Inspiring Farmers Through Farmer FIRST

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Message

The 'Farmer FIRST' project is intended to engage scientists of ICAR Institutes and Agricultural Universities to undertake technology application directly in active partnership of farmers. Putting the concept into action ensures bringing perceptional change among scientists to realize ground realities and develop technologies as per needs of farming community. This also enhances farmers-scientists' interface and enriches knowledge of all stakeholders.

I am delighted to know that ICAR-Agricultural Technology Application Research Institute Kolkata is going to publish a document on 'Farmer FIRST' project being implemented by four institutions in Odisha since 2017-18. This document spells the intrinsic modules of fruitful technology application, i.e., farmer-scientist interface, technology assemblage, application and feedback, partnership and institutional building and content mobilization through e-enabled knowledge sharing.

To come out with such a useful document is laudable. I congratulate the Director, ICAR-ATARI Kolkata and the team of scientists for this publication.

(A.K. Singh)

Date : 25.02.2020

Preface

Farmers FIRST Programme (FFP) is one of the prestigious projects of Agricultural Extension Division, ICAR, New Delhi which is being run at 52 different locations under ICAR Research Institutes and State Agricultural Universities in this country. Here, farmers are being placed in the front for addressing problems relating to agricultural production using their innovations, resources available with them and its management at farmers' field conditions. Small and marginal farmers and women were the major target groups. The project proposals were prepared considering various components- i) farmer-scientist interface which provided platform to exchange knowledge between farmers and other stake holders; ii) technology assemblage, application and feedback which enabled researcher to explore and include various modules (crop, horticulture, livestock, NRM, enterprise based modules) depending upon different agro-ecosystems; iii) partnership and institutional building which created opportunities to develop models of partnership, organizing capability, marketing ability, attitude and leadership quality; and finally, iv) content mobilization through e-enabled knowledge sharing.

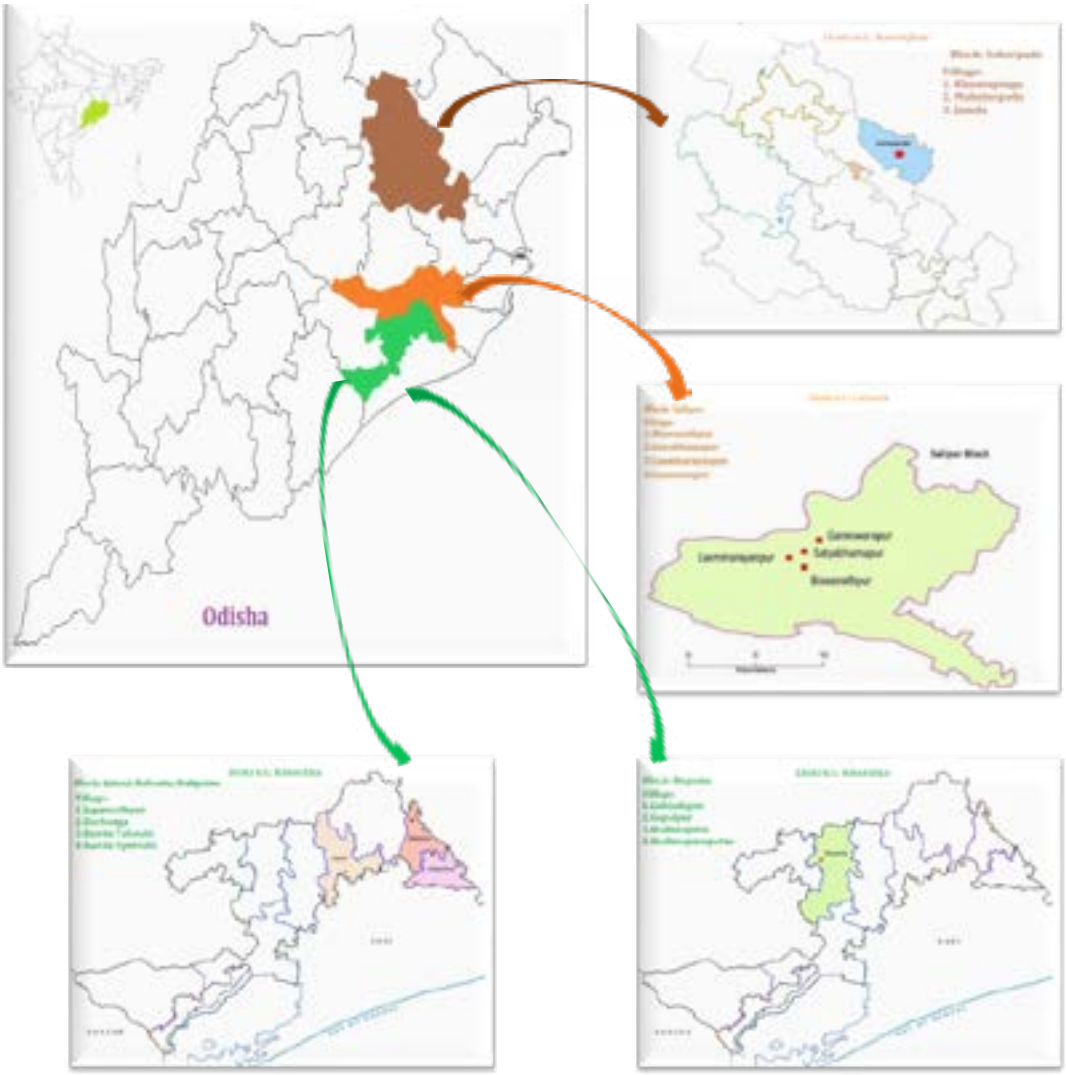
I feel very happy to share that four such valuable projects (three for ICAR institutes and one for state agricultural university) were sanctioned by the Council under ICAR-ATARI Kolkata since year 2017-18. All the projects were implemented very meticulously in their target villages with justified technology interventions. Through FFP programme, 6082 farm families consisting of 10928 beneficiaries covering more than 1000 ha area, were addressed on various issues related to agriculture. Income of farmers from agricultural produce was increased through introducing a large number of new rice crop varieties e.g. *CR Dhan 307 (Maudamani)*, *CR Dhan 409* (*Pradhandhan)*, *Hasant, Pooja, Rajlaxmi,, Prateekhya, Nua Kalajira, Swarna Sub-1* etc.; green gram var. *IPM-2-3* and *TARM-1*; black gram varieties e.g. *PU-31* and *IPU-2-43*; and new vegetables and fruits varieties (e.g. cucumber var. *Rajamata*; cauliflower var. *Namdhari N-60* and *Fujiyama*; tomato var. *KSP 1306 Bahubali*; okra var. *Samrat*; pumpkin var. *Vimal*; bitter gourd var. *VNR* 28; French bean var. *Falguni*; Amaranthus var. *All Green*; tissue culture banana var. *Bantala*; papaya var. *Red Lady* and so on). Poultry strains viz. *Vanaraja*, *Kaveri* and *Pallishree* became very popular for backyard rearing by the rural farm women. Fish based integrated farming system model was very effective mean for augmenting farmers' income. In low rainfall areas, farmers became very aware in rain water harvesting for cultivating off-season vegetables to fetch better remunerative prices.

This document entitled '*Inspiring Farmers Through Farmer FIRST*' reflects detail information about the projects, achievements under various activities, upscalable technology modules, success stories, awards etc. by implementing institutes under ICAR-ATARI Kolkata. As Director of this institute, I thankfully acknowledge the guidance received from Agricultural Extension Division, Indian Council of Agricultural Research, New Delhi. Thanks are also due to all Principal Investigators of the concerned institutes, scientists and staff of ICAR-ATARI Kolkata for their tireless efforts in preparing this publication.

21st February, 2020

(S. S. Singh)
Director

Operational Villages for Farmer FIRST Programme in Odisha



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Chapter 1: Details of Projects

The initiative of Farmer FIRST Programme (FFP) was taken by Agricultural Extension Division, Indian Council of Agricultural Research (ICAR), New Delhi to move beyond the production and productivity, to privilege the smallholder agriculture, and complex, diverse and risk prone realities of majority of the farmers through enhancing farmer-scientist interfaces. The term '*Farmer FIRST*' refers the Farmers' Farm, Innovations, Resources, Science and Technology (FIRST). The basic concept was that the farmer would be in a centric role for research problem identification, prioritization, conduct of experiments and its management in farmers' field conditions. It emphasized resource management, climate resilient agriculture, production management including storage, marketing, supply chains, value chains, innovation systems, information systems etc.
With that concept, Agricultural Extension Division of ICAR, New Delhi invited project proposals for funding under Farmer FIRST Programme from ICAR Institutes/ Agricultural Universities and directed to submit the project proposals to the concerned Agricultural Technology Application Research Institute (ATARI) considering their Zone. As per directives of the Council, all the submitted projects were screened by Zonal Programme Management Committee (ZPMC) constituted by the Council and the same were forwarded to the Programme Management Committee (PMC) at the Council level for consideration. The FFP was started during third quarter of the year 2016-17 and all projects were approved for two years i.e. up-to the year 2017-2018. Under the then Zone-II (i.e. Zonal Project Directorate, Kolkata), one project from ICAR-National Research Centre on Litchi (ICAR-NRCL), Muzaffarpur; one from ICAR-Indian Institute for Agricultural Biotechnology (ICAR-IIAB), Ranchi; one from Bihar Agricultural University (BAU), Bhagalpur and one from Birsa Agricultural University (BAU), Ranchi was sanctioned.

With the rename of Zonal Project Directorate (ZPD) into Agricultural Technology Application Research Institute (ATARI) and creation of three new ATARIs in the country as well as subsequent adjustment of states under each ATARI, Andaman and Nicobar Islands, Odisha (previously was under ZPD, Jabalpur or Zone-VII) and West Bengal had been brought under ATARI Kolkata/ Zone-V and Bihar along with Jharkhand had been included under new ATARI Patna/ Zone-IV. As a result, two projects from Bihar and two from Jharkhand had been shifted to ICAR-ATARI Patna and four projects of Odisha state i.e. one from ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack; one from ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar; one from ICAR-Indian Institute of Water Management (ICAR-

IIWM), Bhubaneswar (ICAR-IIWM), Bhubaneswar and one from Odisha University of Agriculture and Technology (OUAT), Bhubaneswar came under ICAR-ATARI Kolkata since 2017-18. However, after achieving very good success in FFP Phase-I (during the year 2016-18), Agricultural Extension Division, ICAR, New Delhi decided to extend that prestigious programme for next two years (2018- 2020). The institute-wise details about four projects have been given under different subheads.

1.1 Name of institute: ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack

1.1.1 Title of the project: '*Increasing productivity and sustaining the rice based production system through Farmer FIRST approach*'

1.1.2 Name and designation of PI: Dr. S.K. Mishra, Principal Scientist, ICAR-NRRI, Cuttack

1.1.3 Name and designation of Co-PIs with affiliating institute:

- Dr. (Mrs.) L. Das,* Principal Scientist, ICAR-CIWA, Bhubaneswar
- Dr. B. Mondal, Principal Scientist, ICAR-NRRI, Cuttack
- Dr. S. K. Pradhan, Principal Scientist, ICAR-NRRI, Cuttack
- Dr. S. Saha, Principal Scientist, ICAR-NRRI, Cuttack
- Dr. S. Lenka, Principal Scientist, ICAR-NRRI, Cuttack
- Dr. S. D. Mahapatra, Principal Scientist, ICAR-NRRI, Cuttack
- Dr. P. K. Nayak, Principal Scientist, ICAR-NRRI, Cuttack
- Dr. S. C. Giri, Principal Scientist, ICAR-CARI Regional Centre, Bhubaneswar
- Dr. G. C. Acharya, Principal Scientist, ICAR-IIHR Regional Centre (CHES), Bhubaneswar
- Dr. R. Tripathi, Senior Scientist, ICAR-NRRI, Cuttack
- Dr. N. T. Borkar, Scientist, ICAR-NRRI, Cuttack
- Dr. M. Sivashankari, Scientist, ICAR-NRRI, Cuttack
- Mr. J. Bisen, Scientist, ICAR-NRRI, Cuttack
- Ms. S. Priyadarsani, Scientist, ICAR-NRRI, Cuttack
- Dr. M. Kumari, Scientist, ICAR-IIHR Regional Centre (CHES), Bhubaneswar

*(*Acted as PI till 25th June, 2018 before her transfer to ICAR-CIWA, Bhubaneswar)*

1.1.4 Budget:

Name of Institute	*Year*	*Budget*		
		Capital	*General*	*Total*
ICAR-NRRI, Cuttack	2017-18	4.45	34.00	38.45
	2018-19	15.50	17.70	33.20
	2019-20	2.00	15.50	17.50

1.2 Name of institute: ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

1.2.1 Title of the project: '*Promoting Improved Agriculture and Allied Sector Technologies in Khordha District*'

1.2.2 Name and designation of PI: Dr. H. K. De, Principal Scientist, ICAR-CIFA, Bhubaneswar

1.2.3 Name and designation of Co-PIs with affiliating institute:

- Dr. (Mrs.) P. K. Sahoo, Principal Scientist, ICAR-CIFA, Bhubaneswar
- Dr. P. C. Das, Principal Scientist, ICAR-CIFA, Bhubaneswar
- Dr. S. C. Rath, Principal Scientist, ICAR-CIFA, Bhubaneswar
- Dr. S. Sarkar, Scientist, ICAR-CIFA, Bhubaneswar
- Dr. I. Sivaraman, Scientist, ICAR-CIFA, Bhubaneswar

1.2.4 Budget:

Name of Institute	*Year*	*Budget*		
		Capital	*General*	*Total*
ICAR-CIFA, Bhubaneswar	2017-18	0.00	20.22	20.22
	2018-19	2.25	16.50	18.75
	2019-20	0.00	15.50	15.50

1.3 Name of the institute: ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar

1.3.1 Title of the project: '*Enhancing water and livelihoods security and improving water productivity in tribal dominated paddy fallow rainfed agro eco system of Odisha*'

1.3.2 Name of PI of the project: Dr. P. Nanda, Principal Scientist, ICAR-IIWM, Bhubaneswar

1.3.3 Name and designation of Co-PIs with affiliating institute:

- Dr. A. Mishra, Pr. Scientist, Soil & Water Conservation Eng., ICAR-IIWM, Bhubaneswar
- Dr. S. Mohanty, Pr. Scientist, Soil & Water Conservation Eng., ICAR-IIWM, Bhubaneswar
- Dr. M. Das, Pr. Scientist, Soil Chemistry, ICAR-IIWM, Bhubaneswar
- Dr. R. K. Mohanty, Pr. Scientist, Fishery Science, ICAR-IIWM, Bhubaneswar
- Dr. P. S. Bramhanand, Pr. Scientist, Agronomy, ICAR-IIWM, Bhubaneswar
- Mr. A. Das, Project Director, District Watershed Mission, Keonjhar, Odisha
- Dr. M. K. Padhi, Pr. Scientist, Poultry Science, ICAR-CARI, Regional Centre, Bhubaneswar
- Dr. D. Sethi, Scientist, ICAR-IIWM, Bhubaneswar

1.3.4 Budget:

Name of Institute	Year	Budget		
		Capital	General	Total
ICAR-IIWM, Bhubaneswar	2017-18	16.00	14.00	30.00
	2018-19	11.00	13.75	24.75
	2019-20	3.50	14.50	18.00

1.4 Name of institute: Odisha University of Agriculture and Technology (OUAT), Bhubaneswar

1.4.1 Title of the project: '*Enhancing Farm Productivity & Profitability with 'Farmer-FIRST' focus in Khordha district of Odisha*'

1.1.2 Name and designation of PI: Dr. B. Behera, Prof. & Head, Deptt. of Agronomy, College of Agriculture, OUAT, Bhubaneswar

1.1.3 Name and designation of Co-PIs with affiliating institute:

- Dr. M. R. Mohapatra, Joint Director of Extension, Directorate of Extension Education, OUAT, Bhubaneswar
- Dr. P. Tripathy, Professor (Vegetable Science), College of Agriculture, OUAT, Bhubaneswar
- Dr. N. C. Behura, HOD (Poultry Sc.), College of Veterinary Science, OUAT, Bhubaneswar
- Dr. M. K. Mishra, Professor (Plant Pathology), College of Agriculture, OUAT, Bhubaneswar
- Dr. S. Nanda, Director, College of Fisheries, Rangeilunda, OUAT, Bhubaneswar
- Dr. N. R. Sahoo, Assoc. Prof., AICRP on Post-Harvest Technology, CAET, OUAT, Bhubaneswar

1.4.4 Budget:

Name of Institute	Year	Budget		
		Capital	General	Total
OUAT, Bhubaneswar	2017-18	6.00	37.41	43.41
	2018-19	11.20	17.05	28.25
	2019-20	4.00	14.50	18.50

Chapter 2: Activities and Achievements

The Farmer FIRST Programme was aimed at enhancing farmer-scientist interface for technology development and application. Farmers' innovation, technology, feedback, multiple stakeholder's participation, multiple realities, multi method approaches, vulnerability and livelihood interventions were focused for achieving success of the programme. At the time of preparing project proposal, groups of scientists from various disciplines visited their targeted villages, organized many interface meetings with farmers, and conducted baseline survey to finalize/ include the required interventions for different modules (e.g. crop based, horticulture based, livestock based, enterprise based, NRM based and IFS based modules). Each project was given a target to cover 500-1000 farm families spread over in nearby cluster of 2-4 villages. Small and marginal farmers and farm women were the major target groups. Various activities including farmer-scientist interface meet, providing capacity building training, inputs distribution, literatures distribution, feedback collection and analysis, technical guidance to the farmers etc. were conducted at the time of implementation of the project. Every year, all the projects were reviewed very critically by the Committee at ATARI level (ZPMC) and at Council level (PMC) for further improvement. Farmers' fields were also visited by the committee time to time. In this chapter, various activities and salient achievements during the year 2017 to 2020 have been discussed under different modules and are presented below.

