

IMPACT EVALUATION OF MINI IRRIGATION PROJECTS EXECUTED BY THE ITDAs

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Research and Training Institute, Bhubaneswar**

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IMPACT EVALUATION OF MINI IRRIGATION PROJECTS EXECUTED BY THE ITDAs

EXECUTIVE SUMMARY

I. Study Background

Water is the basic input for agriculture. Artificial application of water to land for the purpose of agricultural production is called irrigation. Effective irrigation influences the entire growth process from seedbed preparation, germination, root growth, nutrient utilisation, to plant growth and regrowth, yield and quality.

Agriculture is the mainstay of the tribal people of Orissa. It is characterized by low productivity for lack of adequate irrigation facility for which the tribal farmers resort to rainfed farming subject to the vagaries of nature. Under the Tribal Sub Plan (TSP) strategy, after grounding of ITDAs in TSP areas, considerable emphasis has been given to raise the irrigation potential of the area to increase productivity of land. Since irrigation constitute a critical infrastructure for income generation, a large number of mini irrigation projects have been constructed in tribal areas incurring sizable amount of expenditure to provide assured irrigation facility. Under this backdrop, it is felt imperative to conduct an impact evaluation study of the mini irrigation projects in selected ITDA areas located within the TSP area of the State.

Accordingly the study was conducted in four selected ITDA areas namely; Nilagiri, Bonai, Paralakhemundi and Thuamul Rampur during 2007 - 2008. In these areas, 41 mini irrigation projects of different kinds such as, Water Harvesting Structures (WHS), Diversion Weirs, Cross Bunds, Weir Dams, River Lifts, Shallow Tube Wells, Dug Wells etc executed by these 4 ITDAs in 39 villages covering 237 tribal beneficiaries coming under 10 blocks were taken into purview of the study. The projects were selected from their inception to 2006-07.

II. Major Objectives

The primary objectives of the study were to assess the impact of the projects on the following aspects:

- Enhancement of productivity of the land brought under irrigation.
- The extent of increase in the input use.
- The level of employment generation for both family labour and hired labour.
- Increase in farm income of the beneficiaries.
- Improvement in socio-economic status of the beneficiaries.

III. Key Findings

On the basis of the empirical study, the following key findings have emerged out:

1. As observed during the study, there are no instances of complete failure of the irrigation projects but the farmers have experienced decrease in the estimated ayacut in some cases. Damaged irrigation canals and silting of the reservoirs are some of the reasons for reducing the irrigation efficiency of these projects. There is also gap in the actual ayacut and the estimated ayacut especially during *Rabi* season which primarily depends on the intensity of rain received during rainy season. Installation of additional sluice gate in some projects may help to check the run off of excess water during rainy season and there by increase the irrigation potential.
2. Among the respondents 42% are illiterates and 24% are just literates. 29% of the respondents have gone up to primary level where as the percentage of persons with secondary and college education is negligible. This low literacy level which is contributing to the low awareness level of the farmers/water users appears to be a hindrance for adoption of improved technologies of farming.
3. The study revealed that for 78% of the tribal respondents agriculture is the primary source of livelihood, 19% of the respondents depend on

wage earning and only 3% are engaged in service especially in Bonai area.

4. The male workforce and female workforce are 1.64 (91% of the adult male are workers) and 1.46 (85% of the adult female are workers) per household respectively. As such the percentage of total workforce to total adult population comes to 88% which is a very healthy trend. The higher proportion of this family level workforce has significant contribution in the process of farm production.
5. During the pre-project period the average operational land holding per household was 2.67 acres which increased to 2.85 acres during post-project period. Most of the tribal farmers (56%) are marginal farmers followed by the small farmers (37%). The percentage of big farmers having land more than 5 acres is very negligible i.e., only 7%.
6. The cropping intensity which was 100% during pre-project period has increased to 143% during the post-project period. The gross cropped area has expanded by 48% during post-project period.
7. The number of farmers growing *kharif* paddy during pre and post project periods remaining almost constant, the yield rate per acre has increased from 4.95 Q/acre to 8.67 Q/acre (75% increase) in the post project period. Thus, the rate of yield has increased quite considerably.
8. After getting assured irrigation, 101 farmers out of 237 have adopted cultivation of high yielding summer paddy and produced more than 9 Quintals per acre. The study revealed that the productivity in Paralakhemundi ITDA area is the highest in comparison to other areas which ranges from 10 to 12 Quintals per acre. It is observed that the farmers in Bonai ITDA area utilize 41% irrigation potential for more remunerative non-paddy crops like wheat, mustard and vegetables in stead of paddy cultivation during summer.
9. During pre-project period adoption of high yielding *kharif* paddy was limited to 89 farmers and that has increased to 220 during post-project period. Use of local varieties of paddy has remarkably gone down to 7%

