

Krishi Vigyan Kendra, Kakdwip - In service of Sundarban



**Central Inland Fisheries
Research Institute
Barrackpore, Kolkata - 700120**



KRISHI VIGYAN KENDRA, KAKDWIP – IN SERVICE OF SUNDARBANS

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Krishi Vigyan Kendra, Kakdwip
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Foreword

From a begging bowl image during the fifties to reach a stage of exporting food grains, India has come a long way. The green revolution was one of the most striking success stories of the post independence era. The other revolutions viz. white, blue and yellow are no less important. The impact of the green revolution was so dramatic that India becomes a role model for many other developing countries.

This massive transformation was possible owing to concerted efforts in implementing an agricultural development strategy that consisted of technological breakthrough and their application in agriculture, hard and dedicated work of Indian farmers and supportive policies of government.

Krishi Vigyan Kendra of Central Inland Fisheries Research Institute, Kakdwip has played a very critical role in the transformation of agriculture in the largest delta of the world Sundarbans. The effort of KVK has changed the rural landscape in prosperity.

D. Nath
Director

Preface

Agriculture continues to be the backbone of Indian economy. It is known for its multifunctionalities of providing employment, livelihood, food, nutritional and ecological securities. Agriculture and allied activities contribute around 30 percents of the GDP of India and is a major source of poverty alleviation and empowerment of the agrarian folk.

Agriculture is a way of life, a tradition, which, for centuries, has shaped the thought, the outlook, the culture and the economic life of the people of India. Rapid growth of agriculture is essential not only to achieve self reliance at national level but also to household security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty levels.

The population explosion in India is raising biotic pressures, extension of agriculture into fragile ecosystems, overexploitation of ground water, overuse of chemicals and practice of slash and burn agriculture leads to declining soil health. Preservation of environment and resource base is essential for sustainable agriculture.

Krishi Vigyan Kendra of CIFRI, Kakdwip has played a major role in the transformation to sustainable agriculture in Sundarbans through imparting training on five disciplines viz. fisheries, agronomy, horticulture, animal science and home science, conducting frontline demonstrations on paddy, chilli, mustard, sesamum and green gram. This book attempts to show the various achievements of KVK from its inception.

Authors

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▲ Krishi Vigyan Kendra of CIFRI (ICAR), Kakdwip



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The Spectacular Mangroves – life line of Sundarbans biosphere reserves
▼



The Area we Serve

Sundarbans is the largest prograding delta on this planet formed at the estuaries phase of the Ganges- Brahmaputra river system. The Indian Sundarbans (Latitude 21° 32'-22° 40'N, Longitude 88° 22'- 89°0'E) in the north east coast of India occupy 9630 square kilometer and are bounded by River Hugli in the West, River Raimangal in the East, Bay of Bengal in the South and Dampier Hodges line in the North. There are 56 islands of various sizes and shapes in Sundarbans and these are separated from each other by a network of tidal channels, inlets and creeks, some of which act as pathways for both freshwater discharge from upland and to and fro movement of flood and ebb. This area is also the only **Mangrove Tigerland** on the globe. The coastal area has a gentle slope and major portion of it lies 7-8 m above mean sea level. The meso-macrotidal regime inundates most areas twice daily. The Sundarbans are a combination of land and waterbodies in the following proportion.

- | | |
|---|-----------------------|
| 1. Land covered by Halophytes and Mangroves | 1750 square kilometer |
| 2. Area occupied by Creeks and inlets | 2350 square kilometer |
| 3. Area occupied by recently raised Shoals | 217 square kilometer |

Sundarbans being the nursery for nearly 90% of the aquatic species of eastern coast, the coastal fishery of eastern India is dependent upon Sundarbans. Apart from Bengal tiger Sundarbans harbours many rare and endangered animal species including the largest crocodiles of the earth, the estuarine crocodile, the salvator lizard, betagur terrapin, sea turtles like olive ridley, green turtle; hawks bill turtle, the mighty fishing cats, leopard cats are some of the rare species among 53 rare and endangered animals. There are 20 identified species of prawns and 44 species of crabs including two edible ones. Besides this 33 species of mangroves and 37 mangrove related plants are also thriving in this area.

Sundarbans lies within the torrid zone the presence of Bay of Bengal, network of river systems, canals, tanks etc do not allow extreme climatic condition to prevail. The mean annual rainfall is 1800 mm out of which 80% occurs during the monsoon season from July to September. The rainfall in remaining 8 months of the year is very erratic and nominal. The cloudy weather during monsoons results in less number of sunshine hours per day affecting photosynthetic activity and consequently yield of crops. Winter is of very short spell, last mostly for December and January and causes meak prospects for rabi crops. The high relative humidity throughout the year causes very high infestation of pests and diseases to crop plants.

Agriculture continues to be the backbone of Sundarbans economy. Economic stagnation is caused by backwardness of agriculture as it is based on mono cropping approach. Apart from high salinity of soil, lack of irrigation facilities, existence of low lying lands and lack of

capital are the other constraints being faced by the resource poor farming community. A massive application of science and technology with great effort of transfer of know-how can enable the Sundarbans' agriculture to face the challenges of poverty, food insecurity and malnutrition.

Sri Atal Bihari Vajpayee, Prime Minister of India in his address to 88th Indian Science Congress on January 3, 2001 said that having achieved food sufficiency, our aim now is to achieve food security for all our citizens. The percentage of our population living below the poverty line has come down, and we have overcome starvation. Our objective now is to overcome malnutrition. The new century will be the Century of Knowledge and the Century of Mind. However, if the brain does not develop properly in nearly one-third of our children who are undernourished, how will we be able to create those young minds that are essential to build India of our dreams in the 21st century? More than 50 percent of the pregnant women and children are anemic. Vitamin and protein deficiencies are rampant. These realities overshadow our achievements and burden our national conscience. At another level, the increases in food production that we have achieved in the past 3-4 decades have come at a cost to the agricultural environment. There has been both qualitative and quantitative degradation of land, water, and bio-resources. I have seen fertile lands that have become uncultivable due to water logging and salinization. I have seen areas where yields have come down because of wrong cropping pattern and faulty usage of fertilizers. I have also seen how excessive pumping of water has caused such acute depletion of water table that even drinking water has become scarce. Environmental security is, therefore, no longer peripheral to the issues of food and nutritional security. Neglecting it yesterday has proved costly today; and could prove far costlier tomorrow. We must, therefore, step up our programmes on soil and water management, renewable energy sources, forest management, containment of chemicals and other pollutants, waste management, and conservation of bio-diversity for sustainability of Indian agriculture. The task of ensuring food, nutrition, and environmental security in a vast country like India is gigantic. And not all solutions to the problem lie in science technology, although your contribution will certainly be invaluable. What is needed is a collective and coordinated action among all those who are associated with our agriculture and the rest of the food economy. We know that Mother Nature yields the best crop only when all the necessary conditions are properly fulfilled. Similarly, kisans and rural credit institutions, Agriculture Universities and Krishi Vigyan Kendras, meteorological offices and marketing cooperatives – all have to work in perfect concert for us to achieve best results in the task before us.

Land, water, climate, flora and fauna are the basic natural resources for agriculture development, which is subject to various kinds of deteriorating influences. Since Agriculture cannot subsist on a deteriorating natural resource base. It is imperative to evolve strategies for conservation, sustainable and holistic development of this area.

Krishi Vigyan Kendra of CIFRI, Kakdwip has been serving in Sundarbans with five disciplines that is Fisheries, Crop Science, Horticulture, Animal Science and Home Science

with major emphasis on sustainable and viable agriculture by imparting need based situation and location specific scientific knowledge to farming community by following the principles of *"learning by doing"* and *"seeing as believing."*

Genesis

Indian economy since independence is highly dependent on Agriculture and failure of monsoon rainfall for one year can change the whole economic scenario of the country. Agriculture provides livelihood to 65% of the total population of India and 23% of the GDP comes from it. The country's food grain production was only 51 million tones at the time of independence, which has now reached up to 210 million tones. In our country several development programme had been initiated by Government of India right from the independence to boost the agricultural production as well as the development of rural area. Community Development Programme was started in 1952 along with the first Five Year Plan emphasizing mainly on increasing agricultural production. Intensive Area Development Programme and Intensive Area Agriculture Programme were next in the galaxies of programmes to uplift the socio-economic status of the down trodden poor populace of rural area. The major breakthrough came in 1967 when the green revolution was ushered in India with high yielding varieties of food grain along with the use of chemical fertilizers and pesticides and irrigation that dramatically changed the food grain production of the country but not without giving regional disparities in terms of productions well as economic status. While Punjab, Haryana and Western Uttar Pradesh were the main beneficiaries due to the early innovators farming community, other states failed to catch the momentum because of late action from their part.

Dr. A.P.J. Abdul Kalam, President, Republic of India in his address at the 21st Convocation of the Govind Ballabh Pant University of Agriculture & Technology Pantnagar, November 17, 2003 said that the First Green Revolution launched by great visionaries Shri C. Subramaniam and Dr. M.S. Swaminathan with the help of agricultural scientists, farmers and entrepreneurs, liberated India from the situation of what was called "ship to mouth existence." Through an effort of historical magnitude, India attained self-sufficiency in food and we can now export certain quantity of food-grains.

Sri Atal Bihari Vajpayee, Prime Minister of India in his address to 90th Indian Science Congress on January 3, 2003 has said that we have to further consolidate the gains we have made in agricultural science and achieve higher productivity in the production of pulses, oil seeds and vegetables, animal husbandry, dairying, fisheries, horticulture, cultivation of medicinal and energy plants, and agro-processing industries. Application of new scientific and technological capabilities generated through Biotechnology, IT and Space Technologies should be extensively pursued. Minimizing wastage in farm produce continues to be neglected tasks in most parts of the country. All these efforts are essential to increase rural incomes and generate new employment opportunities in the rural economy, which is our first developmental priority.

The education commission (1964-66) has recommended that a vigorous effort be made to establish specialized institutions to provide vocational education in agriculture and allied fields at the pre and post matriculate levels to cater the training needs of a large number of boys and girls coming from rural areas. The commission further suggested that such institutions be named as "Agricultural Polytechnics". These recommendations were thoroughly discussed during 1966-72 by the Ministry of Education, Ministry of Agriculture, Planning Commission, Indian Council of Agricultural Research and other allied institutions. Finally, the ICAR muted the idea of establishing Krishi Vigyan Kendras (Agricultural Science Centers) as innovative institutions for imparting vocational training to the practicing farmers, school drop outs and field level extension functionaries.

The ICAR Standing Committee on Agriculture Education, in its meeting held in August 1973, observed that since the establishment of Krishi Vigyan Kendras (KVKs) was of national importance which would help in accelerating the agricultural production and also in improving the socio-economic conditions of the farming community, the assistance of all related institutions should be taken in implementing these schemes. The ICAR, therefore, constituted a committee in 1973 under the chairmanship of Dr. Mohan Singh Mehta of Seva Mandir, Udaipur, Rajasthan for working out a detailed plan for implementing this scheme. The committee submitted its report in 1974 and following the recommendations, first Krishi Vigyan Kendra was established in Pondichery in 1974 by the ICAR. At present 325 KVKs are working in India.

Krishi Vigyan Kendra of Central Inland Fisheries Research Institute (ICAR) at Kakdwip was established (vide Council letter F. NO. - 22(1)/79- Edn-II, dated. 05.11.1979) in November 1979 as the second KVK in the West Bengal under the administrative control of Central Inland Fisheries Research Institute, Barrackpore and continued till December 31, 1987. As per ICAR directive Krishi Vigyan Kendra, Kakdwip was transferred under the administrative control of Central Institute of Brackishwater Aquaculture, Madras with effect from January 1, 1988 and continued till July 31, 1989. Again as per ICAR directive Krishi Vigyan Kendra, Kakdwip was transferred under the administrative control of Central Inland Fisheries Research Institute, Barrackpore with effect from August 1, 1989.

Basic Concept of Krishi Vigyan Kendra

The Mohan Singh Mehta Committee (1974) enunciated the following three basic concepts of Krishi Vigyan Kendra

- ❖ The kendra will impart learning through work experience and hence will be concerned with technical literacy, the acquisition of which does not necessarily require as a precondition for the ability to read and write.
- ❖ The kendra will impart training to only those extension workers who are already employed or to the practicing farmers and fishermen. In other words, the kendra will

cater the needs of those who are already employed or those who wish to be self-employed.

- ❖ There will be no uniform syllabus for a kendra, the syllabus and programmes of each kendra will be tailored to the felt needs, natural resources and the potential for agricultural growth in that particular area.

Basic Principles of Krishi Vigyan Kendra

The Committee further suggested that the success of kendra will depend upon adherence to the following three basic principles.

- ❖ Accelerating agricultural and allied productions in the operational area of the kendra should be the prime goal.
- ❖ Experimental learning i.e. "*teaching by doing*" and "*learning by doing*" should be the principal methods of imparting skill training; and
- ❖ Training efforts should not be made to make economically good people better but the poor ones good so as to raise the living conditions of the poorest of the poor.

Mandate of Kvk :

The Mandate of Krishi Vigyan Kendra of CIFRI, Kakdwip is:

- ⇒ Conducting "on-farm testing" for identifying technologies in terms of location specific sustainable land use systems.
- ⇒ Organizing training to update the extension personnel with emerging advances in agricultural research on regular basis.
- ⇒ Organizing short and long-term vocational training courses in agricultural and allied vocations for the farmers and rural youths with emphasis on "learning by doing" for higher production on farms and generating self employment.
- ⇒ Organizing frontline demonstrations on various crops to generate production data and feedback information.

Objectives :

The Kendra has been functioning with the following objectives to achieve the above mandate as per guidelines of the Council.

- To promptly demonstrate the latest agricultural technologies to the farmers as well as extension workers of State Departments of Agriculture/Horticulture/ Fisheries/Animal Science/Non-Government Organizations with a view to reduce the time lag between the technology generation and its adoption.
- To test and verify the technologies in the socio-economic conditions of the farmers with a view to study the production constraints and modify the technologies to make them appropriate.
- To impart training to the practicing farmers/farm women, rural youth and field level extension functionaries by following the method of "teaching by doing" and "learning by doing".
- To back-up with training and communication support to the district level development departments viz. Agriculture/Horticulture/Fisheries/Animal Science and Non-Government Organizations in their extension programmes.

Thrust Areas

- Productivity improvements of kharif rice through selection of appropriate situation specific improved varieties.
- Integrated nutrient management
- Conservation and management of rainwater for rabi crops
- Technology standardization for fruit and vegetable for less saline soils
- Integrated fish farming with agriculture, poultry, piggery and duckery
- Management technologies for fish seed raising
- Value addition and preservation of fruits and vegetables

Description of Agro Climatic Zone and Farming Situation of the District :

The Agricultural District of South 24 Parganas lies between $21^{\circ} 2' - 22^{\circ} 6'$ North latitude & $88^{\circ} 25'$ to 89° East longitude. This District is bounded by the District North 24 Parganas in the east, Kolkata city in the north, the river Hooghly in the west and Sundarbans forest converging in Bay of Bengal in the south.

The geographical area of the district is 8,12,818 ha having a total population of 58 lakhs of which 70% are rural. This district has got around 9.5% of state's population and 8.4% of land. The population density is 650 per square kilometer. The climate is sub tropical with high humidity and high annual rainfall. According to agro-climatic conditions, 2 distinct soil groups are found here 1) Gangetic alluvium and 2) Coastal saline soil. Soil texture is clay to clay loam and the soil reaction is slightly acidic to slightly alkaline. The land situation is medium to low land having many constraints like salinity, impeded drainage and lack of irrigation facilities in the Sundarbans area. The southern portion of the district constitutes the Sundarbans region which has a network of tidal rivers and creeks forming course of islands.

In the coastal areas, the surface water is generally saline and unsuitable for human consumption and agricultural use. Fresh ground water is found at a depth of 300 to 400 meters and its exploration is very costly. The annual rainfall is 1700-1800 mm.

The cropping intensity of the district is 135% only. Among the cultivated crops, aman paddy as principal crop grown in kharif season out of which 29% is under HYV. The other crops features in the cropping pattern are pulses, oilseeds and vegetables and betel vine, but their cultivation is limited because of the dearth of irrigation water. Out of total gross cropped area 30% are irrigated. The major crops grown are kharif & boro rice, tomato, brinjal, bhindi, cucumber, bitter gourd, watermelon, ridge gourd, chilli, yam, betel vine, mustard, sesamum, sunflower green gram, lathyrus.

95% of the peoples depend on agriculture, 85 % of whom belongs to small and marginal farmers, 55% of the people are landless agricultural laborers finding local employment only for 5 to 6 months.