2.1 ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack

Under FFP, ICAR-NRRI, Cuttack covered 852 farm families which benefitted 3047 farmers during 2017-18. The total number of farm families and total beneficiaries during the year 2018-19 and 2019-2020 were 1035 and 2441 and 770 and 2410, respectively.

2.1.1 Crop based modules:

2.1.1.1 Details of villages and families:

Four villages viz. Biswanathpur, Satyabhamapur, Laxminarayanpur and Ganeswarpur of Salipur block, Cuttack district, Odisha were selected for undertaking the ICAR-sponsored Farmer FIRST Programme since 2017-18. Out of total over 1800 families in these four villages, 800 farm families were selected proportionately for technological interventions in the cluster as per the objectives of the programme. The brief socio-economic profile of the selected farmers from the cluster is given in the following table. The table indicates that most of the farmers are middle-aged (42%), having

education up-to high school (79%) and living in joint families (62%) with up-to 8 family members (85%). They are primarily dependent on agriculture (98.5%) for livelihood without any other secondary occupation (91%) and 86% are having at least 10 years of farming experience. But, largely they are marginal farmers (68%) with up-to 1 ha of landholding and have good source of irrigation either through canal (56%) or bore wells (40.5%). Technological interventions were made in four modules namely, crop-based, horticulture-based, NRM-based, livestock-based and enterprise-based modules, which are discussed below in details.

Table: Socio-economic profile of selected villages (N=800)

Sl. No.	*Variable*	*Category*	*Frequency*	*Per cent*
1	Age (in years)	Young (<30)	280	35.00
		Middle (30-50)	336	42.00
		Old (>50)	184	23.00
2	Education	Illiterate	56	7.00
		Functional literate	104	13.00
		Up-to primary school	140	17.50
		Up-to middle school	140	17.50
		Up-to high school	192	24.00
		Above high school	168	21.00
3	Family type	Nuclear	304	38.00
		Joint	496	62.00
4	Family size	Small (up to 4 members)	260	32.50
		Medium (5-8 members)	420	52.50
		Large (Above 8 members)	120	15.00
5	Primary occupation	Agriculture	788	98.50
		Others	12	1.50
6	Secondary occupation	Yes	72	9.00
		No	728	91.00
7	Farming experience	Up to 10 years	112	14.00
		11-20 years	320	40.00
		21-30 years	200	25.00
		>30 years	168	21.00
8	Land holding	Marginal (up to 1 ha)	544	68.00
		Small (1 to 2 ha)	180	22.50
		Medium (2 to 4 ha)	48	6.00
		Large (above 4 ha)	28	3.50
9	Source of irrigation	Shallow tube well	16	2.00
		Bore well	324	40.50
		Canal	448	56.00
		Pond	12	1.50

Sl. No.	Variable	Category	Frequency	Per cent
10	Social participation	Not a member of any organization	356	44.50
		Member of one organization	424	53.00
		Member of More than one Organization	12	1.50
		Office bearer	8	1.00

2.1.1.2 Details of technological intervention provided:

a) Introduction of high yielding and hybrid rice varieties:

Crop planning meetings were being conducted at least twice a year before *Kharif* and *Rabi* seasons with key farmers and farm women stakeholders from the cluster villages. Accordingly, varietal demonstration of over 25 newly released high yielding rice varieties including two hybrids (*Rajalaxmi* and *CR Dhan 701*) suitable for all the available ecologies with complete package of practices were conducted for three years during wet seasons involving over 450 selected rice farmers of the four adopted villages. As critical inputs, farmers were provided with seed minikits of about 10 kg and partial amount of fertilizers and pesticides. Based on the findings of baseline survey, they were trained and motivated particularly in seed treatment, nursery bed management, line transplanting with young seedlings, fertilizer management, seed production technologies for preserving quality seeds for future and post-harvest technologies. Other interventions included application of need-based pesticides, pest monitoring and surveillance using pheromone traps, nitrogen management with NRRI-developed customized Leaf Colour Chart (LCC), training and capacity development programmes, continuous monitoring and technical backstopping.

b) Rice farm mechanization:

In order to reduce the cost of production, drudgery of farmers and to reduce in effective farm operational time, extensive training-cum-demonstrations programmes were conducted on over 20 different types of implements like 8-row power operated mechanical rice transplanter, raising mat-type nurseries on trays & cemented floors for rice transplanter, 8-row tractor driven fertilizer cum seed drill, 6-row drum seeder, finger weeder, cono-weeder, power tiller with cage wheel, power reaper, power thresher-cum-winnower, manual pedal thresher, rice husk combustor, rice parboiling unit, battery-operated power sprayer and Knapsack sprayers.

c) Field days and farmers meets:

Showcasing of the superiority of demonstrated crop over the farmers own managed crop always facililated technological adoption and diffusion in a social system. Therefore,

farmers' field days at various stages of crop growth, and crop cutting experiments (CCEs) at the time of harvesting were organized in the presence of both beneficiary and non-beneficiary farmers, local line department officials and project staff. These CCEs were followed by Farmers Meets for experience sharing and participatory evaluation of the performance of introduced rice varieties and demonstrated technologies.

d) Introduction of rice-pulse cropping system:

To make use of residual soil moisture after *Kharif* rice, high yielding black gram (var. *PU-31*, *IPU-02-43*) and high yielding green gram (var. *IPM-02-03*) were introduced in the rice-fallow and rice-local pulse system for additional family income and maintaining soil health.

2.1.1.3 Salient achievements:

During *Kharif* 2017-18, varietal demonstration of 20 new and promising high yielding rice varieties were conducted involving 435 participating farmers and the results are given in the following table. Out of those, only five varieties namely, *CR Dhan 303*, *CR Dhan 304*, *CR Dhan 307* (*Maudamani*), *Pooja* and *CR Dhan 409* (*Pradhandhan*) were selected by farmers for continuing demonstration in next *Kharif* 2018-19 season based on criteria like productivity potential, grain quality, cooking quality, plant height, plant sturdiness and pest resistance for three prominent ecologies of the locality i.e. medium land, shallow low land and low land. Accordingly, only four varieties were demonstrated during *Kharif* 2018-19 season involving 430 participating farmers and the crop cutting experiment results are given in the table. During third year, in *Kharif* 2019-20, six rice varieties including two hybrids (*Rajalaxmi* and *CR Dhan 701*) and one new but a popular BPH resistant variety from OUAT (*Hasant*) were demonstrated involving 420 participating farmers and the crop cutting experiment results are given in the table.

Field view of '*Maudamani*' super rice


Field view of rice variety '*Pradhandhan*'

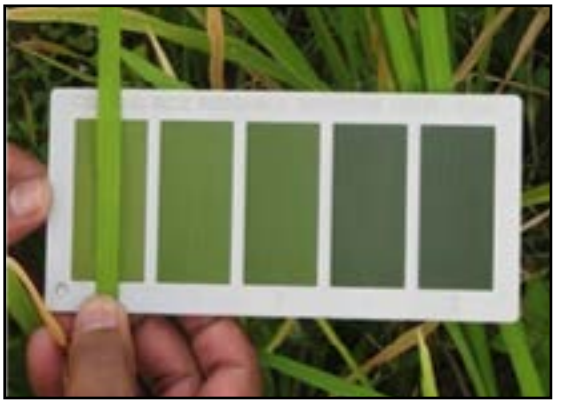
Field view of hybrid rice *'Rajalaxmi'*

Field view of rice variety *'Hasant'*

Skill training cum demonstration on raising mat-type nursery

Demonstration on 8-row power operated transplanter

Skill training cum demonstration on raising mat-type nursery



Demonstration on 8-row power operated transplanter

Demonstration on mechanical weeding

Farmers' field visit by Director, ICAR-NRRI

Table: Average grain yield of rice varieties demonstrated during *Kharif* 2017-18

Sl. No.	*Varieties demonstrated*	*Av. grain yield (t/ ha)*	*Sl. No.*	*Varieties demonstrated*	*Av. grain yield (t/ ha)*
Up land (100-120 days)			**Low land (150-165 days)**		
1	*CR Dhan 100 (Satyabhama)*	4.24	11	*CR Dhan 408 (Chakaakhi)*	5.20
2	*CR Dhan 200 (Pyari)*	4.36	12	*CR Dhan 409 (Pradhandhan)*	5.60
3	*CR Dhan 205*	4.38	13	*CR Dhan 500*	4.36
Medium land (120-135 days)			14	*CR Dhan 502 (Jayanti)*	4.70
4	*CR Dhan 303*	5.80	15	*CR Dhan 503 (Jalamani)*	4.12
5	*CR Dhan 304*	6.16	16	*CR Dhan 505*	4.80
6	*CR Dhan 307 (Maudamani)*	6.20	17	*CR Dhan 506*	4.64
Shallow low land (135-150 days)			18	*CR Dhan 507 (Prasantdhan)*	4.72
7	*CR Dhan 401 (Reeta)*	5.32	19	*CR Dhan 508*	5.20
8	*CR Dhan 404 (Sumit)*	4.84	20	*CR Dhan 601*	5.44
9	*Pooja*	5.32			
10	*Ketakijoha (aromatic)*	3.80			

Table: Average grain yield of rice varieties demonstrated during *Kharif* 2018-19

Sl. No.	*Rice varieties demonstrated*	*No. of crop cuttings*	*Max yield (t/ ha)*	*Min yield (t/ ha)*	*Avg. yield (t/ ha)*	*Per cent of adv. over check*
1	*CR Dhan 303*	3	6.32	4.40	5.20	-0.51
2	*CR Dhan 307 (Maudamani)*	16	7.84	5.40	6.24	13.86
3	*Pooja*	12	6.52	4.68	5.48	0.00
4	*CR Dhan 409 (Pradhandhan)*	12	7.00	4.68	5.52	7.30
5	*Swarna* (local check)	7	6.96	4.88	5.48	0.00

Table: Average grain yield of rice varieties demonstrated during *Kharif 2019*-20

Sl. No.	*Rice varieties demonstrated*	*No. of crop cuttings*	*Max yield (t/ ha)*	*Min yield (t/ ha)*	*Avg. yield (t/ ha)*	*Per cent of adv. over check*
1	*CR Dhan 307 (Maudamani)*	8	7.12	5.20	6.16	13.65
2	*Pooja*	7	6.60	4.88	5.62	3.69
3	*CR Dhan 409 (Pradhandhan)*	9	6.48	4.60	5.21	-3.87
4	*Hasant*	4	7.20	5.68	6.20	14.39
5	*Rajlaxmi (Hybrid)*	5	8.20	6.40	6.72	23.99
6	*CR Dhan 701 (Hybrid)*	6	7.92	6.20	6.92	27.68
7	*Swarna* (local check)	8	6.80	4.80	5.42	0.00

Amongst popular rice varieties in medium land ecologies, the grain yield was found to be maximum and consistent in variety '*CR Dhan 307*' (popularly known as *Maudamani*) with a maximum of 7.84t/ ha and average of 6.24t/ha as against *Swarna* local check (5.48t/ha) with an average grain yield advantage of 14 percent during 2018-19. In shallow low land ecologies, *Pooja* yielded an average of 5.48t/h with maximum of 6.52 t/h. In case of shallow low land ecologies, *CR Dhan 409* (popularly known as *Pradhandhan*) yielded an average of 5.52t/h with a maximum of 7.0 t/ h.

Table: Average net return (Rs.) from adoption of new rice production technologies

Sl. No.	*Items*	*Avg. value of paddy during pre-FFP period 2016-17 (in Rs./ ha)*	*Avg. value of paddy during post-FFP period 2018-19 (in Rs./ ha)*	*Increase in value of paddy (in Rs./ ha)*	*Per cent increase in value of paddy*
A. Inputs (Cost)					
1.	Seed*	1000	0	-1000	-100.00
2.	Fertilizer	3990	2980	-1010	-25.31
3.	Agricultural Operation	15630	3310	-12320	-78.82
4.	Machinery (Tractor and Thresher)	3500	3100	-400	-11.43
6.	Marketing	2000 (Rs.1000/- per trip)	2200 (Rs.1100/- per trip)	200	10.00
Total Input		26120	11590	-14530	-55.63
B. Outputs (Return)					
1.	Main produce (Grain)**	55860 (@3.8t/ha)	98875 (@5.65t/ha)	43015	77.00

Sl. No.	Items	Avg. value of paddy during pre-FFP period 2016-17 (in Rs./ ha)	Avg. value of paddy during post-FFP period 2018-19 (in Rs./ ha)	Increase in value of paddy (in Rs./ ha)	Per cent increase in value of paddy
2.	Bye-product (Straw)	2490	2760	270	10.84
Gross Return		58350	101635	43285	74.18
Net Return		**32230**	**90045**	**57815**	**179.38**

**Seed rate: 50 kg/ ha, Cost of seed: Rs.20/- per kg.*
Straw Yield: 4.15t/ ha (2016-17), 4.46 t/ ha (2017-18), 4.60 t/ ha (2018-19), Cost of Straw= Rs. 600/- per ton
***MSP: During 2016-17 = Rs.1470.00; During 2017-18 = Rs. 1550.00; During 2018-19 = Rs. 1750.00*
Value of main produce (grain) during 2016-17 (MSP-Rs.1470.00) = Rs. 55860/- for 3.80 tons of paddy
Value of main produce (grain) during 2018-19 (MSP-Rs.1750.00) = Rs. 98875/- for 5.65 tons of paddy.

It was evident from the above table that when the average grain yield of paddy was compared with pre-FFP (2016-17; 3.80 t/ h) and post-FFP (2018-19; 5.65 t/ h) period, there was a quantum jump of average 48.68 percent in rice productivity in the cluster. In monetary terms, the net return had increased from Rs. 32230/- per hectare to Rs. 90045/- per hectare with an increase in income by over 179 per cent among the beneficiary rice growers.

The following table also depicted that the introduction of pulse crops in rice-fallow gave very good results. Through utilizing residual moisture, the average yield of green gram in adopted villages was 2.99 q/ ha in 2016-17, but performed best during 2017-18 with 4.85 q/ ha. Green gram performed best in Satyabhamapur with average yield of 5.50 q/ ha. Average yield of black gram in adopted villages was 4.57 q/ ha in 2016-17, but performed better during 2018-19 with 6.27 q/ ha. Black gram performed best in Ganeswarpur with average yield of 8.04 q/ ha followed by Satyabhamapur (6.44 q/ ha).

Table: Year-wise productivity of pulses in different villages during three years

Sl. No.	Crop and Variety	No. of farmers	Area (ha)	Avg. yield (q/ ha)	Avg. yield of local variety (q/ ha)	Yield advantage over local variety (%)
***Rabi* Season 2016-17**						
1.	*Green Gram (IPM-2-3)*	34	4.53	2.99	2.50	19.6
2.	*Black Gram (PU-31)*	16	2.13	4.57	4.00	14.25
***Rabi* Season 2017-18**						
3	*Green Gram (IPM-2-3)*	138	48.06	4.85	3.80	27.63
***Rabi* Season 2018-19**						
4	*Green Gram (IPM-2-3)*	45	18	3.90	3.15	23.81
5	*Black Gram (IPU-2-43)*	80	32	6.27	4.35	

2.1.1.4 Number of farmers benefitted:

Under the crop-based module, rice demonstrations were conducted involving about 450 farmers during three intervention years. However, these varieties have spread to all nearby villages including all the 1800 plus farm families of the adopted village cluster. The introduction of high yielding varieties of pulses (green gram and black gram) in less-favourable rice-fallow areas with the utilization of residual moisture has benefited over 150 rice growers with some additional family income as well as helped in soil health management.

2.1.1.5 Impact in the village/area/district:

Rice grain yield advantages of about 30-60 % and incremental income of 50-300 % (depending on the land type, varieties, crop management practices and market price) were obtained over previously grown varieties.

- The average yield advantage of green gram (var. *IPM-2-3*) over local varieties was found to be 17.6 %, 27.63 % and 23.81 %, respectively during three intervention years. Similarly, average yield advantage of black gram (var. *PU-31* and *IPU-2-43*) was found to be 14.25 % and 44.14 %, respectively in two intervention years. With the introduction pulse crops, an area of about 50.0 ha has come under high yielding green gram and black gram in the cluster.
- Although over twenty varieties were demonstrated during first year of interventions, these three varieties substituted viz. *Maudamani*, *Pooja* and *Pradhandhan* almost all other varieties of the cluster like *Swarna*, *Swarna Sub-1*, *Kalachampa* and other extensively grown local varieties. The consumers' preference criteria like yield advantage, grain quality, cooking qualities, suitability for local value-added food products and other preferred parameters of these varieties for three separate ecologies (medium land, shallow low land & low land, respectively) have helped to spread to over eighty percent rice growing area of the locality.
- Apart from the above three varieties, three more varieties introduced during *Kharif* 2019-20 namely, *Hasant* (BPH resistant) and *Rajalaxmi* (hybrid) in medium land and *CR Dhan 701* (hybrid) in shallow low land area have been very well appreciated by the farmers of the cluster based on their productivity and other quality parameters.

2.1.2 Horticulture based module

2.1.2.1 Details of villages and families:

Four villages viz.Biswanathpur, Satyabhamapur, Laxminarayanpur and Ganeswarpur of Salipur block, Cuttack district, Odisha were covered under that programme.

