Annual Progress Report

April, 2018–March, 2019

Enhancing Agricultural Productivity and Rural Livelihoods through Scaling-up of Science-led Development in Odisha: Bhoochetana

Submitted to

Department of Agriculture & Farmer Empowerment
Government of Odisha

ICRISAT DEVELOPMENT CENTER

ICRISAT

INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

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Contents

1. Executive Summary

The Odisha Bhoochetana Project has the mandate of improving crop productivity and rural livelihoods through science-based Natural Resource Management in the State. The objectives of the project include assessment of nutrient status of soils in 30 districts through stratified random sampling, identification of best bet soil, water and crop management practices to increase the productivity, upgrading of two laboratories as referral labs, capacity building of Dept. of Agriculture staff and consortium partners including farmers and concurrently monitor, evaluate, assess and document the impacts for mid-term corrections.

A total of 39674 samples covering 3957 villages and 310 blocks across 30 districts were collected for analysis at ICRISAT, Hyderabad. So far analysis of 37538 out of 39674 samples is completed with regard to soil pH, electric conductivity, organic carbon and available nutrient content for major, secondary micro-nutrients. Results indicate that 84% samples are acidic in pH, 99.6% samples showed normal electric conductivity and 51% and 25% of samples are found to be deficient in available P and available K respectively, with 43% samples low in soil C content. Similarly deficiency of magnesium, sulphur, boron, and zinc were reported in 27%, 51%, 80% and 43% samples, respectively.

With regard to setting up of referral laboratories at Bhubaneswar and Sambalpur, the laboratory in Bhubaneswar is ready for plug and play status and with regard to Sambalpur, space for setting of laboratories is finalized, renovation of the laboratories and electric work and setting up of separate transformer is in progress.

A total of 4166 demonstrations were conducted in an area of 2510 acres across all the 30 districts, 81 blocks and 360 villages. During *kharif* season, 1698 demonstrations covering an area of 1260 acres were organized across 30 districts, 54 blocks and 187 villages. Similarly a total of 2468 demonstrations covering an area of 1250 acres across 30 districts, 65 blocks and 218 villages were organized during *rabi,* 2018. Majority of the demonstrations were laid out to showcase crop diversification options, improved cultivars, application of micronutrient viz. zinc and boron and adding of humic acid. Demonstrations in *kharif* include field crops viz. paddy, finger millet, foxtail millet, pearl millet, maize, pigeonpea, groundnut and vegetables in nutrition garden viz. brinjal, tomato, chillies, cabbage etc. Similarly in *rabi,* demonstrations were organized on paddy, finger millet, maize, sorghum, chickpea, blackgram, greengram, cowpea, groundnut, mustard, vegetables in nutrition garden viz. cauliflower, tomato, chilles, potato etc. Around twenty non-crop demonstrations on waste decomposer were organized to show case manure production out of farm waster in a faster manner.

The average increase in crop yield in *kharif,* 2018 was 43% in finger millet, 33% in foxtail millet, 21% in maize, 17% in pearl millet, 17% in paddy, 19% in groundnut, 115% in pigeonpea compared to farmers' practices. Among technologies, soil test based application of NPK along with boron in finger millet and foxtail millet, soil test based application of NPK and zinc and boron in maize, paddy and pigeonpea and soil test based application of NPK, zinc, boron and humic acid in pearl millet and groundnut gave higher yield response compared to farmers practice.

A total of 477 capacity building programmes covering 15461 participants were organized during 2018-19. Men and women farmers and stakeholders were trained on best bet agricultural practices. Thirty four exposure visits with a participation of 1491 farmers were organized to show case various technologies across various centers of excellence.

In order to monitor the interventions, build good working relationships with line departments, national institutions, agricultural university and to converge the facilities and resources of participating agencies, 99 visits were undertaken by the scientist of ICRISAT across 30 districts during 2018-19. The scientists also visited and interacted with the farmers to orient them about conducting demonstrations of improved technologies viz. improved cultivars, soil test based nutrient application and management of micronutrients deficiencies during *kharif* and *rabi* seaons.

A total of 1800 demonstration covering an area of 890 acres on paddy, finger millet, pigeonpea and groundnut is envisaged to be conducted across 30 districts during *kharif,* 2019. Various technologies that are intended to be demonstrated during the period are climate smart cultivars recommended for location specific conditions, management of micro-nutrient deficiencies viz. zinc and boron, application of humic acid and integrated pest management.

2. Introduction and Objectives

The project aims at improving crop productivity and rural livelihoods through science-based Natural Resource Management in the State of Odisha. Soil health mapping through the collection of about 40,000 representative soil samples by stratified sampling methods across 30 districts provides a sound base for precise nutrient management, not only for nitrogen (N), Phosphorous (P) and Potassium (K) but also for the deficiciencies in secondary and micronutrients. It also envisages economic and environmental benefits by avoiding indiscriminate use of NPK fertilizers. The two laboratories selected in the State will be upgraded to state-of-the-art referral laboratories of international standards to cater to future requirementsof swift and precise quality analyses of a sizeable number of soil, water, fertilizer, and plant samples.

The project will facilitate science-led developments through capacity building of master-trainers/farmers/stakeholders and harnessing the synergies of consortium partners like the Department of Agriculture and Watershed, Odisha Remote Sensing Application Center, OUAT and NGOs. Identification and dissemination of nutrient-soil-crop-water management practices in collaboration with the DoA is expected to generate significant increase in he productivity of major crops with participating farmers in the state. The project will establish pilots as sites of learnings in the districts to scale out as well as evaluate farmer-preferred innovations. Data collection through crop cutting experiments, surveys in the pilots/districts, synthesis of results as reports, and expert monitoring and evaluation will serve as tools for review and mid-term correction.

While focusing on improvement in productivity and livelihoods during two years, the project will also strengthen the State by setting up state-of-the-art soil analysis laboratories,

providing GIS-based soil maps, and enhancing the availability of improved seeds and well trained para-professionals, farmers and stakeholders.

The specific objectives

- To upgrade two existing soil analytical laboratories in the state to serve as referral laboratories and run them efficiently with government support.
- Identify the best soil, crop, water and nutrient management options for sustainable intensification of major crops in different agro-ecoregions to increase productivity through demonstrations in pilot sites and scalingup in partnership with DoA and other partners through convergence.
- To assess the nutrient status of soils in the 30 districts of Odisha through stratified soil sampling.
- To build the capacity of DoA staff in undertaking soil analysis, handling data and that of other consortium partners including farmers for scalingup science-led holistic development strategy using ICT tools.
- To concurrently monitor, evaluate, assess and document the impacts of the scalingup approach in order to enable mid-course corrections.

3. Project Launch and Team Building

A state-level workshop was organized to deliberate on Orissa Bhoochetana on 23rd June 2018 at Bhubaneswar. Around 170 delegates representing the Department of Agriculture & Farmers Empowerment (DDAs, DAOs &officersof head offices), NGOs, OUAT, and ICRISAT participated. Following the welcome address by Dr SP Wani (former Director-IDC), the objectives of the workshop were spelt out by Dr Sreenath Dixit (Head –IDC), who underlined the project's emphasis on scaling up science-led interventions to improve crop productivity. He said the workshop would serve to sensitize the key partners in Odisha, including the State Agriculture University and staff of agriculture departments in the districts. Prof S Pasupalak, Vice Chancellor, OUAT, in his address emphasized the role of the university in the project and the importance of encouraging students to get involved in field work like soil sampling. He also highlighted that given most of the soils in Odisha were acidic, treatment with soil amendments was critical. Mr Muthu Kumar (Director, Department of Agriculture, Odisha) urged the officers of the departmentto implementation the project effectively, suggested demonstrations in non-rice cropping systemsas well, and to identify known technologies from farmers for scaling-up in the state. Dr Wani presented the concept and activities of the Bhoochetana project, citing the success of the project in Karnataka, where farmers realized enhanced benefits by 20-60% from improved managementcompared to farmers' normal practices. He urged the consortium of DoA, OUAT, KVKs, ICRISAT and other research and extension institutions to work together to achieve impacts. Mr Sourabh Garg, Principal Secretary, Government of Odisha, indicated that the main objective of the project was to rejuvenate the soils and improve crop yields by 10% in two years, for which capacity building programs would need to be conducted at department level as well as at farmers' level. "The NGO partners in the project will bring in the aspect of community mobilization and assist in capacity building at the village level. The focus of this project should be on non-paddy cropping system," Mr Garg said, citing the example of the seed village concept which is an

important part of the project. He opined that the project would be a good start for doubling farmers' incomes. The inaugural session ended with a vote of thanks by Dr Wani.

Plate 3.1: Participants during project launch and tea building st Bhubaneshwar.

Dr Mukund Patil presented an overview of the activities plannedand illustrated how real time monitoring through a digital dashboard and ICT-based tools would facilitate two-way information exchange with the farmers. Presenting highlights of the soil data analysis for Dhenkanal district and the widespread soil degradation, he sought inputs from officials, NGO representatives and OUAT professors in finalizingthe *kharif* plan for the respective districts. This was done through group discussions in which the participants were split into four groups (Table 3.1.) Dr Pattanaik (Head, Soil Science Department, OUAT) and Dr Antaryami Misra (Associate Professor, Soil Science Department, and OUAT) suggested considering the Hirakund dam command area while delineating zones as well as the availability of assured irrigation. It was finally suggested to customize the district work plan based on the agro-climatic and other local details such as the availability of assured irrigation, danger from wild animals, etc.

Table 3.1. Participants split into groups to discuss challenges, opportunities and work plans.

	Agro-climatic Zone	Districts
Group1	North western plateau	Sundargarh, Deogarh, Sambalpur,Jharsuguda
	North central plateau	Mayurbhanj, Keonjhar
	North eastern coastal plain	Balasore, Bhadrak, Jajpur, Keonjhar
Group 2	East & south eastern coastal	Kendrapara, Khurda, Jagatsinghpur, Puri, Nayagarh,
Group 3	North eastern Ghat	Rayagada, Gajapati, Ganjam, Koraput
	Eastern Ghat highland	Koraput, Nabarangpur
	South eastern Ghat	Malkangiri, Koraput
	Western undulating	Kalahandi, Nuapada
Group 4	West central table	Bargarh, Balangir, Boudh, Sonepur, Sambalpur,
	Mid central table land	Angul, Dhenkanal, Cuttack, Jajpur

The group discussions were facilitated by Drs Girish Chander, Gajanan Sawargaonkar, Mukund Patil and Aviraj Datta for group numbers 1, 2, 3 and 4, respectively, and a group leader was identified totake the planning discussions forward.

The presentation by group 1 highlighted the challenges of non-availability of suitable seed (varieties of pulses, oilseeds), lack of seed production and buy-back guarantee; problems with

cattle and wild animals, labor, low mechanization, and soil acidity. Since soil salinity in Bhadrak and Balasore and degraded soils in Mayurbhanj, Jharsuguda, and Keonjhar districts are challenges, it was suggested that converging ongoing programs (soil health card program; NFSM, RKVY, BGREI, TRFA, State plans – line transplanting, seed village program, green manuring and seed production, minor millet program, ATMA, etc,) would be ideal. The group suggested the inclusion of additional technologies to do with on-farm mechanization, post-harvest technologies and value addition, promotion of organic farming and composting, integrated nutrient management (INM,) market linkages integrated farming system, digital monitoring, and single window solutions to farmer issues – from seed to harvest. The mechanism for capacity building was discussed, and it was decided to focus on a greater number of farmer trainings, field schools, and field days to popularize the results of field demonstrations, engage with lead farmers/krushaksathis as agents for scaling-up, use digital technologies for scaling-up and ease the movement and monitoring of department officials through facilitation.

Group 2 highlighted the predominance of the paddy-based cropping system, low productivity, water scarcity, poor drainage, poor marketing facility, lack of availability of quality seed, and menace of stray animals. Convergence of ongoing schemes was seen as an answer to these challenges: BGREI for paddy; NFSM for pulses; NMOOP- Oilseed; and soil health card. The group proposed to bring in additional technologies such asmicro irrigation, soil reclamation, and focused extension program in PPP mode, need-based seed multiplication and farm mechanization. It was agreed that change could be brought about by focusing on capacity building activities, for which the following actionable points were proposed:extending the NAMET mode to NGOs (PPP),linking KVKs to farmers,training master trainers,having farm facilitators, lead farmers, farmers interest groups, farmer field schools (FFS),result demonstrations, and inter- and intra-state exposure visits.

Group 3 shared details of the wide range of crops in the region (paddy, finger millet, niger, maize, pigeonpea, turmeric, ginger, sugarcane, etc). The challenges identified across these districts were soil erosion, poor irrigation facilities, lack of timely availability of seeds, acidic soils, low organic carbon, open grazing, imbalanced use of fertilizers, slow transfer of technology, clay pan formation, and poor market support. They came up with five schemes to be converged into the Bhoochetana program: NFSM, BGREI, Millet mission, NMAET, and PKVY. It was proposed to bring additional technologies like soil amendments, green manuring for non-paddy crops, slashing and shredding implements, mechanization, maize and millet harvesters, zero till seed drill and ICT. The need for capacity development was reiterated and the mechanism proposed was to engage through farm facilitators, distribution of package of practices to farmers, simulatinga game on water management, and filling SAW posts on priority.

Group 4 highlighted the following key challenges: Inadequate and non-timely supply of assured irrigation,non-availability of desired seed variety both in *kharif* and *rabi* ,animal nuisance (elephant,monkey, wild bear/boar),indiscriminate use of pesticides (in Bargarh),lack of coordination between irrigation and agriculture departments,poor extension network (diversion of extension functionaries for non-agriculture purposes),labor shortage during peak seasons,cultivation of paddy in rainfed uplands, lack of agro-based industries/ agri-

entrepreneur / value addition and value chain,and lack of market linkages and forward linkages. The ongoing programs that can tackle these challenges were identified as Jalanidhi/BKVY, RKVY, lifting water from canal for additional coverage, building cold storage for vegetablesand other perishable products, crop insurance, soil test-based fertilizer recommendations, etc. Additional technologies such as seed production through contract farming and buy-back policy, hybrid seed production for paddy, development of farmer-breeder, solar micro irrigation, and *in-situ* production of hydroelectricity by hydro volt tech, etc were suggested. This change could come about by focusing on training programs for Krushak sathis, involvement of district-level training coordinators, and incentivizingSAWs and Krushak sathis, among others.

The presentationswere followed by deliberations on the way forward. Asking the groups to take the opportunity to bring about change in the livelihoods of farmers, Dr Wani was optimistic that a proactive consortium would facilitate the action plan. He emphasized that convergence of all department activities was critical not only for conducting the target 1800 demonstrations but also to build astrong district team that would adopt innovative ways to help farmers. He urged all the district officials to take advantage of the presence of ICRISAT and its technologies in their districts. Commissioner (Agril.), Government of Odisha, encouraged all the department officials to help ICRISAT bring about change in the farming scenario of the state.

In the plenary session chaired by Mr Sourabh Garg, the group leaders shared the presentations on the discussion points.

4. Entry Point Activity: Analysis of Odisha Soils

As part of the Bhoochetana project, before the start of *kharif* 2018, soil sample collection was initiated in all the 30 districts. A stratified random composite soil sampling methodology was followedthat combines a number of discrete samples collected from a single field homogenized into a single sample for analysis. A total of 39674 soil samples are collected till date from across 310 blocks in 3957 villages (Table 4.1). Soil samples numbering 37538 were analyzed at the CRAL laboratory at ICRISAT and results shared with Department of Agriculture, Odisha. OUAT students were trained in soil sampling methods and were involved along with NGO partners.

Plate 4.1: Left: Soil sampling in Barkote block in Deogarh district; Right: Training of OUAT students in soil sampling & participation in soil sample collection in Khorda district.

Table 4.1. Soil samples collected from across Odisha.					
S.No	District	Blocks (No)	Villages (No)	No. of samples collected	No. of samples analyzed
1	Angul	8	104	1040	1020
2	Balasore	12	156	1550	1550
3	Bargarh	12	156	1560	1550
4	Bhadrak	7	91	910	910
5	Balangir	14	182	1820	1829
6	Boudh	3	39	390	370
7	Cuttack	14	182	1820	1820
8	Deogarh	3	39	390	390
9	Dhenkanal	8	104	1040	1030
10	Gajapati	7	91	910	540
11	Ganjam	22	280	2870	2810
12	Jagatsinghpur	8	104	1040	1040
13	Jajpur	10	130	1300	1300
14	Jharsuguda	5	78	650	100
15	Kandhamal	12	156	1480	1474
16	Kalahandi	13	114	1140	1120
17	Kendrapara	9	117	1170	1150
18	Keonjhar	13	169	1690	1640
19	Khurda	10	127	1300	1300
20	Koraput	11	137	1370	1269
21	Malkangiri	7	90	901	509
22	Mayurbhanj	26	338	3340	3317
23	Nabarangpur	10	108	1286	1213
24	Nayagarh	8	104	1040	1040
25	Nuapada	5	63	647	657
26	Puri	11	139	1430	1420
27	Rayagada	11	143	1430	1010
28	Sambalpur	9	117	1170	1170
29	Sonepur	6	78	780	780
30	Sundargarh	16	221	2210	2210
	Total	310	3957	39674	37538

4.1 Outcomes of soil test analysis

A total of 37538 samples were analyzed for pH, electric conductivity, organic carbon and available nutrient levels for major, secondary and micro nutrients. Results indicate that 84% of soils have acdic pH, 11% are neutral and only 4.61% shown alkaline reaction. The data on electric conductivity indicated that 99.61% soils are EC normal. About 43% soils found to be deficient in organic carbon and 51% deficient in available P, 25% deficient in available K. Among the secondary nutrients, magnesium is deficient in 27% and Sulphur in 51% of the soils. In case of micronutrients, deficiency of boron and zinc to the extent of 80% and 43% respectively. The district and block wise results on soil testing is presented as separate sub-heads below.

4.2 District wise results

4.2.1 Soil pH

The analays of the data on pH indicated that more than 80% of the soils in the districts are acidic in nature (Table 4.2; Figure 4.1). In case of Jharsuguda 100% samples have shown acidic reaction followed by Kendrapara, Mayurbhanj and Jagatsinghpur, while only 45% of samples in Naupada shown acidity. Twenty two percent of samples from Naupada reported to be alkaline in nature followed by Balangir (16%), Kalahandi (14%), Baudh (14%), Angul (11%) and Sonepur (10%). Further, 34% of samples from Naupada shown to be neutral in reaction followed by Boudh (29%), Balangir (26%), Kalahandi (54%) and Sonepur (22%).

Table 4.2. District wise extent of acidic, neutral and alkaline soils in Odisha (% of soil samples).

District	Acidic	Neutral	Alkaline
Jharsuguda	100	0	0
Kendrapara	98	2	0
Mayurbhanj	97	3	0
Jagatsinghpur	96	3	0
Puri	96	3	1
Koraput	96	4	1
Kandhamal	95	5	0
Sundergargh	94	5	1
Nabrangpur	94	5	1
Bhadrak	93	5	1
Gajapti	93	3	4
Jajpur	93	4	2
Keonjhar	93	6	1
Khurda	92	6	2
Malkangiri	89	9	1
Sambalpur	89	7	4
Cuttack	88	9	4
Deogarh	87	12	1
Balasore	85	13	1
Dhenkanal	82	14	3
Rayagada	81	15	4
Bargarh	80	15	5
Nayagarh	74	19	7
Ganjam	70	22	8
Angul	69	20	11
Sonepur	68	22	10
Kalahandi	62	25	14
Balangir	59	26	16
Boudh	57	29	14
Nuapada	45	34	22
Total	85	11	4

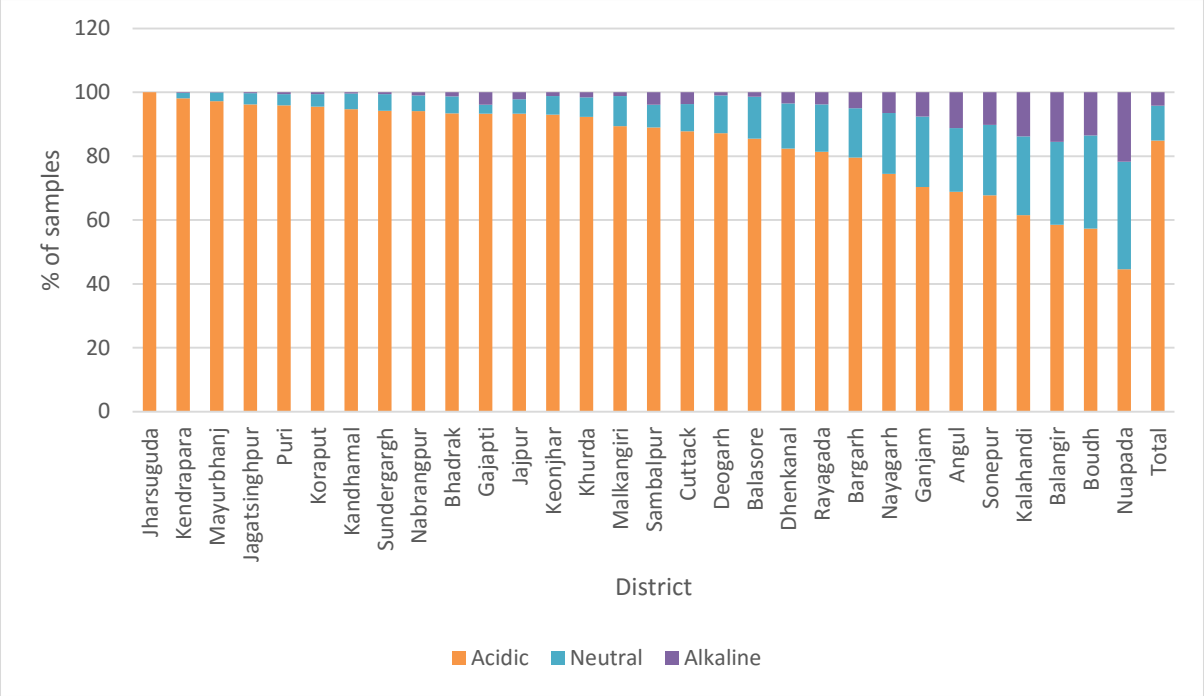

Figure 4.1: District wise details of acidic, neutral and alkaline soils in Odisha.

4.2.2 Electric conductivity

The soil analysis data showed normal that majority of samples (99.6%) have normal electric conductivity while it was found to be at injurious level in Sundergarh (1.36%) followed by Kendrapara (1.22%) and Ganjam (1.07%). The detils of the same is given in Table 4.3 and Figure 4.2

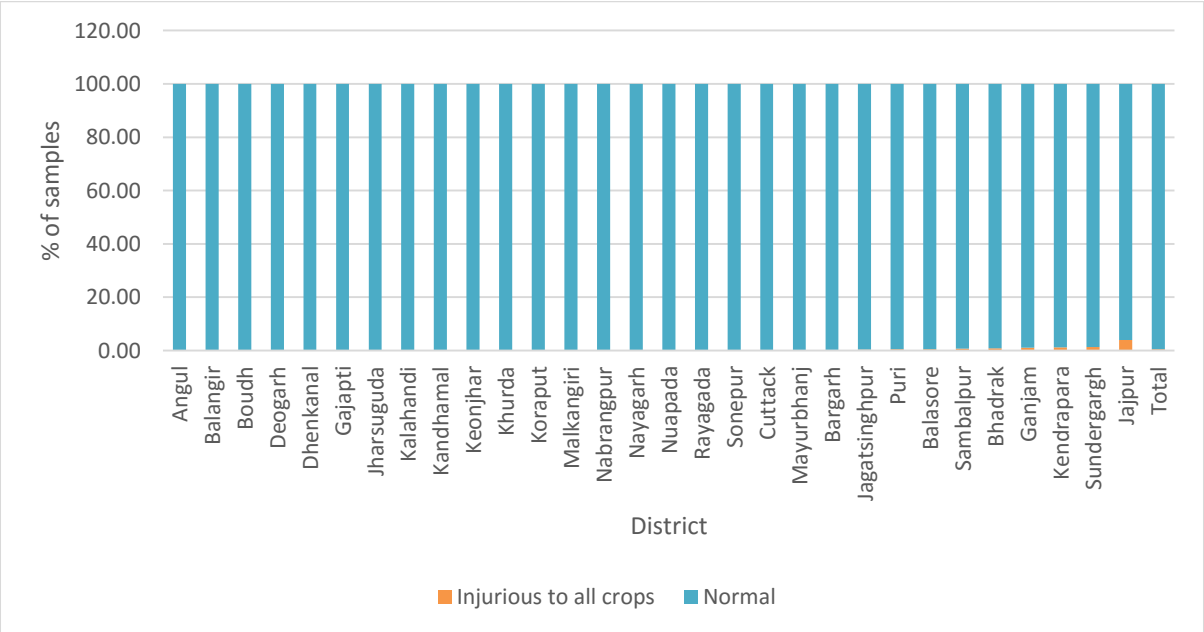

Figure 4.2: District wise EC levels in Odisha.

Table 4.3. District wise EC in the soil of Odisha (% of soil samples).		
District	Injurious to all crops	Normal
Angul	0.00	100.00
Balangir	0.00	100.00
Boudh	0.00	100.00
Deogarh	0.00	100.00
Dhenkanal	0.00	100.00
Gajapti	0.00	100.00
Jharsuguda	0.00	100.00
Kalahandi	0.00	100.00
Kandhamal	0.00	100.00
Keonjhar	0.00	100.00
Khurda	0.00	100.00
Koraput	0.00	100.00
Malkangiri	0.00	100.00
Nabrangpur	0.00	100.00
Nayagarh	0.00	100.00
Nuapada	0.00	100.00
Rayagada	0.00	100.00
Sonepur	0.00	100.00
Cuttack	0.11	99.89
Mayurbhanj	0.12	99.88
Bargarh	0.19	99.81
Jagatsinghpur	0.38	99.62
Puri	0.42	99.58
Balasore	0.52	99.48
Sambalpur	0.68	99.32
Bhadrak	0.88	99.12
Ganjam	1.07	98.93
Kendrapara	1.22	98.78
Sundergargh	1.36	98.64
Jajpur	4.00	96.00
Total	0.45	99.55

4.2.3 Organic Carbon

The data on organic carbon is presented in (Table 4.4; Figure 4.3). The data showed that the organic carbon content is low in 43% of soils, while it was medium in 39% and high in 18% of soil samples. The 41% of soils in Koraput district were found to contain higer organic carbon, while it was very low Khurda district (8%).

Table 4.4. District wise soil organic carbon in the samples (% of total samples).				
District	High	Medium	Low	Total
Koraput	41	35	25	100
Nuapada	34	44	22	100
Deogarh	28	43	28	100
Sonepur	27	38	36	100
Malkangiri	24	34	42	100
Kandhamal	23	35	42	100
Bargarh	23	41	36	100
Kendrapara	22	51	27	100
Sambalpur	22	39	39	100
Angul	22	45	34	100
Nabrangpur	20	42	38	100
Rayagada	19	28	53	100
Balangir	17	36	46	100
Cuttack	17	46	37	100
Dhenkanal	17	51	32	100
Keonjhar	16	37	47	100
Ganjam	16	39	45	100
Mayurbhanj	16	39	45	100
Balasore	15	33	52	100
Puri	14	42	44	100
Kalahandi	14	35	51	100
Jajpur	14	37	49	100
Bhadrak	14	45	40	100
Sundergargh	13	39	47	100
Jharsuguda	13	48	39	100
Boudh	13	36	51	100
Jagatsinghpur	12	44	44	100
Gajapti	8	29	63	100
Nayagarh	8	38	54	100
Khurda	8	31	62	100
Total	18	39	43	100

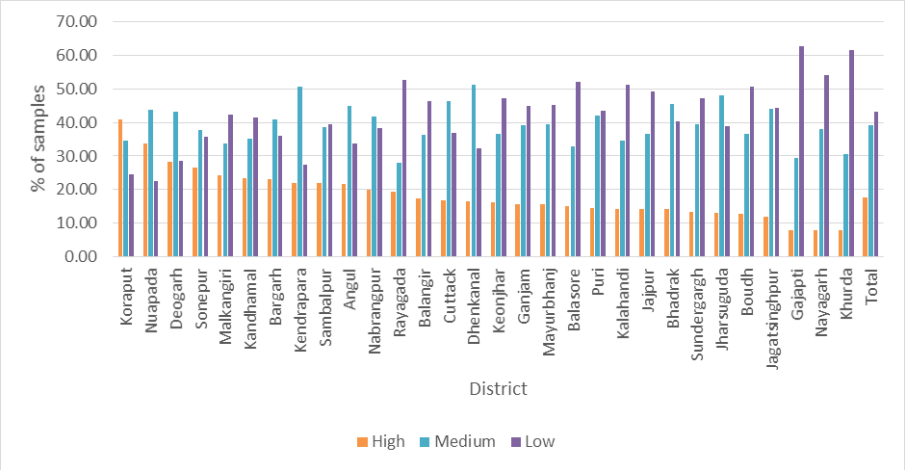

Figure 4.3 Soil organic carbon levels in various districts in Odisha state.