Salient Information of the District

Physical		Area (ha)	Demographic Statistics		
1.	Geographical area	8,12,818	1.	Total Population	57,15,030
2.	Forest area	1,70,580	2.	Small Farmers	1,47,893
3.	Not cultivated area	2,24,505	3.	Marginal Farmers	2,33,439
4.	Unreclaimed area	3,224	4.	Recorded Borgadar	1,04,509
5.	Fallow area	5,000	5.	Patta Holders	85,716
6.	Net cultivated area	3,92,119	6.	Agricultural Laborers	3,40,111
7.	Double cropped area	1,41,162	7.	No. of Blocks	30
8.	Gross cultivated area	5,33,281	8.	No. of Gram Panchayats	359
9.	Cropping Intensity	135%	9.	No. of Municipalities	6

Distribution of Size of Holding in the District

Size of Holding (Area in ha)	No. of Holdings	Percentage (%)	Area (ha)
Up to 1.0 ha	2,54,566	64	67,112
1.0 - 2.0 ha	79,552	20	88,305
2.0 - 4.0 ha	47,731	12	1,05,066
Above 4.0 ha	15,910	4	91,837
Total	3,97,759	100	3,32,320

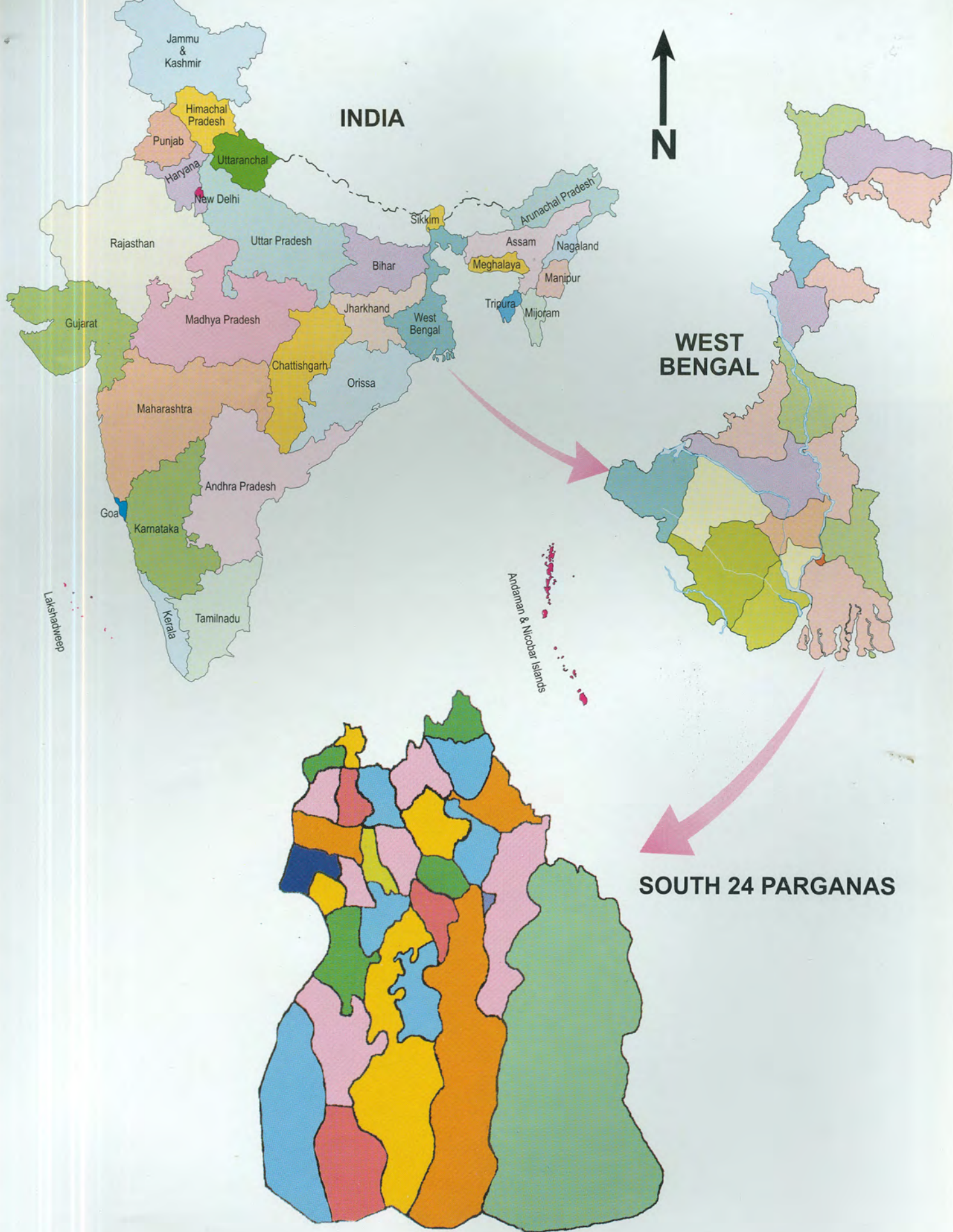
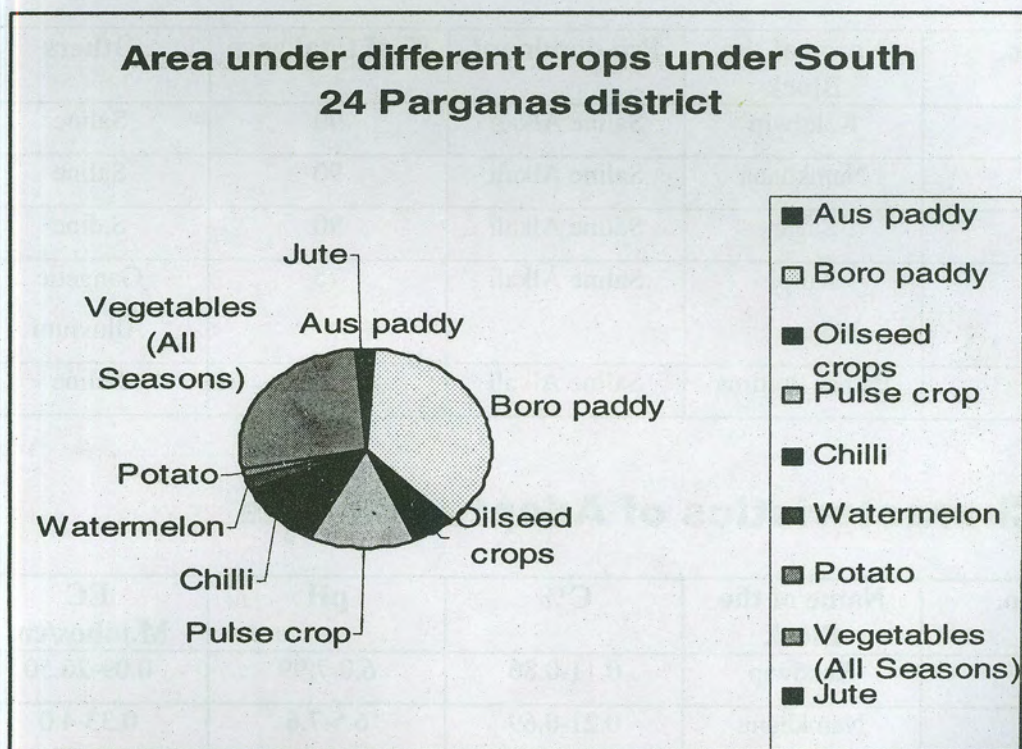


Fig 1 : Location map of study area

Area Under Different Crops of the District

Crops	Area (ha)
Aman paddy(Local)	2,54,639
Aman paddy (HYV)	1,08,121
Aus paddy	1,610
Boro paddy	59,475
Oilseed crops	9,705
Pulse crop	22,025
Chilli	17,921
Watermelon	3,700
Potato	1,978
Vegetables (All Seasons)	43,620
Jute	1,875



Area under Cultivation and Land Situations in Adopted Blocks

Sl. No.	Name of the Block	Area under Cultivation (ha.)	Land Situation (in %)		
			High	Medium	Low
1.	Kakdwip	21080	4	26	70
2.	Namkhana	16880	8	12	80
3.	Sagar	15544	10	28	62
4.	Kulpi	18187	2	3	95
5.	Pathar Pratima	31455	4	26	70

Soil Groups of Adopted Blocks

Sl. No.	Name of the Block	Pre-dominant	% of total area	Others
1.	Kakdwip	Saline Alkali	90	Saline
2.	Namkhana	Saline Alkali	90	Saline
3.	Sagar	Saline Alkali	90	Saline
4.	Kulpi	Saline Alkali	75	Gangetic Alluvium
5.	Pathar Pratima	Saline Alkali	70	Saline

Soil Characteristics of Adopted Blocks

Sl. No.	Name of the Block	C%	pH	EC M.mhos/cm
1.	Kakdwip	0.11-0.86	6.0-7.99	0.09-26.50
2.	Namkhana	0.21-0.69	6.5-7.6	0.33-4.0
3.	Sagar	0.22-0.84	4.8-7.9	0.18-5.80
4.	Kulpi	0.06-0.88	5.4-8.5	0.21-7.8
5.	Pathar Pratima	0.01-1.44	4.3-8.5	0.09-26.50

Particulars of Krishi Vigyan Kendra

1. Name of the KVK : KRISHI VIGYAN KENDRA of CIFRI
(ICAR), Kakdwip - 743 347,
District South 24 Parganas, W.B.
2. KVK Code : 12004.
3. Name of the Host- : CENTRAL INLAND FISHERIES
Organization & : RESEARCH INSTITUTE (ICAR),
Address : Barrackpore - 700120, West Bengal.
Telegraphic Address : FISHSEARCH: Barrackpore.
Fax No. : ++91-33-25920388.
E. Mail : *cifri @ vsnl.net.in*
4. Name of the Head of : DIRECTOR, CENTRAL INLAND
the Organization with : FISHERIES RESEARCH INSTITUTE.
Designation : BARRACKPORE
5. Name of the Incharge : DR. R.L. SAGAR.
of the KVK with Designation : Principal Scientist (AE) & Officer- in-
Charge.
6. Address of K.V.K. : KRISHI VIGYAN KENDRA OF CIFRI
P.O. - Kakdwip - 743 347, 24 Parganas (S)
West Bengal
7. Telegraphic Address : KVK: FISHSEARCH., KAKDWIP - 743 347.
Telephone No. : ++91-3210-256496 (Office)
Nil (Residence).
8. Letter No. & date by which : F. NO. - 22(1)/79- Edn-II, dt. 05.11.1979.
KVK was sanctioned by
ICAR
9. Month and Year :
of inception : NOVEMBER, 1979.

Organization

Staff Position

Sl. No.	Designation with discipline	Name	Highest Degree & Diploma	Pay Scale (Rs.)	Date of Joining
Scientists					
1.	Principal Scientist (Agricultural Extension)	Dr. R.L. Sagar	Ph.D. in Agricultural Extension	16400-22400	30.11.1998
2.	Principal Scientist (Fish And Fishery) Till 1 st August 2003	Mr. J. G. Chatterjee	M.Sc. in Comparative Zoology and Anatomy	16400-22400	11.04.1981
3.	Scientist, (Agricultural Extension)	Mr. Ganesh Chandra	M. Sc.(Ag.) in Agricultural Extension	8000-13500	01.01.2000
Technicals					
4.	T-9 (Home Science)	Miss. M. Sen.	BA Dip. in. H. Sc.	12000-16500	10.08.1983
5.	T- 8 (Agronomy)	Dr. A.K. Chattopadhyay	Ph. D in Agronomy	10000-15200	21.08.1981
6.	T- 8 (Horticulture)	Mr. S.K. Sadhukhan	M. Sc. (Ag.) Horticulture	10000-15200	08.07.1983
7.	T- 6 (Animal Science)	Dr. A. Biswas	M. V. Sc. (Veterinary Pathology)	8000-13500 + NPA	21.07.1995
8.	T- 6 (Horticulture)	Mr. C. N. Mukherjee	M.Sc.(Ag.) in Agronomy	8000-13500	06.01.1987
9.	T-4 (Agronomy) Till 29 th June 2002	Dr. P. K. Dhara	Ph. D. in Agricultural Engineering	5500-9000	24-01-1996
10.	Driver, T-2	Mr. A.K. Goswami	H.S.	4000-6000	26.12.1983
Administrative					
11.	Senior Clerk	Mrs. A.R. Panigrahi	BA, Dip in H. Sc.	4000-6000	15.09.1980

Supporting					
12.	SSG- II	Mr. R.P. Halder	-	2610-3540	15.05.1980
13.	SSG- II	Mr. M.C. Gharami	-	2610-3540	15.05.1980
14.	SSG- II	Mr. G.C. Gharami	-	2610-3540	15.05.1980
15.	SSG- II	Mr. N.T. Dalui	-	2610-3540	15.05.1980
16.	SSG- II	Mr. B.D. Gharami	-	2610-3540	15.05.1980
17.	SSG- II	Mr. B.P. Samanta	-	2610-3540	08.08.1984
18.	SSG- II	Mr. B. P. Mishra	-	2610-3540	08.08.1984

Infrastructure Development

Total land with KVK

1. KVK administrative-cum-laboratory building : 1.72 acres
2. Land for farm construction : 7.0 acres

The Sundarbans Development Board, Govt. of West Bengal handed over 42.75 Acres of char land and 1.72 acres of low homestead land for construction of Administrative-cum-laboratory building and hostel. 35.75 acres of char land was returned back to Sundarbans Development Board, Govt. of West Bengal on 12th March 2003. Actual possession of land for farm construction up to March 2003 with embankment is only 7.0 acres. The Kendra took over its own office and administrative building in January 1994. At present the hostel building needs urgent repair. The appropriate areas of the building are given below.

Administrative-cum-laboratory building	:	414m ²
Pump house	:	56m ²
Hostel-building	:	240m ²

Proposal for boundary wall, staff quarters and farm construction has been sent to the Council for providing fund, but till date no approval has been received. An amount of Rs. 14.86 lakhs and Rs. 2.83 lakhs were deposited to CPWD during the year 1995 for construction of boundary wall and repairing of the hostel building and pump house respectively. Unfortunately the work could not be completed as CPWD submitted higher revised budget

which has been communicated to the council for vetting. But so far no approval has been received from the council resulting in poor infrastructure facility.

The renovation of Office-cum-Administrative building has been completed with the ICAR catch up grant of Rs. 2.0 lakhs in 2000.

Budget

The Annual Budget of Krishi Vigyan Kendra of CIFRI, Kakdwip has been sanctioned and released by ICAR through the Zonal Coordinating Unit of the TOT Projects, Zone II, Kolkata. The details of budget allotment, fund received and expenditure are given below.

Financial year	Budget allotment	Fund received (Rs)	Recurring expenditure (Rs)	Non Recurring expenditure (Rs)	Works (Rs)	Total (Rs)
1979-80	839962	* 358435	6094	122341	230000	358435
1980-81	487134	* 235664	86206	29458	120000	235664
1981-82	257306	* 325636	112715	62921	150000	325636
1982-83	275178	* 198237	134509	63728	-	198237
1983-84	743000	* 793375	226565	(-) 10330	577500	793375
1984-85	398000	* 298860	268154	30706	-	298860
1985-86	800000	* 328803	320200	8603	-	328803
1986-87	206000	* 197566	201166	(-) 3600	-	197566
1987-88	166000	144000	421107	-	-	421107
1988-89	Under CIBA details not available					
1989-90	342000	117000	292765	-	-	292765
1990-91	597000	Nil	597448	-	-	597448
1991-92	570000	560000	665421	-	-	665421
1992-93	682000	130000	769364	-	-	769364
1993-94	1988000	1392000	970672	-	-	970672
1994-95	1765000	1983000	1205289	-	494010	1699299
1995-96	2761000	2761000	1335091	-	1486360	2821451
1996-97	1390000	1900000	1522418	-	-	1522418
1997-98	1750000	1750000	1799546	679772	-	2479318
1998-99	2150000	2150000	2027801	-	-	2027801
1999-2000	2762000	2762000	2336801	-	199235	2536036
2000-01	2554000	2554000	2366805	-	-	2366805
2001-02	2417000	2417000	2472321	-	-	2472321
2002-03	2810000	3010000				
2003-04						

* No break up of funds for KVK received, thus actual expenditure taken as fund received for KVK

Budget under Front Line Demonstration

Budget For Frontline Demonstration on oilseeds and pulses are sanctioned and released by the ICAR through the Zonal Coordinating Unit of the TOT Projects, Zone II, Kolkata separately under oilseeds and pulses fund. The details of budget allotment, fund received and expenditure under oilseeds and pulses are given below.

Financial year	Oilseeds				Pulses			
	Opening balance (Rs)	Receipt (Rs)	Expenditure (Rs)	Closing balance (Rs)	Opening balance (Rs)	Receipt (Rs)	Expenditure (Rs)	Closing balance (Rs)
1990-91	-	23875	20662	3213	-	-	-	-
1991-92	3213	45190	38220	10183	-	31000	2500	28500
1992-93	10183	-	7483	2700	28500	36000	40200	24300
1993-94	2700	70000	49850	22850	24300	36750	17250	48300
1994-95	22850	67000	47790	42060	48300	6000	15200	34600
1995-96	42060	95000	134863	2197	34600	49800	84400	-
1996-97	2197	71000	7125	66072	-	34900	-	34900
1997-98	66072	35875	88691	13256	34900	45577	68561	13916
1998-99	13256	7369	20625	-	13916	-	-	13916
1999-2000	-	48825	13200	35625	13916	12350	12100	14166
2000-01	35625	-	4800	30825	14166	-	11376	2790
2001-02	30825	4800	3181	32444	2790	4620	7385	25
2002-03	32444	3181			25	12225		

Training

Training is regarded as one of the integral component of development programmes. Training requires special skills and positive attitude on the part of the facilitator which are not commonly find in traditional teachers. These skills and attitudes to be developed in order to ensure successful programme for the training.

The vocational training programmes prepare the practicing farmers to adopt modern agricultural technologies and the young farmers and school dropouts for scientific farming on their own farms or in his agrobased industries.

The training need assessment of the farming communities of the adopted development blocks viz. Kakdwip, Namkhana, Kulpi, Sagar and Patharpratima in five disciplines that is Fisheries, Agronomy, Horticulture, Animal Science and Home Science are done through the process given below

1. Identification of Courses for Farmers/ Farmwomen & Rural Youth:

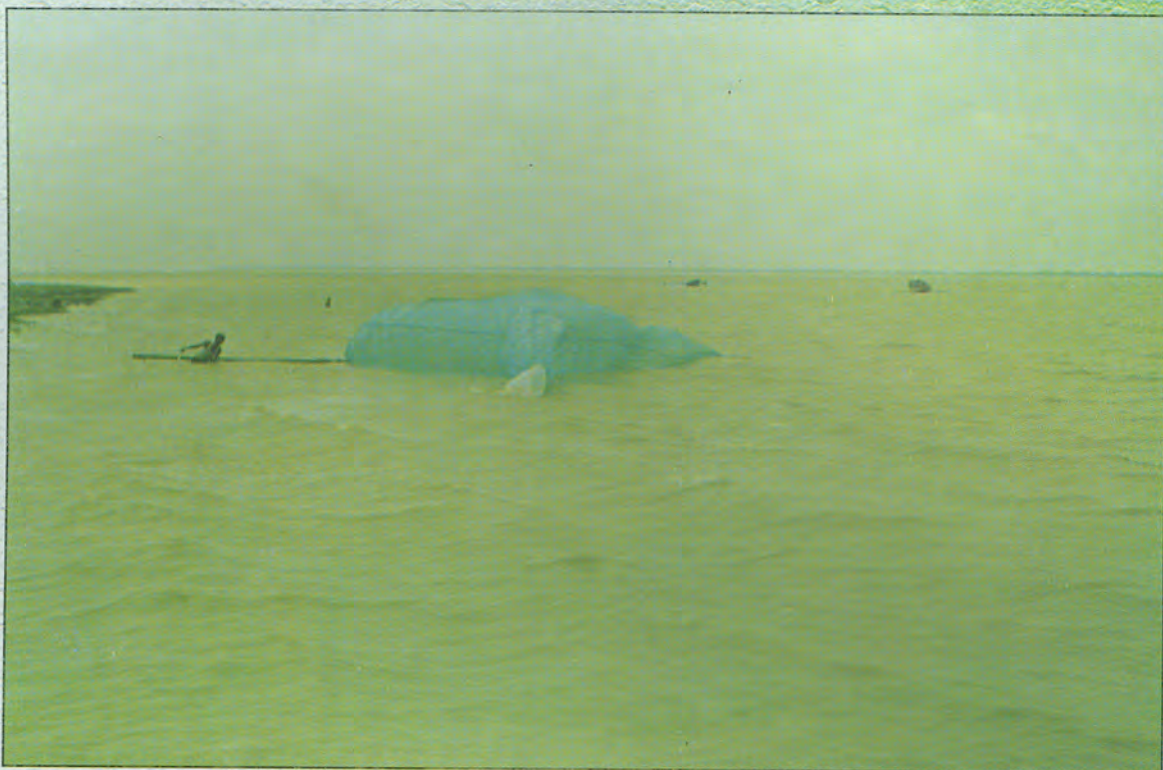
- ▲ Training need assessment is done by knowing the skill and knowledge gap through a structured schedule form cum questionnaire, through using agro-ecosystem analysis (PRA techniques), group discussion and benchmark survey system model.
- ▲ Training curriculum and the duration of training programmes are set based on the needs of clientele groups.
- ▲ Top priority is given on the entrepreneurship development for the rural youth
- ▲ Adult learning theory ELC module are used for implementing of training programmes
- ▲ KVK faculties' are using various tools of learning viz. interactive lectures, small group tasks, interactive demonstrations, case studies, role play as training methodologies.

