Doubling of Farmers' Income by 2022

Strategy Document for Odisha

Indian Council of Agricultural Research
Department of Agricultural Research and Education
Ministry of Agriculture & Farmer's Welfare, GoI, New Delhi

State-level Coordination Committee

Chairman: Dr. S Pasupalak, Vice-Chancellor, Orissa University of Agriculure and Technology, Bhubaneswar, Odisha, India

Convener: Dr. H Pathak, Director, ICAR-National Rice Research Institute, Cuttack, Odisha, India

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Editors

S Pasupalak
H Pathak

Editorial Team

PK Roul
GAK Kumar
MR Mohapatra

Published by

Director, ICAR-National Rice Research Institute, Cuttack 753006, Odisha, India
On behalf of State-level Coordination Committee, Odisha

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Preface

Average farm household income of farmers of Odisha is low (Rs. 4,953 per month), compared to the national average (Rs. 6,430 per month). Farmers' income is increased when productivity goes up, cost of production comes down, risk is reduced, post-harvest loss is minimized and commodities produced get a remunerative price. Increasing farm income in the state, however, is very challenging because of its dependence on monsoon, small land-holding, subsistence nature of farming and poor infra-structure for storage and marketing. To increase income of farmers, a range of strategies (economic, technological, infrastructural, policy and social) need to be adopted to transform the current production-driven cropping system to income-driven farming system. Agricultural research should be re-oriented with farmers' participatory approach to unshackle the vicious circle of poverty and drudgery and fulfill the aspirations of resource-poor, smallholder farmers. A state-wise, agro-climatic zone-specific action plan is required to address the constraints of increasing farmers' income.

Aiming to boost Indian agriculture, the Government of India has set a goal to double the farmers' income by the year 2022. Accordingly, Secretary, DARE and Director General, ICAR, Dr. T. Mohapatra constituted State-level Coordination Committee (SCC) for Doubling Farmers' Income by 2022. The Committee is entrusted with the responsibilities of assessing the present agro-ecological, economic, social and natural factors affecting the income of Odisha farmers, formulate strategies and implement it with the help of all the stakeholders.

The Committee held a number of meetings and several rounds of informal discussions and Email correspondences with the officials from State Agricultural Departments, State Agricultural University, ICAR Institutes, NGOs, private organizations, farmers and other stakeholders for drafting the document on Doubling Odisha Farmers' Income by 2022. Inputs and guidance have been taken from various sources including the policy paper on Strategy for Doubling Income of Farmers in India, developed by ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi; presentations made by Prof. MS Swaminathan; Dr. Ramesh Chand, Member Niti Aayog; Niti Aayog Policy Paper on Doubling Farmers Income–Rationale, Strategy, Prospects and Action Plan; National Bank for Agriculture and Rural Development (NABARD) Monograph on Doubling Farmers Income by 2022; and Directorate of Agriculture: Agricultural Statistics of Odisha 2015-16.

The Chairman and the Convener thank Dr. T. Mohapatra, Secretary, DARE and Director General, ICAR for entrusting this important responsibility. The contributions made by the SCC members; officials of Odisha University of Agriculture and Technology (OUAT) and ICAR Institutes, fellows of National Academy of Agricultural Sciences (NAAS), Bhubaneswar Chapter; other experts, individuals and orgaizations farmers and secretarial help rendered by Mr. Sunil Sinha are duly acknowledged.

We sincerely hope that the document will be useful in enahncing income of farmers of Odisha.

Place: OUAT, Bhubanswar
Date: January 1, 2018

(**H.Pathak**)
Convener

(**S. Pasupalak**)
Chairman
State-level Coordination Committee

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Abbreviations

AGRISNET	Agriculture Resource Information System Network
ATMA	Agricultural Technology Management Agency
B:C	Benefit Cost Ratio
BBSR	Bhubaneswar
BGREI	Bringing Green Revolution to Eastern India
BPH	Brown Plant Hopper
CIFA	Central Institute of Freshwater Aquaculture
CIPHET	Central Institute of Post Harvest Engineering & Technology
CIWA	Central Institute for Women in Agriculture
CLCC	Customized Leaf Color Chart
CTCRI	Central Tuber Crops Research Institute
DAC & FW	Department of Agriculture Cooperation & Farmers Welfare
DAHDF	Department of Animal Husbandry, Dairying & Fisheries
DAH&VS	Directorate of Animal Husbandry & Veterinary Services
DARE	Department of Agricultural Research and Education
DAS	Days After Sowing
DAT	Days After Transplanting
DBM	Diamond Back Moth
DDA	Deputy Director of Agriculture
DORB	De Oiled Rice Bran
FLD	Front Line Demonstration
FMD	Foot and Mouth Disease
GNOC	Groundnut Oil Cake
HDI	Human Development Index
HYV	High Yielding Varieties
ICAR	Indian Council of Agricultural Research
IFS	Integrated Farming System
IIWM	Indian Institute of Water Management
INM	Integrated Nutrient Management
IPDM	Integrated Pest and Disease Management
IWM	Integrated Weed Management
IWMP	Integrated Watershed Management Programme

KVK	Krishi Vigyan Kendra
MFPI	Ministry of Food Processing Industries
NAAS	National Academy of Agricultural Sciences
NABARD	National Bank for Agriculture and Rural Development
NDP	National Domestic Product
NHM	National Horticulture Mission
NMSA	National Mission for Sustainable Agriculture
NRRI	ICAR-National Rice Research Institute
OLM	Odisha Livelihoods Mission
OMFED	Orissa State Cooperative Milk Producers' Federation
OUAT	Orissa University of Agriculture and Technology
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
PPR	Peste Des Petits Ruminants
PSB	Phosphorus Solubilising bacteria
R & D	Research and Development
RCD	Raw Cattle Dung
RDF	Recommended Doses of Fertilizers
RITE	Regional Institute for Training on Extension
RKVY	Rashtriya Krishi Vikas Yojana
SIFS	Specialized Integrated Farming System
SSP	Single Super Phosphate
STFR	Soil Test-based Fertilizer Recommendation
T. japonicum	*Taraxacum japonicum*
T. viridae	*Trichoderma viridae*
YMV	Yellow Mosaic Virus

1. Introduction

Odisha has a geographical area of 1,55,707 km^2 with a population of 4.19 crores. Agriculture is the mainstay of State's economy providing livelihood support to a very large section of population. Agriculture in the state is characterized by low productivity due to traditional agricultural practices by poor farmers, inadequate irrigation infrastructure, skewed land distribution, marginal and small size of land-holding, low investment and capital formation and natural calamities occurring in quick succession. The State is divided into 10 agro-climatic zones, viz., North-Western Plateau, North-Central Plateau, North-Eastern Coastal Plain, East and South-Eastern Coastal Plain, North-Eastern Ghat, Eastern Ghat High Land, South-Eastern Ghat, Western Undulating Zone, West Central Table Land and Mid-Central Table Land. The climate of the State is tropical, characterized by high temperature, high humidity, medium to high rainfall, short and mild winter. The normal rainfall in the State is 1450 mm, of which about 80% is confined to monsoon months (June-September). Soil types range from fertile alluvial deltaic soils in Coastal Plains, mixed red and black soils in Central Table Land, red and yellow soils with low fertility in Northern Plateau to red, black & brown forest soils in Eastern Ghat region.

Farmers' income is increased when productivity goes up, cost of production comes down, risk is reduced, post-harvest loss is minimized and commodities produced get a remunerative price. It should also improve income from allied activities to agriculture. Aiming to boost Indian agriculture, the Government has set a goal to double the farmers' income level by the year 2022. To fulfill the aim, a range of approaches and strategies need to be adopted starting from transformation of production-driven as well as market-driven factors and an enabling environment, which support farmers in all their endevours. Current level of average income of an Indian farmer is about Rs. 6,430 per month (NSSO, 2012-13) with huge disparity among different regions. Farmers of Punjab earned highest income (Rs. 18,060) followed by those in Haryana (Rs. 14,440), Jammu & Kashmir (Rs. 12,685) and Kerala (Rs. 11,890), whereas farmers of Bihar earn the least (Rs. 3,560) per month. Average farm household income of farmes of Odisha is low (Rs. 4,953), compared to other states. To increase income of farmers, a range of strategies (Economic, Technological, Infrastructural, Policy and Social) need to be adopted to transform the current production-driven to income-driven farming system. Agricultural research should be re-oriented with farmers' participatory approach to unshackle the vicious circle of poverty and drudgery and fulfill the aspirations of resource-poor, smallholder farmers. A state-wise, agro-climatic zone-specific action plan is required to address the constraints of increasing farmers' income in Odisha. The document assesses the agro-ecological, economic and social factors affecting the income of Odisha farmers; identifies the options for doubling farmers' income as per agro-climatic zones of Odisha; outlines the success stories in different agro-climatic zones for increasing productivity and farmers income; outline the strategies to double the income of the farmers and develop a action plan to implement the strategies.

2. Composition of the State-level Coordination Committee (SCC)

Aiming to boost Indian agriculture, the Government of India has set a goal to double the farmers' income level by the year 2022. Accordingly, Secretary, DARE and Director General, ICAR, Dr. T. Mohapatra constituted State-level Coordination Committee for Doubling

Farmers' Income by 2022. The Committee for Odisha is Chaired by Prof. S. Pashupalak, Hon'ble Vice-chancellor, Odisha University of Agriculture and Technology, Bhubaneswar. The Convener of the committee is Dr. H. Pathak, Director, ICAR-National Rice Research Institute, Cuttack, Odisha. The composition of the State-level Coordination Committee is presented below and a list of contributors is given in Annexure I.

- Odisha University of Agriculture and Technology (OUAT), Bhubaneswar, Odisha
- ICAR-National Rice Research Institute (NRRI), Cuttack, Odisha
- ICAR-Indian Institute of Water Management (IIWM), Bhubaneswar, Odisha
- ICAR-Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar, Odisha
- ICAR-Central Institute of Women in Agriculture (CIWA), Bhubaneswar, Odisha
- ICAR-Central Horticultural Experimentation Station (CHES), Bhubaneswar, Odisha
- ICAR- Central Tuber Crop Research Institute (CTCRI), Bhubaneswar, Odisha
- Department of Agriculture, Government of Odisha, Bhubaneswar, Odisha
- Department of Animal Husbandry, Government of Odisha
- Department of Horticulture, Government of Odisha, Bhubaneswar, Odisha
- Department of Fisheries, Government of Odisha, Cuttack, Odisha
- DAC&FW, Government of India, New Delhi
- DAHDF, Government of India, New Delhi
- Ministry of Food Processing Industries, Govt. of India, New Delhi

The Committee is entrusted with the responsibilities of assessing the present agro-ecological, economic, social and natural factors affecting the income of Odisha farmers, formulate strategies and implement it with the help of all the stakeholders. The Committee focused it work as per the following objectives.

1. Assess the agro-ecological, economic, social and natural factors affecting the income of Odisha farmers.
2. Identify the options for doubling farmers' income as per agro-climatic zones of Odisha.
3. Validate the options and quantify its effect on the farmers' income.
4. Formulate the strategies based on above information to double the income of the farmers.
5. Develop a plan of action to implement the strategies to double farmers' income.
6. Implement the strategies with the help of all the stakeholders.

3. Meetings of the SCC

The committee held a number of meetings and several rounds of informal discussion and Email correspondences with the officials from State Agricultural Departments, State Agricultural University, ICAR Institutes, NGOs, private organizations, farmers and other

stakeholders for drafting the document on Doubling Odisha Farmers' Income by 2022. The details are as follows.

1. March 6, 2017: Formation of the Coordination Committee
2. March 16, 2017: Consultations of Scientists (held at NRRI)
3. April 3, 2017: 1st Meeting cum Workshop of Odisha State Coordination Committee (held at NRRI)
4. July 3, 2017: 2nd Meeting cum Workshop of Odisha State Coordination Committee (held at NRRI)
5. October 11, 2017: Presentation at ICAR (held at Krishi Bhawan)
6. October 14, 2017: Meeting with the NAAS Fellows, Odisha Chapter (held at NRRI)
7. October 21, 2017: Meeting with KVKs and State Department for success stories in Odisha (held at NRRI)
8. October 27-28, 2017: 3rd Meeting of Odisha State Coordination Committee and State Department (held at OUAT)
9. October 31, 2017: 4th Meeting with OUAT, KVKs and State Department for success stories (held at NRRI)
10. November 3, 2017: Meeting at New Delhi

4. Odisha State Profile

Odisha has a geographical area of 1,55,707 km^2 with a population of 4.19 crores. Agriculture is the mainstay of state's economy and providing livelihood support to a large section of rural population. The total cultivated land of the state is 61.80 lakh ha out of which 29.14 lakh ha (47%) is high land 17.55 lakh ha (28%) medium land and 15.11 lakh ha (25%) low land. About 84% of the farmers are small and marginal and have limited access to resources. Literacy too is a concern for this vulnerable group of farming community. As per Agricultural Census 2010-11, the number of operational holdings of the state is 46.67 lakh with operational area 48.52 lakh ha. The state witnessed a decline in operational area due to urbanization and more of land put to nonagricultural use. Agriculture in the state is characterized by low productivity due to traditional agriculture practices by poor people, inadequate irrigation infrastructure, skewed land distribution, small size holding, low investment and capital formation and natural calamities occurring in quick succession.

The climate of the state is tropical, characterized by high temperature, high humidity, medium to high rainfall, short and mild winter. The normal rainfall in the State is 1451 mm, of which about 80% is confined to monsoon months (June-September).

4.1. Agro-ecologies in the State

The state is divided into 10 agro-climatic zones on the basis of soil, weather and other relevant characteristics (Table 1). Soil types range from fertile alluvial deltaic soils in coastal plains, mixed red and black soils in Central Table Land, red and yellow soils with low fertility

in Northern Plateau to red, black & brown forest soils in Eastern Ghat region. They differ widely from highly acidic to slightly alkaline and from light sandy to stiff clays. Soils are mainly acidic with the degree of acidity varying widely. Further, about 4 lakh ha is exposed to saline inundation, 3.54 lakh ha to flooding and 0.75 lakh ha to waterlogging in the deltaic areas. These are low in water holding capacity, fertility and having various production constraints. Agriculture sector in the state has an impeccable track record of meeting the challenges of food demand due to rapid growth of population. This can be construed to have been achieved through a favourable interplay of infrastructure, technology, extension and policy support. The net area sown and gross cropped area during the year 2013-14 were 54.24 lakh ha and 90.54 lakh ha, respectively. The cropping intensity for the year was 167 per cent. Rice was the major crop in *kharif* season, so were pulses and oilseeds in Rabi season. The gross irrigation potential created till 2013-14 from all sources was 50.05 lakh ha (33.53 lakh ha during *kharif* and 16.52 lakh ha during *rabi*) and gross irrigated area during the year was 35.21 lakh ha (22.54 lakh ha during *kharif* and 12.67 lakh ha during *rabi*) which is 70.35% of the irrigation potential created.

Table 1. Agro-climatic Zones of Odisha

Agro-climatic Zone	Climate	Annual rainfall (mm)	Soil group
1. North Western Plateau	Hot & Moist	1648	Red & Yellow
2. North Central Plateau	Hot & Moist	1535	Red loamy
3. North Eastern Coastal Plateau	Hot & moist sub-humid	1568	Alluvial
4. East & South Eastern Plateau	Hot & humid	1449	Coastal alluvial saline
5. North Eastern Ghat	Hot & moist sub-humid	1597	Laterite and brown forest
6. Eastern Ghat High Land	Warm & humid	1522	Red
7. South Eastern Ghat	Warm & humid	1522	Red, mixed red and yellow
8. Western Undulating	Warm & moist	1527	Black, mixed red & black
9. West Central Table Land	Hot & moist	1527	Red, heavy textured colour
10. Mid Central Table Land	Hot & dry sub-humid	1421	Red loamy, laterite mixed red & black

Source: NIDM Odisha, National Disaster Risk Reduction Portal, Dec 2017

4.2. Land use and cropping pattern

Rice is the most important food crop of Odisha. Nearly 70% of the state's population directly or indirectly depends upon rice cultivation. It is grown in an area of 41.8 lakh ha with productivity of 1821 kg ha^{-1} (rice) during 2013-14. Pulses are the second most important group of crops next to cereals in Odisha. The state grows ten important pulse crops namely, greengram, blackgram, pigeonpea, horsegram, lentil, gram, cowpea, rajmah, lathyrus and ricebean. During 2013-14, in Odisha, pulse crops were grown in about 20.88 lakh ha with production of 10.58 lakh tonnes and average productivity of 507 kg ha^{-1}. The yield of pulse crop both in India and Odisha maintains a plateau since last six decades. Breaking of this plateau is very much necessary to fulfill the protein requirement of vast population of the country.

Groundnut, sesame, castor, mustard, niger, sunflower, safflower, soybean and linseed are the major oilseed crops grown in the state. Of these, groundnut, sesame, mustard and niger are the major ones. Now, sunflower is gaining popularity in the State. The oilseed situation demands to enhance the production to meet the domestic need.

Among the fiber crops, jute and mesta are the most important ones. Jute is mainly cultivated in the coastal districts of undivided Balasore, Cuttack & Anandpur subdivision of Keonjhar and Mesta in the interior districts of Mayurbhanj, Keonjhar and Koraput. The area under jute & *mesta* is shrinking fast, mainly due to invasion of polythene & synthetic fibers as a cheaper & convenient substitute in addition to the inadequate marketing support.

The agro-climatic condition of the State is favourable for production of brinjal, chilli, tomato, okra, cucurbits, greens and bean, peas. Odisha is the second largest producer of vegetables in the country next to West Bengal. The major vegetables having commercial significance grown in the State are *solanaceous* vegetables (brinjal, tomato and chilli), cole crops (cauliflower, cabbage, knolkhol), cucurbits, okra, legumes, greens and tropical tuber crops (sweet potato, *dioscorea, amorphophalus, colocasia*). The vegetable growers of the State are now taking much interest in cultivation of hybrid vegetables and high value exotic vegetables like broccoli, red cabbage, lettuce and Chinese cabbage.

Major fruits grown in the State are mango, guava, citrus, banana, litchi, papaya, etc. Commercial floriculture has been identified as a profitable venture, which can open up great opportunities to the farmers. Besides, there is vast scope for promotion of allied sectors such as dairy, poultry, pisciculture, mushroom cultivation, bee keeping, value addition to agricultural produce, etc.

4.2.1. Land use pattern in Odisha

The state is broadly divided into four physiographic zones namely Coastal Plains, Central Table Land, Northern Plateau and Eastern Ghats. Total geographical area of the state is 15571 thousand ha out of which 5813 thousand ha is forest area, 342 thousand ha of miscellaneous tree and groves, 494 thousand ha of permanent pasture, 375 thousand ha culturable waste land, 840 thousand ha barren and unculturable land, 1298 thousand ha non-agriculture land and 5424 thousand ha net area sown land as per the report of Economic Survey 2014-15. The State has a cultivated area of 6200 thousand hectares out of

which 2700 thousand ha is high land, 1900 thousand ha medium and 1600 thousand ha are low land (Fig 1).

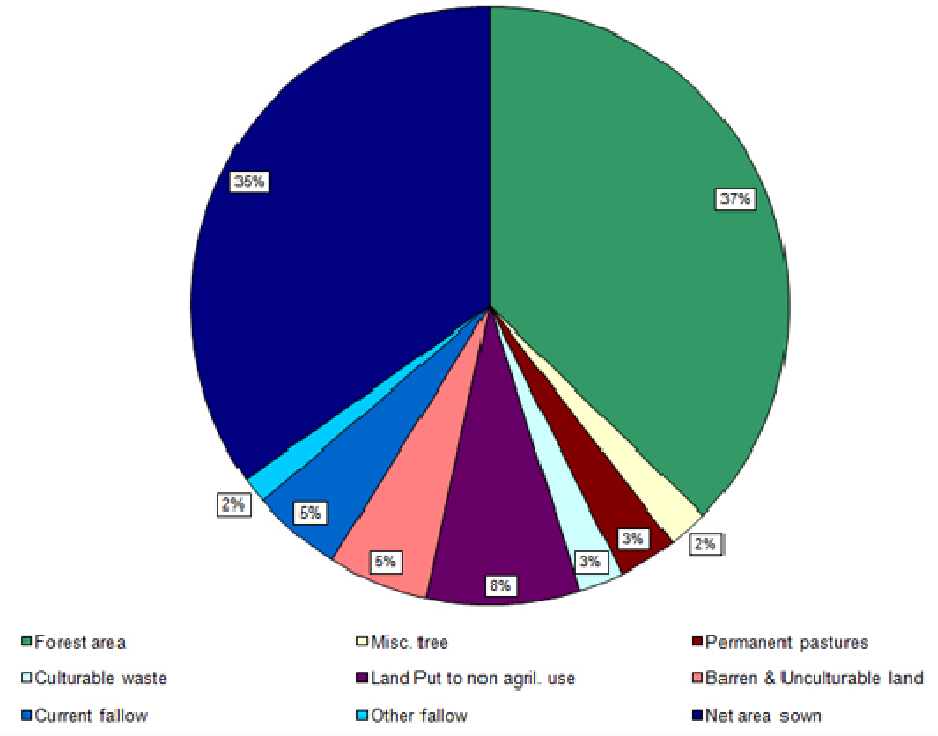

Fig 1. Land use pattern in Odisha (2013-14)

Source:http://envis.cesodisha.org/landuse/ Dec 2017

4.2.2. Cropping pattern in Odisha

The state has a cultivated area of 62 lakh ha out of which 27 lakh ha is high land, 19 lakh ha medium and 16 lakh ha low land. The paddy area during kharif is about 42 lakh and during Rabi 2.5 lakh ha. *Kharif* is the main cropping season and rice is the principal crop during kharif season. Cropping during rabi season is mainly confined to irrigated areas and areas with residual moisture. Other important crops produced in the State are pulses (*Arhar*, Mung, *Biri*, *Kulthi*), Oil seeds (Groundnut, *Til*, Mustard and Niger), Fibres (Jute, Mesta, Cotton), Sugarcane, Vegetables and Spices. Mango, Banana, Coconut & Cashew Nut are the main Horticultural crops of the state.

4.3. Natural resource endowments

Odisha is the store house of natural resources. Among these, water, wild life, forest and mineral resources are found in abundance and these are very essential for growth and development of the state. The total forest areas in the state is 5813 thousand hectares constituting about 37% of the total geographical area. The state is endowed with abundant water resources and extensive network of rivers and streams. For effective utilization and management of water resources, river basin plans for all the eleven river basins of the state have been prepared and steps are being taken to set up River Basin Organization. Soils of

Odisha influenced by climate, topography and parent material are the most heterogeneous for which the average productivity of many crops is low. Identification of specific soil problems and their efficient management would accelerate the crop productivity. The soils of Odisha have been divided into eight broad groups viz. red soil, black soil, laterite soil, deltaic alluvial, coastal saline and alluvial soil, brown forest soil and mixed red and black soil.

Sources of farmers' income in Odisha

Farm household income of Odisha is among the lowest in the country. Among the various sources of farmers' income in Odisha, wages/salaries contribute the largest share.

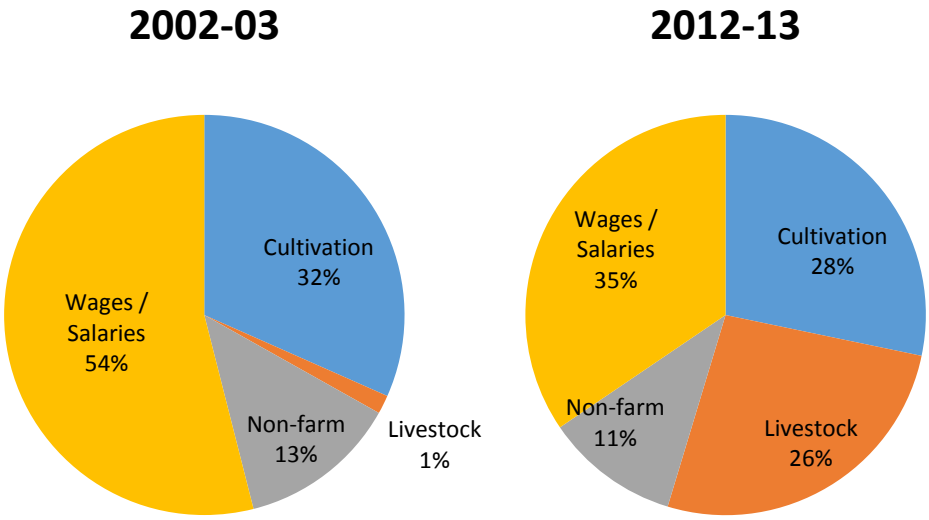

Fig. 2. Contribution of different sources to farmers' income of Odisha in 2002-03 and 2012-13

However, the proportions of shares from various sources are changing. For example, share from crop cultivation decreased from 32% in 2002-03 to 28% in 2012-13 (Fig. 2). Share of income from livestock, increased from 1% to 26%, while the contribution from both non-farm business (13% to 11%) and wages and salaries (54% to 35%) declined during this period. Annual farm household income of different states has been depicted in Fig. 3.

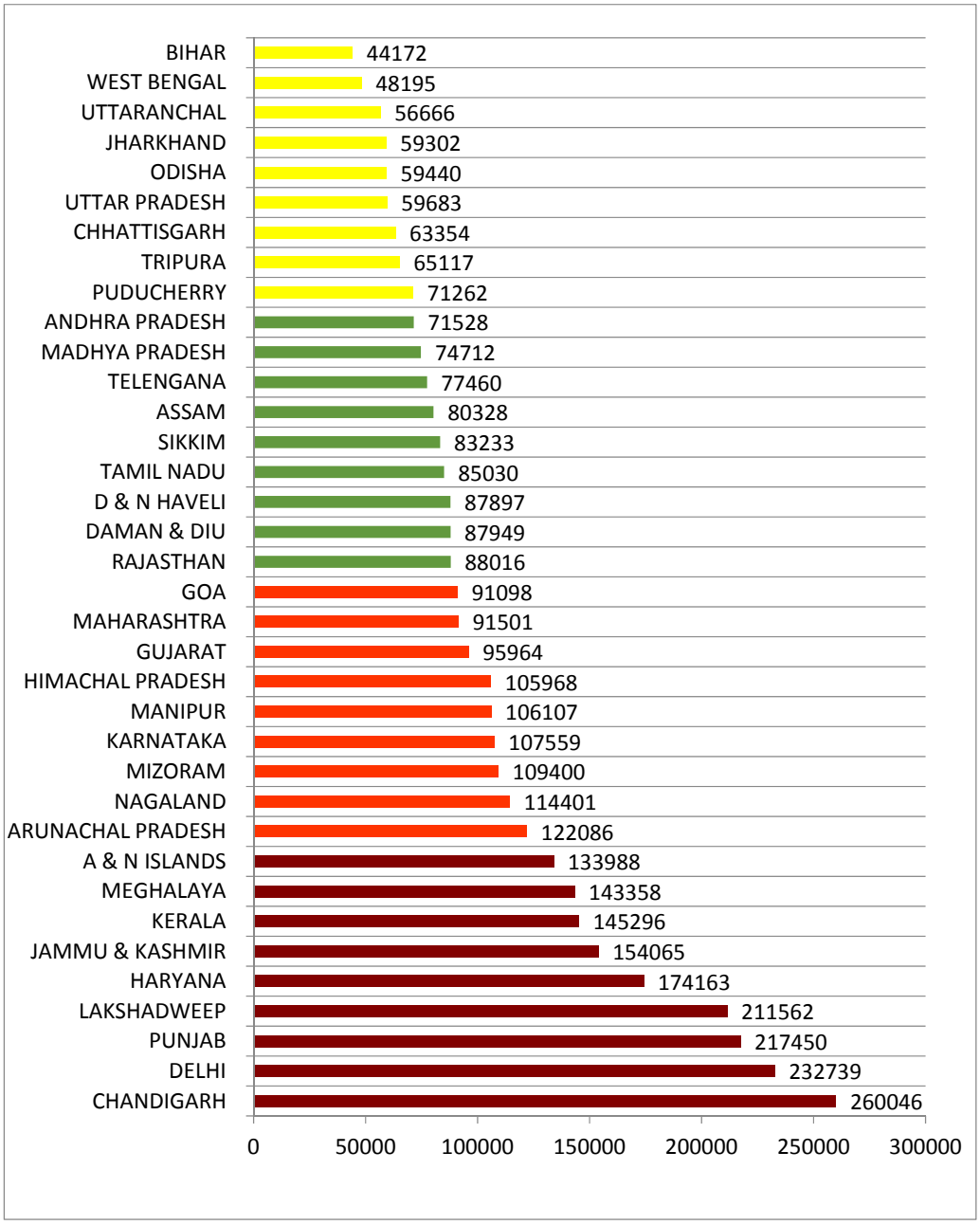

Fig. 3. Annual farm household income in different states of India

Source: Thiagu Ranganathan (2015)

4.4. Important development indicator in agriculture

4.4.1. Land holding

Land holding pattern is a prime determinant of the production structure and socio-economic conditions in a society. Operational land holdings are classified as marginal, small, semi-medium, medium and large land holdings depending upon the area controlled in a single land holding. Distribution of operational holdings indicates that the total number of

operational holdings has increasing over the years but the area under holdings has been declining except for scheduled castes. As per 2000-01 agriculture census, the area of operational holdings of all social groups was 50.81 lakh ha, which has declined to 50.19 lakh ha in 2005-06 census and finally to 48.52 lakh ha in 2010-11 census. The corresponding figures for scheduled caste stood at 5.14, 5.26 and 5.65 lakh ha, respectively for 2000-01, 2005-06 & 2010-11, while for scheduled tribes the figures were 16.31, 17.48 and 16.15 lakh ha, respectively.