2.1.2.2 Details of technological intervention provided:

a) Introduction of hybrid vegetables:

The farmers in cluster used to grow all types of vegetables as the land and climate were suitable for vegetables before and after rice crop. However, they were ignorant about suitable high yielding and hybrid varieties, scientific package of practices, management of nutrients, pests and diseases, post-harvest care and packaging for marketing. Therefore, introduction and demonstrations of hybrid vegetables like okra (var. *Nirmal*, *Arka Anamika*, *Samrat F1*, *Radhika*), brinjal (var. *VNR-B-5*), tomato (var. *BSS-1004*, *Samrudhi F1*, *KSP 1306 Bahubali*, *Rohit*), bitter gourd (var. *Nakhara special*, *Akash*), ridge gourd (var. *Rama F1*), pumpkin (var. *VNR-14*,*VNR-11*, *Arjun F1*, *BSS-750*), papaya (var. *Red Lady*), banana (var. *Bantala*), drumstick (var. *PKM-1*, *PKM-2*) broccoli (var. *Pocha*), cauliflower (var. *Namdhari NS-60*), cabbage (var. *Rare Ball*), bean (var. *Royal Somani* and *Bush Shravani*) and cowpea (var. *Sangita B.S.*) had been extensively carried out in the cluster. Under the horticulture-based modules, over 150 farmers and farm women were provided with quality vegetables seeds as critical inputs, the details of which are mentioned in the table.

Table: Coverage of vegetable demonstrations during 2018-2020

Sl. No.	*Crops and variety*	*No. of farm families*	*Area (in acres)*
A.	**Vegetables (*Kharif* season 2018-19)**		
1	Cauliflower (var. *Namdhari N-60*)	47	2.25
2	Cabbage (var. *Rare Ball*)	11	1.05
3	Okra (var. *Samrat*)	13	1.35
4	Beans (var. *Royal Somani*)	10	0.40
5	Cow pea (var. *Sangeeta*)	22	0.80
6	Broccoli (var. *Pocha*)	06	0.25
7	Pumpkin (var. *VNR 14*)	53	18.00
8	Nutritional vegetable seed kit (1. Tomato- *KSP 1306Bahubali*, 2. Beans- *Shravani*; 3. Radish- *Palak Patta*; 4. Koshala- *Red Kanka*; 5- Coriander- *Royal Green*; 6- Pumpkin- *Rana BSS-749*; 7- Amaranthus- All Green; 8- Cucumber- *Supriya*; 9- French Bean- *Harith*; 10- Okra- *Amba*)	115	4.60
Total		**277**	**28.80**
B.	**Vegetables (winter/*Rabi 2018*-19)**		
9	Tomato (Var. *Samrudhi F1*)	37	4.60
10	Okra (Var. *Samrat F1*)	40	2.00
11	Bitter gourd (Var. *Nakhar Special*)	84	16.80

Sl. No.	Crops and variety	No. of farm families	Area (in acres)
12	Ridge gourd (Var. Rama F1)	62	2.00
	Total	**223**	**25.40**
C.	**Vegetables (winter/*Rabi 2019*-20)**		
13	Pumpkin (var. *VNR 11*)	95	20.0
14	Tomato (var. *Rohit)*	15	4.0
15	Okra (var. *Radhika*)	20	6.0
16	Ridge gourd (var. *Rama*)	10	4.0
17	Bitter gourd (var. *Akash*)	10	3.0
18	Banana tissue culture (var. *Bantala*)	20	0.5
	Total	**170**	**37.5**

b) Relay vegetable cropping in trellis:

Before the project was implemented, it was observed that few farmers were growing one or two vegetables in trellis made of bamboo twigs in their backyard kitchen garden as a traditional practice. Therefore, efforts were made though the project to make the trellis more scientific and to grow 4-5 climber vegetables crops in relay. Accordingly, crop calendars were prepared and capacity of about fifty selected relay vegetable growers having suitable piece of lands was developed. The most acceptable relay sequence of climber vegetables was: 1. Bitter gourd (Feb.-May) 2. Cucumber (May-Aug.) 3. Cow pea (Aug.-Nov.) 4. Lab-lab bean/French bean (Nov-Feb.). With the same trellis structure four to five crops were harvested in a year. Before about one month of the first crop completed its harvesting cycle, seeds of second crop were sown by digging at the basal ridge. By the time the second crop started climbing the trellis, the first crop became dry and removed carefully without damaging the succeeding crop and the trellis structure. Alternate ridges and furrows were made for proper irrigation and drainage management.

c) Demonstrations on nutritional kitchen garden:

Before starting of the project, farmers and farmwomen were growing vegetables with their own saved seeds or available with fellow farmers or local vegetable seed shops. Therefore, farmwomen of the cluster were made aware about the nutritional values of various crops. Accordingly, over 150 farm women were trained and provided with nutritional vegetable seed kits as critical inputs, consisting of over ten types of vegetables, namely, tomato (*KSP 1306 Bahubali*), beans (*Shravani*), radish (*Palak Patta*), koshala (*Red Kanka*), coriander (*Royal Green*), pumpkin (*Rana BSS-749*), Amaranthus (*All Green*), cucumber (*Supriya*), French bean (*Harith*), and okra (*Amba*). Now, they have adopted the scientific practices of growing nutritional kitchen gardens at their home backyards.

d) Protected cultivation in poly house:

In order to meet the demand of fruit saplings and high value vegetable seedlings for the entire cluster, a poly house (16 m x 8 m) was constructed during 2018-19 in Satyabhamapur village under the project. Healthy vegetable seedlings were being grown in pot trays using coco peat for local distribution and for sale. In addition, training on raising grafted saplings of mango and guava was imparted. That helped the farmers in growing off season vegetables which led them to earn additional profits. The vegetables were grown under controlled environment throughout the year. That facility not only increased the productivity but also helped to produce superior quality vegetables. The diseases and pests were better controlled under the enclosed area. The fruit saplings were also produced and maintained in that controlled environment.

e) Introduction of hybrid fruits:

Based on the farmers' demand, hybrid fruit saplings of mango (var. *Amrapali, Dasheri, ArkaNilachal* and *Keshari*), papaya (var. *Red lady*) and tissue culture banana (var. *G-9*) were introduced in the cluster.

f) Capacity building:

Capacity building was an integral part for any innovative technology to get adopted and popularized. Accordingly, training and continuous technological backstopping on commercial vegetable production, trellis system and marketing were provided.

2.1.2.3 Salient achievements:

Yield attributing parameters, productivity, cost of cultivation and net return of six major vegetables namely, okra, brinjal, tomato, ridge gourd, bitter gourd and pumpkin were calculated as mentioned in Table based on data from field demonstration of vegetables in the cluster during 2018-19. The B:C ratio of brinjal was found to be the highest and as high as 4.87 closely followed by tomato (4.22) and pumpkin (3.36). Thus, among the vegetable crops, brinjal gave the maximum returns to the farmers. Yield of tomato had been recorded highest among vegetables with 56.27t/ha. The yield advantage of tomato had been highest after the technological interventions, which was around 204.16 % followed by brinjal, pumpkin and ridge gourd. The interventions had resulted in the increase in productivity of the major vegetable crops.

Table: Yield attributing parameters and economics of vegetables in the farmers' fields

Sl. No.	*Crops*	*Avg. wt. of fruits (g)*	*Avg. no. of fruits/ plant*	*Yield (t/ ha)*	*Cost of cultivation/ ha (in Rs.)*	*Total return/ ha (in Rs.)*	*B:C ratio*
1.	Okra	12.56	14.94	9.27	55000	103731	1.88
2.	Brinjal	99.82	19.00	51.80	85000	414478	4.87

Sl. No.	Crops	Avg. wt. of fruits (g)	Avg. no. of fruits/ plant	Yield (t/ ha)	Cost of cultivation/ ha (in Rs.)	Total return/ ha (in Rs.)	B:C ratio
3.	Tomato	69.31	36.56	56.27	80000	337663	4.22
4.	Ridge gourd	179.80	13.08	13.07	58000	156877	2.70
5.	Bitter gourd	87.50	17.69	08.53	47000	102323	2.17
6.	Pumpkin	3850.6	5.27	40.42	52000	174897	3.36

Distribution of seeds for vegetable production

Field monitoring and technological backstopping

A field view of brinjal demonstration

A field view of demonstration

Relay vegetable cropping in trellis

Nutritional kitchen gardening by farm women

Freshly harvested pumpkin ready for sale

Training programme on protected horticulture

Farmers visiting FFP poly house in adopted cluster

Fruit and vegetable saplings inside the poly house

Vegetable seedlings being grown using pot trays and coco peat inside the poly house

Young vegetable seedlings in pot trays

2.1.2.4 Number of farmers benefitted:

Under the horticulture-based module, over 200 farm families were targeted based on their land suitability, land holding, experiences and interest in vegetable farming and socio-economic conditions. Apart from imparting training and demonstrations in vegetable cultivation, about fifty farmers were made capable to grow 4-5 vegetables per

year from the same piece of land resulting in 4-5 times increase in their farm income over a single crop. Similarly, about another fifty vegetable farmers were also supplemented with growing fruit crops like mango, banana and papaya in their backyard. Over twenty farmers among them had converted their backyard to commercial fruit cultivation. They were made available with quality fruit sapling from government nurseries as well as grown in FFP poly house. Apart from 200 core vegetable beneficiaries, over 1000 other farmers and farm women of the cluster had been given training and technological backstopping. Indirect benefits were received by large number of farmers from nearby villages in terms of getting quality vegetable seedling from the FFP poly house on payment basis.

2.1.2.5 Impact in the village/ area/ district:

From more than 200 vegetable growers, commercial vegetable cultivation have been started by over 50 farm families in about 30-40 hectare land and relay cropping in trellis by another 50 farmers in about 16 hectare land. Adoption of relay vegetable cropping in trellis system using local materials like bamboo pegs and twigs helped to earn net profit of about Rs. 6.75 lakhs/ ha per annum to the families.

2.1.3 Livestock based modules

2.1.3.1 Name of villages:

Four villages i.e. Biswanathpur, Satyabhamapur, Laxminarayanpur and Ganeswarpur of Salipur Block, District-Cuttack, Odisha were covered under FFP programme.

2.1.3.2 Details of technological intervention provided:

Under the livestock-based modules, three major livelihood options were explored, namely, introduction of dual purpose improved backyard poultry farming, improved backyard duck farming and pond-based scientific freshwater aquaculture. Accordingly, about 70 landless, marginal or small land holders were identified for training and capacity building in poultry rearing, 30 for duck rearing and 20 pond owners for aquaculture production.

a) Introduction of dual purpose improved poultry breeds:

Training cum demonstration on scientific production of backyard poultry and duckery were conducted for mostly women members of the selected families for last three years. As critical inputs, chicks (strain *Vanaraja*), ducklings (strain *Khaki Campbell* and improved native breed), feeder, drinker, immunization, poultry feeds for initial 3 weeks vital period, multivitamins and need-based antibiotic medicines were provided to women members of the selected families.

Table: Critical inputs provided for backyard poultry and duckery production

Sl. No.	Technology	No. of Farm Families		Critical inputs provided
		2017-18	2018-19	
1.	Backyard poultry production	30	65	20 chicks (*Vanaraja*) per family with drinker, feeder, initial chick feed, vaccines etc.
2.	Improved duck farming	30	15	20 ducklings (*Khaki Campbell*/ improved native breed) per family with drinker, feeder, initial chick feed, vaccines etc.

b) Demonstrations on scientific management of freshwater aquaculture:

Although the cluster was having about 25 pond owners, mostly half to one acre size, but no one was advocating scientific fish production technologies at the time of project implementation. Therefore, training-cum-demonstrations on management of pond based freshwater aquaculture were conducted for the pond owners. They were made aware about the water quality parameters, cleanliness of pond, fish predators, stocking density, stocking ratio of various carps, artificial and natural feed management, fish health management, growth monitoring etc. As critical inputs, they were provided with fries, fingerlings of Indian major carps (IMC) namely rohu, catla and mrigal, floating feeds and plankton nets.

2.1.3.3 Salient achievements:

The economics of backyard poultry and duck rearing have been shown in the following.

a) Backyard poultry rearing-

Total expenditure = Cost of 20 chicks + cost of feed + cost of one feeder + cost of one drinker + cost of medicine

= Rs. (340 + 800 +140+ 100+ 25)/- = Rs. 1405/-

Total income = Sale of 257 eggs @ Rs. 10/- + Sale of 19 kg meet @140/- per kg

= Rs. (2570 + 2660)/- += Rs. 5230/-

Net return = Rs. (5230 – 1405)/- = Rs. 3825/-

B : C Ratio = 3.72

b) Duck rearing-

Total expenditure = Cost of 20 ducklings + cost of feed + cost of one feeder + cost of one drinker + cost of medicine

= Rs. (400 + 600 +140+ 130+ 15)/- = Rs. 1285/-

Total income = Sale of 260 eggs @ Rs. 7/- + Sale of 10 kg meet @100/- per kg

= Rs. (1820 + 1000)/- += Rs. 2820/-

Net return = Rs. (2820 – 1285)/- = Rs. 1535/-

B:C Ratio = 2.19

It was found that from backyard poultry, the gross return was around Rs. 5230/- from a batch of 20 birds and the benefit:cost ratio was observed to be 3.72 with net profit of about Rs. 3825/-. Similarly, in case of duck farming, it was evident that the gross return was around Rs. 2820/- from a batch of 20 birds and the benefit cost ratio was observed to be 2.19 with a net profit of about Rs. 1535/-. But, in subsequent years, that net profit increased as there was no investment cost towards drinkers and feeders. Leaving apart additional family income, the family members consumed protein rich eggs and meat and were less dependent on outside sources of protein.

Women participants during poultry and duckery training

Chicks and other input distribution to women beneficiaries

Adult folk of *'Vanaraja'* poultry strain

Rearing of duck by women farmer

One day old ducklings of *'Khaki Campbell'*

Adult *'Khaki Campbell'* ducks

Training on scientific fish farming for pond owners

Assessing pond water quality and presence of natural fish feed

Distribution of fish seeds to fish farmers

Stocking of fingerlings in ponds

2.1.3.4 Number of farmers benefitted:

So far as direct beneficiaries were concerned, 70 farm women were provided with poultry chicks, 30 with ducklings and 20 pond owners with fish fingerlings of rohu, catla and mrigal during three years of interventions. Most of those beneficiaries were also provided with chicks or ducklings or fish seeds in consecutive years looking at their performance and capacity to expand the poultry or duck or fish farming.

2.1.3.5 Impact in the village/ area/ district:

Looking at the success of the poultry farming, over twenty beneficiary families had procured chicks through project staff to expand their farming. They had constructed their poultry rearing units with own investment. Introduction and adoption of poultry strain '*Vanaraja*' and ducklings of '*Khaki Campbell*' in the cluster had been a boon to many marginal farmers having very less land holding as a sustainable livelihood option for their families. Excited by the income from '*Vanaraja*' egg and meat which fetched higher price than farm egg or broiler meat, about five local broiler farms of nearby villages were started keeping dual purpose '*Vanaraja*' strain. The duck farming has been

well adopted by 10-15 families in Biswanathpur village having concentration of some minority communities.

In case of freshwater fish farming, one of the young fish farmers has become an entrepreneur incubated through the project as the local 'fingerlings grower-cum-supplier', which has helped in commercialization of aquaculture production in the region. This young entrepreneur has become the source of inspiration for many villagers in the locality. In long run, this will help in generating local employment among youths.

2.1.4 Enterprise based modules:

2.1.4.1 Name of villages:

Four villages e.g. Biswanathpur, Satyabhamapur, Laxminarayanpur and Ganeswarpur of Salipur block, Cuttack district, Odisha were considered for FFP activities.

2.1.4.2 Details of technological intervention provided:

a) Introduction of paddy straw and oyster (Dhingiri) mushroom:

For promoting entrepreneurship and ensuring family nutritional security, interventions were done in mushroom production mostly targeted to educated rural youths and farm women. Intensive training-cum-demonstrations were conducted for over hundred such women and youths. As critical input to learn and start production, they were provided with spawn bottles, gram floor, polythene sheets etc. as critical inputs, details of which are given in the following table. Apart from family income, an analysis of nutritional benefits in case of oyster mushroom was also shown through the table mentioned later.

b) Introduction of vermicomposting (strain Eudriluseugeniae):

During the period, each farmer was provided with one ready-made vermicompost pit along with one earth worm strain *Eudriluseugeniae*@ one kg for creating awareness and for popularizing the practice of vermicompost preparation among the farmers in the targeted villages. It helped farmers towards organic agricultural production. The salient features of this interventions are given below.

2.1.4.3 Salient achievements:

The salient achievements about this enterprise i.e. introducing paddy straw and oyster (Dhingiri) mushroom and vermicomposting production in the adopted villages are shown below.

- ◊ The scientific knowledge of farmers regarding mushroom production and marketing had been strengthened through providing different capacity building training programmes
- ◊ Nutritional status of the farmers had been improved a lot through establishing and popularizing mushroom production units in the area.

- ◊ Mushroom cultivation generated additional income to the farmers and had been proved to be a profitable enterprise.
- ◊ Production and use of vermicompost had become the integral part of organic agricultural production in the locality.