2. Identification of Courses for in Service Personnel/ Extension Functionaries:

- ▲ Panel discussion at levels of individual, group and organization on the basis of national priorities and agrarian needs of the areas
- ▲ The training is imparted to the in service personnel following the methodologies of ELC.

Discipline : Fisheries

Fishery is one of the main occupations of Sundarbans. But the fisheries activities are not based on the scientific line. This has created a lot of problems and led to the extinction of a number of fish species. Unrestricted fishing is the norm, and anyone can take as much as is possible, with little or no enforcement of any existing fishing regulations. The tendency for individual maximizing behavior in human societies is similar to scramble competition of the biological world and characterizes much of the fishery exploitation. Sound management of natural resources requires correct basic knowledge about ecosystems. Management practices based on the assumption that high biomass means high productivity have failed in the past, and will fail again in the future. Any serious attempt to build knowledge must come from a strong foundation of basic research. Merely renting a trawler and producing kg/ha biomass estimates for the Sundarbans is a waste of money because what is really needed is knowledge of how the ecosystem functions.



▲ Prawn seed collection from rivers



▲ Net Weaving by a fisherman

The Sundarbans are an important aquatic resource in many ways. For fishes, the Sundarbans function as nursery grounds for important commercial species of the continental shelf that are harvested in India and Bangladesh. Further, many commercial estuarine fishes grow to maturity there and make up a large part of the near-shore fishery of the northern Bay of Bengal. Other fishes and prawns that spend most of their lives in freshwater descend annually to the estuary for spawning. Some seventy species of fish were commonly available in the Sundarbans, and fishing was the most important "hand industry" in the area.

There are two additional kinds of fisheries that demand special attention: the bheri and the paddy-cum-fish farm. (A) The Bheri: This is an embanked area with a regulated opening; it lets in tidal water carrying fish larvae. The opening is closed after the water level rises to about five feet; the captured larvae thus mature in the protected area. This is a widely practiced method of fish farming in the swamps, very productive and relatively inexpensive. (B) Paddy-cum-Fish Farm: This is fish farming practiced in paddy fields that retain a water level of one to three feet for a period of six months. The fish feed on, among other things, paddy insects and, thus, act as natural pestivores. If the fish are of the ground-feeding species, they also help in tillage and in oxygenation of the soil; fish excrement provides an excellent organic manure. This symbiotic system can increase paddy production by 5 to 15 percent and the growth of the fish by as much as 30 percent.

Through organizing training programmes for the farming community of Sundarbans Krishi Vigyan Kendra, Kakdwip have brought a conspicuous change in the aquatic production of the area. The various training courses conducted and number of trainees participated under the fisheries discipline are given below

1. Polyculture pond preparation for finfish and shellfish
2. Technique of application of mohua oil cake & lime in fishpond.
3. Quality feeding practices in Indian major carps.
4. Technique of preparation of fresh water nursery pond
5. Brackishwater nursery pond management.
6. Collection of Pituitary gland and its preservation.
7. Seed production of Indian Major Carps through hypophysation
8. Technique of transportation of fish seed
9. Technique of diagnosis of common fish diseases and its remedial measures
10. Conservation of brackish water prawn and fish seeds.
11. Quality feeding practices in Indian Major Carps
12. Conservation of traditional freshwater fishes
13. Paddy-cum-fish culture technique

14. Artificial feed preparation technique with locally available ingredients for prawn
15. Controlled breeding of common carp
16. Fish seed transport technique
17. Protection of dwindling fishes in river by mesh size control of nets.
18. Identification of Indian Major Carp seeds.

FISHERIES											
Year	No. of Courses	Duration	Participants								
			SC/ST			Others			Total		
			M	W	T	M	W	T	M	W	T
1980-81	10	2-5	35	-	35	45	-	45	80	-	80
1981-82	14	2-5	58	-	58	100	-	100	158	-	158
1982-83	12	2-5	8	-	8	98	-	98	106	-	106
1983-84	12	2-5	8	-	8	98	-	98	106	-	106
1984-85	12	2-5	4	2	6	116	-	116	120	2	122
1985-86	10	2-5	8	-	8	88	2	90	96	2	98
1986-87	12	2-5	11	-	11	118	-	118	129	-	129
1987-88	25	2-5	78	23	101	238	40	278	316	63	379
1988-89	22	2-5	94	26	120	218	63	281	312	89	401
1989-90	30	2-5	91	33	124	309	78	387	400	111	511
1990-91	28	2-5	78	38	116	264	62	326	342	100	442
1991-92	37	2-5	52	18	70	283	42	325	335	60	395
1992-93	43	2-5	117	85	202	334	183	517	451	268	719
1993-94	30	2-5	218	94	312	269	234	503	487	328	815
1994-95	29	2-5	96	60	156	236	115	351	332	175	507
1995-96	24	2-5	136	62	198	340	84	424	476	146	622
1996-97	22	2-5	130	36	166	216	62	278	346	98	444
1997-98	26	2-5	298	107	405	167	28	195	465	135	600
1998-99	33		266	85	351	387	122	509	653	207	860
1999-2000	25		159	33	192	353	65	418	512	98	610
2000-01	28		213	79	292	234	104	338	447	183	630
2001-02	30		147	26	173	326	113	439	473	139	612
2002-03	36		177	59	236	292	120	412	469	179	648
2003-04	13		62	22	84	103	33	136	165	55	220
Total	563		2544	888	3432	5232	1550	6782	7776	2438	10214

Discipline : Agronomy

Crop production is the backbone of Sundarbans. The total food security of this area depends on it. Among the cultivated crops, aman paddy as principal crop grown in kharif season out of which 29% is under HYV. The other crops features in the cropping pattern are pulses, oilseeds and vegetables and betel vine, but their cultivation is limited because of the dearth of irrigation water. Out of total gross cropped area 30% are irrigated. The major crops grown are kharif & boro rice, betel vine, mustard, sesamum, sunflower green gram, lathyrus.

Apart from rice, Betelvine provides seasonal employment and income to a large section of farmers. The cropping intensity at present in the adopted areas of KVK has reached to 150%. The various training courses conducted and number of trainees participated under the Agronomy discipline are given below.

1. Fertilizer application techniques in rice
2. Practice of seeds storing techniques.
3. Organic fertilizer application technique in betelvine.
4. Root rot disease management in betelvine.
5. Vermi-compost preparation and its use.
6. Soil sampling techniques.
7. Earhead cutting caterpillar control in rice.
8. IPM for BPH in rice.
9. Zinc nutrition in boro rice.
10. IPM for BLB in boro rice.
11. Seedling raising techniques of rice.
12. Salt treatment of post harvest rice seeds
13. Rhizobium inoculation in moong seeds.
14. Water management in mustard
15. Nitrogen application technique in rice.
16. Anthracnose management in betelvine
17. Pest and disease management in betelvine
18. Hybrid rice cultivation
19. Practice of organic farming in rice
20. Organic fertilizer application in boro rice

A. AGRONOMY

Year	No. of Courses	Duration	Participants								
			SC/ST			Others			Total		
			M	W	T	M	W	T	M	W	T
1980-81	6	2-5	12	-	12	38	-	38	50	-	50
1981-82	12	2-5	42	-	42	107	-	107	149	-	149
1982-83	12	2-5	48	-	48	130	-	130	178	-	178
1983-84	10	2-5	28	-	28	74	-	74	102	-	102
1984-85	11	2-5	14	-	14	98	-	98	112	-	112
1985-86	12	2-5	33	-	33	104	-	104	137	-	137
1986-87	10	2-5	-	-	-	108	-	108	108	-	108
1987-88	18	2-5	49	32	81	124	38	162	173	70	243
1988-89	17	2-5	62	18	80	107	18	125	169	36	205
1989-90	22	2-5	72	38	110	143	22	165	215	60	275
1990-91	22	2-5	36	24	60	168	44	212	204	68	272
1991-92	30	2-5	48	27	75	248	56	304	296	83	379
1992-93	30	2-5	55	29	84	148	71	219	203	100	303
1993-94	18	2-5	20	15	35	201	64	265	221	79	300
1994-95	37	2-5	100	32	132	268	107	375	368	139	507
1995-96	35	2-5	277	91	368	399	103	502	676	194	870
1996-97	45	2-5	154	63	217	387	83	470	541	146	687
1997-98	28	2-5	189	157	346	214	70	284	403	227	630
1998-99	44		408	170	578	434	174	608	842	344	1186
1999-2000	29		237	115	352	250	113	363	487	228	715
2000-01	23		130	115	245	100	85	185	230	200	430
2001-02	27		133	102	235	112	73	185	245	175	420
2002-03	35		131	148	279	124	121	245	255	269	524
2003-04	28		120	84	204	105	75	180	225	159	384
Total	561		2398	1260	3658	4191	1317	5508	6589	2577	9166

Discipline : Horticulture

Horticulture deals with the cultivation of fruits and vegetables. In commercial orchards, as well as in homestead gardens, the Sundarbans produces a wide variety of fruits and vegetables. The principal fruits are coconut, banana, mango, papaya, jack fruit, guava, sapota, custard apple and tamarind. These fruits and trees also produce marketable by-products. Among the vegetables, the major crops grown are tomato, brinjal, bhindi, cucumber, bitter gourd, watermelon, ridge gourd, chilli, yam.

The various training courses conducted and number of trainees participated under the Horticulture discipline are given below

1. Grafting of sapota.
2. Yellow mosaic virus vector control in bhindi.
3. Technique of hybrid vegetables
4. Techniques of raising off-season tomato.
5. Veneer grafting in mango.
6. Seedling raising of cauliflower.
7. Boron application in cauliflower
8. Control of leaf curl disease in chilli
9. Intercultural operations in vegetable garden
10. Use of balanced fertilizers in hybrid tomato
11. Mulching in pointed gourd
12. Application of potash in coconut
13. Air layering in guava
14. Control of borers in brinjal & bhindi
15. Use of NAA to control fruit drop in mango
16. Method of compost preparation
17. HYV chilli production technique
18. Fertilizer application in coconut
19. Seed bed preparation of chilli and tomato
20. Improved technique of papaya cultivation
21. Cultivation of banana in field borders and pond bunds.

B. HORTICULTURE											
Year	No. of Courses	Duration	Participants								
			SC/ST			Others			Total		
			M	W	T	M	W	T	M	W	T
1980-81	4	2-5	-	-	-	40	-	40	40	-	40
1981-82	10	2-5	22	-	22	70	-	70	92	-	92
1982-83	10	2-5	18	-	18	124	-	124	142	-	142
1983-84	10	2-5	20	-	20	58	-	58	78	-	78
1984-85	10	2-5	-	-	-	96	-	96	96	-	96
1985-86	9	2-5	-	-	-	98	-	98	98	-	98
1986-87	8	2-5	7	2	9	72	1	73	79	3	82
1987-88	22	2-5	138	48	186	178	24	202	316	72	388
1988-89	19	2-5	103	35	138	122	45	167	225	80	305
1989-90	25	2-5	134	52	186	238	42	280	372	94	466
1990-91	24	2-5	159	21	180	237	46	283	396	67	463
1991-92	28	2-5	75	25	100	183	46	229	258	71	329
1992-93	33	2-5	124	57	181	223	133	356	347	190	537
1993-94	22	2-5	86	47	133	358	230	588	444	277	721
1994-95	34	2-5	50	46	96	369	94	463	419	140	559
1995-96	36	2-5	267	43	310	588	88	676	855	131	986
1996-97	33	2-5	173	15	188	236	48	284	409	63	472
1997-98	25	2-5	126	36	162	218	90	308	344	126	470
1998-99	30		173	38	211	317	100	417	490	138	628
1999-2000	25		318	84	402	277	69	346	595	153	748
2000-01	22		161	95	256	134	65	199	295	160	455
2001-02	24		119	62	181	120	62	182	239	124	363
2002-03	23		103	45	148	116	36	152	219	81	300
2003-04	32		141	74	215	174	81	255	315	155	470
Total	518		2517	825	3342	4646	1300	5946	7163	2125	9288

Discipline : Animal Science

Though fisheries is the main source of income along with crop production for the farmers of this area, but animal rearing as well as poultry has given a new source of earning to them. Livestocks like cows indigenous as well as jersey and holstein freezer are kept for milk production. Bengal goat and garole sheep are the prominent small ruminant of Sundarbans. The introduction of broiler as well as layer poultry farming, piggery though as small scale by the farmers of this area has given a boost to the additional family income.

The various training courses conducted and number of trainees participated under the Animal Science discipline are given below.

1. Feeding of bengal goat
2. Care and management of crossbred calves
3. Poultry broiler management
4. Brooding management of poultry broiler under intensive system
5. Feeding and breeding of cross bred cows
6. Cross bred pig management
7. Health care and feeding practice of garole sheep
8. Feeding practices of crossbred pigs
9. Vaccination against bacterial and viral diseases of livestock
10. Control of internal parasites of bovine
11. Flashing technique of pigs
12. Fodder cultivation
13. Technique of improving nutritive value of paddy straw
14. Grading up of deshi cattle through artificial insemination
15. Integrated poultry cum fish farming
16. Poultry rearing under backyard system
17. Duck rearing in duck cum fish farming
18. Supplementary feeding, deworming and vaccination practice of goat
19. Deworming of crossbred cattle
20. Disease prevention of pigs
21. Care and management of crossbred dairy cattle
22. Feeding of swine

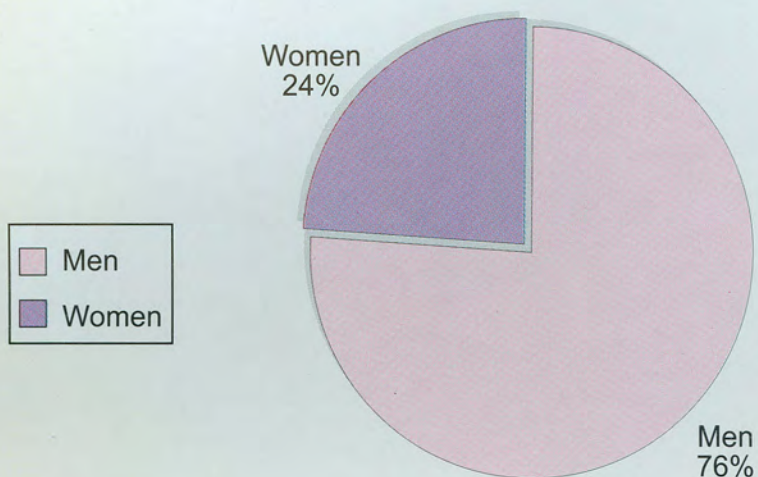
C. ANIMAL SCIENCE

Year	No. of Courses	Duration	Participants								
			SC/ST			Others			Total		
			M	W	T	M	W	T	M	W	T
1984-85	2	2-5	-	-	-	20	-	20	20	-	20
1985-86	8	2-5	-	-	-	72	-	72	72	-	72
1986-87	8	2-5	4	-	4	76	-	76	80	-	80
1987-88	10	2-5	44	18	62	69	24	93	113	42	155
1988-89	12	2-5	48	16	64	60	12	72	108	28	136
1989-90	12	2-5	58	15	73	78	22	100	136	37	173
1990-91	8	2-5	24	6	30	58	8	66	82	14	96
1991-92	10	2-5	28	4	32	79	5	84	107	9	116
1992-93	5	2-5	26	4	30	58	39	97	84	43	127
1993-94	-	-	-	-	-	-	-	-	-	-	-
1994-95	13	2-5	19	19	38	74	42	116	93	61	154
1995-96	18	2-5	58	-	58	173	165	338	231	165	396
1996-97	19	2-5	65	16	81	140	38	178	205	54	259
1997-98	23	2-15	117	92	209	203	70	273	320	162	482
1998-99	30		156	66	222	260	114	374	416	180	596
1999-2000	26		150	109	259	222	158	380	372	267	639
2000-01	15		48	19	67	132	48	180	180	67	247
2001-02	-	-	-	-	-	-	-	-	-	-	-
2002-03	14		55	32	87	85	37	122	140	69	209
2003-04	24		73	60	133	156	103	259	230	162	392
Total	257		973	476	1449	2015	885	2900	2989	1360	4349

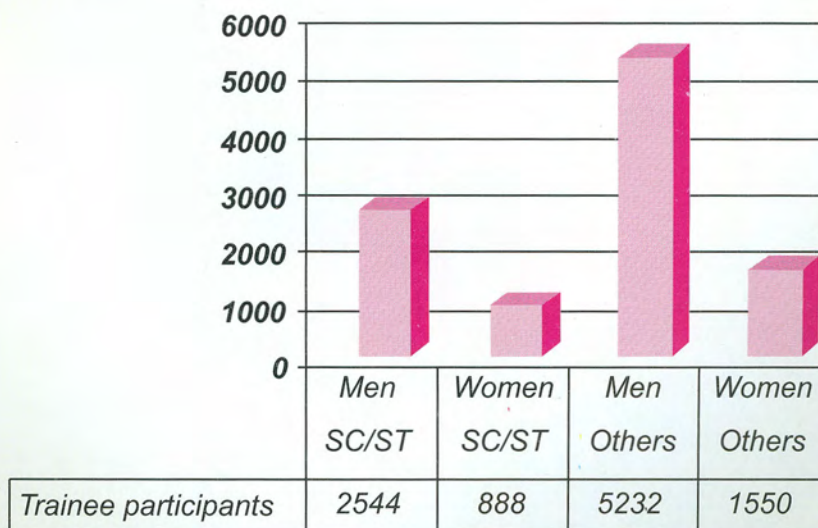


▲ Cache of fishes from a farm pond

Gender Distribution of trainees under Fisheries discipline



Trainee participants under Fisheries discipline



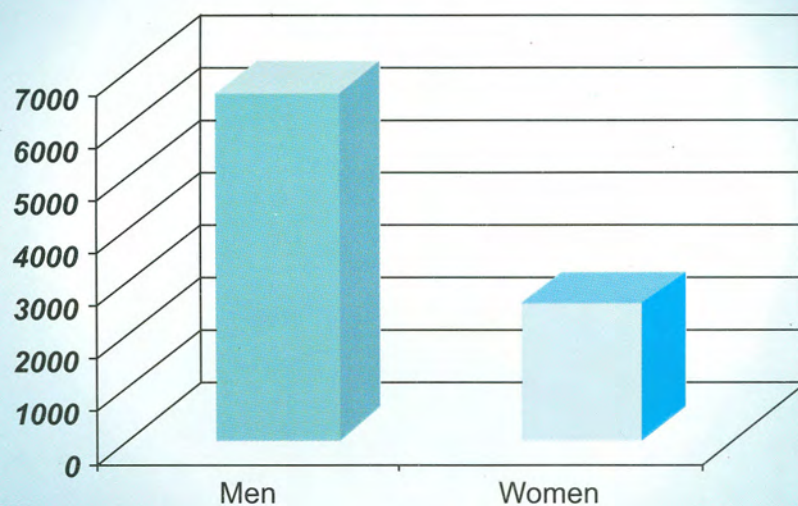


▲ Dapog method of rice nursery management

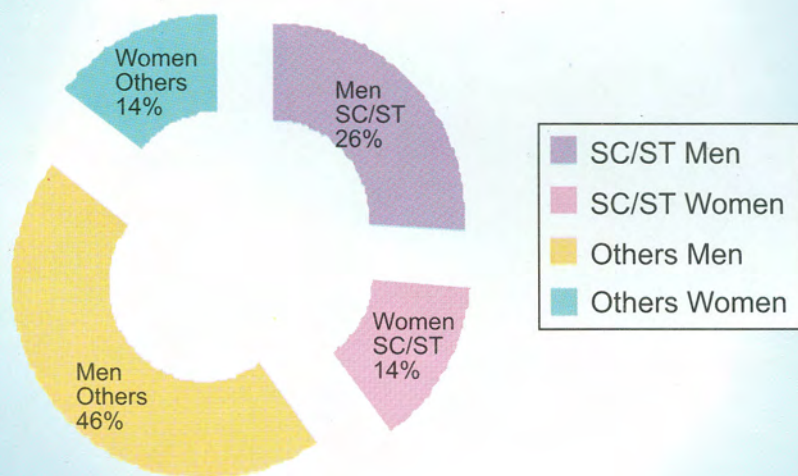


▲ A bumper crop of paddy on instructional farm at KVK campus

Gender distribution of trainees under Agronomy discipline



Trainee participants under Agronomy discipline





▲ Off campus training programme of Horticulture



▲ A bumper crop of watermelon



▲ Potato crop in adopted farmers' field



▲ Bumper harvest of gourd vegetables at adopted farmers' field

Discipline : Home Science

The story of the Sundarbans is older than that of Bonobibi, the forest goddess who rules this land of mud and water. Demographic accounts of women in the Sundarbans have them numbering about 932 for every 1,000 men and they are central to their communities and families.

