>
2.	Dhiraj Roy	"
<hr/>		
1.	Niranjan Sardar	<b>Bansir</b>
<hr/>		
1.	Dilip Adhikari	<b>Joytishpur</b>
2.	Prabhas Haldar	"
3.	Amal BNarman	"
4.	Samar Haldar	"
5.	Mritunjoy Sardar	"
6.	Gour Haldar	<b>Joytishpur</b>
7.	Ranjan Mondal	"
8.	Dulal Naskar	"
9.	Archana Naskar	"
10.	Raman Sardar	"
11.	Abani Mondal	"
12.	Ramprasad Paramanik	"
13.	Nemai Sardar	"
14.	Radharaman Jana	"
15.	Muktiram Sardar	"
16.	haran Haldar	"
17.	Dinabandu Maity	"
18.	Dilip Naskar	"
<hr/>		
1.	Tapan Maity	Birinchibari
<hr/>		
1.	Rafiq Sardar	<b>Basanti</b>
2.	Bibhash Naskar	"
3.	Erchan Gazi	"
<hr/>		
1.	<b>Nirmal Mondal</b>	<b>Dhasbhanga</b>
<hr/>		
1.	Rekha Haldar	Bhiranmoipur
2.	<b>Bishni Mirdha</b>	"
<hr/>		

**Source : Data base of Fishery Project, JGVK**

**Table : 5 Nursery farmers – 2009**

<b><u>Sl. No.</u></b>	<b><u>Name of Fish Farmer</u></b>	<b><u>Village Name</u></b>	<b><u>Pond Area (in Dec.)</u></b>
1.	Dayal Mondal	Ranigor	25
2.	Bimal Das	Hirrommaypur	40
3.	Nilkomal Sardar	Bharatgor	150
4.	Jagadish Mondal	Jyotishpur	08
5.	Anar Molla?	Joygopalpur	07
6.	Bantul Mondal	Joygopalpur	10
7.	Subir Sardar	Bharatgor	12
8.	Parash Sardar	Maheshpur	25
9.	Saheb Molla	Joygopalpur	25
10.	Swapan Mondal	Ranigor	40
11.	Majad Molla	Radharanipur	09
12.	Modhusudan Mondal	Jyotishpur School	85
13.	Murari Mondal	Bharatgor	20
14.	Nirmal Sardar	Natun hut	06
15.	Niranjana Sardar	Joygopalpur	28
16.	Karmadhar Sardar	Harakrishnapur	12
17.	Gopal Das	Radharanipur	10
18.	Md. Rahul Alam	Bharatgor	15
19.	Achinta Gayen	Ranigor	16
20.	Asutosh Bera	Mohespur	08
21.	Tajrul Morol	Ranigor	10
22.	Bijon Panda	Nafargang	30
23.	Anup Mondal	Bharatgor	15
24.	Mohananda Sardar	Bharatgor	12
25.	Binod Das	Harakrishnapur	35
26.	Nrayan Biswas	Ranigor	08
27.	Ushrup Molla	Fulmalancha	50
28.	Sulata Mukherjee	Chandipur	25
<b>Total area :</b>			<b>721 Decimal = 7.21 acre</b>

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**Source : Data base of Fishery Project, JGVK**

#### **4.2 Objective two : Establishment of small level hatchery to secure local availability of carp fingerlings**

To develop and improve the regular supply of better fish quality, a hatchery was constructed under the name “Ma Sarada Matshya Hatchery”. The hatchery was inaugurated by state fishery minister Mr. Kiranmoy Nanda on January 18, 2009, though production was started from 2008. The details of hatching activities during 2008-2010 are given in table no. 6. This shows (i) total renu production is increasing over the years. In 2008 production was 303 bati, the production increased to 396 bati in 2009 and in 2010 the production is 418 bati. The nursery farmers are around 28. Around 40 PC of renu were taken by the farmers while rest utilized by the JGVK’s nursery pond.



***Training of JGVK Staff, Farmers and SHG Women***

**Table : 6 Production of Hatchery and its use by the farmers (2008-2010)**

Sl. No.	Area	Year		
		2008	2009	2010
1	Total number of Hatching	4	11	
2	Total renu Spawn production (in Bati)	303	396	418
3	Total farmers taken renu and develop nursery	17	15	20
4	Farmers taken renu (in Bati)	138	143	130
5	Renu used in JGVK's pond (in Bati)	168	253	288
6	Total Dhani farmer (fingerlings)	160	33	45
7	Total Dhani pona (fingerlings) production	256.5	169	300.5