Table: Details of technological input distribution for mushroom farming and vermi-composting during 2017-20

Sl. No.	*Enterprise*	*Major interventions*	*No. of targeted beneficiaries per year*	*Target achieved during the subsequent years*
1	Paddy straw mushroom	Spawn bottles @ 5 beds/ beneficiary	100	(50+100+150) 300
2	Oyster mushroom	Spawn bottles @ 5-10 beds/ beneficiary	100	(50+157) 207
3	Vermi-composting	Ready-made vermi-compost pits @ 1 each earth worm strain *Eudriluseugeniae* @ 1kg each	20	(25+15) 40

Table**:** Results of nutritional analysis of oyster mushroom production (N=500)

Sl. No.	*Production class per bed*	*No. of units*	*Avg yield (kg)*	*Avg no. of family members*	*Nutritional benefits per person*							
					Avg. yield per member	*Water (g)*	*Calorie (kcal)*	*Protein (g)*	*Fat (g)*	*Fiber (g)*	*Iron (mg)*	*Calcium (mg)*
1	≥ 1 kg/ bed	151	0.912	5	0.182	161.97	78.43	6.02	0.73	4.20	2.37	5.47
2	1-2 kg/ bed	191	1.862	4	0.466	413.36	200.17	15.36	1.86	10.71	6.05	13.97
3	More than 2 kg/ bed	158	2.883	5	0.577	512.02	247.94	19.03	2.31	13.26	7.50	17.30

Participants in a mushroom training

Demonstration on paddy straw mushroom

Paddy straw mushroom by a beneficiary woman

Oyster mushroom by a beneficiary woman

Low cost mushroom production unit of an incubated farmer entrepreneur

Vermi-compost units by a beneficiary farmer

2.1.4.4 Number of farmers benefitted:

A total of 120 farmers comprising of 100 farmers for mushroom and 20 farmers for vermicomposting got direct benefit from the programme.

2.1.4.5 Impact in the village/ area/ district:

Among more than hundred trained beneficiaries, four young entrepreneurs were incubated and promoted the mass production and marketing of oyster mushroom as well as paddy straw mushroom. They have become commercial producers-cum-suppliers of mushroom in the area. They have developed their own low-cost production unit with 400-500 beds each using low- cost shade nets. In case of vermicomposting, the adopted farmers are using the harvested vermicompost in their kitchen gardens and selling the surplus quantity @ Rs. 10-15 per kg in local market and supporting their livelihood. In addition, they are also rearing the worms and selling the same.

2.2 ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

During three consecutive years since 2017-18, ICAR-CIFA, Bhubaneswar was able to cover 396 farm families and beneficiaries each. In the year 2017-18, 2018-19 and 2019-20, the total numbers of beneficiaries were 710, 619 and 581, respectively.

2.2.1 Crop based modules

2.2.1.1 Name of villages:

The name of selected villages were Jagannathpur under Balianta Block, Dorbanga under Balipatna Block, KantiaTalasahi and Kantia Upersahi under Jatani Block of Khurda district, Odisha.

2.2.1.2 Details of technological intervention provided:

a) Integrated nutrient management (INM) in paddy:

Integrated Nutrient management in paddy was demonstrated in four adopted villages. The following practices were carried out to reduce the use of chemical fertilizer under Integrated Nutrient Management (INM).

- Application of Zinc Sulphate @ 25 kg/ha and FYM @ 12.5 t/ ha.
- Green manuring with Dhaincha (25 kg seed/ ha)
- Recommended dose of fertilizer (N:P:K) - 80:40:40
- Introduction of Leaf Colour Chart (LCC) developed by ICAR-NRRI, Cuttack for efficient nitrogen management in paddy.
- Emphasis was given on seed treatment with fungicides (Thiram 42% @ 3 g/ kg seed) to reduce the yield loss and to reduce the use of chemical weedicides, Cono-weeder was demonstrated.

b) Introducing pulse var. TARM 1 in rice fallow:

Most of the areas used to lie as fallow after harvesting of paddy in the villages. The soil moisture was not used properly for a second crop. So, the field was unused for most of the time due to less irrigation availability. Green gram was demonstrated in rice fallow to utilize the available soil moisture after harvesting of rice. Training and demonstrations were provided to the selected farmers on seed dressing and inoculation to maintain better seed health, higher germination and growth.

Seeds were treated with seed dressing fungicides like Carbendazim 0.2% along with

Mancozeb 0.3% to control seed borne diseases such as damping off of seedling, seedling blight and wilting. The fertilizer dose given per hectare was 12.5 kg N, 25 kg P_2O_5 and 12.5 kg K_2O before sowing. Chlorpyrifos @ 2.5 ml/litre water was also sprayed to control flea beetles. Before planting, green gram seeds were inoculated with *Rhizobium*, *Phosphobactor* and *Trichoderma* @ 250gm each/10 kg of seed. Seed dressing was done with Gaucho (Imidaclorpid) @ 1.5 ml/kg of seed. A powdery mildew resistant variety (*TARM 1*) was demonstrated for the year 2017-18. The *IPM-02-03* cultivar was demonstrated during the year 2018-19 which is resistant to yellow vein mosaic virus (YMV). The certified seeds were procured from Odisha State Seed Corporation.

2.2.1.3 Salient achievements:

The comparative yields of paddy var. *Pooja* and *Swarna Sub 1* under traditional practice and using INM technologies have shown in the following table. The respective yield gain was recorded to be 12.5 and 20% while adopting nutrient management practices. The *TARM 1* cultivar of a green gram in rice fallow was demonstrated and an average yield of 6.25 q/ ha was recorded in demonstration plots (B:C ratio was 1.82).

Sl. No.	*Year*	*Area of intervention*	*Yield (t/ ha)*		*Gain in yield (%)*
			Farmers' practice	*INM technology*	
1	2018-19	Integrated nutrient management in paddy var. *Pooja*	4.0	4.5	12.5
2		Integrated nutrient management in paddy var. *Swarna Sub 1*	4.0	4.8	20
3	2017-18	Introduction of pulse var. *TARM 1* in rice fallow	3.75	6.25	66.6
4	2018-19	Introduction of pulse var. *IPM-02-03* in rice fallow	3.75	6.00	62.5

Transplanted paddy field

Grain filling Stage

Maturity Stage

Harvesting

Harvesting of green gram

Green gram var. *TARM 1*

Green gram var. *IPM-02-03*

2.2.1.4 Number of farmers benefitted:

Considering the integrated nutrient management in paddy, during three consecutive years the total number of farmers benefitted was 319 and total area covered was 122 ha. On the other hand, introduction of pulses varieties *TARM 1* and *IPM-02-03* in rice fallow land was concerned, 523 farmers were benefitted and 90.2 ha was covered with pulse crops in fallow land. The details of beneficiaries and area covered in different years have been presented in the following table.

Area of intervention	*Year*	*No. of beneficiaries*	*Total area (ha)*
Integrated nutrient management (INM)	2017-18	227	90.8
	2018-19	38	9.6
	2019-20	54	21.6
	Total	**319**	**122**
Introduction of pulse var. *TARM 1* and *IPM-02-03*	2017-18	197	31.8
	2018-19	156	20.0
	2019-20	170	38.4
	Total	**523**	**90.2**

2.2.2 Horticulture based modules

2.2.2.1 Name of villages:

The names of selected villages for intervention in bitter guard were Jagannathpur under Balianta Block, Dorbanga under Balipatna Block, Kantia Talasahi and Kantia Upersahi under Jatani Block of Khurda district, Odisha. The selected villages for interventions in cauliflower and French bean were Jagannathpur under Balianta Block and Dorbanga under Balipatna Block of Khurda district, Odisha.

2.2.2.2 Details of technological intervention provided:

i) Introduction of improved variety of bitter gourd:

An improved variety (*VNR 28*) was demonstrated in 2.5 ha area in the adopted villages during the year 2018-19. Special focus was given on seed treatment to avoid any disease and disorder. The recommended dose of fertilizer to be applied per hectare was 60 kg N, 50 kg P_2O_5 and 40 kg 25 K_2O. The half of N and entire P & K were applied before planting. The balance N was given at the time of flowering for better fruit set. A distance of 120 cm was maintained between the rows and 90 cm between the plants. First harvesting started after 50-60 days of planting. Further pickings were done at an interval of 2-3 days as bitter gourd fruits mature very fast and turn red.

Bitter gourd var. *VNR 28*

Trellis system of bitter gourd cultivation

b) Introduction of late variety of cauliflower var. 'Fujiyama':

Early variety of cauliflower was transplanted in the main field during October and available for market during December to January while the late variety transplanted in December and harvested during March. Due to availability in the off season, farmers got a better price for that. Late variety of cauliflower var. *Fujiyama* was demonstrated in the adopted villages. Seed rate of 375 g/ ha was recommended to the beneficiaries. Thirty days old seedlings were transplanted in the main field at a spacing of 45 cm. Fifty kg N, 100 kg P and 50 kg K as basal and 50 kg N after 45 days were applied as RDF per hectare of land. Gap filling was done after 20 days of planting to maintain the population and uniform growth. Hoeing and weeding were done on 30th and 45th day of planting. Irrigation was given at weekly interval. To prevent diamond back moth, Cartap hydrochloride @ 1 g/ lit was sprayed as insecticides. To prevent from club root disease, seedlings were dipped in Carbendazim solution 2 g/l for 20 minutes. To control leaf spot and leaf blight, Mancozeb was sprayed @ 2 g/ lit. Blanching was done to get a pure white perfect curd of flower.

Cauliflower (var. *Fujiyama*) at curd formation stage

Cauliflower var. *'Fujiyama'*

c) Introduction of bush type French bean var. 'Falguni':

Bush type French bean var. *'Falguni'* was demonstrated due to strong and bushy nature. Seed rate was 50 kg/ ha. The seeds were treated with Carbendazim @ 2 g/kg of seed 24 hours before sowing to control fungal diseases and then sown in the sides of the ridges at a spacing of 45 cm × 30 cm. Irrigation was done immediately after sowing and again on third day and thereafter, once in a week. The crop was earthed up after each weeding. First picking was started after 40 days of sowing.

Pod filling stage of French bean var. *'Falguni'*

Demonstration plot of French bean var. *'Falguni'*

2.2.2.3 Salient achievements:

The following are the salient features of adopting new varieties of vegetable crops in the selected villages which were suggested for the farmers during FFP programme.

- The average yield of bitter guard var. *VNR 28* obtained from the demonstrated plots was recorded as 8 t/ ha. The yield was 51% higher than other traditional varieties. Though the size of bitter guard was small, that was very popular among the farmers.
- An average yield of cauliflower var. *'Fujiyama'* was 17 t/ ha comprising the yield advantage of about 31% in the demonstrated plots against other varieties. *Fujiyama* as a late variety was harvested during off-season. As a consequence, it provided higher income than other varieties.
- Bush type French bean var. *'Falguni'* was demonstrated because of its strong and bushy nature. An average yield of 8 t/ ha of green pods in 75-85 days was obtained (B:C ratio was 1.91).

Technology intervention	*Yield (t/ ha)*		*Gain in yield (%)*
	Farmers' practice	*Recommended practice*	
Introduction of improved bitter gourd var. *VNR 28*	5.3	8.0	51
Introduction of cauliflower var. *Fujiyama*	13	17	30.7

2.2.2.4 Number of farmers benefitted:

The number of farmers benefitted during various year has been shown as under.

Technology intervention	*2018-19*	*2019-20*
Introduction of improved bitter gourd var. *VNR 28*	20	Nil
Introduction of cauliflower var. *Fujiyama*	19	25
Introduction of bush type French bean var. *Falguni*	10	28

2.2.3 Livestock based modules

2.2.3.1 Name of villages:

The name of selected villages were Jagannathpur under Balianta Block, Dorbanga under Balipatna Block, KantiaTalasahi and Kantia Upersahi under Jatani Block of Khurda district, Odisha.

2.2.3.2 Details of technological intervention provided:

a) Introduction of backyard poultry strains (Kaveri/ Vanaraja):

As Farmer FIRST project operated in a whole village adoption concept, the landless and women were covered under backyard poultry rearing. Women SHGs were provided with training on backyard poultry. *'Vanaraja'/'Kaveri'* strains as a dual purpose birds were taken up. Brooding of one day old chicks and vaccination were done by the SHG members. Lassota vaccine was given to 7 and 21 days old chicks for administration to healthy chickens as an aid in the prevention of Newcastle disease. Gumboro vaccine was given to 14 and 28 days old chicks against Infectious Bursal Disease (IBD) in chickens. Those vaccinations were given to the chicks by drinking water administration or by aerosol spray. Pre-starter, starter and finisher feeds were provided for better growth and to enhance the egg production.

Landless women with poultry bird

Poultry as a component of IFS

2.2.3.3 Salient findings:

Backyard poultry strains viz. *'Kaveri'* and *'Vanaraja'* were demonstrated in the adopted villages. Landless and SC/ST women got benefitted from that. By rearing those strains, the farmers got 1.79 times higher income than the local breeds/ strains reared.

2.2.3.4 Number of farmers benefitted:

The details about number of farmers benefitted during three consecutive years are presented as under.

Technology intervention	No. of farmers benefitted		
	2017-18	2018-19	2019-20
Popularizing backyard poultry strains like *'Kaveri'/'Vanaraja'*	154	107	Nil

2.2.4 Aquaculture based modules

2.2.4.1 Name of villages:

The name of selected villages for scientific carp culture and introduction of minor carp in backyard ponds were Jagannathpur under Balianta Block, Dorbanga under Balipatna Block, KantiaTalasahi and Kantia Upersahi under Jatani Block of Khurda district, Odisha. In addition, Integrated Farming System was adopted in Jagannathpur under Balianta Block, Dorbanga under Balipatna Block and Kantia Upersahi under Jatani Block of Khurda district, Odisha.

2.2.4.2 Details of technological intervention provided:

a) Scientific carp culture:

Indian major carps in the ratio 1:2:1 (Catla: Rohu: Mrigal) with a stocking density of 6000 fingerlings/ha was stocked in the community ponds of the villages. Pond preparation, de-weeding of pond, fertilizer application etc. were carried out before stocking to maintain the water quality. Pond preparation including liming and weed removal were done by the members. Supplementary feeding using floating feed (26% protein) @ 2% of biomass was provided. Feed was applied through broadcasting method. Periodic measurement of water pH and other hydro-biological parameters were carried out and appropriate corrective measures recommended. Periodic sampling using cast net was done to check the health status of the fish.

Haul of Indian Major Carps

Application of potassium permanganate as disinfectant

Sampling in presence of Dr. V. P. Chahal, ADG (Ag. Extension), New Delhi

Harvesting from community pond of Jagannathpur, Balianta block

b) Introduction of minor carp in backyard ponds:

Puntius gonionotus was introduced to backyard ponds in combination with other major carp species. These are mainly column feeder and very much compatible with Indian major Carps. It can be cultured together with the same feed and pond management

Introduction of minor carps in composition with IMC in the backyard ponds

protocol as that for major carps. The backyard ponds used to hold water for only 6-7 months, so that species were introduced to maximize biomass production. Liming and pre-stocking water management was practiced. Bigger size fingerlings were stocked and supplementary feeding with floating feed (26% protein) @ 2% of biomass was provided.

c) Integrated farming systems:

Four beneficiaries were selected for IFS module. Technological supports were provided for horticultural and aquaculture interventions. Fruit plants like mango, guava, rose apple, bael etc. were planted along with different seasonal vegetables like bitter gourd, cauliflower and French bean as critical inputs. Those farms were also provided with

fish seeds of major carp and minor carps for rearing up-to fingerling size. After selling the seeds, the pond was utilized for grow out culture for rest of the seasons. Fish seed production was demonstrated in 3 IFSs along with poultry, dairy and horticultural crops. The details of farmers and their enterprises are shown in the table.

Farm I	Farm II
Name of the farmer: Sh. Gadadhar Pradhan ***Total area:*** 1 ha ***Pond area:*** 0.15 ha ***Enterprise combination:*** Fish seed rearing + fish grow out culture + poultry + plantation (mango, coconut, bael, betelvine & papaya) + dairy + goatery	***Name of the farmer:*** Sh. Bishnu Charan Jena ***Total area:*** 1.2 ha ***Pond area:*** 0.32 ha ***Enterprise combination:*** Fish seed rearing + fish grow out culture + poultry + plantation (mango, coconut, guava and rose apple) + vegetables (Cauliflower, bitter gourd, french bean and leafy vegetables) + dairy
Farm III	**Farm IV**
Name of the farmer: Sh. Hata Kishore Swain ***Total area:*** 1.5 ha ***Pond area:*** 0.6 ha ***Enterprise combination:*** Fish seed rearing + fish grow out culture + poultry + plantation (mango, coconut, guava, bael and papaya) + vegetables (Cauliflower, french bean and brinjal) + dairy + vermi composting	***Name of the farmer:*** Sh. Debaraj Pradhan ***Total area:*** 1 ha ***Enterprise combination:*** Plantation (mango, coconut, guava and banana) + vegetables (bottle gourd, bitter gourd, french bean, pointed gourd, leafy vegetables and colocasia) + dairy + vermi composting

2.2.4.3 Salient achievements:

The comparative production of fishes under traditional practice and recommended practice has been shown in the following table. Composite fish farming was practiced in 6 community ponds with an average yield of 3.0 t/ha per year. The fish yield increased by 87.5% compared to pre-adoption period. As a result, per capita consumption of fish was doubled in the adopted villages.

Technology	Yield (t/ha)		Gain in yield (%)
	Farmers' practice	Recommended practice	
Scientific carp culture	1.6	3.0	87.5

Introducing minor carp in backyard ponds provided intermittent income to the farmers through species diversification, maximizing biomass production and thereby giving consumers a better choice. Combination of major and minor carps in those ponds gave 30% higher yield as compared to major carp group alone. The details of yield benefits are given below.

Technology	Yield (t/ ha)		Gain in yield (%)
	Farmers' practice	Recommended practice	
Introduction of minor carp in backyard ponds	1.6	2.08	30

Integrated farming systems were in the process of being established and the enterprises were in different stages. Final data regarding yields and profit with respect to few enterprises were still awaited which might take approximately one more year. However, the income from some of the components (already received) showed that definitely there would be more profit from the IFS based aquaculture adopted by farmers during FFP programme.

2.2.4.4 Number of farmers benefitted:

The year-wise benefitted farmers and total area covered under aquaculture are given below.