The Sundarbans is a demanding home to those who live there. It requires much of those who live there in order to survive, regardless of their gender. It requires prayers to Bonobibi, humility and gratitude, ingenuity, and tolerance. Living and working in the Sundarbans is dangerous. And just as the men do it, so do the women. It requires both men and women to work hard and face many of the same dangers.

The women of the Sundarbans are practically unknown outside their direct social relationships. Women of the Sundarbans work not only taking care of household duties but often to help the family survive financially. Some of them cultivate on family plots while others fish. Fishing for prawn is a particularly dangerous job and one taken on by women and their children who may move through the waters, waist or neck deep, dragging nets behind them to catch their prey.

To empower these deprived women folk KVK Kakdwip has organized various training programmes for them. The various training courses conducted and number of trainees participated under the Home Science discipline are given below.

1. Mixed fruit pickle making
2. Operation of knitting machine.
3. Technique of different food products making
4. Layout of nutritional garden and plantation of seedlings
5. Technique of different craft product preparation
6. Mushroom cultivation technique
7. Preparation of ladies garments
8. Storage of grains
9. Mushroom pickle preparation
10. Chilli sauce and pickle making
11. Shrimps pickle making
12. Mango pickle preparation
13. Papaya sweets and bari making
14. Technique of different food product preparation
15. Use of waste product in decorative article making
16. Fish drying with edible salt
17. Cauliflower pickle making
18. Use and importance of leafy vegetable preparation
19. Care of new born baby

20. Preparation of tomato sauce
21. Embroidery work
22. Preparation of guava jelly
23. Woolen garment preparation
24. Child care
25. Diet for old-aged people

D. HOME SCIENCE											
Year	No. of Courses	Duration	Participants								
			SC/ST			Others			Total		
			M	W	T	M	W	T	M	W	T
1980-81	4	2-5	-	17	17	-	43	43	-	60	60
1981-82	10	2-5	-	26	26	-	78	78	-	104	104
1982-83	10	2-5	-	11	11	-	89	89	-	100	100
1983-84	10	2-5	-	11	11	-	89	89	-	100	100
1984-85	10	2-5	-	15	15	-	68	68	-	83	83
1985-86	10	2-5	-	17	17	-	81	81	-	98	98
1986-87	10	2-5	-	12	12	-	88	88	-	100	100
1987-88	-	-	-	-	-	-	-	-	-	-	-
1988-89	22	2-5	-	108	108	-	209	209	-	317	317
1989-90	23	2-5	-	169	169	-	235	235	-	404	404
1990-91	28	2-5	-	108	108	-	236	236	-	344	344
1991-92	27	2-5	-	128	128	-	202	202	-	330	330
1992-93	33	2-5	-	214	214	-	506	506	-	720	720
1993-94	74	2-5	-	160	160	-	430	430	-	590	590
1994-95	30	2-5	-	120	120	-	308	308	-	428	428
1995-96	26	2-5	-	191	191	-	454	454	-	645	645
1996-97	26	2-5	-	90	90	-	159	159	-	249	249
1997-98	23	2-15	-	152	152	-	298	298	-	450	450
1998-99	27		-	155	155	-	319	319	-	474	474
1999-2000	21		-	132	132	-	272	272	-	404	404
2000-01	29		-	217	217	-	410	410	-	627	627
2001-02	27		-	160	160	-	297	297	-	457	457
2002-03	28		-	185	185	-	282	282	-	467	467
2003-04	29		-	200	200	5	311	316	5	511	516
Total	537			2598	2598	5	5464	5469	5	8062	8067

Training Programmes conducted under Frontline Demonstration

Under frontline demonstration programme, training programmes were being conducted on different aspects of cultivation of paddy, chilli, mustard, sesamum and greengram. The details of training areas and training achievements are given below.

FLD on Paddy

1. Seedling raising technique in rice
2. Fertilizer management technique in rice
3. Disease and pest management in rice
4. Water management in rice
5. Integrated nutrient management in rice
6. Integrated pest management in rice

FLD On Chilli

1. Control of leaf curl disease in chilli
2. HYV chill production technique
3. Insect Pest Management in chilli

FLD on Mustard

1. Water management in mustard.
2. Disease management in mustard
3. Fertilizer application technique in mustard
4. Aphid management in mustard

FLD on Sesamum

1. Seed treatment and sowing of sesamum
2. Pests and disease management in sesamum
3. Water management in sesamum

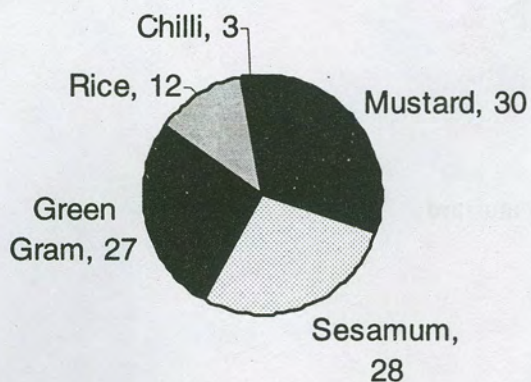
FLD on Green Gram (Moong)

1. Seed treatment with Rhizobium culture in moong
2. Pests and disease management in moong
3. Nutrient and water management in moong

Number of Training Courses and Beneficiaries under Frontline Demonstration (1998-2003)

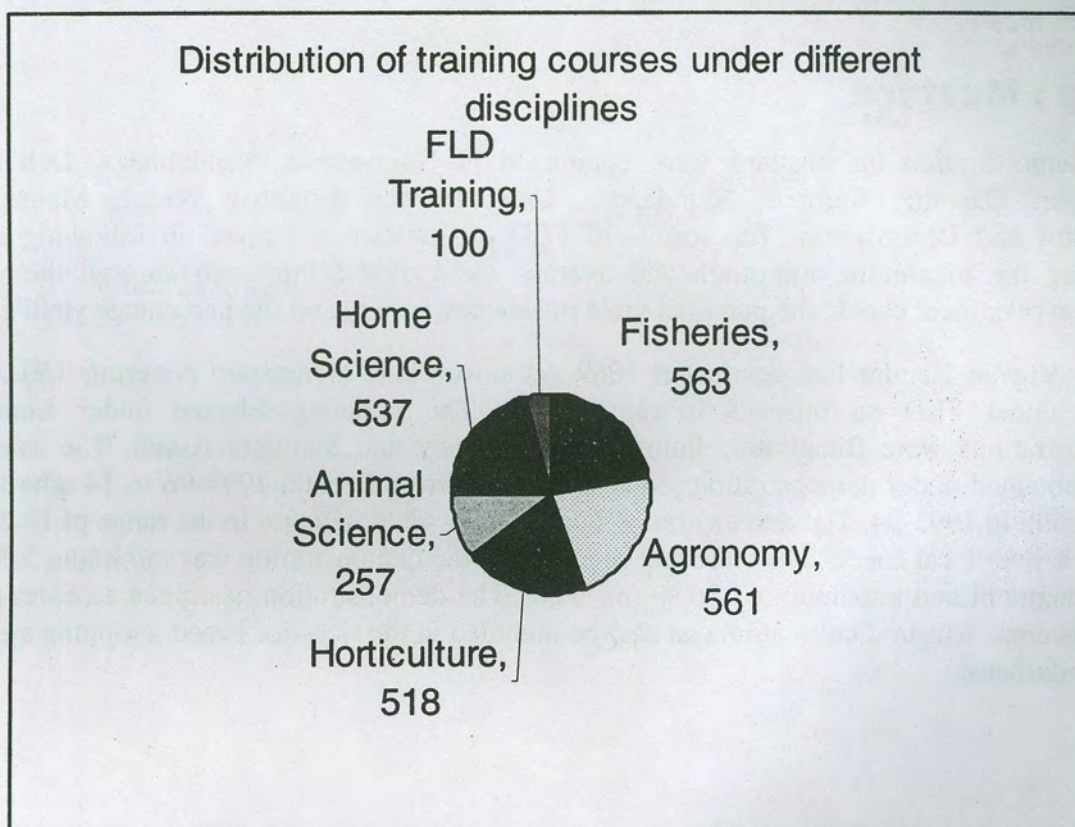
Crop	No. of Courses	Participants						
		SC/ST		Others		Total		
		M	W	M	W	M	W	Total
Mustard	30	235	145	352	246	587	391	978
Sesamum	28	201	135	361	195	562	330	892
Green Gram	27	171	80	260	136	431	216	647
Rice	12	57	35	100	63	157	98	255
Chilli	3	18	8	22	12	40	20	60
Total	100	682	403	1095	652	1777	1055	2832

Number of courses under FLD training programmes



Number of Training Courses and Beneficiaries in various Training Programmes (1980-2003)

Disciplines	No. of Courses	Participants						
		SC/ST		Others		Total		
		M	W	M	W	M	W	Total
Fisheries	563	2544	888	5232	1550	7776	2438	10214
Agronomy	561	2398	1260	4191	1317	6589	2577	9166
Horticulture	518	2517	825	4646	1300	7163	2125	9288
Animal Science	257	973	476	2015	885	2989	1360	4349
Home Science	537	-	2598	5	5464	5	8062	8067
FLD Training	100	682	403	1095	652	1777	1055	2832
Grand Total	2536	9114	6450	17184	11168	26299	17617	43916



Frontline Demonstration

Frontline Demonstration is the new concept of field demonstration evolved by ICAR with the inception of technology mission on oilseeds and pulses. The main objective of FLD is to demonstrate newly released crop production and protection technologies and its management practices in the farmers' field under coastal saline soil of South 24 Parganas district of West Bengal. While demonstrating the technology in the farmers' field, the scientists are also studying the factor contributing higher crop production, field constraints of production and thereby generate the production and feed back information and encourage the farmers to adopt and popularize the new technologies for accelerating the production. Demonstrations were conducted during the period under mustard, green gram, sesamum, rice and chilli crops.

A. Oilseeds

Frontline Demonstration on oilseeds was started since the inception of technology mission on oilseeds. Under oilseeds, FLD of two crops viz. mustard and sesamum were conducted in the adopted areas.

Crop : Mustard

The demonstration on mustard were conducted in Narayanpur, Nandabhaga, Debnibas, Rajnagar, Dasmile, Shibpur, Mundapara, Gangadharpur, Bhubhan Nagar, Mainapara, Belpukur and Dhurbachoti. The results of FLD on mustard are given in following table showing the maximum, minimum and average yield of the improved variety, the yield increase over local check, the potential yield of selected variety and the percentage yield gap.

Krishi Vigyan Kendra had conducted 1069 demonstrations of mustard covering 150.0 ha. land under FLD on oilseeds in rabi season. The varieties selected under frontline demonstrations were Bhagirathi, Jhumka, Seeta, Binoy and Sanjukta Asech. The average yield obtained under demonstration plot was 5.2 q/ha from Seeta in 1995-96 to 14 q/ha from Bhagirathi in 1993-94. The demonstration has given an yield increase in the range of 14.29 % to 75 % over local check. The yield gap seen during the demonstration was minimum 3.70 % for Bhagirathi and maximum 62.86 % for Seeta. The demonstration has given an extra crop for this area. Mustard cultivation can also be included in the rice-rice based cropping system of Sundarbans.

Year	Variety	No. of Demo.	Area (ha)	Yield (Q/ha)			Local check (Q/ha)	Yield increase over local check (%)	Potential yield (Q/ha)	Percent age Yield gap
				Max.	Min.	Avg.				
1992-93	Bhagirathi RW-351	66	3.0	17.0	10.5	13.5	7.9	70.88	14.0	3.70
	Jhumaka NC-1	30	2.0	14.0	9.5	12.5	8.5	47.06	14.0	10.70
1993-94	Bhagirathi RW-351	100	15.0	15.0	13.0	14.0	9.0	55.56	14.0	-
	Jhumaka NC-1	63	5.0	14.0	13.0	13.5	9.0	50.00	14.0	3.70
1994-95	Seeta B-85	136	20.0	8.0	6.0	7.0	4.0	75.00	14.0	50.00
1995-96	Seeta B-85	117	20.0	5.0	4.8	5.2	4.0	30.00	14.0	62.86
1996-97	Seeta B-85	70	5.6	10.0	8.0	9.5	6.5	46.15	14.0	32.14
	Binoy B-9	100	14.4	9.6	7.2	8.0	6.5	23.08	14.0	42.86
1997-98	Binoy B-9	150	15.0	10.0	7.0	9.0	7.0	28.57	14.0	35.71
1998-99	Binoy B-9	12.0	20.0	9.5	7.0	8.0	7.0	14.29	14.0	42.86
2000-01	Bhagirathi RW-351	75	10.0	11.0	9.5	10.2	7.0	45.71	14.0	27.14
2002-03	Bhagirathi RW-351	45	6.0	11.5	7.5	10.30	7.0	47.14	14.0	26.43
	Sanjukta Asech 4C-6-3/II	30	4.0	11.9	7.9	10.75	7.0	53.57	12.0	10.72
2003-04	Sanjukta Asech 4C-6-3/II	75	10.0	Crops are standing in the field						
Total		1069	150.0							

Feed back :

The feedback received are given as under

1. For Researcher- The agroclimatic condition in Sundarbans is favourable for the cultivation of late varieties of mustard as the fields are vacated after the cultivation of rice crop only in the month of mid november. Variety RW-351, Jhumka and Sanjukta asech has shown its good potential as a second mustard crop after rice in this area. The infestation of aphids are seen in the field in severe form during 1994-95, 1995-96, 1996-97 and 1998-99 and it has affected the crop yield considerably. In 2002-03 after a long time there was no

infestation of aphids seen in the field as usual visible during last two to three years. Variety RW-351 has given average yield in the range of 10.3 q/ ha to 14 q/ha and this yield can be seen as satisfactory in this coastal saline agro-ecosystem. The variety Jhumka has given average yield in the range of 12.5 q/ha to 13.5 q/ha. Sanjukta asech has given a average yield of 10.75q/ ha in 2002-2003. Variety Seeta has performed miserably in this area.

2. For Development Department- The seeds of new mutard variety are not available in the local market. Development department should ascertain the seed availability of RW-351 and Sanjukta asech before prescribing it to the farmers of this area, since the seeds of these varieties are in short supply. For the replacement of traditional variety in this area, seed should be supplied in proper time. The farmers may be given some incentives to cultivate mustard crop, as continuous cropping of paddy will take its toll on the soil nutrient status. As the fresh water for irrigation is in short supply in this area, the cultivation may be promoted in the area having irrigation facility.

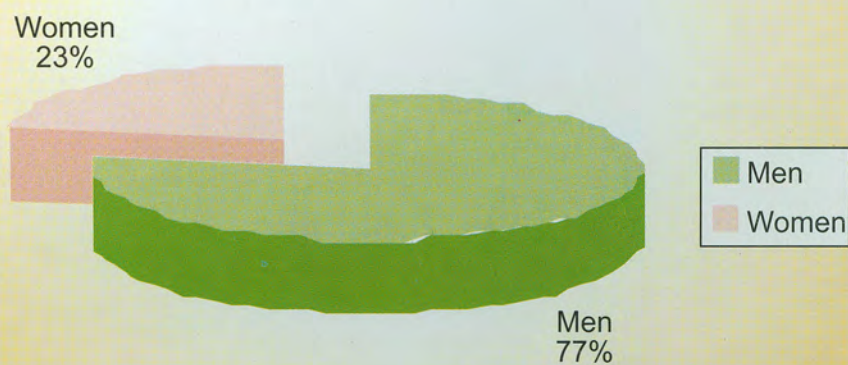
3. For Policy Makers: The performances of varieties RW-351, Jhumka and Sanjukta asech are more or less satisfactory. These varieties has the potential of replacing other low yielding varieties of mustard in this area. Since mustard is the main edible oil in West Bengal, the farmers may be given some incentives to grow this crop over boro paddy. New aphid resistant varieties may be demonstrated in this region as it will reduce the application of chemical pesticides in this region.