**Note :** One Bati contains approximately 70 grams of fish pollen / and contains 30,000 fish spawn

**Source :** Data base of Fishery Project, JGVK

**Table : 7 Details of Hatching activities during 2009**

Serial number of hatching	Date	Total production (in Bati)	Production expected (in Bati)	Loss (in Bati)	PC of loss	Species
1	9/3	50	60	10	17	American rui
2	24/4	0	70	70	100	rohu, catla, Mirgel
3	28/4	7	50	43	14	"
4	2/5	0	50	50	100	"
5	18/5	120	130	10	8	"
6	12/6	20	60	40	66	"
7	20/6	60	60	0	0	"
8	25/6	34	40	6	15	"
9	4/7	60	60	0	0	"
10	21/7	0	80	80	100	"
11	7/8	45	50	5	10	"

**Source :** Data base of project compiled by Mr. Ramprasad Pramanik, Project Co-ordinator

**Table : 8 Details of Hatching activities during 2010**

Serial number of hatching	Date	Total production (in Bati)	Production expected (in Bati)	Loss (in Bati)	PC of loss	Species
1	7/5	51	60	9	15	American
2	18/5	16	50	34	68	rui
3	28/5	4	50	46	98	rohu, catla,
4	8/6	0	50	50	100	Mirgel
5	16/6	33	50	17	34	"
6	28/6	130	100	+30	130	"
7	5/7	49	50	1	98	"
8	18/7	50	50	0	0	"
9	27/7	65	60	+5	108	"
10	9/8	20	30	10	67	"
						"
						"
						"

**Source :** Data base of Fishery Project, JGVK

4.2.1 Along with construction of small hatchery and related infrastructure following activities were undertaken: (i) brooder ponds are made ready at the JGVK campus (ii) selection and insertion of 500 kg brooder fish purchased and put in the brooder ponds (iii) preparation of nursery ponds in the JGVK campus (iv) identification, orientation of nursery farmers and preparation of their pond.

4.2.2 (i) production from hatchery started in 2008 with guidance and support from experts from Bangladesh like Dr. Kundu, Dr. Wahab and Indian experts like Dr. Nandeeshha and local fishery department (ii) then the juveniles were supplied to the trained nursery farmers to their prepared pond. The details of production of fish juveniles, number of nursery farmers undertake nursery farming are given in the table 6 (iii) subsequently fries with 1"-1.5" size after 25-40 days, supplied to the beneficiary farmer most of them are formally trained by JGVK. Besides trained farmers, some other local pond owners also took fries from the nursery farmers and JGVK nursery (iv) the farmers started selling fish after 4-5 months with a size of 500-750 grams. The case studies provided the success stories of some of the farmers.

#### **4.3 Objective 3 : secure supply of fingerlings to the local consumers through a number of local fish farmers**

The local hatchery and scientific nursery provide good quality fingerlings to the local consumers. During 2008 and 2009 (till Aila cyclone struck), about 300 local pond owners collected fingerlings from JGVK and nursery farmers.

#### **4.4 Key achievements**

4.4.1 **Local availability of good quality fish** juveniles from local hatchery.

4.4.2 Trained human resource at JGVK and local area on scientific fish farming like hatchery application, nursery preparation, pond management, scientific fishing etc.

4.4.3 Growing fish production in the area. Poor farmers earn money by selling fingerlings, fries and fish and also consume fish on a regular basis thus increase the

nutrition intake. The annual net income is on average Rs.5000/annum on a pond size of 0.10 acre, some farmers earn more.

4.4.4 JGVK campus developed as a demonstration cum production centre. This is the only such centre in the Sundarban region.

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### Case study one - successful farmer – Mr. Lakshman Mahato

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Mr. Lakshman Mahato of Joygopalpur village is a poor villager having 12 decimal pond area. After training from the project he cleaned the bond as per prescription form JGVK's fishery project staff. Then he purchased fingerlings from JGVK's nursery. The details are as follows :

#### 1. Inputs in the pond

❖	Catla * @ 10 per decimal	120
❖	Silver carp * @ 4 per decimal	48
❖	Rohu * @ 12 per decimal	144
❖	Mirgal * @ 4 per decimal	48
❖	Mocha ** @ 15 per decimal	180
❖	Mola @ 100 per decimal	1200

\* each fingerlings having 2" – 4" size

\*\* Mocha (prawn, *Macrobrachium Rosenbergil*) each mocha having 10-15 gram weight



**Catching fish with the help of neighbours**

#### 2.1 Fertiliser treatment. Once in a month he applied the fertilizer

*	Gobar (cowdung) @ 5 kg per decimal	60 kg
*	Phosphate 400 gram per decimal	4.8 kg
*	Urea 200 gram per decimal	2.4 kg

2.2 **Feed** : every day he applied 300 gram mustard seed (khol) and 600 gram rice dust.