4.2.4 Phosphorus

The data on phosphorus content showed that majority of soils i.e. 53% across the district are found to contain lower levels of phosphorus, while it was medium in 30.09% and high in 17% of the soils in the state (Table 4.5; Figure 4.4). The soils in Rayagada district found to contain higher levels of phosphorus (48%), while the 74% of soils in Mayrurbhanj are found to be contain lower levels of phosphorus.

Table 4.5. Status of soil phosphorus in various districts (% samples).

District	High	Medium	Low
Mayurbhanj	9	16	74
Sundergargh	10	17	73
Keonjhar	13	19	69
Balangir	9	24	68
Malkangiri	14	19	67
Kalahandi	10	23	67
Nuapada	9	27	64
Deogarh	9	27	64
Nabrangpur	13	26	61
Dhenkanal	13	31	56
Sonepur	13	31	56
Ganjam	16	28	56
Sambalpur	18	29	54
Jharsuguda	19	28	53
Boudh	12	37	51
Khurda	18	31	50
Kandhamal	26	24	50
Gajapti	21	30	49
Balasore	13	38	49
Angul	16	35	49
Nayagarh	17	40	42
Kendrapara	10	47	42
Koraput	22	36	42
Bhadrak	19	40	41
Bargarh	24	39	37
Jajpur	26	37	37
Cuttack	27	38	34
Jagatsinghpur	22	46	32
Puri	27	44	29
Rayagada	48	28	24
Total	17	30	53

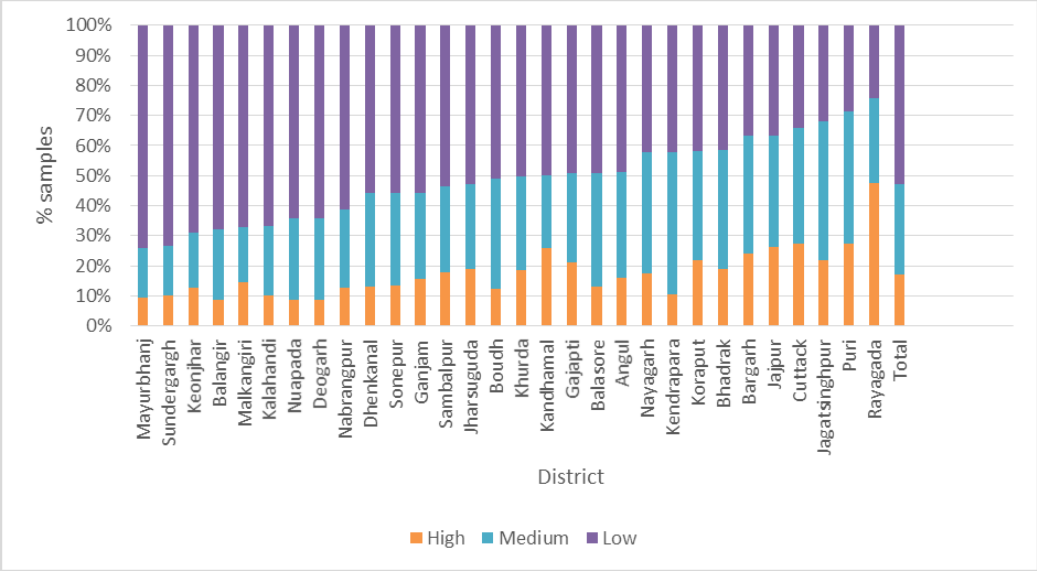

Figure 4.4: Percentage of samples showing levels of phosphorus in the soil.

4.2.5 Potassium

The data on soil potassium content across various districts in the state is given in Table 4.6; Figure 4.5. The analysis showed that majority of the soils (46.69%) are found to be medium in potassium while 28% and 25% of the soils have higher and lower levels of potassium. About 65% of the soils in Rayagada and Naupada shown to have higher potassium compared to Khurda where only 8% of the wer found to have higher potassium. In constrast majority of soils i.e. more than 30% of the soils in Balasore, Mayurbhanj, Jagpur, Khurda, Malkingiri, Puri, Keonjhar and Cuttack found to be lower potassium content compared to Naupada, Rayagada, Gajapati district whre less then 10% of the soils were found to have lesser levels of potassium.

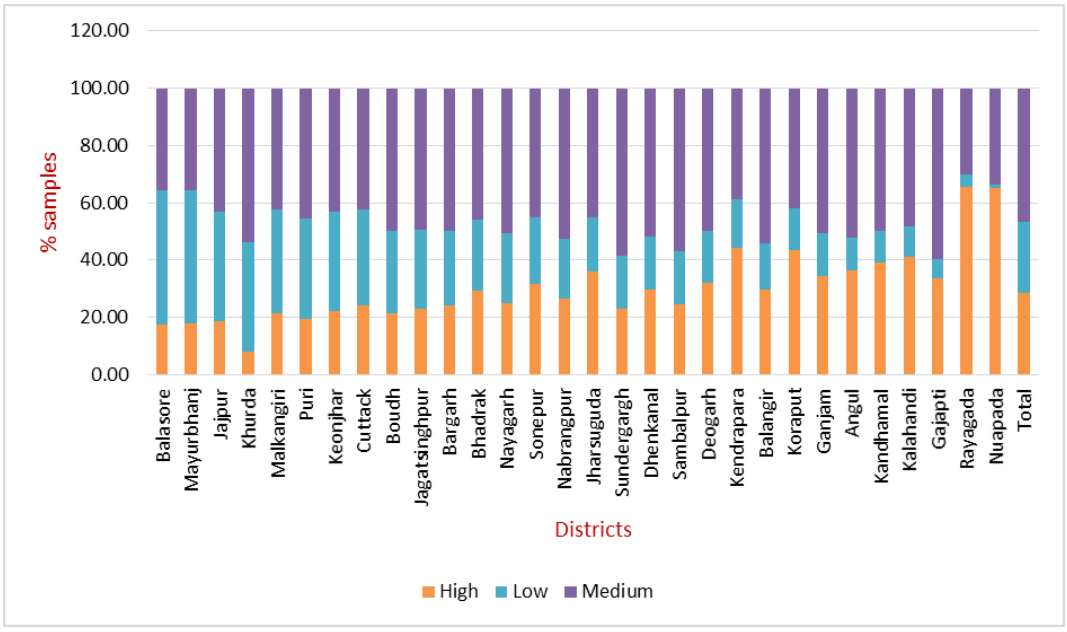

Figure 4.5: Soil potassium levels in various districts in Odisha.

Table 4.6. District wise details of soil potassium levels in Odisha (% of samples).				
District	High	Low	Medium	Total
Angul	36	11	52	100
Balangir	30	16	54	100
Balasore	17	47	36	100
Bargarh	24	26	50	100
Bhadrak	29	25	46	100
Boudh	21	29	50	100
Cuttack	24	33	43	100
Deogarh	32	18	50	100
Dhenkanal	30	19	52	100
Gajapti	34	7	60	100
Ganjam	34	15	51	100
Jagatsinghpur	23	27	50	100
Jajpur	19	38	43	100
Jharsuguda	36	19	45	100
Kalahandi	41	11	48	100
Kandhamal	39	11	50	100
Kendrapara	44	17	39	100
Keonjhar	22	35	43	100
Khurda	8	38	54	100
Koraput	43	15	42	100
Malkangiri	21	36	42	100
Mayurbhanj	18	47	36	100
Nabrangpur	26	21	52	100
Nayagarh	25	25	50	100
Nuapada	65	1	33	100
Puri	19	35	45	100
Rayagada	65	5	30	100
Sambalpur	25	18	57	100
Sonepur	32	23	45	100
Sundergargh	23	19	59	100
Total	28	25	47	100

4.2.6 Calcium

Results of soil analysis showed that 90% of soils in Odisha state were found to be sufficient in soil calcium levels except Gajapathi where 40% of soils were found to have deficient levels of calcium (Table 4.7; Figure 4.6).

Table 4.7. Status of calcium in soils of Odisha (% samples).			
District	Deficient	Sufficient	Total
Kendrapara	1	99	100
Nuapada	1	99	100
Bhadrak	2	98	100
Cuttack	2	98	100
Jagatsinghpur	2	98	100
Kalahandi	3	97	100
Nayagarh	4	96	100
Dhenkanal	4	96	100
Balangir	4	96	100
Deogarh	5	95	100
Boudh	5	95	100
Ganjam	5	95	100
Sonepur	6	94	100
Jajpur	6	94	100
Angul	6	94	100
Rayagada	7	93	100
Bargarh	7	93	100
Kandhamal	8	92	100
Puri	10	90	100
Malkangiri	10	90	100
Balasore	11	89	100
Nabrangpur	12	88	100
Sambalpur	13	87	100
Khurda	13	87	100
Sundergargh	15	85	100
Koraput	15	85	100
Keonjhar	18	82	100
Jharsuguda	18	82	100
Mayurbhanj	26	74	100
Gajapti	40	60	100
Total	10	90	100

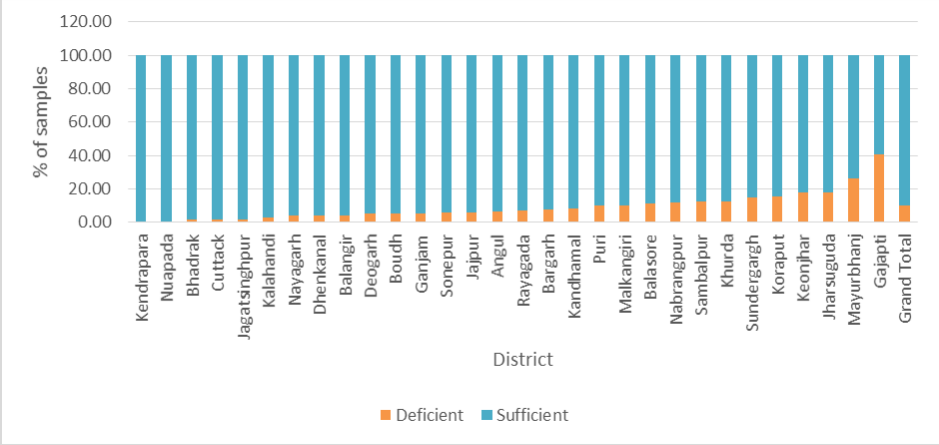

Figure 4.6: Soil calcium levels in various districts of Odisha.

4.2.7 Magnessium

In general more tha 70% of soil samples shown to have sufficient levels of magnesium (Table 4.8; Figure 4.7). Data from the analysis suggest soils in Kendrapara, Jagitsinghpur, Bhadrak, Naupada, and Cuttack have higher magnesium levels compared to Gagapati, Khandamal, Mayurbhanj, Korapur, Keonjhar.

Table 4.8. District wise details of magnesium levels in Odisha (% of samples)

District	Deficient	Sufficient
Kendrapara	1	99
Jagatsinghpur	3	97
Bhadrak	4	96
Nuapada	4	96
Cuttack	8	92
Nayagarh	13	88
Puri	14	86
Dhenkanal	17	83
Kalahandi	18	82
Jajpur	18	82
Boudh	21	79
Ganjam	21	79
Deogarh	21	79
Balangir	21	79
Angul	24	76
Sonepur	25	75
Khurda	27	73
Balasore	31	69
Rayagada	34	66
Sambalpur	35	65
Nabrangpur	37	63
Sundergargh	37	63
Bargarh	38	62
Jharsuguda	38	62
Malkangiri	40	60
Keonjhar	42	58
Koraput	46	54
Mayurbhanj	50	50
Kandhamal	54	46
Gajapti	76	24
Total	28	72

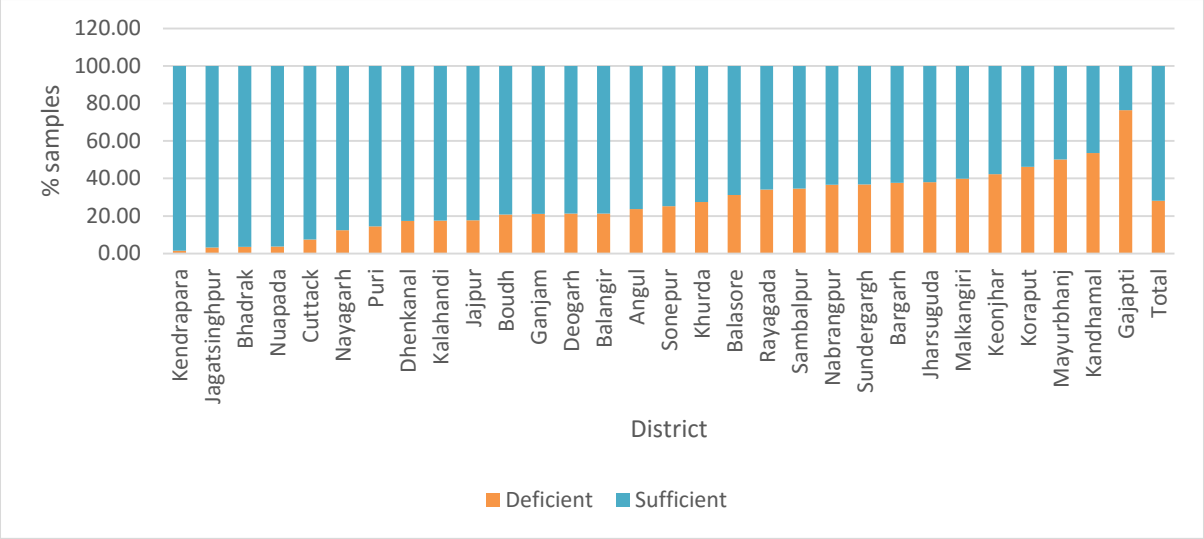

Figure 4.7: Magnessium levels in soils of Odisha.

4.2.8 Sulphur

The district wise details of Sulphur levels in the state of Odisha is presented in Table 4.9; Figure 4.8. The soil analysis showed that the sufficiency level of Sulphur range from 13 to 75% with average value of 49% across the state. Similarly the the deficiency level range for 25 to 87% with an average value of deficiency of 51% across the state. More than 70% of the soils in Sonepur, Naupada and Bargarh found to have sufficient levels of Suphur.

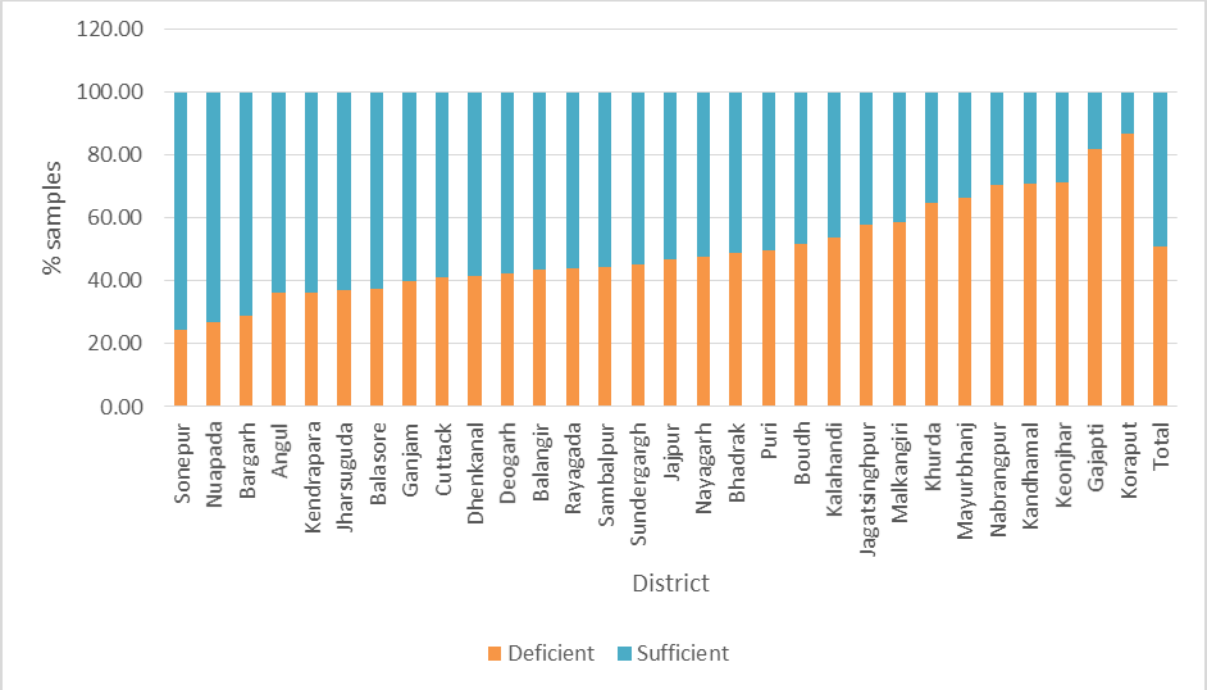

Figure 4.8: District wise sulphur levels in Odisha (%).

Table 4.9. District wise Sulphur content in Odisha (% samples).			
District	Deficient	Sufficient	Total
Sonepur	25	75	100
Nuapada	27	73	100
Bargarh	29	71	100
Angul	36	64	100
Kendrapara	36	64	100
Jharsuguda	37	63	100
Balasore	37	63	100
Ganjam	40	60	100
Cuttack	41	59	100
Dhenkanal	42	58	100
Deogarh	42	58	100
Balangir	44	56	100
Rayagada	44	56	100
Sambalpur	44	56	100
Sundergargh	45	55	100
Jajpur	47	53	100
Nayagarh	48	52	100
Bhadrak	49	51	100
Puri	50	50	100
Boudh	52	48	100
Kalahandi	54	46	100
Jagatsinghpur	58	42	100
Malkangiri	59	41	100
Khurda	65	35	100
Mayurbhanj	66	34	100
Nabrangpur	70	30	100
Kandhamal	71	29	100
Keonjhar	71	29	100
Gajapti	82	18	100
Koraput	87	13	100
Total	51	49	100

4.2.9 Zinc

The data on zinc levels showed that defincincy of about 43% of the soils were deficient in zinc. The zinc deficient is very much prevalent in Balangir followed by Naupada, Boudh, Sonepur and Kalahandi (Table 4.10; Figure 4.9). In constrast, the soils in Cuttack followed by Dhenkanal, Kendrapara and Jharsuguda found to have sufficient levels of zinc.

Table 4.10. District wise details of zinc in Odisha (% samples).			
District	Deficient	Sufficient	Total
Balangir	76	24	100
Nuapada	72	28	100
Boudh	66	34	100
Sonepur	64	36	100
Kalahandi	63	37	100
Angul	61	39	100
Nabrangpur	59	41	100
Keonjhar	55	45	100
Jagatsinghpur	55	45	100
Deogarh	55	45	100
Bargarh	53	47	100
Malkangiri	52	48	100
Koraput	49	51	100
Gajapti	42	58	100
Nayagarh	42	58	100
Balasore	41	59	100
Sambalpur	41	59	100
Kandhamal	41	59	100
Sundergargh	39	61	100
Mayurbhanj	39	61	100
Bhadrak	38	62	100
Ganjam	32	68	100
Puri	30	70	100
Rayagada	28	72	100
Khurda	25	75	100
Jajpur	25	75	100
Jharsuguda	21	79	100
Kendrapara	19	81	100
Dhenkanal	19	81	100
Cuttack	18	82	100
Total	43	57	100

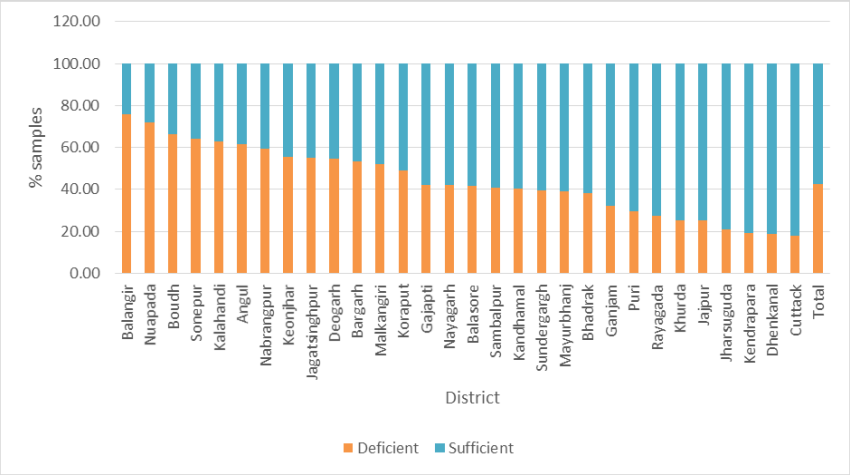

Figure 4.9: Deficiency and sufficiency levels zinc in various districts in Odisha.

4.2.10 Boron

The district wise details of boron is presented in Table 4.11; Figure 4.10. The data reveales that more than 80% of soils across the districts are deficient in boron. In case of Jharsuuguda, Nabrangapur, Sundergarh, Boudh, Gajapati, Sambalpur, Balangir, Malkangiri, Mayurbhanj, Baragarh and Sonepur more than 90% of the soils are deficient in boron, while 43 and 64% soils in Bhadrak and kendrapara were found to have sufficient in boron content.

Table 4.11. District wise levels of boron in Odisha (%

District	Deficient	Sufficient	Total
Kendrapara	36	64	100
Bhadrak	57	43	100
Jagatsinghpur	63	37	100
Puri	63	37	100
Ganjam	64	36	100
Balasore	68	32	100
Dhenkanal	74	26	100
Deogarh	76	24	100
Jajpur	77	23	100
Rayagada	80	21	100
Angul	80	20	100
Nuapada	80	20	100
Nayagarh	81	19	100
Cuttack	83	17	100
Khurda	83	17	100
Koraput	83	17	100
Kalahandi	87	13	100
Kandhamal	87	13	100
Keonjhar	90	10	100
Sonepur	90	10	100
Bargarh	90	10	100
Mayurbhanj	92	8	100
Malkangiri	92	8	100
Balangir	92	8	100
Sambalpur	92	8	100
Gajapti	93	7	100
Boudh	94	6	100
Sundergargh	95	5	100
Nabrangpur	95	5	100
Jharsuguda	98	2	100
Total	81	19	100

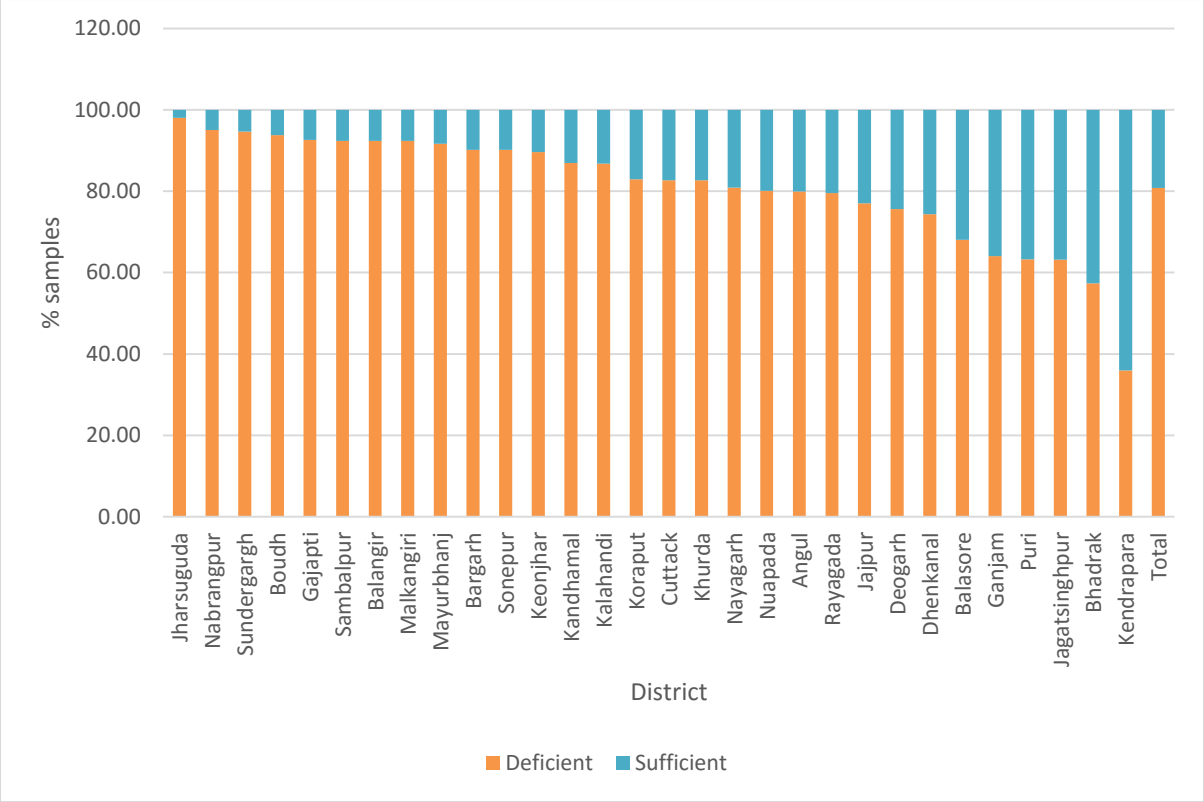

Figure 4.10: District wise boron deficiency and sufficiency levels in Odisha (%).

4.2.11 Ferrous

The district wise deficiency levels of ferrous is presented in Table 4.12; Figure 4.11. The data reavealed that the ferrous levels in the soils across the districts is sufficient with no deficiency in three districts viz. Khurda, Kendrapara and Jharsuguda.

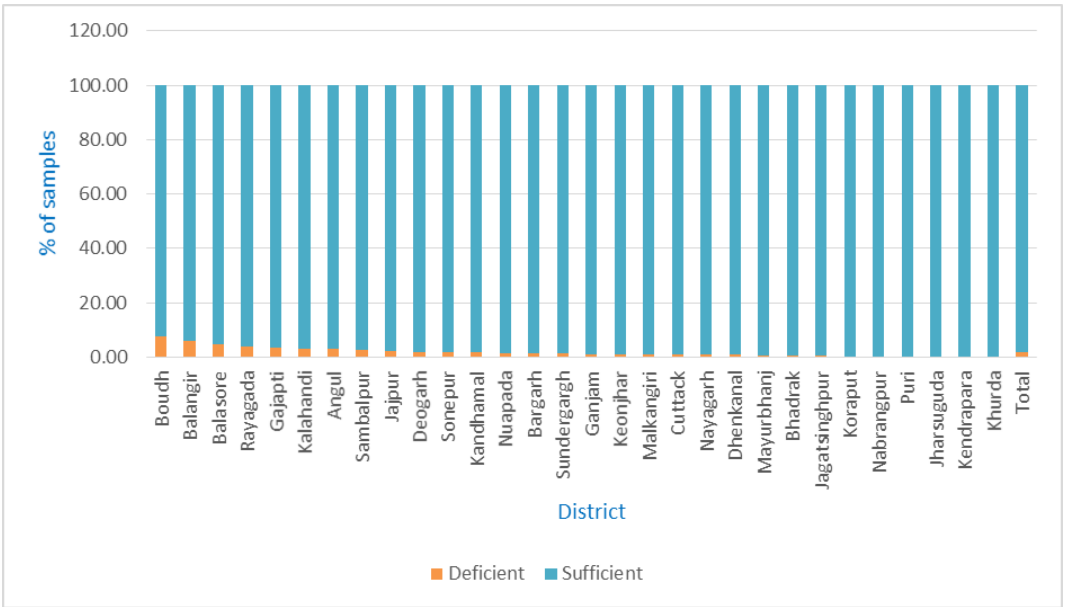

Figure 4.11: Ferrous deficiency levels in Odisha soils.