during the post-project period against 61% during pre-project period. This shows the positive trend of adoption of innovative technology for enhancing production through varietal replacement during the post project period.

10. The average household consumption of paddy of 4.59 Quintals per acre during the pre-project period has increased to 5.82 Quintals per acre during post project period. Like wise, the sale of surplus paddy which was almost negligible during the pre project period has increased to 2.96 Quintals per acre during the post project period.
11. The fertilizer use has increased considerably by 223% between pre-project and post project periods. Increase in irrigation potential leads to use of higher doses of fertilizer and adoption of high yielding varieties resulting increase in production and productivity of crops as revealed from the findings of the study.
12. There is no significant increase in use of organic manure although there is increase in cropping intensity by 143% because of awareness regarding benefits of using organic manure. Almost every household maintains a compost pit but the process of compost making is not always done in a scientific manner.
13. Most of the farmers know about the availability of agricultural inputs like HYV and improved seeds, fertilizers, pesticides, farm implements and farm machineries as well as credit.
14. With the improvement in the socio-economic status during the post project period, the tribal farmers have taken care for improving their housing and educational status. They have increasingly acquired modern assets like bicycles, radio sets, mobile phones and two-wheelers. There is limited use of electric fan and TV as there is no electricity in most of the villages.
15. Realising the benefits of education 126 families were found to be sending their children to Primary and ME schools and 37 families to High

Schools. There are college-going children from 15 families. This trend is a recent trend.

16. Because of increase in cropping intensity, adoption of high yielding paddy and other labour intensive non-paddy crops like maize, vegetables and sugarcane, the per acre use of bullock labour and family labour has gone up by 6% and 23% respectively during the post project period which is an encouraging trend. Out of the total human labour employment, family labour has the lion's share of 75% followed by hired labour (13%) and labour cooperative (12%). There is additional 57% employment generation of bullock labour and 83% of human labour over the pre-project period per household.
17. The impact of irrigation is directly proportional to the Farm Business Income. The Investment, Gross Return and Net Return per acre have increased by 29%, 81% and 128% respectively during the post project period. The average per-rupee return of Rs.2.12 over investment during the pre project has been enhanced to Rs.2.99. The beneficiaries can derive higher return by optimum utilization of the irrigation resources and the technology with the guidance of the extension personnel.

IV. Key Recommendations

On the basis of the key findings which have emerged out of the empirical study, the following recommendations have been made by the study team for consideration of government. All the recommendations have been done with the prime objective of making the mini irrigation projects more successful as a programme and with an intention to ensure that the benefits accrue to the tribals for whose development this scheme is under implementation by ITDAs:

- I. The tribal beneficiaries may be encouraged to form Water Users' Associations (Pani Panchayats) to facilitate optimum use of irrigation water through effective crop planning in the entire ayacut.