Table 2. Important development indicators of Odisha

Indicators	**Odisha**	**India**
Demographic Indicators	**2011**	**2011**
1. Total Population (In millions)	42	1210
2. 2 % contribution to national population	3.47	100
3. Sex Ratio (females per 1000 males)	978	940
4. Under 6 sex ratio (females per 1000 males)	934	914
Economic Indicators	**2009-10**	**2009-10**
1. Net Domestic Product (at factor cost) (Rs. crores)	97359	4493743
2. Contribution of Agriculture to NSDP/GDP (%)	21.05	14.62
3. Contribution of Industry to NSDP/GDP (%)	17.28	20.16
4. Contribution of Services to NSDP/GDP (%)	61.66	65.22
5. Per Capita Net Domestic Product (factor cost) (Rs.)	24098	33731
6. NDP Growth rate (%)	8.48	8
Human Development Indicators	**2007-08**	**2007-08**
1. Human Development Index Value (HDI)	0.362	0.467
2. HDI Rank (out of 23)	22	
3. Gender Related Development Index (GDI)	0.524	0.590
4. GDI Rank (out of 35)	32	122
5. Gender Empowerment Measure (GEM)	0.393	0.497
6. GEM Rank (out of 35)	29	
Human Development Indicators	**2011**	**2011***
1. Inequality Adjusted Human Development Index Value (IHDI)	0.296	0.343
2. Inequality Adjusted Human Development Index Rank (out of 19)	17	
3. Loss in HDI due to Inequalities (%)	33.11	32
4. Literacy Rate (%)	73.45	74.04
5. Male Literacy Rate (%)	82.40	82.14
6. Female Literacy Rate (%)	64.36	65.46
Poverty and Hunger Indicators	**2009-10**	**2009-10**
1. Poverty Headcount Ratio (%)	37	29.8
2. Total number of poor (in millions)	15.32	354.68
	2005	**2005**
3. Multidimensional Poverty Index (MPI)	0.339	0.283
4. Multidimensional Poverty Headcount (%)	63.2	53.7
5. Number of Multidimensional Poor (in millions)	26.5	612

Indicators	Odisha	India
	2007	**2007**
6. Global Hunger Index (GHI)	23.8	23.3
7. GHI Rank (out of 17)	12	
	2005-06	**2005-06**
8. Prevalence of calorie undernourishment (%)	21.4	20
9. Prevalence of Underweight Children under 5 years of age (%)	40.9	42.5

Table 3. District-wise estimates of area of operational holdings for all social groups in Odisha (2010-11)

(Area in ha)

District	All Groups		Scheduled Caste		Scheduled Tribes	
	Nos.	Area	Area	Nos.	Nos.	Area
Angul	151450	146607	20014	15036	24496	21461
Balasore	285759	221581	61328	41492	2887	20144
Bargarh	193336	259515	28660	23938	44146	52801
Baudh	190915	170349	49189	37758	1752	1130
Bhadrak	249605	277289	40567	35430	58154	67592
Bolangir	75922	80266	14958	10834	9963	13375
Cuttack	164983	142648	36884	26532	3663	3102
Deogarh	43051	43737	5283	3862	16888	20167
Dhenkanal	111572	81980	17273	10209	16567	12303
Gajapati	69343	56414	1905	1129	51255	40879
Ganjam	295389	273919	41036	31150	14511	15984
Jagatsinghpur	122869	94900	31523	21385	340	261
Jajpur	125411	147883	34399	34092	8865	11093
Jharsuguda	63146	63338	9480	6049	27021	21503
Kalahandi	184310	255684	31576	33344	61182	93791
Kendrapara	91512	92801	14672	9532	91707	71184
Keonjhar	162140	126550	27479	21591	1599	919
Khurda	256477	253167	23740	17742	123950	116651
Koraput	119392	109999	14803	11501	6471	6572
Malkangiri	166734	270982	18004	22641	106458	164497
Mayurbhanj	96535	122450	23314	21189	66781	93964
Nawarangpur	389981	357627	22294	14401	246790	229630
Nayagarh	146456	187942	21674	24933	86666	113451
Nuapada	112064	92188	9624	6116	10542	12986
Kandhamal	98750	120502	12569	12382	37097	46993
Puri	163660	136786	30933	22166	67	27
Rayagada	129614	157890	12496	10894	95843	112584
Sambalpur	101129	149328	11633	11769	51090	57436
Sonepur	95721	91701	19632	11837	10678	9356
Sundargarh	210240	265993	15536	14530	152078	182855
State Total	4667466	4852014	702478	565464	1425507	1614693

Source: Agricultural Census, 2010-11

Table 4. Size Class-wise & Group-wise Distribution of the Number of Operational Holdings for all Social Groups in Odisha

Year		Size Class (Area in ha)					
		Marginal	Small	Semi Medium	Medium	Large	All class
All Social Group							
2000-01	No.	2294520	1113599	500531	145110	13375	4067135
	Area	1155145	1543709	1344201	817591	220387	5081033
2005-06	No.	2597164	1156162	472129	119529	11408	4356392
	Area	1341668	1587713	1250650	658208	181237	5019476
2010-11	No.	3368296	918647	311261	63688	5574	4667466
	Area	1921842	1497752	918947	381272	132201	4852014
Scheduled Caste							
2000-01	No.	393318	124640	42526	8183	329	568996
	Area	181294	170626	112469	44748	4768	513905
2005-06	No.	453408	133304	38482	5654	318	631166
	Area	214727	178387	99273	29659	4470	526515
2010-11	No.	564873	107869	26356	3230	150	702478
	Area	296118	171927	76401	18702	2316	565464
Scheduled Tribes							
2000-01	No.	638669	370169	170573	47276	3247	1229934
	Area	346508	516790	457778	264796	44913	1630785
2005-06	No.	771153	416540	175356	71399	2956	1407404
	Area	432988	580545	468877	227056	38785	1748251
2010-11	No.	949504	335732	118248	20867	1156	1425507
	Area	584636	543852	344892	122170	19143	1614693

Source: Agriculture Census, 2010-11

4.4.2. Production

Production and productivity in crop sector play a vital role in agriculture growth for the state. Food grain is the core product of crop sector in Odisha. Rainfall and its temporal and spatial distribution have direct bearings on the food grain production & productivity in the state. Recurring natural hazards led to varying degree of food grain production since last decade. Flood, cyclone and drought extensively damaged the food grain production in alternative years of 2011-12, 2013-14 & 2015-16. Consequently, food grain production declined sharply to 64.18 lakh ton in 2015-16 by 39% after a bumper crop of 105.27 lakh ton during 2014-15. Rice production in particular, fell by 40% over the rice production of 2014-15. Food grain production in Odisha from 2011-12 to 2015-16 is given in Table 5.

Table 5. Production (lakh ton) of Major Crops in Odisha

Crop	2011-12	2012-13	2013-14	2014-15	2015-16
Rice	5807	9497	7613	9845	5875
Maize	212	227	264	188	111
Other Cereals	50	9	10	10	13
Total Cereals (A)	6069	9786	7941	10088	6033
Tur	115	128	124	124	123
Other Pulses	132	264	259	279	232
Total Pulses (B)	247	424	419	439	385
Total Food grains (A+B)	6316	10210	8360	10527	6418
Groundnut	79	82	87	62	56
Other oilseeds	87	64	54	52	23
Total Oilseeds (C)	166	264	170	142	97
Cotton	231	336	299	316	298
Other fibers	120	29	31	27	24
Total Fibers (D)	351	434	397	403	366
Sugarcane	885	952	937	723	577
Potato	63	65	71	104	57
Other crop	75	74	74	73	69
Ginger	135	134	134	133	128
Total Other crops (E)	1158	1226	1217	1034	832
Grand Total (A+B+C+D+E)	7991	12134	10144	12106	7713

Source: Directorate of Agriculture and Food Production, Odisha; Directorate of Economics & Statistics, Odisha; Directorate of Horticulture, Odisha.

4.4.3. Cropping intensity

There are mainly three ways to meet the increasing demand for food and other farm products. One way is to expand the net area under cultivation, the second is to intensify cropping over the existing area and the third is to raise the productivity of production per hectare. Thus, raising the cropping intensity and productivity seem to be more viable strategies to increase production of farm products and farmers' incomes. Cropping intensity implies raising a number of crops from the same field during one agriculture year. Higher cropping intensity means more than one crop from the same area in an agricultural year. The cropping intensity in Odisha has increased from 157% in 2005-06 to 167% in 2012-13 which further rose to 146% during 2015-16 (Table 6).

Table 6. Cropping Intensity in Odisha

Year	Net area sown ('000 ha)	Gross cropped area ('000 ha)	Cropping Intensity (%)
2005-06	5,691	8,928	157
2011-12	5,292	8,799	166
2012-13	5331	8879	167
2013-14	5424	9054	167
2014-15	5496	9011	164
2015-16	5608	8180	146

4.4.4. Irrigation

Extensive irrigation drives the crop sector towards optimum production and productivity. In Odisha, out of total cultivated land of 61.80 lakh ha, about 54.74 lakh ha (36.11 lakh ha during kharif season and 18.03 lakh ha during rabi season) irrigation potential were created in 2015-16, as against 51.54 lakh ha during 2014-15. About 3.20 lakh ha of new irrigation potential were created during 2015-16. Major and Medium (flow), Minor (flow), Minor (lift), other sources and Mega lift projects contributed 37.29, 12.97, 24.54, 25.15 and 0.05%, respectively of total irrigation potential created during the year. Apart from that, out of total 18.66 lakh ha of cultivated land in the 8 KBK districts of the State, 12.77 lakh ha were irrigated as on 2014-15. Table 7 shows the status of irrigation potential created and utilized since 2005-06 to 2015-16.

Table 7. Status of Irrigation Potential Created & Utilized in Odisha

(in '000 ha)

Year	Irrigation Potential Created			Potential Utilized			% of utilisation
	Kharif	Rabi	Total	Kharif	Rabi	Total	
2005-06	2731.5	1294.92	4026.42	1922.7	1042.79	2965.49	73.65
2011-12	3089.34	1501.43	4590.77	2078.9	1009.18	3088.08	67.27
2012-13	3102.84	1543.99	4646.83	2186.86	1178.73	3365.59	71.55
2013-14	3312.3	1618.64	4930.95	2254	1267	3521	71.41
2014-15	3457.47	1696.56	5154.03	2327	1134	3461	67.15
2015-16	3670.91	1803.48	5474.39	2241.41	1052.94	3294.35	60.18

Source: Directorate of Agriculture: Agricultural Statistics of Odisha, 2015-16

4.4.5. Fertiliser and Pesticides consumption

Chemical fertilizers are vital input to crop production. The detail of fertilizer consumption of Odisha is given in Table 8.

Table 8. Fertilizer Consumption in Odisha

(In thousand ton)

Year	Nitrogen (N)	Phosphorous (P)	Potassium (K)	Total	Consumption (kg ha^{-1})
2011-12	323.4	135.48	55.8	514.68	62.3
2012-13	315.04	124.19	50.97	490.2	58.7
2013-14	312.99	117.7	56.45	487.14	57.1
2014-15	314.07	126.22	59.24	499.53	58.9
2015-16	332.24	131.51	53.74	517.49	65.9

Source: Directorate of Agriculture and Food Production, Odisha

Further, the use of fertilizers differs widely across the districts. During 2015-16, out of 30 districts, only 10 districts were above the state average of 65.91 kg ha^{-1}. The average consumption of fertilizer in Nabarangapur district is the highest i.e. 137.54 kg ha^{-1}, followed by Balasore (126.55 kg ha^{-1}), while Kandhamal is the lowest consuming district (13.95 kg ha^{-1}). The Table 9 reflects the district wise fertilizer consumption during 2015-16.

Table 9. District-wise Consumption of Fertilizers, 2015-16

District	Nitrogen (N)	Phosphorous (P)	Potassium (K)	Total	Consumption (kg ha^{-1})
Angul	4692	2681	804	8177	29.86
Bolangir	12835	4673	2363	19871	47.35
Balasore	22171	9496	5410	37077	126.55
Bargarh	33719	14940	5421	54080	126.18
Bhadrak	13646	7878	3463	24987	122.89
Boudh	4394	1576	445	6415	50.67
Cuttack	14626	2935	2079	19640	76.53
Deogarh	2987	1483	369	4839	50.28
Dhenkanal	4568	1838	744	7150	32.3
Gajapati	3665	1657	343	5665	45.51
Ganjam	29998	6623	2534	39155	72.34
Jagatsinghpur	6564	3224	1477	11265	65.51
Jajpur	9421	4445	2399	16265	70.08
Jharsuguda	3931	2213	814	6958	86.53
Kalahandi	20438	8513	3341	32292	58.37
Kandhamal	1011	756	276	2043	13.95
Kendrapara	5235	2584	578	8397	34.44
Keonjhar	9298	5811	1621	16730	45.39
Khurda	6744	1436	870	9050	52.42
Koraput	11142	4689	2538	18369	54.75

District	Nitrogen (N)	Phosphorous (P)	Potassium (K)	Total	Consumption (kg ha^{-1})
Malkangiri	4299	1927	467	6693	36.35
Mayurbhanj	15089	6762	2291	24142	57.74
Nuapada	7062	3549	692	11303	45.61
Nayagarh	3971	1030	771	5772	30.03
Nawarangpur	26196	7300	2706	36202	137.54
Puri	10149	3805	2308	16262	74.81
Rayagada	8418	3235	864	12517	57.75
Sambalpur	19596	7216	3186	29998	114.61
Sonepur	7065	3232	1031	11328	55.23
Sundargarh	9311	4002	1534	14847	41.79
Odisha	332241	131509	53739	517489	65.91

Source: Directorate of Agriculture and Food Production, Odisha.

The pesticide consumption in the State declined to 0.93 thousand tons during 2015-16 which was 1.28 thousand tons during 2014-15. Per ha consumption of pesticide also declined to 115 thousand tons during 2015-16 compared to 147 thousand tons in 2014-15 (Table 10).

Table 10. Pesticide Consumption in Odisha

Year	Total consumption ('000 ton)	Consumption (g ha^{-1})
2011-12	1.16	148.00
2012-13	1.21	158.00
2013-14	1.44	169.00
2014-15	1.28	147.00
2015-16	0.93	115.00

Source: Directorate of Agriculture and Food Production, Odisha.

4.4.6. Implements and Mechanization

Farm mechanization has great significance for enabling farmers to take up timely and quality agricultural operations, reducing costs of production and improving productivity. Massive farm mechanization programme has been taken up by the state during recent past. The machineries, equipments supplied under farm mechanization are presented in Table 11, which show a tremendous rise in demand for improved farm machineries and equipment.

Table 11. Machineries Supplied under Farm Mechanization

(Supplied in Nos)

Year	Tractor	Power tillers	Combined harvester	Rotavator
2008-09	1500	5280	49	38
2009-10	2325	7615	72	36
2010-11	4750	12742	123	311
2011-12	9231	11257	78	96

2012-13	11085	12503	103	469
2013-14	11891	13032	399	4553
2014-15	10325	14388	264	4631
2015-16	11688	9166	407	5003

Source: Directorate of Agriculture and Food Production, Odisha.

4.4.7. Farm credit

Modern agriculture is capital intensive, farmer's access to farm credit is crucial in enhancing crop productivity, especially in Odisha's context. It encourages farmers to undertake new investments and adopt new technologies for more productivity. The details of disbursment of crop loan are given in Table 12.

Table 12. Disbursement of Crop Loan

Year	Crop loan disbursed
2010-11	5449
2011-12	8520
2012-13	8457
2013-14	12582
2014-15	12866
2015-16	15869

Source: Directorate of Agriculture and Food Production, Odisha.

5. Infrastructure for Agriculture and Government Programmes

5.1. Agricultural Extension Services

The Agriculture Extension machinery under the Directorate of Agriculture is engaged in the transfer of latest production technologies to the farmers round the year. There is tremendous scope for up-gradation of technologies adopted in farming of different crops in the state. The Agricultural Extension Workers from the village level and upwards play the significant role in the process of technology transfer.

5.2. Agricultural Farms

There are 62 farms existing under Agriculture Directorate having a total geographical area of 2171 ha. The Departmental farms are used for production of Foundation and Certified Seeds for use in various purposes.

5.3. Soil Testing Services

Soil testing is an important technical support service for farmers. In order to cater to this need, the Department provides facilities for soil testing through 27 Soil Testing Laboratories located at different districts.

5.4. Establishment of Agro Industrial Estate

The scheme was introduced during 2013-14 with a view to establish Agro Industrial estates in potential pockets through opening up opportunities for value addition and commercial agri-entrepreneurship. For implementation of the scheme, a sum of Rs 661.82 lakh was provided for establishment of Agro Industrial Estate in the state. Steps were taken to establish one Agro Industrial Estate at Nawarangpur through IDCOL.

5.5. Establishment of *Krushak Hat*

The scheme is being implemented from 2013-14 and a provision has been proposed for continuation of the scheme.

5.6. Development of Infrastructure for Post Harvest Management

The scheme was introduced during 2013-14 in order to develop infrastructure for post harvest management in a bid to facilitate value addition for better returns. During 2014-15, steps were taken to establish community threshing floor and popularization of Dal mill for processing of pulses and value addition at a total cost of Rs. 103.25 lakh.

5.7. Infrastructure Development of Input Sale Centres

The Scheme is being implemented in the state for infrastructure development of input sale centers, so that the agri-inputs could be stored well in advance to facilitate timely agricultural operations by the farmers.

5.8. Strengthening and Infrastructure Development for Training/Research Centre/ Laboratories/Implement Factory

The Directorate of Agriculture has 3 Regional Institutes for Training on Extension (RITE), 27 Soil Testing Laboratories (except Bhadrak, Jajpur & Gajapati) , 2 fertilizer Testing Laboratories, 13 Adaptive Research Stations, 1 Institution of Minor Irrigation and Water Use, 1 Seed Testing Laboratory and 1 Odisha Farm Machineries Research and Development Centre (OFMRDC), Bhubaneswar. RITEs have engaged themselves in imparting intensive training to farmers, agri-entrepreneurs and the extension functionaries, while Adaptive Research Stations are engaged in multi location trials and evolving location specific technologies. The various Laboratories (Soil/Fertilizer/Pesticide/Seed testing) look after quality control and soil testing aspects. The OFMRDC designs, tests and produces different agricultural implements/machineries.

5.9. Construction of New Buildings

This Scheme is being implemented in the State since 2012-13 for construction of new buildings in order to strengthen agriculture extension to aid smooth implementation of various programmes.

5.10. Establishment of Marketing Infrastructure for Horticultural Produce

Due to inadequate marketing infrastructure, the producers are not getting remunerative prices for their produce at the time of harvest. Keeping this in view, a new initiatives has been taken for establishment of 5 rural market/apni mandi, 5 retail market/outlet, 20 nos. static/mobile vending cart and 5 functional infrastructure for collection, grading and sorting of agricultural produce.

5.11. Establishment of Regional Coconut Nursery

The scheme is being implemented under Mission for Integrated Development of Horticulture (MIDH). This scheme envisages rising of coconut seedling in Government Farm and Nurseries and seedlings are sold to the farmers at subsidized rate for area expansion of coconut in the state.

5.12. Establishment & Revival of Block level Nurseries

Quality planting materials play a vital role in increasing the production and productivity of horticultural crops. With a view to provide quality planting materials for public sale as well as utilization in Government programmes, it has been programmed to establish / revive at least one nursery in each Block for production and stocking of quality planting materials of fruit, vegetable and flowers. Besides sale of quality planting materials, these nurseries will sell garden tools to the farmers.

5.13. Watershed Development Works

Main aim of the Integrated Watershed Management Programme is to implement different soil and moisture conservation, water harvesting, plantations and ground water recharge activities. The activities are implemented following the ridge to valley approach. All activities contribute towards restoration of the catchment area by reducing the volume and velocity of surface run-off and regeneration of vegetative cover in forest and common land. Drainage line treatment with a combination of vegetative and engineering structures, such as earthen checks, brushwood checks, gully plugs, loose boulder checks, gabion structures are constructed for water harvesting and in situ conservation.

5.14. Odisha University of Agriculture & Technology (OUAT)

5.14.1. Education

The University conducts Undergraduate and Post Graduate courses in Agriculture, Horticulture, Forestry, Agricultural Engineering, Home Science, Fishery Science, Animal

Husbandry & Veterinary Sciences, Basic Sciences, Microbiology, Bioinformatics, Computer Application and Agri-Business Management through 10 Colleges and one Centre for Post Graduate Studies.

5.14.2. Research

The Orissa University of Agriculture and Technology undertakes fundamental, applied and adaptive research in all the 10 agro-climatic zones of the State with the objective of generating location specific technologies for higher production and productivity in agriculture and allied sectors through eight Regional Research and Technology Transfer Stations (RRTTS), four Sub-Stations (RRTTSS), seven Commodity Research Stations and 13 Adaptive Research Stations. Fifty-one All India Co-ordinated Research Projects and 49 ad-hoc Research Projects are in operation with financial support from ICAR, Government of India, State Government and several other external funding agencies.

5.14.3. Extension Education

Presently 31 Krishi Vigyan Kendras (KVKs) are functioning in 28 districts of the state under OUAT.

5.14.4. Establishment of 10 Agro Polytechnic Centres

Keeping in view 10 agro-climatic zones of the state, regional needs of the farmers and to create middle level skill technical manpower (agro-technicians) in the field of Agriculture and allied fields of Horticulture, Animal Science and Fishery Science through practical oriented agricultural and agro-based technological education, 10 Agro-Polytechnic Centres have been established in 10 agro-climatic zones in the districts of Ganjam, Dhenkanal, Bhadrak, Deogarh, Boudh, Sundergarh, Bolangir, Keonjhar, Sambalpur and Koraput under OUAT. Diploma courses are being offered in 6 in Agriculture Science, 2 in Horticulture and one each for Fisheries and Animal Sciences.

5.14.5. Extension Training and IMAGE

Institute on Management of Agricultural Extension (IMAGE) as a State Agricultural Management and Extension Training Institute (SAMETI) caters to the HRD needs of ATMAs in districts by facilitating preparation of Strategic Research and Extension Plan (SREP), conducting Techno Managerial Training at district level and other trainings, disseminating farm information by organising district level exhibitions and distribution of printed leaflets and such other activities.

5.15. Odisha State Seed & Organic Products Certification Agency (OSSOPCA)

The objective of establishing Seed Certification Agency is to give adequate support to the Controller of Seed to enforce Seeds Act, 1966 and Seed Rule, 1968. The Seed Certification Agency is to ensure that seeds of superior crop plant variety are made available to farmers through seed certification. The Agency verifies genetical identity of a variety with respect to its distinctness, uniformity and stability parameters, high degree of physical purity, high standards of germinability to give rise to vigorous seedlings, freedom from all designated seed borne diseases, weeds and other crop seeds, thereby qualifying the minimum prescribed standards, which should be ascertainable under field and laboratory conditions. This Agency is to bring the benefit to the common farmers for higher yield and productivity

by verifying the superior varieties and hybrids evolved by plant breeders. Under "Traceability System in Seed Certification", the online activities for Seed Certification has been implemented from *Kharif* 2014 for the entire state. This will bring more transparency in seed certification activity.

5.16. Agricultural Promotion and Investment Corporation of Odisha Limited (APICOL)

The Agricultural Promotion and Investment Corporation of Odisha Limited (APICOL), which was established during the year 1996 as a promotional organization is engaged in promotion of commercial agri-enterprises including agro based and food processing industries in the state. The Corporation has been implementing various programmes through the agricultural extension network of the Department to encourage mechanization investment in the field of agriculture including investment in creation of captive irrigation source in farmers' fields through establishing Shallow Tube Wells (STW), Bore Well (BW), Dug Wells (DW) and River Lift Irrigation Projects (RLIP). The Corporation acts as the channelizing agency for release of subsidy under various schemes of State Agriculture Policy 2008 as well as new Agriculture Policy 2013 including farm mechanization covered under various Central as well as State Plan schemes. It also provides escort services to houses engaged in Agri-business.

APICOL is acting as the Virtual Office of Agricultural and Processed Food Products Export Development Authority (APEDA), under the Ministry of Commerce and Industry, Government of India. Commercial Agri-Enterprises has been considered as one of the prime movers for not only self-employment but also for creation of indirect employment opportunities. Number of Commercial Agri-Enterprises and Agro Service Centers has been established and Capital Investment Subsidy has been released for these projects by APICOL.

5.17. Odisha State Seeds Corporation (OSSC)

The Odisha State Seeds Corporation (OSSC) has been designated as the Nodal Agency for production, procurement and supply of quality seeds to the farmers of the state. The Odisha State Seeds and Organic Products Certification Agency (OSSOPCA) is responsible for certification of the seeds produced in the state under the Seeds Act. The OSSC has been implementing the 'Seed Village Programme' as "*Mo Bihana Yojana*" for production of certified paddy and non-paddy seeds through farmers. Incentives at various rates are given to the seed growers under various schemes for taking up production of certified seeds. The seeds produced in farmers' fields are processed by the OSSC/ Government Processing Plants and through designated private processors and are procured by the OSSC Limited. after certification by the OSSOPCA.

Besides procuring seeds from the farmers under the Seed Village Programme, the OSSC procures certified seeds from the OUAT, MoU farms, the National Seeds Corporation and other National/State Pubic Sector agencies for meeting farmers' need for quality seeds.

5.18. Odisha Agro Industries Corporation (OAIC)

The Odisha Agro Industries Corporation Limited (OAIC) is functioning in the state since 1974. It is engaged in marketing of various agricultural inputs including agricultural machineries/ equipments/implements through its network. Besides, the Corporation also executes Shallow Tube Wells, Bore wells and River Lift Irrigation Projects for the farming community. It also provides other inputs such as fertilizers, pesticides and cattle/poultry feed to the farmers.

5.19. Odisha State Cashew Development Corporation (OSCDC)

The OSCDC Limited was established in the year 1979 with main objectives to develop land, raise cashew plantation and other suitable species, render technical guidance and assistance to cashew growers and make available good planting materials.

5.20. Animal Resources Development Sector

Table 13. Departmental Infrastructure

Sl.No.	Institution	Number
1.	Veterinary Dispensary (VD)	540
2.	Livestock Aid Centre (LAC)	2939
3.	Frozen Semen A.I. Centres (VD & LAC + Other centers)	2659+31901
4.	Clinical Investigation Laboratory, State Veterinary Laboratory	4
5.	Animal Disease Research Institute	1
6.	District Diagnostic Laboratory	26
7.	Odisha Biological Products Institute	2
8.	Department Training Centers	7
9.	Livestock Breeding Farms	11
10.	Poultry Breeding Farms + Duck Breeding Farms	8+2
11.	Fodder Farms	20
12.	Sheep Breeding Farm	1
13.	Goat Breeding Farms	6

Table 14. Fisheries Sector

FISH SEED HATCHERY	Unit	Fry Capacity (in million)
Freshwater		
Government (R&D)	**05**	**489.00**
Government hatchery	**20**	**11.70**
Government rearing farm	**59**	
OPDC	**05**	210.00
Private	**97**	520.00
Freshwater prawn seed hatchery		
Govt.	**03**	80.0
Private	**07**	125.0

SHRIMPSEED HATCHERY	**Unit**	**Capacity (in million)**
Brackish water		
Government	**2**	75.0
Private	**12**	292.5
ICE PLANT AND COLD STORAGE	**Unit**	**Capacity (in ton)**
Ice Plant	57	613.5
Cold Storage	12	67.0
MARINE FISH LANDING CENTRE		
Harbour	4	
Jetty	8	
Landing platform	15	
Other landing Centres	36	
Total	**63**	
Fish Drying platform	10	
CRAFTS (Marine) 2012-13		
A. Mechanised		
Trawler	1563	
Gillnetter	591	
B. Motorised	4081	
C. Country Crafts (Non-Motorised)	3522	
TOTAL	**9757**	
Marine Products Export Development Agency 2013-14		
Processing Plants	20	459.50
Storage Premises	21	
Peeling Sheds	20	215.82
Ice Plant	2	58.00

5.21. Government Programmes

5.21.1. National Mission on Oilseeds and Oil Palm (NMOOP)

Government of Odisha have implemented this mission from the financial year 2014-15 with a funding pattern of 75:25 between Centre and State for increasing the production and productivity of oilseeds and oil palm crops. Under this mission, 3 mini missions are being implemented.