Table 4.12. District wise details of ferrous in the Odisha (% samples)			
District	Deficient	Sufficient	Total
Boudh	8	92	100
Balangir	6	94	100
Balasore	5	95	100
Rayagada	4	96	100
Gajapti	4	96	100
Kalahandi	3	97	100
Angul	3	97	100
Sambalpur	2	98	100
Jajpur	2	98	100
Deogarh	2	98	100
Sonepur	2	98	100
Kandhamal	2	98	100
Nuapada	2	98	100
Bargarh	1	99	100
Sundergargh	1	99	100
Ganjam	1	99	100
Keonjhar	1	99	100
Malkangiri	1	99	100
Cuttack	1	99	100
Nayagarh	1	99	100
Dhenkanal	1	99	100
Mayurbhanj	1	99	100
Bhadrak	1	99	100
Jagatsinghpur	0	100	100
Koraput	0	100	100
Nabrangpur	0	100	100
Puri	0	100	100
Jharsuguda	0	100	100
Kendrapara	0	100	100
Khurda	0	100	100
Total	2	98	100

4.2.12 Copper

The data on copper showed that the soils in Odisha are sufficient in copper content in all the districts (Table 4.13; Figure 4.12). In case of Jharsuguda and Kendrapara the 100% of samples shown that there is no deficiency of copper.

Table 4.13. District wise copper deficiency and sufficiency levels (% samples).			
District	Deficient	Sufficient	Total
Jharsuguda	0	100	100
Kendrapara	0	100	100
Ganjam	0	100	100
Jagatsinghpur	0	100	100
Dhenkanal	0	100	100
Cuttack	0	100	100
Nayagarh	0	100	100
Bhadrak	0	100	100
Khurda	0	100	100
Gajapti	1	99	100
Jajpur	1	99	100
Koraput	1	99	100
Deogarh	1	99	100
Nuapada	1	99	100
Mayurbhanj	1	99	100
Kalahandi	1	99	100
Nabrangpur	1	99	100
Sambalpur	1	99	100
Boudh	2	98	100
Sonepur	2	98	100
Malkangiri	3	97	100
Rayagada	3	97	100
Bargarh	3	97	100
Angul	3	97	100
Balasore	3	97	100
Keonjhar	3	97	100
Puri	4	96	100
Sundergargh	5	95	100
Balangir	5	95	100
Kandhamal	6	94	100
Total	2	98	100

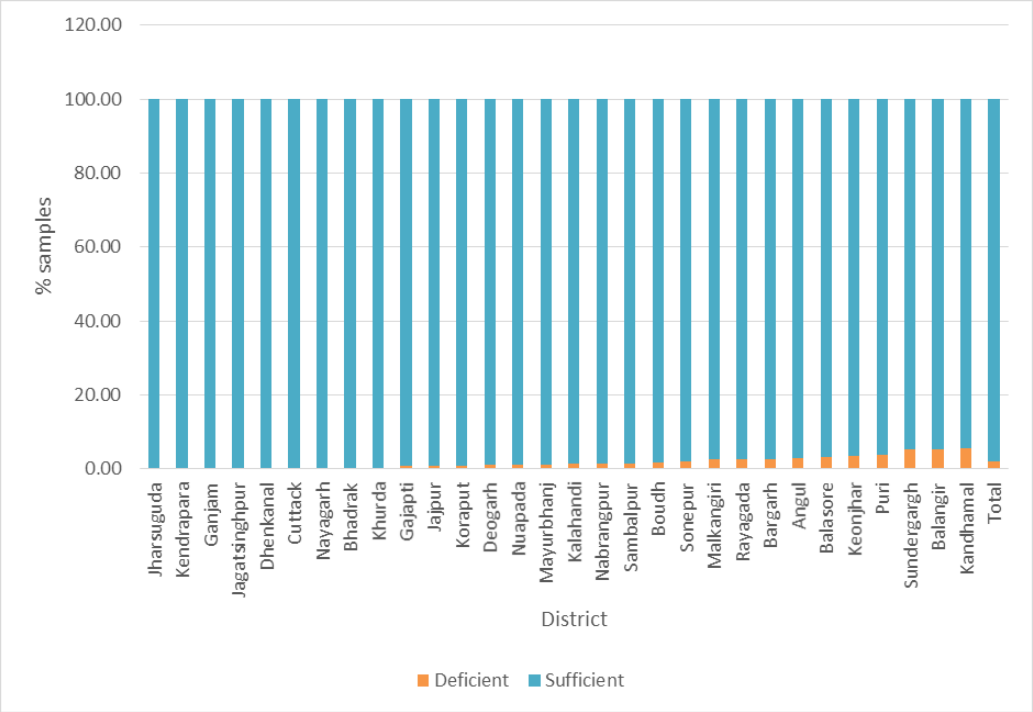

Figure 4.12: Copper deficiency and sufficiency levels in Odisha.

4.2.13 Manganese

The details of manganese deficiency and sufficiency levels is presented in Table 4.14; Figure 4.13. The data showed that 97% of the soils across various don't show the deficiency of manganese.

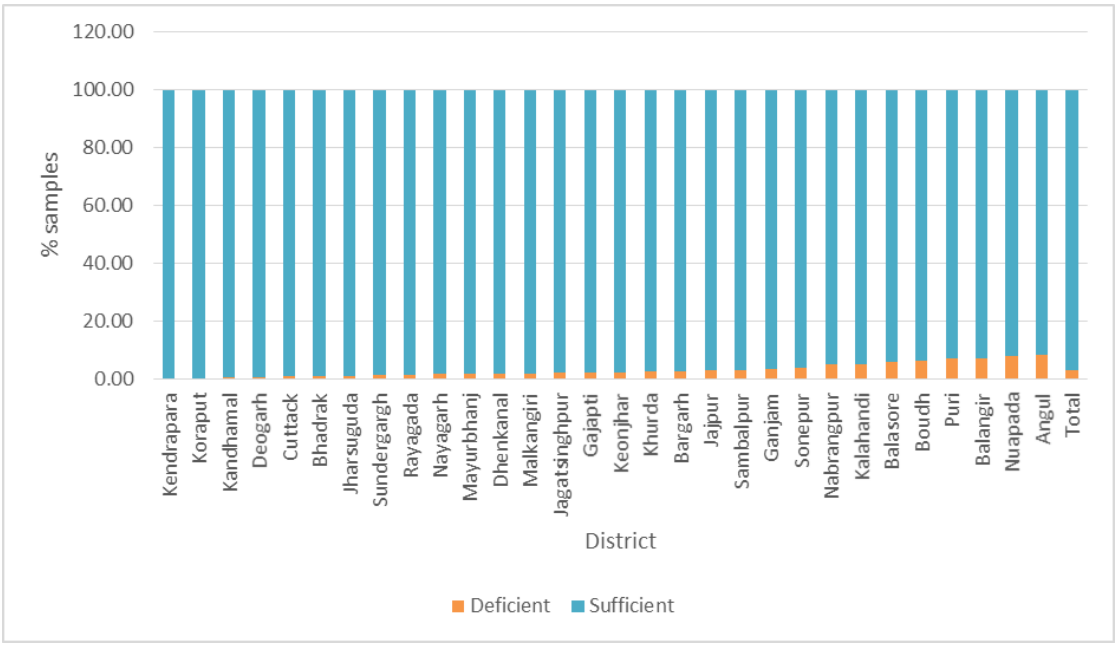

Figure 4.13: Manganese status in the soils of Odisha.

Table 4.14. District wise manganese sufficiency and deficiency levels in Odisha (% samples).			
District	Deficient	Sufficient	Total
Kendrapara	0	100	100
Koraput	0	100	100
Kandhamal	0	100	100
Deogarh	1	99	100
Cuttack	1	99	100
Bhadrak	1	99	100
Jharsuguda	1	99	100
Sundergargh	1	99	100
Rayagada	1	99	100
Nayagarh	1	99	100
Mayurbhanj	2	98	100
Dhenkanal	2	98	100
Malkangiri	2	98	100
Jagatsinghpur	2	98	100
Gajapti	2	98	100
Keonjhar	2	98	100
Khurda	2	98	100
Bargarh	3	97	100
Jajpur	3	97	100
Sambalpur	3	97	100
Ganjam	3	97	100
Sonepur	4	96	100
Nabrangpur	5	95	100
Kalahandi	5	95	100
Balasore	6	94	100
Boudh	6	94	100
Puri	7	93	100
Balangir	7	93	100
Nuapada	8	92	100
Angul	8	92	100
Total	3	97	100

4.4 Block wise results

Block wise results indicate that soil in 100% of soils across ten blocks in Mayrubhan are acidic in nature, while only 28% of soils in Khariar block in Naupada district shown to acidic in nature. In so far as soil alkalinity is concerned, highst percent of soils i.e. 44 % of the soils in Khariar block in Naupada are alkaline in nature. Majority of the soils across all the block in the state shown tolerance EC except for Ganjam block in Ganjam district where 29% of soils have higher levels of EC that are injurious to crop growth. Highest deficiency of organic caron (95%) was noticed in Krushnaprasad, Puri followed by Bolagarh in Khurda (95%), Bonapur, Khurda (91%) and Rasuloour, Jajpur (87%). The deficiency of available P range from 6% in Laxmipur, Koraput to 95% in Bolagarh, Khurda. The deficiency of available potassium ranged from 0% in Laxmipur, Koraput to 83% in Bonapur, Khurda. Available calcium was found to be deficient in Krushnaprasad, Puri (80%) followed by R. Udayagiri, Ganjam (75%), Baripada and Mayurbhanj

(54%). The deficiency of magnesium ranged from 0% in Rajkanika and Rajanagar, Kendrapara to 94% in Rayagada, Gajapati district. The sulphur deficiency ranged from 4% in Athgarh, Cuttack to 100% in Kotpad, Korapur. Majority (>80%) of the blocks in Balangir found to be deficient in zinc while Banki-Dampada block in Cuttack shown to have no deficiency. Majority of soils in all the blocks (>80%) are found to be deficiency in boron while in Kendrapara, Ganjam and Bhadrak are found to have lesser deficiency levels. Khrushnprashad block in Puri district registered highest level of deficiency of manganese. The block wise soil test data is presented in Annexure 1.

4.4 State Level Consultation

As a part of Odisha Bhoochetana project, a state level consultation program was organized on 22nd Feb 2019 at ICRISAT, Hyderabad with to harness and converge the best expertise in the fields of soil science and agronomy from ICAR, OUAT and DoA in achieving precision and efficiency in decision making in recommending soil test based nutrient management systems. The experts include Dr. Antaryami Mishra and Dr. Rabindra Naik, Associate Professros, Soil Science, OUAT, Bhubhaneswar, Dr. Sanjay Kumar Ray, Head, Johat Centre, ICAR-NBSSLUP, Dr. B. N. Ghosh, Principal Scientist, Kolkatta Centre, ICAR-NBSSLUP and Shri Sharada Prasanna Kar, Soil Chemist, STL, Govt. of Odisha, Bhubaneswwar. The consultation program aimed at managing acid soils with best unified nutrient management strategies for sustainable soil health. Enhancing agricultural productivity with soil test based fertilizer recommendations for major crops of Odisha was to be the major agenda during the discussion. At this backdrop, eminent soil scientists from ICAR and OUAT were gathered under one roof. Dr. Sreenath Dixit welcomed the participants and explained the objectives of the program. Dr. Pooran Gaur in his opening remarks called for application of research findings from Bhoochetana project to develop a plan as to which of those micronutrients needed to be applied and disseminate the crop recommendations. Dr. Girish Chander gave an overview of the project while Dr. Pushpajeet presented the initial outcomes from soil analysis completed under the project. Dr. Dixit discussed about the sharing Bhoochetana objectives and program activities which can be built upon the address soil acidity and micronutrients problem and recommendations based on clear, scientific and credible results to the end users. Dr. Antaryami Mishra presented briefly on fertility status of Odisha soils. Dr. Rabindra Nayak presented the micro-nutrient status of Odisha soils along with the recommended doses based on his research experience. Dr. Ghosh discussed about the effect of management practices on nutrient availability and indicators which can be developed from the data sets of this project. Mr. Sharada Kar explained the acid management scheme of Odisha government and the cost recovery challenges faced during execution of liming scheme. Dr. Sanjay Ray spoke at length resolving research based issues in acid soils and guided the team on preparation of GIS thematic maps. Dr. P. K. Mishra discussed briefly about the content in soil health cards and style of presentation. All the participants actively participated in the discussion on improvement of soil health card leading to a format that was as need upon. The consultation programme concluded with recommendation on nutrient doses, acid soil management strategy, planning of various interventions in the upcoming season and researchable issues in soil health management. The following are the outcomes of the consultation:

- Conducting of trial/demonstration to address the issue of soil acidity in the pilot sites of the project
- Setting up crop demonstrations during *kharif* season in those farmer's fields where the soil samples have already been analyzed
- Analyze the amendments especially the Paper Mill Sludge (PMS) for heavy metal prior to its application
- Recommendation on application of 25 per cent higher N, P and K over and above RDF if the nutrient status is low and 25 per cent lesser if soil status is high
- Recommendation on reintroduction of PMS as an amendment to correct soil acidity on a larger scale
- Recommendation on soil application of boron @ 1kg per ha every year
- Recommendation on application of sulphur @ 30 kg per ha (200 kg gypsum) for cereals and 45 kg per ha for oilseeds in deficient soils
- Recommendation on application of 5 kg Zn/ha/year (25 kg $ZnSO_4$) in case of paddy and 2.5 kg /ha/year for pulses and other cereals and 2 kg Zn/ha/year for oilseeds in deficient soils
- Recommended the usage of biofertilizers like Azospirillum, Azatobacter, PSB, Rhizobium
- Promoting the seed priming with 1 % zinc sulphate heptahydrate and 1 % KH_2PO_4 in acidic soils
- Promoting application of well decomposed poultry manure @ 2.5 t/ha in furrows as a substitute of lime in management of acid soil
- Incentivizing and promotion of large scale production of aerobic composting both on individual and community basis
- Making mandatory the digital soil maps to be the reference point for soil fertility and crop recommendations.
- Finalized the critical soil limits for Odisha soils
- Low cost PMS could be considered as second best options for management of acid soils.
- Chemical liming materials could be considered particularly for the soils where the pH is below <5.0 in alternate year with INM to reduce cost of liming materials.
- Recommendation that PMS dose of 50% of lime requirement (LR) is highly desirable option in the state of Odisha.

4.5 Digital Soil Mapping for Developing Soil Nutrient Maps of Odisha

Digital Soil Mapping (DSM) - or predictive soil mapping – provides option to generate soil property surfaces at fine resolution with the uncertainty of prediction. There are three steps in DSM: 1) collection of legacy soil data or field and laboratory measurement of soil properties and development of the base maps of available data including climatic information, land cover, terrain and geological variables; 2) Estimation of soil properties by using quantitative relationship between measure point data and spatial maps prepared in first step; 3) estimated soil properties further used to derive more difficult-to-measure soil properties such as soil water storage, carbon density, and phosphorus fixation. Although the DSM product has some

prediction uncertainties, but it provides the spatial information at much higher resolution and at less cost. DSM methodologies will be implemented to developed prediction map of selected soil nutrients for Odisha state.

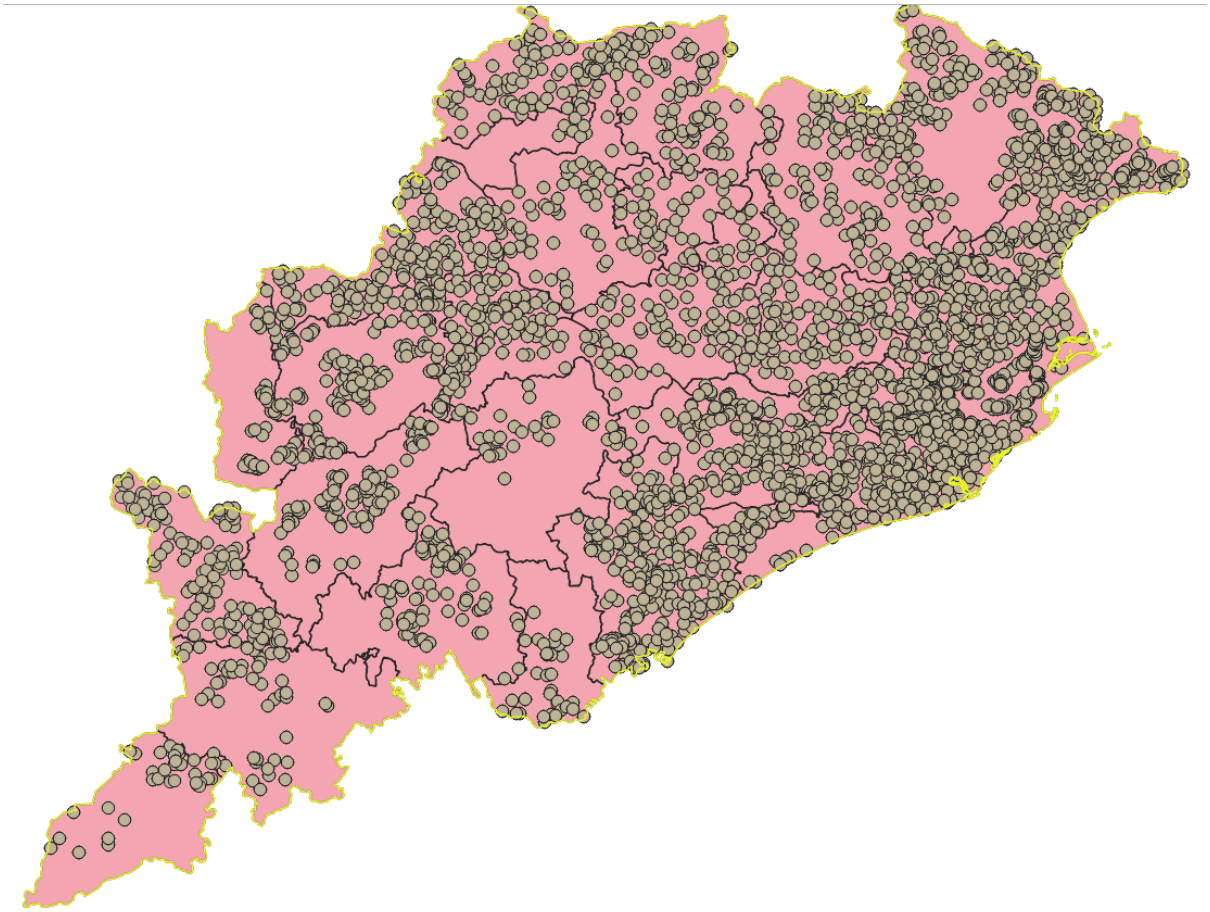

Figure 4.14: Distribution of soil sample point across Odisha.

4.5.1 Environmental covariates

Environmental variables are the factors, which may have influence on development of soil over period of time. The key variables include elevation, precipitation, and temperature (Figure 4.15). The digital elevation model (DEM) acquired with the shuttle radar topographic mission (SRTM) with spatial resolution of 90 m around the study area was downloaded for Odisha state. The DEM was processed in QGIS software to derived slope and aspect as terrain attributes. The global raster data of WorldClim Bioclimatic variables for WorldClim version 2 was used to extract the bioclimatic variables.

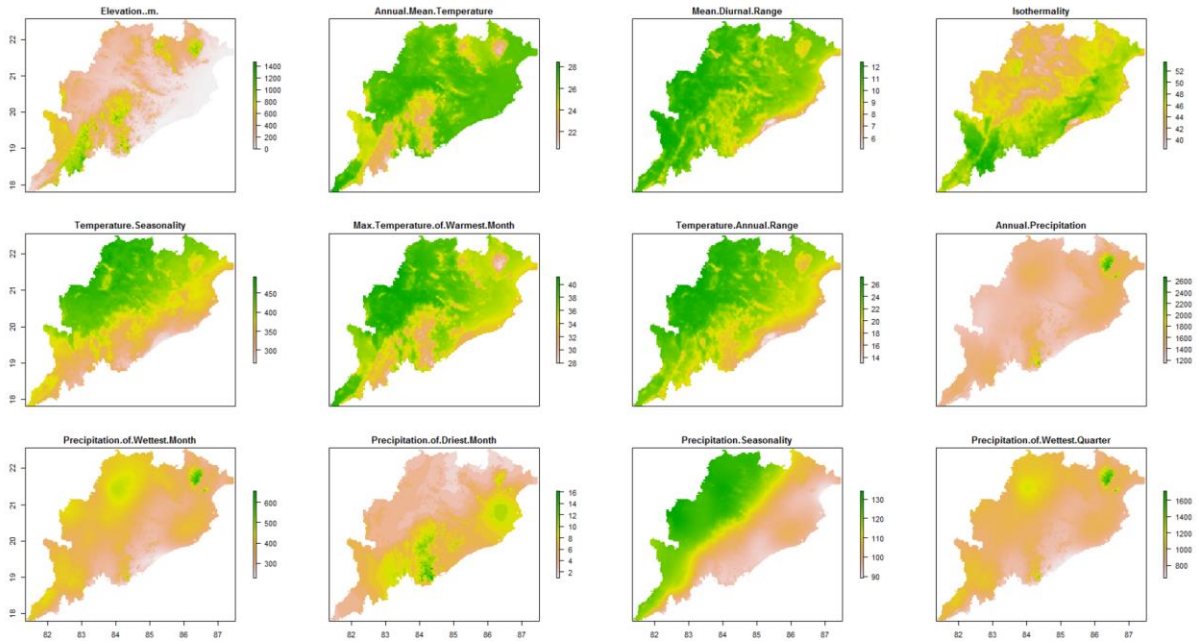

Figure 4.15: Rarster images of environmental covariate.

4.5.2 Data distribution and transformation

The distribution of soil nutrient values was checked for skewness, kurtosis and normality. In case data is not following normal distribution, data transformation techniques such as logarithmic, square root, power were used to transform the data to fit into normal distribution. Logarithmic transformation method is commonly used data transformation techniques, which also found suitable to transform both legacy dataset and big dataset to fit to normal distribution. Spatial variation in organic carbon content of surface soil samples was studied through semivariogram using spherical model.

4.5.3 Digital soil mapping

The steps used for developing soil nutrient maps for Odisha state using DSM techniques are as follow.

1. Preparing stack of rasters of covariates
2. Extracting the point information from raster stack with respecting geo-coordinates of soil sampling points.
3. Exploratory analysis: Checking for extracted data for distribution of values of fertility parameters and selecting appropriate data transformation
4. Data partitioning: 75% sample data points for calibration of model and remaining 25% data points for validation of model.
5. Applying validated model to prepare the digital soil map
6. Preparing classified map based on existing rule of fertility recommendations

The classified maps of soil fertility parameters are shown in Fiigure 4.16-4.18 using Random Forest model. Further investigation will be done to assess the quality and accuracy of the

maps. The finalized maps based on accuracy level will be used for information dissemination and for online application.

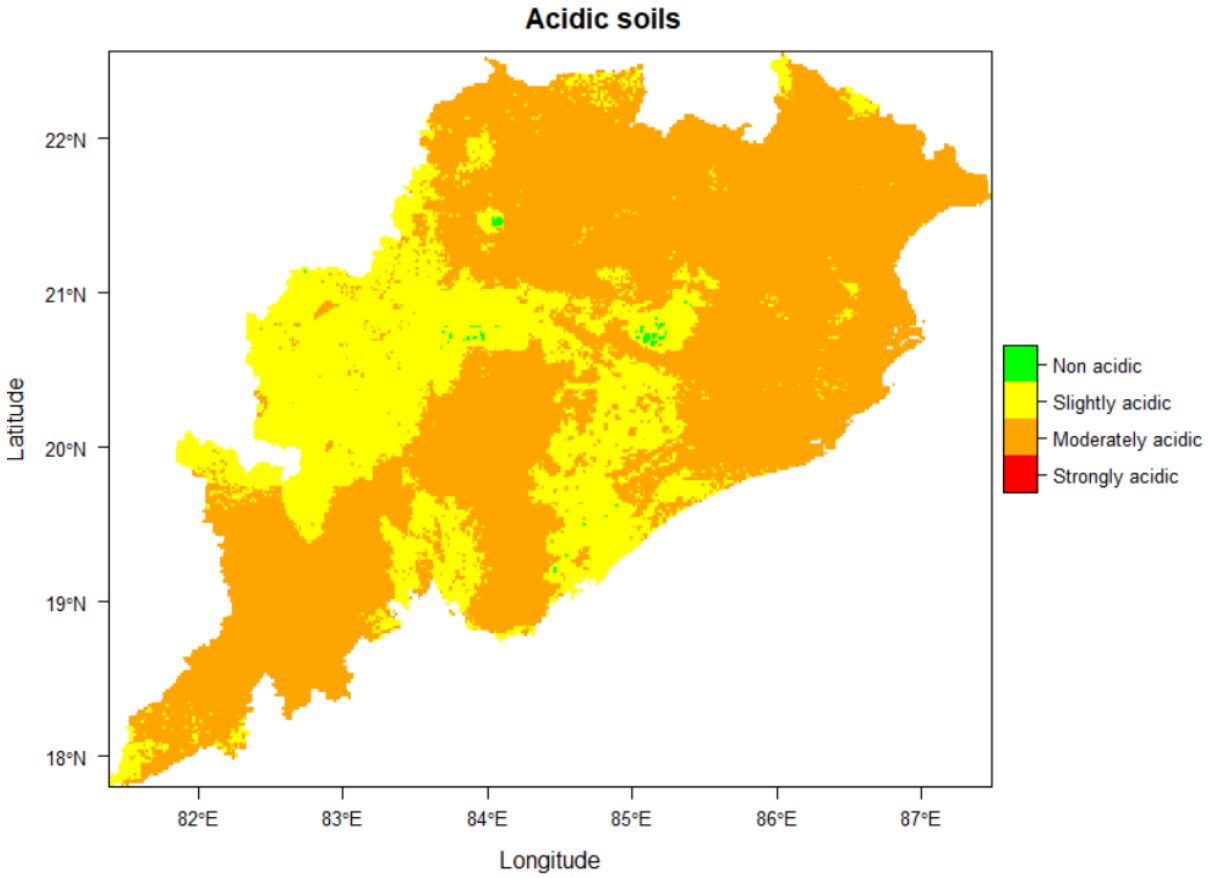

Figure 4.16: Classification map based of pH values.