Technology intervention	Year	No. of beneficiaries	Total area (ha)
Scientific carp culture	2017-18	121	5.33
	2018-19	280	6.5
	2019-20	280	6.5
Introduction of minor carp in backyard ponds	2017-18	11	0.24
	2018-19	15	0.41
Fish based integrated farming system	2018-19	3	3
	2019-20	3	3
Integrated farming system	2018-19	1	1
	2019-20	1	1

2.3 ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar

2.3.1 NRM based modules

In the year 2017-18, ICAR-IIWM covered a total of 204 farm families comprised of a total of 279 beneficiaries. During 2018-19 and 2019-2020, the respective number of total farm families and total number of beneficiaries were 265 *vs.* 357 and 327 *vs.* 484.

2.3.1.1 Name of villages:

Three villages viz. Khuntapingu, Jamuda and Malarpada under Saharapada block of Keonjhar district, Odisha were considered for conducting various activities of Farmer FIRST Programme under ICAR-IIWM, Bhubaneswar.

2.3.1.2 Details of technological interventions provided:

The following technological interventions on NRM based module were adopted in the operational villages.

a) *Water budgeting for the project villages*

b) *Consumptive water use of the water harvesting structures developed using pumpset and conveyance pipes*

c) *Sprinkler based micro irrigation*

d) *Straw and polythene mulching for water conservation*

2.3.1.3 Salient achievements:

Water budgeting of the project area was done by estimating total water input and output in the system. Availability of surface and ground water was done by periodical monitoring of water bodies and dug wells. Water budgeting and crop planning were done according to the water availability. Water harvesting structures developed by watershed department and other schemes of state government were targeted to ensure optimum utilization of harvested water for fishery and vegetable cultivation as income enhancement measures. Fifteen sprinkler sets were distributed in three villages to those farmers who had bore well and were cultivating vegetables under the project. Straw mulching was promoted in 2017-18 and problem of termite was faced in straw mulching. Hence in 2018-19 and 2019-20, polythene mulching was distributed to the farmers for conserving moisture in fields and for reducing frequency of irrigation and thus, saved water, time, energy and labour.

Water harvesting pond

Water level monitoring for water budgeting

Mulching in vegetable production

Farmers' training at Mallarpada

Farmers' training on drip irrigation

Farmers' training at Khuntapingu

Distribution of irrigation implements

2.3.1.4 Number of farmers benefited:

Five hundred farmers in three villages were benefitted from the water harvesting, water budgeting, consumptive water use, pump, sprinkler irrigation, mulching etc.

2.3.1.5 Impact in the village/area/district:

Thirty two acres of land covered under SRI during *Rabi* season of 2018-19 and 60 acres during *Kharif* of 2019-20. More than 20 ha of paddy-fallow in three villages was brought into vegetable cultivation during post *Kharif* season.

2.3.2 Crop based modules

2.3.2.1 Name of villages:

Khuntapingu, Jamuda and Malarpada village under Saharapada block, Keonjhar district, Odisha were selected for conducting various activities relating to crops based module under Farmer FIRST Programme.

2.3.2.2 Details of technological interventions provided:

The following technological interventions on crops based module were done in three villages.

a) ***Introduction of line transplanting in hybrid rice, mechanical weeding, single young seedling, alternate wetting and drying***

b) ***Provision of assured irrigation through harvested rain water***

c) ***Scientific fertilizer application***

d) ***Mechanizing agricultural farm operations***

- ✦ Introduction of kerosine run pump for irrigation
- ✦ Introduction of power thresher- cum- fan type winnower
- ✦ Introduction of cono-weeder

2.3.2.3 Salient achievements:

The achievements under crop based module have been shown below.

- ❖ Line transplanting was introduced in hybrid rice in project adopted villages. Ten cono-weeders were distributed among the selected farmers for mechanical weeding. Application of FYM and alternate wetting/ drying were advised to them. They were also recommended for soil test based fertilizer application. Three centrifugal pumps were provided for ensuring irrigation during monsoon failure to provide supplemental irrigation.

Line sowing

Demonstration of cono-weeder application

Demonstration on vegetable cultivation

Visit of scientists to farmers' fields

- During 2018-19, one field training was organized for the selected farmers in Mallarpada village. They were motivated to repair one defunct lift irrigation point. A group of 42 farmers were encouraged for vegetable production in 37 acres of rice-fallow land during *Zaid* 2019.
- Three kerosin run pumps of 3.5 hp capacity were given to the selected farmers along with flexi pipes for irrigation. The pumps were used by farmer groups for vegetable cultivation in all three villages.

Distribution of threshers

Distribution of conoweeder

Distribution of pump and pipe

2.3.2.4 Number of farmers benefited:

During the period of 2017-2020, more than 160 farmers were benefitted from adopting above crop module in the selected villages. Sixty farmers in three villages used their pump for vegetable cultivation. Some of them also used pumps for supplemental irrigation in up land paddy.

2.3.2.5 Impact in the village/area/district:

During 2017-19, farmers were demonstrated with improved production methods in 10 ha area. Line sowing was adopted by the farmers in 24 ha of land during 2019-20. The SRI method was adopted by 64 farmers in 32 acres of land in Malarpada village.

Two groups of unemployed youths and one group of farmers in Malarpada started vegetable cultivation in leased lands from other farmers. Since the members of those groups were landless, it could be taken as an example of creating situation for bringing people back to agriculture at a time when people were leaving agriculture as occupation. In Jamuda village, one group of farmers used the pumpset to start cultivation of vegetables and sweet corn near the perennial stream of their village. In Khuntapingu, the pumpset was predominantly used by tribal households, belonging to the BPL group. Hence, it provided livelihood support to poorest farmers of the village.

2.3.3 Horticulture based modules

2.3.3.1 Name of villages:

Three villages i.e. Khuntapingu, Jamuda and Malarpada under Saharapada block of Keonjhar district were considered for conducting various activities of crops based module.

2.3.3.2 Details of technological interventions provided:

The following technological interventions on crops based module were done in three villages.

a) *Introduction of vegetable cultivation*
b) *Introduction of tuber crop cultivation*
c) *Introduction of tissue culture banana and pineapple cultivation*
d) *Introduction of radish, okra and Amaranthus in kitchen garden*
e) *Introduction of pheromone trap and sticky trap for vegetable cultivation*

Visit to ICAR-CHES and ICAR-CTCRI in Bhubaneswar motivated the farmers towards cultivating vegetables, pineapple, tissue culture banana, yam and tapioca. The focus of training was on micro irrigation through drip and sprinklers. That training motivated farmers to adopt sprinkler based irrigation for saving water.

2.3.3.3 Salient achievements:

The achievements of introducing various horticultural crops in the selected villages have been described as under.

- During 2017-18, vegetable cultivation was started in the project villages with 10000 seedlings of brinjal (var. *Mahi green*). During 2018-19, brinjal (20000), tomato (10000) and chilli (5000) seedlings distributed among the interested farmers for cultivation. A total of two hundred farmers in three villages were benefitted. Again, during 2019-20, a substantial number of seedlings viz. brinjal (20000 seedlings), tomato (7000 seedlings), chilli (3000 seedlings), cauliflower (2500 seedlings), cabbage (2500 seedlings) and capcicum (1000 seedlings) were distributed among other selected farmers. Polythene mulching was provided for moisture conservation. A total of 204 farmers were provided with vegetable seedlings.
- Planting materials of tapioca (2000 seedlings) and yam (200 kg) were distributed to 103 farmers in three villages during 2018-19. Average yield of tapioca per plant was recorded to be 5.6 kg with maximum weight of 8.3 kg, whereas, the average weight of yam per plant was 3.8 kg with maximum weight of 12.8 kg. Wide variation in yield was due to the difference in FYM and water application.
- Tissue culture banana of var. *G9* (1000 saplings) and var. *Bantala* (500 saplings), and suckers of pineapple var. *queen* (600 seedlings) were distributed among the selected farmers for introducing horticultural crops.
- Raddish, Amaranthus and okra were also distributed to women farmers to encourage kitchen gardening. It was aimed at making people aware about scope of kitchen gardening for improving family nutritional status. The produce was also used for domestic consumption.

Vegetable Seedling distribution programme

Director, ICAR- IIWM visited farmer fields

Vegetable cultivation in field of Mrs. Mina Mohanta

- The farmers, cultivating vegetables, were distributed with pheromone traps (along with lure) and yellow sticky traps for installing in the vegetable fields during the year 2018-20 to trap flies and insects. That increased awareness among people for using non-chemical means to control different pests.

Demonstration of insects trapped in Pheromone trap in farmer field

Demonstration of insects trapped in yellow sticky trap in farmer field

2.3.3.4 Number of farmers benefited:

More than 200 farmers were benefitted from vegetable cultivation, 103 farmers from tuber crop cultivation and 202 farmers including women farmers were benefitted from kitchen gardening. Two groups of unemployed landless youth from Malarpada, one

group of farmers each from Khuntapingu, Malarpada and Jamuda started vegetable cultivation in groups on the leased paddy-fallow land from other farmers. About 140 farmers were benefitted from using non-chemical pheromone traps in their fields.

2.3.3.5 Impact in the village/area/district:

More than 20 ha of land was brought under vegetable cultivation during *Rabi* season, of which about 5 ha of brinjal field was extended till mid of *Zaid* season (till mid-April). By introducing those vegetable crops cultivation in rice fallow the income of the farmers was increased near to double than earlier. Pheromone traps and sticky trap had become very popular in the selected villages. More than 50 other farmers from the adopted villagesand nearby villages had already adopted that technology to control pest.

2.3.4 Fishery based modules

2.3.4.1 Name of villages:

Fishery based module was also applied in the three adopted Farmer FIRST villages i.e. Khuntapingu, Jamuda and Malarpada, Saharapada block, Keonjhar district, Odisha.

2.3.4.2 Details of technological interventions provided:

The following technological interventions on fishery based module were done.

a) Scientific fish farming through introducing Indian Major Carps (IMC)-

Three farmer groups of 10 farmers in each group were formed from three selected villages. The each group was given responsibility of fish production in their pond. Farmers of Khuntapingu village were provided with 1500 fingerlings whereas Malarpada village supplied with 3600 fingerlings and Jamuda village with 1700 fingerlings. The species composition was catla (30%), rohu (30%), mrigal + common carp (30%) and grass carp (10%). The technical know-how was given to all the farmers through conducting training programmes for scientific fish production. Fish feed was also given as one of inputs. After one year, larger size fishes (1.4-1.6 kg) were harvested for market and smaller size fishes were left in the pond for further growth.

2.3.4.3 Salient achievements:

The economic feasibility of introducing IMC in the ponds has given in the following table.

Name of village	*Pond area (m^3)*	*No. of Indian Major Carp fingerlings in the pond*	*Yield (kg) after one year (size- 1.4 to 1.6 kg)*	*Gross income (in Rs.)*
Malarpada	22200	3600	1230	246000
Khuntapingu	3900	1500	570	114000
Jamuda	5100	1700	688	137600
Total	***31200***	***6800***	***2488***	***497600***

Harvesting of fishes

2.3.4.4 Number of farmers benefited:

During 2018-20, a total of 30 farmers from three villages were actively involved in scientific fish production. Through introducing Indian Major Carps in 3 ha (approx.) pond, the annual earning was around Rs. 5 lakh from selling of 25 quintal fishes. The farmers of Mallarpada village started a corpus fund of Rs. 1.5 lakh from their fish farming.

2.3.4.5 Impact in the village/area/district:

The group of farmers started fish farming in one more community pond. In other two villages, several farmers have started fish farming in their own farm pond.

Release of fish fingerlings to pond

Harvesting of fishes

2.3.5 Enterprise based modules

2.3.5.1 Name of villages:

Three villages i.e. Khuntapingu, Jamuda and Malarpada ofSaharapada block, Keonjhar district, Odisha were included for conducting various activities ofenterprise based module.

2.3.4.5.2 Details of technological interventions provided:

a) Introducing mushroom production

Farmers and farm women from Khuntapingu, Mallarpada and Jamuda were given trainings and demonstrations for scientific Dhingri mushroom production utilizing locally available materials/ inputs. They were also guided to get mushroom spawn to initiate that enterprise.

2.3.5.3 Salient achievements:

After trainings and demonstrations, trained farmers procured mushroom spawn from the local resources and started dhingri mushroom production. Most of the farmers used mushroom for their domestic consumption at the initial stage except Mrs. Ranjita Mohanta and Mr. Jugal Mohanta from Khuntapingu village who started marketing of mushroom. Mrs. Ranjita Mohanta sold 24 kg of Dhingiri mushroom @ Rs.100.00 per kg. Likewise, Mr. Jugal Mohanta also earned Rs. 70000/- during 2018-19 from mushroom production.

2.3.5.4 Number of farmers benefited:

A total of 30 farmers from the three selected villages had been able to start mushroom production

2.3.5.5 Impact in the village/area/district:

Mushroom production in the adopted villages had become supplementary source of livelihood income with minimal investment. Out of 30 farmers, 5 farmers had already started commercial mushroom production. With the passage of time, about 20 other farmers from the same villages and surrounding villages started mushroom production.

Mr. Lambodar Nayak engaged in dhingri mushroom

Training onmushroom productionfarmer field

2.4 Odisha University of Agriculture and Technology (OUAT), Bhubaneswar

Total numbers of farm families and beneficiaries covered by OUAT, Bhubaneswar during 2017-18 and 2018-19 were 450 and 1760, and 471 and 2079, respectively. The respective numbers of families and beneficiaries were 490 and 2150 during 2019-20.

2.4.1 Crop based modules

2.4.1.1 Name of villages:

Four villages viz. Gobindapur, Gopalpur, Brahmapura and Brahmapurapatna under Begunia block of Khurda district, Odisha were considered for conducting various activities of Farmer FIRST Programme.

2.4.1.2 Details of technological interventions provided:

The following technological interventions on field crops based module were applied in the operational villages.

Module	*Technological interventions*	*Area covered (ha)*	*Number of households covered*
Field crops based module	Varietal substitution in rice var. *'Prateekhya'* to facilitate greengram in rice fallow	20	50
	Adoption of short grained aromatic rice variety cv. *'Nua Kalajira'*	0.8	2
	Introducing high yielding rice varieties like *'Upahar'* under rice-fallow system	30	100
	Introducing aromatic rice var. *'Geetanjali'*	2.5	14
	Introducing green gram var. *'IPM 02-14'* in rice-fallows	20	75
	Introducing greengram var. *'IPM 02-14'* other than rice fallows	20	50
	Introducing high yielding rice variety cv. *'Mrunalini'* under rice-fallow system	40	170
	Introducing rice var. *'Swarna Sub-1'*	50	216
	Total	***183.3***	***677***

2.4.1.3 Salient achievements:

The salient achievements of Farmer FIRST Programme during the period 2017-2020 in Khurda district under OUAT, Bhubaneswar, Odisha have been discussed under the following points.

- Demonstrations were done on rice cv. '*Prateekhya*' in an area of 20 ha involving 50 households. The variety gave average grain yield of 5.2 t/ha with net return of Rs. 29600/- per ha as against the yield of 4 t/ha with net return of 24700/- per ha for cultivated by the farmers under medium land condition. It replaced the existing varieties e.g. '*Mayurkantha*', '*Lalat' etc.*
- Aromatic rice cv. '*Nua Kalajira*' was introduced in an area of 0.8 ha in 2 households. The variety gave average grain yield of 3.2 t/ ha and net return of Rs. 37000/- per ha to the farmers.
- In the year 2018-19, demonstrations of rice cv. '*Swarna Sub-1*' were conducted in 30 ha area involving 136 households. The '*Swarna Sub-1*' variety had average grain yield of 4.27 t/ha against the yield of 3.84 t/ha from the existing variety '*Swarna*' in the region. The farmers got net return of Rs. 27550/- per ha from the new variety '*Swarna Sub-1*' whereas the net profit was recorded to be Rs.21600/- per ha for existing variety '*Swarna*' under medium land conditions. During the year 2019-20, it was adopted by 80 farmers in 20 ha area.
- Another new variety of rice i.e. '*Upahar*' was introduced and demonstrated in the selected villages. A total area of 30 ha was covered involving 100 households. Farmers got average grain yield of 4.03 t/ha from '*Upahar*' variety against the average yield of 2.0 t/ha from the existing variety-'*Mayarkantha*'. Thus, net return was calculated as Rs. 24250/- and Rs. 5000/- per ha from new and existing variety, respectively.
- Demonstrations were also done on aromatic rice cv. *Geetanjali* in an area of 2.5 ha in 14 households. The variety had average grain yield of 2.91 t/ha and net return of Rs. 23200/- .
- For enhancing yields of green gram, YMV resistant greengram cv. '*IPM 02-14*' was selected and demonstrated for the farmers in 20 ha area involving 75 households in rice fallows under rain-fed conditions. The average grain yield of that variety was 360 kg/ha and the net return was Rs. 6400/- per ha. It replaced the local '*Nayagarh*' variety.
- In the year 2019-20, high yielding rice variety cv. '*Mrunalini*' was introduced in 40 ha area for 170 farmers under rice-fallow system.

2.4.1.4 Number of farmers benefited:

During the year 2017-2020, the details of farmers benefitted from introducing different new varieties of rice and green gram have been shown in the following table.

Module	Technological interventions	Number of households covered		
		2017-18	2018-19	2019-20
Field crops based module	Varietal substitution in rice to facilitate greengram in rice fallow cv. *'Prateekhya'*	50	-	-
	Adoption ofshort grained aromatic rice cv. *'Nua Kalajira'*	2	-	-
	Introducing greengram var. *'IPM 02-14'*	50	75	
	Introducing rice var. *'Swarna Sub-1'*	-	136	80
	Introducing rice var. *'Upahar'*	-	100	-
	Introducing aromatic rice var. *'Geetanjali'*	-	14	-
	Introducing high yielding rice variety cv. *'Mrunalini'* under rice-fallow system	-	-	170

2.4.1.5 Impact in the village/area/district:

During past three years of FFP, demonstrations on improved rice varieties were done in an area of 183.3 ha involving 677 farmers in the selected villages. Other farmers within the selected villages as well as in surrounding villages were very much influenced with the performance of those new rice varieties. As a result, 40 more farmers had already collected seed materials from the adopted farmers and raised the nursery in an area of 20 ha.