- II. In some cases the irrigated land remains fallow for unavailability of bullock labour during land preparation. The farmers may be provided with credit for purchase of bullocks. Besides, farm mechanization equipments especially for primary and secondary tillage operations and threshing need to be popularized. The SHGs formed in the villages may be assisted for procurement of tillage equipments and provide these to the farmers on hiring basis. This has been successful in Batisahi RLP in Nilagiri.
- III. The plant protection equipments and simple and low cost farm implements like mould board plough, weeder, paddy thresher, improved sickle etc need to be popularized in large scale through provision of subsidy.
- IV. Availability of inputs like HYV and improved seeds, fertilizers and plant protection chemicals within the farmers reach through the SHGs and Water Users Associations needs to be ensured.
- V. Financial assistance may be provided for land leveling through Land Development Schemes in order to bring additional area under irrigation that has been successful in Ranidumer village in Kaniguma GP of Thuamul Rampur block.
- VI. Dissemination of adequate and timely technology on crop production including selection of varieties, seed replacement, water management, application of chemical fertilizer basing on soil test results, inter cultural operations, Integrated Pest Management (IPM) and post-harvest technology are to be given priority through personal contacts, group discussions and field visits by the extension personnel.
- VII. Required technology demonstrations on field crops as well as vegetables, farmers' trainings and exposure visits may be organized.
- VIII. The successful farmers may be encouraged through felicitation in block/ district level exhibitions and awareness camps.
- IX. The water storage capacity of the reservoirs may be enhanced by raising the height of the dam wherever possible to facilitate irrigation during *rabi*

season which in turn will enhance the cropping intensity resulting in increase in farm return and income.

- X. The farmers' demand to increase the length of the irrigation channels may be considered wherever feasible in order to raise the efficiency & coverage of irrigation.
- XI. To check the runoff of excess water during rainy season and bring additional area under irrigation, the farmers' proposal for installation of additional sluice gates may be examined in some of the projects looking at the feasible aspect.
- XII. The cases of low discharge of water in shallow tube wells may be identified and rectified. The discharge of dug wells can be increased by increasing the depth as suggested by the dug well beneficiaries in Jharanaghati village in Nilagiri block.
- XIII. Supply of High Density Poly Ethylene (HDPE) pipes on subsidy may be examined for improving the efficiency of delivery system in case of lift irrigation through shallow tube wells and dug wells to minimize the loss of water during flow in earthen channels.
- XIV. Repairing of the field channels of the irrigation projects which is frequently damaged due to flow of excess water during rains may be done to increase the irrigation efficiency.
- XV. The feasibility for introducing pisciculture in the project head through SHGs may be studied as observed in Rajamunda Check Dam in Lanjigarh block of Thuamul Rampur ITDA.
- XVI. The problem of low voltage and irregular supply of electricity impairing the efficiency of the River Lift Projects need to be rectified by upgrading the transformer.

V. Concluding Remarks

The mini irrigation projects executed by the ITDAs for development of agriculture practiced by the tribal farmers have positive impact on the socio-economic life of the beneficiaries. Though, there are no instances of complete

failure of the irrigation projects, irrigation potential created in most of the cases have reduced for reasons like silting of the reservoir, damaged delivery channels, low voltage and irregular power supply and the like.

It is therefore felt essential for installation of additional sluice gate, increase of the height of the dams, repairing, renovation and extension of delivery channels, plantation in the catchment area, regular power supply in some projects which will certainly help enhance the irrigation efficiency of these projects.

Installation of shallow tube wells and bore wells are integrated part of private irrigation that need to be encouraged by way of providing subsidy where the beneficiaries can use the water and simultaneously earn by providing water to neighbouring farmers. It is now high time to give a thought to improve the field extension system for dissemination and adoption of the innovative technologies in the field of agriculture, horticulture, soil conservation, pisciculture and animal husbandry to make the optimum use of the irrigation projects in order to derive the maximum benefit out of the investment made by the Government.

Involvement of the NGOs, SHGs, Water Users Associations (Pani Panchayats) is to be strengthened for effective multi-disciplinary extension.

Exposure visit of farmers to the successful irrigation projects will definitely have positive demonstration impact. The successful tribal farmers should be encouraged through felicitation in public gatherings like agricultural exhibitions and awareness camps. The concerned executing agencies should make recurring financial provisions for periodical inspection maintenance of these projects in direct consultation with the beneficiaries.

Finally, it can be said for sure on the basis of the findings of the evaluation based on empirical study that Mini Irrigation projects have certainly brought prosperity for the tribal farmers and it should be continued. However, there are some loose ends which need to be looked in to so that this programme can be more efficiently implemented and the tribal communities can avail more benefits that they are getting at the moment.