5.21.2. Mini Mission–I on Oilseeds

Quality oil seeds of groundnut, soybean, rapeseed, sunflower, linseed mustard, sesame and niger are supplied at subsidized rates from the financial year 2014-15 under the scheme. During 2015-16, incentives have been provided to the farmers for production of foundation and certified seeds.

5.21.3. Mini Mission-II on Oil Palm

The main objective of this scheme is to provide subsidies for production of Oil Palm seedling, maintenance cost for newly created Oil Palm plantation, micro-irrigation etc. with financial assistance from Government of India and State Government in the ratio of 75:25.

5.21.4. Mini Mission–III on Tree Borne Oilseeds (TBOS)

It has been proposed to take up olive plantation in the State under Mission-III of NMOOP. Under the scheme, assistance will be provided to the farmers.

5.21.5. National Food Security Mission (NFSM)

This is a centrally sponsored scheme launched in 2007-08 with the objective of increasing production of rice and pulses through expansion of area and enhancement of productivity in a sustainable manner in the identified districts. As per the revised guideline of the Govt. of India, NFSM has five major components, such as, (1) NFSM-Rice, (2) NSFM-Pulses, (3) NFSM-Coarse cereals, (4) NFSM-Commercial crops and (5) NFSM-Wheat. Except NFSM- Wheat, all other components were implemented in the state from the financial year 2014-15.

5.21.6. National Mission for Sustainable Agriculture (NMSA)

Under NMSA, components, namely Soil Health Management (SHM), On-farm Water Management (OFWM), Rain-fed Area Development (RAD), Climate Change and Sustainable Agriculture Monitoring, Modelling, Networking (CCSAMMN), Soil Health card and Paramparagat Krishi Vikas Yojana have been implemented which are outlined below.

Soil Health Management (SHM): The objectives to maintain soil health through promoting use of soil test based recommendations, organic manures, integrated nutrient management besides conducting front line demonstrations and capacity building for sustainable crop production.

Soil Health Card: This component of NMSA has been implemented during 2015-16 with objective of providing soil testing results to the farmers in the form of “Soil Health Card”.

Rain-Fed Area Development (RAD): This component introduced appropriate farming system by integrating multiple components of agriculture like crop, horticulture, livestock, fishery, forestry with agro based income generating activities and value addition practices.

Paramparagat Krishi Vikash Yojana (PKVY): This component of NMSA implemented in the State during 2015-16 with an objective of promoting organic farming through adoption of low cost eco-friendly technologies.

5.21.7. National Mission on Agriculture Extension and Technology (NMAET)

This is a centrally sponsored scheme with 4 sub-missions, namely- i) Sub-mission on Agriculture Mechanisation (SMAM), ii) Sub-mission on Agriculture Extension (SMAE) , iii) Sub-mission on Seed and Planting Materials (SMSP) and iv) Sub-mission on Plant Protection and Plant Quarantine (SMPP).

Sub-mission on Agriculture Mechanisation (SMAM): The schemes like “Macro-Management of Agriculture” through which subsidy assistance for farm mechanization was provided, “Promotion of Agriculture Mechanisation through Training Testing and

Demonstration" and "Post-Harvest Management and Technology" have been subsumed under this sub-mission.

Sub-mission on Agriculture Extension (SMAE): The centrally sponsored scheme "Support to State Extension for Extension Reforms", the Central Plan Scheme, "Capacity Building to Increase Competitiveness in Agriculture" and "AGRISNET Project/National e-Governance Plan for Agriculture" have been subsumed under this sub-mission.

5.21.8. Rashtriya Krishi Vikas Yojana (RKVY)

This scheme was introduced by Government of India in 2007-08 with the objective of achieving 4% growth in agriculture and allied sectors. RKVY aims at achieving and sustaining desired annual growth by ensuring holistic development of agriculture and allied sectors. This scheme promotes development of agriculture, horticulture and other allied areas like animal husbandry, dairy development, fisheries, agriculture research & education, minor/lift irrigation and watershed development.

5.21.9. Biju Krushaka Kalyan Yojana (BKKY)

To provide health insurance to the farmers, Biju Krushaka Kalyan Yojana (BKKY) has been introduced by State Government in 2013-14. It is an earnest effort to provide them financial support through health and accident insurance as a part of commitment of a welfare state.

5.21.10. Odisha Watershed Development Mission

The State Government has given priority to the development of rain fed areas in the State during 12th Five Year Plan. The OWDM has also been designated as the state level nodal agency for implementation of the flagship programme, Integrated Watershed Management Programme (IWMP), which was launched by the Department of Land Resources. The project covers 26 districts of Odisha except Puri, Jagatsinghpur, Kendrapada and Bhadrak. The main objectives of IWMP are to restore ecological balance by harnessing, conserving and developing degraded natural resources.

5.21.11. Sustainable Harnessing of Ground water in water Deficit Areas (BKVY)

This programme was introduced in 26 districts of the state in 2010-11 and popularly known as Biju Krushak Vikash Yojana (BKVY), which has been implemented through Odisha Lift Irrigation Corporation under Water Reources Department. Under this scheme, deep bore wells are being constructed in clusters of farmers' fields which cover 5 ha during kharif and 2 ha during rabi season.

5.21.12. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been launched during 2015-16 by Ministry of Agriculture and Farmers Welfare, Government of India with an objective of access to some means of protective irrigation to all agricultural farms to "produce per drop more crop" to achieve much desired rural prosperity. PMKSY has 4 major components: 1) Accelerated Irrigation Benefit Programme, 2) *Har Khet Ko Pani*, 3) Per Drop More Crop and 4) Watershed Development. Odisha Watershed Development Mission (OWDM) has been designated as State Nodal Agency for PMKSY at State. Preparation of District Irrigation Plan (DIP) is mandatory for implementation of PMKSY. During 2015-16, DIPs of all districts have been prepared.

5.21.13. National Horticultural Mission (NHM)

This is a centrally sponsored scheme launched in 2005-06 and activities have been extended to all the 30 districts of Odisha for development of 14 major horticultural crops. The main objective of the programme is to promote horticultural crops including fruits, flowers, vegetables and other crops.

5.21.14. Establishment of Regional Coconut Nursery

This scheme has been implemented under Mission for Integrated Development of Horticulture (MIDH) from 2014-15 with an objective of raising of coconut seedlings in Government Farms and Nurseries and sold to farmers at subsidized rates.

5.21.15. Special Crop Specific Scheme Floriculture

The scheme envisages achieving self-sufficiency in floriculture as well as generation of revenue for the farmers. Assistance has been provided to the floriculture farmers to take up rose, tuberose, marigold & jasmine for cultivation in their fields.

5.21.16. Scheme for Coconut

The objective of the scheme is to increase area and production of coconut as the existing provision made under the Coconut Development Board (CDB) but production is not sufficient to meet the demand of the State.

5.21.17. Scheme for Banana

The scheme envisages to make the state self-sufficient in banana production and to generate more profit for the farmers as the areas covered under existing schemes are not sufficient to cater to the demand of the state. It has been programmed to take up banana tissue culture plantation under the scheme to give impetus to banana cultivation in the state.

5.21.18. Scheme for Betel Vine

As the farmers have to incur a huge expenditure during its initial period of establishment, it is proposed to provide assistance to the tune of 50 percent of the 1st year establishment cost under the new scheme “Special Crop Specific Scheme- betel vine” under State plan with the objective to promote betel vine cultivation in the state.

5.21.19. Scheme for Development of Potato, Spices and Vegetables

In order to encourage farmers to take up cultivation of potato and other vegetables, quality seed materials were sold to the farmers at subsidized rate.

A state level task force on agriculture development and rejuvenation was constituted under the Chairmanship of Chief Secretary, Odisha by Agriculture Department as recommended by NITI Aayog.

- Odisha is among the few states in India that presents a separate budget on agriculture since 2013-14, which is indicative of the priority given to agriculture and allied sector.
- Since 2013-14, agriculture budget is reflecting an increasing trend. The State’s agriculture budget for 2013-14 was Rs. 7162.00 crore, whereas the provision for 2015-16 and 2016-17 was Rs. 10903.62 crore and Rs.13181.89 crore, respectively.

- The state has formed a separate “Agriculture Cabinet” for farmer centric development.
- State Potato Mission has been formed for making the state self sufficient in production of Potato by the year 2017-18.
- State has formulated “Odisha Fisheries Policy, 2015" and intends to be pioneer in Aquaculture Development.
- Bovine Breeding Policy and Poultry Policy are major achievements of the State in 2015-16.

6. Productivity Gaps and Major Constraints

6.1. Productivity Gaps

Yield rate is one of the major indicators to assess the production trend of the agriculture crops in the state. The yield rate of food grains in Odisha is below the average yield rates in some of the major states and at all India level. There is, therefore, a need for greater efforts through different policy interventions to increase the productivity of major crops.

The average yields of major crops in Odisha are given in Table 15. The average yield rate of rice has increased from 18.21 q ha^{-1} in 2013-14 to 23.63 q ha^{-1} in 2014-15. But during 2015-16, it declined to 14.91 q ha^{-1}. However, the yield rate of Potato and Sugarcane decreased from 123.24 to 101.73 and from 719.51 to 644 q ha^{-1}, respectively during 2015-16 over previous year. The yield rate of Wheat, Ragi, and Groundnut has declined during 2015-16. The yield rate of Gram and Jute increased slightly i.e. from 7.70 to 7.75 and from 16.25 to 21.74 q ha^{-1}, respectively during 2015-16 over 2014-15.

Table 15. Average yield (q ha^{-1}) of major crops in Odisha during 2011-16

Crops	2011-12	2012-13	2013-14	2014-15	2015-16
Rice	14.5	23.61	18.21	23.63	14.91
Autumn rice	7.78	17.32	14.63	17.75	7.19
Winter rice	14.33	24.02	17.39	23.78	14.85
Summer rice	32.13	31.65	34.22	33.42	33.56
Ragi	5.62	7.7	8.09	7.38	6.2
Gram	7.8	7.74	7.68	7.7	7.75
Greengram	2.87	3.13	3.52	3.56	2.94
Blackgram	2.66	3.34	3.11	3.37	3.28
Sugarcane (‘000 t ha^{-1})	610.19	655.45	658.91	719.51	644
Mustard	2.12	2.75	2.69	2.44	2.05
Jute	14.77	17.52	18.09	16.25	21.74
Cotton	3.86	4.82	4.1	4.23	4.04
Potato	109.03	122.12	115.98	123.24	101.73
Groundnut	11.89	12.31	14.49	12.68	10.97
Wheat	16.4	19	15.75	16.28	13.47

Source: Directorate of Agriculture and Food Production, Odisha, Directorate of Economics & Statistics, Odisha.

6.2. Production constraints of different crops

6.2.1. Cereals

- Low yield of direct sown upland rice due to severe weed problem and moisture stress
- Low fertilizer use and want of balanced fertilization
- Severe weed problem in direct sown upland & medium land rice
- Non availability of high yielding export quality aromatic rice to make rice production more remunerative
- Iron toxicity in low land paddy fields
- Pest and disease problems like gall midge, caseworm, leaf folder, gundhi bugs, BLB and sheath rot

6.2.2. Pulses

- Low productivity of horsegram
- Stored grain pests
- Lack of improved package of practices for greengram, blackgram, bengalgram, lentil and arhar
- YMV, PMB & leaf curling in winter sown greengram
- Pod borer and blister beetle damage in arhar
- Leaf spot and powdery mildew in greengram and blackgram

6.2.3. Oilseeds

- Gradual yield reduction in groundnut due to continuous cropping
- Tikka disease in groundnut
- Collar rot and bud necrosis in groundnut
- Difficulty in digging of rainfed kharif groundnut due to hardening of soil at maturity
- Low yield of linseed taken as pyra in low and medium lands
- Low yield of niger
- Severe incidence of aphids in mustard
- Lack of suitable variety in toria group
- Lack of development of suitable agro-technique for yield maximization
- Severe pest attack at flowering and podding

6.2.4. Vegetables

- Non-availability/non-adoption of seeds of improved/high yielding varieties of vegetables
- Low and imbalanced use of manure and fertilizes
- Severe wilt in solanaceous vegetables
- Flower and fruit drop in solanaceous and curcurbit crops

- Micronutrient deficiency due to excess use of high analysis fertilizers
- Problem of phompsis fruit rot and root knot in brinjal
- Vine borer and white grub attack in pointed gourd
- Yellow vein mosaic virus disease in okra
- Cultivation of local variety of sweet potato with poor management practices resulting in low yield
- Problem of tuber rotting

6.2.5. Fruits

- Poor bearing of mango, ber, guava, citrus & papaya
- Die back in citrus
- Severe wilt and bunchy top in banana
- Canker disease attack in guava fruits
- Fruit drop, jassid and fruit fly attack in mango

6.2.6. Commercial crops

- Low yield of sabai grass
- Fruit drop and fruit rot in jack fruits
- Survival of plantation crops is difficult due to non availability of water for irrigation

6.2.7. Fodder crops

- Unwillingness of the farmers to use cultivable lands for fodder cultivation
- Lack of suitable cultivars of fodder and its agro-techniques
- Non-adoption of suitable package of practices for fodder crops
- Marketing problem of fodders
- Seed supply problem at farmers level
- Storage problem for green fodders

6.2.8. Animal production

- Foot and mouth disease and diarrhea in cattle
- Ranikhet disease in poultry
- Lack of fodder cultivation and feeding of live stocks with less nutrient feeds
- Less milk production due to rearing of more desi breeds of cows and buffaloes than cross bred
- Cross-bred animals are not preferred as they are more susceptible to diseases

7. Potential for Development of Horticulture, Livestock, Fisheries, Agro-forestry and Post-harvest processing, etc.

Horticulture is becoming popular in the hilly districts. Odisha has immense potential in horticulture, particularly in vegetable cultivation and micro irrigation. Onion is the most important horticulture crop, followed by vegetable. Commercial floriculture is also increasing; the recently established flower growers' market in Ganjam is the precursor of the growth of this rising sector. Commercial dairy farming is also gaining in importance. Fresh and salt-water fisheries, especially prawn cultivation, play a vital role in the economy. Odisha's agriculture exports mainly derive from prawn farming.

8. Role of Technology

8.1. Strategy and action plan for enhancing production, cost reduction, quality improvement, generating additional income

Farmers' income can be improved when productivity goes up, cost of production comes down, risk is reduced, post-harvest loss is minimized and commodities produced get a remunerative price. It should also improve income from allied activities to agriculture. The strategy should integrate these all. The following options are available for increasing farmers' income.

8.1.1. Improving productivity and quality

1. Providing quality seed and enhancing seed replacement ratio
2. Promoting high-yielding varieties and hybrids
3. Growing nutrient rich rice (CR Dhan 310 and 311) and aromatic rice
4. Increasing cropping intensity in rice-fallow areas

8.1.2. Increasing input use efficiency

1. Crop planning to identify areas where the crop can be grown with least input
2. Promoting water harvesting and micro-irrigation to achieve per drop-more crop
3. Using soil health card and site-specific crop management
4. Promoting farm mechanization and solar energy

8.1.3. Reducing crop loss

1. Adopting plant protection measures
2. Promoting resistant varieties and e-surveillance
3. Crop insurance to mitigate risks at affordable cost
4. Weather services and forecasting system

8.1.4. Diversification

1. Dairy husbandry for small farmers
2. Promotion of intensive vegetable production
3. Promotion of inland fisheries
4. Promotion of ancillary activities like poultry, beekeeping and mushroom cultivation
5. Strengthening Organic Food Program

8.1.5. Market price realization and value addition

1. Community/co-operative farming with crop-value chain
2. Use of the crop biomass to make products through small industry
3. Creation of a national farm market with information system for export and online selling
4. Agribusiness Incubation Centres to promote agri-preneurship

8.2. Action plan for enhancing production and income

As suggested by Prof. MS Swaminathan, an agro-climatic zone-specific action plan is required to address the constraints of increasing farmers' income. An attempt has been made to identify improved practices, their potential and constraints for increasing farmers' income in different agro-climatic zones of Odisha at block level. The bio-physical characteristics, farming systems, risks and uncertainties, potential increase income and role of development agencies in various agro-climatic zones in Odisha were assessed (Table 17). The agro-climatic zone may have different farming situations such as upland, lowland, irrigated, shallow lowland, and deepwater. The existing farming practices, their constraints, major technological interventions in various time-period and their potential for increasing farmers' income in different agro-climatic zones of Odisha are presented in Tables 18 to 27. The administrators/implementing agencies can refer the ready reckoner (Table 16) to identify the agro-climatic zone of the block and then refer the recommendations for specific ecology under the block within the agro-climatic zone and farming situation to increase the farmers' income (Table 18 to 27). Besides the technological interventions in different farming situations, the following action points should go hand-in-hand for doubling the farmers' income: (1) value addition and market linkage for getting better price of the farm produce, (2) enhancement of minimum support price by the Government, (3) increasing subsidy and improving availability of farm inputs, (4) insurance coverage for crops/animal/fisheries activities under taken by the farmers, (5) promotion of technologies by the line departments and development agencies and (6) Development/Modernisation of infrastructure like markets, storage and processing units.

Table 16. Ready-reckoner for block-level implementation of recommendation for doubling the farmers' income in Odisha by 2022.

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
1.	Angul	Angul	Anugul	10	27
			Banarpal		
			Chhendipada		
		Talcher	Talcher		
			Kaniha		
		Athmallik	Athmallik		
			Kishorenagar		
		Pallahara	Pallahara		
2.	Balasore	Balasore	Balasore	3	20
			Remuna		
			Basta		

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
			Baliapal		
			Bhograi		
			Jaleswar		
			Bahanaga		
			Soro		
			Simulia		
			Khaira		
		Nilgiri	Nilgiri		
			Oupada		
3.	Bargarh	Bargarh	Bargarh	9	26
			Barpalli		
			Attabira		
			Bhatli		
			Bheden		
			Ambabhana		
		Padmapur	Padmapur		
			Paikmal		
			Jharabandha		
			Gaisilet		
			Sohela		
			Bijepur		
4.	Bhadrak	Bhadrak	Bhadrak	3	20
			Bonth		
			Basudevpur		
			Tihidi		
			Chandabali		
			Dhamnagar		
			Bhandari Pokhari		
5.	Bolangir	Bolangir	Bolangir	9	26
			Loisinga		
			Puintala		
			Agalpur		
			Deogaon		
			Gudvella		
		Patnagarh	Patnagarh		
			Belpara		
			Khaparakhol		
		Titilagarh	Titilagarh		
			Muribahal		
			Saintala		
			Bongamunda		
			Tureikela		
6.	Boudh	Boudh	Boudh	9	26
			Harabhanga		
			Kantamal		
7.	Cuttack	Cuttack	Cuttack Sadar	4	21
			Baranga		
			Kantapada		
			Niali		
			Tangi Choudwar		
			Salipur		

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
			Nischintakoili		
			Mahanga		
		Athgarh	Athgarh	10	27
			Tigiria		
			Baramba		
			Narasinghpur		
		Banki	Banki		
			Dampara		
8.	Deogarh	Deogarh	Riamal	1	18
			Barkote		
			Tileibani		
9.	Dhenkanal	Dhenkanal	Sadar	10	27
			Odapada		
			Gondia		
		Hindol	Hindol		
		Kamakhya Nagar	Kamakhyanagar		
			Kankadahad		
			Bhuban		
			Parjang		
10.	Gajapati	Parala-Khemundi	Kasinagar	5	22
			Paralakhemundi		
			Rayagada		
			Gumma		
			R.Udayagiri		
			Mohana		
			Nuagad		
11.	Ganjam	Berhampur	Rangeilunda	4	21 22
			Kukudakhandi		
			Digapahandi		
			Sankhemundi		
			Chikiti		
			Patrapur		
		Chhatrapur	Chhatrapur		
			Ganjam		
			Khalikote		
			Kodala		
			Purusottampur		
			Hinjilicut		
			Polsara		
			K.S.Nagar		
		Bhanjanagar	Bhanjanagar	5	
			Belguntha		
			Jagannathprasad		
			Buguda		
			Aska		
			Seragad		
			Dharakote		
			Sorada		
12.	Jagatsinghpur	Jagatsinghpur	Jagatsinghpur	4	21
			Raghunathpur		
			Biridi		

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
			Balikuda		
			Nuagaon		
			Tirtol		
			Kujang		
			Erasama		
13.	Jajpur	Jajpur	Jajpur	4	20 27
			Binjharpur		
			Korei		
			Bari		
			Rasulpur		
			Dasarathpur		
			Sukinda		
			Dangadi		
			Dharmasala		
			Badachana		
14.	Jharsuguda	Jharsuguda	Jharsuguda	9	18 26
			Lakhanpur		
			Kolabira		
			Laikera		
			Kirimira		
15.	Kalahandi	Bhawanipatna	Bhawanipatna	8	25
			Kesinga		
			Narla		
			M.Rampur		
			Karlamunda		
			Lanjigarh		
			Thumal Rampur		
		Dharmagarh	Dharmagarh		
			Junagarh		
			Jaipatna		
			Koksara		
			Kalampur		
			Golamunda		
16.	Kandhamal	Baliguda	Balliguda	5	22
			Chakpad		
			Daringibadi		
			G.Udayagiri		
			Kotgarh		
			Nuagaon		
			Raikia		
			Tikabali		
			Tumudibandh		
		Kandhamal	Phulbani		
			Phiringia		
			Khajuripada		
17.	Kendrapara	Kendrapara	Kendrapara	4	21
			Derabis		
			Marsaghai		
			Mahakalapada		
			Garadpur		
			Pattamundai		

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
			Rajnagar		
			Aul		
			Rajkanika		
18.	Keonjhar	Anandpur	Anadapur	3	20
			Hatadihi		
			Ghasipura		
		Champua	Champua	2	19
			Jhumpura		
			Joda		
		Keonjhar	Keonjhargarh		
			Harichandanpur		
			Patna		
			Ghatgaon		
			Saharpada		
			Telkoi		
			Banspal		
19.	Khurda	Bhubaneswar	Bhubaneswar	4	21
			Jatni		
			Balipatna		
			Balianta		
		Khurda	Khurda		
			Tangi		
			Banpur		
			Bolgarh		
			Chilika		
			Begunia		
20.	Koraput	Koraput	Koraput	6	22 23 24
			Similiguda		
			Pottangi		
			Laxmipur		
			Nandapur		
			Bandhugaon		
			Narayanpatna		
			Lamtaput		
			Dasmantapur		
		Jeypore	Jeypore	7	
			Kotpad		
			Kundara		
			Boriguma		
			Boipariguda		
21.	Malkangiri	Malkangiri	Malkangiri	7	24
			Korkunda		
			Podia		
			Khairaput		
			Kudumuluguma		
			Kalimela		
			Mathili		
22.	Mayurbhanj	Bamanghati	Rairangpur	2	19
			Bijatala		
			Bisoi		
			Jamda		

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
			Bahalda		
			Tiring		
			Kusumi		
		Baripada	Baripada		
			Kuliana		
			Suliapada		
			Rasgovindpur		
			Morada		
			Samakhunta		
			Bodasahi		
			Bangiriposi		
			Betnati		
			Sarasakana		
		Kaptipada	Udala		
			Kaptipada		
			Khunta		
			G.B.Nagar		
		Panchpir	Karanjia		
			Thakurmunda		
			Jasipur		
			Sukruli		
			Raruan		
23.	Nabarangpur	Nawrangpur	Nawrangpur	6	23
			Umerkote		
			Tentulikhunti		
			Chandahandi		
			Kosagumuda		
			Papadahandi		
			Jharigam		
			Dabugaon		
			Raighar		
			Nandahandi		
24.	Nayagarh	Nayagarh	Nayagarh	4	21
			Ranpur		
			Odagaon		
			Nuagaon		
			Khandapada		
			Bhapur		
			Daspalla		
			Gania		
25.	Nuapada	Nuapada	Nawapara	8	25
			Komna		
			Khariar		
			Sinapalli		
			Boden		
26.	Puri	Puri	Krushna-prasad	4	21
			Brahmagiri		
			Sadar		
			Gop		
			Kakatpur		
			Astarang		

Sl. No.	District	Name of the Sub-Divisions	Name of Blocks	Agro-Climatic Zone	Table No. for Recommenda-tions
			Nimapara		
			Pipili		
			Delang		
			Kanas		
			Satyabadi		
27.	Rayagada	Rayagada	Rayagada	5	22
			Kasipur		
			Kolnara		
			K.Singpur		
		Gunupur	Gunupur		
			Gudari		
			Bisam-Cuttack		
			Chandrapur		
			Muniguda		
			Ramanguda		
			Padmapur		
28.	Sambalpur	Sambalpur	Dhankhanda	9	18
			Maneswar		
			Jujumura		
			Rengalli		
		Rairakhol	Rairakhol		
			Naktideul		
		Kuchinda	Kuchinda	1	26
			Bamra		
			Jamankira		
29.	Subarnapur	Sonepur	Tarva	9	26
			Sonpur		
			Dunguripalli		
			Binika		
		Biramaharajpur	Biramaharajpur		
			Ullunda		
30.	Sundargarh	Panposh	Kuarmunda	1	18
			Nuagaon		
			Bisra		
			Lathikata		
		Sundargarh	Lafripada		
			Hemgiri		
			Rajgangpur		
			Kutra		
			Sundargarh		
			Bargaon		
			Subdega		
			Balisankara		
			Tangarpalli		
		Bonai	Lahunipada	1	
			Koira		
			Bonaigarh		
			Gurundia		

Table 17. Bio-physical characteristics, farming systems, risks and uncertainties, potential increase in income and role of development agencies in various agro-climatic zones in Odisha

Name of the Agro-Climatic Zone	Bio-physical Characteristics	Existing Farming System	Major Farming Situation	Most Cropping System	Potential to Increase in Income with Improved practices by 2022 (%)*	Risks & Uncertainties	Role of Development Agencies
1. North Western Plateau	Climate: Hot & moist sub-humid Rainfall: 1600 mm Soil: Red, Brown Forest, Red & Yellow, Mixed Red & Black	Agri + Horti + Animal husbandry (AH)	Rainfed Upland	Rice-fallow	96.18	Intermittent Drought, Lack of life saving irrigation	• Transfer of technology • In-time availability of inputs • Crop loan and crop insurance • Disease pest identification & its management. • Creation of irrigation sources • Rural infrastructure development like road, electricity & cold chain etc. • Market information & linkage • Formation of farmers' organization for access to technological information, farm input, credit & marketing. • Revision of minimum support price • Disaster management
2. North Central Plateau	Climate: Hot & moist sub-humid Rainfall: 1534 mm Soil: Lateritic, Red & Yellow, Mixed Red & Black	Agri + Horti + AH	Rainfed Upland and medium land	Rice-fallow	76.90	Intermittent Drought, Lack of life saving irrigation	
3. North Eastern Coastal Plain	Climate: Moist sub-humid Rainfall: 1568 mm Soil: Red, Lateritic, Deltaic Alluvial, Coastal Alluvial & Saline	Agri + Horti + Fishery	Rainfed Medium land and Irrigated medium land	Rice-Pulse and Rice-fallow	63.91	Flood, Cyclone Saline soil, Submergence Lowland Rice	
4. East & South Eastern Coastal Plain	Climate: Hot & Humid Rainfall: 1577 mm Soil: Saline, Lateritic, Alluvial, Red & Mixed Red & Black	Agri + Horti + Fishery + AH	Rainfed Medium land and Irrigated medium land	Rice-fallow and Rice-Pulse	133.52	Flood, Cyclone Submergence of Lowland Rice	
5. North Eastern Ghat	Climate: Hot & moist, sub-humid Rainfall: 1597 mm Soil: Brown Forest, Lateritic Alluvial, Red, Mixed Red & Black	Agri + Horti + AH	Rainfed Upland and medium land	Rice-fallow Maize-fallow	73.75	Drought, Acidic Soil, Cattle menace	
6. Eastern Ghat High Land	Climate: warm & sub-humid Rainfall: 1522 mm Soil: Red, Mixed Red & Black, Mixed Red & Yellow	Agri + Horti + AH	Rainfed Upland and medium land	Rice-fallow Maize-fallow	72.92	Drought, Acidic Soil, Cattle menace	
7. South Eastern Ghat	Climate: warm & sub-humid Rainfall: 1710 mm Soil: Red, Lateritic & Black	Agri + Horti + AH	Rainfed Upland and medium land	Rice-fallow	93.08	Drought, Acidic Soil, Cattle menace	
8. Western Undulating Zone	Climate: Hot & moist sub-humid Rainfall: 1352 mm Soil: Red, Mixed Red & Black and Black	Agri + Horti + AH	Rainfed Upland and medium land	Rice-fallow Cotton-Fallow	80.34	Drought, Acidic Soil, Cattle menace	

Name of the Agro-Climatic Zone	Bio-physical Characteristics	Existing Farming System	Major Farming Situation	Most Cropping System	Potential to Increase in Income with Improved practices by 2022 (%)*	Risks & Uncertainties	Role of Development Agencies
9. West Central Table Land Zone	Climate: Hot & moist sub humid Rainfall: 1614 mm Soil: Red & Yellow, Red & Black, Black, Brown Forest & Lateritic	Agri + Horti + AH	Rainfed/Irrigated Upland and medium land	Rice-fallow Rice-greengram Groundnut vegetable	76.15	Flood, Cyclone Drought	
10. Mid Central Table Land Zone	Climate: Hot & moist sub-humid Rainfall: 1421 mm Soil: Alluvial, Red, Lateritic, Mixed Red &Black	Agri + Horti + AH	Rainfed/Irrigated Upland and medium land	Rice-fallow Blackgram fallow Rice-greengram Rice-vegetable Mango Orchard	76.08	Flood, Cyclone Submergence Lowland Rice	

*Improved practices for increasing farmers' income in different agro-climatic zones of Odisha are presented in Table 18 to 27.