Crop : Sesamum

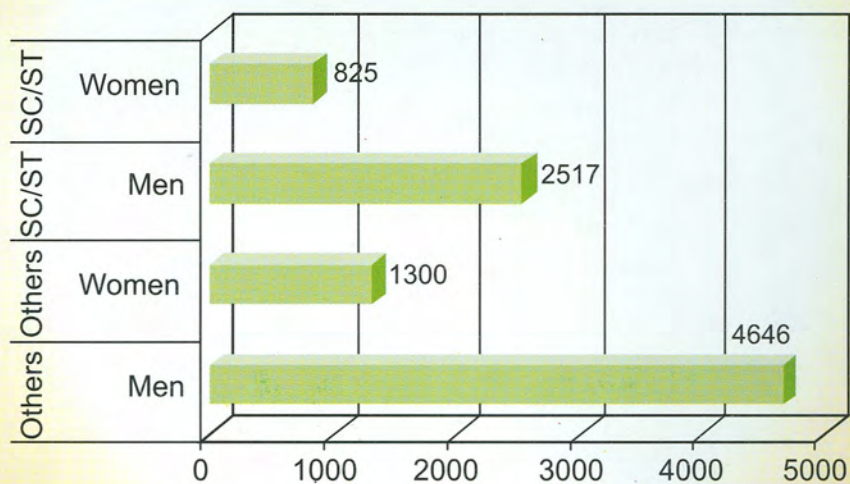
The FLD on sesamum were conducted in Surendranagar, Nandabhaga, Debnibas, Fatikpur, Akshaynagar, Shibpur, Mundapara, Gangadharpur, Bhubhan Nagar, Mainapara, Belpukur and Budhakali. The results of FLD on sesamum are given in following table showing the maximum, minimum and average yield of the improved variety, the yield increase over local check, the potential yield of selected variety and the percentage yield gap.

Krishi Vigyan Kendra has conducted 1073 demonstrations under FLD on sesamum taking 130 hectare land in summer season since 1992-93. The varieties selected under FLD were Improved Selection-5 and B-67 developed by the Oilseeds Research Station, Behrampur, Murshidabad district of West Bengal. The average yield obtained for Improved Selection-5 under demonstration plots were in the range of 8.0 q/ha to 8.50 quintals/ha with the maximum yield ranges between 8.5 q/ha to 9.35 quintals/ha. The average yield obtained for B-67 under demonstration plots were in the range of 8.5 q/ha to 9.0 quintals/ha with the maximum yield ranges between 9.0 q/ha to 10.0 quintals/ha. The yield increase seen over local check were in the range of 14.29 to 70 %. The percentage yield gap of the demonstration were in the range of 10 to 20 %, which can be seen as satisfactory in the agro-ecological condition of Sundarbans.

Gender distribution of participants under Horticulture discipline



Trainee participants under Horticulture Discipline





▲ Cultivation of high yielding variety of okra by adopted farmer



▲ Brinjal cultivation by an adopted farmer at Mundapara, a tribal village



▲ Off campus training programme under Animal Science discipline

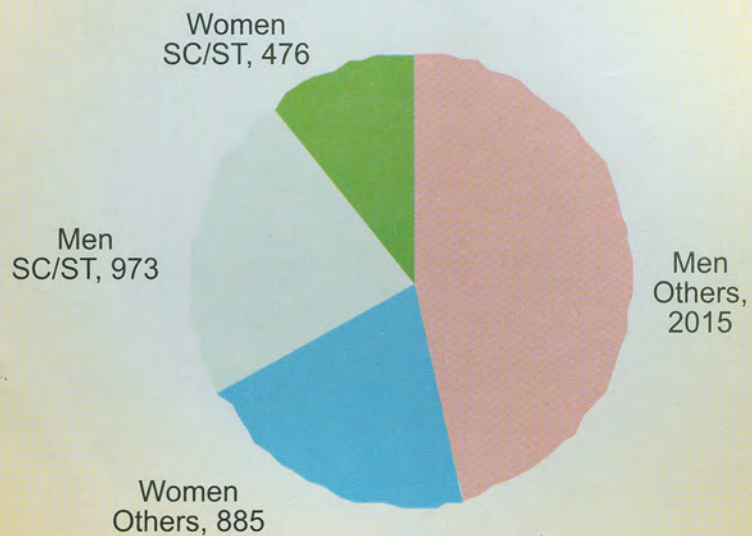


▲ Demonstration of poultry vaccine preparation to farm science club members under training programme of extension functionaries

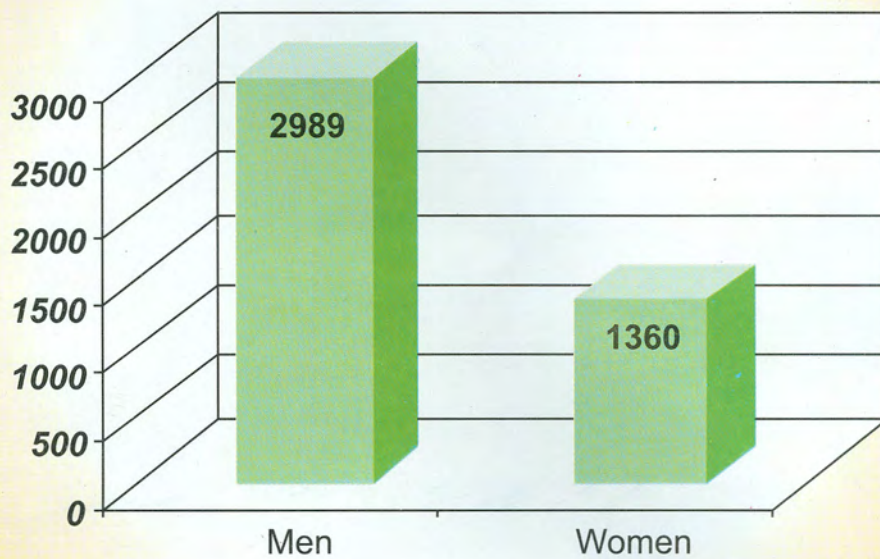


▲ Poultry vaccine in an integrated poultry cum fish culture programme under collaborative programme with ICAR Institute

Trainee participants under Animal Science discipline



Gender distribution of trainees under Animal Science discipline





▲ Trainees are learning by doing



▲ Director, CIFRI visits Home Science laboratory

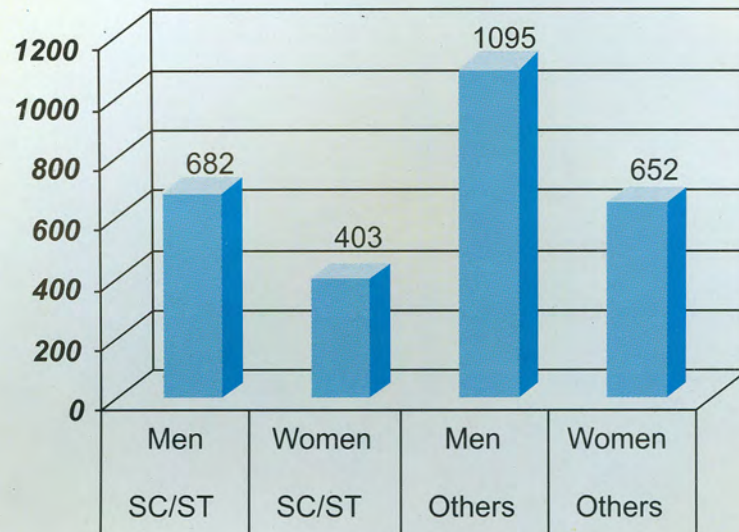


▲ Practical exposure of trainees under Home Science discipline

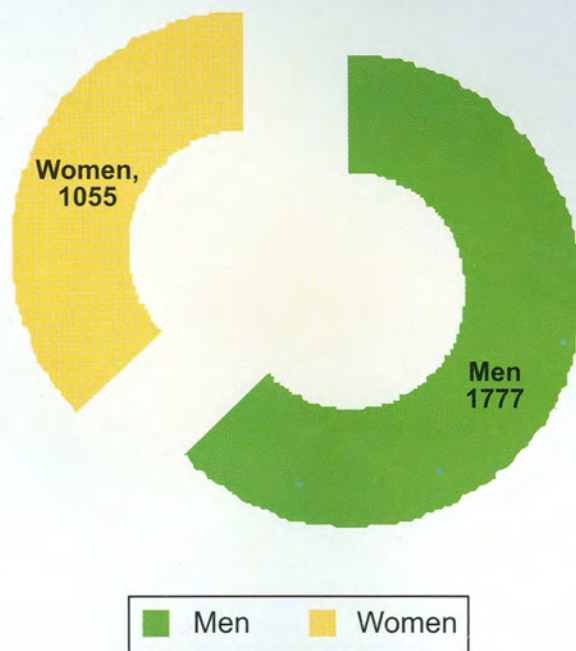


▲ Zonal Coordinator Visits home science lab

Trainees distribution under FLD training programmes

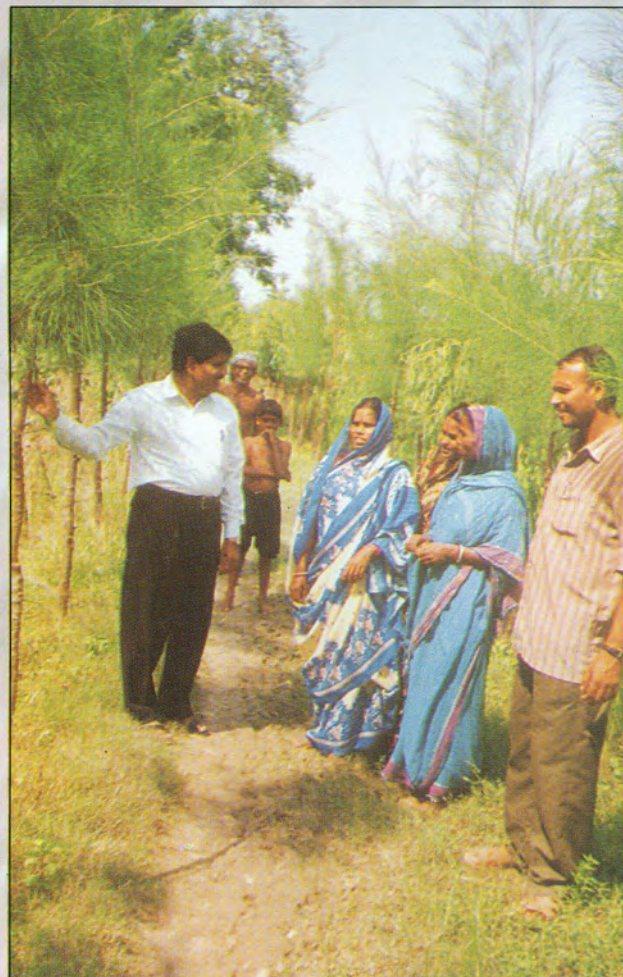


Gender distribution of trainees under FLD training Programme





▲ Vegetable cultivation in KVK instruction unit



▲ Scientist interaction with farm women on social forestry in a village of Sundarbans

Year	Variety	No. of Demo.	Area (ha)	Yield (Q/ha)			Local check (Q/ha)	Yield increase over local check (%)	Potential yield (Q/ha)	Percentage Yield gap
				Max.	Min.	Avg.				
1992-93	Rama IS-5	113	10.0	9.0	6.5	8.0	5.0	60.00	10.0	20.00
1993-94	Rama IS-5	171	20.0	9.0	8.0	8.5	5.0	70.00	10.0	15.00
1994-95	Tillotama B-67	122	20.0	9.0	8.0	8.5	6.0	41.67	10.0	15.00
1995-96	Rama IS-5	172	20.0	8.5	7.5	8.0	7.0	14.29	10.0	20.00
1996-97	Tillotama B-67	120	10.0	9.0	7.5	8.0	6.5	23.08	10.0	20.00
1997-98	Tillotama B-67	150	20.0	10.0	7.0	9.0	6.5	38.46	10.0	10.00
1998-99	Rama IS-5	85	10.0	8.9	7.65	8.5	6.0	41.67	10.0	15.00
2000-01	Rama IS-5	35	5.0	9.0	6.5	8.0	6.0	33.33	10.0	20.00
2001-02	Rama IS-5	35	5.0	8.75	6.35	8.0	6.0	33.33	10.0	20.00
2002-03	Rama IS-5	35	5.0	9.35	7.20	8.5	6.0	41.67	10.0	15.00
2003-04	Rama IS-5	35	5.0	Crops are standing in the field						
Total		1073	130.0							

Feed back:

The feedback received are given as under

1. For Researcher: Improved Selection-5 has given satisfactory average yield in the range of 8.0 q/ha to 8.50 quintals/ha with the maximum yield ranges between 8.5 q/ha to 9.35 quintals/ha. without showing any sign of stem rot and phyllody in the field. Crop matured in 80-85 days after sowing. B-67 has given average yield in the range of 8.5 q/ha to 9.0 quintals/ha with the maximum yield ranges between 9.0 q/ha to 10.0 quintals/ha. The crop has given an alternative to the farmers in the lean summer season.

2. For Development Department: Seed availability of Improved Selection -5 as well as B-67 should be ascertained before prescribing it to the farmers of this area, since the seeds of this variety are in short supply. For the replacement of traditional variety in this area seed should be supplied in proper time. The demonstration has shown that the farmers are adopting this varieties over local varieties because of its good yield as well as to get some additional income during the lean summer season.

3. For Policy Makers : The performance of variety Improved Selection-5 and B-67 are more or less satisfactory. Seed availability of variety Improved selection-5 and B-67 should be ensured to the farmers at the right time. Improved Selection -5 and B-67 has a great potential to replace the other low yielding traditionally grown sesamum varieties in Sundarbans. Since sesamum is also one of the edible oil crop in West bengal, the farmers may be given some incentives to grow this crop. The cultivation of sesamum will generate employment as laboyr requirement during lean summer season.

B. Pulses

Frontline Demonstration on pulses was started since the inception of technology mission on pulses. Under pulses, FLD of green gram were conducted in the adopted areas of KVK of CIFRI, Kakdwip. In 1992-93 FLD on arhar was conducted in the adopted village.

1. Green Gram

Frontline demonstration on green gram were conducted in Narayanpur, Nandabhaga, Debnibas, Budhakhali, Arunberia, Shibpur, Mundapara, Gangadharpur, Bhubhan Nagar, Kusumpukur, Belpukur, Akshaynagar, Kumarpur and Dhurbachoti. The results of FLD on green gram are given in following table showing the maximum, minimum and average yield of the improved variety, the yield increase over local check, the potential yield of selected variety and the percentage yield gap.

Year	Variety	No. of Demo.	Area (ha)	Yield (Q/ha)			Local check (Q/ha)	Yield increase over local check (%)	Potential yield (Q/ha)	Percentage Yield gap
				Max.	Min.	Avg.				
1992-93	K-851	113	10.0	9.5	8.0	8.0	2.0	300.0	12.0	50.00
1993-94	K-851	286	20.0	9.5	8.0	9.0	7.0	28.57	12.0	33.33
1994-95	Sonali B-1	186	20.0	10.0	7.0	8.0	6.0	33.33	11.0	37.50
1995-96	Pusa Baishakhi	230	20.0	8.5	7.0	8.0	5.0	60.00	12.0	50.00
1996-97	K-851	180	14.0	9.0	6.5	7.0	6.0	16.67	12.0	71.42
1997-98	K-851	220	20.0	9.5	7.0	8.0	7.0	14.29	12.0	50.00
1998-99	B-105	95	10.0	8.45	6.90	7.5	6.0	25.00	11.0	46.66
2000-01	K-851	20	2.0	8.65	7.0	7.9	6.5	21.53	12.0	51.89
2001-02	K-851	30	3.0	8.85	6.8	7.8	6.5	20.00	12.0	53.84
2002-03	PDM-54	35	5.0	10.50	7.80	9.50	6.50	46.15	13.0	36.84
2003-04	PDM-54	35	5.0	Crops are standing in the field						
Total		1430	129.0							

Krishi Vigyan Kendra had conducted 1430 demonstrations land of green gram on 129 ha under FLD on pulses in Summer season. The varieties selected under frontline demonstrations were K-851, Sonali, Pusa Baishakhi and PDM-54. The average yield obtained for K-851 under demonstration plot were in the range of 7.0 q/ha to 9.0 quintals/ha with the maximum yield ranges between 8.65 q/ha to 9.5 quintals/ha. The average yield obtained for Sonali under demonstration plot was 8.0 q/ha with the maximum yield of 10.0 quintals/ha. The average yield obtained for Pusa Baishakhi under demonstration plot was 8.0 q/ha with the maximum yield of 8.5 quintals/ha. The average yield obtained for PDM-54 under demonstration plot was 9.5 q/ha with the maximum yield of 10.5 quintals/ha. The Demonstration has given an yield increase in the range of 14.29 % to 300 % over local check. The yield gap seen during the demonstration was minimum 33.33 % and maximum of 71.42 % for K-851. The yield gap for other varieties under the demonstration were 37.50 % for Sonali, 50.0% for Pusa Baishakhi and 36.84 % for PDM-54. Green gram as a summer crop has become one of the important crop due to its soil nutrient replenishing capacity.

Feed back:

The feedback received are given as under

1. For Researcher: The agroclimatic condition in Sundarbans is favourable for the cultivation of green gram as the fields are vacated after the cultivation of main rice crop. Variety K-851, Sonali, Pusa Baishakhi and PDM-54 has shown its good potential. PDM-54 has given satisfactory average yield of 9.50 q/ha with maximum yield of 10.50 q/ha without showing any sign of yellow mosaic or any other disease in the field. Crop matured in 80-85 days after sowing. The average yield obtained for K-851 under demonstration plot were in the range of 7.0 q/ha to 9.0 quintals/ha with the maximum yield ranges between 8.65 q/ha to 9.5 quintals/ha. Sonali (B-1) had given an average yield of 8 q/ha. Besides non availability of seeds of new improved varieties, non availability of Rhizobium culture is one of the main constraints for the farmers of this area.

2. For Development Department: The seeds of new green gram variety are not available in the local market. Development department should ascertain the seed availability of K-851 and PDM-54 before prescribing it to the farmers of this area, since the seeds of these varieties are in short supply. For the replacement of traditional variety in this area, seed should be supplied in proper time. The farmers are very much enthusiastic to grow green gram because of its soil nutrient replenishing characteristic. The increase in the soil nitrogen availability to the aman paddy crop just after green gram is the main reason behind it. Besides shortage of seeds of new improved varieties, non availability of Rhizobium culture is one of the main constraints for the farmers of this area.

3. For Policy Makers: The performances of varieties K-851, Sonali, Pusa Baishakhi and PDM-54 were more or less satisfactory. These varieties has the potential of replacing other low yielding varieties of green gram in this area. The farmers are very much enthusiastic to grow green gram because of its soil nutrient replenishing characteristic. The increase in the

soil nitrogen availability to the aman paddy crop just after green gram is the main reason behind it. Besides shortage of seeds of new improved varieties, non availability of Rhizobium culture is one of the main constraints for the farmers of this area.. Availability of Rhizobium culture should be maintained.

2. Arhar

Frontline demonstration on arhar was conducted in Nandabhaga, Budhakhali, Mundapara, Belpukur and Akshaynagar in 1992-93. The results of FLD on arhar is given in following table showing the maximum, minimum and average yield of the improved variety, the yield increase over local check, the potential yield of selected variety and the percentage yield gap.