CHAPTER - 1

INTRODUCTION

INTRODUCTION

Irrigation is the artificial application of water to land for the purpose of agricultural production. Effective irrigation will influence the entire growth process which includes seedbed preparation, germination, root growth, nutrient utilisation, plant growth and regrowth, yield and quality.

The key to maximising irrigation efforts is uniformity. The producer has a lot of control over how much water to supply and when to apply it but the irrigation system determines uniformity. Deciding which irrigation systems is best for a farmer requires knowledge of equipment, system design, plant species, growth stage, root structure, soil composition and land formation. Irrigation systems should encourage plant growth while minimising salt imbalances, leaf burns, soil erosion, and water loss. Proper irrigation management takes careful consideration and vigilant observation.

Irrigation provides around 40% of world's food from only 17% of the global cropped area. Some 2400 million people depend on irrigated agriculture for food and livelihood. Irrigation has stabilized food production and prices by enabling greater production control and scope for crop diversification. Irrigated agriculture is the dominant user of water accounting for 80% of water consumption. Inappropriate management of irrigation has contributed to environmental problems including excessive water depletion, falling of water tables owing to excessive mining and water quality reduction, water logging and salinization.

The history of irrigation development in India can be traced to prehistoric times. Irrigation has played a significant role in India's monsoon climate and its agrarian economy. After independence, the Government of India launched an ambitious programme to improve agricultural production through extensive development of the irrigation infrastructure. Development works in irrigation were taken up in all five-year and annual plans. Apart from China, the irrigation system in no other country is as extensive as in India.

The importance of ground water in national life is evident from the fact that around 56% of irrigated agriculture is based on ground water and 85% of rural drinking water comes from ground water. Even after all the major and medium irrigation projects are implemented, a substantial part of irrigation (not far below 50%) will still depend on ground water. One of the biggest developments that has taken place in Indian irrigation after independence is ground water irrigation. This system is predominantly owned and managed by farmers. The share of ground water-irrigated area has increased between 1952-53 and 1996-97 from about 30% to about 55%. The main factor in the growth of ground water irrigation has been tube well irrigation, which grew at an impressive rate of 9.9% per annum during the period 1960-61 to 1996-97. Area under tubewell irrigation, which accounted for less than 1% of the net irrigated area (NIA) up to 1960; increased to about 33% in 1996-97. The rapid development of groundwater irrigation not only helped well-owning farmers, but also farmers who did not own wells through water markets.

The Value of Irrigation

Thus, irrigation contributes a lot in improving productions and enhancing quality of life of people. To be precise, Irrigation allows primary producers,

- to grow more crops
- to produce better quality crops as water stress can dramatically impact on the quality of farm produce
- to lengthen the growing season by starting the season early
- to have 'insurance' against seasonal variability and drought
- to maximise benefits of fertiliser applications as fertilisers need to be watered into the ground in order to best facilitate plant growth.
- to cultivate the areas that would otherwise be 'less productive'.
- to take advantage of market incentives for unseasonal production
- to obtain greater returns over the investment.

Choosing an Irrigation System

There is a huge diversity in the types of irrigation technologies/ systems used, which is attributable to,

- Variations in soil types
- Varying topography of the land
- Availability of power sources
- Availability of water
- Sources of water
- The size of the area being irrigated
- On farm water storage capacity
- Availability of labour/ financial resources

Problems

While irrigation has provided a number of important benefits, the potential drawbacks of over/under watering are as follows:

Under-watering/ no watering during critical stages of crop:

- Loss in market value for yield reduction
- Reduction in crop size and quality

Over-watering:

- Unwanted vegetative growth
- Reduction in water table due to valuable water losses
- Unnecessary spread of pesticides, pathogens and weeds
- Unnecessary water runoff
- Leaching of nutrients
- Lower product quality and reduced yields
- Increased operational costs like labour, pumping, cost of water hence, reduced profit

Present Irrigation Scenario in Orissa

During last three decades, irrigation potential of Orissa during *kharif* season from all sources has increased from 10.15 lakh hectare in 1975-76 to 27.22 lakh hectare in 2006-07. Similarly, *rabi* irrigation potential has increased from 3.64 lakh hectare to 13.19 lakh hectare during the same period. In term of percentage, *kharif* and *rabi* irrigation potential has increased by more than 250% and 350% respectively during last 30 years. When we take the year 2006-07, the statistical data indicate that the gross irrigated area of 31.49 lakh hectares (20.02 lakh hectares during *kharif* and 11.47 lakh hectares during *rabi*) is only 74% of the irrigation potential created. Source-wise irrigation potential created and gross irrigated area in the State during 2006-07 is indicated below.