Table 18. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 1: North Western Plateau

Districts: Sundargarh, Deogarh, parts of Sambalpur & Jharsuguda

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed upland	Rice Khandagiri Annapurna - Fallow 22 q ha^{-1} Rs 11,000/-	• Less remunerative • Monocrop with broadcasting of seed	1) In-situ and ex-situ rain water harvesting (Field bunding/ check dam/ tank cum well system) 2) Crop diversifica-tion with Arhar var. UPAS-120 with line sowing 10 q ha^{-1} Rs 18,250/-	3) INM practices: Soil application of PSB @ 5Kg ha^{-1}, Seed treatment, Rhizobium culture @ 20gm per Kg seed with STFR. 4) Weed management in Arhar (Imazethapyr 10% SL) @750 ml ha^{-1} Arhar 12 qtl ha^{-1} Rs 23,250/-	5) Pod borer management (pheromone trap , neem oil and Spinosad) 15 q ha^{-1} Rs 25,000/-	6) Adoption of technology as of 3rd year 15 q ha^{-1} Rs 25,000/-	7) Same technology to be adopted as on 4th year 15 q ha^{-1} Rs 25,000/-	127.27
Rainfed medium land	Rice (MTU-1010, Lalat) – Mustard (loc. Var.) Paddy 28 q ha^{-1} Rs 12500/-	• Broad-casting • Low yield due to stem borer infestation	1) In-situ and ex-situ rain water harvesting (check dam/ tank cum well system/ Flexi rubber check dam) 2) Improved rice varieties Pyari, CR Dhan 203, CR Dhan 209, CR Dhan 300, CR Dhan 303, CR Dhan 304, Maudamani, CR Dhan 310, Naveen, Swarna 3) Line transplanting 4) Stem borer management 31.75 q ha^{-1} Rs 14,750/-	5) Weed management in Paddy (Preemergence of Pretilachlor 6% + Bensulfuran Methyl 0.6% @ 10 5Kg ha^{-1} at 3 DAT) Paddy : 36.5 q ha^{-1} Rs 18,000/-	6) INM in paddy 42.5 q ha^{-1} Rs 21,250/-	7) Adoption of technology as of 3rd year 42.5 q ha^{-1} Rs 21,250/-	8) Same technology to be adopted as on 4th year 42.5 q ha^{-1} Rs 21,250/-	70.00

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Irrigated medium land	Paddy (var. MTU-1010) – Paddy (var. MTU-1010, Lalat) 38.5 q ha^{-1} Rs 16250/-	• Staggered planting • Weed infestation • Indiscriminate use of aquaculture application • Stem borer and sheath blight infestation	1) Improved irrigation infrastructure 2) Line transplanting with RDF (80:40:40) 3) Weed management 4) IPM in paddy 42 q ha^{-1} Rs 19,100/-	5) Paddy hybrid Ajay / Rajalaxmi in kharif with line transplanting <u>Kharif</u> :52 q ha^{-1} Rs 25,125/- <u>Rabi</u> :46.75 q ha^{-1} Rs 19,875/-	6) BPH management 7) INM <u>Kharif</u> 56 q ha^{-1} Rs 26800/-	8) Same technology to be adopted as 3rd year 42.5 q ha^{-1} 56 q ha^{-1} Rs 26800/-	9) Same technology to be adopted as 4th year 56 q ha^{-1} Rs 26800/-	64.92
	Vegetable (Cabbage-180q ha^{-1}) Rs.18,000	• Imbalanced aquaculture application • Diamond back moth in cabbage	1) Improved nursery raising and planting technique of cabbage 200q ha^{-1} Rs.21,000	2) Snosad 45% SC@ 125ml ha^{-1} for management of DBM in cabbage 225q ha^{-1} Rs.25,000	3) STB fertilizer application in cabbage 235 q ha^{-1} Rs.29,000	4) Adoption of technology as of 3rd year 235 q ha^{-1} Rs.29,000	5) Same technology to be adopted as on 4th year 235 q ha^{-1} Rs.29,000	61.11
Irrigated lowland	Paddy (var. Swarna) – Paddy (var. Swarna) <u>Kharif</u> 41.5 q ha^{-1} Rs 17,500/	• Staggered planting • Indiscriminate use of aquaculture • Sheath rot & sheath blight • BPH and Stem borer	1. Rice Var. Swarna Sub-1, Reeta, Sumit, CR Dhan 407, Poorna Bhog, CR Sugandh Dhan 907, CR Dhan 701 (Hybrid), Savitri 2. Line transplanting 3. INM 4. BPH management 5. Pond based rice-fish-horti farming System <u>Kharif</u> 50 q ha^{-1} Rs 21000/-	6. Paddy var. Rani Dhan / Sarala / Pooja replaced with Swarna <u>Kharif</u> 52.5 q ha^{-1} Rs 23,750/-	7. IWM in paddy <u>Kharif</u> 55 q ha^{-1} Rs 26,250/-	8. Adoption of technology as of 3rd year <u>Kharif</u> 55 q ha^{-1} Rs 26,250/-	9. Same technology to be adopted as on 4th year <u>Kharif</u> 55 q ha^{-1} Rs 26,250/-	61.42

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Green gram 2.6 q ha^{-1} (Rs.9950)	• Low yield • YMV incidence	1. IPM 02-3/ IPM 02-14 2. Seed Treatment with T. viridae @5gm/kg 3. Spraying of neem oil (1500 ppm) @ 2 ml/lt. at 25 DAS/ Thiamethoxam @ 150 gm ha^{-1}. at 40 DAS 4.5 q ha^{-1} (73%) Rs.18900/ha	4. STFR in green gram 5. Spraying Water soluble fertilizer (19;19:19::NPK) @ 10 gram/lt. at 30 & 45 DAS 5.4 q ha^{-1} (20%) Rs.21800/ha	6. Seed inoculation with rhizobium @ 20g /kg of seed + ammonium molybdate @ 3 g/10 kg of seed 7. 7. Installation of yellow sticky traps @ 50/ha. 5.9 q ha^{-1} (9.2%) Rs.23700/ha	8. Adoption of technology as of 3rd year 5.9 q ha^{-1} (9.2%) Rs.23700/ha	9. Same technology to be adopted as on 4th year 5.9 q ha^{-1} (9.2%) Rs.23700/ha	138.19
Lowland, low lying areas	Flooded rice fields/ low lying areas	• Flooded rice fields/ low lying areas • Rs.20,000/ha	1. Low input extensive aquaculture system with yield of 1 t ha^{-1}	2. Low input extensive aquaculture system with yield of 1 t ha^{-1} Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100
	Extensive Paddy-cum-fish culture	• Extensive Paddy-cum-fish culture • Rs.20,000/ha	1. Scientific paddy – cum- fish culture	2. Scientific paddy – cum- fish culture Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	33.33 33.33 140
	Semi-intensive	• Semi-intensive	1. Semi-intensive system of carp	3. Semi-intensive system of carp	5. Adoption of technology as of	7. Adoption of technology as of	9. Adoption of technology as	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	carp poly culture	carp poly culture • Rs.2,00,000/ ha	culture with yield 6 t ha^{-1} 2. High value fish based culture	culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	of 4th year Rs.2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	80
	Semi-intensive two species commercial aquaculture (Andhra model)	•Semi-intensive two species commercial 43quaculture (Andhra model) •Rs.3,00,000/ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-
	Intensive pangasius culture	• Intensive Pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like Murrel, Magur, Pabda	2. High value cat fish culture like Murrel, Magur, Pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Homestead	Poultry (10 nos) 1 Kg body wt. per bird Rs 1500/-	• Less egg and meat production from local poultry bird	1. Backyard poultry rearing of Pallishree (10 nos) 2 Kg body wt. per bird Rs 2500	2. Rearing of Pallishree / Rainbow rooster bird (20 nos) with proper brooding management, vaccination- 38 Kg meat : Rs 3600/-	3. Rearing of Pallishree bird (30 nos) with proper feeding 43 Kg meat Rs 4300	4. Adoption of technology as of 3rd year 43 Kg meat Rs 4300	5. Same technology to be adopted as on 4th year 43 Kg meat Rs 4300	186.60
	Goatery (5 nos/farmer)- Rs.2000/-	• Mortality of kids • No additional feeding	1. Goatery (5 nos/ farmer)- Rs. 2000/-	2. Deworming Rs. 2750/-	3. Feed management Rs. 3200/-	4. Adoption of technology as of 3rd year Rs. 3200/-	5. Same technology to be adopted as on 4th year Rs. 3200/-	60.00
	Average Increase in Income over 5 years							**148.81**

Table 19. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 2: North Central Plateau

Districts: Mayurbhanj, major parts of Keonjhar, (except Anandapur & Ghasipura block)

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed Upland	Rice-fallow 14 q ha^{-1} Rs.7200/ha	• Guda dhana • Broadcast sowing • No fertilization	1. In-situ and ex-situ rain water harvesting (Field bunding/ check dam/ tank cum well system) 2. Reclamation of acid soils wherever applicable 3. Crop diversification 4. Arhar Var. LRG-41 5. Indoxacarb @1ml/l 8.2q ha^{-1} Rs.10260	6. Line sowing 7. Weedicide, Pendimethalin 1 kg a.i ha^{-1} 10 q ha^{-1} Rs 12300	8. IPM against pod borer in arhar (Use of ph. Traps @8/ac, T. chilonis @ 1lakh ha^{-1}, spraying of Indoxacarb @1ml/lt) Line sowing11.5 q ha^{-1} Rs.13400	9. Adoption of technology as of 3rd year Rs.13400	10. Same technology to be adopted as on 4th year Rs.13400	86.11
	Maize-fallow 17.5q ha^{-1} - Rs 9500/ha	• Local var • Broadcasting • Weed menace • Drudgery in harvesting of grains	1. Hybrid maize (S-36) 2. Line sowing (60X25 cm) 25q ha^{-1} Rs.15100	3. Herbicide Atrazine @1 kg a.i ha^{-1} 4. STB fert application 28q ha^{-1} Rs.16500	5. Mech. Maize shelling 28 q ha^{-1} Rs.17200	6. Adoption of technology as of 3rd year Rs.17200	7. Same technology to be adopted as on 4th year Rs.17200	81.05
Medium land	Rice-fallow 23 q ha^{-1} Rs.10000/ha	• Lalat • Broadcasting • Drought at later stage of crop growth	1. In-situ and ex-situ rain water harvesting (check dam/ tank cum well system/ Flexi rubber check dam) 2. Manaswin/ Hiranmayee/ Naveen/DRR-42	4. STB 44quacultur application 5. Weedicide (Bensulfuronmethyle+Pretilachlor @ 10 5Kg ha^{-1} at 3 DAT+ One HW at 35 DAT) 28 q ha^{-1} Rs. 13000	6. IPDM practices against blast, stem borer (Use of ph. Traps@20ha^{-1}, 7. *T. japonicum* @ 1lakh ha^{-1}, spraying of Cartap hydrochloride@2 gm/lt against stem borer), Spraying of	8. Adoption of technology as of 3rd year Rs. 15300	9. Same technology to be adopted as on 4th year Rs. 15300	53.00

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			3. Line transplanting 25.5 q/ha Rs.10500		Tricyclazole @ 1gm/lt against blast 30.0 q ha^{-1} Rs. 15300			
Irrigated shallow lowland	Rice-vegetable Rice:38 q ha^{-1} Rs. 13300	• Var. Pratishkya • Broadcast sowing • Beushening • Imbalanced fertilization • Disease and pest infestation	1. STFR 2. Rice Var. Swarna Sub-1, Reeta, Sumit, CR Dhan 407, PoornaBhog, CR SugandhDhan 907, CR Dhan 701(Hybrid) 3. Line Transplanting 42.0 q ha^{-1} Rs. 16300	4. Herbicide: Bispyribac Na 5. STFR 6. Line Transplanting 46.0 q ha^{-1} Rs.21500	7. Herbicide: Bispyribac Na 8. STFR 9. Line Transplanting 10. IPM 50.0 q ha^{-1} Rs.25000	11. Adoption of technology as of 3rd year Rs. 25000	12. Same technology to be adopted as on 4th year Rs. 25000	87.96
	Cultivation of tomato variety Utkal Kumari) (140 q ha^{-1} Rs.34000)	• Low keeping quality due to thin skin (Utkal 45quacu) • Low yield	1. Cultivation of tomato variety Utkalpragnya 2. RDF of NPK (100:50:150 5 Kg ha^{-1}) 190 q ha^{-1} (Rs.42000/ha)	3. Management of early blight of tomato 205q ha^{-1}. (Rs.46000/ha)	4. Foliar application of $CaCl_2$(0.6%) +borax(0.2%) for enhancing plant growth yield and quality of tomato 5. Value addition 6. Collective marketing 225 q ha^{-1} (Rs.52000/ha)	7. Adoption of technology as of 3rd year Rs.52000/ha	8. Same technology to be adopted as on 4th year Rs.52000/ha	52.94
Lowland, low lying areas	Flooded rice fields/ low lying areas	• Flooded rice fields/ low lying areas • Rs.20,000/ha	1. Low input extensive aquaculture system with yield of 1 t ha^{-1}	2. Low input extensive aquaculture system with yield of 1 t ha^{-1} Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100
	Extensive Paddy-cum-fish culture	• Extensive Paddy-cum-fish culture • Rs.20,000/ha	1. Scientific paddy – cum- fish culture	2. Scientific paddy – cum- fish culture Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/	1. Semi-intensive system of carp culture with yield 6 t ha^{-1}	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ha	33.33

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
		ha	2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs. 2,00,000/ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs. 2,50,000/ha 4. High value fish based culture Rs. 4,50,000/ha	5. Adoption of technology as of 2nd year Rs. 2,50,000/ha 6. Adoption of technology as of 2nd year Rs. 4,50,000/ha	7. Adoption of technology as of 3rd year Rs. 2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs. 2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	- 80
	Semi-intensive two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs. 3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-
	Intensive pangasius culture	• Intensive Pangasius culture • Rs.4,00,000/ha	1. High value cat fish culture like Murrel, Magur, Pabda	2. High value cat fish culture like Murrel, Magur, Pabda Rs. 10,00,000/ha	3. Adoption of technology as of 2nd year Rs. 10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Homestead	Goatery (5 nos/ farmer)- Rs.2000	• Worm infestation • Mortality of kids • No additional feeding • Poor shed mgt.	1. Deworming Rs. 2600	2. Feed management Rs. 3900	3. Shed management and sanitation 4. Vaccination against PPR Rs. 5200	5. Adoption of technology as of 3rd year Rs. 5200	6. Same technology to be adopted as on 4th year Rs. 5200	160
	Local poultry bird (10 birds) Rs. 1500/-	• Low growth • No additional feeding	1. Banaraja -10birds /farmer 2.0 kg /bird Rs.1800	2. RD Vaccination at 7th day, 21st day 2.5 kg/bird Rs. 2000	3. Shed management and additional feeding 2.8 kg/bird Rs.2300	4. Adoption of technology as of 3rd year Rs.2300	5. Same technology to be adopted as on 4th year Rs.2300	53
	Under-utilised paddy straw	• No value to aquaculture straws	1. Oyster Mushroom (20beds/ farmer) Rs.850	2. Paddy straw- Apr-Sep-20 beds, Oyster Mushroom- Oct-Mar-20 beds) Rs.1200	3. Value addition 4. Marketing Rs.1200	5. Adoption of technology as of 3rd year Rs.1200	6. Same technology to be adopted as on 4th year Rs.1200	41.17
	Average Increase in Income over 5 years							**141.1**

Table 20. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 3: North Eastern Coastal Plain

Districts: Balasore, Bhadrak, parts of Jajpur & Hatadihi block of Keonjhar

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed bunded upland	Rice- fallow (32.5q ha^{-1}) (Rs. 10200/ ha)	• Low yield of paddy • High cost in manual weeding/ cultivation	1. Varietal substitution of Khandagiri with Jogesh 34.2q ha^{-1} (Rs.12640/ha)	2. Postemergence application of bispyribac Na@ 250ml ha^{-1} followed by one hand weeding 35.5 ha^{-1} (Rs.13600/ha)	3. Mechanical Transplanting & Harvesting 4. Market linkage 38.5q ha^{-1} (Rs 15140/ha)	5. Adoption of technology as of 3rd year 38.5q ha^{-1} (Rs 15140/ha)	6. Same technology to be adopted as on 4th year 38.5q ha^{-1} (Rs 15140/ha)	48.43
Rainfed Medium land	Rice (Limited irrigation) (40q ha^{-1}) (Rs. 12290/ha)	• Sheath blight in paddy • Hand weeding • High cost of cultivation	1. Seed treatment with Thiophenate methyl@1.5g/kg seed and alternate spraying of (Trifloxystrobin+ Tebuconazole) @ 0.4g/ltr& Thifluzamide24SC @ 1ml/ltr water 43.5q ha^{-1} Rs.17840/ha	2. Pre-emergence application of Bensulfuron methyl+pretilachlor@ 105Kg ha^{-1} followed by one hand weeding 47.5q ha^{-1} (Rs.15,437/ha)	3. Mechanical Transplanting & Harvesting 51.5q ha^{-1} Rs.16,737/ha)	4. Adoption of technology as of 3rd year 51.5q ha^{-1} Rs.16,737/ha)	5. Same technology to be adopted as on 4th year 51.5q ha^{-1} Rs.16,737/ha)	36
Rainfed shallow lowland	Rice-fallow 32.9 q ha^{-1} Area:1.0ha Rs.15200	• Local var.(Pateni and others) • Random transplanting • Blanket fertilization • Hand weeding • Rabi fallow	1. (Var.Option 1) HYV Luna Suvarna/ Luna Sampad 2. (Var. Option 2) Local var. Pateni 3. Line transplanting 4. Infield refuge system for rice-fish integration 5. STFR	7. (Var.Option 1) HYV Luna Suvarna/ Luna Sampad 8. (Var. Option 2) 9. Line transplanting 10. STFR 11. Herbicide-Penoxsulam 12. Blackgram as paira (PU	13. HYV Luna Suvarna 14. Line transplanting 15. STFR 16. Herbicide-Penoxsulam 17. Blackgram as paira (PU 35/Prasad, NPK 20-40-20 41.5 q ha^{-1} Rs.19200	18. Adoption of technology as of 3rd year 41.5 q ha^{-1} Rs.19200 3.0 q ha^{-1} Rs.6200	19. Same technology to be adopted as on 4th year 41.5 q ha^{-1} Rs.19200 3.0 q ha^{-1} Rs.6200	67.10

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			6. Blackgram paira, var.PU 35/Prasad 38.5 q ha^{-1} Rs.17700 1.7 q ha^{-1} Rs.4200	35/Prasad, NPK 20-40-20 41.5 q ha^{-1} Rs.19200 3.0 q ha^{-1} Rs.6200	3.0 q ha^{-1} Rs.6200			
Irrigated Medium land	Rice-fallow Area:1.0 ha Rice:42 qha^{-1} Rs. 15300 Fish Small tanks (5-30 cent) 1q/20 cent Rs. 5000	• (Option 1) Broadcast sowing • Beushaning • Imbalanced fertilization • (Option 2) Random transplanting • Imbalanced fertilization • Rabi fallow • Fish production – low profit	1. Line sowing 2. Herbicide: Bispyribac Na 3. STFR 4. Line Transplanting 5. STFR 6. Fish seed production (spawn-fry) 45.0 q ha^{-1} Rs. 16300 166000 fry Rs. 7500	7. Line sowing 8. Herbicide: Bispyribac Na 9. STFR 10. Line Transplanting 11. STFR 12. Greengram (IPM 2-14)/ blackgram (PU 35) as paira 13. Fry+SFL and SYL production 47.0 q ha^{-1} Rs.17500 2.5 q ha^{-1} Rs.7000 70000 fry 20000 SFL/SYL Rs.9000	14. Line sowing 15. Herbicide: Bispyribac Na 16. STFR 17. Line Transplanting 18. STFR 19. Greengram/black gram with NPK 20-40-20 20. Fry+SFL and SYL production 47.0 q ha^{-1} Rs.17500 4 q ha^{-1} Rs.11000 70000 fry 20000 SFL/SYL Rs.9000	21. Adoption of technology as of 3rd year 47.0 q ha^{-1} Rs.17500 4 q ha^{-1} Rs.11000 70000 fry 20000 SFL/SYL Rs.9000	22. Same technology to be adopted as on 4th year 47.0 q ha^{-1} Rs.17500 4 q ha^{-1} Rs.11000 70000 fry 20000 SFL/SYL Rs.9000	84.72
Lowland, low lying areas	Flooded rice fields/ low lying areas	• Flooded rice fields/ low lying areas • Rs.20,000/ha	1. Low input extensive aquaculture system with yield of 1 t ha^{-1}	2. Low input extensive aquaculture system with yield of 1 t ha^{-1} Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100
	Extensive Paddy-cum-fish culture	• Extensive Paddy-cum-fish culture • Rs.20,000/ha	1. Scientific paddy – cum- fish culture	2. Scientific paddy – cum- fish culture Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100
Pond System	Small farm pond (<0.2	• Small farm pond (<0.2	1. Seed production of carps	2. Seed production of carps	3. Adoption of technology as of	4. Adoption of technology as of	5. Adoption of technology as of	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	ha)	ha)	Rs.30,000/ha	Rs.30,000/ha	2nd year Rs.30,000/ha	3rd year Rs.30,000/ha	4th year Rs.30,000/ ha	
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4thyear Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of	13. Adoption of technology as of 4th year Rs.2,50,000/ha 14. Adoption of technology as of 4th year	33.33 33.33

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	5. Adoption of technology as of 2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	- 80
	Semi-intensive two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-
	Intensive pangasius culture	• Intensive Pangasius culture • Rs.4,00,000/ ha	6. High value cat fish culture like Murrel, Magur, Pabda	7. High value cat fish culture like Murrel, Magur, Pabda Rs.10,00,000/ha	8. Adoption of technology as of 2nd year Rs.10,00,000/ha	9. Adoption of technology as of 3rd year Rs.10,00,000/ha	10. Adoption of technology as of 4th yr Rs.10,00,000/ha	100
Homestead	Dairy 1 desi cow Milk: 1.5 Rs.4000	• No green fodder supplements • High cost of	1. Hybrid napier var. CO 4/ Paragrass 2. Backyard poultry, Rainbow	3. Hybrid napier , var. CO4/ Paragrass 4. Azolla production	7. Hybrid napier / Paragrass 8. Azolla production 9. Farm made feed	12. Adoption of technology as of 3rd year Rs.6000/yr	13. Same technology to be adopted as on 4th year	83.33

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Poultry (Desi variety, 10 Nos.) Rs.2000	concentrate feeding, low milk yield • Slow body weight gain	Rooster/Kegg (10 birds) Milk : 1.5l/day Rs. 4500/yr Body wt: 2.0 kg/ bird+350 eggs/yr Rs. 2500	(FLD 6) 5. Farm made feed (broken rice, DORB, pulse bran , wheat bran , GNOC , salt , mineral mixture) 6. Rainbow rooster in 2 batches(10 Nos./batch) /yr (FLD 7) Milk: 2.2 l/day Rs.5000 Rs.3500	10. Value addition of milk (50%)for chhena making 11. Rainbow rooster in 2 batches(10 Nos./batch) /yr Milk: 1.0 L/day Chhena: 0.25 kg/day Rs.6000/yr Rs.5000	Rs.5000	Rs.6000/yr Rs.5000	
	Average Increase in Income over 5 year							**148.6**

Table 21. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 4: East & South Eastern Coastal Plain zone

Districts: Kendrapara, Khurda, Jagatsinghpur, Cuttack, Puri, Nayagarh, part of Ganjam

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Upland	Rice-Fallow Cropping System Rice(Khandagiri)- Fallow 17 q ha^{-1} (Rs. 7589)	• Low income from paddy	1. Crop diversification- High yielding sweet corn C.v- Madhuri Rs. 16500/ha (117%)	2. Weed control by pre emergence application of Atrazine @ 1-1.55Kg ha^{-1} 0-3 DAS Rs. 20100/ha (21.8%)	3. Line sowing of Maize 4. Spacing 60x45cm Rs. 26450/ha (31.5%)	5. Adoption of technology as of 3rd year Rs. 26450/ha	6. Same technology to be adopted as on 4th year Rs. 26450/ha	248.53
Medium land	Rice-Groundnut/ Chilli cropping system Rice(Lalat)- 28 q ha^{-1} (Rs.14100)	• Low yield due to old var- Lalat,MTU-1001- • Inadequate application of fertilizer	1. Cultivation of hybrid rice Var- Rajalaxmi/Ajay 2. RDF of NPK 120:60:60 5Kg ha^{-1} 35 q ha^{-1}, (28.5%) Rs.20600/ha	3. Line transplanting of paddy 4. Weed management in paddy- Pre-emergence weedicide: Londax power (Bensulfuron methyl + pretilachlor) @ 105Kg ha^{-1} 0-5 DAT or post emergence Byspyrabic sodium 200 ml per ha 25 DAT/ 41 q ha^{-1} Rs.24700/ha (19.9%)	5. Soil test based nutrient management in hybrid rice 6. Micronutrient application as per soil test results 7. Market linkage 51 q ha^{-1} Rs.30300/ha	8. Adoption of technology as of 3rd year 51 q ha^{-1} Rs.30300/ha	9. Same technology to be adopted as on 4th year 51 q ha^{-1} Rs.30300/ha	114.89
	Groundnut 11 q ha^{-1} (Rs. 14300)	• Low yielding variety • Low income • from G. nut • Soil acidity	1. Var: Devi 2. Application of lime @ 0.2 LR and Sulphur @ 405Kg ha^{-1} in groundnut 14 q ha^{-1}	3. Seed treatment with Vitavax power 1.5 gm/kg of seed or Trichodermaviride 5gm/kg	5. Seed inoculation with Rhizobium culture 20 gm/kg of seed 6. Soil test based quacultur	7. Adoption of technology as of 3rd year 18 q ha^{-1} Rs. 23600/ha (12.9%)	8. Same technology to be adopted as on 4th year 18 q ha^{-1} Rs. 23600/ha	65