Nursery bed preparation in rice

Transplanting of Seedlings

Line transplanting of in rice

Local practice of Beushaning

Demonstration on use of power weeder

Demonstration on rice cv. *Mrinalini*

2.4.2 Horticulture based module

2.4.2.1 Details of villages:

For implementing FFP in Khurda district of Odisha under OUAT-Bhubaneswar, Gobindapur, Gopalpur, Brahmapura and Brahmapurapatna villages under Begunia block were selected during the year 2017-2020.

2.4.2.2. Details of technological interventions provided:

A series of technological interventions were adopted under horticulture based module in the selected villages which are briefed in the table below.

Module	*Technological interventions*	*Area covered (ha)*	*Number of households covered*
Horticulture Based module	Production intensification of cucumber through introducing hybrid var. *'Rajamata'*	5.6	82
	Production enhancement of pumpkin by introducing hybrid var. '*Vimal*'	11.7	81
	Introduction of tissue culture banana var. '*Bantala*'	3.3	21
	Introduction of papaya hybrid var. '*Red Lady*'	2.5	13

2.4.2.3 Salient achievements:

The salient achievements of adopting various horticultural interventions are presented under the following subheads.

a) ***Intensification of cucumber production using hybrid cucumber var. 'Rajamata':*** To increase the production of cucumber, hybrid cucumber var. '*Rajmata*' was introduced in four villages. A total of 1.6 ha area was covered with 24 farmers. During the year 2017-18, about 42 tonnes of cucumber was produced which realized a gross return of Rs. 717300/- and net return of Rs. 588300/- against the expenditure of Rs. 129000/-. The average benefit: cost ratio was 4.56: 1. In the

subsequent years, farmers of four villages produced total 87 tonnes cucumber from 4.0 ha area and got gross return of Rs.1305000/- and net return of Rs. 825000/- against an expenditure of Rs. 480000/-.

b) ***Production enhancement of pumpkin by introducing hybrid var. 'Vimal':***
During the year 2017-18, the hybrid pumpkin variety '*Vimal*' was demonstrated for 43 farmers covering 4.5 ha area for enhancing their yield. From 4.5 ha cultivated area, total production of ripe pumpkin was 120.6 tonnes which fetched the gross income of Rs. 964000/-. The total investment was calculated to be Rs. 450000/-. Thus, farmers had a net return of Rs. 514000/- with B: C of 1.14:1 within the time span of only around 3 months. In the very next year, farmers produced 109.60 tonnes of pumpkins from 4.00 ha of land with an investment of Rs. 321000/-. The gross income and net profit were calculated to be Rs. 931600/- and Rs. 609800/-, respectively.

c) ***Introduction of tissue culture banana var. 'Bantala':***
Demonstrations were taken up in the selected farmers' fields on tissue culture banana variety-'*Bantala*' in an area of 3.3 ha involving 21 households. The crop gave average fruit yield of 2060.61 bunches/ha and net profit of Rs. 208182/- per ha against the expenditure of Rs. 134242/- per ha.

d) ***Introduction of papaya hybrid var. 'Red Lady':***
With the aim of increasing production, during the year 2018-19, hybrid papaya var. '*Red lady*' was introduced in 2.5 ha involving 13 households in the selected villages. The hybrid variety produced average 29.2 tonnes of papaya per ha. The net profit was Rs. 109600/- per ha against the expenditure of Rs. 124000/-.

2.4.2.4 Number of farmers benefited:

The details of farmers benefitted in different year have been shown in the following table.

Module	*Technological interventions*	*Number of households covered*		
		2017-18	*2018-19*	*2019-20*
Horticulture based module	Production intensification of cucumber through introducing hybrid var. '*Rajamata*'	24	46	12
	Production enhancement of pumpkin by introducing hybrid var. '*Vimal*'	43	22	16
	Introduction of tissue culture banana var. '*Bantala*'	-	21	-
	Introduction of papaya hybrid var. '*Red Lady*'	-	13	-

2.4.2.5 Impact in the village/ area/ district:

The cucumber and pumpkin production in the selected villages have become one of the important components of their routine cultivation. Not only that, it has also been spread in the adjacent villages. Twenty five farmers have already adopted cucumber cultivation in more than 10.0 ha area. Similarly, pumpkin cultivation has spread to another 6.0 ha areacomprising of 15 farmers.

Field preparation for cucumber

Harvesting of cucumber at dawn

Washing and grading of cucumber

Harvesting of pumpkin

Preparation of pit for planting banana

Tissue culture banana ready for harvest

2.4.3 Livestock based modules

2.4.3.1 Details of villages:

Livestock based module was also included in four selected villages (Gobindapur, Gopalpur, Brahmapura and Brahmapurapatna) under Begunia block of Khurda district, Odisha.

2.4.3.2 Details of technological interventions provided:

For increasing income of livestock farmers in the above villages, '*Pallishree*' strain of poultry birds were introduced for promoting backyard poultry rearing. A total of 400 chicks were distributed among 20 households. The technological know-how was provided by the scientists of OUAT, Bhubaneswar relating to Farmer FIRST Programme.

2.4.3.3 Salient achievements:

A total of 400 three week old chicks of strain '*Pallishree*' were provided to 20 households @ 20 birds per household. The birds were reared for a period of 7 weeks and the mean body weight per bird was around 2 kg. The mortality was totally avoided by taking care of birds in respect of feeding, health care and other management practices. The gross income of each farmer from 20 birds was noted as Rs. 5330/- and the net profit was Rs. 4430/-.

2.4.3.4 Number of farmers benefited:

Total 20 farmers were benefitted from that programme during the period.

2.4.3.5 Impact in the village/ area/ district:

The introduction of '*Pallishree*' poultry birds under back yard rearing created great impact in the selected villages as well as in surrounding villages. As a result, the following three farmers have been motivated and started their poultry farming recently.

Sl. No.	*Name of the farmer*	*Capacity of farming (No. of birds)*
1	Sh. Radhamohan Das	1500
2	Sh. BibhudattaMajhi	200
3	Sh. Srikanta Kumar Jena	1000

2.4.4 Enterprise based modules

2.4.4.1 Details of villages:

Various enterprise based modules were also implemented in Gobindapur, Gopalpur, Brahmapura and Brahmapurapatna village of Begunia block, Khurda district under Farmer FIRTST Programme.

Shed for backyard poultry

Tools for poultry bird rearing

'Pallishree' poultry birds

Weighing of birds for sale

2.4.4.2 Details of technological interventions provided:

The details of technological interventions, inputs provided and number of farmers covered are shown in the following table.

Module	*Technological interventions*	*Inputs provided*	*Number of households covered*
Enterprise based module	Introduction of paddy straw mushroom	600 spawn bottles	33
	Introduction of oyster mushroom	1000 spawn bottles	50
	Introduction of apiculture	35 bee boxes	20

2.4.4.3 Salient achievements:

- ✦ During 2017-18, around 600 paddy straw mushroom spawn bottles and around 1000 oyster mushroom spawn bottles were provided to the women SHGs for skill and economic empowerment of farm women. The women farmers got net return of Rs. 74/- and Rs. 60/- per bed of paddy straw and oyster mushroom, respectively. A spawn laboratory has been constructed for production and supply of quality spawn to the farmers.

- To promote apiculture in the selected villages, farmers were trained for apiculture through conducting capacity building training programme and 35 bee boxed were distributed amongst 20 farmers.
- In addition, as need based activity, soil samples from farmers' fields were collected and analysed. About 100 soil health cards (SHCs) were prepared and distributed among 100 farmers under that programme.

2.4.4.4 Number of farmers benefited:

A total of 203 farmers were directly benefitted from starting musroom cultivation and quality honey production, and also getting their soil samples analyzed through that programme.

2.4.4.5 Impact in the village/ area/ district:

On-campus and off-campus training and demonstration programmes were organized for mushroom growers during the period. After gaining knowledge and skill, total 100 farmers had started raising paddy straw mushroom @ 10 beds each. Adjacent to the selected village one farmer (Sh. Basant Kumar Das) from Dingara village had already started raising 250 beds of paddy straw mushroom. More than 10 farmers from nearby village had started honey production. More than hundred farmers were applying soil test based fertilizer during cultivation of different crops.

Demonstration on raising paddy straw mushroom

Raising paddy straw mushroom under jackfruit tree

Harvesting of fruiting bodies of paddy straw mushroom

Apiculture

Chapter 3: Upscalable technology modules

During the year 2017-20, three ICAR institutes and one SAU used various modules along with different interventions considering the suitability and availability of technologies. Out of those applied technology modules, few technology modules had been proved successful in the targeted/ adopted FFP villages. If these technologies are adopted by other farmers in the same FFP village or outside villages in a large scale, there may be ample chance to increase income of farmers from various agricultural produces. These viable technology modules, recommended by different institutes, have been pointed out as under.

3.1 ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack

3.1.1 Introducing high yielding super rice variety '*Maudamani*':

The variety, *CR Dhan 307*, popularly known as '*Maudamani*' (130-135 days duration) having potential of above 10 t/ha grain yield in farmers' fields and an average of about 7 t/ h can become a boon for irrigated or favourable rainfed ecologies of the state, where mostly '*Swarna*' (140-145 days) is grown. This will not only yield better, but can advance next crop by ten days as compared to '*Swarna*'. In addition, the variety '*Hasant*' from OUAT, Bhubaneswar introduced last year has also proven equally good. If availability of quality rice hybrid seeds can be ensured, then hybrid rice production can do wonder in the district and nearby districts.

3.1.2 Adopting relay vegetable cropping in trellis:

Adoption of introduced hybrid vegetables by over 200 farm families has recorded highest increase in their income of up-to 275 per cent. But, more remarkably, the scientific propagation of 4-5 vegetable crops round the year in suitable land through relay cropping in locally made trellis can be promoted throughout the state to increase farmers' income multiple times.

3.1.3 Using power-operated paddy thresher cum winnower:

Among over 20 types of farm implements introduced and demonstrated in the cluster, the power operated paddy thresher- cum- winnower has shown highest acceptability among the rice grower. With the increase in labour charges and declining bullock population for paddy threshing and winnowing, farmers are facing lots of problems for post-harvest processing. Six such thresher- cum- winnower, provided through the project, have been widely adopted and very extensively used by the villagers.

3.1.4 Cultivating paddy straw mushroom:

Paddy straw mushroom for domestic consumption as well as for commercial production in the district has very high demand with 1:89 B:C ratio. The market rate of paddy straw mushroom ranges from Rs. 200-350/- per kg as per seasonal production and demand. One can easily take up 8-10 mushroom crops in a year.

3.1.5 Rearing dual purpose '*Vanaraja*' poultry strain:

The introduction of dual purpose strain '*Vanaraja*' has also been adopted by all beneficiary farm women. This has not only generated extra family income with very less investment but has very high B:C ratio of 3.72, and also can meet the nutritional requirement of all family members with less dependence on outside sources.

The income analysis of all above major project interventions with regard to doubling farmers' income can be summarized in the following table.

Table: Economic feasibility of various agri-farming in adopted cluster with regard to doubling farmers' income

Sl. No.	*Major interventions*	*Approx. no. of total farm families*	*Approx. land area of interventions or no. of units*	*Pre-FFP avg. net returns (in Rs.)*	*Post-FFP avg. net returns (in Rs.)*	*% increase in net returns or income*
1	HYV rice	450	90 ha	32230 per ha	78665 per ha	144.07
2	Pulses	200	50 ha	11350 per ha	13543 per ha	19.32
3	Rice + pulse	200	50 ha	43580 per ha	92208 per ha	111.58
4	Vegetables	200	20 ha	343950 per ha	1289969 per ha	275.05
5	Poultry	70	1600 chicks	3000 per family	7650 per family	155.00
6	Duckery	30	900 ducklings	2000 per family	3070 per family	53.50
7	Fisheries	20	20000 fish fingerlings	15000 per family	51250 per family	241.67
8	Mushroom	100	2500 bottles	Not applicable	3000 per family	Additional family income
9	Mushroom as enterprise	4	500 beds	Not applicable	420000 per family	New agri-preneurs
10	Vermi-composting	20	40 vermi-pits	Not applicable	4000 per family	Additional family income

3.2 ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

3.2.1 Introducing new pulse var. '*TARM 1*' in rice fallow:

Most of the areas of Khordha district remained fallow after harvesting of paddy. The soil moisture was not used properly by raising a second crop. Green gram was introduced

in rice fallow after harvesting of rice and the seeds were procured from Odisha State Seed Corporation Limited. The *TARM 1* cultivar of green gram was introduced in the adopted villages as this cultivar bears 10-11 number of seeds per pod. It gave an average yield of 6.25 q/ ha with B:C ratio of 1.82. The variety is also resistant to powdery mildew. The big size seeds fetch a good price in the market and very much acceptable by the farmers. Therefore, this new pulse variety may be used for upscaling within as well as outside the district.

3.2.2 Introducing bush type French bean var. *'Falguni'*:

Bush type French bean (var. *Falguni*) was introduced in the demonstration plots for its strong and bushy nature in the year 2018-19. First picking started after 40 days of sowing. About four to five number of pickings were done within 75-85 days. The pods are slender and lustre green in colour which make it preferable than other cultivars.*'Falguni'* variety of French bean proved profitable for the farmers as it gave an average yield of 8 t/ha of green pods. The B:C ratio was recorded to be 1.91 in the demonstrated fields. This new variety can give additional income to the farmers and it should be popularized among the farmers.

3.2.3 Adopting fish based integrated farming system:

Integrated farming system was introduced in the adopted villages for optimum utilization of resource available with the farmers to maximize their profit. Three fish based integrated farming systems were developed in the adopted villages under Farmer FIRST project. A combination of different enterprises, where the pond based fish farming remains at the centre, may be considered for upscaling. Horticulture, plantation crops, dairy and poultry bird rearing were integrated in all three IFSs. In that system, nothing was wasted as the by-product of one enterprise became the input for the others. By adopting that system, farmers fetched more earning from the existing unutilized resources. Due to combination of different enterprises, the system directly or indirectly improved soil health and agricultural productivity. Under today's scenario, farmer must adopt this IFS module for enhancing their agricultural income.

3.3 ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar

3.3.1 Developing water harvesting structures for crops and fish production:

In mitigating water scarcity in drought prone areas, renovation of exiting defunct water bodies like ponds, wells, lakes, rivers, streams etc. can enhance the water capacity.

Water budgeting and crop planning are to be done to ensure water availability. Pump-set and conveyance pipes may be used to carry water from harvested structures to the crop/ vegetable fields with ease. Sprinkler based micro irrigation can also be used for judicious use of water. By developing these water bodies, not only the cropping intensity is increased but also it creates opportunity for fish production. Thus, additional income may be generated from the existing sources. Side by side, mulching can be practiced while cultivating crops/ vegetables for moisture conservation.

3.3.2 Popularizing SRI method of rice cultivation:

Practicing line transplanting in hybrid rice, mechanical weeding by cono-weeder, applying FYM or soil test based fertilizers and using proper irrigation caused better yield in rice during demonstration of SRI method at farmers' fields. This method may be popularized among rice growers in the district.

3.4 Odisha University of Agriculture and Technology (OUAT), Bhubaneswar

3.4.1 Introducing new rice cv. '*Mrinalini*' under rainfed conditions:

'*Mrinalini*' rice has been developed and released by OUAT, Bhubaneswar. It is suitable for shallow low land condition. The duration of the variety is 146 days and the plant height is 117 cm. The average yield is 5.6 t/ ha and the potential yield has been recorded as 9.6 t/ha. The duration of the variety is such that it facilitates growing of green gram crop after harvest of rice in rice fallow under residual soil moisture conditions. This variety may be popularized among the farmers in Khurda and surrounding districts.

3.4.2 Introducing new green gram var.'*IPM 02-14*'under rainfed conditions:

'*IPM 02-14*' green gram has been developed by ICAR-IIPR, Kanpur and it is yellow vein mosaic virus resistant. The average yield under rainfed condition is 5 q/ ha. The traditionally grown '*Nayagarh local*' exhibits more seed shattering behaviour resulting loss in the yield. It can be avoided through growing green gram var. '*IPM 02-14*'.

3.4.3 Raising of tissue culture banana var. '*Bantala*':

Tissue culture banana plantlets- i) are high yielding progenies of true-to type and uniform elite clones of different varieties available in large quantities in tissue culture process, ii) are disease free at the time of planting and the similar conditions can be maintained throughout the crop growth period by proper crop management, iii) have manifested better growth and performance in the fields, iv) have uniform maturity of fruits facilitating good market price, and v) can produce three crops in 30

months. That banana variety gave average fruit yield of 2060.61 bunches/ ha and net profit of Rs.208182/- per ha against the total expenditure of Rs. 134242/- per ha during demonstrations in the farmers fields. It can be popularized among other farmers in and around Khurda district to increase income.

3.4.4 Cultivating hybrid cucumber var. '*Rajamata*':

'*Rajamata*' cucumber plants bear small to medium size fruit at maturity. The fruit colour at maturity is usually dark green and seeds per fruit are very few. The taste and storability of fruit are very good and yield potential ranges from 30-35 tonnes per ha. The average yield per ha in the demonstrated villages was 22.24 tonnes and had very good market demand. This variety can also be popularized which can substantially increase the farmers' income.