2.3 Once in a month he used the net.

### 3. Return after six months

3.1	Total cost (fingerlings, feed, fertilizer, labour) (1+2)	Rs.2000/-
	Sale of sold	Rs.6000/-
	<b>Net income</b>	<b>Rs.4000/-</b>
	In addition, they consume fish	Rs.2000/-
	<b>Total earnings</b>	<b>Rs.6000/-</b>



#### 4. **Key learning**

- 4.1 **Mr. Mahato put less number of fingerlings** compare to earlier situation.
  - 4.2 **Applied regular feed, fertilizer, clean the pond.**
  - 4.3 *He is now earning few thousand rupees every year.*
  - 4.4 **Neighbours are encouraged** to involve in fish farming.
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**Note : One decimal = 0.001 acre**

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#### **Case study – 2 : Successful farmer Saheb Ali Molla**

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*Mr. Molla is a landless farmer. Except 0.40 acre pond, he has no other land. After getting training at JGVK in 2008, he undertook the following:*

- 1. *At the beginning he cleaned ponds, using 150 kg Mohua Oil Cake (MOC).*
- 2. **Treatment:** *used 10 kg cowdung per decimal = 400 kg cowdung*
  - *200 gram phosphate per decimal = 8 kg*
  - *200 gram urea per decimal = 8 kg*  
*(he applied cowdung and phosphate together and kept it for 7 days. Then mix with urea, he applied the three together in the pond.*
  - *For 7 consecutive days, every day 30 minutes, he pumps fresh water from the nearby pond. This increase the availability of oxygen in the water*
- 3. **Feed**
  - *First week @ 500 gram mustard cake/day (twice in a day)*
  - *Second week @ 1 kg mustard seed/day (twice in a day)*
  - *Third week @ 2 kg mustard seed/day (twice in a day)*
- 3.1 **Netting** *after three weeks*  
*After four weeks*
- 4. **Expenditure and income**

-	Total cost (1+2+3+labour)	Rs. 4,700/-
-	Total sold	<u>Rs.15,000/-</u>
	<b>Profit (Net Income)</b>	<b>Rs. 10,300/-</b>

*In the next session (2009) he sold about **Rs.22,000/-** within 70 days.*

#### 5. **Key learnings**

- 6.1 **Mr. Molla feels, new information from JGVK's training helped him – maintenance of pond, providing feed, fertilizer, use of net etc. and availability on-site support by JGVK staff.**
  - 6.2 **Now Molla advises neighbouring farmers for fish farming.**
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### Case study : 3 - Community action for scientific fish farming – an initiative of Jyotishpur High School

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The school is located very close to (within one km.) JGVK office. The school has two big ponds having water area of approximately 0.50 and 0.55 acre. Since last 20-22 years, the school committee leased out these two ponds to outside farmers at a rate of Rs.2-3000 / year.



Head teacher explaining the process of fish farming in the school ponds

After seeing, listening to various initiatives of JGVK on fish farming, head teacher of the school Mr. Madhusudan Mondal got interested and convinced his school management committee members for better use of pond located in the school premises. Mr. Mondal contacted JGVK. After discussion, JGVK provided technical support to the school authorities. With JGVK's support and guidance, care was taken by the school authorities. After 6 months, school authorities catch 185 kg of fish each weighing over 1 kg. **According to Mr. Ramprasad Pramanik this is an achievement. School authorities earn Rs.20,350/- by selling 185 kg fish.** After this sale an estimated Rs.15,000/- worth of fish are still available in the pond.

Mr. Paramanik also did a comparative study of growth of fish production in the two ponds. The pond located close to the school having: (i) less depth (ii) less number of fingerlings (iii) everyday provided feed. In addition, students after their mid-day meal wash their plates in this pond. Thus fishes are getting extra feed in the form of rice, vegetables (iv) **the initiative of Headmaster, committee members and collaboration with JGVK develop local community resources productive and create a good example before the community.**



Students wash their plates in the pond after their mid day meal

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### Case study : 4 - Successful farmer in a Aila ravaged pond

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*Mr. Binod Das of Harakrishnapur village took Renu pona from Joygopalpur Hatchery. He got Rs.5000/- through sale of 2" fingerlings. His pond has over Rs.4000-5000/- worth of fingerlings. Suddenly on May 25<sup>th</sup> 2009 Aila cyclone inundated his pond though salt water. After this loss, he decided to clean his pond and start fish production again. He drains out the salt water from his pond.*

*Then in February 2010, he cleaned the salted pond bed with sweet water. Then he took 6 bati renu pond from first Hatching (in 2010) of JGVK's hatchery. Which cost Rs.2000/-. He spend another Rs.2000/- on feed and fertilizer. **Total cost = Rs.4000/-**. After 25 days, his Dhani pona grown to 1" – 1.5" size. He sold 65 kg @ Rs.200 / kg and earns Rs. 13,000/-.*