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			(27.2 %) Rs.18300/ha	4. Application of RDF 16 q ha^{-1} Rs. 20900/ha	application 18 q ha^{-1} Rs.23600/ha (12.9%)		(12.9%)	
	Chilli 25 q ha^{-1} (Rs 10500)	• Low yield • Leaf curl of Chilli • Flower drops	1. Var:Suryamukhi /Daya 2. Seed treatment with Imidacloprid 17.8SL@ 7 ml per kg of seed and foliar spray of Imidacloprid 17.8SL@.5ml/l of water twice starting from 45 DAT at 15 days interval 29 qtha^{-1} Rs 12500	3. RDF application 125:50:100 kg N: P2O5:K2O ha^{-1} 4. Spraying of 0.125% Tricontanol and IAA 10ppm reduce flower drop and increasing fruit set. 31 q ha^{-1} Rs 14700	5. Spray Planofix @ 10 ppm at flowering and three weeks later to increase yield or agripro-2 gm/litre 6. Market linkage 35 q ha^{-1} Rs 18900	7. Adoption of technology as of 3rd year 35 q ha^{-1} Rs 18900	8. Same technology to be adopted as on 4th year 35 q ha^{-1} Rs 18900	80
Lowland	Rice (Pooja) 30 q ha^{-1} (Rs.14000)	• Flood prone • Susceptible to false smut • Inadequate application of fertilizer	1. Cultivation of rice Var- Swarna Sub-1 2. Seed treatment with Vitavax power 3. RDF of NPK 80:40:40 5Kg ha^{-1} 4. Pond based farming system (Horti-Fish) 35 q ha^{-1}, Rs.20000/ha	5. Line transplanting of paddy 6. Weed management in paddy- Pre-emergence weedicide:- Londax power (Bensulfuron methyl+ pretilachlor) @ 105Kg ha^{-1} 0-5 DAT or post emergence Byspyrabic sodium 200 ml per ha 25 DAT/ 42 q ha^{-1} Rs.24700/ha	7. Soil test based nutrient management in rice 8. Micronutrient application as per soil test results 9. Market linkage 45 q ha^{-1} Rs.29000/ha	10. Adoption of technology as of 3rd year 45 q ha^{-1} Rs.29000/ha	11. Same technology to be adopted as on 4th year 45 q ha^{-1} Rs.29000/ha	107.14

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Green gram 2.6 q ha^{-1} (Rs.9950)	• Low yield • YMV incidence	1. Greengram- IPM 02-3/ IPM 02-14 2. Seed Treatment with T. Viridae @5gm/kg 3. Spraying of neem oil(1500 ppm) @ 2ml/lt. at 25 DAS/ Thiamethoxam @ 150 g ha^{-1}. at 40 DAS 4.5 q ha^{-1} Rs.18900/ha	4. STFR in G.gram 5. Spraying Water soluble fertilizer(19;19:19 ::NPK) @ 10 gram/lt. at 30 & 45 DAS 5.4 q ha^{-1} Rs.21800/ha	6. Seed inoculation with rhizobium @ 20g /kg of seed + ammonium molybdate @ 3 g/10 kg of seed 7. Installation of yellow sticky traps @ 50 ha^{-1}. 5.9 q ha^{-1} Rs.23700/ha	8. Adoption of technology as of 3rd year 5.9 q ha^{-1} Rs.23700/ha	9. Same technology to be adopted as on 4th year 5.9 q ha^{-1} Rs.23700/ha	138.19
Rainfed medium land	Rice – Fallow Rice (Lalat)- broadcasting 35.7q ha^{-1} Rs.12975/-	• Lack of suitable variety • High weed incidence • Improper nutrient management	1. Bina dhan 11 42.3q ha^{-1} Rs.15350/-	2. 1st year intervention 3. Post emergence spray of Bispyribac sodium @200ml ha^{-1} followed by one hand weeding 45q ha^{-1} Rs. 16700/-	4. 2nd Year intervention 5. STFR application 48.3 q ha^{-1} Rs. 17975 /-	6. Adoption of technology as of 3rd year 48.3 q ha^{-1} Rs. 17975 /-	7. Same technology to be adopted as on 4th year 48.3 q ha^{-1} Rs. 17975 /-	38.53
Irrigated medium land	Vegetable (Cabbage-180q ha^{-1}) Rs.18,000	• Imbalanced aquaculture application • Diamond back moth in cabbage	1. Improved nursery raising and planting technique of cabbage 200q ha^{-1} Rs.21,000	2. Spinosad 45% SC@ 125ml ha^{-1} for management of DBM in cabbage 225q ha^{-1} Rs.25,000	3. STB fertilizer application in cabbage 240 q ha^{-1} Rs.32,000	4. Adoption of technology as of 3rd year 240 q ha^{-1} Rs.32,000	5. Same technology to be adopted as on 4th year 240 q ha^{-1} Rs.32,000	52.38
Lowland, low lying areas	Flooded rice fields/ low lying areas	• Flooded rice fields/ low lying areas • Rs.20,000/ha	1. Low input extensive aquaculture system with yield of 1 t ha^{-1}	2. Low input extensive aquaculture system with yield of 1 t ha^{-1} Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Extensive Paddy-cum-fish culture	• Extensive Paddy-cum-fish culture • Rs.20,000/ha	1. Scientific paddy – cum- fish culture	2. Scientific paddy – cum- fish culture Rs.50,000/ha	3. Adoption of technology as of 2nd year Rs.50,000/ha	4. Adoption of technology as of 3rd year Rs.50,000/ha	5. Adoption of technology as of 4th year Rs.50,000/ha	100
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ ha 14. Adoption of technology as of 4th year Rs.2,50,000/ ha 15. Adoption of technology as of 4th year Rs.4,50,000/ ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	5. Adoption of technology as of 2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ ha 10. Adoption of technology as of 4th year Rs.4,50,000/ ha	- 80
	Semi-intensive two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ ha	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Intensive pangasius culture	• Intensive pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like murrel, Magur, pabda	2. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Allied activities Homestead	Deshi cattle-65 lit /month (Rs.1500)	• Deshi Breed • Low yield of milk due to stray grazing • Supply of local available feed	1. Breed improvement through AI 2. Azolla cultivation for supplementary feed (20%) increase milk yield up to .5-1lit/ per day. 85 lit/Month (30.7%) Rs. 2000/per month	3. Azolla supplementary feed (20%) increase milk yield up to 1-1.5lit/ per day. 4. Supplementation of vitamin mineral mixture @30gm/meal 5. Fodder Cultivation var. Hybrid nippier var. CO-4 240 lit/Month Rs. 4000 per month	6. Management of Hybrid Napier 7. Value addition of milk 8. Market linkage 270 lit/Month (12.5%) Rs.5000 per month	9. Adoption of technology as of 3rd year 270 lit/Month (12.5%) Rs.5000 per month	10. Same technology to be adopted as on 4th year 270 lit/Month (12.5%) Rs.5000 per month	233.33
	Poultry birds-(Rs. 3800)	• Low income from poultry due to rearing of local bird	1. Backyard poultry 10 nos (Vanaraja) 2. Vaccination of birds (Laasota + Gumber) Net Income-Rs. 6,250/ (64%)	3. Backyard poultry 10 nos (Vanaraja) with proper vaccination (Lassota+ Gumber) 4. Supplementary 5. feeding with azolla Net Income-Rs. 7750/-	6. Backyard poultry 10 nos (Palishree) with proper vaccination (Lassota+ Gumber) 7. Supplementary feeding with azolla 8. Calcium supplementation to birds Net Income-Rs.10,500/-	9. Adoption of technology as of 3rd year	10. Same technology to be adopted as on 4th year	176.31

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Mushroom Net Income (Rs. 4000/yr)	• Low income due to im-proper management	1. Mushroom production of OSM-11 (20 beds/month) and Blue Oyster mushroom cultivation2 bags/day 2.4 kg/day (Rs.9000/yr)	2. Mushroom production of OSM-11 (20 beds/month)and Blue Oyster mushroom cultivation (20 beds/month) 3. Management of competitor moulds and diseases in straw mushroom 3.2 kg/day (Rs.10500/yr)	4. Value addition of Mushroom 4.5 Kg/day Rs. 13200/yr	5. Adoption of technology as of 3rd year 4.5 Kg/day Rs. 13200/yr	6. Same technology to be adopted as on 4th year 4.5 Kg/day Rs. 13200/yr	230
	Average Increase in Income over 5 years							**163.16**

Table 22. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 5: North Eastern Ghat

Districts: Kandhamal, Gajapati, Rayagada, part of Ganjam and patches of Koraput

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed upland	Rice-Fallow 18.6 q ha^{-1} (Rs. 7340/ ha)	• Water stress • Old var. Khandagiri/ Pathara • Broadcast sowing • Blanket fertilization • Hand weeding • Damage by Stem borer	1. Drought tolerant variety Sahabhagi Dhan/ Jyotirmayee/ DRR 44 22.3 q ha^{-1} Rs 10300/-	2. Line sowing 3. STFR 24.5 q ha^{-1} Rs. 12830/-	4. Chemical weed control 5. Stem borer control- Cartap Hydrochloride 50% SP @ 2g/litre of water 27 q ha^{-1} Rs. 14300/-	6. Adoption of technology as of 3rd year 27 q ha^{-1} Rs. 14300/-	7. Same technology to be adopted as on 4th year 27 q ha^{-1} Rs. 14300/-	94.82
Rainfed Medium Land/ Shallow lowland	Rice- Black gram Rice: 32.5 q ha^{-1} (Rs.12800/ ha) Black gram (Paira) 2.2 q ha^{-1} (Rs.7800/ ha)	• Local varieties- RGL/ MTU 1010/Lalat/ IR 64 • Hand transplanting • Blanket fertilization • Hand weeding • Damage by stem bore • Local variety • No fertilizer application • Local Blackgram variety	1. HYV Naveen/ DRR-44 38q ha^{-1} Rs.16700 2. HYV PU 35/ Jyoti 3. Use finger lings of composite fish culture 3.0 q ha^{-1} Rs.9000/- 3.9 q ha^{-1} Rs.10400 Rs.60000 from fish culture	4. Line transplanting 5. STFR 6. Herbicide: Butachlor/ Bispyribac Na 42.2q ha^{-1} Rs.18000 7. Application of N and P @ 20-40 5Kg ha^{-1} in 10 days before sowing 4 q ha^{-1} Rs.12000	8. Transplanting of Paddy by self propelled transplanter 9. Harvest of paddy by Paddy reaper 45.4q ha^{-1} Rs.21000 10. INM with seed 61quaculture of Rhizobium and PSB 4.2q ha^{-1} Rs.15000	11. Adoption of technology as of 3rd year Rice: 45.4q ha^{-1} Rs.21000 Blackgram: 4.2q ha^{-1} Rs.15000	12. Same technology to be adopted as on 4th year Rice: 45.4q ha^{-1} Rs.21000 Blackgram: 4.2q ha^{-1} Rs.15000	71.29

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Semi-Irrigated upland	Maize-Fallow 23q ha^{-1} (Rs.23300/ ha)	• Use of composite variety • Blanket fertilizer dose • Weed	1. Hybrid maize PAC 34/OMA 14 2. NPK @ 120:80:80 27q ha^{-1} Rs.27400/- (17.6%)	3. Weed control- Atrazin @ 1 l ha^{-1} Simazine $^{-1}$ @ 1 5Kg ha^{-1} 31.6q ha^{-1} Rs.30100/- (29.2%)	4. 4.Cultivation of sweet corn variety Sugar 75/ Misti 36.3q ha^{-1} Rs.34200/- (46.8%)	5. Adoption of technology as of 3rd year 36.3q ha^{-1} Rs.34200/- (46.8%)	6. Same technology to be adopted as on 4th year 36.3q ha^{-1} Rs.34200/- (46.8%)	46.76
	Arhar-Fallow 5.8 q ha^{-1} (Rs.13850/ ha)	• Local var. (desi kandula & sana kandula, bada kandula) • Broadcast ing • Blanket fertilization • High weed infestation	1. HYV Arhar ASHA/ LRG 41 7.1 q ha^{-1} Rs. 19600/- (41.5%)	2. Line sowing 3. STFR 4. Herbicide- Pendimethalin @15Kg ha^{-1} 8.3q ha^{-1} Rs.23100/- (66.8%)	5. Seed production of Arhar C.v BRG-176 / BRG-4/BRG 5 10.3 q ha^{-1} Rs. 26100/- (88.4%) Rhizobium	6. Adoption of technology as of 3rd year Rs. 26100/-	7. Same technology to be adopted as on 4th year Rs. 26100/-	88.44
	Brinjal- fallow 150 q ha^{-1} (Rs.28000/ ha)	• Fruit and Shoot borer problem • Rabi fallow • Old variety- Blue Star • Shoot and fruit borer	1. Cultivation of brinjal var. Muktakeshi / Utkal Jyoti / Utkal Tarini 185q ha^{-1} Rs. 35500/-	2. Control of shoot and fruit borer: Use of tricho cards @ 5-6 Nos. per acre and at in interval of 7-10 days, 195 q ha^{-1} Rs. 41800	3. Market linkage for sale of brinjal. 208 q ha^{-1} Rs.52100/-	4. Adoption of technology as of 3rd year Rs.52100	5. Same technology to be adopted as on 4th year Rs.52100	86.07
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm	• Medium sized farm	1. Extensive scientific carp	4. Extensive scientific carp	7. Adoption of technology as of	10. Adoption of technology as of	13. Adoption of technology as	140

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	pond (0.2 to 1 ha)	pond (0.2 to 1 ha) • Rs.50,000/ha	culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9.Adoption of technology as of 2nd year Rs.4,50,000/ha	3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	of 4th year Rs.1,50,000/ ha 14. Adoption of technology as of 4th year Rs.2,50,000/ ha 15. Adoption of technology as of 4th year Rs.4,50,000/ ha	300 620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ ha 14. Adoption of technology as of 4th year Rs.2,50,000/ ha 15. Adoption of technology as of 4th year Rs.4,50,000/ ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture	1. Semi-intensive system of carp culture with yield 6 t ha^{-1}	3. Semi-intensive system of carp culture with yield 6 t ha^{-1}	5. Adoption of technology as of 2nd year Rs.2,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ ha	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
		• Rs.2,00,000/ ha	2. High value fish based culture	Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	6. Adoption of technology as of 2nd year Rs.4,50,000/ha	8. Adoption of technology as of 3rd year Rs.4,50,000/ha	10. Adoption of technology as of 4th year Rs.4,50,000/ ha	80
	Semi-intensive two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ ha	-
	Intensive pangasius culture	• Intensive Pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like Murrel, Magur, Pabda	2. High value cat fish culture like Murrel, Magur, Pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Homestead	Dairy 2 Cow Milk: 1 lit /day Rs. 5800/yr	• No green fodder supplements • High cost of concentrate feeding • No value addition in milk	1. Vaccination 2. Maintaining of sanitation of cattle shed Milk : 1.5 lit /day Rs.7000/yr (20.7%)	3. Hybrid nappier ,/ var. CO 4 . CO4(0.25 acre) 4. Farm made feed (broken rice , pulse bran), hay of pulses 5. Artificial insemination Rs.7000/yr	6. Location specific mineral mixture @ 80g/day. 7. Value addition of milk for cheese making Rs.9000/yr	8. Adoption of technology as of 3rd year Rs.9000/yr	9. Same technology to be adopted as on 4th year Rs.9000/yr	55.17
	Average Increase in Income over 5 year							**153.1**

Table 23. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 6: Eastern Ghat High Land

Districts: Major parts of Koraput, Nawarangpur

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed Upland unbounded	Maize-Fallow 23q ha^{-1} (Rs.23300/ ha)	• Use of composite variety • Blanket fertilizer dose • Weed problem	1. Hybrid maize PAC 34/ OMA 14 2. NPK @ 120:80:80 27q ha^{-1} Rs.27400/- (17.6%)	3. Weed control- Atrazin @ 1 l ha^{-1} Simazine^{-1} @ 1 5Kg ha^{-1} 31.6q ha^{-1} Rs.30100/- (29.2%)	4.Cultivation of sweet corn variety Sugar 75/ Misti 36.3q ha^{-1} Rs.34200/- (46.8%)	5. Adoption of technology as of 3rd year 36.3q ha^{-1} Rs.34200/- (46.8%)	6. Same technology to be adopted as on 4th year 36.3q ha^{-1} Rs.34200/- (46.8%)	46.76
Rainfed upland	Niger 2 q ha^{-1} Rs 4700	• Local variety • High weed infestation • imbalance aquaculture use and • High incidence of disease	1. HYV utkal niger 150 2. IWM pendimethalini1kg ha^{-1} Yield- 3 q ha^{-1} Rs. 7800/-	3. STFR 4. Application Yield-4q ha^{-1} Rs 9200	5.IPDM in niger Yield- 5 q ha^{-1} Rs.11000	6. Adoption of technology as of 3rd year 5 q ha^{-1} Rs.11000	7. Same technology to be adopted as on 4th year 5 q ha^{-1} Rs.11000	134
	Ragi 6 q ha^{-1} Rs 5000/-	• Growing of local variety variety • High weed infestation • Imbalance aquaculture use • Incidence of blast	1. HYV bhairabi/ Subhra 2. IWM in Ragi with pendimethalin 1kg ai ha^{-1} Yield- 10 q ha^{-1} Rs. 9000/-	3. STFR Application Yield-11.8q ha^{-1} Rs 10000/-	4.IDM in ragi for blast 5.Seed treatment with pseudomonas fluroscence 10g/kg of seed 6.Foliar spray of tricyclazole 6g/l Yield- 12.5 q ha^{-1} Rs.10300/-	7. Adoption of technology as of 3rd year Yield- 12.5 q ha^{-1} Rs.10300/-	8. Same technology to be adopted as on 4th year Yield- 12.5 q ha^{-1} Rs.10300/-	106

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Ginger – fallow 40q ha^{-1} Rs10,000	• Local var. • Severe rhizome rot • Blanket fertilizer application • Micronutient deficiency in acidic soil	1. HYV- Suprabha 50q ha^{-1} Rs 15000	2. STBRF application 3. Seed treatment with T.Viridae + Soil application with T. Viridae @ 105Kg ha^{-1} 4. Soil drenching with redomil MZ 2g l^{-1} 56 q ha^{-1} Rs 15800/-	5.management of ginger with boron (4.5 kg) and zinc (6.0 kg) due to acidic soil 60q ha^{-1} Rs 18200/-	6. Adoption of technology as of 3rd year 60q ha^{-1} Rs 18200/-	7. Same technology to be adopted as on 4th year 60q ha^{-1} Rs 18200/-	82
	Vegetables 85q (Potato) *kharif* Rs 20000/-	• Imbalance aquaculture use • High weed infestation • Diseases and pest incidence	1. STFR application 2. IWM (metribuzin @0.5 kg ai ha^{-1} 98q Rs26400/-	3. Ipm for 4. For termite, Chlorpyriphos 2g/l, white fly imidachlorpid 1ml/3lof water 103q Net income Rs. 28000	5.Disease management through IDM 112q Rs 29300 Yield 110q ha^{-1} Rs. 28000	6. Adoption of technology as of 3rd year Yield 110q ha^{-1} Rs. 28000	7. Same technology to be adopted as on 4th year Yield 110q ha^{-1} Rs. 28000	40
	Tomato *kharif* Yield 90q Rs 21000	• Imbalance aquaculture use • High weed infestation • Diseases and pest incidence	1. STFR application 2. IWM (metribuzin @0.5 kg ai ha^{-1} Yield 102q ha^{-1} Rs 24400	3. Ipm for termite, Chlorpyriphos 2g/l, white fly imidachlorpid 1ml/3lof water IPM Yield 107qha^{-1} Rs25100/	4.INM Yield 108q ha^{-1} Rs26000	5. Adoption of technology as of 3rd year Yield 108q ha^{-1} Rs26000	6. Same technology to be adopted as on 4th year Yield 108q ha^{-1} Rs26000	23.80
Irrigated (Medium land)	Paddy-Vegetables 30q ha^{-1} (Rs.12000)	• use of imbalanced fertilizer • high rate of insect pest infestation (BPH& Stem	1. Use of Green manuring in Paddy (Dhannicha 205Kg ha^{-1}) 2. STFR 33q ha^{-1} (Rs.15000)	3. BPH management 4. Split application of N-fertilizer 36q ha^{-1} (Rs.18000)	5.IPM 39q ha^{-1} (Rs.20000)	6. Adoption of technology as of 3rd year 39q ha^{-1} (Rs.20000)	7. Same technology to be adopted as on 4th year 39q ha^{-1} (Rs.20000)	66.66

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
		Borer)						
	Vegetables (Cabbage & Cauliflower) Rs. 70,000	• Use of low quality planting material • DBM in Cauliflower and leaf webber in Cabbage.	1. Introduction of Hybrid tolerant planting material 160q ha^{-1} (Rs.80000)	2. STFR 180q ha^{-1} (Rs.90000)	3. DBM management 200q ha^{-1} Rs110000	4. Adoption of technology as of 3rd year 200q ha^{-1} Rs110000	5. Same technology to be adopted as on 4th year 200q ha^{-1} Rs110000	57.14
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3.Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7.Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	5.Adoption of technology as of 2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	- 80
	Semi-intensive two species commercial aquaculture (Andhra	• Semi-intensive two species commercial aquaculture (Andhra	1. Improved efficiency through genetically improved carps, better quality feed and scientific	2. Improved efficiency through genetically improved carps, better quality feed and scientific	3.Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	model)	model) • Rs.3,00,000/ ha	management	management Rs.3,50,000/ha				
	Intensive pangasius culture	• Intensive pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like murrel, Magur, pabda	2. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	3.Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ha	100
Homestead	Poultry Desi Breed (20no) Rs. 8000	• Low production due to single enterprise	1. Poultry (Banaraja) (20) Rs 12000	2. Feed management of Banaraja Rs. 16000	3.Feed management of Banaraja Rs. 16000	4. Adoption of technology as of 3rd year Rs. 16000	5. Same technology to be adopted as on 4th year Rs. 16000	100
	Average Increase in Income over 5 year							**140.16**

Table 24. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 7: South Eastern Ghat

Districts: Malkangiri & parts of Koraput

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed Upland	Rice-fallow 21.7 q ha^{-1} Rs.8100	• Local var. Trimurti • Broadcast sowing • Blanket fertilization • Hand weeding	1. Paddy var. Sahabhagidhan, 2. Line Sowing, 3. STFR Yield-32.5q ha^{-1} Rs-10500	4. Brown manuring (Dhanicha 15 5Kg ha^{-1} with application of 2,4-D Ester 1kg ai ha^{-1} at 30DAS. 5. STFR 6. Herbicide-Bispyribac Na Yield-34.5q ha^{-1} Rs-12000	7. Use of power reaper 8. Thresher for cost reducing implements in rice. Yield-34.6q ha^{-1} Rs.14000	9. Adoption of technology as of 3rd year Yield-34.6q ha^{-1} Rs.14000	10. Same technology to be adopted as on 4th year Yield-34.6q ha^{-1} Rs.14000	80.24
Rainfed Medium land	Rice-Greengram Rice 31.8q ha^{-1} Rs.12250 Greengram Rs .3000	• Hand weeding • Manual transplanting • Late planting, 2nd week of August. • Local seeds • YMV, Low yield	1. Paddy var-Hybrid Ajay/Bina 11 2. Line transplanting Early planting (Last week of July 3. STFR 4. Green gram in Var-TARM-1 /IPM02-3,IPM02-14 Yield 42.6q ha^{-1} Rs 22000 Yield 2.5 q ha^{-1} Rs.2500	5. INM (Dhanicha incorporation, soil application of PSB 5kg ha^{-1} and Azosporilium 10 5Kg ha^{-1} 6. Weed management with Bispyribac sodium @25 g ha^{-1} at 20-25DAT 7. STFR Yield-44.0q ha^{-1} Rs-23000 Yield 3.0 q ha^{-1} Rs.3500	8. Use of power reaper , thresher for cost reducing implements in rice. Use of zero till drill showing 9. YMV mgmt 10. IDM - Moong IPM 2-14+ yellow sticky trap @ 30 ha^{-1} and Thiomethoxam spray @ 200 g ha^{-1} Yield-45.0 q ha^{-1} Rs.24000 Yield 3.5 q ha^{-1} Rs.5000	11. Adoption of technology as of 3rd year Yield-45.0 q ha^{-1} Rs.24000 Yield 3.5 q ha^{-1} Rs.5000	12. Same technology to be adopted as on 4th year Yield-45.0 q ha^{-1} Rs.24000 Yield 3.5 qha^{-1} Rs.5000	90.16
Irrigated Medium land	Hyv paddy-37.8q ha^{-1} Rs.17920	• Rice weed menace high cost in transplanting	1. Paddy Hybrid Ajay/ Binadhan/ Hiranmayee 2. Fripronil in	4. Hiranmayee 5. line trans planting 6. STFR Yield 43.0q ha^{-1}	7. Use of power reaper, 8. Thresher for cost reducing	9. Adoption of technology as of 3rd year Yield 43.0q ha^{-1}	10. Same technology to be adopted as on 4th year	33.92

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
		stemborer	nursery 1.5kg/ 1000m^2 and 15 5Kg ha^{-1}15 DAT, 50 nos of Phermeno traps ha^{-1} and Trichogamma japanicom 50,000/ha. 3. Pre emergence application of Bensulfuron (0.6%)Pretilachlor@660g ha^{-1} at 3 to 7 DAT Yield 42.6q ha^{-1} Rs.22580	Rs.23500	implements in rice. Yield 43.0q ha^{-1} Rs.24000	Rs.24000	Yield 43.0q ha^{-1} Rs.24000	
	Pointed guard Rs.4000	• Fruit drops , • Unavailability of planting material	1. Var. Kajola Rs.5000	2. Trailing system 3. STFR Rs.7000	4. Trailing system 5. Production of planting material Rs.7500	6. Adoption of technology as of 3rd year Rs.7500	7. Same technology to be adopted as on 4th year Rs.7500	87.50
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1}	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ ha	140

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 3. High value SIFS with exotic horticulture	5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	14. Adoption of technology as of 4th year Rs.2,50,000/ ha 15. Adoption of technology as of 4th year Rs.4,50,000/ ha	300 620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000 /ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ ha 14. Adoption of technology as of 4th year Rs.2,50,000/ ha 15. Adoption of technology as of 4th year Rs.4,50,000/ ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1}	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha	5. Adoption of technology as of 2nd year Rs.2,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ ha	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			2. High value fish based culture	4. High value fish based culture Rs.4,50,000/ha	6. Adoption of technology as of 2nd year Rs.4,50,000/ha	8. Adoption of technology as of 3rd year Rs.4,50,000/ha	10. Adoption of technology as of 4th year Rs.4,50,000/ ha	80
	Semi-intensive two species commercial 73quaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ ha	-
	Intensive pangasius culture	• Intensive pangasius culture • Rs.4,00,000/ha	1. High value cat fish culture like murrel, Magur, pabda	2. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Homestead	Poultry Rs. 3000	• Less growth of local birds	1. Pallishree (10 birds), vaccination, feeding 2 kg/6 month/birds 20 kg Rs.4000	2. Supplementation of vitamin and mineral mixture (@10-15gm/day) 1.5kg/bird Rs.6000	3. 15 birds each Rs.8000	4. Adoption of technology as of 3rd year Rs.8000	5. Same technology to be adopted as on 4th year Rs.8000	166.66
	Goatery 3 nos. Rs.5000	• Low income Rs.6500 from goatery unit due to local breed	1. Improved Black bengel Live body weight (kg/annum) 6kg, Rs.7000	2. Deworming of goats Albendazole @10mg/kg body weight (upto 6 months)and Zycloz@1lm/10kg body weight) after 6 months. Live body weight (kg/annum) 10kg, Rs.9000	3. Improved feed management Live body weight (kg/annum) 12kg, Rs.10000	4. Adoption of technology as of 3rd year Rs.10000	5. Same technology to be adopted as on 4th year Rs.10000	100.00
	Average Increase in Income over 5 years							**160.32**

Table 25. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 8: Western Undulating Zone
Districts: Kalahandi & Nuapada