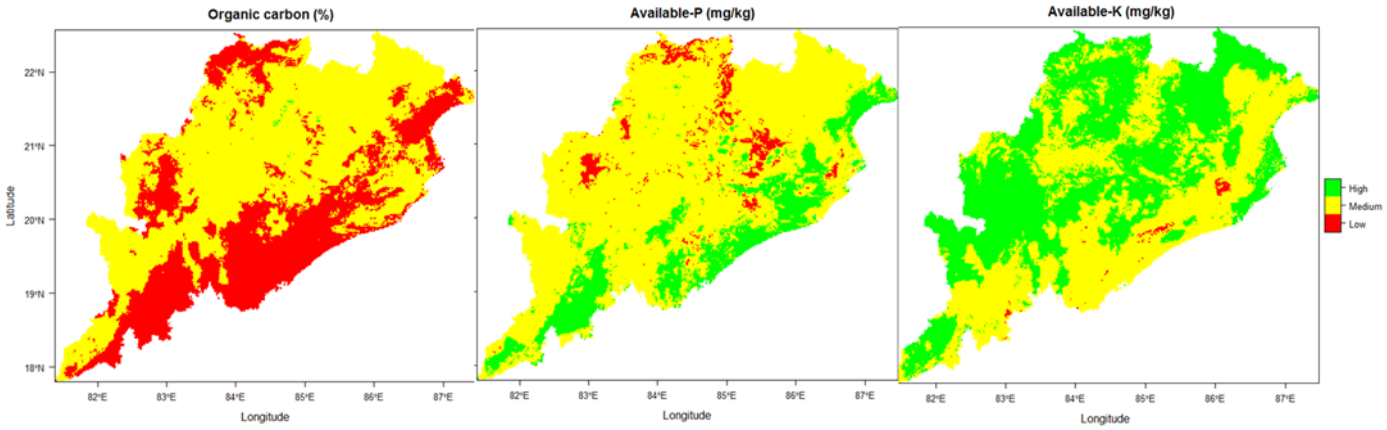

Figure 4.17: Status of organic carbon, available-P, and available-K in Odisha.

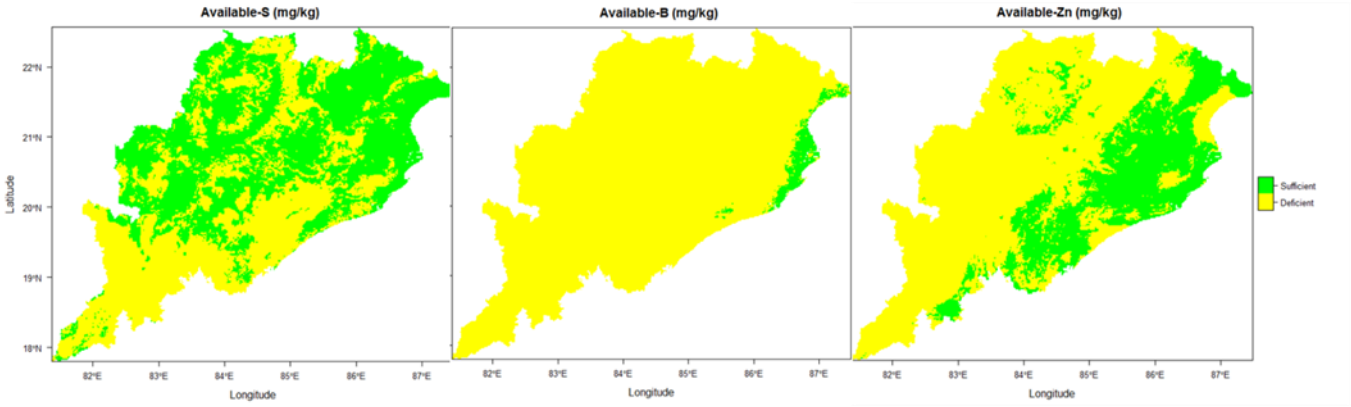

Figure 4.18: Status of Available-S, Available-B, and Available-Zn in Odisha.

5. Demonstration of Improved Agricultural Practices

5.1 Area and number of demonstrations

Field demonstration is an extension method usually conducted by research and /or extension worker preferably in collaboration with farmer in his/her field to validate and demonstrate a new technology. It reinforces the belief in technology through seeing and doing. As part of the Bhoochetana project, ICRISAT has committed to carry out 1600 demostratopms per year covering all the 30 districts in the state. Based on results of soil samples analyzed, trials were laid out in farmer-participatory mode during *kharif* and *rabi* 2018-19 (Table 5.1). A total of 4166 demonstrations were conducted in an area of 2510 acres across all the 30 districts, 81 blocks and 360 villages. During *kharif* season, 1698 demonstrations covering an area of 1260 acres were organized across 30 districts, 54 blocks and 187 villages. During *rabi* 2018-19, a total of 2468 demonstrations covering an area of 1250 acres across 30 districts, 65 blocks and 218 villages. Majority of the demonstrationswere laid out to showcase crop diversification options, improved cultivars, application of micronutrient viz. zinc and boron and adding of humic acid to improve carbon content. Demonstrations in *kharif* include field crops viz. paddy, finger millet, foxtail millet, pearl millet, maize, pigeonpea, groundnut and vegetables in nutrition garden viz. brinjal, tomato, chillies, cabbage etc. Similarly in *rabi,* demonstrations were organized on paddy, finger millet, maize, sorghum, chickpea, blackgram, greengram, cowpea, groundnut, mustard, vegetables in nutrition garden viz. cauliflower, tomato, chilles, potato etc. Twenty one non-crop demonstrations on waste decomposer were organized to show case manure production out of farm waster in a faster manner. Demonstrations could not be carriedout in Keonjhar district during *kharif* season due to the cyclones and other operational issues. During *kharif,* 2018, there was crop failure in case of paddy in Naupada (20 demos of 20 acres) and pigeonpea in Bargarh (17 demos of 3 acres). Similarly crop failure due to severe infestation of viraus was reported during *rabi* in case of black gram Keonjhar (36 demons covering 15 acres).

Table 5.1. District, block, village and season wise deonstrations conducted during 2018-19.												
District	*Kharif*				*Rabi*				Total			
	No. of Blocks	No. of Villages	Area (acre)	No. of Demos	No. of Blocks	No. of Villages	Area (acre)	No. of Demos	No. of Blocks	No. of Villages	Area (acre)	No. of Demos
Angul	2	13	77	153	2	3	13	43	3	16	90	196
Balangir	1	9	65	66	2	7	15	30	2	15	80	96
Balasore	2	3	42	54	3	5	23	34	4	8	65	88
Bargarh	1	3	57	109	1	2	41	81	1	3	97	190
Bhadrak	1	2	20	40	1	1	25	49	1	3	45	89
Boudh	2	5	18	28	2	12	20	26	2	17	38	54
Cuttack	1	2	30	30	1	1	20	39	1	3	50	69
Deogarh	1	4	52	49	3	6	54	201	4	10	106	250
Dhenkanal	1	3	69	69	1	3	16	31	1	6	85	100
Gajapathi	2	3	33	66	3	4	31	62	3	5	64	128
Ganjam	3	8	48	55	4	25	52	74	6	29	100	129
Jagatsinghpur	3	6	31	31	3	8	30	60	3	8	61	91
Jajpur	1	2	25	50	1	2	44	87	1	2	69	137
Jharsuguda	1	2	47	54	1	1	65	98	1	2	111	152
Kalahandi	4	10	6	12	3	7	18	56	4	17	24	68
Kandhamal	4	10	58	74	2	7	12	46	5	17	70	120
Kendrapara	4	6	45	60	4	6	67	136	4	6	112	196
Keonjhar					3	6	105	203	3	6	105	203
Khorda	1	2	60	60	1	3	14	69	1	4	74	129
Koraput	2	11	14	27	5	47	162	401	5	56	175	428
Malkangiri	1	10	40	40	2	8	30	60	3	18	70	100
Mayurbhanj	2	12	62	89	2	7	60	63	3	16	121	152
Nabarangpur	2	10	65	150	1	2	15	50	2	12	80	200
Nayagarh	5	26	42	60	3	6	16	55	6	30	58	115
Nuapada	1	7	58	58	2	7	17	30	2	13	74	88
Puri	1	2	49	49	1	3	47	89	1	3	96	138
Rayagada	2	6	38	60	3	5	14	30	3	10	52	90
Sambalpur	1	2	60	60	1	2	29	80	1	2	89	140
Sonepur	1	2	5	10	2	4	23	21	3	6	28	31
Sundargarh	1	7	50	35	3	18	174	164	3	21	224	199
Total	**54**	**187**	**1262**	**1698**	**65**	**218**	**1248**	**2468**	**81**	**360**	**2510**	**4166**

In commensurate with district wise importance of crop and its contributin to the economy, 4029 demonstrations on crops covering 2460 acres were organized during 2018-19 across various districts (Table 5.2; Annexure 2). A total of 1107 demonstrations covering 948 acres covering 23 districts were organized in rice during 2018-19 followed by chickpea, pigeonpea, green gram, black gram and maize.

Table 5.2. Crop-wise demonstration conducted during 2018-19.									
Crop	*Kharif*			*Rabi*			Total		
	No. of districts	Area (acres)	No. of demos	No. of districts	Area (acres)	No. of demos	No. of districts	Area (acres)	No. of demos
Black Gram				13	224	372	13	224	372
Chickpea				19	448	927	19	448	927
Cowpea				1	58	189	1	58	189
Finger Millet	5	56	98	3	25	54	5	81	152
Foxtail Millet	2	13	18				2	13	18
Green Gram				16	249	440	16	249	440
Groundnut	3	30	41	1	30	60	4	60	101
Maize	4	29	52	6	73	150	6	101	202
Mustard				3	15	32	3	15	32
Paddy	23	869	976	5	79	131	23	948	1107
Pearl Millet	1	8	12				1	8	12
Pigeonpea	10	248	464				10	248	464
Sorghum				1	3	13	1	3	13
Total	29	1261.93	1698	30	1248	2468	30	2509.68	4166

The details of technologies demonstrated across 30 districts is presented in Table 5.3 and technology and crop wise details is given in Annexure 3. The puspose of conducting the demonstrations is to showcase Soil Test Based Recommendation (STBR) on application of nutrient with combination of other improved corp management practices. In commensurate with wise spread deficiency i.e. more than 80% of soils showing deficiency of boron, maximum number of demonstrations i.e. 1231 demonstrations covering 957 acres were organized followed by STBR + Line Sowing (667 demos, 395 acres), STBR + Line Sowing + Nipping (379 demos, 177 acres), STBR + Humic Acid (343 demos. 190 acres), STBR + Improved cultivar (334 demos, 149 acres) and STBR + Cropping System (244 demos, 91 acres). Along with soil test based nutrient management practices other managemne practices like line sowing in black gram, green gram, chickpea, pigeonpea, groundnut, finger millet, maize etc. was also demonstrated during 2018-19. In view of growing long duration paddy during *kharif* and no scope for taking second crop, emphasis was laid on growing short duration pulses viz. green gram, black gram and and chickpea in rice fallow situation under STBR + Cropping System category of technology. To facilitate production of more number of auxillary flower bearing branches and to overcoming the apical dominance, nipping of apical bud using simple devise is being demonstrated in crops like chickpea and pigeonpea during *kharif* and *rabi* seasons. In view of wide spread deficiency of organic carbon and low productivity, demonstration were also organized on apploication Humic Acid wherever applicable. In view of majority soils being acidic in nature and higher prevalence of micro-nutrient deficiencies like zinc and boron, demonstrations were organized with a combination of micronutrients and soil test based nutrient management practices. Wherever farmers have the practice using low yielding varieties, demonstrations on improved cultivars that are responsive to nutrients and showing

tolerance to abiotic stress like submergence, moisture stress and pest and disease infestation were organized according to location specific situation.

Table 5.3 Details of technology wise demonstrations conducted during 2018-19

Technology	*Kharif*		*Rabi*		Total	
	Area (Acres)	No. of Demos	Area (Acres)	No. of Demos	Area (Acres)	No. of Demos
STBR + Cropping Systems	3	51	88	193	91	244
STBR + Line Sowing	48	75	347	592	395	667
STBR + Line Sowing + Nipping	145	232	31	147	177	379
STBR + Nipping	73	137			73	137
STBR + Improved Cultivar	15	23	134	311	149	334
STBR + Improved Cultivar + B			108	135	108	135
STBR + Improved Cultivar + B + Zn			106	205	106	205
SBTR + B	723	817	234	414	957	1231
STBR + Humic Acid	82	117	109	226	191	343
STBR + Humic Acid + B	98	113	8	11	106	124
STBR + Humic Acid + Zn			3	4	3	4
STBR + Humic Acid + Zn + B	13	11	2	2	14	13
STBR + S	10	20			10	20
STBR + Zn			34	65	34	65
STBR + Zn + B	51	78	36	92	87	170
Nutritional Garden	2	24	3	50	5	74
Waste Demomposer			5	21	5	21
Grand Total	1261.93	1698	1248	2468	2510	4166

5.2 Performance of crops

5.2.1 Fingermillet

The details of crop performance in *kharif* , 2018 is presented in Table 5.4; Figure 5.1. Finger millet demonstrations wer organized in Gajapathi, Ganjam, Kandhamal, Koraput and Malkangiri districts in Odisha. The improved technologies tested in the demonstrations include STBR + Humic Acid and STBR + B + Zn. The average yield of crop in improved practice was across 98 demonstrations is 492 kg/acre which is 43% higher than the farmer practice. Highest yield response of 175% was obtained in Kandhamal with STBR + B application.

Table 5.4. Performance of Finger Millet demonstrations during *Kharif* , 2018.

District	Area (Acres)	No. of Demos	Farmers Practice (kg/acre)	Improved Practice (kg/acre)	% increase
Gajapathi	33	66	333	412	24
Ganjam	1	2	700	800	14
Kandhamal	9	16	236	650	175
Koraput	1	2	400	535	34
Malkangiri	12	12	351	464	32
Total/Average	56	98	329	471	43

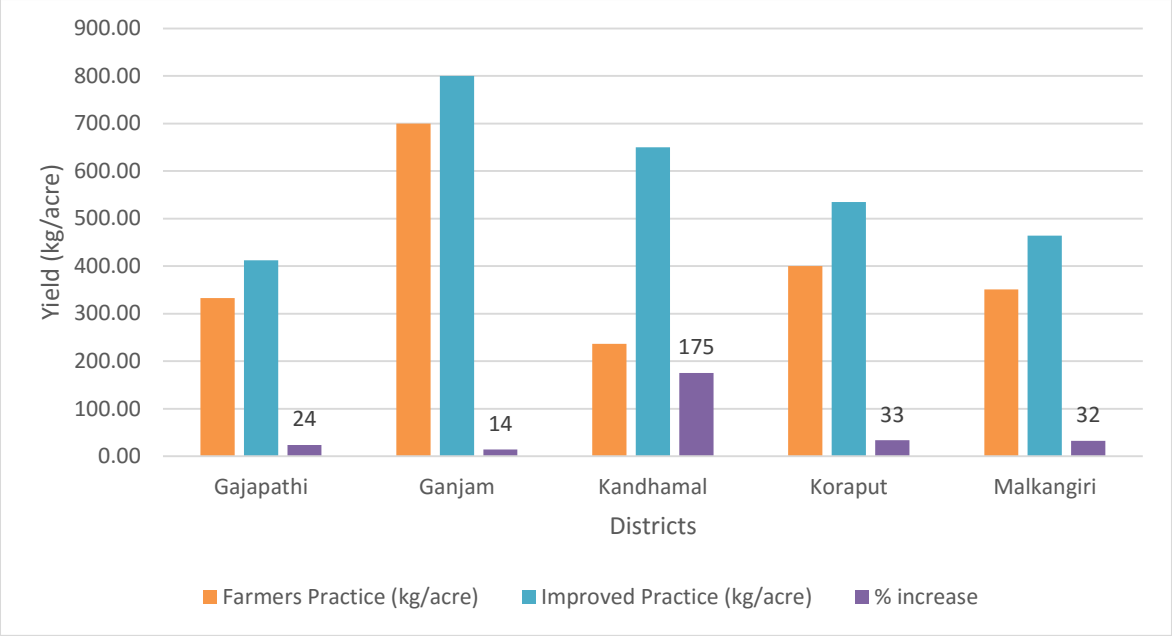

Figure 5.1: performance of finger millet in kharif, 2019 in Odisha.

Plate 5.1: Crop demonstration with finger millet in Korapur district.

5.2.2 Foxtail Millet

Eighteen demonstrations in an area of 13 acres were organized in foxtail millet in two districts i.e. Koraput and Malkangiri (Figure 5.2). Among the technologies that were tested were line sowing in Koraput and STBR + B in Malkangiri districts. The average increase in yeild was 33 % compared to farmers traditional practice.

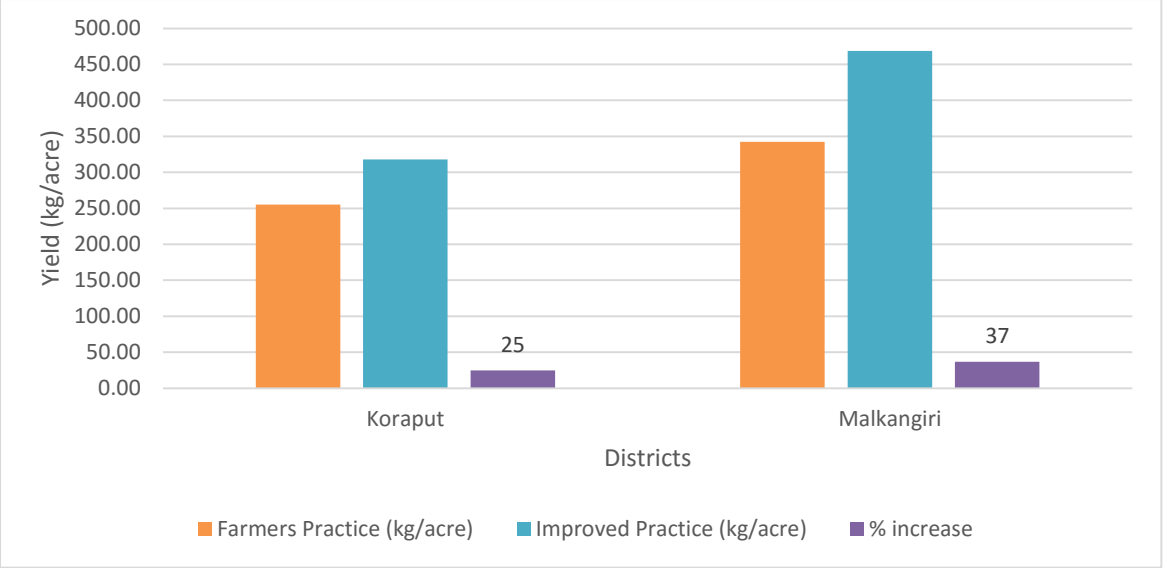

Figure 5.2: Response of foxtail millet in kharif, 2018 in Odisha.

5.2.3 Maize

Maize demonstrations comprising of 32 in an area of 18 acres were organized in three districts i.e. Ganjam, Kalahandi and Mayurbhanj. Improved technologies demonstrated include STBR + Humic Acid + Zn + B and STBR + Zn + B, STBR + B and line sowing. The average yield response to the improved technologies was 21% compared to farmers practice (Figure 5.3)

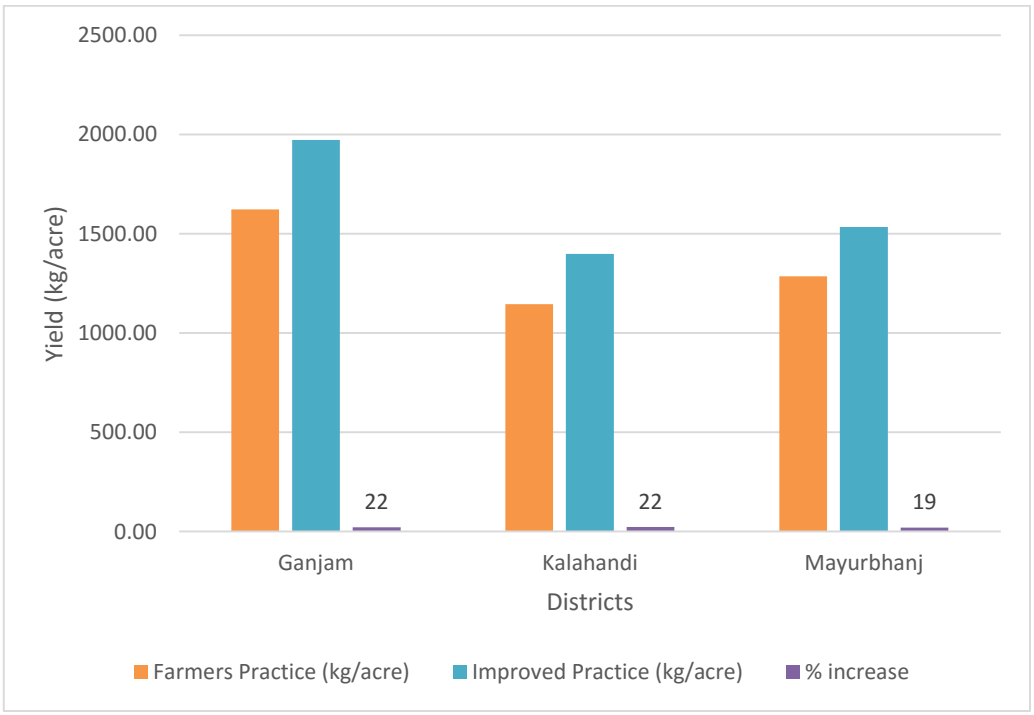

Figure 5.3: Performance of maize under soil test based Nutrient Management in kharif, 2018 in Odisha.

Plate 5.2: Crop demonstration with maize crop in Kalahandi district.

5.2.4 Pearl Millet

Twelve demonstration covering an area of around 8 acres were organized in Ganjam district on STBR + Zn + B during *Kharif* , 2018. The average yield recorded with improved practice was 1961 kg/acre which is 17% higher than farmers practice i.e. 1673 kg/acre.

5.2.5 Paddy

A total of 940 demonstrations comprising of 23 districts covering an area of 833 acres were organized during *kharif* , 2018 (Table 5.5; Figure 5.4). The improved technologies demonstrated include STBR with boron and or zinc, humic acid and improved cultivar. The combination of STBR with micronutrients viz. Zn and B, humic acid and improved cultiar as accordingly soil test resulsts and prevailing location specific conditions. The yield response ranged from 3-65% with maximum response to STBR + B in Khandamal (65%) followed by Malkangiri (36%), Boudh (31), Nayagarh (27), Baragarh (24%), Rayagada (22%) and Balangir (20%).

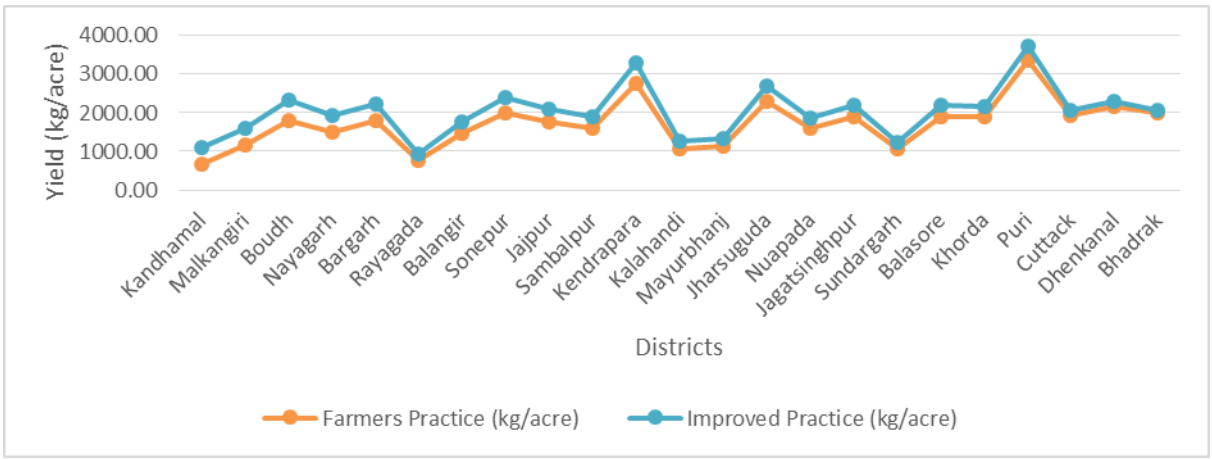

Figure 5.4: perfcormance of paddy under improved management practices in kharif, 2018 in Odisha.

Table 5.5. Demonstration on paddy organized during *kharif* , 2018 in Odisha.					
District	Area (Acres)	No. of Demos	Farmers Practice (kg/acre)	Improved Practice (kg/acre)	% increase
Balangir	50	50	1469	1767	20
Balasore	42	54	1914	2198	15
Bargarh	50	50	1808	2237	24
Bhadrak	20	40	2013	2069	3
Boudh	8	8	1790	2346	31
Cuttack	30	30	1923	2071	8
Dhenkanal	69	69	2171	2308	6
Jagatsinghpur	31	31	1903	2204	16
Jajpur	25	50	1754	2103	20
Jharsuguda	47	54	2286	2709	19
Kalahandi	2	4	1075	1283	19
Kandhamal	44	52	656	1083	65
Kendrapara	45	60	2764	3299	19
Khorda	60	60	1900	2158	14
Malkangiri	20	20	1181	1605	36
Mayurbhanj	53	62	1125	1339	19
Nayagarh	42	60	1510	1924	27
Nuapada	28	28	1604	1865	16
Puri	49	49	3354	3744	12
Rayagada	4	4	769	940	22
Sambalpur	60	60	1593	1903	20
Sonepur	5	10	1986	2382	20
Sundargarh	50	35	1066	1229	15
Total/Average	833	940	1803	2112	17

Plate 5.3: Demonstrations with paddy crop - Left: Mayurbhajn ditrict; Right: Bhadrak district.

5.2.6. Groundnut

Twenty one demonstrations covering an area of 20.10 acres were organized in Ganjam and Koraput districts. The technologies tested in Ganjam are STBR + Humic Acid + Zn + B and STBR + Zn + B and in case of Koraput line sowing was demonstrated in organically grown groundnut. The yield response was 19% in Ganjam and 23% in case of Koraput.

5.2.7 Pigeonpea

A total of 385 demonstrations comprising of 234 acres were organized with improved practices of STBR + micronutrients i.e. zinc and boron across eight districts (Table 5.6; Figure 5.5). Along with nutrient management line sowing and nipping with battery operated hand held devise was as demonstrated. Highest yield response of 190% was obtained in Angul followed by Deogarh (175), Nabrangpur (44%), Koraput (32%), Kalahandi (24%), Balangir (14%) and Naupada (9%).

Table 5.6. Pigeonpea demonstration organized during *Kharif* , 2018 in Odisha.