3.4.5 Introducing hybrid pumpkin var. '*Vimal*':

The hybrid pumpkin var. '*Vimal*' has- i) small to medium size fruits at maturity, ii) green to yellow fruit colour at maturity, iii) small cavity, iv) less seeds, v) light orange flesh, vi) sweet in taste, vii) excellent storability, and viii) long crop duration. The average yield was recorded as 27 t per ha. Considering the potential yield of this variety, farmers' should be advised to cultivate for higher income in the district.

Chapter 4: Success Stories

During implementing of FFP programme at various locations of Odisha state, some of the farmers had achieved outstanding performance while adopted a particular technology module. It created great impact on their personal life or on family members or on the society as a whole. Their success was clearly visible to others, credible and might change the surrounding scenario, if replicated. Therefore, for convincing other fellow farmers, it is very essential to highlight the stories of their success/ achievements. Some of such stories of successful farmers have been described in this chapter.

4.1 ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack

Among several technological interventions made during the project implementation period, following are the most significant and successful technological interventions. Accordingly, details of few such successful adaptors of these technologies are described subsequently.

As per the base line information collected before implementation of the project, it was found that rice, pulses, vegetables and rearing of livestock were the major agricultural activities in the cluster. The major rice varieties grown were '*Pradhan*' (local variety), '*Pooja*' and '*CR-1018*'. Fruit trees viz. mango, banana, papaya, guava, karonda, areca nut, and coconut were also grown in the village. The old and traditional rice varieties were found to be susceptible to pest and diseases. Imbalance fertilizer application, especially more use of urea in rice crop, had raised serious doubts among vast section of the farmers on the productivity of the soil. Micro-nutrient deficiencies had also been reported in vegetable crops. Weed infestations particularly in low land ecologies was a major threat so far as profitability of the rice was concerned. Unavailability of water at the time of requirement due to delaying in canal and sub-canal supply and high infestation of weeds in the canal were great concern. Small machines and tools for rice farming were almost absent for which the cost of production and loss of crops were found to be very common. After paddy cultivation in the *Kharif* season, local black gram and green gram (for utilizing the residual moisture) were grown.

Apart from canal, there were more than twenty small to medium size ponds, majority of those ponds were used only for irrigation. Constrained by insufficient financial resource to install electric pumps, the villagers were forced to continue with the drudgery in the traditional ways to irrigate. Although the village had a large number of animal population, but there was no apparent grazing lands and fodder fields for the animals.

The animals were constantly exposed to parasitic infection causing loss of farmers' economy and animal welfare. On an average each farm household had nearly four cow and on an average each cow was producing only four litres of milk per day for 250 days a year. The low production of milk by the crossbred cows was attributed to the lack of grazing fields as well as fodder cultivation. After careful analysis of all those problems and opportunities, the present 'Rice-Based Module' i.e. rice followed by pulses, vegetables, livestock and others enterprises like mushroom and vermi-composting was undertaken.

4.1.1 Title: Cultivating new rice var. *'CR Dhan 307'('Maudamani')* enhanced income of farmers

Out of 23 demonstratedvarieties, *CR Dhan 307* (*Maudamani*) had best yields compared to other varieties and performed exceptionally well in field conditions. The following data is about the yearly analysis of profit of a progressive farmer for the year 2018-19.

Name of farmer : Sri Bhima Charan Das

Address : Village-Laxminarayanpur,
Block- Salipur,Distt.-Cuttack

Contact no. : 09938993558 (M)

Field visit by scientists and farmers

'Maudamani' field of Sri B. C. Das

Fields of Mauramani rice

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	Pooja cultivation	Maudamani cultivation
Yield of product	17quintals/yr	25 quintals/yr
Fixed cost (Rs.)	Seeds-700/-	Seeds-800/-
Recurring cost (Rs./year)	20000/-	20000/-
Gross income (Rs./year)	25000/-	33750/-
Net profit (Rs./year)	4300/-	12950/-
B:C ratio	1.20	1.62
Marketing	Marketing helped in ensuring the above mentioned profit	More profit is obtained
Dissemination of knowledge in the locality	Less diverse	More diverse
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	3	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

Grain yield advantages of about 30-60 per cent and incremental income of 200-300 per cent (depending on the land type, varieties, crop management practices and market price) were obtained over previously grown varieties. Thus, more profit was obtained from new varieties.

Adoption/ spread:

'Maudamani' rice variety is spread among 435 farmers and it covers an area of about 40 ha area.

4.1.2 Title: Introducing new tomato var. *'BSS-1004'* and *'Samrudhi'* increased farmers' profit

Introduction of high yielding quality seeds of tomato (*F1-BSS-1004* and *Samrudhi F1*) by ICAR-NRRI, Cuttack has increased the yield of tomato significantly in the project villages. It ensures the profit to the farmers. The yearly income analysis of tomato cultivation has been shown in the table below.

Name of farmer : Sri Shiba Narayan Samal

Address : Village-Satyabhamapur Block- Salipur,Distt.- Cuttack

Contact no. : 09853231696 (M)

Sri S. N. Samal along with his field

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	Tomato cultivation	Tomato Cultivation
Yield of product	40 quintals	50 quintals
Fixed cost (Rs.)	2160/-	2800/-
Recurring cost (Rs./year)	26400/-	26400/-
Gross income (Rs./year)	32000/-	75000/-
Net profit (Rs./year)	3440/-	45800/-
B:C ratio	1.12	2.57
Marketing	Marketing helped in ensuring the above mentioned profit	More profit is obtained
Dissemination of knowledge in the locality	Less diverse	More diverse
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	3	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

Commercial vegetable production helped in incurring more profit to the farm households. The nutritional needs were also accomplished. Adoption of relay cropping

in trellis system using local materials helped to earn about Rs. 6.75 lakh/ha per annum to the families.

Adoption/ spread:

This tomato variety has already spread among 100 farmers covering an area of about 13 ha.

4.1.3 Title: Fish-cum-duck farming: A source of additional income generation

Fishery-cum-duckery is well adopted by the farmers after interventions by the project in the year 2018-19. The family was rearing fishes along with 8 male and 12 female ducks provided through the project. The economic analysis has given below.

Name of farmers : Smt. Priyanka Mohanty and Sh. Amaresh Mohanty
Address : Village- Satyabhamapur Block- Salipur, Distt.- Cuttack
Contact no. : 08339919448/ 08658436212 (M)


Fish-cum-duck farming of Sri and Smt. Mohanty

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	-	Both fish and duck farming
Yield of product	-	1825 egss/year and 3 q fish/year
Fixed cost (Rs.)	-	Duck farming-2000/- and fish farming-50000/-
Recurring cost (Rs./year)	-	Duck farming-9125/- and fish farming-13760/-.
Gross income (Rs.)	-	Duck farming-10800/- per year and fish farming-45000/- per 2years
Net profit (Rs./year)	-	Duck farming-1675/- and Fish farming-31240/-
B:C ratio (with 25% fixed cost)	-	Duck farming-1.18 Fish farming-3.27
Marketing	-	Local marketing through fish wholesalers and broiler firms

Impact factor	*Before adoption*	*After adoption*
Dissemination of knowledge in the locality	1	5
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	3	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

By adopting fish-cum-duck farming, the consumption of animal sources protein (through egg, fish and meat) was increased substantially. It also generated regular income for their family round the year. Now, they are producing fish fingerlings commercially and supplying to the other farmers in the village.

Adoption/ spread:

More than 30 farm families in the selected village had adopted that practice. Gradually, more farmers are being attracted and started thinking about this business.

4.1.4 Title: Fish fingerling production: A newly emerged agri-business

Fish fingerlings production is adopted by the farmers after providing necessary interventions under FFP during 2018-19. The profit analysis of this enterprise has shown below.

Name of farmer : Sri Santanu Kumar Behera
Address : Village- Biswanathpur,
Post- Mahasinghpur, Block- Salipur
District- Cuttack (Odisha)
Contact no. : 09438005840 (M)


Sri S. K. Behera at his pond site

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	-	Fish Farming
Yield of product	-	3 q/year
Fixed cost (Rs.)	-	60000/- per year
Recurring cost (Rs./year)	-	13760/-
Gross income (Rs./year)	-	95000/-
Net profit (Rs./year; after subtracting 25% of the fixed cost)	-	66240/-
B:C ratio (with 25% of fixed cost)	-	3.30
Marketing	-	Marketing helped in ensuring the above mentioned profit
Dissemination of knowledge in the locality	Less diverse	More diverse
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	3	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

Farmers received regular income and became lesser dependence on other protein, vitamin and nutritional sources. One entrepreneur (as fish fingerlings grower and supplier) has been developed who is not only producing commercial fish fingerlings but also supplying fingerlings to other fish farmers in the surrounding villages.

Adoption/ spread:

Fish fingerlings production was the integral part of fishery enterprises in the adopted villages. Many fish farmers from nearby block had already adopted that business which covered about 100 ha water bodies in the district.

4.1.5 Title: Back yard poultry farming for increasing livelihood income

Under Farmer FIRST Programme, during 2018-19, many poultry farmers including women got trainings for poultry bird rearing under backyard system. They were provided with 20 '*Vanaraja*' chicks each and other inputs to start rearing at their home to generate additional income. Mostly the birds were reared under backyard system. But, considering the fast and heavy growth, birds were supplemented with the feeds

available with the households. A total of 11 females and 8 male birds were present at the time of data collection. The economics of poultry rearing have been given in the following table.

Name of farmer : Smt. Prabhati Pani

Address : Village-Satyabhamapur
Block-Salipur, Distt.- Cuttack

Contact no. : 09439255031 (M)

Smt. P. Pani engaged in poultry rearing

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	-	Poultry rearing
Yield of product	-	1500/year
Fixed cost (Rs.)	-	6000/-
Recurring cost (Rs./year)	-	9600/-
Gross income (Rs./year)	-	Eggs-12000/-, Meat-7200/-, Total-19200/-
Net profit (Rs./year)	-	3600/-
B:C ratio	-	2.00
Marketing	-	Marketing of surplus helped in ensuring the above mentioned profit
Dissemination of knowledge in the locality	Less diverse	More diverse
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	3	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

Smt. Pani was benefitted with an additional annual income of Rs. 3600/- from rearing '*Vanaraja*' birds.

Adoption/ spread:

Other women farmers were convinced from such types of additional earnings. As a result, more than 50 other farmers in the selected and surrounding villages had adopted backyard poultry farming as a supplementary business.

4.1.6 Title: Use of vermi-compost for organic betelvine production

In the selected villages, farmers were producing betelvine since long back with applying fertilizers. The growth and quality of betel leaves were not so good which resulted to low market price. Farmers shared that problem with the scientists of ICAR-NRRI, Cuttack. During 2018-19, farmers were suggested to apply vermicompost for betelvine production. Vermicompost usage had significant impact on the quality of betel leaves and farmers got very good market price from selling those leaves. After that, it has been a common practice in the adopted villages to prepare vermicompost from their own and to apply in betelvine. The economics have been calculated as follows.

Nameof farmer : Sri Bhima Charan Das
Address : Village- Laxminarayanpur
Block- Salipur, Distt.- Cuttack
Contact no. : 09938993558 (M)

Betelvine production from vermicompost

Economic and social impact:

Impact factor	*Before adoption (with other fertilizers)*	*After adoption (with use of vermicompost)*
Farmers' practice	Betel leaf production	Betel leaf production
Yield of product	156000 leaves/year	156000 leaves/ year
Fixed cost (Rs.) for one unit	20000/-	20000/-
Recurring cost (Rs./year)	20000/-	25000/-
Gross income (Rs./year)	50000/-	70000/-
Net profit (Rs./year)	10000/-	25000/-
B:C ratio	1.25	1.55

Impact factor	*Before adoption (with other fertilizers)*	*After adoption (with use of vermicompost)*
Marketing	Marketing helped in ensuring the above mentioned profit	More profit is obtained
Dissemination of knowledge in the locality	Less diverse	More diverse
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	3	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

The income from the existing betelvine cultivation was increased only through applying vermicompost in place of other fertilizers.

Adoption/ spread:

That practice was adopted by 10 other farmers covering an area of about 5 ha in the project villages. Gradually, farmers are gaining interest for this enterprise.

4.2 ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

4.2.1 Title: Fish based integrated farming system: A key to boost farmers' income

Integrated farming system approach may be the best suitable model for small land holders in our country for increasing income per unit area of land. Sri Gadadhar Pradhan is an example of successful fish based IFS farmer. Mr. Pradhan was involved in different farming practices like cereal, horticulture, livestock and fisheries. He had total 1 ha land with him. In addition, he had 3 cattle, 30 sheep and a pond covering the area of 0.15 ha where he used to practice grow out culture.

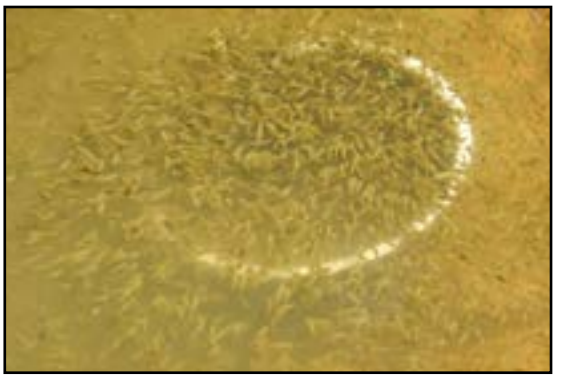
In the year 2017-18, carp seed rearing was introduced by the scientists of ICAR-CIFA, Bhubaneswar under Farmer FIRST project. Through integration of pond, livestock, agriculture altogether in a scientific manner, he was able to earn substantial amount of

profit. The economic analysis of fish based IFS, followed by Mr. Pradhan, has shown in the following table.

Name of farmer : Sri Gadadhar Pradhan
Address : Village-Giringo, Block- Balipatna
District-Khordha, State-Odisha
Contact no. : 09438308534 (M)

Application of potassium permanganate as disinfectant

Application of Floating Feed



Fingerlings of Indian Major carps

Sampling of fingerlings to check health status

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	Grow out culture (Extensive)	Carp seed rearing
Yield of product	3.5 q	4.5 q
Fixed cost (Rs.)	Nil	Nil
Recurring cost (Rs./year)	25000	28000
Gross income (Rs./year)	60000	103000

Impact factor	*Before adoption*	*After adoption*
Net profit (Rs./year)	35000	75000
B:C ratio	2.4	3.6
Marketing	Nil	Other farmers were procuring directly from pond
Dissemination of knowledge in the locality	Nil	Nil
Knowledge gain based on 1-5 scale*	2	4
Feeling of economic security based on 1-5 scale*	2	4
Ability to understand and solve problems based on 1-5 scale*	3	5
Self-image in community based on 1-5 scale*	2	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

The farmer got a higher profit of Rs. 40000/- from carp seed rearing than the enterprise adopted before.

Adoption/ spread:

Fish based IFS has become popular among the farmers in selected villages. Farmer to farmer technology dissemination was very fast. As a result, at least 15 farmers had developed similar practice.

4.3 ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar

4.3.1 Title: Increasing farmers' income through vegetable cultivation

Smt. Mina Mohanta purchased 1.5 ha of land. Out of which, 1 ha was non-irrigated and 0.5 ha was irrigated through a bore well. Dug well was the only source of irrigation before start of the project. As the rainfall was very low, availability of water in the well was not sufficient to cultivate any crop. Various inputs were also provided through Farmer FIRST Programme for creating irrigation facilities so that vegetable could be produced. Exposure visit to ICAR-CHES and CTCRI was provided to enhance knowledge and skills about seedling preparation, horticultural and tuber crop cultivation. Vegetable seedlings of brinjal, tomato, chilli, cauliflower, cabbage, capsicum, okra, radish, Amaranthus were distributed for cultivation. After adoption of village, vegetable cultivation was done during *Kharif*, *Rabi* and *Zaid* seasons with sprinkler irrigation from bore well.

Name of farmer : Smt. Mina Mohanta
Address : Village- Khuntapingu,
Block- Saharpada, District-Keonjhar
Contact no. : 09777791929 (M)


Smt. M. Mohanta in her vegetable field

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	Primarily rainfed paddy cultivation and *Kharif* rainfed vegetable cultivation with occasional flood irrigation from well	Vegetable cultivation in *Kharif*, *Rabi* and *Zaid* seasons with sprinkler irrigation from bore well
Yield of product	Paddy and vegetables	Only vegetables
Fixed cost (Rs./ year/ ha)	5000/-	10000/-
Recurring cost (Rs./ year/ ha)	186000/-	170000/-
Gross income (Rs./ year/ ha)	333000/-	520000/-
Net profit (Rs./year/ ha)	142000/-	340000/-
B:C ratio	1.74	2.89
Marketing	Local market	Local market
Dissemination of knowledge in the locality	1	4
Knowledge gain based on 1-5 scale*	1	4
Feeling of economic security based on 1-5 scale*	1	4
Ability to understand and solve problems based on 1-5 scale*	1	5

Impact factor	*Before adoption*	*After adoption*
Self-image in community based on 1-5 scale*	1	5
Self-confidence based on 1-5 scale*	1	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

Smt. Mohanta achieved success in producing vegetable crops. She earned Rs. 340000/- from the sale of vegetables in place Rs. 165000/- in one year from 1.5 ha land. The cropping intensity in her field was calculated to be 240%.

Adoption/ spread:

Smt. Mohanta has become a role model for the farm women in her village as well as her nearby villages. More than 20 farmers adopted vegetable cultivation covering more than 15 ha area in the district.