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed Upland	Cotton-Fallow 8 q ha^{-1} (Rs. 18,000)	• High incidence of sucking pest and bollworm. • Rampant use of fertilizer & indiscriminate use of plant chemicals	1. Demonstration of IPM practices 2. Growing castor and marigold as trap crop 3. Sowing of imidacloprid treated seed (5 g/kg of seed) 4. Installation pheromone traps 20nos. ha^{-1} 12q Rs.22,000	5. Demonstration of IPM practices 6. Application of HaNPV @ 500 l ha^{-1}. & handpicking of harmful larvae 7. Neem pesticide for management of sucking pests and bollworm at early vegetative stage @ 2 l ha^{-1} 8. Set up bird perches @20 nos. ha^{-1} 13.5q Rs.25,000	9. Plough deeply to expose resting pupae. 10. Avoid excess use of nitrogen fertilizers at the reproductive. 11. Use 5% neem seed kernel extract (NSKE) at 45 DAS. 12. Topping cotton twigs at 90 days after sowing. 13. Application Indoxacarb 14.5 SC @ 250 ml ha^{-1} 15q ha^{-1} (Rs. 28,000)	14. Adoption of technology as of 3rd year 15q ha^{-1} (Rs. 28,000	15. Same technology to be adopted as on 4th year 15q ha^{-1} (Rs. 28,000	55.55
Rainfed Medium land	Rice-Green gram Paddy(MTU 1001) 28 q ha^{-1} (Rs.13000)	• High weed incidence • Imbalance dose of fertilizer • application Low yield due to terminal drought • Incidence of BLB	1. Weed management in paddy-Pre-emergence weedicide Londax power (Bensulfuron methyl+ pretilachlor) @ 105Kg ha^{-1} 0-5 DAT 35 q ha^{-1}, Rs 17,000./ha	2. Post –emergence weedicide Bispyribic sodium200ml ha^{-1} followed by one hand weeding 37q ha^{-1} Rs.19,000/ha	3. Cultivation of short duration rice Var-Sahabhagi 4. STFR 5. Spraying of Plantomycin @ 1gm/l of water or Streptocycline (2gm/10lit) + copperoxychloride (1gm)/l of water. 40 q ha^{-1}, Rs. 20,000/ha	6. Adoption of technology as of 3rd year 40 q ha^{-1} Rs. 20,000/ha	7. Same technology to be adopted as on 4th year 40 q ha^{-1} Rs. 20,000/ha	53.80

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Green gram- 4.0q ha^{-1} Rs.10000	• High seed rate • Farmers do not apply fertilizer and bio fertilizer • YMV infestation	1. Demonstration on Green gram (var. IPM 02-3) 2. Seed inoculation with rhizobium& PSB @ 20 gm/kg of seed 3. Seed sowing behind the plough 5.8 q ha^{-1} (Rs.16000)	4. Demonstration on Management of YMV 5. Installation of yellow sticky trap 6. Spyaring of Imadichloroprid 5ml@15lit of water 6.0q ha^{-1} (Rs.18,000)	7. Demonstration on Green gram 8. (IPM 02-14) 9. STFR 6. 2q ha^{-1} (Rs.22000)	10. Adoption of technology as of 3rd year 40 q ha^{-1} Rs. 20,000/ha	11. Same technology to be adopted as on 4th year 40 q ha^{-1} Rs. 20,000/ha	100
Rainfed Low land	Rice- Green gram Rice: 30qha^{-1} Rs. 16,000	• Heavy weed incidence • Incidence of sheath blight disease in paddy • Micronutrient deficiency • Blanket fertilizer	1. Demonstration effect of Herbicide in paddy 2. Pendimethalin (38.7% SC) @ 750g ha^{-1}/ Bispyribic Na 200ml ha^{-1} at 0-3 DAT 35 q ha^{-1} Rs. 19,000	3. Application of Validamycin @ 1l ha^{-1} for control against sheath blight 36.0 q ha^{-1} Rs.20,000	4. Foliar application of application of zinc @2.5gm/lit of water 5. SFTB 38.0 q ha^{-1} Rs.22,000	6. Adoption of technology as of 3rd year 40 q ha^{-1} Rs. 20,000/ha	7. Same technology to be adopted as on 4th year 40 q ha^{-1} Rs. 20,000/ha	25.00
	Rabi Green gram (residual moisture) 3.8 q ha^{-1} Rs. 8,000	• Blanket fertilization and seed inoculation is not followed • Incidence of leaf spot & Powderly mildew • Lack crop management practices	1. Seed inoculation with rhizobium& PSB @ 20 gm/kg of seed before sowing 2. STFR 5.5 q ha^{-1} (Rs.14000)	3. Spraying of Copper oxychloride 1gm/lit of water to control leaf spot. 5.9q ha^{-1} Rs.16,000	4. Application of Sulphur 3gm/lit of water to control Powdery mildew. 5. Planofix hormone 250ml ha^{-1} before flowering for better pod development. 6. 2q ha^{-1} Rs.18,000	7. Adoption of technology as of 3rd year 6.2q ha^{-1} Rs.18,000	8. Same technology to be adopted as on 4th year 6.2q ha^{-1} Rs.18,000	125
Irrigated Upland	-Paddy-vegetables 18.7 q ha^{-1} Rs. 9800	• Cultivation of upland paddy varieties	1. Paddy cultivation 2. Herbicide - Pendimethalin 23.8 q ha^{-1}	3. Onion (*Kharif*&*rabi*) with herbicide – Quizalpfop ethyl5%	4. Copper oxychloride + Thiomethaxom 5. STFR	6. Adoption of technology as of 3rd year 139.0 q ha^{-1}	7. Same technology to be adopted as on 4th year	175.50

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
		• Low yield • Weed infestation • Blanket fertilization	Rs.13700	EC+Oxyflurofen 32.5% EC 122.0 q ha^{-1} Rs.20800	139.0 q ha^{-1} Rs.27000	Rs.27000	139.0 q ha^{-1} Rs.27000	
	Yield of cauliflower 138-145.0 q ha^{-1} Rs. 88600	• Unavailability of quality seed • -Imbalance use of fert. • -Pest and disease	1. Good quality seed of cauliflower (Var- Barkha/ Megha /Early Kuanri) 146.0 q ha^{-1} Rs.89300	2. Cauliflower 3. STFR 153.0 q ha^{-1} Rs.96400	4. Cauliflower 5. Flonicamide @ 60gm/acre/ Emamectin Benzoate 100gm/acre 162.0q ha^{-1} Rs. 98800	6. Adoption of technology as of 3rd year 162.0q ha^{-1} Rs. 98800	7. Same technology to be adopted as on 4th year 162.0q ha^{-1} Rs. 98800	11.51
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ha 14. Adoption of technology as of 4thyear Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	5. Adoption of technology as of 2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	- 80
	Semi-intensive two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Intensive pangasius culture	• Intensive pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like murrel, Magur, pabda	2. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Allied activities	Goatery (20 Goats) Rs 8975/-	• High endoparasitic infestation, high morbidity and mortality rate of kids with lower birth weight • No use of supplementary feeding	1. Control of endoparasitic infestation in small ruminants 15 gm of mineral mixture/goat for 2-3 months. 2. Antherimetics @5-7.5mg/kg body weight in 2 doses per month-Quarterly deworming per year 3. Liver tonic @0.25-0.5ml/ goat for 5-7 days along with 50gm of concentrate feed for 3 months Rs 14,175/- per annum	4. Supplementary feeding (Concentrate feeding @ 200gm/day/doe 1month before kidding and 1 month after kidding. Rs 16,855/- per annum	5. Supplementary feeding (Concentrate feeding @ 200gm/day/doe 1month before kidding and 1 month after kidding. Rs 18500/- per annum	6. Adoption of technology as of 3rd year Rs 18500/- per annum	7. Same technology to be adopted as on 4th year Rs 18500/- per annum	106.12
	Mushroom cultivation	• Not cultivating mushroom • New intervention	1. Mushroom production of Paddy straw mushroom (20 beds) and Oyster mushroom(20 bags) Net Income 16kg PSM@100 30kg OM@60 (Rs. 3400/-yr)	2. Mushroom production of OSM-11 (25 beds/month) and Blue Oyster mushroom cultivation40bags/ day Net Income 20kg PSM@100 37kg OM@60	3. Mushroom production of OSM-11 (35 beds/month)and Blue Oyster mushroom cultivation(35beds/month) 4. Management of competitor moulds and	5. Adoption of technology as of 3rd year (Rs. 5800/-yr)	6. Same technology to be adopted as on 4th year (Rs. 5800/-yr)	70.58

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
				(Rs. 4420/-yr)	diseases in straw mushroom Net Income 28kg PSM@100 50kg OM@60 (Rs. 5800/-yr)			
	Average Increase in Income over 5 years							**157.52**

Table 26. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 9: West Central Table Land Zone

Districts: Bargarh, Bolangir, Boudh, Sonepur, Parts of Sambalpur and Jharsuguda

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Up land (bunded) Rainfed	Rice-Fallow 15 q ha^{-1} Rs 6,000/-	• Local var. • Broadcast sowing Blanket fertilization • Hand weeding • Rabi – fallow • Incidence of Gundhy bug	1. Paddy var. Sahabhagidhan 2. staggered transplanting 3. STFR application 18q ha^{-1} Rs.8,000/-	4. Paddy var. Sahabhagidhan 5. 15 days early & line transplanting 6. STFR application 7. Herbicide Oxadiargyl and one hand weeding 22 q ha^{-1} Rs.10,000/-	8. Paddy var. Sahabhagidhan 9. 15 days early & line transplanting 10. STFR application 11. Herbicide Oxadiargyl and one hand weeding 22 q ha^{-1} Rs.10,000/-	12. Adoption of technology as of 3rd year 22 q ha^{-1} Rs.10,000/-	13. Same technology to be adopted as on 4th year 22 q ha^{-1} Rs.10,000/-	66.66
Medium land, Irrigated	G.nut-Vegetables <u>G.Nut</u> 4 q ha^{-1} Rs 12,000/- <u>Vegetable</u> 130 q ha^{-1} Rs 20,000	• Local var • Hand weeding • Blanket 80quaculture 80n • Incidence of White grub and Cercospora • Wilt and fruit borer in vegetable	1. Devi var . 2. Herbicide Imazethapyr 3. STFR, Micro-nutrient mix 4. Brinjal var. AN Kranti 5. Tomato var. Swarna Sampad, G.Nut 6 q ha^{-1} Rs 18,000/- Vegetable 220 q ha^{-1} Rs 30,000	6. As in 1st yr 7. Drenching of Chloro-pyriphos 8. Seed dressing with(biofert) 9. Growing of Onion (AFDR) , Watermelon (garden baby),Cauli-flower (snow ball) as vegetables G.Nut - 6 q ha^{-1} Rs 18,000/- Vegetable 240 q ha^{-1} Rs 33,000.	10. As in 1st yr 11. Growing of Onion (AFDR) , Watermelon (garden baby),Cauli-flower (snow ball) as vegetables. G.Nut 6 q ha^{-1} Rs 18,000/- Vegetable 250 q ha^{-1} Rs 35,000	12. Adoption of technology as of 3rd year G.Nut 6 q ha^{-1} Rs 18,000/- Vegetable 250 q ha^{-1} Rs 35,000	13. Same technology to be adopted as on 4th year G.Nut 6 q ha^{-1} Rs 18,000/- Vegetable 250 q ha^{-1} Rs 35,000	65.62
Rainfed lowland	Rice – Greengram (paira) <u>Rice</u> 18 q ha^{-1} Rs 8,000/- <u>G.Gram</u>	• Lalat var. • Late transplanting • Blast and Stem borer • Hand weeding	1. Transplanting before 15 days 2. Spray of Tricyclazole &Propheno-phos 3. Green-gram (paira) local	6. Transplanting before 15 days 7. Mgt of Blast & Stem borer 8. Herbicide 9. Bispyribac Na 10. Green-gram	15. Transplanting before 15 days 16. Measures for Blast & Stem borer 17. Herbicide 18. Bispyribac Na	23. Adoption of technology as of 3rd year 22 q ha^{-1} Rs.10,000/- 3 q ha^{-1} Rs 8000/-	24. Same technology to be adopted as on 4th year 22 q ha^{-1} Rs.10,000/- 3 q ha^{-1}	63.63

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	0.8 q ha^{-1} Rs 3000	• Rabi – Green gram (Paira) • No nutrients • No YMV control measure	4. Protection against YMV DAP 50 5Kg ha^{-1} 5. Rice-fish Integrated System (in-field refuge system) 22 q ha^{-1} Rs.10,000/- 1 .5q ha^{-1} Rs 4000/-	(paira) with 11. Var. TARM-1 12. Micronutrient appln. 13. STFR 14. 2% DAP spray at flowering and 15 days after 22 q ha^{-1} Rs.10,000/- 2 q ha^{-1} Rs 8000	19. Green-gram (paira) 20. Var. TARM-1 21. Micronutrient appln. 22. 2% DAP spray 22 q ha^{-1} Rs.10,000/- 3 q ha^{-1} Rs 8000/-		Rs 8000/-	
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	140 300 620

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3 t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	5. Adoption of technology as of 2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	- 80
	Semi-intensive Two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/	1. Improved efficiency through genetically improved carps, better quality feed and scientific management	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
		ha						
	Intensive pangasius culture	• Intensive pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like murrel, Magur, pabda	2. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Home- stead	Milch Cows (2 nos) Rs 10,000/ yr Local poulty bird (nos) Rs 150/-	• No fodder supplement • high cost concentrate • Low milk yield • Free forazing of birds • Under-utilized homestead	1. Mineral mixture @ 50 gm/cow 2. ten beds;Dhingri mushroom 3. Pallishree birds 10 no 4. Pomogr-anate sapl-ings (5 no) Milk 5 lit/ day Rs 15,000/yr Mushroom 1.4 kg/bed Rs 1000 1.8 kg/ bird Rs 3000	5. Intervention of 1st yr 6. Hyb napier CO4 7. Dhingri mushroom 20 beds; Milk 5 lit/ day Rs 15,000 /yr #Banaraja birds 20 no 1.8 kg/ bird Rs 5000	8. Interven-tion of 2ndyr 9. Hyb napier CO4 10. Dhingri / Milk 6 lit/ day Rs 16,000 /yr 11. Banaraja 15 nos . with overlap bird batches of two yrs 1.8 kg/ bird Rs 8,000	12. Adoption of technology as of 3rd year Milk 6 lit/ day 13. Rs 16,000 /yr 14. Banaraja birds 20 no 1.8 kg/ bird Rs 8000	15. Same technology to be adopted as on 4th year Milk 6 lit/ day Rs 16,000 /yr 16. Banaraja birds 20 no 1.8 kg/ bird Rs 8000	108.69
	Average Increase in Income over 5 years							**165.1**

Table 27. Existing farming practices, constraints and major technological interventions to increase farmer's income in Agro-Climatic Zone 10 : Mid Central Table Land Zone

Districts: Angul, Dhenkanal, Parts of Cuttack and Jajpur

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Rainfed Upland	Rice yield-19.0 q ha^{-1} Net return Rs.4160	• Old variety • Hand weeding • Broadcast sowing • Injudicious fertilization	1. HYV-Satyabhama 2. RDF NPK 60:30:305Kg ha^{-1} 24q ha^{-1} Rs.5600	3. HYV-Satyabhama/ Sahabhagi dhan 4. Herbicide-Oxadiargyl /Oxyflourfen 28 q ha^{-1} Rs.6872	5. HYV Satyabhama/ Sahabhagi dhan 6. Herbicide-Oxadiargyl /Oxyflourfen 7. Line sowing 8. STFR application 35.0 q ha^{-1} Rs.9280	9. Adoption of technology as of 3rd year 35.0 q ha^{-1} Rs.9280	10. Same technology to be adopted as on 4th year 35.0 q ha^{-1} Rs.9280	123.07
Rainfed Upland	Blackgram (*Kharif*) Yield- 3.2 q ha^{-1} Net return Rs.1020	• Local variety • Injudicious fertilization • Pest (Aphid attack) • Broadcast sowing • No weeding	1. 1.HYV- PU 35 4.4 q ha^{-1} Rs.1604	2. HYV- PU 35/ 3. PU 30 4. Rhizobium culture 5. NPK (20-40-20 5Kg ha^{-1}) 6. Imidachloprid/Thiomithoxan 5.2 q ha^{-1} Rs.2132	7. HYV PU 35 8. Rhizobium culture 9. NPK(20-40-20 5Kg ha^{-1} 10. Imidachloprid/Thiomithoxan 11. Herbicide-Pendimethalin 12. Line sowing 5.9q ha^{-1} Rs..2340	13. Adoption of technology as of 3rd year 5.9 q ha^{-1} Rs.2340	14. Same technology to be adopted as on 4th year 5.9 q ha^{-1} Rs.2340	129.41
Rainfed Upland	Mango Orchard (yield-48 q ha^{-1}) Net return Rs.6480)	• Attack of pest (Mango hopper) • Canopy management	1. Application of Thiomethoxam Yield-53 q ha^{-1} Rs.7160	2. .Application of Thiomethoxam/Quinalohos 3. Canopy management Yield-55 q ha^{-1} Rs.7800	4. Application of planofix + etheryl 5. Canopy management Yield-57 q ha^{-1} Rs.7800	6. Adoption of technology as of 3rd year Yield-57 q ha^{-1} Rs.7800	7. Same technology to be adopted as on 4th year Yield-57 q ha^{-1} Rs.7800	20.37
		• Distress sale • Home consumption Unhygenic	1. Mango leather with 0.1% KMS by sun drying 0.2q mango leather Rs.1250	2. Mango leather with 0.1% KMS by solar dryer 0.2q mango leather Rs.1480	3. Mango leather with 0.1% KMS and spices by solar dryer 0.3q Spicy mango leather Rs.2025	4. Adoption of technology as of 3rd year Rs.2025	5. Same technology to be adopted as on 4th year Rs.2025	62

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
Irrigated medium land	Paddy (var. MTU-1010) – Paddy (var. MTU-1010, Lalat) 38.5 q ha^{-1} Rs 16250/-	• Staggered planting • Weed infestation • Indiscriminate use of 85quacultur application • Stem borer and sheath blight infestation	1. Line transplanting with RDF (80:40:40) 2. Weed management 3. IPM in paddy 42 q ha^{-1} Rs 19,100	4. Paddy hybrid Ajay / Rajalaxmi in kharif with line transplanting 52 q ha^{-1} Rs 25,125/-	5. BPH management 6. INM 56 q ha^{-1} Rs 26800	7. Adoption of technology as of 3rd year 56 q ha^{-1} Rs 26800	8. Same technology to be adopted as on 4th year 56 q ha^{-1} Rs 26800	64.92
	Vegetable (Cabbage-180q ha^{-1}) Rs.18,000	• Imbalanced 85quacultur application • Diamond back moth in cabbage	1. Improved nursery raising and planting technique of cabbage 200q ha^{-1} Rs.21,000	2. Spinosad 45% SC@ 125ml ha^{-1} for management of DBM in cabbage 225q ha^{-1} Rs.25,000	3. STB fertilizer application in cabbage 235 q ha^{-1} Rs.29,000	4. Adoption of technology as of 3rd year 235 q ha^{-1} Rs.29,000	5. Same technology to be adopted as on 4th year 235 q ha^{-1} Rs.29,000	61.11
Pond System	Small farm pond (<0.2 ha)	• Small farm pond (<0.2 ha)	1. Seed production of carps Rs.30,000/ha	2. Seed production of carps Rs.30,000/ha	3. Adoption of technology as of 2nd year Rs.30,000/ha	4. Adoption of technology as of 3rd year Rs.30,000/ha	5. Adoption of technology as of 4th year Rs.30,000/ha	-
	Seasonal water bodies	• Seasonal water bodies • Rs.30,000/ha	1. Early maturing species culture like minor carps, tilapia, prawn aquaculture	2. Early maturing species culture like minor carps, tilapia, prawn aquaculture Rs.60,000/ha	3. Adoption of technology as of 2nd year Rs.60,000/ha	4. Adoption of technology as of 3rd year Rs.60,000/ha	5. Adoption of technology as of 4th year Rs.60,000/ha	60
	Medium sized farm pond (0.2 to 1 ha)	• Medium sized farm pond (0.2 to 1 ha) • Rs.50,000/ha	1. Extensive scientific carp culture with yield 3 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-	4. Extensive scientific carp culture with yield 3 t ha^{-1} Rs.1,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture	7. Adoption of technology as of 2nd year Rs.1,50,000/ha 8. Adoption of technology as of 2nd year	10. Adoption of technology as of 3rd year Rs.1,50,000/ha 11. Adoption of technology as of 3rd year	13. Adoption of technology as of 4th year Rs.1,50,000/ha 14. Adoption of technology as of 4th year	140 300

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
			poultry-horticulture 3. High value SIFS with exotic horticulture	Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	620
	Derelict multiple use village pond	• Derelict multiple use village pond Rs.20,000/ha	1. Extensive carp culture system with yield of 3 t ha^{-1}	2. Extensive carp culture system with yield of 3t ha^{-1} Rs.1,50,000/ha	3. Adoption of technology as of 2nd year Rs.1,50,000/ha	4. Adoption of technology as of 3rd year Rs.1,50,000/ha	5. Adoption of technology as of 4th year Rs.1,50,000/ha	500
	Carp poly culture pond aquaculture	• Carp poly culture pond aquaculture • Rs.1,50,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture 3. High value SIFS with exotic horticulture	4. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 5. Integrated farming of fish-poultry, fish-livestock, fish-poultry-horticulture Rs.2,50,000/ha 6. High value SIFS with exotic horticulture Rs.4,50,000/ha	7. Adoption of technology as of 2nd year Rs.2,50,000/ha 8. Adoption of technology as of 2nd year Rs.2,50,000/ha 9. Adoption of technology as of 2nd year Rs.4,50,000/ha	10. Adoption of technology as of 3rd year Rs.2,50,000/ha 11. Adoption of technology as of 3rd year Rs.2,50,000/ha 12. Adoption of technology as of 3rd year Rs.4,50,000/ha	13. Adoption of technology as of 4th year Rs.2,50,000/ha 14. Adoption of technology as of 4th year Rs.2,50,000/ha 15. Adoption of technology as of 4th year Rs.4,50,000/ha	33.33 33.33 140
	Semi-intensive carp poly culture	• Semi-intensive carp poly culture • Rs.2,00,000/ ha	1. Semi-intensive system of carp culture with yield 6 t ha^{-1} 2. High value fish based culture	3. Semi-intensive system of carp culture with yield 6 t ha^{-1} Rs.2,50,000/ha 4. High value fish based culture Rs.4,50,000/ha	5. Adoption of technology as of 2nd year Rs.2,50,000/ha 6. Adoption of technology as of 2nd year Rs.4,50,000/ha	7. Adoption of technology as of 3rd year Rs.2,50,000/ha 8. Adoption of technology as of 3rd year Rs.4,50,000/ha	9. Adoption of technology as of 4th year Rs.2,50,000/ha 10. Adoption of technology as of 4th year Rs.4,50,000/ha	- 80

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Semi-intensive two species commercial aquaculture (Andhra model)	• Semi-intensive two species commercial aquaculture (Andhra model) • Rs.3,00,000/ ha	1. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	2. Improved efficiency through genetically improved carps, better quality feed and scientific management Rs.3,50,000/ha	3. Adoption of technology as of 2nd year Rs.3,50,000/ha	4. Adoption of technology as of 3rd year Rs.3,50,000/ha	5. Adoption of technology as of 4th year Rs.3,50,000/ha	-
	Intensive pangasius culture	• Intensive pangasius culture • Rs.4,00,000/ ha	1. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	2. High value cat fish culture like murrel, Magur, pabda Rs.10,00,000/ha	3. Adoption of technology as of 2nd year Rs.10,00,000/ha	4. Adoption of technology as of 3rd year Rs.10,00,000/ha	5. Adoption of technology as of 4th year Rs.10,00,000/ ha	100
Home stead	Paddy straw introduction	• Non-utilisation of paddy straw • Improper substrate management	1. Mushroom Cultivation Var.OSM11(12 Beds) 0.12q Rs.1000	2. Var. 3. V.Volvaceae/OSM 11 4. .Presoaking of Paddy straw with 2% CaCO3 (12 beds) 0.26 q Rs.1300	5. 3. Var. 6. V.volvaceae/OSM 11 7. Presoaking of Paddy straw with 2% CaCO3 (24 beds) 0.53 q Rs.1600	8. Adoption of technology as of 3rd year (48 beds) 0.53 q Rs.1600	9. Same technology to be adopted as on 4th year (48 beds) 0.53 q Rs.1600	60.00
Home stead	Dairy: 1 CB cows 5 lit/day Rs.16750	• Imbalanced feeding • Improper disease management • Delayed puberty	1. Azolla 5. 6 lit/day Rs.23035	2. .Feed prepn. 3. .Deworming and mineral mixture supple-mentation 6.5 lit/day Rs.29480	4. Feed prepn. 5. Deworming and mineral mixture supple-mentation 6. Disease management of FMD 7.2 lit/day Rs.35268	7. Adoption of technology as of 3rd year 7.2 lit/day Rs.35268	8. Same technology to be adopted as on 4th year 7.2 lit/day Rs.35268	110.55
	Goat (5 nos.) (Live wt.13.5 kg/goat)	• Poor management • Disease	1. Dewormingwithal bendazole@10m g/kg body wt 4 No.Kids	2. .Deworming 3. PPR vaccination 6 No. Kids	4. Deworming 5. PPR Vaccination 6. Feeding	7. Adoption of technology as of 3rd year	8. Same technology to be adopted as on 4th year	53.33

Farming situation	Major existing practices (2016-17)	Constraints	Technological interventions					Increase in income by 2022 (%)
			1st year (2017-18)	2nd year (2018-19)	3rd year (2019-20)	4th year (2020-21)	5th year (2021-22)	
	Net Profit Rs.15000/ year	occurrence • Less income	Live wt.14.2 kg/goat Net Profit Rs.17000	Live wt.14.5kg/goat Net Profit Rs.18000	@250gm/ pregnant doe 1 month before & 1 month after kidding 12 No. Kids Live wt.14.5 kg/goat Net Profit Rs.23000	Rs.23000	Rs.23000	
	Average Increase in Income over 5 years							**141.65**

8.2. Success Stories and their potential contribution to farmers income and strategy for scaling out these technology

8.2.1. Mechanized Direct Seeded Rice

Technology: Dry seeding is done in well-ploughed field during end of May to 1st week of June before onset of monsoon using seed cum fertilizer drill. About 40 kg seeds are required in comparison to 100 kg used in farmers' method per ha basis. Use of NPK fertilizers as basal application along with seed through seed drill. For weed control, two modules as per feasibility, a) pre-emergence application of Pretilachlor within 3 days of receipt of rain after sowing + Mechanical weeding using power weeder at 30 DAS; b) Post emergence application of Bispyribac sodium alone or Bispyribac sodium+Pyrazosulfuron at 15 DAS as per the prevalence of weed flora + Hand weeding (if needed) at 35-40 DAS. *Beushening* is not recommended as crop is line planted with optimum plant population. Subsequent fertilizer as per the recommended splits and need based plant protection measures are followed.

Agro-climatic zone where technology is suitable: North East Coastal Plain zone.

Success: Average reduction in cost of cultivation is Rs.4500 per ha. Saving happens through seed input, less labour consumption in weeding and *beushening*. In most of the demonstrations, grain yield is higher for this method over broadcast DSR or transplanted method. However, in all cases the profitability has been greater than conventional methods. Agriculture department has included this technology in their program presently in an area of 830 acres.

Farmers' views: Shri Chandrakant Mandal, Suanpada, Bonth, Bhadrak; Shri Ajay Kumar Dasmohapatra, Khirasahi, Bhadrak; Shri Pabitra Uchhayat, Khirasahi, Bhadrak are some of the progressive farmers who have successfully adopted this technology with good results.

Existing technology to be replaced: Farmers practice of broadcast direct seeded rice associated with *beushaning*; as well as transplanted rice under assured irrigation can be replaced by this technology.

To which other agro-climatic zones it can be upscaled: All direct seeded rice areas of Odisha

Suggested action plan and linkage with Government program: This technology can be included in block demonstration under BGREI program of department of Agriculture for its upscaling.

Contact address: In-Charge, KVK, Bhadrak, Odisha.

8.2.2. Blackgram and Greengram for Intensification of Rice Fallows

Technology: Cultivating of blackgram/greengram as relay/paira crop after kharif rice is successful under suitable rice fallows particularly in heavy textured soils. Under shallow low land rainfed kharif rice, sowing of blackgram seeds to be taken at 10 days before harvest of rice. Blackgram var. PU 35/ PU 31/ Prasad are suitable for such situations. Optimum time of sowing is last week of October to 3rd week of November and requires 25 kg seeds ha^{-1}. Greengram var. IPM 2-3/IPM 2-14 are suitable which are tolerant to YMV. Crop is raised utilizing residual soil moisture and residual fertility without soil application of fertilizers. Foliar application of water soluble NPK fertilizers such as 18-18-18/19-19-19 at 1% solution twice at 30 and 45 DAS. Post emergence application of Quizalofop ethyl or Imazethapyr herbicide as per the prevalence of weed flora at 15 DAS.

Agro-climatic zone where technology is suitable: North East Coastal Plain zone

Success: Demonstrated yield averaged to 3.3 q ha^{-1} with a minimum of 2.0 q and maximum of 5.8 q ha^{-1} with an average B:C ratio of 2.63. About 50 ha covered under demonstration for blackgram and greengram in rice fallows in two villages, Chhatrapada and Solagan of Dhamnagar block of Bhadrak district.

Farmers' views: Farmers need community mobilization for not allowing animals for open grazing, so that a short duration climate resilient blackgram crop can be raised utilizing residual soil moisture.