District	Area (Acres)	No. of Demos	Farmers Practice (kg/acre)	Improved Practice (kg/acre)	% increase
Angul	77	153	210	610	190
Balangir	15	16	250	284	14
Deogarh	52	49	327	899	175
Ganjam	9	12	650	769	18
Kalahandi	4	7	327	404	24
Koraput	6	12	278	368	32
Nabarangpur	63	126	200	287	44
Nuapada	10	10	225	348	55
Total/Average	234	385	257	553	115

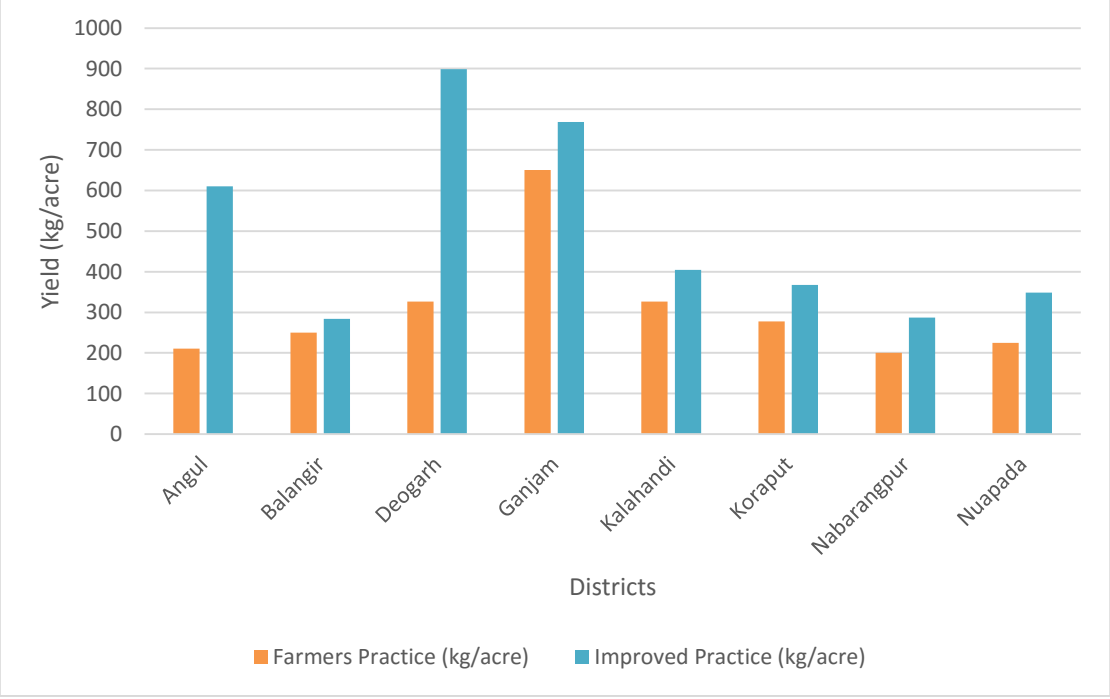

Figure 5.5: Response of pigeonpea to mutrient manangement in kharif, 2018.

Plate 5.4: Crop demonstration with pigeonpea crop in Nuapada district.

5.3 Performance of improved technologies

5.3.1. Finger Millet

The details regarding response of finger millet to improved technologies is given in Table 5.7; Figure 5.6. Of the three technologies tested across 98 locations and 56 acres, application of boron along with soil test based nutrient application gave highest response of 80% compared to farmers practice. Similarly, humic acid application combined with micronutrients (Zn and B) and application of NPK as per soil test values gave higher response i.e. 25% and 23% compared to farmers practice.

Table 5.7. Finger millet response to improved technologies during *kharif* , 2019.

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
STBR + B	21	28	302	544	80
STBR + Humic Acid	15	30	331	413	25
STBR + Zn + B	19	38	354	433	22
Total/Average	55	96	328	470	43

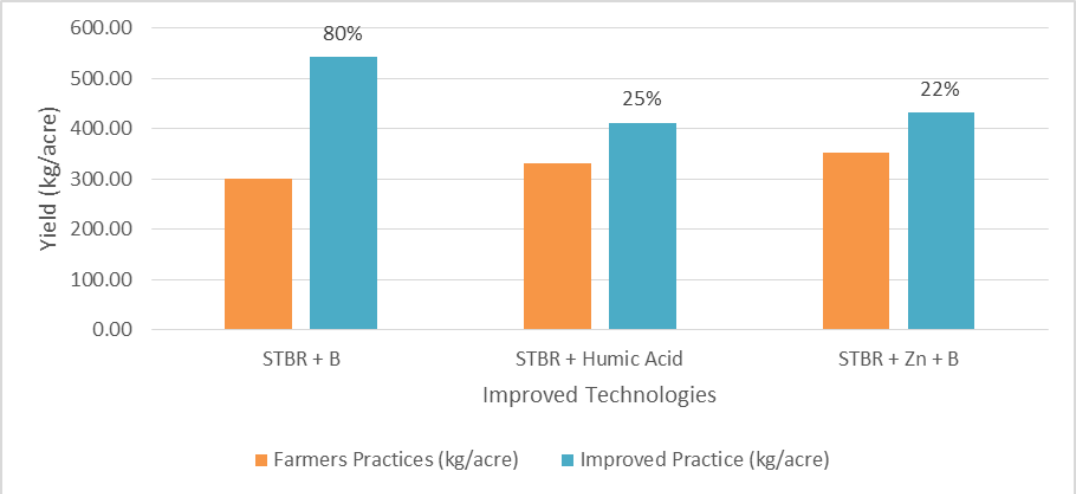

Figure 5.6: Response of finger millet to improved technologies during kharif, 2018.

5.3.2 Foxtail Millet

Two technologies viz. Line Sowing and STBR + B were tested in 18 locations covering 13.00 acres (Table 5.8; Figure 5.7). Results showed that application of boron along with NPK as per soil test values recorded higer yield (469 kg/acre) compared to farmers practice (343 kg/acre) which is higher by 37%. Line sowing also gave higher yield response i.e. 25% compared to farmers practice.

Table 5.8. Response of foxtail millet to improved technologies during *Kharif,* 2019 in Odisha

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
Line Sowing	5	10	255	318	25
STBR + B	8	8	343	469	37
Total/Average	13	18	309	411	33

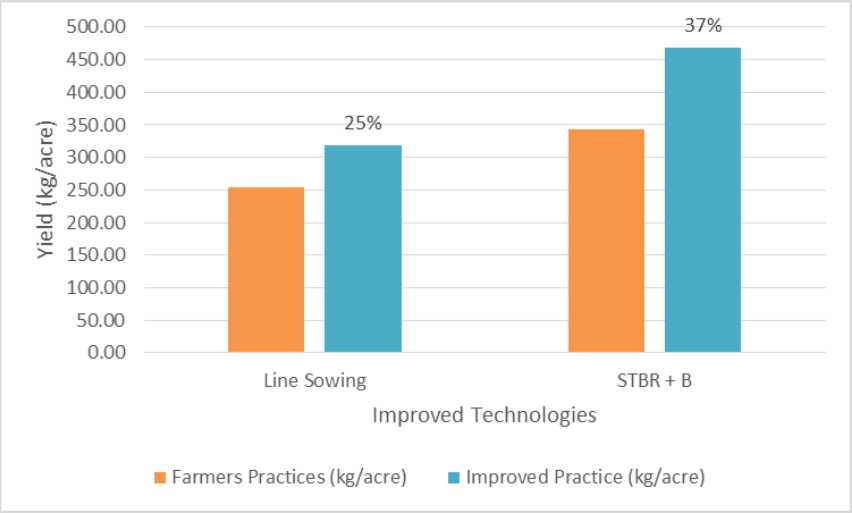

Figure 5.7: Performance of improved technologies in foxmillet in kharif, 2018.

5.3.3. Maize

Application of soil tested based nutrient along with micronutrients (Zn and B) and humic acid were demonstrated in 31 locations gave average reponse of 21% in maize during *kharif,* 2018. Highest yield response of 30% was recorded with STBR + Humic Acid + Zn + B followed by STBR + Zn + B and STBR + B (Table 5.9; Figure 5.8).

Table 5.9. Performance details of improved technologies in maize during *kharif,* 2018 in Odisha.

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
STBR + B	8	20	1285	1534	19
STBR + Humic Acid + Zn + B	2	1	1500	1950	30
STBR + Zn + B	9	10	1647	1977	20
Total/Average	18	31	1479	1787	21

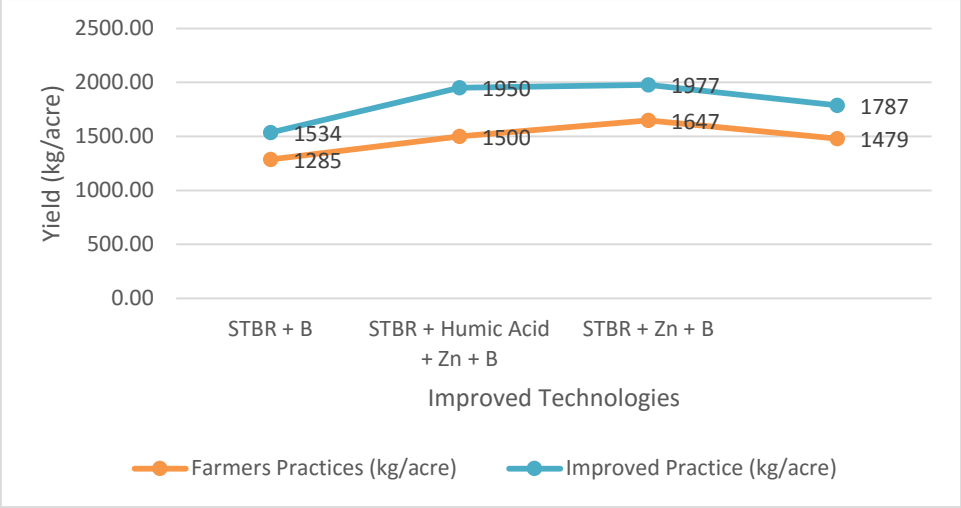

Figure 5.8: Response of maize to imporved technologies in kharif, 2018.

5.3.4. Paddy

Soil test based nutrient application along with micronutrients (Zn and B) and humic acid was tested in 921 locations in an area of 817 acres (Table 5.10; Figure 5.9). The the average yield response was 17% compared to farmers practice. Highest yield response was recorded with STBR + Zn + B (21%) followed by STBR + Humic acid (19%), STBR + B (17%) and STBR + Humic Acid + B (16%)

Table 5.10. Response of paddy to improved technologies in *Kharif,* 2018 in Odisha.

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
STBR + B	657	730	1790	2094	17
STBR + Humic Acid	59	72	1181	1405	19
STBR + Humic Acid + B	98	113	2307	2681	16
STBR + Zn + B	4	6	2047	2468	21
Total/Average	818	921	1809	2116	17

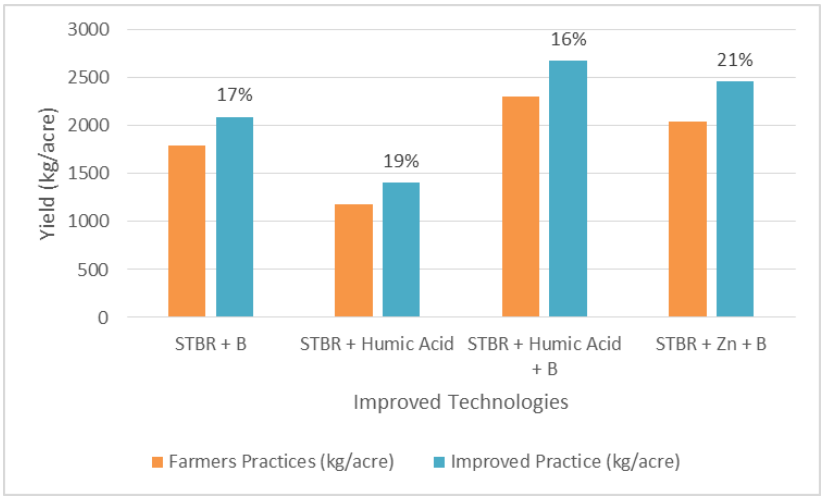

Figure 5.9: Performance of Improved technologies in paddy during kharif, 2018.

5.3.5 Pearl Millet

Improved technologies gave an average yield response of 17% compared to farmers practice across 12 location in *kharif,* 2018 in Odisha (Table 5.11; Figure 5.10). Application of NPK, humic acid, Zn and B as per soil test values recorded higher yield response of 19% compared to farmers practice followed by and application of NPK, Zn and B.

Table 5.11. Performance of improved technlolgies in pearl millet in *kharif,* 2018

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
STBR + Humic Acid + Zn + B	0	1	1600	1900	19
STBR + Zn + B	8	11	1676	1964	17
Total/Average	8	12	1673	1962	17

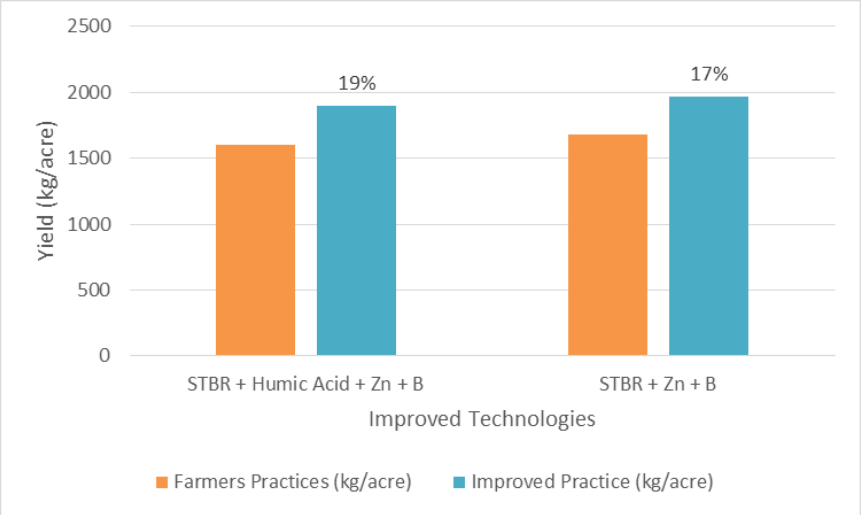

Figure 5.10: Response of peral millet to improved technologies in kharif, 2018.

5.3.6. Groundnut

Imrpved technologies viz. STBR + Humic Acid + Zn + B and STBR + Zn + B were tested in groundnut in 18 locations covering 19 acres. The average yield response of 19% was recorded with improved practice compared to farmers' practice (Table 5.12; Figure 5.11). Application of NPK as per soil test based values along with humic acid and Zn and B gave highest response of 21% and the same combination without humic acid gave a response of 17%.

Table 5.12. Performance of Improved Technologies in Groundnut in *Kharif*, 2018

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
STBR + Humic Acid + Zn + B	8	6	1637	1976	21
STBR + Zn + B	11	12	1690	1977	17
Total/Average	19	18	1667	1976	19

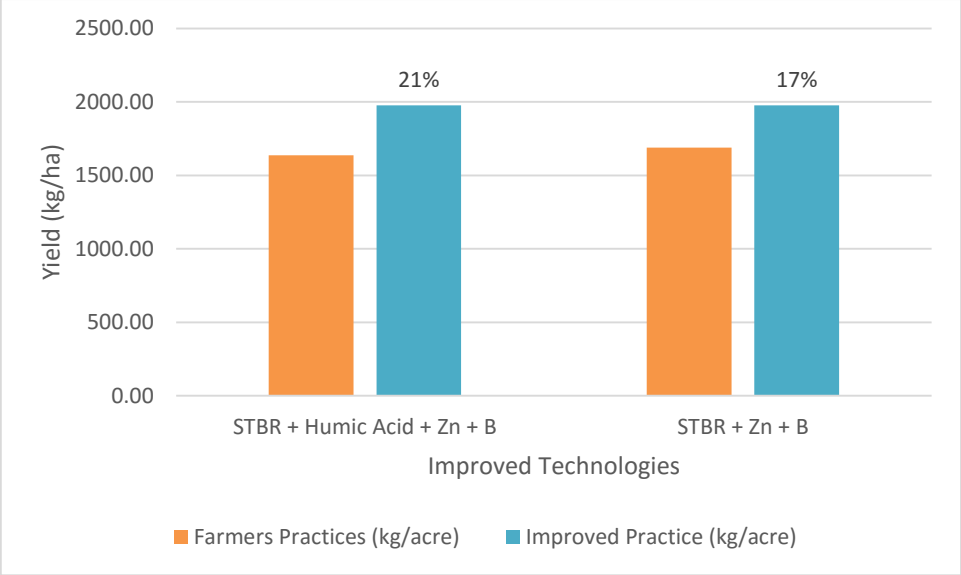

Figure 5.11: Performance of improved technologies in groundnut in kharif, 2018.

5.3.7 Pigeonpea

Highest response of 122% was recorded with line sowing and nipping while IPM through phermone trap recorded very low response i.e. 3% (Table 5.13; Figure 5.12). Nipping with simple hand held devise increased the yield to the extent of 40% followed by line sowing with a yield response of 29%. Among nutrient management practices, application NPK along with Zn and Boron as per soil test values recorded higher yield by 19% compared to farmers practice followed by application NPK + humic acid and NPK + humic acid + Zn + B.

Table 5.13. Response of pigeonpea to improved technologies in *kharif,* 2018.

Improved Technology	Area (Acres)	No. of Demos	Farmers Practices (kg/acre)	Improved Practice (kg/acre)	% Increase
Line Sowing	10	19	296	381	29
Line Sowing + Nipping	138	212	255	700	175
Nipping	73	137	205	286	40
IPM	5	5	282	290	3
STBR + Humic Acid	6	8	652	774	19
STBR + Humic Acid + Zn + B	3	3	652	764	17
STBR + Zn + B	1	1	620	740	19
Total/Average	234	385	257	553	115

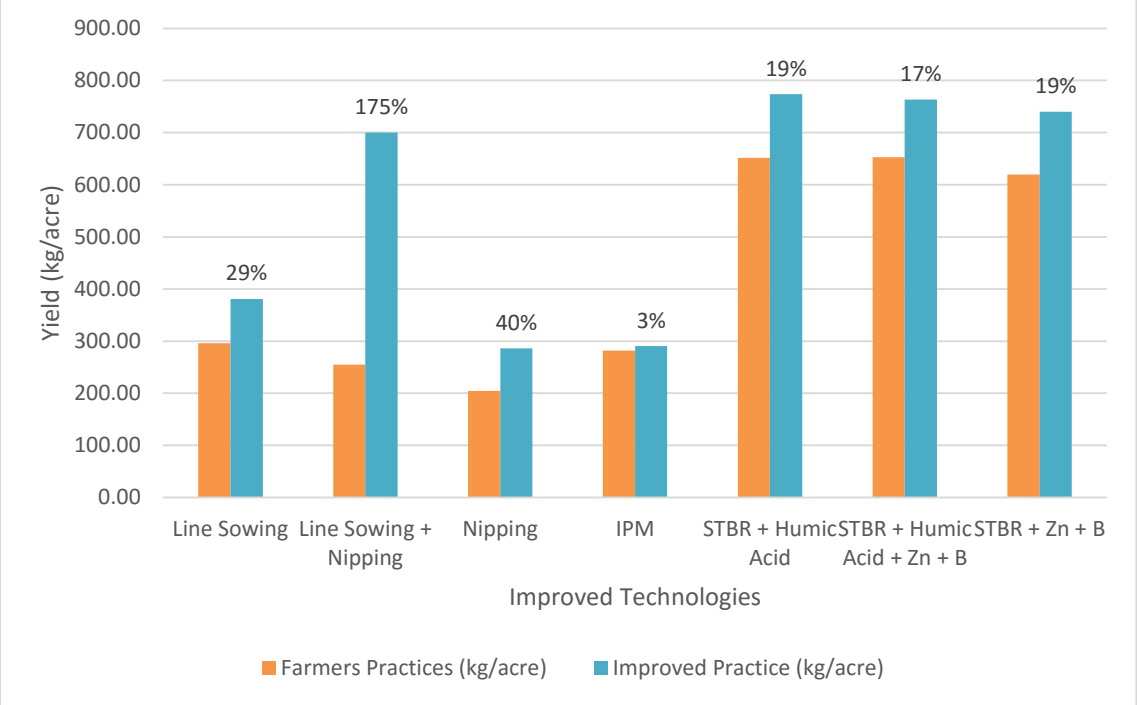

Figure 5.12: Pesponse of Pigeonpea to improved technologies in kharif, 2018.

6. Upgradation of Select Laboratories as Referral Laboratories

Two laboratories in the State, in Bhubaneshwar and Sambalpur, will be upgraded as state-of-the-art referral laboratories conforming to international standards. These labs will cater to the state's need for precision in analyzing a large number of soil, water, fertilizer and plant samples in a short time.

6.1. Preliminary Review of laboratory status

ICRISAT scientists visited the Bhubaneshwar laboratory on 2nd August 2018 and interacted with the Soil Chemist, Mr. Sharada Prasanna Kar, and made the following observations:

- The 3000 square foot laboratory is equipped with spectrophotometers (2), UV spectrophotometer (1), flame photometer (1), pH meters (2), EC meter (1), atomic absorption spectrophotometer (1), and distilled water unit (1).
- It currently analyzes around 15,000 soil samples per year, but only 5% of these are analyzed for sulphur, boron and zinc.
- The state of infrastructure is reasonably good and can be upgraded. The current space will suffice for the proposed upgradation with new instruments.

The laboratory at Sambalpur was visited on 21st July 2018 with the support of Mr. Babaji Sethy, Lab In-charge. Key observations were:

- The laboratory assesses basic soil parameters. Most of the analytical equipment is defunct/outdated. The atomic absorption spectrophotometer has been out of order for the last 5 years; hence facilities for micronutrient estimation are lacking.
- The lab's roof is leaking and needs repair prior to further installation of equipment.

- There is a separate air conditioned room that houses the Microwave Plasma-Atomic Emission Spectroscopy.

Following the visits, one of the immediate requirements identified was to expose the laboratory staff to the state-of-the-art laboratory at ICRISAT. So a training-cum-exposure program was organized to orient and train laboratory staff and OUAT scientists to jointly plan the upgradation of the laboratories.

6.2. Training of laboratory staff and scientists of OUAT

As part of this process, five-day training cum exposure program was organized during 27th to 31st August 2018 at ICRISAT laboratory for six participants from Soil Testing Laboratories (Bhubaneswar and Sambalpur) along with two professors from OUAT (Table 6.1), Bhubaneshwar with the following insights –

Site pre-requisites for referral laboratory set up

- *Hands on training for sophisticated equipments viz .,MPAES*
- *Standard soil analysis procedures*
- *Safety guidelines*
- *Service engineers from Agilent Technologies guided the participants in maintenance, service and floor plans*
- *Group discussion/ queries resolution*

Table 6.1 Participants of the training program for upgrading laboratories.

Sr no	Participant	Designation	Location
1	Dr. Antaryami Mishra	Professor (Soil Science)	College of Agriculture, OUAT, Bhubaneshwar
2	Dr. R.K. Nayak	Associate Professor (Soil Science)	College of Agriculture, OUAT, Bhubaneshwar
3	Mr. Babajee Charan Sethy	Soil Chemist, STL Sambalpur	Director of Agriculture & Food Production, Odisha.
4	Ms. Mamatarani Tripathy	AAO, STL Sambalpur	Director of Agriculture & Food Production, Odisha.
5	Ms. Laxmi Dei	AAO, STL Sambalpur	Director of Agriculture & Food Production, Odisha.
6	Ms. Sharada Prasanna Kar	Soil Chemist, STL Bhubaneshwar	Director of Agriculture & Food Production, Odisha.
7	Mr. Sarat Kumar Das	AAO, STL Bhubaneshwar	Director of Agriculture & Food Production, Odisha.
8	Ms. Geetarani Nanda	AAO, STL Bhubaneshwar	Director of Agriculture & Food Production, Odisha.

Plate 6.1: (L) Hands-on training in handling laboratory equipment and (R) participants receive certificates following the training to upgrade laboratories in Odisha.

6.3 Referral lab Equipment Finalization Meeting

Meeting was conducted on 22nd Oct 2018 at DoA office, Bhubaneshwar to finalise the equipment's for upgradation of soil laboratories.

Outcome*:* Finalised list of equipments was approved by Director of Agriculture.
Committee Members: Pushpajeet Choudhari, Lab Manager; V. Ranganatha Scientific Officer, ICRISAT; Dr. P.K. Mishra Consultant; Mr. Bishnu Patnaik,DDA(Nodal Officer Odisha Bhoochetana); Dr.R.B Nayak, Assoc. Professor OUAT; Mr. Prasanna Kar Soil Chemist STL, Bhubaneshwar and Dr. Antaryami Mishra Professor OUAT

6.4. Updates in Line of Progress

A) ICRISAT

- As per the finalised list, purchase orders for equipments, furniture is released for both laboratories
- High end equipments viz., MP-AES, Spectrophotometer are received at ICRISAT campus
- ICRISAT will deploy all the equipment's to respective locations through common transportation
- No cost extension of project for two years has been approved from Director of Agriculture to ensure smooth co-ordination and better hand holding in running referral laboratories

B) Bhubaneshwar soil testing laboratory:

- Suitable space identified and vacated
- Renovation of flooring and other infrastructural requirements are completed
- Electrical facilities are reviewed by engineers and cost estimate has been finalised
- Equipment wise allocation space is decided
  In a nutshell, Bhubaneshwar laboratory will be soon ready for plug and play

C) Sambalpur soil testing laboratory:

- Suitable space is identified and vacated

- Infrastructure renovation of laboratory is in process as advised by engineers
- As per the equipment expert, existing electrical facilities are incapable to support high end equipment's, hence an estimate to set up new transformer has been routed through Director of Agriculture. In this regard, executive engineer from WESCO visited Sambalpur site on 6th May 2019.

7. Building Partnerships and Capacity development

7.1 Partnerships with local NGOs

ICRISAT has entered into partnership with 16 NGOs for field support and to reachout to a large number of farmers (Annexure 4). In addition, possibilities of partnering with ICAR-NRRI, Cuttack, ICAR-IISC Regional Centre, Koraput and OUAT, Bhubaneswar are being explored. To upscale ICAR-NRRI rice varieties and to build capacity of farmers, NGO staff and field level extension funcitionaries on rice technology a Memorandum of Agreement (MoA) is under progress with ICAR-NRRI during April, 2019. Similarly, ICRISAT also collaborated with OUAT with Department of Soil Science to seek advisory on developing critical limits for various elements, recommendation on doses of nutrient application under varied bio-physical and ecological conditions, management of acid soils etc. Futher, ICRISAT is also collaborating with Seed Production Wing of OUAT to seek advisory location specific varietal recommendation and supply of requsite quisite quantity of seed of improved to conduct demonstration across all the districts in the state.

7.2. Capacity building programmes

There is no better way to integrate capacity building with agricultural development other than equipping extension functionaries and farmers with the skills to adopt best agricultural practices. The district wise capacity building programmes organized for NGO staff and other extension functionaries and farmers is given in Table 7.1. In all a total of 477 capacity building programmes covering 15461 participants were organized during 2018-19.

Table 7.1 District wise capacity building programs organized in Odisha.

Client	District	No. of programmes	No. of participants		
			Male	Femal	Total
Farmers	Angul	6	123	70	193
	Balangir	21	431	317	748
	Balasore	10	476	176	652
	Bargarh	10	238	4	242
	Bhadrak	8	161	40	201
	Boudh	17	628	128	756
	Cuttack	13	186	53	239
	Deogarh	7	140	54	194
	Dhenkanal	9	126	50	176
	Gajapathi	4	100	30	130
	Ganjam	2	64	15	79
	Jagatsinghpu	13	479	15	494

	Jajpur	9	266	5	271
	Jharsuguda	13	237	131	368
	Kalahandi	18	263	86	349
	Kandhamal	9	271	124	395
	Kendrapara	8	197	38	235
	Keonjhar	13	242	85	327
	Khordha	17	318	129	447
	Koraput	5	394	189	583
	Malkangiri	5	101	34	135
	Mayurbhanj	9	383	215	598
	Nabarangpur	15	10	487	497
	Nayagarh	8	196	13	209
	Nuapada	18	512	376	888
	Puri	8	159	11	170
	Rayagada	20	600	809	1409
	Sambalpur	9	700	120	820
	Sonepur	7	418	142	560
	Sundargarh	10	525	378	903
	Total	321	8944	4324	1326
NGOs & Extension Functionaries	Angul	3	25	53	78
	Bargarh	14	139	23	162
	Bhadrak	18	205	44	249
	Boudh	2	19	11	30
	Cuttack	6	53	14	67
	Deogarh	1	22	18	40
	Dhenkanal	14	113	43	156
	Ganjam	1	39	27	66
	Jagatsinghpu	1	9		9
	Jajpur	20	231	38	269
	Jharsuguda	16	130	27	157
	Kalahandi	4	57	18	75
	Khordha	12	191	52	243
	Koraput	2	65	10	75
	Mayurbhanj	1	37	14	51
	Puri	25	225	47	272
	Sambalpur	16	173	21	194
	Total	156	1733	460	2193
Grand Total		477	1067	4784	1546

7.2.1 Training of NGOs and field level functionaries

An orientation training program was conducted for field NGO staff at ICRISAT during 16-18 August 2018. Thirty six participants representing 30 districts attended the training. Various topic that covered include overview of project, soil health management, fertilizers and fertilizer application, climate change impact, adaptation and mitigation strategies, crop cutting experiments for data collection, laying out and management of demonstrations, cropping system management for sustainable crop productivity, plant protection – pest and

disease management, and digital agriculture, knowledge management using ICT. A training manual covering various topics including procedure to be followed was given to the participants. Similarly the NGO partners and other extension functionaries were also trainied by ICRISAT Scientists, OUAT and DoA staff on various topics viz. project planning planning and execution, baselining, soil sampling and crop cutting. In this regard 156 programmes covering 2198 participants were organized (Table 7.2)

Table 7.2. Capacity building of farmersm, NGO staff and other extension functionaries.