Area in '000 hect

Source-wise Potential Created	Kharif	Rabi
Major & Medium	1250.50	563.23
Minor (Flow)	519.02	71.35
Minor (Lift)	421.19	234.28
Other sources	530.79	449.66
Total	2721.50	1318.52
<i>Net Area Sown</i>	5654.00	
Gross Area Irrigated (2006-07)	2001.98	1147.47
% of Irrigation over Net area Sown	35	20

Basic information of the 21 Integrated Tribal Development Agencies (ITDAs) of the State including irrigation status is given below.

Table – 1
Basic Information on ITDAs

Sl. No.	ITDA	No. of Blocks	No. of GPs	No. of Inhabited Villages	Population		Net area Sown (ha)	Irrigated area (ha)			% of irrigation over Net Area Sown	
					Total	ST		Kharif	Rabi	Gross	K	R
1	Parlakhemundi	5	96	1305	347022	237489	41753	2927	494	3421	7	1
2	Bonai	4	55	574	277001	187471	41185	7099	3156	10255	17	8
3	Nilagiri	1	44	137	110232	61356	14761	4570	1381	5951	31	9
4	Th. Rampur	2	37	697	140912	74543	36793	2792	976	3768	8	3
5	Baripada	10	177	1764	930367	497677	118213	29587	10073	39660	25	9
6	Baliguda	9	109	1503	450277	245150	46906	4108	650	4758	9	1
7	Phulbani	3	44	137	110232	61356	14761	4570	1381	5951	31	9
8	Panposh	4	71	386	378195	241993	5624	3814	1710	5524	68	30
9	Gunupur	7	95	1347	388022	223760	77207	18144	3310	21454	24	4
10	Karanjia	5	70	767	371630	224918	75996	20640	--	20640	27	--
11	Champua	3	60	401	300589	155244	56366	6996	4771	11767	12	8
12	Jeypore	5	96	713	458111	239359	125086	43048	8828	51876	34	7
13	Malkangiri	7	108	878	469582	284371	115886	45962	28531	74493	40	25
14	Kuchinda	3	55	499	241773	138578	56102	12085	--	12085	22	--
15	Rayagada	4	76	1122	357281	229092	61744	9719	1056	10775	16	2
16	Nabarangpur	10	169	890	972902	558456	207806	9132	2872	12004	4	1
17	Sundaragr	9	136	732	630139	400959	124857	43865	5472	49337	35	4
18	Kapilpada	4	64	488	328065	218675	58102	22473	3545	26018	39	6
19	Rairangpur	7	71	757	443341	223301	84914	21492	5158	26650	25	6
20	Koraput	9	130	1231	532552	316197	8726	4052	1407	5459	46	16
21	Keonjhar	7	158	1152	704950	401798	110609	25927	4207	30134	23	4
TOTAL		118	1866	17480	8943175	5221743	1483397	343002	88978	431980	23	6

In Orissa, 23% during Kharif and 6% during Rabi of the net area sown has irrigation facilities within the ITDA areas as compared with those of the whole State that is 35% and 20% respectively during Kharif and Rabi

* * *

CHAPTER – 2

OBJECTIVES,

SCOPE

AND

METHODOLOGY

Objectives

The evaluation study has been undertaken with following objectives.

- To review the scheme guidelines.
- To see whether the Projects are implemented in conformity with the feasibility study, scheme guidelines and stipulated financial norms.
- To assess the impact of the project on enhancement of productivity of the land brought under irrigation.
- To assess the increase in farm income of the beneficiary.
- To assess the increase in use of inputs.
- To assess the level of employment generation for both family labour and hired labour.
- To assess the improvement in socio-economic status of the beneficiaries.
- To find out implementation lags, if any and suggest remedial measures.