Existing technology to be replaced: Rice fallows (rainfed)

To which other agro-climatic zones it can be upscaled: East and South Eastern coastal plain zone

Suggested action plan and linkage with Govt program: Demonstrations under Government program of CSBD (Cropping system based demonstration) under RKVY scheme of department of agriculture can be taken up for dissemination of this technology.

Contact address: In-Charge, KVK, Bhadrak, Odisha.

8.2.3. Customized Leaf Color Chart (CLCC) for Nitrogen Management in Rice for Different Ecologies

Technology: Customized leaf color chart (CLCC) is an effective, easy-to-use, low-cost real-time N management tool that can assist the rice farmers in deciding when and how much N should be applied to the crop.The CLCC is a plastic, ruler-shaped strip containing five panels that range in color from yellowish green to dark green matching the color range of rice leaves that cover a continuum from leaf N deficiency to excessive leaf N content. The CLCC can be used by the farmer himself to rapidly assess leaf nitrogen status and to decide the amount and time of nitrogen application.

Agro-climatic zone where the technology successful: North Western Plateau (Zone 1), North Eastern Coastal Plain (Zone 3), East & South Eastern Coastal Plain (Zone 4), North Eastern Ghat (Zone 5) and Eastern Ghat High Land (Zone 6).

Success: Based on the farmers' field trials and feedback obtained through interaction with state government functionaries, nitrogen application based on CLCC recommendation has resulted in increase of rice yield by 10 - 23% as compared to recommended dose of nitrogenous fertilizer application and farmers practice under different systems of rice cultivation. It can even produce same level of yield as farmer's practice with 15-20% less N application. The monetary benefit of this technology ranges from Rs. 6680/- to 10080/- per ha over recommended dose of fertilizers and Rs. 7776/- to 14544/- over the farmers practice. It has also resulted in 22-24% increase in the use efficiency of nitrogen application, reduction in the emission of greenhouse gases and high benefit cost ratio.

Customized leaf color chart

Signing of Memorandum of Understanding

Farmers' views: Farmers have reported that CLCC is easy to use and by using it they can understand at what time they should give the N fertilizer. They have also reported higher yield and savings of a part of nitrogenous fertilizer.

Existing technology to be replaced: Existing farmers practice and general application of recommended dose of nitrogenous fertilizers.

To which other agro-climatic zones it can be upscaled: This technology is suitable for all the Agro-climatic zones.

Suggested action plan (policy and market) for upscaling: The CLCC is commercialized and an MOU was signed with M/S Nitrogen Parameters, Chennai for manufacturing and distributing the CLCC. It can be included in the various central and state government programmes like NFSM, RKVY, BGREI, etc.

Linkage with the ongoing Government programmes: The CLCC may be included as a recommendation in the government programme on soil health card for the application of nitrogenous fertilizers in rice.

Contact address: Director, ICAR-National Rice Research Institute (NRRI), Cuttack, Odisha.

8.2.4. High Protein Rice Varieties in Odisha: A Step Forward Towards Nutritional Security

Technology: Rice is generally deficient in protein content though it contributes 29% dietary protein for millions of rice-eating population. In this context, ICAR-NRRI, Cuttack has developed and released CR Dhan 310 (IET24780: CR2829-PLN-37) at national level as first high protein (10.2%) rice variety. This medium duration (120-125 days) variety has semi-dwarf plant type (110 cm) with medium slender and good grain quality and high mean yield (4483 kg ha^{-1}). Another variety, Mukul (IET 24772: CR2829-PLN-100) has been released by SVRC for Odisha as nutrient rich rice. It has similar plant type and duration with high protein (10.1%) and moderately high (20 ppm) Zinc in polished rice. The average of grain yield in Odisha is 5542 kg ha^{-1}. They are suitable for irrigated and favorable shallow rainfed areas.

Agro-climatic zones where the technology is suitable: Mid-central table land and east and south-eastern coastal plain (non-saline) (Zone 3, 10).

Success: The average yield of Mukul (CR Dhan 311) was found 4645 kg ha^{-1} with protein yield of 469 kg ha^{-1} as compared to Naveen with 382 kg ha^{-1} at ten blocks (20 farmers fields) under Cuttack, Jagatsinghpur, Dhenkanal districts. Farmer, Khetramohan Swain, vill. Mudupur, block-Jagatsinghpur, got award in state level in 2016-17 for his progressive contribution including adoption of high protein rice 'Mukul'.

Farmers' views: Farmers accepted these varieties due to their resemblance with well adapted variety Naveen and suitability in upland/medium land situation.

Existing technology to be replaced: Naveen is popular rice variety in irrigated ecosystem for Odisha. But date of notification of this variety exceeds 10 years. CR Dhan 310 and CR Dhan 311 (Mukul) are phenotypically similar with Naveen with similar yielding potentially. They are being considered as valid replacement of Naveen.

To which other agro-climatic zones it can be upscaled: CR Dhan 310 and CR Dhan 311 are recommended for irrigated upland/medium land area of Odisha across the zones.

Suggested action plan and linkage with Government program: Higher support price for growers and subsidy for mid-day meal rice are required to give benefits both the poor rice-farmers and our underprivileged children in villages of India. Linkage with the mid-day meal programme and BGREI programme are required.

Contact address: Director, ICAR-National Rice Research Institute, Cuttack, Odisha.

8.2.5. Commercial Production of Fish Fries in Small Ponds

Technology: For nursery pond one meter water depth, pH ranging between 7.5 to 8.5 is highly productive for spawn stocking (@ 3 lakhs/10 cents/cycle) and rearing. Survival and growth of spawn are influenced by quality and quantity of food available in the pond. To ensure healthy growth of spawn, artificial feeding is necessary and is restored from the next day after stocking. The most commonly used artificial feeds are groundnut oil cake, rice bran, coconut, mustard cakes, etc. Finely powdered and sieved groundnut oil cake and rice bran mixed at 1:1 are used. It has a short culture period of 15 – 21 days and 4 culture cycles were possible during 4 months of monsoon.

Agroclimatic Zone where the technology is successful: The technology is tested and found successful in North-Eastern Coastal Plain Zone of the state.

Success: Fry yield was found to be 1 lakh/10 cents/crop. The total net income within 4 production cycles was Rs. 60,000/-. The poaching problem in the introduced system is almost nil as it deals with tiny fishes of 20-30 mm size (Fry). Total investment made by the farmer was Rs 20,000/- in 4 culture cycles and the B:C Ratio is found 3.0. As many as 400 numbers of small tanks with water spread area of 21 ha, involving 289 farmers, have been covered for fish fry production in the district.

Farmers' views: Sri Purna Chandra Majhi, Sri Sanjay Kumar Sahoo and Kirtan Majhi were some of the farmers who adopted the technology and found the technology to be simple and remunerative.

Existing technology to be replaced: Practice of unscientific table size fish production solely for domestic consumption purpose is replaced by the current technology.

To which other agro-climatic zones it can be upscaled: The technology can be upscaled in all climatic zones except hilly areas of the state.

Suggested action plan for upscaling and Linkages with the on-going Government programmes: Fishery Department, Government of Odisha can promote the said technology so that the produced frys will be utilized through "Fingerling raising program, RKVY". The OLM, Government of Odisha can promote the technology under "Livelihood development in rural Odisha" program.

Contact address: In-Charge, KVK, Bhadrak, Odisha.

8.2.6. Off Season Mushroom Cultivation: A Boon to Farmer

Technology: During winter the production of mushroom is very low due to extreme low temperature for which the innovative technology of growing it under low cost polyhouse is recommended. Regulation of atmospheric temperature & humidity as suitable for mushroom production are the key features of this technology. The recommended size of polyhouse is 20 ft length, 10 ft width and 9 ft height, inside which three rows of racks are prepared to accommodate 42 mushroom beds. A total of 294 beds can be grown in four months winter period.

Agro-climatic zone where technology is suitable: North East Coastal Plain zone.

Success (Yield and Income gain, Cost benefit ratio, Area covered, No. of farmers): Mushroom yield per bed (avg) 800 gram as against farmers' practice of 400 gram. Net income: Rs. 11, 864/- during 4 months period. B:C Ratio of 2.68. Out of 7 blocks in Bhadrak it has spread to six blocks and about 160 numbers of polyhouses are developed.

Farmers' views: This enterprise is widely accepted by the farming community because of its high market demand, easy cultivation method and higher return during a very short period of time.

Existing technology to be replaced: Mushroom growers undertake no such activity during winter because of low temperature. This technology can be fitted in this off-season.

To which other agro–climatic zone it can be upscaled: East & South eastern coastal plain zone, Mid Central Table land zone.

Suggested action plan for upscaling and Linkages with the ongoing Government programmes: Under NHM scheme of Horticulture infrastructure development can be made and through ATMA scheme polythene sheet can be supported for its upscaling.

Contact address: In-Charge, KVK, Bhadrak, Odisha.

8.2.7. Elephant Foot Yam (Gajendra) Cultivation

Technology: Prepare corms of 500 g size and then put into the solution of 10 kg cow dung and 30 g SAAF in 10 litres of water for 4-6 hours, then extracted from the slurry and the corm are dried in shade. For planting of corms, pits (45 cm length, 45 cm breadth and 45 cm depth) are

prepared. The upper soil should be mixed with cow dung @ 20 kg/pit and inorganic fertilizer i.e. single super phosphate (SSP) @ 30 g/pit. The spacing should be kept 90 cm apart from plant and 90 cm apart from row to row. The seed corm pieces (500 g) after treatment placed inside the pit at the center after placing the upper soil. The terminal bud is kept upward & then mulched with straw followed by slight irrigation. Fertilizer management should be taken as per recommended dose and schedule.

Agro-climatic zone where the technology is successful: North-Eastern Coastal Plain Zone

Success: Average yield was 400 q ha^{-1}. The bulking ratio was recorded 6 times minimum (3 kg) and maximum of 10 times (5 kg) and productivity was recorded 160 kg/decimil. The net return was recorded Rs. 2,90,000/ha and B:C Ratio of 3.5:1. Better cooking quality, devoid of acridity, high multiplication (bulking) ratio, high return from unit area, storability & good market response key features. Elephant foot yam cv. Gajendra has been adopted by 282 no. of farmers in the district who are covered under integrated formal system programme. Few villages where a number of farmers are following this technology are Jamajodi, Gopalpur, Mirzapur, Boulapal, Madhusudanpur, etc. Farmers used to multiply the propagation material i.e. corm in their own field as well spread the material to other farmers on demand.

Farmers' views: Elephant foot yam cv. Gajendra is accepted by the farmers for its cooking quality, devoid of acridity, high multiplication (bulking) ratio, high return from unit area, storability and good market response.

Existing technology to be replaced: Low valued and high input intensive vegetables such as brinjal, tomato, cauliflower, etc. grown on pond dykes can be replaced by elephant foot yam.

To which other agro-climatic zone it can be upscaled: The other agro-climatic zone such as East & South East Coastal Plain, Mid Central Table Land Zone, Western Central Table Land Zone.

Suggested action plan for upscaling: ATMA at each district level is dealing with the development of integrated farming system through which this technology can be popularized. Further, through NHM scheme of Horticulture department planting material can be provided to progressive IFS farmers for its popularization.

Linkage with the on-going Government programmes: ATMA, NHM (Mission of Integrated Development of Horticulture), Mahatma Gandhi National Rural Employment Guarantee Scheme (MG NREGS), RKVY, State plan at each district level with the development of integrated farming system.

Contact address: In-Charge, KVK, Bhadrak, Odisha.

8.2.8. Off-Season Tomato Cultivation

Technology: Demonstration of varietal replacement of *Utkal Kumari* (Farmers own variety) with Improved tomato variety *Utkal Pragnya*, which is having a potential yield of 412.0 q ha^{-1} and many good attributes like indeterminant growth habit, round fruits with thick skin and tolerant to bacterial wilt and early blight. Besides these, the farmer also advised to go for seed

treatment with Vitavax power @ 1.5 g/ Kg seed; soil test based nutrient management of NPK @ 100:50:150 kg ha^{-1}; management of root rot by drenching of fungicide Ridomil MZ WG @ 2g/lit water and early blight by Mancozeb 75% WP @ 2g/ litre of water.

Agro-Climatic Zone: The technology is successfully piloted in East & South Eastern Coastal Plain Zone of Odisha. The cropping pattern is mainly rain fed and cultivating during the month of August.

Success: Farmer got an increased yield of 44.35% to a tune of 253.76 q ha^{-1} from earlier 175.79 q ha^{-1} with an average 26 number of fruits per plant. The net profit increased from Rs. 71,750 to Rs.1, 34,010 per ha where the B:C ratio is 2.42 against the B:C ratio of 1.83 in Farmers practice. The technology horizontally spread to 54 villages in the vicinity.

Farmers' views: Farmer is satisfied with his yield from tomato variety *Utkal Pragnya* and also advocating other fellow farmer friends to go for the new variety.

Existing technology to be replaced: Due to distress sale of Tomato during rabi and thin skin of the tomato, the farmer was not getting a good price. In addition to this, the tomato crop damaged by root rot and early blight brings a severe loss to the profit margin.

To which other agro-climatic zones it can be upscaled: It can be up scaled for Eastern Ghat High Land and North Eastern Ghat of Odisha.

Action Plan: Department of Horticulture can promote and supply quality inputs to farmers.

Linkage with the on-going Government programme: It can be linked with Horticulture Dept. and Reliance Foundation for better convergence of services including inputs, production, marketing and technology dissemination.

Contact Address: In-Charge, KVK, Ganjam-II, Odisha

8.2.9. Cultivation of Flowers

Technology: In order to check the poor quality of flower & low yield of tuberose, soil test based nutrient management practice with 75% RDF + FYM (1 kg/sqm) + Vermicompost (300 g/m^2) + Azospirillum 2g/plant + PSB 2g/plant were recommended to the farmer. Subsequently, a marigold demonstration was conducted in the farmer's field with the application of plant growth regulator GA_3 @ 200 ppm in 15 days interval during bud initiation stage.

Agro-Climatic Zone: The technology is successfully piloted in East & South Eastern Coastal Plain Zone of Odisha and covered more than 12 villages across the district. The cropping pattern is mainly irrigated.

Success: As a result, the farmer got an increased yield of 46.35% to a tune of 6.03 q ha^{-1} with an average 25 number of florets per spike. The benefit-cost ratio per ha area reveals that the net profit of Rs. 3,45,930/- can be achieved with an investment of Rs. 2,30,620/- with a higher B:C ratio of 2.50. Similarly, in marigold, the farmer got an increased yield of 41.3% (130 q ha^{-1}) and relished a net profit of Rs. 3, 19,742/- per ha area with an elevated B: C ratio of 2.59.

Farmers' views: The smile shows on the tined face of the farmers and satisfied with the demonstration results and also advocating fellow farmers to adopt the technology as well as the flower varieties.

Existing technology to be replaced: Up land paddy and vegetable area converted to floriculture for better remuneration.

To which other agro-climatic zones it can be upscaled: It can be up scaled for Eastern Ghat High Land and North Eastern Ghat of Odisha.

Action Plan: Procurement of tuberose, marigold and Gerbera under NHM programme and exposure visit for farmers are to be included by Dept. of Horticulture, Govt. of Odisha.

Linkage with the on-going Government programme: It can be linked with NHM, Horticulture Department and Reliance Foundation for better convergence of services including inputs, production, marketing and technology dissemination.

Contact Address: In-Charge, KVK, Ganjam-II, Odisha

8.2.10. Integrated Weed Management in Paddy

Technology: The farmer has been motivated to go for line transplanting of paddy followed by application of Bensulfuron methyl + Pretilachlor @ 10 kg ha^{-1} at 0-5 days after transplanting (DAT) followed by one manual weeding.

Agro-Climatic Zone: The technology is successfully piloted in East & South Eastern Coastal Plain Zone of Odisha. The cropping pattern is mainly rain fed.

Success: After the demonstration, the no. of weed species were reduced from 22 to 5 per sqm and the yield increases significantly up to 19.56% (22 q ha^{-1}). Further, he got a net profit of Rs. 11,597/- per ha with a higher B:C ratio of 1.67 against 1.52 of farmers practice.

Farmers' views: Farmer is satisfied with the demonstration results and advocating his fellow farmers to practice the new herbicide. The technology spread to more than 500 villages in the district.

Existing technology to be replaced: More weed infestation causes low yield of paddy and increases cost of production.

To which other agro-climatic zones it can be upscaled: It can be up scaled for Eastern Ghat High Land and North Eastern Ghat of Odisha.

Action Plan: Procurement of rice under Government programme and exposure visit for farmers and experiential learning through Department of Agriculture, Government of Odisha, ICAR Institute and KVKs can change scenario of distress sale paddy in Ganjam district.

Linkage with the On-going Government Programme: It can be linked with BGREI, other Agricultural Schemes and Reliance Foundation for better convergence of services including inputs, production, marketing and technology dissemination.

Contact Address: In-Charge, KVK, Ganjam-II, Odisha.

8.2.11. Maize Intercropping

Technology: Intercropping of Maize + cow pea (2:2) at 30x90 cm (Plant to plant- 30 cm) with Maize var. PAC 740, Cowpea var. Utkal Manik/Kashi Kanchan, Seed Treatment with Carbendazim @ 2 g/kg seed for both crops, soil test based fertilizer application (FYM @ 5 t ha^{-1}, NPK- 120:75:60 ha^{-1}, Full P & K, 50 % N as basal, 25 % knee height stage, 35 DAS, 25 % N at tasselling stage, 55 DAS) and $ZnSO_4$ @ 25 kg ha^{-1} application at final land preparation.

Agro-Climatic Zone: The technology is successfully piloted in Northern Eastern Ghat Zone of Odisha.

Success: Average net income was Rs 30,000/- per ha from maize and Rs 12,000/- per ha from cowpea. So crop intensification with scientific management is the only option for him for increasing the net income. The B:C ratio is 1.8.

Farmers' views: Farmers are very happy with the selling price of maize. As the cultivation practice is very similar to cowpea and the profitability is much higher, they will continue to adopt this crop in the future. More than 450 tribal farmers adopted this technology.

Existing technology to be replaced: Maize-fallow to Maize + cowpea-fallow.

To which other agro-climatic zones it can be upscaled: Eastern Ghat High Land, South Eastern Ghat where maize is grown.

Action Plan: Cowpea intercropping in maize will be promoted by providing some incentives or subsidy to the maize growers.

Linkage with the On-going Govt. Programme: Processing unit need to be established at Gajapati district.

Contact Address: In-Charge, KVK, Gajapati, Odisha.

8.2.12. Production of Off-Season Carp Seed Using Cifabroodtm

Technology: Round the year fish seed production hinders access to fish seed. Indian Major Carps are the mainstay in India and these fishes spawn during the monsoon season (June-September) and hence seed is available to the fish farming only after August-September after 21 days of nursing of spawn. ICAR-CIFA developed a brood stock diet 'CIFABROODTM for early maturation of broods and producing quality seeds. CIFABROODTM, as a brood stock feed advances maturation and growth of gonads, facilitating early spawning and significantly increases spawning response. The spawning can be advanced three to four weeks depending on the region of operations.

Agro-climatic zone where the technology is successful: The cases were reported in the coastal region of Odisha, which falls under Eastern Ghats hot moisture sub humid eco-region and in East coast plain and Hill region.

Success: The 35-40 days of early maturation of broodstock was reported and more than 88.14% of fertilization rate during the month of April- May was reported. The price of spawn at the start of the seed production season i.e during April-May is very high (Rs. 1200/- to Rs. 700/- per lakhs of spawn) compared to the normal season (June- September) (Rs. 250/- to Rs. 400/- per lakhs of spawn). Higher price is available at early season. The B:C ratio was reported at 4.7.

Farmers' views: We are very happy to use this technology as standardized feed for carps, which replaces many un-standardized practices like using raw feed ingredients. We are able to sell the seed one month before other hatcheries and able to get more than double the price compared to the seasonal rate of spawn.

Existing technology to be replaced: The conventional practice of feeding the carp broodstock is farm made feeding system which consists of feeding a various combinations of oil cakes (mustard oil cake, ground nut oil cakes), rice bran, mineral mixture, and cooked grains (pulses, rice).

To which other agro-climatic zone it can be up scaled: The technology can be upscaled in all ACZs. The breeding season of the carps is related with the climatic condition of the adopted zone.

Suggest action plan for upscaling: At present, the CIFABROODTM is commercialized to only one firm located in West Bengal who holds the exclusive rights to supply all over country. This leads to high price and non-availabiity of the feed all over the country. Hence, efforts need to be placed to make the technology of CIFABROODTM production (feed formula) available to large number of feed producers.

Linkages with the ongoing government programme: The support available to the hatchery establishment and seed production should also be linked with the use of CIFABROOD as a part of good aquaculture practices.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.13. Incorporation of Minor Carps in Polyculture System

Technology: The technology is to incorporate minor carp *P. gonionotus* @ 20% of total stocking density (i.e., 1600 numbers) into the polyculture system with catla, rohu and mrigal were

stocked in the ratio 40:30:30. The technology is to harvest *P. gonionotus* after 5-6 months of stocking, allowing the major carps to grow further for another 4-5 months.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco-region and in East coast plain and Hill region.

Success: Farmers adopting composite fish culture have no intermediary income during culture period and there is a low yield due to single harvest with Indian Major Carps. There are many minor carp species, which have culture potential and regional importance which command high consumer preference. Being categorized as local fish by the consumers, these minor carps also command 20-30% higher market price than the Indian major carps depending on the regional demand. Attempts are made to diversify the major carp based composite culture systems by changing the composition incorporating minor carps. These fishes have also a good market demand and consumer preference and play an important role in species diversification and conservation. An additional average net income of Rs. 26,030/- per ha with a meagre additional investment of Rs. 4,330/- per ha from the same water body encourages the farmers towards the new technology. Monoculture of *P. gonionotus* gave an average gross production of 815 kg ha^{-1} after five months, whereas from polyculture, gross production amounted to 1,373 kg ha^{-1} during the same rearing period.

Farmers' views: Farmers in this study perceived that incorporation of minor carps and harvesting after 5-6 months is profitable which supplements intermediary income during the crop cycle.

Existing technology to be replaced: Traditional polyculture system.

To which other agro-climatic zone it can be upscaled: The technology can be up scaled to prominent zones in Odisha that has more demand for minor carps in individual farmers and community ponds.

Suggest action plan for upscaling: Government has to take special attempts to use the unexploited water bodies like seasonal ponds, derelict water bodies can be encouraged for the production of minor carps along with major carps.

Linkages with the ongoing Government programmes: This technology can be promoted with the state government with development of schemes targeting species diversification.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.14. Small Holder Carp Hatcheries in Fish Seed Production

Technology: The carp hatcheries are the primary means of the production of fish seed. The fish hatchery technology caters fish seed production and technology of induced breeding and hatchery management are the components of this enterprise. The demand for fish seed has no limits and this technology can satisfy farmer's seed requirement. A carp hatchery should

possess sufficient nursery ponds, rearing ponds, brood ponds, hatching and breeding pools for seed production. The primary requirement of carp breeding is adequate number and sizes of brood stock which is a key factor for successful artificial propagation. Induced breeding is practiced using synthetic hormones.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Success: The establishment and works done by KVK-Khordha, ICAR-CIFA with five hatcheries could result that adequate resources of ponds and other facilities enabled to produce the fish seed production with its potential. The average seed production is found to be 6.2 crores spawn, 26.40 lakh fry, 520 kg fingerlings, and 2220 kg yearlings with average operation of 12 cycles/year. The hatcheries have created employment opportunities of 168 man days with B:C ratio of 2.79.

Farmers' views: The hatcheries were able to adopt improved practices like replenishment and maintenance of good quality brood stock, feeding the brood with proper quality feed, etc. the enterprise is profitable according to the farmers.

Existing technology to be replaced: New innovation for seed production to meet the market demand for carp seed.

To which other agro-climatic zone it can be upscaled: This technology as an enterprise can be adopted in all the agro climatic zones.

Suggested action plan for upscaling: Quality seed production should be the target for the existing and future hatcheries to be established.

Linkage with the ongoing Government programmes: The process of producing quality fish seeds is an intensive activity and it is mandatory for the hatcheries to adopt scientific management practices, such as Best Management Practices (BMPs). R & D centers and extension agencies along with the government have to create a platform for small scale hatchery owners to update with latest information, knowledge and share best practices through skill development initiatives on a regular basis for sustaining and competing in the sector of fish seed production.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.15. Composite Fish Culture in Community/Village Ponds

Technology: A community pond of 5 acre area is situated in Raghuagarada village of Balipatna block. Members managing the pond visited KVK in 2012 for support towards enhancing fish production. The members were frustrated and shared their past experience and narrated about the failures in managing the community pond. They clearly stated that they were willing to adopt scientific management practices in composite fish culture in their community pond to increase its production. The technology package of ICAR-CIFA was adopted. In the first year the group was advised to remove 20-30% of aquatic weed manually. Stocking density was with

Grass carp, Catla, Jayanti Rohu and Mrigal (8000 fingerlings ha^{-1}). The other supplementary feed (GNOC) was partially provided to motivate the group. Water quality testing and necessary application of lime was also advised. Sustainable natural plankton production was maintained through application of fertilizer in different schedule.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Success: The group realized the importance of scientific management practices to increase fish production. Fish production of the pond increased to 3.2 t ha^{-1} in 2015-16 from initial production of 1.4 t ha^{-1}.

Farmers' views: The group regained their inner potential and got the faith of villagers that profit can be made from their pond through community approach and constant dedication without vested interest. After witnessing success many fish farmers and pond owners have approached KVK for demonstration and training programme at their village. Though KVK has withdrawn, the group continues the practice and feels that it is profitable.

Existing technology to be replaced: Traditional capture based fisheries.

To which other agro-climatic zone it can be upscaled: Can be upscaled to all warm water perennial ponds managed by Community/village level institutions.

Suggest action plan for upscaling: The development schemes of the government.

Linkage with the ongoing Government programmes: Institutions coupled with technology can carry forward community ponds to be more productive. Government needs to work on formalizing a best practice to be adopted across the state for promoting fish culture in community ponds. One time support by the government for community ponds to clean the old ponds, provide technical expertise and adoption of best practices is a pre-requisite as they are common property resources.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.16. Rice Based Integrated Farming System

Technology: The National Rice Research Institute, Cuttack has developed two adoptable technologies / models namely "Rice-fish diversified farming system: for semi-deep (upto 50 cm water depth) and Multi-tier rice–fish horticulture crop based farming system for deep water (upto 1 m or more water depth) and coastal wet land areas.

Agro-climatic zone where the technology is successful: **zone:** East and South Eastern Coastal Plain.

Success: This rice–fish–horticulture based farming system can increase farm productivity by 15-17 times and net income by 20 folds over the conventional system of rice farming. The system generates additional farm employment upto 300 man days ha^{-1} year ha^{-1}. The technology has been validated and up scaled in the farmer's field. Initial investment of Rs. 72,000/- was done by the farmer for establishment and shaping of his rice area (Total 4 acres) into

watershed/pond area of about 1 acre where he was advised to put the Indian major carps and the dugout soil was transformed into raised dykes where the farmer took banana and vegetable crops like cowpea, pumpkin, leafy greens, drum stick etc. At the end of the year he could get the net income of Rs. 1,50,000/- with the B:C ratio of 2.08. The technology has been adopted by many farmers and more than 1000 farmers have been trained through teaching and demonstration.

Farmers' views: Farmer expressed happiness about the diversification of his income specially from rice and fish.

Existing technology to be replaced: Mono rice cropping or rice-pulse system.

To which other agro-climatic zones it can be upsclaed: It can be upscaled to North Eastern Coastal Plain and waterlogged areas of all the zones of Odisha.

Suggested action plan for upscaling: It is also necessary to provide institutional and organizational support, training facilities and technical support for sustainable rice-fish farming. Training and technical support would help to increase the knowledge of farmers, improve productivity and reduce risks.

Linkages with the ongoing Government programmes: The farming system technology has been well supported under the National Mission for Sustainable Agriculture, RKVY and NABARD.

Contact: Director, ICAR-National Rice Research Institute, Cuttack, Odisha.

8.2.17. Carp Fingerling Production in Seasonal Ponds

Technology: Increasing water resources for aquaculture will be a herculean task for the governments and investments will be huge. Often there are green areas that are untouched and one such resource is all about the seasonal and derelict ponds in the district. These water bodies are not utilised properly and fish seed production will be a viable option. Under any acts and policies of the state these water bodies are neglected for its effective utilisation. These ponds can be leased out to landless farmers, who can also benefit from this technology by culturing fish in common property roadside ditches. Pond manuring with GNOC, RCD and SSP, Stocking of IMC fry @ 2-3 lakh ha^{-1}, supplementary feeding with GNOC and Rice bran in 1:1 ratio @ 8-10, 6-8 & 4-6 percent of stocked bio-mass during 1st, 2nd & 3rd month respectively.