Year	Variety	No. of Demo.	Area (ha)	Yield (Q/ha)			Local check (Q/ha)	Yield increase over local check (%)	Potential yield (Q/ha)	Percentage Yield gap
				Max.	Min.	Avg.				
1992-93	UPAS-120	123	10.0	14.0	12.0	13.5	9.5	42.11	16.0	37.11

Frontline Demonstration on arhar variety UPAS-120 had given a maximum yield of 14.0 q/ha and average yield of 13.5 q/ha. The yield increases shown over local check was 42.11%. The percentage yield gap was 37.11%.

FLD on other than Oilseeds and Pulses

Frontline Demonstration other than oilseeds and pulses are conducted on two crops viz. Rice and Chilli. The rice demonstration has been conducted since 2000-01. The chilli demonstration was conducted in 2002-2003.

Crop : Paddy

Rice is indeed one of the oldest types of cereal recorded in the history of mankind. The cultivation of rice in intensive subsistence agriculture becomes synonymous with agriculture. India is the second largest producer of rice in the world being superseded only by China in the gross annual output. Rice is considered first ranking crop in the vast region stretching from lower gangetic plain to the Brahmaputra valley in the east and circum coastal alluvial tract of the peninsular region. The isohyets line 150 cm demarcates the lower boundary of rice except in some edges where rice grows even in 100 cm of annual rainfall. The productivity of rice crop in India is only 21q/ha (2002). West Bengal is the largest producer rice producing state and the rice productivity here is above than the national average i.e. 28 q/ha.

The coastal areas of West Bengal are rainfed and are characterized by variable soil salinity in summer and water logging in wet (kharif season). Rice is the only crop grown in the wet season when soil salinity is reduced to some extent. Poor sunshine, inclement weather, disease pest incidence and the associated adversities affect crop growth in the coastal ecosystem. Sundarbans, the largest delta in the world comprises 10000 square kilometer of area in West Bengal, has very low productivity of rice. Frontline demonstration (FLD) was started in 2000-01 to demonstrate the production potential of newly developed high yielding varieties vis-à-vis local practices.

Mean performance of HYV rice over different location of Sundarbans

Rice varieties	2000-01 Y1	2001-02 Y2	2002-03 Y3	2003-04 Y4	Pooled
IET-5656	48.75	49.50	47.50	48.90	49.00
MTU-7029	50.00	-	47.89	49.00	48.95
CR-1017	49.25	48.75	46.59	48.40	48.42
NC-492	41.25	43.50	43.20	-	43.00
Ranjit	-	-	43.20	46.50	44.85
CSRC(S) 2-1-7	-	-	-	46.30	46.30
CSRC(S) 11-0-0-5	-	-	-	45.29	45.29
CSRC(S) 5-2-2-5	-	-	-	45.32	45.32
Dudheswar	30.50	31.00	30.56	30.70	30.69

Productivity of rice, yield gaps and technology index

Rice varieties	No. of Demonstrations	Area (ha)	Yield (Kg/ha)			% increase over local check	Technology gap	Extension gap	Technology index
			Potential	Demons.	Local				
IET-5656	35	9.0	5000	4900	3069	59.66	100	1831	2.0
MTU-7029	20	4.0	5000	4895	3069	59.50	105	1826	2.10
CR-1017	25	6.0	5000	4842	3069	57.77	158	1773	3.16
NC-492	20	5.0	4500	4300	3069	40.11	200	1231	4.44
Ranjit	16	3.0	4800	4485	3069	46.16	315	1416	6.56
CSRC(S) 2-1-7	5	1.0	4800	4630	3069	50.86	170	1561	3.54
CSRC(S) 11-0-0-5	5	1.0	4800	4529	3069	47.57	271	1460	5.62
CSRC(S) 5-2-2-5	5	1.0	4800	4532	3069	44.41	268	1363	5.58
Total	131	30.0							

Eight high yielding varieties of paddy viz. IET-5656, MTU-7029, CR-1017, NC-492, Ranjit, CSRC(S) 2-1-7, CSRC(S) 11-0-0-5 and CSRC(S) 5-2-2-5. The last three varieties have been released by Regional Research centre of Central Soil Salinity Research Institute; Canning Town in Sundarbans and are salinity tolerant. Locally popular Dudheswar variety was used as local check. The FLD was conducted to study the gaps between the potential yield and demonstration yield, extension gap and the technology index. To estimate the technology gap, extension gap and the technology index the following formulae have been used.

1. Technology gap = Potential yield – Demonstration yield

2. Extension gap = Demonstration yield- Farmers yield

3. Technology index

$$= [(Potential\ yield - Demonstration\ yield) / Potential\ yield] \times 100$$

The highest yield of 50q/ha was recorded in the FLD plots of variety MTU-7029 in 2000-2001. On an average paddy variety IET-5656 has given the highest yield of 49 q/ha constantly for three consecutive years followed closely by MTU-7029 and CR-1017. The results indicates that the frontline demonstration has given a good impact over the farming community of Sundarbans as they were motivated by the new agro technologies applied in the FLD plots. Yield of rice was, however varied in different years, which might be due to the

rainfall condition, climatic aberrations, as well as the change in the location of trails in each year. The high yielding varieties of rice has performed extremely well when compared to the local check variety Dudheswar. The percentage increase in the yield over local check is in the range of 59.66, 59.50, 57.77, 40.11, 46.16, 50.86, 47.57 and 44.41 for IET-5656, MTU-7029, CR-1017, NC-492, Ranjit, CSRC(S)2-1-7, CSRC(S) 11-0-0-5 and CSRC(S) 5-2-2-5 respectively. The technology gap which corroborates to the gap in the demonstration yield over potential yield was 100 kg/ha for IET-5656 to 315 kg/ha for Ranjit. The technology gap observed may be attributed to dissimilarity in the soil fertility status and weather conditions. Hence location specific recommendation appears to be necessary to bridge the gap between the yields of different varieties. A very wide gap was recorded in the yield of demonstration variety and the local check variety Dudheswar. The highest extension gap was found in the variety IET-5656, closely followed by the MTU-7029 and CR-1017 which emphasized the need to educate the farmers through various means for the adoption of improved high yielding varieties and improved agro technologies to reverse this trend of wide extension gap. More and more use of new HYV's by the farmers will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to disenchantment discontinuance of old varieties with the new technology. The technology index shows the feasibility of the evolved technology at the farmers' field. The lower the value of technology index more is the feasibility of the technology. The technology index is lowest for the variety IET-5656 and highest for the variety Ranjit. But the range of technology index shows that the gap of the new technologies evolved at the research stations and the farmers' field is very low from 2 percent to 6.56 percent. The technology index indicated that the varieties of paddy have performed its optimum under the Sundarbans condition and this will accelerate the adoption of newer varieties to increase the productivity of rice in Sundarbans area.

One of the main factors associated with the non replacements of local rice variety Dudheswar is its high price in local market, but gross as well as net return of the newer evolved technologies is always greater than the local check variety because their exist a wide yield gap of 12.5 q/ha to 18.31 q/ha.

The high yielding varieties of rice has given a very good yield in rainfed coastal areas of Sundarbans in comparison to the local check variety. These varieties may be popularized in this area by the Extension agencies to bridge the higher extension gap. As the farmers associated with the rice cultivation are by and large marginal and small farmers, the production as well as the productivity of the rice crop can be increased considerably, if the farmers are educated about the impact of adopting new technologies.

Crop : Chilli

This year Chilli crop demonstration of variety Pusa Sadabahar have been done on farmers' field of 4 adopted villages namely Mainapara, Kumarpur, Moondapara and Bhuvannagar of KVK under Frontline Demonstration Programme on other than Oilseeds and Pulses. The variety has given 26q/ha maximum and 24q/ha average yield, which is 50% more than the local check variety Suryamukhi. The results are given in the table below.

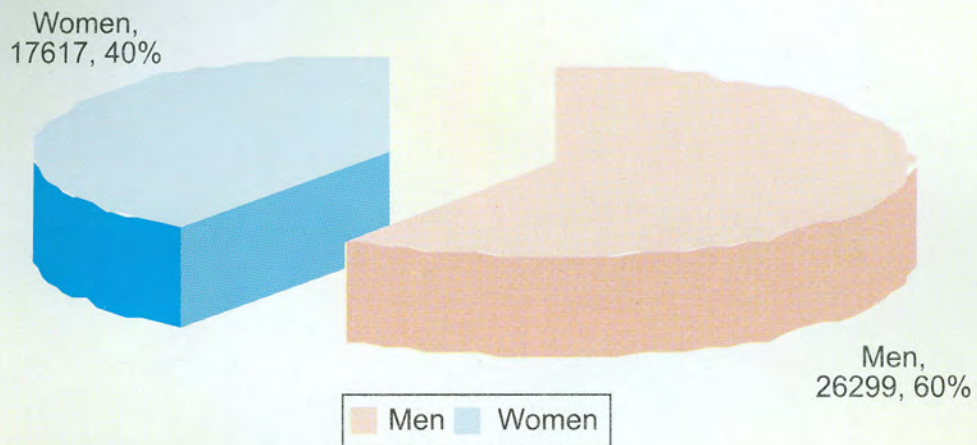
variety	Farmers (no.)	Area (ha)	Demonstration Yield (q/ha)			Local check (q/ha)	% increase in yield over local check
			Max.	Min.	Avg.		
Pusa Sadabahar	50	10	26.00	22.00	24.00	16.00	50.00



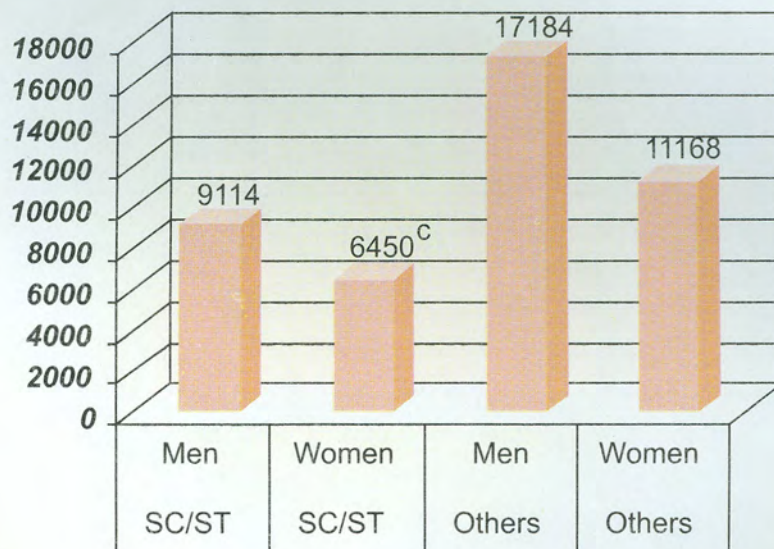
▲
Bumper harvest of Sunflower crop in adopted villages of KVK
▼



Gender distribution of trainees



Distribution of trainees according to castes and categories





▲ Frontline demonstration of Mustard in adopted village



▲ Bumper crop of Sesamum under FLD on oilseeds and pulses



▲ A good harvest of green gram crop under FLD on oilseeds and Pulses



▲ Scientists' interaction with adopted farmer under FLD on green gram



▲ A spectacular Paddy crop under FLD on Paddy



▲ Scientist interaction with adopted farmers under paddy FLD



▲ Scientists' interaction with adopted farm families under FLD on Chilli



▲ A bumper chilli crop under FLD on chilli



▲ On-farm testing on rice-cum fish farming



▲ CIFRI QRT team interaction with KVK scientist



▲ QRT team inspects a betel vine borj in the adopted village



▲ QRT team visits demonstration plots under FLD on chilli



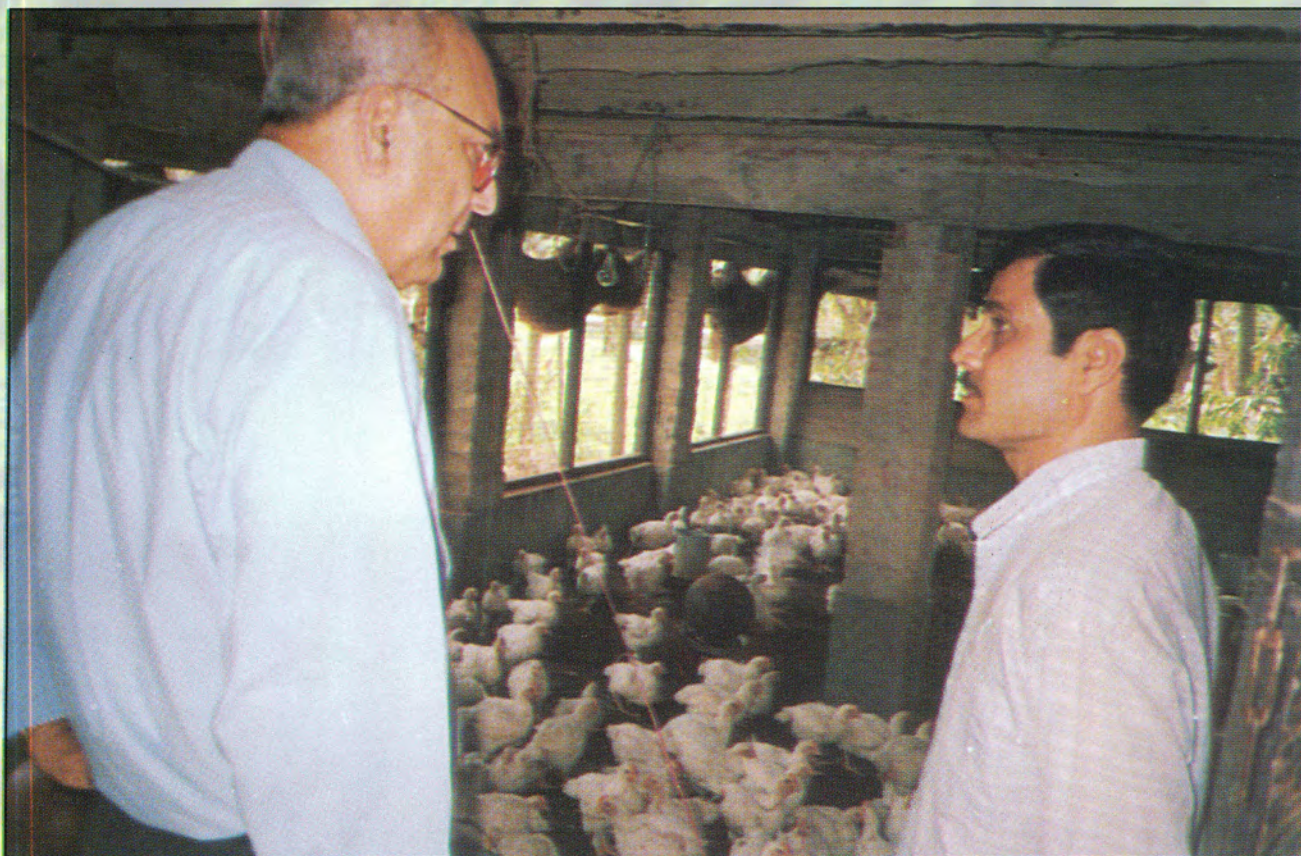
▲ QRT team interacts with an adopted farmer



▲ QRT team visits fisheries pond of an adopted farmer



▲ QRT team visits Home Science lab



▲ QRT team visits a broiler poultry farm being run by an ex trainee of KVK



▲ Scientific Advisory committee meeting on 21st May 1999



▲ Scientific Advisory committee meeting on 27th December 2000

On Farm Testing

On farm testing is an approach of adaptive research conducted on farmers field within the farming system perspective in their active participation and management. The technology is being evaluated not solely in terms of its technological and economic performance but also in terms of its conformity to the socio-economic and cultural circumstances, goals and needs of the target group farmers. Four important points are considered under OFT are farmers perspective, farmers participation, farmers management and farmers field.

Salient Features of OFT

- It is holistic
- It is farmers participatory
- It is problem solving
- It is gender sensitive
- It is interdisciplinary
- It is interactive and iterative
- It emphasizes extensive on farm activities
- It complements research station research
- It acknowledges the location specificity of technical solution
- It recognises interdependencies among multiple clients
- It emphasizes feed back.

Krishi Vigyan Kendra, Kakdwip has conducted on farm testing on rice cum fish culture to test the varietal suitability with different fishes and prawn varieties. The problem identified was low rice production and consequent poor income per unit area of land. The test were conducted using hypothesis that integration of prawn in rice-cum fish farming to increase productivity and income. The *Randomized Block Design* was adopted for the experiment. The intervention identified were 1. Design of plot 2. Water intake 3. Stocking of freshwater prawn seed alongwith other fish seed. The critical inputs identified were rice seed, fin fish and shell fish seed, lime, manure and fertilizers. The results of the experiments are given below.

Results 2000-2001

Treatment	Replica tion	Production(q/h)			Cost of produc- tion (Rs/ha)	Return from OFT (Rs/ha)	Increase in Income above control (Rs/ha)
		Rice	Fish	Prawn			
1. IET-5656 + Fish + Prawn	4	48.75	22.90	4.10	1,46,200	2,25,200	62,850
2. NC-492 + Fish + Prawn	4	42.00	22.10	3.95	1,45,800	2,25,000	62,650
3. MTU-7029 + Fish + Prawn	4	51.00	22.50	4.00	1,46,500	2,17,200	54,850
4. CR- 1017 + Fish + Prawn	4	50.00	22.00	4.20	1,45,000	2,30,200	67,850
5. CR-1017 +Fish	4	50.00	22.00	-	1,23,000	1,62,350	control

On farm testing on rice-cum-fish culture were done on farmers field in the adopted areas of KVK. 20 farmers were selected for this purpose from five adopted villages of KVK namely Moondapara, Buddhakhali, Nandabhaga, Arunberia and Basar. The rice varieties selected for on farm testing are *Swarna* (IET-5656), *Swarna mashuri* (MTU-7029), *Dharitri* (CR-1017) and *Sabita* (NC-492). The fish species *Labeo rohita*, *Catla catla* and prawn species *Macrobrachium rosenbergii* were selected for integration with rice. Rice variety CR-1017 was used as control with *Labeo rohita*. The above result clearly shows that inclusion of prawn has given an income in the range of Rs. 54850- Rs. 67850 over the control. The maximum income was obtained with growing high yielding rice variety in combination with Indian major carps and prawns.

Results 2001-2002

Treatment	Replica- tion	Production(q/h)			Cost of production (Rs/ha)	Return from OFT (Rs/ha)	Increase in Income above control (Rs/ha)
		Rice	Fish	Prawn			
1. IET-5656 + Fish + Prawn	6	48.75	22.90	4.90	1,46,250	2,25,000	65,000
2. Ranjit + Fish + Prawn	6	46.00	24.90	4.10	1,42,000	2,17,000	57,200
3. MTU-7029 + Fish + Prawn	6	51.00	22.00	4.90	1,53,000	2,17,200	57,200
4. CR- 1017 + Fish + Prawn	6	50.00	24.90	4.10	1,50,000	2,34,000	74,200
5. NC-492 +Fish	6	42.00	23.00	-	1,26,000	1,60,000	control

On farm testing on Rice-cum-fish culture were done on farmers field in the adopted areas of KVK. 30 farmers were selected for this purpose from five adopted villages of KVK namely Dhurbachoti, Buddhakhali, Debnibas, Kusumpukur and Basar. The rice varieties selected for on farm testing are *Swarna* (IET-5656), *Ranjit*, *Swarna Mashuri* (MTU-7029), *Dharitri* (CR-1017) and *Sabita* (NC-492). The fish species *Labeo rohita*, *Catla catla* and prawn species *Macrobrachium rosenbergii* were selected for integration with rice. Rice variety NC-492 was used as control with *Labeo rohita*. The above result clearly shows that inclusion of prawn has given an income in the range of Rs. 57000- Rs. 74200 over the control. The maximum income was obtained with growing high yielding rice variety in combination with Indian major carps and prawns.