4.4 Odisha University of Agriculture and Technology (OUAT), Bhubaneswar

4.4.1 Title: Real time cucumber production improved livelihood income of farmers

The villages are surrounded by forests with sal as the pre-dominant tree. The climate is characterized by hot and dry summer and mild winter with an average annual rainfall of about 1408 mm. The soil is red lateritic with clay loam texture.During, *Rabi* season of 2017-18, through Farmer FIRST Programme under OUAT, Bhubaneswar, Odisha one attempt was made to improve the livelihood of vegetable growers through cultivation of off-season vegetables specifically cucumber with the introduction of hybrids with scientific package of practices. Regular interactions with the farmers and scientists were made through person-to-person, training programmes, field diagnostics etc. The beneficiary farmers were provided with technical know-how and critical inputs viz. '*Rajmata*' hybrid seed. The best management practices were popularized through field demonstrations.

Name of the farmer : Sh. Siba Muduli
Address : Village- Gopalpur, Block- Begunia,
Distt.- Khordha, Odisha
Contact no. : 09178063881 (M)


Cucumber cultivation by Sh. S. Muduli

Economic and social impact:

Impact factor	*Before adoption*	*After adoption*
Farmers' practice	Local variety	Hybrid cucumber var. '*Rajmata*'
Yield of product	3.75 tonnes in 0.2 ha	5.65 tonnes in 0.2 ha
Total cost (Rs.)	25000/-	15000/-
Gross income (Rs.)	60000/-	82300/-
Net profit	35000/-	67300/-
B:C ratio	2.4	5.5
Marketing	Local market	Local market
Dissemination of knowledge in the locality	1	5
Knowledge gain based on 1-5 scale*	1	5
Feeling of economic security based on 1-5 scale*	2	5
Ability to understand and solve problems based on 1-5 scale*	2	4
Self-image in community based on 1-5 scale*	3	5
Self-confidence based on 1-5 scale*	3	5

**1-5 scale indicates 1 = lowest and 5 = highest*

Benefits:

Sri Siba Muduli earned Rs. 82300/- from an area of 0.2 ha of land by producing 5.65 tonnes with an expenditure of Rs. 15000/-. He harvested cucumber fruits in 17 phases for a period of 35 days after fruit set. Sri Muduli was highly convinced about off season cultivation of cucumber to catch better market price. He also experienced the importance of scientific package of practices of high value crops. That demonstration encouraged other farmers for commercial cultivation to improve their livelihood.

Adoption/ spread:

From the success of Mr. Muduli, more than 20 farmers started hybrid cucumber and off-season vegetable production covering more than 10 ha area in the selected villages.

Chapter 5: Publications

Various categories of publications including research articles, popular articles, book chapters, leaflets, brochures, abstracts etc., came out under Farmer FIRST Programme during the year 2017-2020, have been presented in this chapter.

5.1 ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack

5.1.1 Leaflets:

Das L, Mishra S K, Saha S, Patnaik S S C, Nayak P K, Mohapatra S D, Lenka S, Tripathi R, Guru P K, Giri S C, Acharya G C and Kumari M. 2018. Increasing productivity of rice-based production system through Farmer FIRST approach, published by the Director, ICAR-NRRI, Cuttack, pp: 1-8.

Giri S C, Das L, Mishra S K and Behera R K. 2018. Backyard poultry: A profitable farming option of rural women. Published by the Director, ICAR-NRRI, Cuttack. pp: 1-4.

Giri S C, Das L, Mishra S K and Behera R K. 2018. Duck farming: An assured enterprise for economic development of rural women. Published by the Director, ICAR-NRRI, Cuttack. pp: 1-4.

Kar M K, Das Lipi, Rao G J N, Singh O N, Pradhan S K, Mishra S K, Pande K, Mohanty S K, Behera R K, Singh S K, Bose L K Dash S K and Pathak H. 2018. Production technology for rice variety CR Dhan 303. Published by the Director, ICAR-NRRI, Cuttack, pp: 1-4.

Kar M K, Das Lipi, Rao G J N, Singh O N, Pradhan S K, Mishra S K, Pande K, Mohanty S K, Behera R K, Singh S K, Bose L K Dash S K and Pathak H. 2018. Production technology for rice variety CR Dhan 304.Published by the Director, ICAR-NRRI, Cuttack, pp: 1-4.

Kumari M, Acharya G C, Naresh P, Das Lipi, Mishra S K and Behera R K. 2018. Seasonal calendar for cultivation of vegetable crops in Odisha. Published by the Director, ICAR-NRRI, Cuttack. pp: 1-4.

Lenka S, Das L, Mishra S K, Behera R K and Saha S. 2018. Mushroom farming: A profitable livelihood option for rural women. Published by the Director, ICAR-NRRI, Cuttack. pp: 1-4.

Pradhan S K, Das L, Kar M K, Meher J, Mishra S K, Behera R K, and Pathak H. 2018. production technology for rice variety CR Dhan 205. Published by the Director, ICAR-NRRI, Cuttack, pp: 1-4.

Pradhan S K, Das L, Mishra S K, Behera R K, Pathak H and Mohapatra T 2018. Production technology for rice variety C R Dhan 505.Published by the Director, ICAR-NRRI, Cuttack. pp: 1-4.

Pradhan S K, Das L, Mishra S K, Behera R K and Pathak H. 2018. Production Technology for rice variety C R Dhan 307 (Maudamani). Published by the Director, ICAR-NRRI, Cuttack, pp: 1-8.

Pradhan S K, Das L, Panda B B, Pandit E, Nayak D K, Mishra S K, Saha S, Behera R K and Pathak H. 2018. Production technology for rice variety C R Dhan 409 (Pradhan Dhan). Published by the Director, ICAR-NRRI, Cuttack, pp: 1-4.

Pradhan S K, Das L, Pandit E, Barik S R, Mukherjee A K, Mishra S K, Behera R K, and Pathak H. 2018 Production technology for rice variety C R Dhan 506. Published by the Director, ICAR-NRRI, Cuttack, pp: 1-4.

Srinivas P, Das L, Acharya G C, Mishra S K, Kumari M, Behera R K and Lenka S. 2018. Vermicomposting for quality farm produce. Published by the Director, ICAR-NRRI, Cuttack, pp: 1-4.

5.2 ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

5.2.1 Research article:

De H K, Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S., panda N and Shasani S. 2019. Impact of Farmer FIRST project on livelihood of farmers. *Indian Journal of Ag. Sciences*. (Communicated).

5.2.2 Book chapter:

De H K, Sivaraman I, Das M. K, Sahoo P K, Das P C, Rath S C, Sarkar S, Das R and Debbarma J. 2019. Farmer FIRST project of ICAR-CIFA-An overview. IN: Aquaculture as a tool for empowering SC/ST farmers of India: Three decades of ICAR-CIFA's contribution (B. C. Mohapatra, H. K. De, D. Panda, Pravati K. Sahoo, B. R. Pillai Eds.), ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, pp:109-117 [ISBN No. 978-81-935417-6-0].

5.2.3 Popular articles:

De H K, Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S, Rath D P, Das R, Debbarma J.2019. Farmer FIRST Pariyojana- Ekablokan. *Neelitima***10**: 72-75.

De H K, Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S, Rath D P. 2019. Krushaka manankarojgaraku duigunita karibare "Farmer FIRST" ra jogadana. *Krishi Jagran (Odia)*, (Communicated).

De H K, Sivaraman I, Das M. K, Sahoo P K, Das P C, Rath S C, Sarkar S, Das R and Debbarma J. 2019. Farmer FIRST- Ekaabhinavayojana. *KrishiJagran (Odia)* **3**(3): 48-51.

5.2.4 Leaflet:

De H K, Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S, Das R and Debbarma J. 2019. Carp seed rearing can double aquafarmers' income- Technical intervention of Farmer FIRST project proved it. ICAR-CIFA Extension Series-43, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar.

5.2.5 Brochures:

De H K and Sivaraman I. 2018. Promoting improved agriculture and allied sector technologies in Khordha district through Farmer FIRST approach. Brochure, Farmer FIRST project, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar.

De H K, Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S. 2019. Farmer Farmer FIRST parijojana madhyamare unnata krushi ebong anusangika krushi khetraku proschahana (Odia). Brochure, Farmer FIRST Project, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar.

5.2.6 Abstracts presented in seminar/ conference:

De H K , Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S, Das R and Debbarma J. 2019. Farmer FIRST project. Paper presented in National workshop on "Aquaculture as a livelihood option for tribal farmers of India" held at ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar during 18-19 Feb., 2019.

De H K, Sivaraman I, Das M K, Sahoo P K, Das P C, Rath S C, Sarkar S, Rath D Pand Sashani S. 2019. Ensuring sustainable rural livelihood-A case of Farmer FIRST Project. Paper presented in PAF Congress 2019 on "Increasing aquaculture production in India through synergistic approach between multinational

industries, domestic entrepreneurs and aquaculturist" held at ICAR-CIFA, Bhubaneswar during 15-17 November, 2019.

De H K, Sivaraman I, Das M. K, Sahoo P K, Das P C, Rath S C, Sarkar S, Das R and Debbarma J. 2018. Doubling farmer's income through Farmer FIRST approach-A case study of carp seed rearing. Paper presented in ISEE National seminar 2018 on "Integrated farming system for enhancing farmer's income and nutritional security" held at WBUAFS, Kolkata during 5-7 Dec., 2018.

5.3 Odisha University of Agriculture and Technology (OUAT), Bhubaneswar

5.4.1 Research article:

Tripathy P, Behera B, Malik D, Sahoo A, Singh A K and Roul P K. 2019. Real time cucumber production benefits farmers and consumers. In:*Indian Horticulture*, **64** (5): 14-18.

5.4.2 Popular articles:

Behera B and Mallik D. 2019. Krushak Dinalipi (Farmers diary). Published by OUAT, Bhubaneswar, pp: 1-5.

Pradhan P, Behera B and Malik D. 2019. Greenhouse management. Published by OUAT, Bhubaneswar, pp: 1-10.

Sahoo N R, Pal U, Behera B and Mallik D. 2019. Dalmill and Dal processing. Published by OUAT, Bhubaneswar, pp: 1-6.

Tripathy P, Beura S, Behera B and Sahoo A. 2018. Cultivation of Tissue culture Banana. Published byOUAT, Bhubaneswar, pp: 1-7.

Tripathy P, Sethy K, Behera B and Malik D. 2019. Cultivation of papaya. Published by OUAT, Bhubaneswar, pp: 1-10.

Chapter 6: Awards

In recognizing the expertise and outstanding achievements of scientists and farmers engaged for successful implementation of FFP in the targeted beneficiaries, various kinds of awards/ recognitions were conferred by different competent authorities. It encouraged the people to do better and provided as a source of inspiration in future. A large numbers of personnel, who were engaged with FFP and won different types of awards/ recognitions, have been enlisted in this chapter.

6.1 ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack

Name of the awardee (Scientist/ Farmer)	*Name of the award*	*Year*	*Conferring authority*	*Purpose*	*Type of award/ recognition (Certificate/ Cash amount)*	*Photograph*
Dr. Sumanta Kumar Mishra (Principal Scientist& PI, ICAR-NRRI)	Krushi Ratna Award	2018	Orissa Krushak Samaj	Significant achievements in transfer of technologies and increasing farmers income	Citation & Memento	
Sri Bhima Charan Das	Padma Bhusan Dr. Radhanath Rath Memorial Award 2018	2018	ICAR	Adoption of improved rice and vegetable production technologies, enterprising vermi-composting and organic betel leaf production	Citation & Memento	
Sri Siba Narayan Samal	Best innovative farmers	2017	NRRI	Scientific cultivation of rice and vegetables; farm mechanization for cost reduction	Certificate & Memento	
Sri Udhab Charan Padhi	Best innovative farmers	2017	NRRI	Commercial vegetables cultivation and popularizing rice farm mechanization	Certificate & Memento	

Name of the awardee (Scientist/ Farmer)	*Name of the award*	*Year*	*Conferring authority*	*Purpose*	*Type of award/ recognition (Certificate/ Cash amount)*
Sri Sangram Keshori Pani	Best farmer award	2018	NRRI	Commercial milk, poultry and vegetable production and rice farm mechanization	Certificate & Memento
Sri Rajan Kumar Behera	Best farmer award	2019	NRRI	Commercial mushroom and poultry production	Certificate & Memento
Sri Purna Chandra Behera	Best farmer award	2019	NRRI	Commercial mushroom production	Certificate & Memento
Smt. Sanjukta Barik	Best woman farmer	2018	NRRI	Mushroom and poultry farming	Certificate & Memento
Smt. Kuni Samal	Best woman farmer	2018	NRRI	Mushroom and poultry farming	Certificate & Memento
Smt. Rebati Sethi	Best woman farmer	2018	NRRI	Mushroom and nutri-farming	Certificate & Memento
Smt. Santilata Samal	Best woman farmer	2018	NRRI	Mushroom and nutri-farming	Certificate & Memento
Smt. Arati Behera	Best woman farmer	2018	NRRI	Mushroom and duck farming	Certificate & Memento
Smt. Azima Bibi	Best woman farmer	2018	NRRI	Mushroom and duck farming	Certificate & Memento
Smt. Binodini Biswal	Best woman farmer	2018	NRRI	Vegetable and poultry farming	Certificate & Memento
Smt. Arnapurna Biswal	Best woman farmer	2018	NRRI	Vegetable and poultry farming	Certificate & Memento

6.2 ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

Name of the awardee (Scientist/ Farmer)	*Name of the award*	*Year*	*Conferring authority*	*Purpose*	*Type of award/ recognition (Certificate/ Cash amount)*	*Photograph*
Mr. Gandharba Khuntia	Progressive farmer	2016	ICAR-CIFA	Celebration of Jai Kisan Jai Vigyan Week	Certificate	
Mr. Padmanav Choudhury	Progressive fish farmer	2018	ICAR-CIFA	Celebration of KisanDiwas	Certificate	
Mr. Hatakishore Swain	Progressive fish farmer	2018	ICAR-CIFA	Celebration of KisanDiwas	Certificate	
Mr. Biswaranjan Dev	Director of Fish Farmers Producer Company	2019	ICAR-CIFA	Launching of Bhargabi Fish Farmers Producers Company Ltd	Memento	

6.3 ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar

Name of the awardee (Farmer)	*Name of the award*	*Year*	*Conferring authority*	*Purpose*	*Type of award/ recog-nition (Certificate/ Cash amount)*	*Photograph*
Smt. Mina Mohanta	Best farmer award	2019	ICAI-NRRI	Excellence in vegetable cultivation	Certificate	

6.4 Odisha University of Agriculture and Technology (OUAT), Bhubaneswar

Name of the awardee (Scientist/ Farmer)	*Name of the award*	*Year*	*Conferring authority*	*Purpose*	*Type of award/ recognition (Certificate/ Cash amount)*	*Photograph*
Sh. Ramaballava Baliarsingh	Felicitation	2019	ICAR-NRRI, Cuttack	Improved rice cultivation	Certificate	

News coverage

ICAR-National Rice Research Institute (ICAR-NRRI), Cuttack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Coverage on Rashtriya Mahila Kisan Diwas celebration with adopted farmwomen in Samaja Odia Daily (Cuttack Edition of 16.10.2018)

Coverage on Rashtriya Mahila Kisan Diwas celebration with adopted farmwomen in NRRI Newsletter (Oct-Dec, 2018 issue)


Rashtriya Mahila Kisan Diwas


ଧାନ କିସମରେ ନୂତନ ପଦ୍ଧତି ଆଣିବ ସଫଳତା

Coverage on demonstration programme of new paddy varieties under FFP in Samaja Odia Daily (Cuttack Edition of 23.9.2019)

ଉଦ୍ୟାନ କୃଷି କୌଶଳ ବିକାଶ ପ୍ରଶିକ୍ଷଣ କାର୍ଯ୍ୟକ୍ରମ

Coverage on protected horticulture training in Samaja Odia Daily (Cuttack Edition of 29.11.2019)

Coverage on Swachh Bharat Abhiyan in adopted villages in Samaja Odia Daily (Cuttack Edition of 25.12.2019)

ପ୍ଲାଷ୍ଟିକ୍ ବର୍ଜ୍ଜନ ସଚେତନତା ଶିବିର ଓ ସ୍ୱଚ୍ଛଭାରତ କାର୍ଯ୍ୟକ୍ରମ

News coverage

ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar

The Odisha Post, Bhubaneswar, 21st Nov., 2019

www.icar.org.in 20 th Nov., 2019

News coverage

ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar


କୃଷକ ତାଲିମ ଶିବିର ଉଦ୍‌ଯାପି

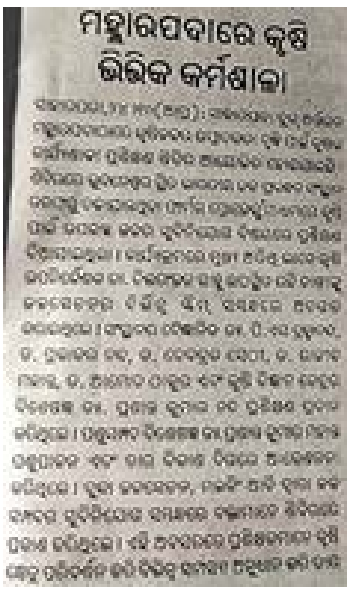

ଚାଷୀଙ୍କୁ କୃଷି ଯନ୍ତ୍ରପାତି ପ୍ରଦାନ


ମହାରପଦାରେ କୃଷି ଭିତ୍ତିକ କର୍ମଶାଳା


କୃଷକଙ୍କୁ କୃଷି ଉପକରଣ ବିତରଣ


ଫାର୍ମର ଫାଷ୍ଟ ତରପତ୍ର ଫଳଚାଷ ବଣ୍ଟନ


କୃଷି ଯନ୍ତ୍ରପାତି ପ୍ରଦାନ ମେଳା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କୃଷକ ତାଲିମ ଶିବିର ଉଦ୍‌ଯାପିତ


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