Binod Das with his family put Renupona in his nursery pond

Another 20 kg (Rs.4000/-) fish still lying in the pond. After one week he put these 20 kg fingerlings in another pond and put 4000 renu pona in the pond. Binodbabu said, **though price of fish is decreasing still he expect to earn Rs.10000/- net profit. From 0.45 acre water area he earns nearly Rs.15,000/- (net income) within 6-7 months. This is an achievement. His initiative encouraged other farmers affected by Aila cyclone last year to involve in fishery programme again.**

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#### Case study : 5 - Collective effort by women

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Ms. Dhara Adhikari, aged about 55, is a member of **Prerona** SHG. She is having one pond with 12 decimal of water area and another small pond (Dhoba). She along with other members of SHG underwent training at JGVK. After training, she along with her husband started 'scientific fish farming in these pon's. As a result her earnings from sale of fish **have increased to Rs.4000/year**. She highlighted two points for her success: (i) **regular feeding and cleaning of pond**.

Every morning and evening he provide feed (ii) **get good quality fingerlings from JGVK's nursery and timely on site support by the JGVK (Samity) staff.**

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Ms. Adhikari apply feed in the pond

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#### Case study : 6 - Women took charge of the fish farming in the household

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Ms. Archana Naskar and Ms. Rekha Mondal both are members of **Suniti** SHG of Joygopalpur village. Their husbands got training at JGVK; both the families having two small ponds. They also work with their husbands to take care of their ponds. Subsequently they got on-site orientation from JGVK staff. Now they are primarily responsible for fish farming – collect fingerlings, provide regular feed, fertilizer, cleaning the pond, catch fish and sale to the nearby market. Through this farming, they earn approximately Rs.6000-7000/- year. In addition, their diet contains fish almost everyday. **They feel proud about their involvement in fish farming and income from it. Their success also encouraged other members of SHG to take active role in fish farming. Both of them wanted more training for scientific fish farming. In addition to fishing they also utilize their pond sides for vegetable cultivation, Banana Cultivation, which supplements their diet and earn some cash income.**



Group Members catching fish

4.5 **All these case studies shows that:** (i) spread of fish farming, fish nursery and fish production in the area in recent years (ii) availability of good quality renu pona (spawn) from the Hatchery (iii) orientation, training and on site support on better pond management, fish farming are available from JGVK (iv) the area having potential for more inland indigenous fish farming.

4.6 **Cost benefit ratio of nursery fish farming:** The table – 9 provide the cost benefit of 11 selected nursery farmers. **All the 11 nursery farmers getting benefit from their nursery.** On average they are getting Rs.3000-4000 as net income within 25-30 days. In addition, they keep some fish to grow and sale these fish with a weight of 600-800 gram after 6-7 months. It is also interesting to observe that : (i) **all the farmers regularly apply fertilizer, feed in the pond and observe the advice given by the JGVK staff** (ii) JGVK staff, besides formal training, provide on site support to the farmers. This is possible due to **concentration of nursery farmers** in the nearby area.

4.7 **Challenges faced:** The project went well. Problem arises in the second year. When Aila cyclone (May 25<sup>th</sup> 2009) was inundated the large number of pond with saline water, thus, reducing the demand for fish juveniles. A number of nursery farmers lost their fish. The situation continued untill end of 2009. Then farmers with support from JGVK and advice from experts clean their pond and started fish farming again. The year 2010 has shown a growing demand from the local farmers.

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***Participants of International Workshop visited JGVK's hatchery, demonstration farm and extension activities on February 23<sup>rd</sup>, 2010***



***Campaign for Preservation of Small Local fishes by people, mostly women.***

**Table : 9 – Cost benefit of 11 nursery farmers during June – August 2008**

PURCHASE / EXPENDITURE								SALE / INCOME					PROFIT & LOSS		
Sl.	Area of pond in Dec	Farmer's Name	Quality	Qty. Cups / Kg / 1000 f	Rate	Amount	Tot. Amount	Quality	Qty. Kg	Rate	Amount	Date	Tot. Amount	Net Profit	Net loss
1	5	Madhusudan Mondal	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung	4 50 40 10 100	300 10 15 7 1	1,200 500 600 70 100		Fingerling stock in pond	10 5 10	200 150 100	2,000 750 1,000	5-Jul-08 15-Jul-08			
							2,470						3,750	1,280	
2	9	Swapn Mondal	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung	7 100 60 10 200	300 10 15 7 1	2,100 1,000 900 70 200		Fingerling stock in pond	6 7 15	400 300 100	2,400 2,100 1,500	9-Jul-08 15-Jul-08			
							4,270						6,000	1,730	
3	10	Arabindal Sardar	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung Netting	5 50 100 25 50	300 10 15 7 1	1,500 500 1,500 175 50 400		Fingerling stock in pond	50 20 20	130 100 100	6,500 2,000 2,000	10-Jul-08 20-Jul-08			
							4,215						10,500	6,375	
4	19	Gopal Bar	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung	5 100 30 7 100	300 10 15 7 1	1,500 1,000 450 49 100		Fingerling stock in pond	5 15	300 200	1,500 3,000	5-Jul-08			
							3,099						4,500	1,401	
5	12	Narayan Biswas	RENUPONA M.O.C. T.S.P.	2 15 4	250 15 7	500 225 28		Stock in pond	15	100	1,500				
							753						1,500	747	
6	16	Prabir Patra	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung	3 25 3 100 -	300 10 15 7 1	900 375 21 700		Stock in pond	6	400	2,400				
							1,396						2,400	1,004	