Results 2002-2003

Treatment	Replication	Production(q/h)			Cost of production (Rs/ha)	Return from OFT (Rs/ha)	Increase in Income above control (Rs/ha)
		Rice	Fish	Prawn			
1. IET-5656 +Fish+Prawn	6	47.50	22.90	4.90	1,46,250	2,14,750	68,200
2. NC-492 +Fish+Prawn	6	43.20	24.90	4.10	1,42,000	2,17,000	57,200
3. MTU-7029 +Fish+Prawn	6	47.89	24.80	4.90	1,53,000	2,17,200	57,200
4. CR- 1017 +Fish+Prawn	6	46.59	24.00	4.10	1,50,000	2,34,000	74,200
5. IET-5656 +Fish	6	47.50	23.200	-	1,26,000	1,60,000	control

On farm testing on Rice-cum-fish culture were conducted on the farmers' field in the five adopted villages namely Kamdeb nagar, Narayanpur, Kusumpukur, Jaharpur & Debnibas of KVK Kakdwip. 30 farmers from these villages were selected for this purpose. The rice varieties selected for on farm testing are *Swarna* (IET-5656), *Swarna mashuri* (MTU-7029), *Dharitri* (CR-1017) and *Sabita* (NC-492). The fish species *Labeo rohita*, *Catla catla* and fresh water prawn *Macrobrachium rosenbergii* were selected for integration with rice. Rice variety *Swarna* (IET-5656) was also used as control with *Labeo rohita*. The above result clearly shows that integration of prawn has given an income in the range of 57200-74200 above the control. The maximum yield and benefits were achieved with growing high yielding rice variety in integration with Indian major carps and prawns.

Other On-Farm Testing

Integrated Nutrient Management in Betelvine

Treatment	No. of farmers	Area	Yield (no.of leaves/ha/year)	% Increase in yield over control
Vermicompost	10	0.2	1.9 million/ha/year	17.8
Integrated nutrient management	10	0.2	1.95 million/ha/year	20.0
Mustard oil cake	10	0.2	1.56 million/ha/year	control

On-farm testing on integrated nutrient management in betelvine was conducted on 30 boraj. Application of vermicompost was taken as first treatment and it was compared with INM. Application of mustard oil cake as nutrient was taken as control. The result as shown in the above table indicates that the yield of crop was increased by 20% to 1.95 million/ha/year of Betel leaves followed by 17.8% in vermicompost applied field over the control plots. This test has shown to farmers the efficacy of integrated nutrient management in betelvine.

Extension Activities undertaken in KVKs Adopted Areas

Year Activities	1980- 97	1997- 98	1998- 99	1999- 2000	2000- 2001	2001- 2002	2002- 2003	2003- 2004	Total
Field / Fish farmers Day	89	20	15	11	08	13	23	32	211
Kisan mela/ Exhibition	38	02	02	02	02	04	02	02	54
Film/ Slide show	256	02	04	20	20	10	10	10	332
Farm Science Club organised	22	2	2	3	2	2	3	10	46
Diagnostic Services	965	68	60	40	58	50	65	115	1421
Advisory Services	12887	260	350	210	236	240	317	400	14900
Crop Clinic Centre	18	4	4	3	5	4	6	20	64
Publication Distribution	25	310	253	225	245	285	210	305	1858
Radio Talk Delivered	25	-	-	4	2	2	1	-	34

Field Day/ fish farmers' day is the most essential part of any demonstration programmes. 211 field/ fish farmers' days were organised since the inception of KVK. 54 Kisan mela and exhibitions were organized to show the farmers the new improved technologies developed by the scientists and the achievement of KVK. 332 slide shows have been organized for the upliftment of the Sundarbans populace. 46 farm science clubs were organized in villages to share the experiences and views of the farming community. 1421 diagnostic services and 14900 advisory services were rendered to the farmers. 64 crop clinic centers were organized in the villages to show the improvement of scientific and sustainable agriculture. 34 radio talks were delivered for the benefit of population of whole South Bengal.

Kisan Divas :

Kisan Divas, the birth centenary of Choudhary Charan Singh was celebrated with great enthusiasm at village Moondapara, a tribal village of Sundarbans under KVK adopted area. The main Function was held at the Moondapara primary school under the chairmanship of Sri D. K. Kanungo, Deputy Magistrate, Kakdwip. Sri R. K. Chakroborty, Principal Scientist and Officer in Charge, KRC of CIBA, Kakdwip was the chief guest. Ten progressive farmers of KVK adopted areas were honoured with kisan samman on this occasion by Sri D. K. Kanungo, Deputy Magistrate, Kakdwip.

Doordarshan Kendra, Kolkata has covered the Kisan Divas celebration on 23rd December 2002 being organised by Krishi Vigyan Kendra of CIFRI, Kakdwip. The TV crew has also covered the various activities such as frontline demonstrations and various farm activities namely betelvine cultivation, poultry keeping, composite fish culture, hybrid tomato cultivation being done by the ex-trainees of Krishi Vigyan Kendra, Kakdwip. The Kisan Divas celebration had been telecasted on Doordarshan Bengali channel on 24th December 2002 and 25th December 2002 in the programme Camera Cholche and Palli Katha, respectively.

Farmer Awareness Programme on Rural Godown Subsidy Scheme :

Two farmers awareness programmes on "Rural Godown Subsidy Scheme" was jointly organised by Directorate of Marketing and Inspection, Ministry of Agriculture, Govt. of India, Eastern Regional Office, Kolk and Krishi Vigyan Kendra of CIFRI, Kakdwip.

- Farmers Awareness Programme on "Rural Godown Subsidy Scheme" at Samaj Bhaban, Bhuban nagar, Kakdwip on 25th February 2003. 60 farmers had attended this programme and got benefited.
- Farmers Awareness Programme on "Rural Godown Subsidy Scheme" at Narayanpur Shishu Vidyapith Narayanpur, Namkhana on 26th February 2003. At this programme 60 farmers were present and they quietly listen the lectures of various Resource Personnel present on this occasion and got benefited.

Functional Linkage with different Organisations

Sl. No.	Name of the organization	Nature of linkage
1.	Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Regional Research Station, Kakdwip	On-farm testing, advisory services
2.	PAO, ADO, Dept. of Agriculture (Govt. of West Bengal)	Training and extension support & frontline demonstration programme.
3.	DDARD & P.O. BLDO, Animal Resources Development Deptt (Govt. of West Bengal)	Training and extension support collaborative survey programme on animal development.
4.	West Bengal University of Animal & Fisheries Science, 68, Kshudiram Bose Sarani, Kolkata	Animal resource survey, research and extension support, client oriented need based programme in the field of training and development.
5.	Central Institute of Brackishwater Aquaculture, Kakdwip	Training, Extension & OFT support
6.	Central Soil Salinity Research Institute (RRS) Canning Town	TOT & OFT Programme
7.	Central Research Institute for Jute and Allied Fibers Nilganj, Barrackpore, W.B.	Research and Extension support
8.	Panchayat Bodies	Client oriented and need based programme in the field of training and demonstration
9.	Department of Forest, Govt. of West Bengal	Natural resource management and conservation of Sundarbans Biosphere reserve
10.	NGOs of South 24 Parganas District	Training, Extension and Technical support.
11.	Ramkrishna Ashram KVK, Nimpith	Training, Extension and Technical support.
12.	Sundarbans Development Board (Govt. of West Bengal)	Land and other logistics

Development Indicators for KVK Operational Area

Sl No.	Particulars	1992-93	Current Years
1.	Cropping intensity (%)	135	150
2.	Productivity (q/ha)	-	-
a.	Aus paddy (Local) (q/ha)	20.00	28.50
b.	Aus paddy (HYV) (q/ha)	35.40	42.50
c.	Aman paddy (Local) (q/ha)	20.91	27.37
d.	Aman paddy (HYV) (q/ha)	36.96	42.70
e.	Boro paddy (HYV) (q/ha)	39.51	45.00
f.	Green gram (q/ha)	5.70	8.25
g.	Mustard (q/ha)	6.75	9.50
h.	Sesamum (q/ha)	6.50	9.00
i.	Chilli (dry) (q/ha)	16.50	24.50
j.	Tomato (hybrid) (q/ha)	400.00	500.00
k.	Betel vine (leaves/ha/yr.)	60 lacs	85 lacs
l.	Fish production (q/ha/yr.)	6.9	21.5
m.	Poultry broiler (gm/6 weeks)	1500	1750
n.	Milk production (Crossbred) (L/lactation)	1500	1700
o.	Mushroom production (Kg/Sq. meter)		3.00
3.	Irrigated area	30%	38%
	Use of fertilizer NPK (Kg/ha)	35.40	55.20
5.	No of betel vine yard (Boroj)	2000	6500
6.	Net income (ha/yr.)	Rs. 20,000/-	Rs. 35,500/-
7.	Total diesel consumption (Ltr)	5500	7000
8.	Employment generated Man days/worker/year	250	315



▲ Scientific Advisory committee meeting on 29th October 2001



▲ Scientific Advisory committee meeting on 20th July 2002



▲ Scientific Advisory committee meeting on 1st August 2003



▲ Farmers field visit by KVK scientist



▲ Advisory services being provided by KVK scientist



▲ Diagnostic visit by KVK scientist



Farmers awareness programme on rural godown subsidy scheme





Scientists interaction with members of self-help groups





▲ Exhibition organised on the occasion of Chaudhary Charan Singh Birth Anniversary on 23rd December 2001



▲ Organization of Kisan Divas on 23rd December 2002 at tribal village Mundapara



▲ Facilitation of progressive farmers on the occasion of Kisan Divas



▲ Trained tribal farm ladies with a flock of RIR birds in a tribal village



▲ RIR chick distribution to tribal people under on farm trial programme



▲ Pig rearing by an adopted farmer



▲ A trained tribal farmer with his family and indigenous pigs



▲ Scientist interaction with farm women

Impact Study

“Impact Study on Introduction of Summer Green Gram (*Vigna radiata* L) Cultivation in Rice-Fallow Cropping System in Sundarbans, West Bengal”

Introduction :

Several well tested and proven technologies to enhance production and productivity of the crops and powerful communication technologies are available in the hands of researchers; still the world is challenge by the vicious cycle of poverty, malnutrition and environmental degradation. In a country like India where a large population is vegetarians, the cheap and best sources of protein are still pulses. Besides being rich in protein, they sustain the productivity of cropping system. Their ability to use atmospheric nitrogen through biological nitrogen fixation is economically sounder and ecologically acceptable.

Sundarbans, world biggest delta, is one of the most unique regions, measuring over 10000 Kms². This mangrove ecosystem stretches across coastal West Bengal and Bangladesh over the northern parts of Bay of Bengal. It is dominated by rice-rice based cropping system, where generally rice-fallow cropping system is being enhanced every year. The current situation has geometrically been deteriorating the soil potential with very high incidence of salinity and spread of uncultivated land.

Small and marginal farmers whose livelihoods depend only on agriculture predominantly populate this area. Any change in cropping practices there is worthless unless it is —

- Culturally appropriate
- In agreement with self interest
- Clearly beneficial
- Not economically risky

Moreover, the small and marginal farmers in this tract have certain limitations which include —

- Lack of capital beyond family supply
- Habit of not investing or using credit or outside input
- Little access to outside agricultural support system
- Reluctance to take risks.

Being abreast with all these characters, introduction of summer green gram cultivation in the 5 adopted blocks of Krishi Vigyan Kendra of CIFRI viz. Kakdwip, Namkhana, Patharpratima, Sagar and Kulpi were started under frontline demonstration programme on

oilseeds and pulses with special emphasis on growing at least one crop in summer season when the field is lying vacant. The critical yield gap in production of green gram crop at national level is given in the following Table.

Table 1: Critical yield gaps in green gram farming

Crop	Yield potential on research plots (q/ha)	Yield under FLD at farmers field (q/ha)	National average (q/ha)
Green gram	11-12	9-10	3.81

The present impact study of introduction of green gram cultivation in rice fallow cropping system in Sundarbans was done to assess the socio-economic betterment of farming community with following objectives:

- To study social as well as economic betterment of farming community through adoption of rice-green gram crop rotation
- To study various constraints affecting farmers in adoption of these technologies
- To study the impact of KVK activities on rural population.

Methodology :

The study was conducted in 4 selected villages viz. Nandabhaga, Debnibas, Belpukur, and Gangadharpur from within the adopted community development blocks of KVK, Kakdwip. The coverage was made of 60 farmers randomly, 15 from each village belonging to marginal, small and medium category.

This study was done using Participatory Rural Appraisal techniques, formal household survey using questionnaire with open ended questions and focused group discussion with the participants. PRA tools used for this purpose were transect, resource map, seasonality of livelihood (pre and post), change of livelihood (pre and post), timeline and economic ladder analysis before the start of FLD on green gram and after 10 years.

As apart of exploratory study a schedule was developed to elicit responses from farmers about green gram cultivation in rice-fallow system. The primary purpose was to determine what changes did happen after cultivating green gram since last several years. Details regarding their characteristics, cropping pattern, adoption pattern, seed source, varietals preference of the farmers, biotic and abiotic constraints and cost of cultivation were studied. In addition to this, it also includes questions about farm size and farmers' experience as well as questions regarding concerns they have in growing green gram.

Under focused group discussion, list of activities undertaken through FLD on green gram in the respective villages was made. It is later validated with local informants to ensure that no important activity should be omitted. Considering each activity the villagers were asked about the effect of KVK programme on increasing income, food availability, soil nutrient replenishment, sustainability of land and constraints being faced by them.

This impact study was conducted in the month of May-June 2002, using before- after analysis. Triangulation of data was done to improve the validity and reliability of the result. Although open-ended questions tend to be more difficult and time consuming to analyze, they presumably provide “unbiased, unconstrained and thoughtful responses”. Answering these questions allowed respondents the opportunity to elaborate on responses that would otherwise be constrained if close-ended questions were asked.

Results And Discussion :

Demographic Characteristics: A total of sixty farmers were selected for this study from four selected villages, viz. Nandabhaga, Debnibas, Belpukur, and Gangadharpur, belonging 33% to marginal farmers, 50% to small farmers and 17% to medium and large farmers. The distribution of various categories of farmers is given in Table 3. The great majority (more than 80%) of the farming population of this area belongs to small and marginal category.

Table-2: Category of farmers and size of holding

Categories and size of holding	farmers(N=60)	Percentage
1. Marginal (Up to 1 ha.)	20	33
2. Small (1 to 2 ha.)	30	50
3. Medium and large (Above 2 ha.)	10	17

The farmers surveyed (90%) were largely depend on agriculture as the only source of income, while 10% of them have secondary source of income that includes business and daily wage income from non-farming work though in every case farming remains to constitute their primary source of income and livelihood.

The educational qualification of respondent farmers shows that 70% of them are having education up to secondary level. 20% of them can only read and write, while remaining 10% are illiterate. This shows that rate of literacy among farming population is satisfactory and this may have helped them in responding quickly to new technologies. Eighty percent of the respondent farmers belong to the general categories and 20% of them are to scheduled caste/ scheduled tribe and other backward classes.

Agricultural Characteristics: To cope with the prevailing land situation in Sundarbans, all the selected farmers under this study were motivated by extension agents to grow green gram on lowland. The predominant soil type is clay loam texture.

The average cropping intensity in Sundarbans areas at present is only 116%. 40% of the respondent farmers have cropping intensity of more than 150%, 45% of the farmers have in between 120-150% and 15% of them have a cropping intensity of less than 120%.

Table-3: Cropping intensity of selected farmers

Cropping intensity	No. of farmers (N=60)	Percentage
1. less than 100	-	-
2. 100-120	9	15
3. 120-150	27	45
4. 150 -200	24	40
5. 200 and above	-	-

The prevalent farming situation in Sundarbans areas being characterised by kharif season with paddy cultivation in rain-fed condition and water requirement for growing rabi and summer crops are met only through residual soil moisture and/or stored rain-water. One of the greatest lacunae faced by the farmers of this area is lack of soil moisture. The green gram crop requires only one irrigation during its whole life span. But farmers with assured irrigation facilities prefer vegetable and commercial crops like betel vine to food grain and oilseeds crops. 20% of the respondent farmers have irrigated land between 20 to 50% while 70% of them have irrigated land between 50 to 75% and only 10% of the farmers have more than 75% of their land irrigated. 95% of the respondents have pond as their source of irrigation and only 5% are irrigating their field using canal water.

Table -4: Land areas irrigated

Land area irrigated (%)	No. of farmers(N=60)	Percentage
1. 0-10	-	-
2. 10- 20	-	-
3. 20-50	12	20
4. 50-75	42	70
5. 75 and above	6	10

During the discussion and survey the respondents were specifically asked about the land-base, i.e., cultivated land that they had before the start of FLD and at present. It has been found that before the start of this programme 55% of the farmers belonged to marginal farmers' category, having a land area of less than 1 hectare and at present the percentage has been reduced to 33%. Before the start of FLD 35% of the farmers had land area of 1 to 2 hectares that has now been increased to 50%. The category of medium-large farmers included only 10% before the start of FLD, and the percentage has at present escalated to 17%.

Table -5: Total land area owned and covered

Area owned and covered	Before		After	
	Farmers (N=60)	Percentage	Farmers (N=60)	Percentage
Up to 1 ha.	33	55	20	33
1-2 ha.	21	35	30	50
2 and above	6	10	10	17

A decrease of 22% was seen in farmers with less than 1 hectare of land area after the successful adoption of green gram cultivation during summer season. An increase of 15% in small farmers' category and 7% in large farmers categories were also observed after the implementation of this programme..

Socio-economic Characteristics :

One of the most significant aspects of any programme is the economic betterment of farming community. During PRA study (livelihood analysis), focused group discussion and household survey, one special area of concern was an increase in net income of farmers after the introduction of green gram cultivation in this area. The net income in rupees/annum also includes the income coming from next paddy crop grown after the green gram crop, because the following paddy crop gets their nutrient supply through fixed nitrogen of preceding green gram crop. The replenishment of soil nutrient by the green gram crop always reduces the cost of cultivation of next paddy crop because of its stored nitrogen supply.