Scope

Agriculture is the mainstay of the tribal people of Orissa. It is characterized by low productivity coupled with poor or lack of irrigation facility. The irrigation potential in tribal areas is very low for which the tribal farmers depend on rainfed farming. Under the Tribal Sub Plan (TSP) strategy, after grounding of ITDAs in TSP areas, considerable emphasis has been given to augment the irrigation potential of the area to increase productivity of land. Since irrigation constitute to be a critical infrastructure for income generation, a large number of mini irrigation projects have been constructed in tribal areas to provide assured irrigation facility incurring heavy expenditure. Under this backdrop, it is felt imperative to conduct an impact evaluation study of the mini irrigation projects in selected ITDAs located within the TSP area of the State.

Methodology

The study was conducted in four ITDA areas during December, 2007 to March, 2008. Only four ITDAs out of 21 were taken for the study keeping in view the shortage of staff for collection of primary information since two more studies were conducted simultaneously by the Institute. The four ITDAs

namely, Nilagiri, Bonai, Paralakhemundi and Thuamul Rampur were selected through purposive sampling method keeping in view to cover each Revenue Division of the State.

It may not be out of place to mention here that during the 4th Five-Year Plan, 4 Tribal Development Agencies (TDAs) namely Paralakhemundi, Gunupur, Keonjhar and Baliguda coterminous with respective sub-divisions were established for integrated development of the area and tribal people on pilot basis. Earlier the tribal development (TD) blocks were taken as the administrative units for implementation of tribal development programmes.

1. Nilagiri ITDA Nilagiri ITDA comes under Central Division and it covers only one block namely Nilagiri. It appears that thrust has been given by the ITDA for overall improvement of the socio-economic status of the tribals and focus has been given for implementation of all the development schemes successfully in that block.
2. Bonai Bonai ITDA is the first of its kind since the first project report on Bonai ITDA in the country was discussed in Home Ministry as well as Planning Commission, GoI during the year 1975. Bonai ITDA covers 4 blocks. It is obvious that the tribals in this area have availed the benefits of ITDA for a longer period as compared to other ITDAs.
3. Paralakhemundi From Southern Division, Paralakhemundi ITDA was selected because of existence of a good number of MIPs, WHS, Diversion Weirs, Cross Dams, LIPs. Being one of the oldest ITDAs, it is presumed that maximum thrust has been given for execution of different development programme in the ITDA area. The area of operation of Paralakhemundi ITDA is extended to 5 blocks.

4. Thuamul Rampur Thuamul Rampur ITDA was selected as it comes under KBK districts and located in Southern Division. More over, this ITDA covering 2 blocks is the most drought prone area and needs special attention to improve the farm income of the tribal community.

The villages in the ITDA area were selected through Simple Random Sampling method. The beneficiaries of the projects available in the selected villages were interviewed personally.

Collection of Data

Data have been collected from primary as well as secondary sources. The primary sources data were collected from the beneficiaries of the mini irrigation projects through personal interview, group discussion and village schedule. Secondary sources data were collected mainly from the ITDAs. The following schedules were used for data collection.

1. Household Schedule
2. Village Schedule
3. Focus Group Discussion Schedule
4. Project Schedule

Coverage

For the purpose of the study, the farmers who have been benefited by the mini irrigation projects like Water Harvesting Structures (WHS), Diversion Weirs, Cross Bunds, Weir Dams, River Lifts, Shallow Tube Wells, Dug Wells etc executed by the ITDAs in the selected villages were taken into the purview of study.

Reference Period of the Study

For the purpose of study, the mini irrigation projects were taken from their inception to 2006-07. The wide period has given a scope to study the impact of the old projects on farming and the current status of these projects. The fieldwork for data collection was taken up during December 2007 and January 2008.

Limitations of the Study

Availability of investigators for data collection was the major limitation for the study as simultaneously two more studies were undertaken for which adequate number of in-house staff could not be made available during the period for field work. Outsourcing of required manpower was not possible as the project did not have financial provision for the same. However, services of two in-house staff (Statistical Assistants) along with two outsourced staff (Research Scholars) were utilized for collection of primary as well as secondary data. Besides, December-January, being the harvesting and threshing season mainly for paddy, the major kharif crop of the State, it hindered availability of the beneficiaries for personal interview. In view of the situation, the investigators utilized the evening time for interview and group discussion with major group of tribal farmers.