**Table : 9 (Contd.) – Cost benefit of 11 nursery farmers during June – August 2008**

PURCHASE / EXPENDITURE								SALE / INCOME						PROFIT & LOSS	
Sl.	Area of pond in Dec	Farmer's Name	Quality	Qty. Cups / Kg / 1000 f	Rate	Amount	Tot. Amount	Quality	Qty. Kg	Rate	Amount	Date	Tot. Amount	Net Profit	Net loss
7	33	Parash Sardar	RENUPONA Mohua Khol M.O.C. T.S.P. Carraja	21 120 120 20 5	300 10 15 7 200	6,300 1,200 1,800 140 1,000		Fingerling Fingerling Fingerling Fingerling	23 18 29 20	250 250 150 150	5,750 4,500 4,350 3,000	5-Jul-08 15-Jul-08 20-Jul-08 25-Jul-08			
							10,440						17,600	7,160	
8	33	Amjad Gaze	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung Water supply	10 20 50 20 500 10	300 10 15 7 1 20	3,000 200 750 140 500 200		Fingerling stock in pond	14 60	400 150	5,600 9,000	25-Jul-08			
							4,790						14,600	9,810	
9	5	Karna Sarda	RENUPONA Mohua Khol M.O.C. T.S.P. Cowdung	2 30 6 3 60	300 10 15 7 1	1,000 300 30 21 60		Fingerling stock in pond	4 15	400 100	1,600 1,500	20-Jul-08			
							1,411						3,100	1,689	
10	25	Achinta Gayen	RENUPONA M.O.C. T.S.P. Urea Egg Cowdung	5 20 10 2 12 200	400 15 7 6 2 1	2,000 300 70 112 24 200		Fingerling stock in pond	5 30	300 150	1,500 4,500	25-Jul-08			
							2,606						6,000	3,394	
11	10	Tajrul Morol	RENUPONA Urea T.S.P. Cowdung	1 2 5 50	500 14 7 1	500 26 35 50		Fingerling stock in pond	5 10	300 100	1,500 1,000	20-Jun-08			
							613						2,500	1,887	

Note : Triple Super Phosphate (TSP)

Source : Data base of Fishery project, JGVK

## 5. Key lessons from the project

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**5.1 Confidence of JGVK staff:** The trainings of JGVK staff, their exposure, interaction with outside experts, different hatcheries and institutes, develop their knowledge base on scientific method of fish farming. Thus develop their confidence.

**5.2 Improved knowledge base of farmers:** Series of orientation, exposure by international, national and local experts and practical application/demonstration were useful to local poor farmers. They are now access and use the facilities. Thus increase their cash income and nutritional content in the diet.

**5.3 Infrastructure has created a positive impact in the area:** The infrastructural facilities like setting up small hatchery, demonstration nursery, brooder pond at the JGVK campus help the poor farmers, pond owners from surrounding area to encourage for better fish farming with technical support, guidance as well as quality inputs from JGVK.

**5.4 Women are empowered:** Through JGVK, women are mobilized and take care of their pond. They became more confident (empowered) as their effort help to supplement family income. In addition, they also utilise the pond sides with vegetable cultivation.

**5.5 From the project all the primary stakeholder's viz. nursery farmers, fish farmers, consumer of fingerlings are getting benefit both** in monitory terms and nutritional terms.

Thus, JGVK, with its hatchery, demonstration farm, scientific information and knowledge (capable human resource) along with experienced farmers from the surrounding villages develop as a growth centre of scientific fish farming with a concern for protection of small local varieties of fish.



**Vegetable Cultivation on the pond side**

## 6. Follow-up plan and activities

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6.1 After December 2009, the activities are going on in 2010 with the technical support of AwF and IGF support. The activities includes: (i) hatching, nursery farming, supply of fingerlings and free on-site support to farmers in the nearby area. (ii) one of the important initiative undertaken by JGVK is to **campaign for and preservation of small indigenous species of fish** (iii) **the JGVK is planning to increase the capacity of hatchery and encourage / support the farmers to set up more nursery pond in the nearby blocks.**

6.2 JGVK considers the two year initiative a successful one with some problems due to AILA cyclone on May 25<sup>th</sup>, 2009. Due to cyclone saline water inundated large number of ponds. However, JGVK with technical support from outside experts, local fishery departments, research institutes and involving local fishery groups and farmers took initiative to remove saline water from the farmer's pond and provide necessary treatment.