KVK demonstrated the feasibility of the technology in terms of fingerling survival rate and additional income generation from these seasonal ponds to attract the pond owners for the profitable enterprise.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Success: A survival rate of 73.25% and additional net income of Rs. 77,130/- per ha was achieved.

Farmers' views: It is profitable and the unutilized ponds can be utilized effectively.

Existing technology to be replaced: Carp culture

To which other agro-climatic zone it can be upscaled: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Suggested action plan for upscaling: Under any acts and policies of the state these water bodies are neglected for their effective utilization. There are state development schemes for community ponds, reservoirs and others and for seasonal ponds there has been no mention.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.18. Incorporating Freshwater Prawn in Carp Polyculture

Technology: Freshwater prawn is a cash crop, which has a very good demand and consumer preference in local market. Its commercial scale production in monoculture system is meant for export market and foreign exchange. A viable technology of stocking prawn along with IMC (catla and rohu) can fulfill the local demand and financial security to the resource poor fish farmers. Stocking of Catla and Rohu fingerlings @ 5000 ha^{-1}, Stocking of juvenile @ 10,000 ha^{-1} in nursery, Supplementary feeding with GNOC & Rice bran in 1:1 ratio through provision of check tray can be used. Stocking of IMC without Mrigal provides a good niche for the prawn to grow without competition. Provision of hide-out facilitates moulting and reduces cannibalism of prawns.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Success: Production increased from 2.4 t ha^{-1} to 2.76 t ha^{-1} and 22.3% increase in net income.

Farmers' views: It is profitable as the farmer gets better price for prawns. It serves an opportunity for rural fish farmers to consume the high valued prawn which is not affordable for them to purchase from the market.

Existing technology to be replaced: Carp polyculture.

To which other agro-climatic zone it can be upscaled: All tropical pond system.

Suggested action plan for upscaling: The number of freshwater prawn hatcheries is less compared to the carp hatcheries. It is high time that the government has to invite private

entrepreneurs to invest on establishing freshwater prawn hatcheries to meet the demand. In the country there has been a threat to freshwater prawn culture due to the introduction of white leg shrimp (*Litopenaeus vannamei*). Promoting freshwater prawn in polyculture system for a small scale farmer will keep the demand open for this species. Farmers can also earn income by rearing post larvae procured from hatcheries to juveniles as the mortality will be high during this phase as practiced in carp seed production. As informed like the other technologies incorporation of prawn in polyculture system also need to have a special mention in the state scheme.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.19. Farm Made Feed for Carp Culture

Technology: In any aquaculture operation feed cost constitutes 50-60% of total cost involved. Protein is the costliest nutrient in a formulated feed. Hence, reduction in protein cost in a feed reduces the overall feed cost and ultimately reduces the input cost towards fish culture. Ground Nut Oil Cake (GNOC) is mainly the protein rich ingredient used along with rice bran for preparation of fish feed by fish farmers. It is observed over the years that the cost of GNOC is increasing gradually. Farm made feed is a formulation of low cost balanced diet produced from locally available cheap feed ingredients. The feed is prepared from Til oil cake (30%), mustard oil cake (30%), rice bran (39%) and mineral mixture (1%). Utilization of locally available feed ingredients and reduction of protein cost in a feed, thus increasing the profit margin.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Success: Production increased from 2.85 t ha^{-1} to 2.94 t ha^{-1} and 9.47% increase in net income

Farmers' views: Farmers perceived that farm made feed reduces the cost of cultivation.

Existing technology to be replaced: Traditional feeding methods.

To which other agro-climatic zone it can be upscaled: Can be scaled up to all carp culture system.

Suggested action plan for upscaling: To upscale this practice there needs to be an extensive effort from the extension agencies to bring awareness on the locally available cheap ingredients that can be made as feed. Farmers using farm made feed should be provided with incentives as their production will be less than farmers using commercial feeds like pelletted feeds. To encourage fish farmers to adopt this practice the government can provide small feed pelletizer as incentive. The common ingredient that farmers use for preparation is groundnut oil cake and it is evident that the price is increasing day by day and farmers will not be able to afford to that. This clearly shows that farm made feeds can be a recommendation for the district extension system.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.20. Carp Seed Production in Derelict Ponds

Technology: It is always said that farmers are subsistence and they are contended with what they have, but Mr. Subhendra Prasad Sahu aged 39 from Balkati, thinks always agriculture as a business. Though he had a confidence, but he was not successful as he never looked beyond traditional farming. His ambitions were towards improving farming and to consider it as a business. He had a humble beginning and came into touch with KVK to attend a month long Skill Development training in Freshwater Aquaculture during 2013. However, his contact with KVK dates back in 2008-09 seeking advice and other services. His total farming area is 4 acres with a pond of 1.5 acres and it is a paradise to see poultry birds and ducks at the embankment of the ponds which makes him a proud farmer. In 2015 KVK involved him on the technology assessment of introducing minor carps in polyculture system.

Agro-climatic zone where the technology is successful: Eastern Ghats hot moisture sub humid eco region (12.2) and in East coast plain and Hill region (XI).

Success: His farm is under the banner "Abhipsa Integrated Fish Farm" which deals with a business in seed production of Catla, Rohu, Mrigal, Grass carp, silver carp, common carp and other minor carps with a net income of Rs. 4,00,000/- per year compared to Rs. 1,00,000/- per year in 2008-09. He has two dairy cows, honey bees, poultry and ducks adds Rs.1.00,000/- per year to his income. As a cosmopolite and smart farmer he encashed an incentive from ATMA for integrated farming system (IFS) programme and has been recognized with an award by KVK. The inspiration is about the fish seed business that he earns Rs. 4,00,000/- per year from 1.5 acre pond and also providing fish seeds of diversified species.

Farmers' views: Mr. Subhendra always has appreciation for his attendance with the one month skill development training of KVK that gave him enough ideas to lead the fish seed rearing business. He has always been in touch with KVK and also acts as a master farmer and his farm is a paradise in the small urban village of Balkati. Lessons learnt are on identification of a star technology from farmer's field like earning Rs. 4 lakhs from hardly 1.5 acre of a fish pond which can be scaled up to other farmers.

Existing technology to be replaced: Carp farming.

To which other agro-climatic zone it can be upscaled: Can be upscaled in all parts of the country.

Suggested action plan for upscaling: More number of schemes for seasonal seed production.

Linkages with ongoing Govt. programmes: The IFS model with fish seed production is profitable. The integrations and the enterprise to be included have to be widely disseminated.

Contact: Director, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha.

8.2.21. Area Specific Mineral Mixture along with Hormonal Protocol

Technology: The prevalence of incidence of reproductive disorders (anestrus and repeat breeding of crossbred cows was found to be 30-40 % in different agro climatic zones which causes a loss to the tune of 6,300/animal/month during non-pregnant period. Supplementation of area specific mineral mixture @ 50 g/head/day to crossbred cows with either double synch or estra double synch hormonal protocol improves conception rate by 65-75% of the problematic cows.

Agro climatic zone: Western Central Table Land, North Western Plateau, North Eastern Ghat Zone, Western undulating zone and East & South Eastern Coastal Plain.

Success: Pregnancy percentages in case of mineral supplementation along with estra double synch hormonal protocol, success rate was 74.5% while, mineral supplementation along with double synch hormonal protocol, success rate was 65%. *Income*: Gain For a cow which has been non-pregnant for 6 months the estimated loss to the farmer is Rs. 37,800/-. The cost benefit ratio would be 31 times (for doublesynch) and 37 times for estradoublesynch (assumption 70% success). No. of Animals tested: 3150 crossbred cows.

Farmers' views: The dairy farmers are of the opinion that they are gaining Rs. 30,000/- to Rs. 35,000/- more by selling the pregnant animals. Earliers these farmers were discouraged in dairying as they were selling the cows having anestrus and repeat breeding problems in throw away prices.

Existing technology to be replaced: It will replace traditional approach of nutritional and/or hormonal approach to treat repeat breeding and anestrus animals.

To which other agro-climatic zones it can be upscaled: All Agro-climatic zones can be covered.

Suggested action plan for upscaling: Ensuring availability of inputs and technical expertise at block level.

Linkages with the ongoing Government programmes: The programme can be linked with "Animal Health Camp" under state plan, Government of Odisha and Rastriya Gokul Mission and OMFED.

Contact: Department of Animal Nutrition, College of Veterinary Sciences and Animal Husbandry, OUAT, Bhubaneswar, Odisha.

8.2.22. Utilization of Crop Residue like Paddy Straw and Maize Stover with Mineral Mixture Supplementation

Technology: Paddy straw being the staple fodder to be utilized in a better way through processing and the maize stover which is not utilized by the farmers are to be utilized by the

cattle if chaffing is done. Along with the chaffed straw/maize stover supplementation of mineral mixture @ 30-40 g/day increases the production performance of the animals. Further, 4-5 bundles of straw per animal/day has been saved. Maize stover which (either green or dry) is not utilized by the farmers rather burnt in the field. After introduction of combine harvester, the paddy farmer are not interested to take the straw to the home, so a huge loss of crop residues in our state is expected near future. A suitable method to conserve the straw can be done by bailing or through complete feed block.

Agroclimatic zone: North eastern Coastal Plain, North Central Plateau zone, East & South Eastern Coastal Plain zone.

Success: Increase of milk production to 600- 900 ml by feeding processed straw and maize stover with mineral mixture. More than 300 farmers have been covered with the technology and also practicing. *Income*: Net income per animal/year is Rs. 4020/- with feeding processed crop residue and Rs. 5343/- with mineral mixture supplementation. C:B ratio is 1:2.3 with feeding processed crop residue and 1:2.39 with mineral mixture supplementation.

Farmers' views: The technology is adopted by more than 300 farmers covering 3 districts of Odisha. Though this technology is very simple but the production performance of the animal increased. Secondly the shortage of straw compels them to conserve the same. Maize stover was completely wasted which was utilized partially as green and even after dry stage which was well accepted by the farming communities.

Existing technology to be replaced: Feeding of processed straw/maize stover replacing unprocessed one. Enrichment of the crop residue with mineral mixture.

To which other agro-climatic zones it can be upscaled: Processing of paddy straw can be done in all agro-climatic (10) zones of Odisha. Processing of maize stover can be done in maize growing areas of Odisha.

Suggested action plan for upscaling: Small Chaff cutter to be provided at the farmers' level with subsidized rate. Marketing of milk will be through the milk co-operative societies.

Linkages with the ongoing Government programmes: The programme can be linked with "Enrichment of Crop residues" of state plan Government of Odisha.

Contact: Department of Animal Nutrition, College of Veterinary Sciences and Animal Husbandry, OUAT, Bhubaneswar, Odisha



8.2.23. Backyard Rearing of Improved Coloured Poultry Birds

Technology: Backyard Poultry rearing is an age old practice supporting food and nutritional security of land less small and marginal farmers. The native poultry birds have low productivity (40-60 eggs/annum, 1-1.5 kg adult body weight). Looking to the preference of the farmers, several coloured poultry varieties have been developed with high production potential (1.5 kg body weight at 3 months, 150 eggs/annum). Rearing such improved birds in backyard under free rage/ semi intensive system will increase farm family income.

Agroclimatic zone: East & South Eastern Coastal Plain zone, West Central Table Land Zone.

Success: Increase in egg production from 50 to 150 per bird and increase in body weight from 0.5 to 1.5 kg in 10 weeks. Income: Rs. 15,000/- per family per year with a CB ratio -of 1:3.

Farmers' views: This technology is compatible to the existing farming system and highly remunerative.

Existing technology to be replaced: Rearing of native birds in backyard under free range system.

To which other agro-climatic zones it can be upscaled: The technology is suitable and can be propagated throughout the state irrespective of Agroclimatic zones.

Suggested action plan for upscaling: Ensuring availability of 28 days old chicks at block level. Marketing is not a problem for the coloured birds. Small brooding unit of the coloured birds can be established at the block levels through private entrepreneur.

Linkages with the ongoing Government programmes: The programme can be linked with "Livestock Mission" of centrally sponsored scheme and "Draught Affected Area plan" under state plan, Government of Odisha.

Contact: Department of Poultry Science, College of Veterinary Sciences and Animal Husbandry, OUAT, Bhubaneswar, Odisha.

8.2.24. Goat Rearing

Technology: Selective breeding for recognized breeds of Odisha (Black Bengal & Ganjam), rotation of bucks among farmers to minimize inbreeding in herd, castration of inferior bucks in the herd, supplemental concentrate feeding @ 100 g/day during peri parturient/scarcity period to pregnant does (at least 60 days before parturition to 40 days after parturition) and regular mineral mixture 15 g/day, vaccination for major contagious diseases (PPR, Goat pox and Enterotoxaemia) and deworming thrice a year and providing adequate health care measure.

Agroclimatic zone: East South East Coastal Plain.

Success: The farmer keeping 10 goats generates a live weight of 10.20 kg per doe/year, which amounts to Rs. 2040/- (@ 200/kg live weight) doe i.e. Rs 20,400/- per year. *Income*: In a particular location 10 farmer or women farmer are to pool their goats for their browsing purpose so that one person can manage the browsing for the day, whereas the other 9 can engage in their own work in rotation basis. By following this practice a C:B ratio of 1:1.7 could be obtained.

Farmers' views: The farmers are happy with the package of practice as it is easy to take up. A strong linkage of farmers with the Veterinary Department, Government of Odisha is required as the vaccines are available at subsidised rate at their end.

Existing technology to be replaced: Prolonged use of single buck in a herd, negligence in vaccination, non supplementation of feed/minerals during scarcity/critical periods, infrequent deworming.

To which other agro-climatic zones it can be upscaled: The technology is suitable and can be propagated wherever there is sufficient browsing facility/bushy/hills/shurby/wasteland throughout the state.

Suggested action plan for upscaling: Women farmer of the target area may be encouraged to take up this technology with at least 10 heads of doe ensuring community browsing practice. The farmers should link with the local market and should be encouraged to sell the goats only after one year of age with proper weighing. Small ruminant keeper's cooperative society may be encouraged for ensuring proper price for sale of animals.

Linkages with the ongoing Government programmes: The programme can be linked with "Support to farmer to establish goat unit" of state funded scheme of Government of Odisha.

Contact: Department of Animal Breeding and Genetics, College of Veterinary Sciences and Animal Husbandry, OUAT, Bhubaneswar, Odisha.

9. Value Chain Development, Market Linkages and Trade Potential

Value addition to agricultural produce involves proper post harvest processing, grading, transportation and storage. Poor handling of farm produce results in a loss up to 30% for perishables like vegetables and fruits. According to a study by ICAR-CIPHET, Ludhiana post harvest losses for major food commodities in India covering crops, livestock and fisheries was Rs. 92651 crores during the year 2013-14. Major part of this loss is preventable by improving our post harvest operations including storage. Bulk of the produce is sold by farmers in raw form to local middlemen immediately after harvest. They do not store the produce due to lack of storage facilities. This causes glut in the market resulting in price crashes leading to low income for farmers. Therefore, forward linkage with wholesalers, supermarkets or exporters need to be created for offering better price to the farmers. For this, ways to be chalked out and implemented with government support to integrate small producers into modern value chains. Though there is good demand for processed food, their production has increased by only 3.6% per year during the last decade. The main reason behind this is that neither farmers get attractive price for their produce nor the processors get assured supply from the farmers. Therefore, linking producers to processors through contract farming or market liberalization has potential to increase farm income.

Agriculture in Odisha is dominated by marginal and small farmers. This type of holding is not economically viable due to poor bargaining strength for their surplus produce, market access and scale factor. Some institutional set up needs to be developed through institutional mechanism for pooling of resources, group marketing and value addition. At national level, Farmer Producer Organizations (FPOs) are being promoted in recent years to take up such activities. However, there is need to involve state agencies for establishing such FPOs and nurturing them.

The crops/commodities in Odisha which has vast potential for export are Cashewnut, Groundnut, Sweet Potato, Chilli, Turmeric, Ginger, Onion, Milk Products, Shrimp, Non-basmati rice and Scented rice. Besides these, other products of export potential are Coir Products, Textile Products, Wood Carvings, Handicrafts, etc.

10. Policy and Investment Requirements and Role of the Government

Policies not only create enabling environment for harnessing opportunities and adoption of frontier technologies, but also have positive effect on increasing farmers' income. An integrated policy for increasing farmers' income is in place in Odisha since 2008. Further, the policy has been fine tuned during 2013 and named as State Agriculture Policy, 2013. Reform areas have been identified to promote competition and offer better price to farmers. This includes institutional measures to reform Agricultural Produce Market Committee (APMC) Act, special treatment to Fruits, Vegetables and other perishable products, use of Information Technology and e-commerce, liberalization of land lease agreements and identification of tenants to transfer certain benefits by states. Financial assistance of Rs.75 lakhs per market is being

provided for creating required infrastructure, software and other facilities. This will bring competition, efficiency in marketing system and offer better prices to farmers. Government should also ensure that in the harvesting season, prices do not fall below the MSP. In case the prices fall below MSP, some deficiency payment mechanism need to be developed. Contract farming should be promoted for offering better price to farmers, as most of our farms are deficient in knowledge and resources to adopt modern farming practices. Agri-export zones should be identified and promoted for export of agricultural produce. This needs formation of FPOs in those areas for better organization of farmers' produce. Above all, more investments need to be made on development of storage facilities including cold chains and processing facilities. Proper planning and management is required to ensure timely release of irrigation water which is crucial for the crop. Besides, water harvesting structures are required to be developed particularly in rainfed areas to make water available during dry season.

11. Implementation Plan and Institutional Responsibilities

In order to efficiently implement the recommendations of Odisha State Coordination Committee on Doubling the Farmers' Income by 2022, following implementation plan has been developed. The figure below provides an overview of the plan, while the details are given in the following work plan table.

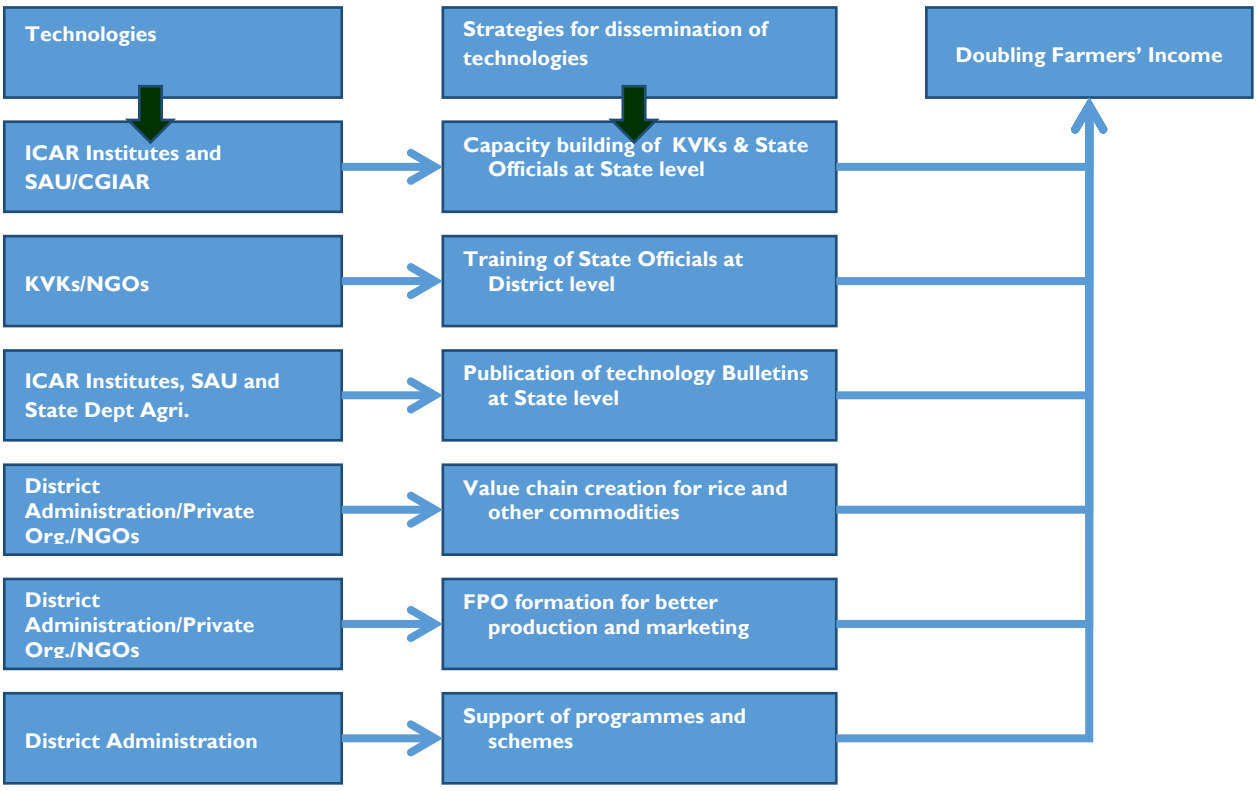

Fig.4 Implementation Plan and Institutional Responsibilities

Table 28. Work Plan for implementing strategies to double the farmers' income by 2022.

Sr. No.	Activities	Time frame	Deliverables/ Monitoring indicator	Institutions
i	Capacity Building of KVKs and State level Officials	1st – 6th months	Twelve training programmes conducted. 300 trained KVK and state government officials	ICAR-NRRI, Cuttack, OUAT, Bhubaneswar, ICAR-CIFA, Bhubaneswar, ICAR-CIWA, Bhubaneswar, ICAR-IIWM, Bhubaneswar, CHES, Bhubaneswar, CTCRI, Bhubaneswar IRRI, Bhubaneswar
ii	Training of District level officials	2nd – 8th months	Twelve training programmes conducted in each district of Odisha. 9000 trained district level officials	All KVKs of Odisha
iii	Publication of technology bulletins for Odisha	1st – 6th months	One lakh each Technology bulletins on all recommended technologies	Printing by State Government, Manuscript development by ICAR-NRRI, Cuttack, OUAT, Bhubaneswar, ICAR-CIFA, Bhubaneswar, ICAR-CIWA, Bhubaneswar, ICAR-IIWM, Bhubaneswar, CHES, Bhubaneswar, CTCRI, Bhubaneswar IRRI, Bhubaneswar
iv	Capacity building in value chain creation and FPO formation	1st – 12th months	314 officials of state government trained	ICAR-NRRI, Cuttack, OUAT, Bhubaneswar, ICAR-CIFA, Bhubaneswar, ICAR-CIWA, Bhubaneswar, ICAR-IIWM, Bhubaneswar, CHES, Bhubaneswar, CTCRI, Bhubaneswar IRRI, Bhubaneswar
v	Value chain creation on various commodity	2nd – 12th months	Three Value chains created in each district on various commodities	District officials, private companies and NGOs

Sr. No.	Activities	Time frame	Deliverables/ Monitoring indicator	Institutions
vi	FPO formation at block level	2^{nd} – 24^{th} months	FPO formed in 314 blocks of Odisha	District officials, private companies and NGOs
vii	Single window creation for beneficiaries of state government programmes	1^{st} – 6^{th} months	30 Single window service centre opened in each districts	State level and district level officials

12. Summary recommendations

Average agricultural productivity and farmers income of Odisha is low compared to other states in the country. To increase crop productivity, quality and judicious use of inputs such as water, seeds, fertilizer and pesticides need to be improved with efficient use of modern technology and diversification of enterprises. To increase income of farmers, a range of strategies (Economic, Technological, Infrastructural/ Information, Political/Policy and Social) need to be adopted to transform the current production-driven cropping system to income-driven farming system and reduce the disparity among farmers of different regions of India. Agricultural research should be re-oriented with farmers' participatory approach to unshackle the vicious circle of poverty and drudgery and fulfill the aspirations of resource-poor, smallholder farmers. The state should enhance its investments on agricultural research and development to achieve the target of doubling farmers' income and address the growing challenges of resource degradation, escalating input crisis and costs with overarching effects of climate change.

An agro-climatic zone-specific action plan has been developed to address the constraints of increasing farmers' income. Attempt has been made to identify improved practices, their potential and constraints for increasing farmers' income in different agro-climatic zones of Odisha. The Committee has worked out the strategies for different agro-ecologies at block level. The block may have different farming situations such as upland, lowland, irrigated, shallow lowland, deepwater, etc. The administrators/implementing agencies can refer the ready reckoner (Table 16, page 30) to identify the agro-climatic zone of the block. Further, one can refer the recommendations for specific ecology under the block within the agro-climatic zone and farming situation to increase the farmers' income (Table 17-27). Besides the technological interventions in different farming situations, the following action points should go hand-in-hand for doubling the farmers' income: (1) value addition and market linkage for getting better price of the farm produce, (2) enhancement of minimum support price by the Government, (3) increasing subsidy and improving availability of farm inputs, (4) insurance coverage for crops/animal/fisheries activities undertaken by the farmers, (5) promotion of technologies by the line departments and development agencies and (6) development/modernisation of infrastructure like markets, storage and processing units.

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Annexure-I

Contributors

1. Prof. S.N. Pasupalak, Vice-Chancellor, OUAT, Bhubaneswar, Chairman
2. Dr. H. Pathak, Director, ICAR-NRRI, Convener
3. Dr. S.K. Ambast, Director, ICAR-IIWM, Bhubaneswar
4. Dr. (Mrs.) J. Kishtwaria, Director, ICAR-CIWA, Bhubaneswar
5. Dr. J.K. Sundaray, Director (Acting), ICAR-CIFA, Bhubaneswar
6. Prof. P.N. Jagdev, Dean of Research, OUAT, Bhubaneswar
7. Prof. P.K. Roul, Dean of Extension Education, OUAT, Bhubaneswar
8. Dr. H.S. Singh, Central Horticultural Experimentation Station, Bhubaneswar
9. Shri H.K. Pattanaik, Representative of Secretary, MFPI, New Delhi
10. Sh. S.C. Sahu, DDA, Cuttack and representative of Director, Agriculture, Cuttack
11. Dr. U.S. Patra, Additional Director and representative of Director, AH&VS, BBSR
12. Sh. Debananda Bhanja, Jt. Director and representative of Director, Fisheries, BBSR
13. Dr. P. Samal, Head, Social Sciences Division, ICAR-NRRI, Cuttack
14. Dr. A.K. Nayak, Head, Crop Production Division, ICAR-NRRI, Cuttack
15. Dr. Mayabini Jena, Head, Crop Protection Division, ICAR-NRRI, Cuttack
16. Dr. O.N. Singh, Head, Crop Improvement Division, ICAR-NRRI, Cuttack
17. Dr. S.G. Sharma, Head, Crop Physiology and Biochemistry Division, ICAR-NRRI, Cuttack
18. Dr. B.C. Patra, Principal Scientist, Crop Improvement Division, ICAR-NRRI, Cuttack
19. Dr. B.R. Pillai, Principal Scientist, ICAR-CIFA, Bhubaneswar
20. Dr. K.N. Mohanta, Principal Scientist, ICAR-CIFA, Bhubaneswar
21. Dr. G.S. Saha, Principal Scientist, ICAR-CIFA, Bhubaneswar
22. Dr. N.K. Barik, Principal Scientist, ICAR-CIFA, Bhubaneswar
23. Dr. Manoranjan Mohapatra, Jt. Director Extension, OUAT, Bhubaneswar
24. Dr. K.R. Rao, Principal Scientist, CTCRI, Bhubaneswar
25. Dr. H.K. Dash, Principal Scientist, ICAR-IIWM, Bhubaneswar
26. Dr. Shivaji Argade, Scientist, ICAR-CIWA, Bhubaneswar
27. Shri Manoj Kumar Mohanty, DDA, Cuttack
28. Dr. B.B. Panda, Principal Scientist, ICAR-NRRI, Cuttack
29. Dr. Annie Poonam, Principal Scientist, ICAR-NRRI, Cuttack
30. Dr. M. Shahid, Scientist, ICAR-NRRI, Cuttack
31. Dr. B. Mondal, Principal Scientist, ICAR-NRRI, Cuttack
32. Dr. Rahul Tripathi, Scientist, ICAR-NRRI, Cuttack
33. Dr. Sushmita Munda, Scientist, ICAR-NRRI, Cuttack
34. Er. Prabhat Kr. Guru, Scientist, ICAR-NRRI, Cuttack
35. Dr. N.N. Jambhulkar, Scientist, ICAR-NRRI, Cuttack
36. Dr. G.A.K. Kumar, Principal Scientist, ICAR-NRRI, Cuttack