Client	Thematic area	No. of programmes	No. of participants		
			Male	Female	Total
Farmers	Celebration of important days	70	4139	1463	5602
	Crop production	126	2025	1321	3346
	Field day	23	460	203	663
	INM	59	1155	405	1560
	IPM	21	388	342	730
	Nipping	4	81	22	103
	Seed treatment	13	305	372	677
	Soil Health Card	5	391	196	587
	Total	321	8944	4324	13268
NGOs & Extension Functionaries	Baseline Survey	57	718	130	848
	Crop Cutting	12	103	60	163
	Project planning & implementation	50	566	162	728
	Soil Sampling	37	346	108	454
	Total	156	1733	460	2193
Grand Total		477	10677	4784	15461

7.2.2. Training of farmers

As part of the Bhoochetana project, 321 capacity building programmes covering 13268 farmers and farm women were conducted during April, 2018 to March, 2019 in all the 30 districts (Table 7.2). The training courses include soil test based integrated nutrient management, management of specific nutrient deficiencies, foliar application of nutrients, soil sampling, interpretation of soil health cards, production technologies for rice, groundnut, pigeonpea, greengram, blackgram, chickpea, mustard, kitchen gardening, line sowing, organic composting, organic farming, crop intensification, sustainable agricultural practices, pest and disease management, seed treatment, nipping, aerobic composting etc. An awareness brochure on boron deficiency and its management in English and Odiya was prepared and distributed in all the districts through NGO partners. In order show case improved technologies i.e. soil test based nutrient management, micro-nutrient application, improved cultivars etc. 23 field days benifitting 481 farmers and farm were organized. Farmers were also motivated to adopt sustainable crop and soil management practices by the DoA staff and scientis from OUAT and ICRISAT during celebration of various important days viz. World Soil Day and World Food Day. In this regard 15 programmes organized to benefit 902 farmers and farm women.

Plate 7.1. Farmers' capacity building – Left: Sundergarh district; Right: Nuapada district.

Plate 7.2. Left: World soil day celebration – Left: Angul district; Right: Koraput district.

7.3 Exposure visits

"Seeing is the believing" is a popular idiom that is applicable in every spear of activity including the development projects like that of Odisha Bhoochetana project. The imprints of particular process, method, technic and skill seen at a particular instance have long lasting effects in the minds of people especially the farmers and it is likely that that particular method, process, skill or technology is most likely to be adopted. In order to expose the farmers to various improved technologies, methods, processes etc. involved in making an enterprsise more profitable, sustainable and economical, exposure visits of varied nature viz. visits to centres of excellance i.e. KVKs, Research Stations, ICAR institutions and progressive farmers fields have been conducted to the farmers during 2018-19 under Bhoochenata project. A total of 34 visits benefitting 857 men and 634 women farmers across the 30 districts were organized (Table 7.3). Important among them are participation in National conference on FFCSWR-2019 organized at Res. Centre, ICAR-CSWCRTI, Koraput, Seed Exhibition organized at ICAR-NRRI, Cuttack during 26th February, 2019 and Krushak Sampark Melas organized in the respective districts (Appendix 5).

Table 7.3 Details of exposure visits conducted under Bhoochetana project.

Activity	No. of programmes	No. of farmers		
		Men	Women	Total
Centres of excellance	6	19	104	123
Exhibition	3	6	0	6
Kissan Mela	3	780	530	1310
National Conference	22	52	0	52
Total	34	857	634	1491

Plate 7.3: Participation in National Conference on FFCSWR-2019 during Feb 2019 – Left: ICRISAT stall for farmers' awareness; Right: Farmers from Koraput district to attend the conference.

8. Benchmarking of Project Sites

Under the Bhoochetana project, ICRISAT has designed a strategy to transform agriculture and allied sectors in the state by increasing agricultural productivity by 10%. Baseline data were collected from a sample of farm families to serve as a benchmark for the project. A survey was planned for all the 30 districts, and a purposive randomized sampling framework was used to select representative villages from study blocks. OUAT students who were trained in conducting the baseline survey completed the survey along with NGO partners. Since the major focus of the project is on improve soil fertility, ensure access to better seed, reduce the cost of cultivation, and enhance productivity and value addition in agriculture and horticulture sub-sectors, the the survey gathered information on demographics, land and crop inventory, consumption of food items (per household), groundwater resources, agriculture implements used and assets of household. A brief summary of the baseline exercise is as under;

8.1 Sample design

Baseline survey was conducted across all 30 districts of Odisha, 249 blocks, 817 villages and 4222 households covering 100% of districts, 79% of blocks, 1.74% villages. As per the Agricultural Census 2015-26 the total number of households in Odisha was 4865 lakhs and the sample constitutes 0.086 % of total population.

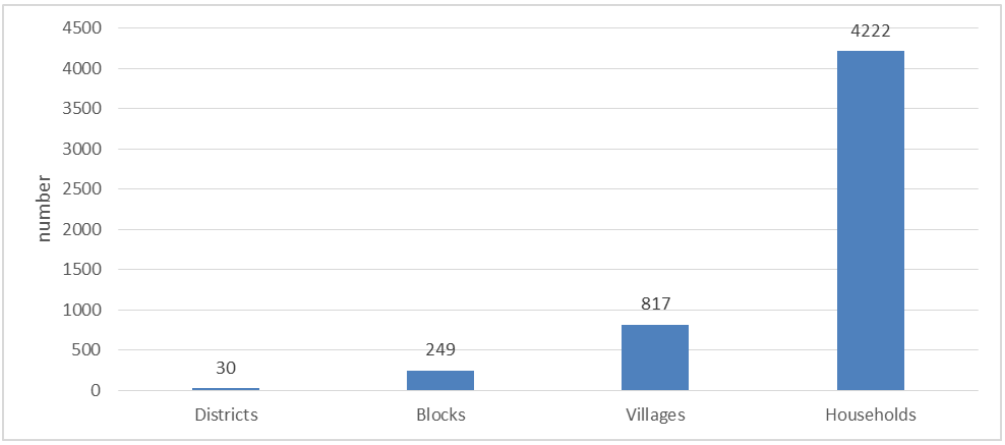

Figure 8.1: Sample design.

8.2 Farmer Type

Marginal farmers constitutes 52% of the sample followed by small (29%) medium (16%) and large (3%).

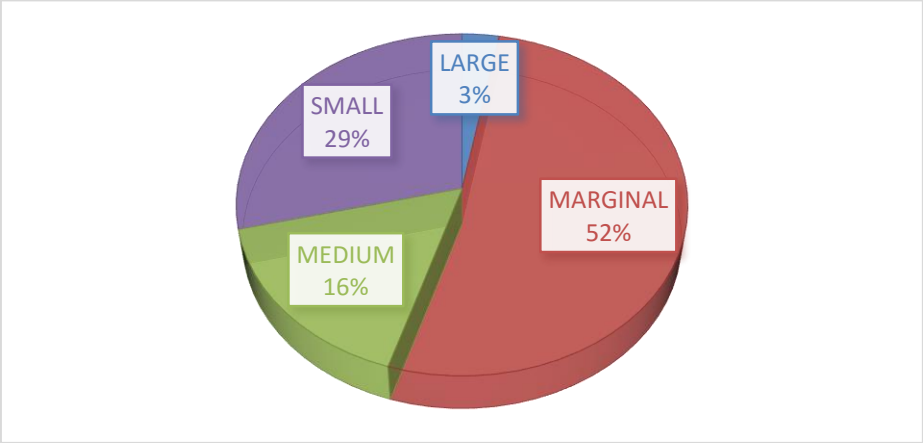

Figure 8.2: Farmer type.

8.3 Average land holdings

The average land holding size of the total sample is around 3 acres and the spread across the farmers groups is large farmer is 13 acres, medium 6.2 acres, small 3.4 acres and marginal farmers 1.3 acres.

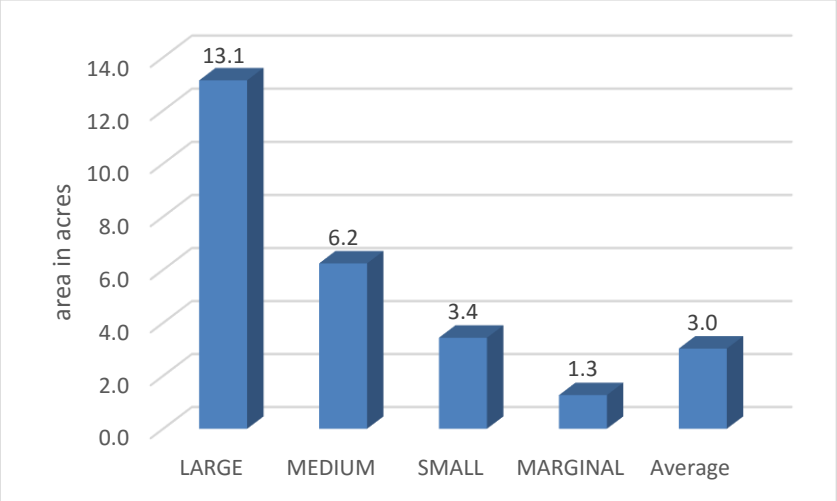

Figure 8.3: Average land holding of farmer.

8.4 Season wise area

On an average nearly 97% of the total cropped area is cultivated in *kharif* season. However in *rabi* season the cropped area was declined by 74% percent. The trend was more evident in large farmers as nearly 83% of the cropped area was kept fallow during *rabi* season, whereas, marginal farmers has cultivated nearly 40% of their cropped land in *rabi* seasons.

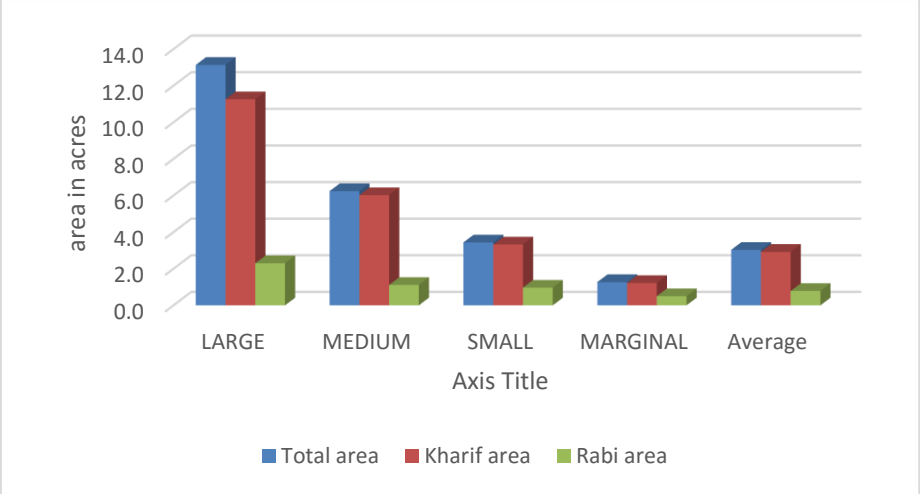

Figure 8.4: Season wise cropped area.

8.5 Cropping pattern in *kharif*

Paddy is the major crop in *kharif* occupying nearly 70% of the cropped area in *kharif* followed by pulses like black gram, green gram, pigeon pea (8.79%). Millets occupies 7.19% of *kharif* area.

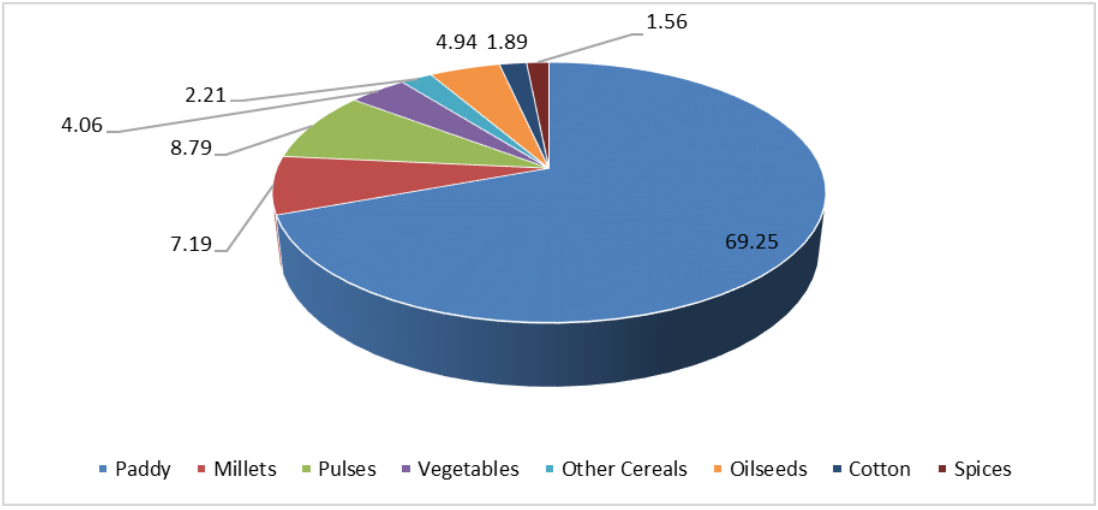

Figure 8.5: crop coverage in kharif (%).

8.6 Cropping pattern in *rabi*

Paddy occupies nearly 47% of area in *rabi* season followed green gram and black gram (30%). Vegetables occupies nearly 9% of total cropped area.

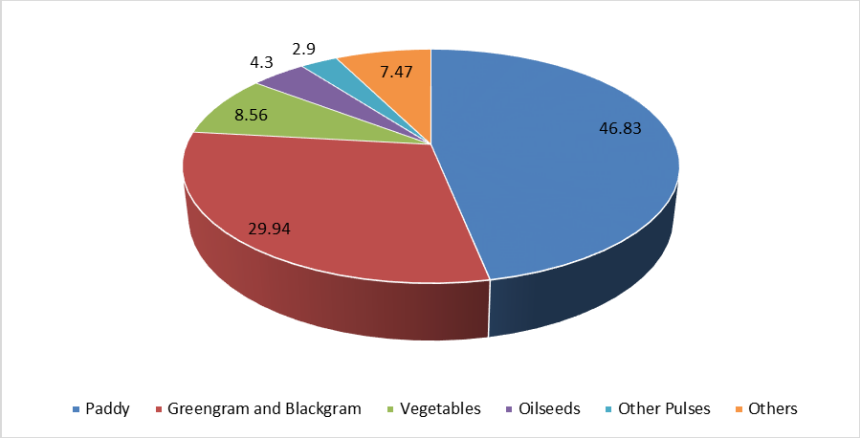

Figure 8.6: Crop coverage in rabi (%).

8.7 Productivity of major crops (Qt/acre)

Paddy is one of the important staple food crops grown in the state. It is cultivated under irrigated conditions and assured rainfall situation. The average productivity of paddy in *kharif* is around 15.67 qt/acre and where as in *rabi* the productivity is around 20.28 qt/acre productivity per acre, nearly 30 % more than the *kharif* crop. Productivity levels of small farmers is high compared to other farmers. Crop wise productivity levels are presented in table 8.1.

Table 8.1. Details of crop wise productivity levels.

Crop	Large	Marginal	Medium	Small	Average
Blackgram	1.77	2.77	2.70	2.04	2.32
Chickpea	6.34	5.93	9.09	7.02	7.06
Cotton	11.25	8.36	11.75	9.76	10.27
Fingermillet	5.48	4.59	4.63	4.49	4.67
Foxtail millet	3.25	3.01	5.23	3.81	3.82
Greengram	2.10	3.53	4.50	1.86	2.94
Groundnut	6.84	4.32	4.84	5.23	5.30
Paddy (K)	31.40	10.38	21.52	25.62	15.67
Paddy (R)	21.7	16.75	20.44	22.23	20.28
Pigeonpea	2.58	2.73	2.58	2.77	2.66
Sesame	0.60	0.70	0.90	0.50	0.68

9. Demonstration of Improved Agricultural Practices (*kharif* 2019)

The district wise details of demonstration planned to be conducted during *kharif,* 2019 is furnished in Table 9.1. A total of 1800 demonstration covering an area of 890 acres on paddy, finger millet, pigeonpea and groundnut is envisaged to be conducted across 30 districts in the state of Odisha. Various technologies that are intended to be demonstrated during the period are climate smart cultivars recommended for location specific conditions, management of micro-nutrient deficiencies viz. zinc and boron, application of humic acid and integrated pest management.

Table 9.1. District-wise action plan for interventions during *Kharif,* 2019.				
District	Crop	Technology	Area (acres)	Demonstrations (No.)
Angul	Groundnut	Improved Cultivar	10	20
		Zn + B	7.5	15
	Pigeonpea	Improved Cultivar	7.5	15
		Zn + B	5	10
Balangir	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	20	40
Balasore	Paddy	Improved Cultivar	15	30
		Zn + B + Humic Acid	15	30
Baragarh	Paddy	Improved Cultivar	15	30
		Zn + B	15	30
Bhadrak	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Boudh	Paddy	Improved Cultivar	7.5	15
		Zn + B + Humic Acid	15	30
	Pigeonpea	Improved Cultivar	7.5	15
Cuttack	Paddy	B + Humic Acid	15	30
		Improved Cultivar	15	30
Deogarh	Groundnut	B	5	10
		Improved Cultivar	12.5	25
	Pigeonpea	Improved Cultivar	12.5	25
Dhenkanal	Paddy	B + Humic Acid	15	30
		Improved Cultivar	15	30
Gajapathi	Finger millet	Improved Cultivar	5	10
		Zn + B	7.5	15
	Paddy	Improved Cultivar	10	20
		Zn + B	7.5	15
Ganjam	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Jagatsinghpur	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	20	40
Jajpur	Paddy	B	10	40
		Improved Cultivar	10	20
Jarsuguda	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Kalahandi	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Kandhamal	Paddy	B	30	60
Kendrapada	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	20	40
Keonjhar	Paddy	Improved Cultivar	7.5	15
		Zn + B	15	30
	Pigeonpea	Improved Cultivar	7.5	15
Khurda	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	20	40
Koraput	Finger millet	Improved Cultivar	5	10

		Zn + B + Humic Acid	5	10
	Paddy	Improved Cultivar	7.5	15
		Zn + B + Humic Acid	7.5	15
	Pigeonpea	Improved Cultivar	5	10
Malkangiri	Finger millet	Improved Cultivar	5	10
		Zn + B + Humic Acid	5	10
	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	10	20
Mayurbhanj	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	20	40
Nabrangpur	Paddy	Improved Cultivar	10	20
		Zn + B	10	20
	Pigeonpea	Improved Cultivar	5	10
		Zn + B	5	10
Naupada	Groundnut	Improved Cultivar	5	10
		Zn + B + Humic Acid	5	10
	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	10	20
Nayagarh	Paddy	B	30	60
Puri	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Rayagada	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Sambalpur	Paddy	Improved Cultivar	10	20
		Zn + B	20	40
Sonepur	Paddy	Improved Cultivar	10	20
		Zn + B + Humic Acid	20	40
Sundergarh	Paddy	Improved Cultivar	10	20
		Zn + B	15	30
	Pigeonpea	Improved Cultivar	5	10
Grand Total			890	1800

10 Monitoring, Evaluation and Learning

Regular monitoring is the key to continuous evaluation of and learning from the project activities. ICRISAT scientists in charge of districts visited their respective districts during 2018-19, and met with agriculture department officials and oriented their respective NGOs on the smooth functioning of the project (Annexure 6). In all nearly 100 visits were conducted by the scientist across 30 districts during 2018-19. This has resulted in good working relationship with the department officials and in convergcence of their ongoing schemes with the Bhoochetana project. The scientists also met with farmers to orient them about conducting deomonstrations of improved technologies viz. improved cultivars, soil test based nutrient application and management of micronutrients deficiencies during kharif and rabi. The farmers were alerted about the best management practices and the importance of nutrition and pest management.

Annexure

Annexure 1. Block level deficiency data of major and micro nutrients and soil conditions

Annexure 1.1 Block level deficiency data of major and micro nutrients and soil conditions for Koraput district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Koraput	Koraput	100	97	3	0	100	13	41	20	2	13	89	31	85	0	0	0
	Kotpad	100	100	0	0	100	19	58	34	12	46	100	74	99	0	0	0
	Kundura	100	100	0	0	100	28	50	28	20	69	78	58	89	0	0	0
	Lamtaput	159	96	3	1	100	13	36	6	25	50	86	45	78	0	2	0
	Laxmipur	100	60	34	6	100	8	6	0	0	17	48	3	41	2	0	0
	Nandapur	200	100	1	0	100	45	55	6	23	62	97	61	93	0	2	0
	Pattangi	100	98	2	0	100	37	19	1	3	20	81	41	58	0	3	0
	Semliguda	100	98	2	0	100	38	37	3	24	65	92	58	80	0	0	0

Annexure 1.2 Block level deficiency data of major and micro nutrients and soil conditions for Malkangiri district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Malkangiri	Kalimela	129	76	22	1	100	43	60	36	8	19	51	48	97	1	2	2
	Khairiput	100	97	2	1	100	27	63	16	11	31	64	41	98	1	7	3
	Korkunda	20	85	10	5	100	80	85	70	5	60	90	85	100	5	0	5
	Mathili	200	95	5	1	100	49	70	50	11	57	55	56	88	1	2	2
	Podia	60	88	10	2	100	32	73	15	13	37	72	53	85	0	0	0

Annexure 1.3 Block level deficiency data of major and micro nutrients and soil conditions for Angul district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Angul	Angul	150	51	29	21	100	42	45	7	0	11	46	62	76	3	0	7
	Athmalik	130	47	31	22	100	37	42	9	5	24	28	55	70	2	0	2
	Banarpal	90	44	30	26	100	39	39	1	0	9	13	56	73	3	1	16
	Chhendipada	100	60	22	18	100	33	43	13	9	34	24	82	70	11	7	23
	Kaniha	150	93	5	1	100	34	49	25	11	35	33	76	80	1	2	17
	Kishornagar	150	80	15	5	100	27	65	12	9	25	34	72	95	4	12	4
	Pallahara	150	93	6	1	100	33	60	7	9	26	69	47	95	0	0	1
	Talcher	100	65	33	2	100	24	37	12	4	23	23	37	69	1	0	3

Annexure 1.4 Block level deficiency data of major and micro nutrients and soil conditions for Deogargh district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Deogarh	Barkote	90	98	2	0	100	23	87	33	12	29	70	61	93	2	1	1
	Reamal	200	81	18	2	100	28	65	12	1	13	33	50	65	1	1	1
	Tileibani	100	90	9	1	100	35	43	16	7	32	37	59	82	3	2	0

Annexure 1.5 Block level deficiency data of major and micro nutrients and soil conditions for Jagatsinghpur district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Jagatsinghpur	Balikuda	200	99	1	1	100	44	29	15	1	3	59	53	35	0	0	1
	Biridi	80	99	1	0	100	53	33	49	0	6	38	70	75	0	0	1
	Erasama	150	92	7	1	99	63	65	21	7	4	47	57	39	2	0	10
	Jagatsinghpur	150	92	8	0	100	43	42	30	3	4	65	67	81	1	1	3
	Kujanga	100	99	1	0	97	30	19	9	0	1	49	23	50	0	0	0
	Naugaon	80	96	4	0	100	50	15	23	3	4	68	40	79	0	0	0
	Raghunathpur	80	94	6	0	100	48	35	43	0	3	89	90	96	0	0	0
	Tirtol	200	99	2	0	100	33	15	39	0	2	56	50	79	0	0	0

Annexure 1.6 Block level deficiency data of major and micro nutrients and soil conditions for Kendrapara district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Kendrapara	Aul	100	100	0	0	100	64	76	18	0	0	19	28	15	0	0	0
	Derabi sh	140	99	1	0	100	33	9	36	2	9	25	6	90	0	0	0
	Garadpur	100	92	8	0	100	57	9	46	0	0	71	59	85	0	0	0
	Kendrapada	100	91	7	2	98	18	54	23	0	1	45	26	51	0	0	0
	Mahakalapada	200	100	0	0	96	10	47	6	0	0	28	4	4	0	0	0
	Marshaghai	100	99	1	0	100	37	45	41	3	4	67	48	80	0	0	0
	Pattamundai	100	99	1	0	100	18	53	4	0	0	60	10	31	0	0	0
	Rajanagar	220	99	1	0	98	23	51	0	0	0	24	13	0	0	0	0
	Rajkanika	90	100	0	0	100	7	32	0	0	0	16	6	19	0	0	0

Annexure 1.7 Block level deficiency data of major and micro nutrients and soil conditions for Khurda district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Khurda	Balianta	100	91	7	2	100	69	16	34	0	14	62	25	97	0	0	0
	Balipatna	120	97	3	1	100	35	14	25	3	10	57	33	70	0	1	1
	Banapur	150	98	2	0	100	91	11	83	13	15	88	47	95	0	1	6
	Begunia	150	93	3	4	100	41	59	45	33	48	63	13	93	0	0	9
	Bhubaneswar	100	89	10	1	100	45	33	7	19	36	42	24	82	0	0	0
	Bolagarh	200	99	1	0	100	95	95	11	1	4	95	10	99	0	0	0
	Chilika	130	88	8	4	100	32	63	28	8	24	35	39	48	0	0	2
	Jatni	100	98	2	0	100	65	61	43	10	55	45	11	67	0	0	0
	Khurda	100	81	14	5	100	66	71	53	15	40	63	21	79	0	0	3
	Tangi	150	84	16	0	100	58	54	53	25	44	68	35	83	0	0	3

Annexure 1.8 Block level deficiency data of major and micro nutrients and soil conditions for Kandhamal district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Kandhamal	Daringbadi	140	98	2	0	100	34	54	6	17	68	79	36	88	0	4	1
	G.Udayagiri	100	94	5	1	100	32	62	5	12	74	80	23	89	0	1	0
	K. Nuagaon	100	97	3	0	100	36	30	5	17	68	80	26	84	2	4	0
	Khajuripada	150	89	11	0	100	41	47	15	5	45	65	41	86	6	6	1
	Kotagarh	100	98	2	0	100	21	37	3	1	33	54	44	68	1	26	0
	Phulbani	150	98	2	0	100	81	49	15	7	58	73	56	95	0	9	3
	Raikia	110	98	2	0	100	40	63	15	12	69	56	34	90	1	5	0
	Tikabali	106	85	14	1	100	64	40	4	7	48	59	37	91	4	2	0
	Tumudibandha	150	95	3	1	100	43	68	30	1	33	93	52	94	2	1	0
	Balliguda	149	93	6	1	100	36	54	5	9	51	64	35	90	3	4	0
	Chakapad	100	95	5	0	100	35	28	13	11	55	66	24	84	0	5	0
	Phiringia	119	97	3	1	100	24	55	6	2	49	76	67	76	2	2	0