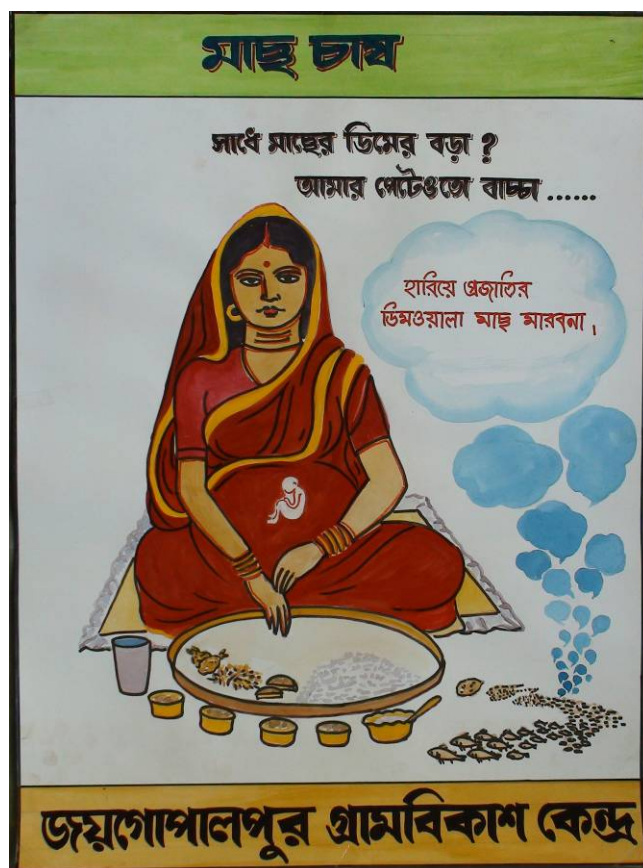
6.3 **JGVK establish good working relationship with local research institutes like Central Inland Fisheries Research Institute, Barrackpur, Kolkata, JGVK staff, local farmers are getting orientation from this institute. Last February, participants of an international workshop “small indigenous fresh water fish species (SIFFS): their role in poverty alleviation, food security and conservation of bio-diversity” visited project area and learn from JGVK’s experience of experimenting with poly-culture of SIFFS. The participants spent one full day at JGVK.**

6.4 **Relationship also developed with state fisheries department. Its officials, field staff also participate in the training of JGVK staff, farmers and share experiences.**

6.5 With this changing scenario, where local farmers got interested and involve in scientific farming of indigenous species, JGVK require support to continue and spread the present work.



Posters developed and being used in the Campaign for Protection, Preservation and cultivation of Local small fishes



Posters developed and being used in the Campaign for Protection, Preservation and cultivation of Local small fishes



#### সার প্রদ্রাৱঃ

- পুকুরে সার দিলে প্রাকৃতিক খাদ্য গ্রাফটন জমে।
- পোনা মড়াদের পর থেকে পানির বাং পর্যবেক্ষণ করে ৭-১০ দিন পর প্রতি শতাংশ ৩-৪ কেজি গোবর সার, ১০০ গ্রাম ইউরিয়া ও ১০০ গ্রাম টি.এস.পি. প্রয়োগ করলে ভাল ফল পাওয়া যায়।
- প্রাকৃতিক খাদ্যের পরিমানের উপর নির্ভর করে সারের পরিমান কম বেশী করা যাবে।

#### চিংড়ির আশ্রয়স্থল স্থাপনঃ

খোলস বদলের পর চিংড়ি দুর্বল থাকে তখন তাদের নিরাপদ আশ্রয়ের জন্য তাল/নারিকেলের শুকনো পাতা/বাঁশের কড়ি/গাছের ডালপালা ব্যবহার করতে হবে।



#### প্রাকৃতিক খাদ্য পরীক্ষাঃ

- জলের রং সবুজ বা বাদামী সবুজ হলে বুঝতে হবে খাদ্য তৈরি হয়েছে।
- ছড় কাঁচের গ্রাস ব্যবহার করে।
- সেকী ডিক ব্যবহার করে।
- হাত ব্যবহার করে।



#### রোগ প্রতিরোধঃ

- রোগ প্রতিরোধের চিহ্ন বিষয় অবশ্যই মনে রাখবেন —
- পুকুরে অতিরিক্ত ও ছোট পোনা না ছাড়া।
- সুস্থ ও রোগমুক্ত পোনা ছাড়তে হবে।
- সঠিক মাত্রায় সার ও খাবার দেওয়া।
- পুকুরের তলার বেশী কাশা জমতে না দেওয়া।
- পুকুরে গাছের ডাল-পালা বা পাতা পড়তে না দেওয়া।
- বাইরে থেকে দূষিত জল প্রবেশ রোধ করা।
- অন্য পুকুরে টানা জাল শোধান না করে ব্যবহার করা।
- শীতের শুরুতে প্রতি শতাংশে ১ কেজি হারে পাথুরে চুন প্রয়োগ করতে হবে।