Table-6: Changes in net income

Net agricultural income (Rs/ annum/ha.)	Before		After	
	Farmers (N=60)	Percentage	Farmers (N=60)	Percentage
Less than 1000	-	-	-	-
1000-2000	21	35	3	5
2000-3000	24	40	24	40
3000-5000	15	25	15	25
5000 and above	-	-	18	30

It is observed from the table 7 that 35% of the farmers earlier had net income less than Rs. 2000/annum. This percentage has now been reduced to only 5%. The percentage distribution in middle income groups having 2000-3000 and 3000-5000 income per annum has not been altered. The high income group having more than 5000 income per annum has registered a percentage as high as 30% while none was there before FLD. It is notable that agricultural growth reduces inequality among the poor as well as lifting the poor above the poverty line. This increase in net income has provided extra money to the farming community. 30% of them have purchased pump sets for irrigation, which was only owned by 5% of the farmers before the introduction of green gram cultivation. Only 10% of the respondents had sprayer before, and the percentage has now gone up to 35%.

Impact of Technology: Regarding extent of adoption of technologies the respondents are quite emphatic, earlier the same technology were adopted only by 5-20% of the farmers has now reached up to 100%

Table-7: Extent of adoption of technologies

Technologies	Before		After	
	Farmers (N=60)	%	Farmers (N=60)	%
1. Improved seeds	6	10	60	100
2. Recommended seed rate	9	15	60	100
3. Seed treatment	9	15	54	90
4. Bio-fertilizers	-	-	24	40
5. Routine plant protection measures	6	10	60	100
6. Green manuring	-	-	48	80
7. Improved cultivar	6	10	60	100
8. water management	-	-	36	60
9. Integrated nutrient management	-	-	21	35

Table 7 indicates that 100% adoption has been achieved with improved seeds, seed rates, routine plant protection measures and improved cultivars. But the least adoption was seen in respect of integrated nutrient management because of its recent nature and 40% in the adoption of Rhizobium inoculation because of non-availability of Rhizobium culture in the local market.

Table -8: Change in the yield/productivity under the intervention

Yield (q/ha)	Before		After	
	Farmers (N=60)	Percentage	Farmers (N=60)	Percentage
1-3	9	15	-	-
3-5	40	67	9	15
5-8	11	18	24	40
8 and above	-	-	27	45

The above table shows that productivity of green gram has increased significantly over the years and at present 45% of the farmers are getting yield of 8 q/ha and above. One of the main aspects of this study was to ascertain the change in the yield and the productivity of green gram in Sundarbans. Before the start of this programme the productivity of green gram in this area was in the range of 1 to 5 q/ha, which has now increased to more than 8 q/ha.

Not the change in the productivity but the social impact of introduction of green gram has given a boost to the social capital to the farm populace of the Sundarbans.

Table -9: Social impact of intervention

Social indicators	Before		After	
	Farmers (N=60)	Percentage	Farmers (N=60)	Percentage
1. Houses				
a. Marginal farmers				
Kutcha	12	20	12	20
Mixed	-	-	3	5
Pucca	-	-	-	-
b. Small farmers				
Kutcha	18	30	24	40
Mixed	-	-	6	10
Pucca	-	-	-	-
c. Medium - large farmers				
Kutcha	6	10	-	-
Mixed	-	-	6	10
Pucca	-	-	4	7

2. Medicare

a. Marginal farmers	-	-	12	20
b. Small farmers	12	20	18	30
c. Medium - large farmers	6	10	10	17

3. Education*a. Marginal farmers*

i. Just literate	3	5	3	5
ii. Primary	3	5	9	15
iii. Secondary	-	-	-	-
iv. Graduate and above	-	-	-	-

b. Small farmers

i. Just literate	3	5	12	20
ii. Primary	6	10	6	10
iii. Secondary	3	5	12	20
iv. Graduate and above	-	-	-	-

c. Medium - large farmers

i. Just literate	-	-	6	10
ii. Primary	3	5	3	5
iii. Secondary	-	-	1	2
iv. Graduate and above	-	-	-	-

The above table indicates that the social impact of green gram cultivation has brought a revolutionary change living of Sundarbans populace and made their livelihood sustainable. The medicare facility, which was earlier only available to 30 % of population, has now reached up to 67%. Literacy rate has also increased significantly and more than 70% farmers are now literate. Social capital has also improved the awareness of farmers with regard to better health care and also improved the food security scenario of Sundarbans.

Economic impact of introduction of green gram cultivation has also not only brought a dynamic change in the marketable surplus of as well as in the household saving required for farming as well as family consumption. The economic impact of intervention is given below in separate table for each farming category.



Celebration of Hindi fortnight at KVK, Kakdwip







 Dignitaries visiting the K.V.K. exhibition stall



Table-10: Economic impact of intervention on marginal and landless farmers

Economic indicators	Before		After	
	Farmers (N=33)	Percen- tage	Farmers (N=20)	Percen- tage
1. Land per farm				
< 0.5 ha.	6	18	12	60
0.5-1.0 ha.	-	-	-	-
2. Contribution in inputs (%)				
<i>a. Family sources</i>				
< 10	-	-	-	-
10-25	3	9	-	-
25-50	6	18	-	-
50 and above	3	9	12	60
<i>b. Purchased</i>				
< 10	-	-	-	-
10-25	-	-	6	30
25-50	-	-	6	30
50 and above	12	36	-	-
<i>c. KVK</i>				
< 10	12	36	8	40
10-25	12	36	8	40
25-50	-	-	-	-
50 and above	-	-	-	-
3. Gender contribution (%)				
0-20	-	-	-	-
20-40	6	18	9	45
40-60	6	18	3	15
60 and above	-	-	-	-

The above table shows that marginal farmers which numbers were earlier 33 (55%) in total selected respondents has now come down to 20 (33%) of total respondents. The most significant economic impact was observed in the land holding of marginal farmers and at present more than 60% of them have lands. Gender contribution in green gram farming has also increased and now 20-40% work is done by 45% of the farmwomen.

Economic impact on small farmers has also indicates about certain dramatic change, the number of small farmers has increased over the years. The total respondents selected for the study were 21 (35%) before intervention has now reached to 30 (50%) of total population. The details are given in below table.

Table -11: Economic impact of intervention on small farmers

Economic indicators	Before		After	
	Farmers (N=21)	Percentage	Farmers (N=30)	Percentage
1. Land per farm				
1.0-1.5ha.	12	43	12	40
1.5-2.0ha.	9	-	-	-
2. Contribution in inputs (%)				
<i>a. Family sources</i>				
< 10	-	-	-	-
10-25	3	14	3	10
25-50	15	71	3	10
50 and above	3	14	24	80
<i>b. Purchased</i>				
< 10	-	-	-	-
10-25	-	-	3	10
25-50	-	-	15	50
50 and above	9	42	6	20
<i>c. KVK</i>				
< 10	3	14	9	30
10-25	5	23	15	50
25-50	-	-	-	-
50 and above	-	-	-	-
3. Gender contribution (%)				
0-20	-	-	5	16
20-40	-	-	5	16
40-60	-	-	5	16
60 and above	-	-	6	20

The above table shows that the gender contribution which was non-existent earlier has now increased significantly over the years. Farmwomen are now taking part in green gram cultivation and their family members in the farming operation. Contribution of family sources in the inputs has also increased over the years. The farmers belonging to medium - large farmers category were 6 (10%) in numbers before intervention has increased to 10 (17%) now in the total selected respondent population. The table shows the economic impact of intervention on the medium and large categories of farmers.

Table 12: Economic impact of intervention on medium - large farmers

Economic indicators	Before		After	
	Farmers (N=6)	Percentage	Farmers (N=10)	Percentage
1. Land per farm				
2-2.5 ha.	3	50	4	40
2.5 ha. and above	3	50	6	60
2. Contribution in inputs (%)				
<i>a. Family sources</i>				
< 10	-	-	-	-
10-25	-	-	-	-
25-50	4	66	4	40
50 and above	2	33	6	60
<i>b. Purchased</i>				
< 10	-	-	-	-
10-25	-	-	-	-
25-50	-	-	4	40
50 and above	4	66	4	40
<i>c. KVK</i>				
< 10	2	33	3	30
10-25	1	16	1	10
25-50	-	-	-	-
50 and above	-	-	-	-

3. Gender contribution (%)

0-20	-	-	-	-
20-40	1	16	3	30
40-60	-	-	1	10
60 and above	-	-	-	-

The land holding pattern has taken a leap turn and at present 60% of the farmers in medium and large categories have 2.5 ha and above land under their possession. The input contribution from family sources has also increased over the years.

Labour utilization (man days/annum) has also increased after the intervention because of the increase in the activity calendar due to the increase in the cropping intensity of the farming community.

Table 13: Changes in labour utilization

Labour utilization (man days/annum)	Before		After	
	Farmers (N=60)	Percen- tage	Farmers (N=60)	Percen- tage
a. Marginal farmers				
< 100	3	5	-	-
100-150	3	5	6	10
150-200	-	-	9	15
200-250	-	-	-	-
b. Small farmers				
< 100	9	15	-	-
100-150	6	10	-	-
150-200	3	5	6	10
200-250	-	-	15	25
c. Medium - large farmers				
< 100	-	-	-	-
100-150	3	5	-	-
150-200	2	3	6	10
200-250	-	-	4	7

The table 13 indicates that the labour utilization which was up to 100 to 150 man days/ year before the intervention has now sharply increased to 150-250 days/ year and at present 47% of the farmers is engaging farm labourers for more than 200 days per year. This also means that the rural to urban migration during the lean season has also decreased to a considerable extent. The extension of farming throughout the year will also boost the livelihood security of rural population as a whole.

Any impact study could not be completed without knowing the factor of non adoption of new technologies. The table given below shows the factors responsible for the non adoption of summer green gram cultivation under different categories viz. knowledge and information, technological, socio-economic and infrastructural and managerial. The data denotes here multiple responses under different categories.

Table 14: Factors of non adoption

Factors	Farmers (N=60)	Percentage	Rank order (Group wise)
I. Knowledge and Information			
1. Lack of information	18	30	I
2. Lack of knowledge about Rhizobium inoculation	10	16	II
II. Technological			
1. Not convinced of superiority	9	15	V
2. Risk and uncertainty	24	40	III
3. Incompatibility	12	20	IV
4. Lack of timely assured irrigation	30	50	II
5. Non availability of Rhizobium culture	36	60	I
6. Complexity	9	15	V
III. Socio-Economic			
1. Small holding	36	60	II
2. Unsustainable farm situation	30	50	III
3. Financial limitation	45	75	I
4. High cost of inputs	27	45	IV
IV. Infrastructural and Managerial			
1. Marketing of output	30	50	III
2. Labour Supply	12	20	VI
3. Lack of timely availability of input	33	55	II
4. Difficulties in transport	18	30	V

5. Management	12	20	VI
6. Harvesting and disposal trouble	39	65	I
7. Security of crops	27	45	IV

The above table shows that under technological factors of non adoption, non availability of Rhizobium culture has caused severe hindrance in the adoption of green gram in this area. Under socio-economic factors, financial limitation is the most significant cause of non adoption of and the small holding is the second most important factor. Under infrastructural and managerial factors of non adoption, harvesting and disposal trouble is the most important one and lack of timely availability of inputs, marketing problems and security of crops are another factors of non adoption of summer green gram cultivation in this area.

Findings and Conclusions :

Impact study on introduction of green gram cultivation in rice-fallow system of Sundarbans has provided a lot of information and important findings.

This study was undertaken to know the on-farm benefits of summer green gram cultivation in Sundarbans. The results has shown that the income of the farmers have grown considerably and 35% of the farmers growing Green gram are getting more than Rs. 5000/annum. This study has also revealed that 35% of the farmers cultivating green gram have acquired assets of more than Rs. 10000.

Maximum numbers of farmers growing green gram are small and marginal farmers and summer green gram cultivation increased their household income as well as food security.

Green gram farming has contributed significantly in social capital formation viz. increase in medicare and health facilities, access to education to the farm families, better feeding habit, better housing, gender contribution to agriculture as well as other benefits. The social capital can help in improving of management and productivity of environmental assets. It will also increase the productivity of physical as well as human capital.

The various factors associated with the non adoption of the new technologies are a great cause for concern. One of the great lacunae is the non availability of Rhizobium culture, which should be rectified immediately by the department of agriculture and research institutes/university.

The extent of adoption of technologies has significantly changed over the years. More than 80% of the farmers are now using the green manuring technology because of the soil

nutrient replenishment characteristics of green gram, which provides good amount of available nitrogen to the next paddy crop.

Saving in production costs has come from technical changes in the crop management and increased input efficiency.

Wide spread adoption of modern seed- fertilizer technology led to a significant shift in the food supply function, contributing to a fall in real food supply.

This study has also revealed that growth in the agriculture sector has economy-wide effect viz. increase in the land ownership, acquiring of new assets and farm implements, increase in labour utilization which results into decreasing rural to urban migration and reduces the unemployment rate and disguised unemployment. It has also utilized the previously unutilized family labour resources.

Improvement in food security through the application of new technologies at the community level can lead to the people's enhanced local capacity to engage in development activities in other areas as well.

Direct involvement of beneficiaries in adopting green gram cultivation technology suitable to their condition has given high payoffs in terms of enthusiasms and interest and also in ensuring that the technology addresses the priority needs that have been identified by the beneficiaries.

Summer green gram cultivation has also ensured sustainable natural resource management objectives. Vulnerability to natural disasters can substantially be reduced through the adoption of green gram cultivation because of the improvement in productivity, increase cash income and acquired assets that families can fall back on when disasters occurs.

Impact of Training Programme

Follow up of the training courses and other programmes are essential and have been maintained through organising 'Extrainees Sammelan,' regular visit to villages, interaction with the beneficiaries of the programmes and on the spot guidance as well as correspondence. The impact of training programme is given as under, based on the discussion with former trainees at ex trainees meet through using of participatory rural appraisal and survey.

Sl. No	Name of technology/skill	No. of trainees	% Adoption	Income Before Training (Rs./unit/ha.)	Income After Training (Rs./unit/ha.)
1.	Composite Fish Culture	80	86	20,000	32,500
2.	Paddy-cum-fish Culture	40	70	4,000	12,200
3.	Betelvine production technologies	150	72	5,000	9,250
4.	Freshwater Prawn farming	20	60	5,500	11,000
5.	Hybrid Tomato Cultivation	60	65	4,600	9,750
6.	HYV Chilli Cultivation	30	70	5,000	8,500
7.	Embroidery work	20	80	-	2,000

The impact of training programme clearly shows that all the above technology has been adopted by over sixty percents of farmers in Sundarbans area, which is satisfactory. The average income of farmers practising composite fish culture has been increased by Rs. 12,500/- whereas farmers growing chilli have become richer by Rs. 3,500 /-. Overall former trainees have learned the various technologies and they got benefited.

Technical Feedback

These are the technical feed backs received from the Technical Experts as well as farming communities of the adopted areas of Krishi Vigyan Kendra of CIFRI, Kakdwip.

- I. Agronomy:
 - 1. Fertilizer consumption in rice has been decreased due to increasing cost of fertilizers as well as use of bio-fertilizers.
 - 2. Green gram has become more popular among farmers as second crop because of its soil nutrients replenishing benefits.
- II. Fishery:
 - 1. Fish farmers need to learn the pituitary gland collection technique and preservation for fish breeding.
 - 2. Preparation of artificial feed with locally available ingredients to minimize the cost of fish feed for higher fish production.
 - 3. Inclusion of fresh water giant prawn in composite fish culture has increased income to a considerable extent.
- III. Horticulture:
 - 1. High incidence of leaf curl disease has brought down the productivity potential of tomato in coastal Sundarbans.
 - 2. Excessive use of pesticides increases resistance to pest and diseases.
- IV. Animal Science:
 - 1. Regular deworming, vaccination and balanced feeding improved the productivity of up-graded milch cow.
 - 2. Proper management and judicious use of health products increase the margin of profit in poultry broiler farming.
- V. Home Science:
 - 1. Value addition of fruits and vegetables has increased the income of rural farmwomen of this area.
 - 2. Mushroom production is being practiced by farmwomen as subsidiary income generation.

Lab to Land Programme

Lab to land Programme was launched by ICAR on its golden jubilee in 1979, to adopt the small and marginal farmers and landless labourers, to educate them about the latest agricultural and allied technologies and to adopt these technologies and pave the way to improve their social and economic lot.

The programme aimed at assisting these selected farm families in developing and implementing individual farm plan for implementing the entire farming system and thereby generating more employment and income. The basic idea is to bring the scientists and farmers into close contact and to introduce low cost relevant technologies which could help in diversification of labour use and creating supplementary sources of income in the fields of agriculture, animal husbandry, sericulture, apiculture, fisheries, rural craft, etc.

The blue print for the development of adopted families is prepared with emphasis on improvement in the farming systems, employment potential and increase in production. Each specialist of LLP is entrusted with about 10 families and is responsible for introducing technical know-how on their farms/houses. Vocational training programmes for improving the income generating skills viz. poultry keeping, dairy farming, goat keeping, proper utilization of food and fodder, preservation of fruit and vegetables, sheep rearing are initiated and organized.

Lab to land Programme has provided the opportunity to the agriculture scientists to come in close contact with the farming communities which would enable them to understand their problems and uncover the barriers of rapid transfer of technology. Major thrust is to introduce the most appropriate technologies that would help in diversification of labour use and introduction of supplementary source of income.

There is an inbuilt mechanism for assessing the progress of programme through half yearly progress reports, personal visits and workshops.

The specific objectives of Lab to Land Programme are as follows:

- ❖ To study and understand the background and resources of the selected farmers and landless agricultural labourers. To introduce low cost relevant agricultural and allied technologies on their farms/houses for increasing their employment, production and income.
- ❖ To assist the farmers to develop feasible farm plans keeping in view the availability of technologies, needs and resources could be made available from external sources/agencies.

- ❖ To guide and help the farmers in adopting improved technologies as per their farm plans and demonstrate to them the economic viability of those technologies as well as methods of cultivation and farm management.
- ❖ To analyze training programmes and other extension activities in relation to their adopted practices and prepare them for active participation in agricultural development programme of state department of agriculture.
- ❖ To make the farmers aware of the various opportunities and agencies which they could utilize to their economic advantage
- ❖ To develop functional relations and linkages with the scientists/ institutions for future guidance, advisory services and help
- ❖ To utilize it as a feed back mechanism for the agricultural scientists and extension functionaries.

Lab to land programme has been implemented by KVK, Kakdwip in the villages Namkhana, Narayanpur, Nandabhaga, Pukurberia, Mainapara, Fraserganj, Debnibas, Belpukur, Lakhipasha, Provabatipur, Arunnagar, Nischintapur and Kakdwip adopting 100 families. The Kendra has been engaged in transfer of technology based on local needs and available resources. A new technology for fish breeding was introduced by all centers of CIFRI including KVK, Kakdwip. Production ranging from 3000 to 3500 kg/ha/year from ponds under fish cum duck culture and 1000 kg/ha/ 5 months from fish cum pig culture. In paddy cum fish culture 971.85 kg of fish/ ha/10 months and of 47.42 q/ha paddy were obtained.