Annexure 1.9 Block level deficiency data of major and micro nutrients and soil conditions for Nayagarh district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Nayagarh	Bhapur	100	92	5	3	100	66	58	35	11	20	53	59	90	0	0	0
	Dasapalla	200	63	29	9	100	49	32	15	2	10	40	53	73	3	1	1
	Gania	100	76	17	6	100	33	50	10	0	6	53	51	89	0	0	2
	Khandapada	120	93	7	0	100	55	58	18	7	27	52	31	92	0	0	0
	Nayagarh	100	66	23	10	100	57	35	23	0	1	42	46	75	4	0	3
	Nuagaon	120	62	32	7	100	41	40	18	3	9	40	35	75	0	1	1
	Odagaon	150	72	18	10	100	53	41	18	0	0	45	41	73	0	0	1
	Ranpur	150	79	15	5	100	77	37	57	9	27	61	23	88	0	0	3

Annexure 1.10. Block level deficiency data of major and micro nutrients and soil conditions for Kalahandi district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Kalahandi	Bhawanipatna	200	48	31	22	100	63	58	2	3	12	54	77	82	7	4	5
	Dharmgarh	100	68	22	10	100	26	64	17	0	4	43	59	83	2	0	0
	Golamunda	100	60	30	10	100	36	45	7	5	18	32	70	80	10	1	0
	Jaipatna	20	85	15	0	100	50	75	10	10	40	75	55	95	0	0	0
	Junagarh	150	82	15	3	100	59	83	7	1	31	43	31	94	1	0	3
	Kalampur	30	90	10	0	100	33	83	20	0	0	80	30	100	0	0	0
	Karlamunda	60	43	40	17	100	73	80	27	0	3	68	87	95	2	0	8
	Kesinga	90	44	23	32	100	62	81	2	1	17	50	76	91	1	1	16
	Koksara	50	66	26	8	100	42	80	6	0	2	42	74	88	0	0	6
	Lanjigarh	100	76	17	7	100	60	63	18	1	21	79	44	97	2	0	3
	M.Rampur	90	70	18	12	100	67	72	28	11	46	82	77	98	2	7	6
	Narla	100	48	27	25	100	36	64	10	5	15	30	84	70	3	0	11
	Thuamul Rampur	30	43	53	3	100	3	17	0	0	3	87	7	57	0	0	0

Annexure 1.11. Block level deficiency data of major and micro nutrients and soil conditions for Nabrangpur district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Nabrangpur	Chandahandi	100	72	20	8	100	30	67	5	2	12	25	65	83	1	2	7
	Dabugam	148	95	5	0	100	63	80	31	11	35	82	71	99	0	0	0
	Jharigan	101	95	5	0	100	27	69	22	4	26	76	63	93	0	0	0
	Kosagumunda	119	99	1	0	100	34	66	18	19	50	76	58	97	0	0	0
	Nabarangpur	20	65	35	0	100	10	60	30	0	0	60	75	100	0	0	0
	Nabrangpur	70	90	10	0	100	30	57	23	4	21	79	44	100	0	0	0
	Nandahandi	88	98	2	0	100	24	55	25	17	41	66	38	94	0	3	2
	Papadahandi	100	99	1	0	100	24	43	23	7	28	58	45	90	0	1	0
	Raighar	161	96	2	2	100	54	75	30	21	58	84	86	99	1	1	31
	Sanmasigan	10	90	10	0	100	0	70	30	0	0	50	20	100	0	0	0
	Tentuli Khunti	198	97	3	0	100	32	53	10	7	29	68	48	95	0	0	0
	Umarkote	98	99	0	1	100	58	35	23	27	66	82	59	96	1	9	0

Annexure1.12. Block level deficiency data of major and micro nutrients and soil conditions for Rayagada district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Rayagada	Bissamcuttack	100	87	11	2	100	43	41	1	10	56	47	22	82	1	3	1
	Chandrapur	100	91	8	1	100	37	53	12	3	21	54	36	91	0	1	1
	Gudari	100	72	21	7	100	47	34	8	6	24	44	50	72	7	4	2
	Kalyansingpur	130	91	8	2	100	55	16	5	4	38	54	19	85	2	2	0
	Kolnara	100	94	4	2	100	68	8	4	7	30	32	16	89	0	0	0
	Muniguda	200	89	11	1	100	62	19	6	10	41	50	22	86	1	7	0
	Padmapur	100	49	38	13	100	80	21	2	5	23	44	59	77	18	1	2
	Rayagada	180	74	21	6	100	35	16	1	9	32	32	15	62	4	1	3

Annexure 1.13 Block level deficiency data of major and micro nutrients and soil conditions for Dhenkanal district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Dhenkanal	Bhuban	100	99	1	0	100	42	38	45	6	23	55	33	90	0	0	1
	Dhenkanal(Sadar)	150	90	9	1	100	49	51	15	9	37	68	24	84	1	0	0
	Gondia	150	93	7	0	100	31	63	16	1	17	47	19	79	0	0	0
	Hindol	150	56	36	8	100	25	40	5	1	3	10	23	53	3	1	7
	Kamakhyanagar	100	86	9	5	100	20	68	22	2	4	47	16	80	0	0	1
	Kankadahad	140	91	7	1	100	24	69	37	8	28	60	16	69	1	0	4
	Odapada	100	83	16	1	100	23	38	6	2	17	23	6	75	2	0	0
	Parjang	140	66	24	10	100	39	74	9	0	8	24	13	71	0	0	0

Annexure 1.14 Block level deficiency data of major and micro nutrients and soil conditions for Puri district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Puri	Astarang	100	94	6	0	99	63	29	29	3	3	46	12	50	0	0	1
	Brahmagiri	150	96	3	1	100	49	29	41	29	33	45	36	64	1	7	19
	Delang	90	89	10	1	100	33	36	41	2	13	42	17	69	0	0	3
	Gop	150	98	2	0	100	32	26	22	1	1	73	28	37	0	0	1
	Kakatpur	100	98	0	2	100	58	39	43	0	1	79	45	84	0	0	0
	Kanas	150	95	5	0	97	31	47	7	0	3	31	13	35	0	0	0
	Krushnaprasad	100	90	9	1	100	95	19	74	80	89	72	45	97	0	40	62
	Nimapada	180	98	2	0	100	18	20	16	0	0	43	33	56	0	0	0
	Pipili	150	97	3	0	100	43	11	49	3	15	40	30	83	0	0	1
	Purisadar	100	96	1	3	100	49	37	51	7	14	43	48	64	0	1	2
	Satyabadi	150	99	0	1	100	39	29	39	0	5	44	24	73	0	0	0

Annexure 1.15 Block level deficiency data of major and micro nutrients and soil conditions for Bhadrak district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Bhadrak	Basudevpur	150	91	9	0	99	39	15	43	6	13	29	52	50	0	1	3
	Bhadaripokhari	120	98	0	2	100	66	55	20	0	0	80	58	78	1	0	0
	Bhadrak	100	76	15	9	99	37	38	31	5	11	59	35	83	4	0	4
	Bonth	150	90	10	0	100	46	59	25	0	1	77	35	70	0	0	0
	Chandabali	150	98	1	1	97	19	45	4	0	0	13	36	6	0	0	0
	Dhamanagar	120	100	0	0	100	38	40	32	0	0	60	33	84	0	0	0
	Tihidi	120	98	2	0	100	43	38	19	0	0	33	15	47	0	0	0

Annexure 1.16 Block level deficiency data of major and micro nutrients and soil conditions for Jajpur district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Jajpur	Barchana	150	94	1	4	100	28	27	11	1	6	45	25	63	3	3	3
	Bari	100	95	4	1	100	59	49	55	6	21	59	44	83	1	3	0
	Binjharpur	100	99	1	0	100	41	61	51	4	8	59	43	84	0	2	0
	Dangadi	100	93	6	0	100	42	76	47	3	15	84	13	90	0	0	0
	Dasaratpur	150	78	13	9	80	20	44	19	2	3	28	9	25	13	0	15
	Dharmasala	150	95	5	0	100	56	24	45	1	15	44	25	77	0	0	0
	Jajpur	150	100	0	0	100	39	9	3	0	0	10	1	81	0	1	0
	Korei	150	95	3	1	100	75	35	63	19	53	59	27	89	0	0	1
	Rasulour	150	100	0	0	87	87	10	71	13	38	55	42	97	0	0	1
	Sukinda	100	81	13	6	98	43	65	25	5	16	47	35	95	6	0	8

Annexure 1.17 Block level deficiency data of major and micro nutrients and soil conditions for Jharsuguda district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Jharsuguda	Laikera	100	100	0	0	100	39	53	19	18	38	37	21	98	0	0	1

Annexure 1.18 Block level deficiency data of major and micro nutrients and soil conditions for Sambalpur district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Sambalpur	Bamara	150	87	9	3	97	57	56	15	12	30	40	41	84	7	3	3
	Dhankauda	100	99	1	0	100	33	44	48	20	59	27	31	96	1	1	9
	Jamankira	250	94	4	2	98	42	62	14	10	29	48	45	96	3	2	1
	Jujumura	100	84	2	14	100	35	59	17	8	40	43	46	89	7	0	12
	Kuchinda	100	92	7	1	100	53	32	9	17	48	61	58	91	2	1	3
	Maneswara	100	87	9	4	100	48	43	9	2	17	36	56	98	0	1	1
	Nakatideula	150	90	7	3	100	25	53	23	19	34	47	31	93	0	0	1
	Rairakhola	150	76	17	7	100	17	61	15	9	26	41	25	95	1	3	1
	Rengali	70	93	6	1	100	56	56	26	20	49	60	39	84	0	3	1

Annexure 1.19 Block level deficiency data of major and micro nutrients and soil conditions for Boudh district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Boudh	Boudh	130	57	26	17	100	54	58	38	6	29	52	71	97	7	2	11
	Harabhanga	90	62	28	9	100	53	43	23	0	8	56	54	86	8	0	4
	Kantamal	150	54	33	13	100	47	49	25	7	21	49	69	96	8	3	3

Annexure 1.20. Block level deficiency data of major and micro nutrients and soil conditions for Sonepur district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Sonepur	Binka	90	97	2	1	100	52	57	43	14	48	17	28	99	0	12	0
	Birmaharajpur	130	67	22	11	100	33	56	16	1	16	28	63	85	5	0	3
	Dunguripali	100	74	19	7	100	22	56	40	3	39	6	45	93	2	0	3
	Sonepur	120	68	24	8	100	40	50	25	8	34	34	72	92	1	2	2
	Tarbha	140	38	37	25	100	36	74	16	1	4	28	88	95	2	1	7
	Ullunda	200	73	21	7	100	34	47	15	8	24	27	69	84	1	1	5

Annexure 1.21. Block level deficiency data of major and micro nutrients and soil conditions for Bargarh district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Bargarh	Ambabhona	160	85	15	0	100	23	17	15	3	33	23	34	79	0	0	0
	Atabira	150	94	5	1	100	37	23	51	5	45	21	53	97	0	1	4
	Bargarh	90	74	12	13	100	37	21	41	6	68	21	37	96	1	7	4
	Barpali	100	85	14	1	99	34	33	39	5	33	28	60	94	2	4	2
	Bhatli	100	96	4	0	100	51	15	46	22	82	23	45	98	0	6	1
	Bheden	100	88	12	0	98	49	31	46	8	44	29	52	88	1	1	4
	Bijepur	150	88	10	2	100	39	44	18	12	46	23	49	86	1	2	3
	Gaisilat	100	59	27	14	100	34	42	12	6	17	22	58	85	2	1	1
	Jharabandha	100	53	29	17	100	28	53	14	3	12	31	64	92	4	2	2
	Padampur	200	74	20	6	100	32	47	14	7	23	36	64	91	2	6	3
	Paikamal	150	74	19	7	100	30	62	9	2	20	49	51	89	3	1	1
	Sohela	150	77	18	5	100	47	42	27	13	46	31	69	92	1	3	4

Annexure 1.22. Block level deficiency data of major and micro nutrients and soil conditions for Balangir district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Balangir	Agalpur	100	66	18	16	100	75	76	12	14	35	43	92	97	26	23	10
	Bangomunda	150	41	31	28	100	52	60	9	2	10	38	73	91	10	5	9
	Belpada	100	82	15	3	100	36	82	18	7	30	59	75	100	1	6	0
	Bolangir	120	48	34	18	100	32	58	11	0	5	34	64	87	3	0	5
	Degaon	149	58	28	14	100	47	68	19	3	23	50	92	97	3	3	3
	Gudbhela	100	58	20	22	100	37	52	9	0	11	48	72	96	7	4	6
	Khaprakhol	150	61	23	15	100	34	73	12	2	9	60	85	98	3	3	6
	Loisinga	100	29	41	30	100	36	54	21	1	10	23	69	89	10	2	6
	Muribahal	150	80	15	5	100	46	72	27	7	39	64	75	95	4	8	1
	Patnagarh	150	65	26	9	100	49	73	15	6	24	47	82	97	8	5	2
	Puintala	150	37	33	29	100	37	65	15	1	3	27	82	78	9	1	29
	Saintala	150	83	13	4	100	61	81	21	11	38	61	86	97	1	10	4
	Titilagarh	150	61	27	12	100	57	59	15	3	46	31	45	88	4	8	4
	Tureikela	100	42	41	17	100	42	81	15	1	9	18	67	84	0	0	13
	(Blank)	10	70	20	10	100	70	10	40	0	20	40	70	100	10	0	0

Annexure 1.23. Block level deficiency data of major and micro nutrients and soil conditions for Nuapada district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Nuapada	Boden	100	42	33	25	100	24	80	0	0	3	31	71	91	2	1	3
	Khariar	100	28	28	44	100	18	56	1	0	2	15	61	69	1	1	13
	Komna	150	41	40	19	100	29	63	1	1	1	25	67	81	3	0	7
	Nuapada	147	60	27	13	100	21	69	3	2	10	18	84	89	1	3	12
	Sinapali	150	47	37	16	100	20	58	0	0	2	43	74	71	1	0	4
	(Blank)	10	40	40	20	100	10	40	0	0	0	20	60	80	10	0	10

Annexure 1.24. Block level deficiency data of major and micro nutrients and soil conditions for Balasore district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Balasore	Bahanoga	100	100	0	0	100	65	55	77	10	44	55	72	91	0	0	1
	Balasore Sadar	150	98	2	0	99	32	60	51	17	30	44	33	61	2	1	4
	Baliapal	150	55	43	1	99	42	23	31	7	23	20	44	32	19	6	9
	Basta	100	70	29	1	99	13	28	12	7	9	12	49	15	3	0	3
	Bhogarai	160	79	17	4	100	51	44	43	29	35	19	34	39	1	6	19
	Jaleswar	150	85	15	0	100	44	27	18	5	9	41	10	49	7	0	0
	Khaira	200	93	7	1	100	71	55	61	5	47	48	43	90	3	2	2
	Nilagiri	100	96	4	0	100	53	70	46	10	27	40	32	98	1	3	2
	Oupada	100	90	10	0	100	44	53	46	18	37	53	35	90	1	10	0
	Remuna	140	89	11	0	99	59	56	63	16	34	38	46	85	2	0	6
	Simulia	100	87	4	9	100	75	62	51	3	27	38	75	93	9	8	11
	Soro	100	90	9	1	98	73	69	65	6	50	44	46	93	4	3	11

Annexure 1.25. Block level deficiency data of major and micro nutrients and soil conditions for Mayurbhanj district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Mayurbhanj	Badasahi	200	99	1	0	100	47	50	44	5	24	40	25	81	0	1	1
	Bahalda	90	97	3	0	100	49	76	61	20	46	60	47	96	0	4	9
	Bangriposi	200	92	7	2	99	33	72	17	4	13	38	34	82	2	1	1
	Baripada	100	100	0	0	100	64	85	68	54	69	79	33	97	0	0	6
	Betnati	250	100	0	0	100	71	84	82	45	79	80	46	98	0	3	1
	Bijatala	100	99	1	0	100	29	64	36	17	29	72	34	89	0	0	0
	Bisoi	150	98	2	0	100	29	69	36	29	40	71	54	89	0	2	0
	Gopobandhunagar	100	100	0	0	100	39	70	41	15	62	77	33	96	0	1	0

	Jamda	50	100	0	0	100	52	92	50	24	38	80	62	96	0	2	6
	Jashipur	200	100	1	0	100	53	88	32	18	44	88	64	100	1	4	3
	Kaptipada	100	100	0	0	100	32	84	49	35	49	80	49	98	0	0	0
	Karanjia	140	99	1	0	100	36	81	48	23	69	85	42	98	0	2	0
	Khunta	100	98	2	0	99	15	86	31	24	45	81	17	97	0	0	0
	Kuliana	200	99	1	0	100	57	86	54	37	51	75	39	84	0	1	2
	Kusumi	99	96	4	0	100	39	84	36	14	24	76	32	90	0	0	0
	Morada	150	99	1	0	100	70	75	72	45	67	65	47	97	0	1	5
	Rairangpur	90	100	0	0	99	36	87	61	32	58	77	46	94	0	0	0
	Raruan	100	100	0	0	100	27	66	25	18	35	46	30	83	1	2	0
	Rasgobindopur	150	99	1	0	100	31	57	68	41	71	51	32	88	0	0	1
	Samakhunta	99	97	3	0	100	41	81	56	13	34	76	37	97	2	0	1
	Saraskana	150	97	3	0	100	47	77	42	9	45	53	53	97	0	0	1
	Sukruli	79	100	0	0	100	41	62	44	28	68	70	29	97	0	0	0
	Suliapada	170	75	25	1	100	45	56	37	26	59	48	23	87	9	0	0
	Thakurmunda	150	98	2	0	100	47	68	31	35	69	69	33	87	1	1	1
	Tiring	50	100	0	0	100	56	78	48	42	56	46	36	94	0	0	10
	Udala	50	100	0	0	100	56	72	28	30	54	72	40	84	0	0	0

Annexure 1.26. Block level deficiency data of major and micro nutrients and soil conditions for Gajapati district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Gajapati	Gosani	100	82	8	10	100	86	76	10	45	75	91	67	93	10	0	5
	Gumma	50	90	8	2	100	64	66	20	26	64	80	26	90	0	0	2
	Kasinagar	80	99	1	0	100	68	45	13	28	48	66	48	84	0	3	5
	Nuagada	70	99	1	0	100	24	49	3	13	70	91	27	94	0	3	0
	R.Udayagiri	120	92	0	8	100	80	58	1	75	88	90	55	93	8	0	0
	Rayagada	120	99	1	0	100	45	14	3	33	94	73	21	98	0	0	1

Annexure 1.27. Block level deficiency data of major and micro nutrients and soil conditions for Ganjam district

District	Block/Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Ganjam	Aska	100	80	11	9	100	52	72	35	1	9	68	55	73	4	0	2
	Beguniapada	150	86	13	1	100	54	71	26	13	47	29	43	81	0	1	5
	Bellaguntha	80	88	9	4	100	48	28	11	0	28	64	23	79	0	0	0
	Bhanjanagar	150	86	11	3	100	33	75	9	5	18	59	23	82	0	0	0
	Buguda	100	82	12	6	100	48	58	17	0	26	46	17	77	0	1	2
	Chhatrapur	100	79	13	8	100	51	51	33	4	42	31	18	47	0	0	1
	Chikiti	100	72	15	13	100	34	53	16	15	29	25	30	53	0	0	10
	Dharakote	160	72	21	7	100	50	51	19	8	18	56	43	79	0	0	7
	Digapahandi	200	62	34	4	100	41	83	11	0	11	27	39	73	0	0	3
	Ganjam	100	34	48	18	71	53	31	3	1	6	8	13	6	0	0	9
	Hinjilicut	50	60	28	12	98	70	46	32	18	28	42	44	52	0	0	0
	J.N.Prasad	250	79	16	4	100	34	63	11	9	27	52	28	76	0	0	6
	K.S.Nagar	50	68	16	16	100	58	62	24	2	16	32	26	64	2	0	2
	Khalikote	100	85	10	5	100	53	86	29	12	30	32	15	66	1	0	3
	Kukudakhandi	100	72	22	6	100	39	45	11	6	25	20	4	50	2	0	2
	Patrapur	250	60	28	12	100	58	61	10	1	16	43	23	65	0	0	2
	Polasara	100	78	19	3	100	18	80	20	3	14	40	49	73	0	0	1
	Purusottampur	100	85	14	1	100	50	16	15	0	24	29	22	58	0	0	9
	Rangeilunda	100	71	24	5	100	35	50	17	4	15	12	40	20	2	0	1
	Sanakhemundi	100	61	30	9	100	44	49	16	9	25	45	47	67	2	0	1
	Sheragada	100	41	43	16	100	60	23	1	0	1	30	34	27	2	0	0
	Surada	270	58	29	13	100	40	39	4	6	18	50	49	71	6	0	4

Annexure 1.28. Block level deficiency data of major and micro nutrients and soil conditions for Keonjhar district

District	Taluk	No of samples	pH			EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Keonjhar	Sadar	100	77	10	12	100	45	52	28	15	41	62	54	87	4	0	8
	Anandapur	120	89	10	1	100	34	56	43	3	18	59	53	85	0	3	2
	Banspal	150	97	3	0	100	12	66	10	3	13	81	59	85	1	1	0
	Champua	120	97	2	2	100	49	70	33	32	66	64	57	91	1	3	0
	Ghasipura	120	80	19	1	100	63	57	17	12	19	58	39	83	1	1	0
	Ghatagaon	110	95	5	1	100	65	82	45	32	63	74	63	94	0	3	5
	Harichandanur	200	96	5	0	100	39	76	40	13	40	69	59	90	1	2	2
	Hatadihi	150	96	4	0	100	71	67	51	16	40	81	53	91	2	5	5
	Jhumpura	120	91	9	0	100	65	63	26	43	77	73	59	91	3	25	0
	Joda	50	94	6	0	100	22	66	12	10	22	60	38	82	2	2	0
	Patna	100	94	6	0	100	68	74	57	28	74	77	73	98	0	3	4
	Saharpada	100	98	0	2	100	41	92	65	22	63	92	84	100	0	1	3
	Telkoi	100	97	3	0	100	44	84	26	11	25	78	39	96	0	0	0

Annexure 1.29. Block level deficiency data of major and micro nutrients and soil conditions for Sundergarh district

District	Taluk	No of samples	pH	pH	pH	EC	% deficient										
			Acidic	Neutral	Alkaline	Normal	OC	P	K	Ca	Mg	S	Zn	B	Fe	Cu	Mn
Sundergargh	Badagaon	100	98	2	0	70	61	53	18	15	34	55	61	98	0	4	1
	Balisankara	100	79	14	7	100	46	57	9	8	43	39	51	90	2	6	4
	Bonigarh	100	100	0	0	100	38	72	17	9	21	35	20	86	0	0	0
	Birsa	300	92	7	0	100	53	81	25	8	25	50	38	96	0	1	2
	Hemgir	240	95	5	0	100	38	79	27	21	48	55	43	97	0	3	2
	Koira	10	100	0	0	100	10	70	20	60	60	70	60	70	0	0	0
	Kuarmunda	250	97	3	0	100	70	90	17	41	65	41	62	98	4	31	0

	Kutra	190	97	3	0	100	35	72	11	19	44	44	34	97	3	4	0
	Gurundia	10	90	10	0	100	90	90	0	0	10	90	90	100	10	0	0
	Lahunipara	200	100	0	0	100	25	83	16	5	31	77	20	99	0	0	0
	Lathikata	100	92	7	1	100	40	80	17	15	39	41	40	95	0	1	2
	Lephripara	130	90	6	2	100	51	65	16	2	20	28	38	98	0	1	2
	Rajangpur	100	87	12	1	100	54	81	14	5	29	28	40	93	3	2	3
	Subdega	100	98	1	1	100	61	63	14	10	28	50	45	97	1	3	1
	Sadar	100	100	0	0	100	65	57	32	13	43	37	39	96	0	1	1
	Tangarpali	100	97	3	0	100	41	57	20	5	24	16	19	90	1	0	0

Annexure 1.30. Block level deficiency data of major and micro nutrients and soil conditions for Cuttak district.

District	Block/Taluk	No of	pH			EC	% deficient										
		samples	Acidic	Neutral	Alkaline	Normal	OC	Av P	Av K	Av Ca	Av Mg	Av S	Av Zn	Av B	Av Fe	Av Cu	Av Mn
Cuttak	Athgarh	200	50	31	20	100	49	8	4	1	7	4	16	64	1	0	1
	Banki	120	99	1	0	100	28	8	18	3	8	62	3	96	0	0	0
	Banki-Dampada	100	96	4	0	100	39	25	52	12	19	43	0	85	0	1	1
	Baramba	50	82	18	0	100	34	60	24	0	2	54	40	86	0	0	0
	Baranga	80	98	3	0	100	64	44	43	1	11	60	31	96	0	0	0
	Choudwar	160	98	2	0	100	47	56	21	4	13	38	1	89	1	0	1
	Cuttack Sadar	100	94	6	0	98	44	19	50	0	9	36	10	90	0	0	0
	Kantapada	100	92	0	8	100	29	60	45	1	6	67	12	90	8	1	7
	Mahanga	200	98	3	0	100	18	24	23	0	0	26	8	69	0	0	0
	Narsinghpur	200	69	23	9	100	23	35	9	1	11	43	14	79	1	0	1
	Niali	100	97	3	0	100	46	39	47	1	7	79	17	94	0	0	0
	Nishantakoili	200	94	5	2	100	36	49	59	1	4	46	51	84	1	0	1
	Salepur	160	96	4	0	100	46	43	66	0	7	38	33	84	0	0	0
	Tigiria	50	98	2	0	100	34	42	38	0	10	34	16	88	2	0	0

Annexure 2. Crop wise and district wise demonstrations organized during 2018-19

			Kharif		*Rabi*		Total	
Category	Crop	District	Area	No. of	Area	No. of	Area	No. of
Cereals & Millets	Finger Millet	Gajapathi	33	66	11	22	44	88
		Ganjam	1	2	8	11	9	13
		Kandhamal	9	16			9	16
		Koraput	1	2	6	21	7	23
		Malkangiri	12	12			12	12
		Total	56	98	25	54	81	152
	Foxtail Millet	Koraput	5	10			5	10
		Malkangiri	8	8			8	8
		Total	13	18			13	18
	Maize	Gajapathi			20	40	20	40
		Ganjam	11	11	3	8	13	19
		Kalahandi	1	1	12	30	13	31
		Kendrapara			10	22	10	22
		Mayurbhanj	8	20	14	20	22	40
		Rayagada	10	20	14	30	24	50
		Total	29	52	73	150	101	202
	Paddy	Balangir	50	50			50	50
		Balasore	42	54	15	10	57	64
		Bargarh	50	50	25	50	75	100
		Bhadrak	20	40	18	35	38	75
		Boudh	8	8			8	8
		Cuttack	30	30			30	30
		Dhenkanal	69	69			69	69
		Jagatsinghpur	31	31			31	31
		Jajpur	25	50			25	50
		Jharsuguda	47	54			47	54
		Kalahandi	2	4			2	4
		Kandhamal	44	52			44	52
		Kendrapara	45	60			45	60
		Khorda	60	60			60	60
		Malkangiri	20	20			20	20
		Mayurbhanj	53	62			53	62
		Nayagarh	42	60			42	60
		Nuapada	48	48			48	48
		Puri	49	49	17	31	66	80
		Rayagada	20	20			20	20
		Sambalpur	60	60			60	60
		Sonepur	5	10	5	5	10	15
		Sundargarh	50	35			50	35
		Total	869	976	79	131	948	1107
	Pearl Millet	Ganjam	8	12			8	12
		Total	8	12			8	12
	Sorghum	Keonjhar			3	13	3	13