#### আমাদের কথাঃ

জয়গোপালপুর গ্রাম বিকাশ কেন্দ্র রাজ্য স্তরের গ্রাম পুনর্গঠন ও পরিবেশ উন্নয়নের একটি স্বেচ্ছাসেবী সংস্থা। মূলত সুন্দরবন এলাকায় এবং রাজ্যের রূটি জেলায় গত এক দশক ধরে কর্মরত। এই সংস্থার মূল কাজ হল গ্রামীণ সম্পদ বিকাশ, গ্রামীণ কুটির শিল্প, স্থায়ীস্থায়ী কৃষি ও পরিবেশ উন্নয়নের জন্য আশ্রয়ী সরমোনোভাবাপন্ন গ্রামবাসী, গ্রাম পঞ্চায়েত এবং ছোট ছোট স্বেচ্ছাসেবী সংস্থা ও ক্লাবকে সহযোগিতার মাধ্যমে সমাজ উন্নয়নের কাজে যোগদান করানো। সুন্দরবন তথা পশ্চিমবঙ্গের গ্রাম এলাকায় অসুখা পুকুর রয়েছে যেগুলি মাছ চাষের আওতায় এনে দরিদ্র জনগোষ্ঠীর ভাগ্য পরিবর্তন সম্ভব। সে লক্ষ্যকে সামনে রেখে জয়গোপালপুর গ্রাম বিকাশ কেন্দ্র মৎস্য প্রকল্প গ্রহণ করেছে, যেখানে উন্নতমানের মাছের চারা উৎপাদনের জন্য মাছের ডিম ফেটাবার নিজস্ব যন্ত্রাণী গঠন করা হয়েছে। স্বল্প ব্যয়ে বৈজ্ঞানিক পদ্ধতিতে কিভাবে মাছ চাষকে লাভজনক করা এবং পরিবার থেকে অপুষ্টি দূর করা যায়। এই বুকলেটটি তারই প্রয়াস মাত্র।

## কার্প-গলদা মিশ্রচাষে মৌরলা



জয়গোপালপুর গ্রাম বিকাশ কেন্দ্র  
জয়গোপালপুর, নতুন হাট, বাদগী, দূঃ ২৪ পরগণা

#### ভূমিকাঃ

আবহমানকাল থেকে বাঙালীর খাদ্য তালিকায় মাছ একটি অবিচ্ছেদ্য অংশ। অতীতে প্রাকৃতিক জলাশয়ের মাছ আহরণ করেই চাখিলা পুষ্ণ হতো। কিন্তু বর্তমানে একদিকে জনসংখ্যা দ্রুতগতিতে বৃদ্ধি পাচ্ছে, অন্য দিকে প্রাকৃতিক জলাশয়ের মাছের প্রাপ্যতা আশঙ্কাজনক ভাবে কমে যাচ্ছে। ফলে মানুষকে নির্ভর করতে হচ্ছে মাছ চাষের উপর। কার্পের পাশাপাশি ছোট মাছেরও রয়েছে বাপক জনপ্রিয়তা। গবেষণায় দেখা গেছে ছোট মাছ তুলির ভিতর মৌরলা মাছ অত্যন্ত পুষ্টি সমৃদ্ধ একটি মাছ যা অন্যান্য মাছের সাথে গ্রাস করলে সার্বিক উৎপাদন তে বাহত করেই না বরং মৌরলার একটি বাড়তি উৎপাদন পাওয়া যায়। মৌরলা মাছ যদি গ্রাসই হয়ে খাওয়া যায় তাতে পরিবারে সকলের রাতকানা, রক্তনুদ্যতা সহ অপুষ্টিজনিত রোগ প্রতিরোধে গুরুত্বপূর্ণ ভূমিকা পালন করতে পারে। গলদা চিংড়ি বাজার মূল্য বেশী বিখ্যার চাখিলা বিক্রি করে আর্থিকভাবে লাভবান হতে পারে।



#### চাষ ব্যবস্থাপনাঃ

##### পুকুর নির্বাচনঃ

- দোখাশ ও এটেল দোখাশ মাটির পুকুর চাষের জন্য ভাল।
- মাকারী সাইজের পুকুর হলে ব্যবস্থাপনা করা সহজ হয়।
- পুকুরে সুবর্ণের আলো পড়ার ব্যবস্থা থাকতে হবে।
- জলের গভীরতা ৫-৭ ফুট হলে উত্তম।
- হাজা-মজা পুকুর সংস্কার করে মাছ চাষ করতে হবে।



#### পুকুর প্রস্তুতিঃ

- পুকুর পাড়ের বড় বোপ কাড় পরিষ্কার করতে হবে।
- পুকুরের তলার বেশী কাশা থাকলে তা উঠিয়ে ফেলতে হবে।
- পাড় ভাঙা থাকলে মৌরলা করতে হবে।

- পানি শুকিয়ে বা বার বার জল টেনে রাখলে মাছ ধরতে হবে।
- প্রতি শতাংশে ১ কেজি হারে পাথুরে চুন প্রয়োগ করতে হবে।
- চুন প্রয়োগের ৪/৫ দিন পর প্রতি শতাংশ ৪/৭ কেজি গোবর সার এবং ২০০ গ্রাম ইউরিয়া ও ২০০ গ্রাম টি.এস.পি. সার প্রয়োগ করতে হবে।



#### পোনা মজুদঃ

পুকুরে গ্রাস প্রাকৃতিক খাদ্য জমেছে কিনা তা নিশ্চিত হয়ে পোনা ছাড়তে হবে।

#### পোনা মজুদের পরিমাণঃ

পোনার জাত	নমুনা-১	নমুনা-২	নমুনা-৩
কালকা	৩	৩	৩
সিলভার কার্প	৯	৯	৬
গ্রাস কার্প	১	—	—
কুই	১০	১০	—
মুগেল	১০	৩	—
সরপুটি	২	—	—
গলদা চিংড়ি	—	১৫	৮০
মৌরলা	৫০	৫০	—

- মাছের পর্যাপ্ত খাদ্য প্রস্তুত হলে পুকুরের জল সবুজ বা বাদামী রং ধারণ করবে।
- বৈশাখ মাসের প্রথম সপ্তাহে মৌরলা সংগ্রহ করে মজুদ করতে হবে, যাতে এরা মজুদ পুকুরে ডিম ছেড়ে বংশ বৃদ্ধি করতে পারে।
- সকালে বা বিকালে ঠাণ্ডা পরিবেশে অগ্নিজনন ব্যাগে বা এ্যালুমিনিয়ামের হিড়িতে মৌরলা বা কই জাতীয় মাছের পোনা পরিবহন করতে হবে।

#### পোনা পুকুরে ছাড়াঃ

- পোনা মাছ সহ ব্যাঘ/হিড়ি তখনই ২০-২৫ মিনিট জলেতে ভাসিয়ে রেখে তাপমাত্রার সমতা আনতে হবে।
- ব্যাঘ/হিড়ির মুখ খুলে দিয়ে হাত দিয়ে পাড়ের/ব্যাঘের এবং পুকুরের জলের তাপমাত্রার ব্যবধান দেখতে হবে।
- তাপমাত্রা সমান না হওয়া পর্যন্ত পাড়ের কিছু জল পুকুরে এবং পুকুরের কিছু জল পাড়ে সিতে হবে।
- উভয় জলের তাপমাত্রা সমান হলে পাড়ের মুখ জমেতে কাত করে ডুবিয়ে জলের যেকোনো দিকে পোনা দল বেধে যেতের বিপরীত দিকে বেরিয়ে যাবে।



#### অতিরিক্ত পোনা মজুদের কুফলঃ

- মাছের খাদ্য, অগ্নিজনন ও আবাসস্থলের ঘাটতি হয়।
- মাছের বৃদ্ধি আশানুরূপ হয় না।
- মাছ বিভিন্ন রোগ ব্যাধিতে আক্রান্ত হয়।
- মাছকে সকালে বাসি খেতে দেখা যায়।
- অপুষ্টি কারণে মাছের মাথা মোটা ও শরীর চিকন হয়ে যায়।
- সার-খাবার ব্যবহার করেও আশানুরূপ ফল পাওয়া যায় না।
- মাছ চাষে লাভ হয় না।

#### মজুদ পরবর্তী ব্যবস্থাপনাঃ

##### খাদ্য প্রয়োগঃ

- প্রতিদিন পুকুরে মাছকে খাবার দেওয়া প্রয়োজন।
- মাছ ছাড়ার পরের দিন থেকে কই জাতীয় মাছের পোনার তৈনিক ওজনের শতাংশ ৩-৪ ভাগ হারে চালের কুঁড়া ও সরিষার খৈল ২৪১ অনুপাতে মিশিয়ে দিতে হবে। মৌরলার জন্য বাড়তি খাবার দেওয়ার প্রয়োজন নেই।
- খাবারের তিন ভাগের দুই ভাগ সকালে এবং এক ভাগ সন্ধ্যায় দিতে হবে।
- গ্রাস কার্পের জন্য কলাপাতা বা নরম ঘাস দিতে হবে।

**Pamphlet (Learning Material) developed by the project. This material is very popular among the local farmers.**