		Total			3	13	3	13
		Cereals Total	975	1156	180	348	1155	1504
Oilseeds	Groundnut	Boudh	10	20			10	20
		Ganjam	19	18			19	18
		Koraput	2	3			2	3
		Malkangiri			30	60	30	60
		Total	30	41	30	60	60	101
	Mustard	Bargarh			1	1	1	1
		Jharsuguda			10	16	10	16
		Sambalpur			5	15	5	15
		Total			15	32	15	32
		Oilseeds	30	41	45	92	75	133
Pulses	Black Gram	Angul			6	8	6	8
		Bhadrak			7	14	7	14
		Boudh			5	4	5	4
		Cuttack			5	9	5	9
		Deogarh			13	40	13	40
		Ganjam			12	14	12	14
		Jagatsinghpur			15	30	15	30
		Jajpur			27	53	27	53
		Kalahandi			3	13	3	13
		Kendrapara			29	57	29	57
		Keonjhar			46	81	46	81
		Sonepur			8	8	8	8
		Sundargarh			51	41	51	41
		Total			224	372	224	372
	Chickpea	Angul			7	35	7	35
		Balangir			15	30	15	30
		Balasore			7	20	7	20
		Boudh			10	18	10	18
		Deogarh			24	112	24	112
		Dhenkanal			6	12	6	12
		Ganjam			15	22	15	22
		Jharsuguda			10	32	10	32
		Kandhamal			12	46	12	46
		Keonjhar			37	74	37	74
		Khorda			11	19	11	19
		Koraput			97	191	97	191
		Mayurbhanj			46	43	46	43
		Nabarangpur			15	50	15	50
		Nayagarh			11	34	11	34
		Nuapada			17	30	17	30
		Puri			12	25	12	25
		Sambalpur			14	41	14	41
		Sundargarh			83	93	83	93
		Total			448	927	448	927
	Cowpea	Koraput			58	189	58	189

		Total			58	189	58	189
	Green Gram	Bargarh			15	30	15	30
		Boudh			5	4	5	4
		Cuttack			15	30	15	30
		Deogarh			18	49	18	49
		Dhenkanal			10	19	10	19
		Ganjam			14	19	14	19
		Jagatsinghpur			15	30	15	30
		Jajpur			17	34	17	34
		Jharsuguda			11	25	11	25
		Kalahandi			3	13	3	13
		Kendrapara			29	57	29	57
		Keonjhar			19	35	19	35
		Puri			19	33	19	33
		Sambalpur			10	24	10	24
		Sonepur			10	8	10	8
		Sundargarh			41	30	41	30
		Total			249	440	249	440
	Pigeonpea	Angul	77	153			77	153
		Balangir	15	16			15	16
		Bargarh	7	59			7	59
		Deogarh	52	49			52	49
		Ganjam	9	12			9	12
		Kalahandi	4	7			4	7
		Koraput	6	12			6	12
		Nabarangpur	63	126			63	126
		Nuapada	10	10			10	10
		Rayagada	8	20			8	20
		Total	248	464			248	464
		Pulses Total	248	464	980	1928	1228	2392
		Grand Total	1254	1661	1205	2368	2458	4029

Annexure 3 Technology wise details of demonstrations conducted during 2018-19

Technology	Crop	*Kharif*		*Rabi*		Total	
		Area	No. of	Area	No. of	Area	No. of
Cropping Systems	Black Gram			14.45	19	14.45	19
	Chickpea			66.87	167	66.87	167
	Finger Millet	1	2			1	2
	Green Gram			6.25	7	6.25	7
	Pigeonpea	2.45	49			2.45	49
	Total	3.45	51	87.57	193	91.02	244
Line Sowing	Black Gram			49.5	40	49.5	40
	Chickpea			178.2	282	178.2	282
	Cowpea			58.31	189	58.31	189
	Finger Millet			6	21	6	21
	Foxtail Millet	5	10			5	10
	Green Gram			41	30	41	30
	Groundnut	1.5	3			1.5	3
	Maize	10.5	21	14.1	30	24.6	51
	Paddy	21	22			21	22
	Pigeonpea	9.5	19			9.5	19
	Total	47.5	75	347.11	592	394.61	667
Line Sowing + Nipping	Chickpea			31.35	147	31.35	147
	Pigeonpea	145.25	232			145.25	232
	Total	145.25	232	31.35	147	176.6	379
Nipping	Pigeonpea	72.98	137			72.98	137
	Total	72.98	137			72.98	137
Nutritional Garden	Nutritional	2.4	24	2.5	50	4.9	74
	Total	2.4	24	2.5	50	4.9	74
SBTR + B	Black Gram			55.5	111	55.5	111
	Chickpea			5.32	12	5.32	12
	Finger Millet	21	28	11	22	32	50
	Foxtail Millet	8	8			8	8
	Green Gram			65.86	131	65.86	131
	Maize	7.75	20	9.86	22	17.61	42
	Mustard			1.05	3	1.05	3
	Nutritional	4.5	6	27.4	19	31.9	25
	Paddy	676.72	750	58.04	94	734.76	844
	Pigeonpea	4.7	5			4.7	5
	Total	722.67	817	234.03	414	956.7	1231
STBR + Humic Acid	Black Gram			22	51	22	51
	Chickpea			10.75	17	10.75	17
	Finger Millet	15	30	6.4	9	21.4	39
	Green Gram			28.5	64	28.5	64
	Groundnut			30	60	30	60
	Maize			11.5	25	11.5	25
	Nutritional	1.35	7			1.35	7
	Paddy	59.19	72			59.19	72
	Pigeonpea	6.05	8			6.05	8
	Total	81.59	117	109.15	226	190.74	343

STBR + Humic Acid + B	Black Gram			1	1	1	1
	Chickpea			4.25	5	4.25	5
	Green Gram			2.25	3	2.25	3
	Maize			0.75	2	0.75	2
	Paddy	97.59	113			97.59	113
	Total	97.59	113	8.25	11	105.84	124
STBR + Humic Acid + Zn	Black Gram			1.5	2	1.5	2
	Finger Millet			0.5	1	0.5	1
	Green Gram			1	1	1	1
	Total			3	4	3	4
STBR + Humic Acid + Zn + B	Finger Millet			1	1	1	1
	Groundnut	7.85	6			7.85	6
	Maize	1.8	1	0.5	1	2.3	2
	Pearl Millet	0.3	1			0.3	1
	Pigeonpea	2.75	3			2.75	3
	Total	12.7	11	1.5	2	14.2	13
STBR + Improved Cultivar	Black Gram			5	9	5	9
	Chickpea			66.44	174	66.44	174
	Green Gram			50.25	102	50.25	102
	Mustard			12.35	26	12.35	26
	Paddy	10.5	13			10.5	13
	Pigeonpea	4.3	10			4.3	10
	Total	14.8	23	134.04	311	148.84	334
STBR + Improved Cultivar + B	Black Gram			15	22	15	22
	Chickpea			45.6	43	45.6	43
	Green Gram			28.5	45	28.5	45
	Maize			13.95	20	13.95	20
	Paddy			5	5	5	5
	Total			108.05	135	108.05	135
STBR + Improved Cultivar + B + Zn	Black Gram			45.7	81	45.7	81
	Chickpea			37.5	75	37.5	75
	Green Gram			18.7	35	18.7	35
	Mustard			0.5	1	0.5	1
	Sorghum			3.43	13	3.43	13
	Total			105.83	205	105.83	205
STBR + S	Groundnut	10	20			10	20
	Total	10	20			10	20
STBR + Zn	Black Gram			6.5	13	6.5	13
	Chickpea			1.9	5	1.9	5
	Green Gram			0.68	3	0.68	3
	Mustard			0.8	2	0.8	2
	Nutritional			8	10	8	10
	Paddy			16	32	16	32
	Total			33.88	65	33.88	65
STBR + Zn + B	Black Gram			8.12	23	8.12	23
	Finger Millet	19	38			19	38
	Green Gram			6.12	19	6.12	19
	Groundnut	10.75	12			10.75	12
	Maize	8.75	10	22	50	30.75	60
	Paddy	4	6			4	6
	Pearl Millet	8	11			8	11

	Pigeonpea	0.5	1			0.5	1
	Total	51	78	36.24	92	87.24	170
Waste Demomposer	Waste			5.25	21	5.25	21
	Total			5.25	21	5.25	21
Grand Total		1261.9	1698	1247.7	2468	2509.68	4166

Annexure 4. Details of partnerships with NGOs in 30 districts of Odisha.

S. No.	District	NGO partnered with
1	Cuttack	Highlands Agriventure Limited,
2	Dhenkanal	Plot No. 73, 1st Floor, Vijaya Vihar, Raghunathpur
3	Khurda	Sisupal Garh Nuangaon Road, Bhubaneswar 751002, Odisha
4	Puri	
5	Bhadrak	Janasadhana NGO,
6	Jajpur	Plot # 73, 1st Floor, Vijaya Vihar; Raghunathpur, Sisupal Garh Nuangaon Road, Bhubaneswar 751002, Odisha
7	Balasore	SAMBANDH
		Plot No. 472/756, Bhargavi Bihar, Sardeipur,(Near Uttara Square)
8	Mayurbhanj	P.O.- Gopinathpur, Bhubaneswar751002,Odisha
9	Jagatsinghpur	Udyama,
		HIG-140-K-6-Kalingavihar, Bhubaneswar751019, Odisha
10	Kendrapara	Action for Protection of Wild Animals (APOWA),
		Hatapatana, Kadaliban PO,Dist. Kendrapara754222, Odisha
11	Bargarh	Association for Development and Research in Socio Economic Activities (ADARSA)
12	Jharsuguda	At- Govindatola (Mehergali, Driver Colony), PO- Dhanupali, Sambalpur 768005, Odisha
13	Sambalpur	
14	Sonepur	Mahashakthi, Balangir, Odisha
15	Koraput	PRAGATI,
		KORAPUT, Near Reeti Printers, Pujariput, Koraput 764020, Odisha
16	Malkangiri	PARIVARTTAN
		At-Hi-Teck Colony, Po/Dist-DNK-Malkangiri 764048, Odisha
17	Kalahandi	Loksebak,
		At Naktiguda (Back side of old income tax colony) PO Bhawanipatana, District, Kalahandi, Odisha 766001
18	Nabarangpur	Harsha Trust,
19	Rayagada	C/o Prafulla Chandra Panda Ichhabatiguda, Nabarangpur 764059
20	Angul	Foundation for Ecological Security (FES),
21	Deogarh	5th Lane, Amalapada, Angul - 759 122; Odisha, Tel: 0674-230610 (O);Fax: 06764-232202, angul.fes@ecologicalsecurity.org
22	Boudh	Udyama,
		HIG-140-K-6-Kalingavihar, Bhubaneshwar751019, Odisha
23	Kandamal	Nirman,
		Plot No: S-2/15 (First Floor), Niladri Vihar, Bhubaneshwar751021, Odisha
24	Nayagarh	Udyama,
		HIG-140-K-6-Kalingavihar, Bhubaneshwar751019, Odisha
25	Keonjhar	TADASHA Gourtota Sahi
		Near Telephone exchange, Keonjhar770001, Odisha
26	Sundargarh	PRAGTI
		At Mahesdihi, Sunargarh758001,Odisha
27	Ganjam	NIRDES (National institute of rural development and environmental sciences)
28	Gajapathi	Janakalyan Pratisthan
29	Balangir	LOKADRUSTI
30	Nuapada	Kharihar

Annexure 5. Exposure visits organized to farmers during 2018-19

District	Date	Place of visit	Purpose	Men	Women
Angul	29/11/18	Niali,Cuttack	Organic farming	4	2
Mayurbhanj	22/01/2019	KVK Jasipur	Exposure visit to KVK	6	41
Nabarangpur	43443	Jharigaon	Exposure visit for farmers on good practices in vegetable cultivation and micro-nutrient application	2	18
Nabarangpur	20/9/2018	Kundra	Exposure visit for farmers on use of mechanization and good irrigation systems	2	18
Nabarangpur	43648	Jharigaon	Exposure visit for farmers on good practices in vegetable cultivation and micro-nutrient application	2	25
Sundargarh	6/2/19 to 8/02/19	Koraput	Soil and Water Management	3	0
Cuttack	26/2/2019	NRRI, Cuttack	Exhibition of different Seeds	2	0
Khordha	26/2/2019	NRRI, Cuttack	Exhibition of different Seeds	2	0
Puri	26/2/2019	NRRI, Cuttack	Exhibition of different Seeds	2	0
Deogarh	18/02/19	Saruali	Krusaka Samparka Mela	250	180
Deogarh	19/02/19	Karalaga	Krusaka Samparka Mela	230	200
Sundargarh	23/12/2018	Alapaka	Krusaka samparka mela	300	150
Angul	6/2/2019 to 8/2/2019	Koraput	National Conference on FFCSWR-2019	3	0
Balasore	6/2/2019 to 8/2/2019	Koraput	National Conference on FFCSWR-2019	3	0
Bargarh	6/2/2019 to 8/2/2019	Koraput	National Conference on FFCSWR-2019	3	0
Bhadrak	6/2/2019 to 8/2/2019	Koraput	National Conference on FFCSWR-2019	2	0
Boudh	6/2/2019 to 8/2/2019	Sunabeda, Koraput	National Conference on FFCSWR-2019	2	0
Cuttack	6/2/2019 to 8/2/2019	Koraput	National Conference on FFCSWR-2019	2	0

Deogarh	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Dhenkanal	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Gajapathi	6/2/19 to 8/02/19	Sunabedha HAL auditorium at Koraput district.	National Conference on FFCSWR-2019	2	0
Ganjam	6/2/19 to 8/02/19	Sunabedha HAL auditorium at Koraput district.	National Conference on FFCSWR-2019	2	0
Jagatsinghpur	6/2/19 to 8/02/19	Koraput	National conference on FFCSWR-2019	2	0
Jharsuguda	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Kalahandi	6/2/19 to 8/02/19	ICAR-IISWC, Sunabeda, Koraput	National Conference on FFCSWR-2019	3	0
Kandhamal	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Kendrapara	6/2/19 to 8/02/19	Sunabeda, Koraput , Odisha	National Conference on FFCSWR-2019	3	0
Keonjhar	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Khordha	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Mayurbhanj	6/2/19 to 8/02/19	Koraput (HAL)	National Conference on FFCSWR-2019	3	0
Nayagarh	6/2/19 to 8/02/19	Sunabeda, Koraput	National Conference on FFCSWR-2019	3	0
Puri	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Sambalpur	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	2	0
Sonepur	6/2/19 to 8/02/19	Koraput	National Conference on FFCSWR-2019	3	0

Annexure 6. Details of visit by scientists during 2018-19

S. No.	Name of Staff	District	Place	Date of travel	Purpose of the travel
1	Prasad J Kamdi	Jajpur	Bhadrak, Jajpur	30-04-2019	Meeting farmers, agri Dept. officials and NGO staff in Bhadrak and Jajpur for *Kharif* 2019 planning
2	Prasad J Kamdi	Bhadrak	Bhadrak, Jajpur	30-04-2019	Meeting farmers, agri Dept. officials and NGO staff in Bhadrak and Jajpur for *Kharif* 2019 planning
3	Vinod S Kukanur	Keonjhar	Sundergarh, Keonjhar	30-03-2019	Field days and to meet DDA for *Kharif* plan
4	Vinod S Kukanur	Sundergarh	Sundergarh, Keonjhar	30-03-2019	Field days and to meet DDA for *Kharif* plan
5	Pushpajeet Choudari	Jharsuguda	Sambalpur, Jharsuguda	30-03-2019	Planning *kharif* demos and lab visits
6	Pushpajeet Choudari	Sambalpur	Sambalpur, Jharsuguda	30-03-2019	Planning *kharif* demos and lab visits
7	Prakashkumar Rathod	Nabrangpur	Nabarangpur	3/4/2019	Visit project sites and initiate CCE and plan for *Kharif* activities
8	Aviraj Datta	Deogarh	Angul, Deogarh	1/4/2019	Project activities
9	Aviraj Datta	Angul	Angul, Deogarh	1/4/2019	Project activities
10	Rohan Khopade	Balangir	Nawapada, Balangir	18/03/2019	Visit *Rabi* demos
11	Rohan Khopade	Naupada	Nawapada, Balangir	18/03/2019	Visit *Rabi* demos
12	Gajanan Sawargaonkar	Kendrapara	Kendrapada, Jagatsingpur	18/03/2019	Visit field demonatrations
13	Gajanan Sawargaonkar	Jagatsingpur	Kendrapada, Jagatsingpur	18/03/2019	Visit field demonatrations
14	Kapil R Raje	Nayagarh	Bhubaneshwar, Nayagarh, Kandhamal	25/03/2019	Conduct field day and *Rabi* crop cutting demonstrations
15	Kapil R Raje	Kandhamal	Bhubaneshwar, Nayagarh, Kandhamal	25/03/2019	Conduct field day and *Rabi* crop cutting demonstrations
16	Rajesh pasumarthi	Baragarh	Bargarh	23/02/2019	Meeting with DoA(DDA) and selection of new NGO partner for Bargarh district. Field visits and capacity building in Ambshada, Kurla villages
17	Girish Chander	Kalahandi	Kalahandi	4/3/2019	Meeting with stakeholders to start PG-ICRISAT watershed activities
18	Sk Das Gupta	Dhenkanal	Odisha	19th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project

19	Sk Das Gupta	Khurda	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
20	Sk Das Gupta	Cuttack	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
21	K Mahadeva Reddy	Dhenkanal	Odisha	19th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
22	K Mahadeva Reddy	Khurda	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
23	K Mahadeva Reddy	Cuttack	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
24	P. K. Mishra	Dhenkanal	Odisha	19th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
25	P. K. Mishra	Khurda	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
26	P. K. Mishra	Cuttack	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
27	Girish Chander	Dhenkanal	Odisha	19th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
28	Girish Chander	Khurda	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
29	Girish Chander	Cuttack	Odisha	18th Feb, 2019	Meeting with DoA for discussing about CB programs and to monitor interventions under the project
30	Moses Shyam D	Dhenkanal	Dhenkanal, Cuttack	18/02/2019	For *rabi* follow-ups and farmer meeting and field visits
31	Moses Shyam D	Cuttack	Dhenkanal, Cuttack	18/02/2019	For *rabi* follow-ups and farmer meeting and field visits
32	Vijay Sandeep jakkula	Koraput	Koraput	6/2/2019	Attend FFCSWR-2019 meeting
33	Pushpajeet Choudari	Koraput	Koraput	6/2/2019	Attend FFCSWR-2019 meeting
34	Moses Shyam D	Dhenkanal	Dhenkanal, Cuttack	22/1/2019	For *rabi* follow-ups and farmer meeting and field visits
35	Moses Shyam D	Cuttack	Dhenkanal, Cuttack	22/1/2019	For *rabi* follow-ups and farmer meeting and field visits
36	Kapil R Raje	Nayagarh	Bhubaneshwar, Nayagarh, Kandhamal	29/1/2019	To check *rabi* trails status
37	Kapil R Raje	Kandhamal	Bhubaneshwar, Nayagarh, Kandhamal	29/1/2019	To check *rabi* trails status

38	Ch Srinivas Rao	Balasore	Balasore, Mayurbhanj	20/1/2019	Monitoring and fiels visits of BC productivity enhancement demonstrations
39	Ch Srinivas Rao	Mayurbhanj	Balasore, Mayurbhanj	20/1/2019	Monitoring and fiels visits of BC productivity enhancement demonstrations
40	Aviraj Datta	Angul	Angul, Deogarh	28/1/2019	Monitor project activities
41	Aviraj Datta	Deogarh	Angul, Deogarh	28/1/2019	Monitor project activities
42	Girish Chander	Kalahandi	Kalahandi, Khorda	17/12/2018	To monitor interventions and conduct SO/RT interviews
43	Girish Chander	Khurda	Kalahandi, Khorda	17/12/2018	To monitor interventions and conduct SO/RT interviews
44	Kiran Petare	Kalahandi	Kalahandi	17/12/2018	To monitor interventions and conduct SO/RT interviews
45	Rajesh pasumarthi	Baragarh	Bargarh	1/12/2018	To observe *Kharif* demonstrations and have meetings with department officials, conduct a famers meet about soil health card and soil health day
46	Pushpajeet Choudari	Sambalpur	Sambalpur, Jharsuguda	1/12/2018	To attend world soil day programme in sambalpur, field visits in Jharsuguda and lab visits
47	Pushpajeet Choudari	Jharsuguda	Sambalpur, Jharsuguda	1/12/2018	To attend world soil day programme in sambalpur, field visits in Jharsuguda and lab visits
48	Prakashkumar Rathod	Nabrangpur	Nabarangpur	10/12/2018	Visit project sites and initiate CCE and plan for *Rabi* activities
49	Vinod S Kukanur	Sundergarh	Sundergarh, Keonjhar	20/11/2018	To meet district officials and visit demo plots
50	Vinod S Kukanur	Keonjhar	Sundergarh, Keonjhar	20/11/2018	To meet district officials and visit demo plots
51	Rajesh Nune	Boudh	Boudh, Sonepur	15/11/2018	Attending farmers meeting at demonstrations sites and training on CCE
52	Rajesh Nune	Sonepur	Boudh, Sonepur	15/11/2018	Attending farmers meeting at demonstrations sites and training on CCE
53	Rohan Khopade	Naupada	Raipur, naupada, Balangir	19/11/2018	To plan CCE to *kharif* demos
54	Rohan Khopade	Balangir	Raipur, naupada, Balangir	19/11/2018	To plan CCE to *kharif* demos
55	Kiran Petare	Rayagada	Rayagada, Kalahandi	3/9/2018	Review *Rabi* crop demonstrations
56	Kiran Petare	Kalahandi	Rayagada, Kalahandi	3/9/2018	Review *Rabi* crop demonstrations
57	Kapil R Raje	Nayagarh	Bhubaneswar, Nayagarh, Kandhamal	19/11/2018	To conduct field day, CCE, meet DDAs
58	Kapil R Raje	Kandhamal	Bhubaneswar, Nayagarh, Kandhamal	19/11/2018	To conduct field day, CCE, meet DDAs

59	Vijaya Ranganatha	Sambalpur	Sambalpur, Jharsuguda	30/10/2018	Visit soil testing labs and meet with Odisha STL staff for lab requirements
60	Vijaya Ranganatha	Jharsuguda	Sambalpur, Jharsuguda	30/10/2018	Visit soil testing labs and meet with Odisha STL staff for lab requirements
61	Girish Chander	Rayagada	Rayagada, Kalahandi, Khurda	3/12/2018	To monitor interventions
62	Girish Chander	Kalahandi	Rayagada, Kalahandi, Khurda	3/12/2018	To monitor interventions
63	Girish Chander	Khurda	Rayagada, Kalahandi, Khurda	3/12/2018	To monitor interventions
64	Pushpajeet Choudari	Sambalpur	Sambalpur, Jharsuguda	30/10/2018	To plan *Rabi* interventions
65	Pushpajeet Choudari	Jharsuguda	Sambalpur, Jharsuguda	30/10/2018	To plan *Rabi* interventions
66	Rajesh pasumarthi	Baragarh	Bargarh	30/10/2018	To plan *Rabi* interventions
67	Girish Chander	Khurda	Khurda	5/11/2018	to monitor *kharif* implementation, 2018 trials/demo and planning for *rabi* 2018-19 demos
68	Mukund Patil	Puri	Puri	22/10/2018	Visit pilot sites and for planning *Rabi* action plan
69	Vijay Sandeep jakkula	Ganjam	Ganjam, Gajapathi	22/10/2018	To observe field trials and have meetings with department officials
70	Vijay Sandeep jakkula	Gajapathi	Ganjam, Gajapathi	22/10/2018	To observe field trials and have meetings with department officials
71	Moses Shyam D	Dhenkanal	Dhenkanal, Cuttack	24/10/2018	Follow-up and conduct farmers meeting and plan for *rabi* season
72	Moses Shyam D	Cuttack	Dhenkanal, Cuttack	24/10/2018	Follow-up and conduct farmers meeting and plan for *rabi* season
73	Prasad J Kamdi	Jajpur	Jajpur, Bhadrak	24/10/2018	To monitor project activities, meet with agri. Dept. officials and plan for *Rabi* season activities
74	Prasad J Kamdi	Bhadrak	Jajpur, Bhadrak	24/10/2018	To monitor project activities, meet with agri. Dept. officials and plan for *Rabi* season activities
75	Prakashkumar Rathod	Nabrangpur	Nabarangpur	25/09/2018	Follow-up and discuss with farmers, NGO staff and officers of state dept. about project activities
76	Rajesh pasumarthi	Baragarh	Bargarh	1/10/2018	To observe field trials and have meetings with department officials
77	Girish Chander	Khurda	Bhubaneshwar, Khudra	27/09/2018	To conduct interviews & Field visit

78	Aviraj Datta	Angul	Angul, Deogarh	7/10/2018	To carry out project activities
79	Aviraj Datta	Deogarh	Angul, Deogarh	7/10/2018	To carry out project activities
80	KH Anantha	Koraput	Koraput, Malkangiri	19/09/2018	To monitor field interventions and meeting with DoA officers, NGO and farmers
81	KH Anantha	Malkangiri	Koraput, Malkangiri	19/09/2018	To monitor field interventions and meeting with DoA officers, NGO and farmers
82	Vinod S Kukanur	Sundergarh	Sundergarh, Keonjhar	17/09/2018	To visit demo plots and meeting with DoA officials
83	Vinod S Kukanur	Keonjhar	Sundergarh, Keonjhar	17/09/2018	To visit demo plots and meeting with DoA officials
84	Kapil R Raje	Nayagarh	Bhubaneshwar, Nayagarh, Kandhamal	19/09/2018	Project activities
85	Kapil R Raje	Kandhamal	Bhubaneshwar, Nayagarh, Kandhamal	19/09/2018	Project activities
86	Rohan Khopade	Naupada	Raipur, Nawapada, Balangir	19/09/2018	To visit *Kharif* demo plots
87	Rohan Khopade	Balangir	Raipur, Nawapada, Balangir	19/09/2018	To visit *Kharif* demo plots
88	Moses Shyam D	Dhenkanal	Dhenkanal, Cuttack	18/09/2018	Follow-up, Supervision of trial plots, farmers and local liasoning
89	Moses Shyam D	Cuttack	Dhenkanal, Cuttack	18/09/2018	Follow-up, Supervision of trial plots, farmers and local liasoning
90	Kiran Petare	Kalahandi	Kalahandi	3/9/2018	Review *kharif* crop demonstrations
91	PK Mishra	Sambalpur	Sambalpur, Jharsuguda	4/9/2018	Project activities
92	PK Mishra	Jharsuguda	Sambalpur, Jharsuguda	4/9/2018	Project activities
93	Pushpajeet Choudari	Sambalpur	Sambalpur, Jharsuguda	4/9/2018	To visit field demonstrations
94	Pushpajeet Choudari	Jharsuguda	Sambalpur, Jharsuguda	4/9/2018	To visit field demonstrations
95	Ch Srinivas Rao	Jagatsingpur	Jagatsingpur, Mayurbhanj, Balasore	3/9/2018	Monitoring and fiels visits of BC productivity enhancement demonstrations
96	Ch Srinivas Rao	Mayurbhanj	Jagatsingpur, Mayurbhanj, Balasore	3/9/2018	Monitoring and fiels visits of BC productivity enhancement demonstrations
97	Ch Srinivas Rao	Balasore	Jagatsingpur, Mayurbhanj, Balasore	3/9/2018	Monitoring and fiels visits of BC productivity enhancement demonstrations
98	Gajanan Sawargaonkar	Kendrapara	Kendrapada, Jagatsingpur	5/9/2018	To visit field demonstrations
99	Gajanan Sawargaonkar	Jagatsingpur	Kendrapada, Jagatsingpur	5/9/2018	To visit field demonstrations

About ICRISAT

International Crops Research Institute for the Semi-Arid Tropics

ICRISAT is a member of the CGIAR Consortium

The **International Crops Research Institute for the Semi-Arid Tropics** (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, of whom 644 million are the poorest of the poor. ICRISAT innovations help the dryland poor move from poverty to prosperity by harnessing markets while managing risks – a strategy called Inclusive Market-Oriented Development (IMOD).

ICRISAT is headquartered in Patancheru near Hyderabad, Andhra Pradesh, India, with two regional hubs and five country offices in sub-Saharan Africa. It is a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

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ICRISAT's scientific information: **http://EXPLOREit.icrisat.org**