* * *

CHAPTER – 3

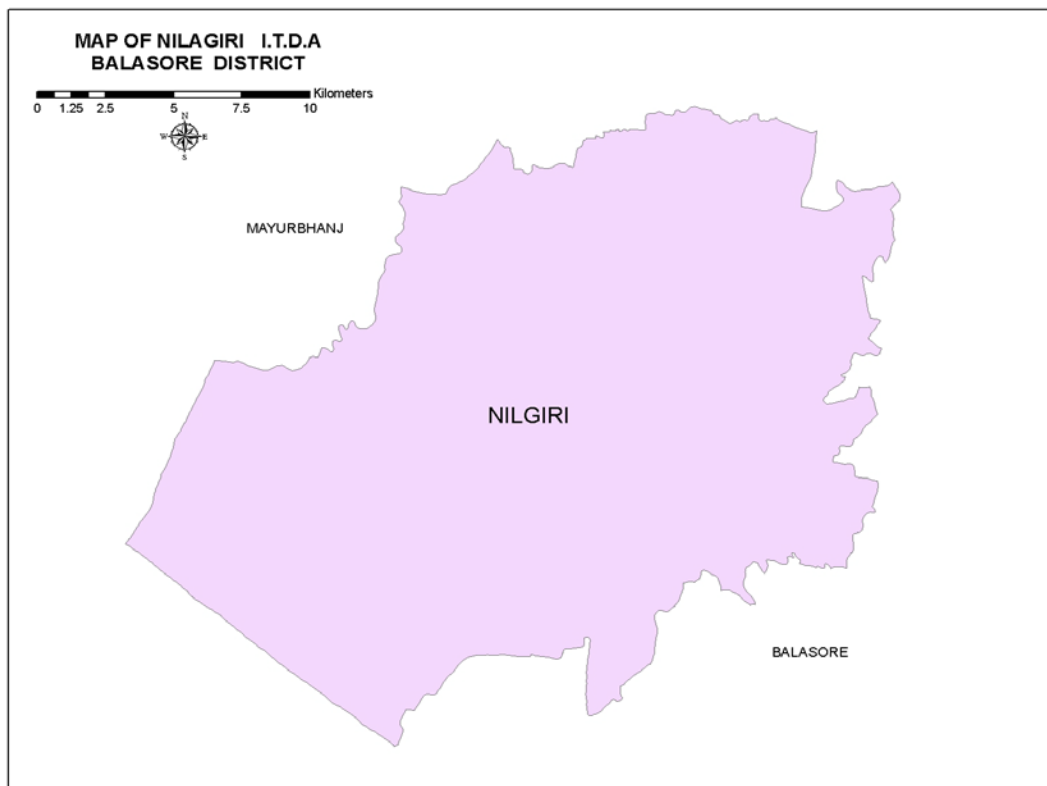
SAMPLE ITDAs

AT A

GLANCE

Nilagiri ITDA

Nilgiri ITDA area lies between 86° 60'E to 86° 85'E Longitude and 21° 55' N and 21° 79' N Latitude. It is coterminous with Nilgiri C.D Block and Nilgiri Sub-Division in Balasore District of Orissa. The ITDA area comes under the North Eastern Coastal Plain agro-climatic zone. The climate of the zone is moist sub-humid with mean annual rainfall of 1568 mm. The soil is red lateritic. The project area is mainly a rolling plain with rising and falling gentle slopes and is studded with innumerable rocky mounts and hills. Parts of the Project area consists of open plains, well cultivated land and watered patches during the rainy season by natural streams and rivers. Forest covers an area of 956 hectares of the project area. The chief species grown in the forest are Sal, Piasal, Asan, Sishu, Kurum, Bandhana, Kendu, Gambhari and mango. As per 2001 census, the total population of Nilagiri ITDA area was 1,10,232 out of which 55975 were males and 54257 females. The sex ratio was 969 females per 1000 males.



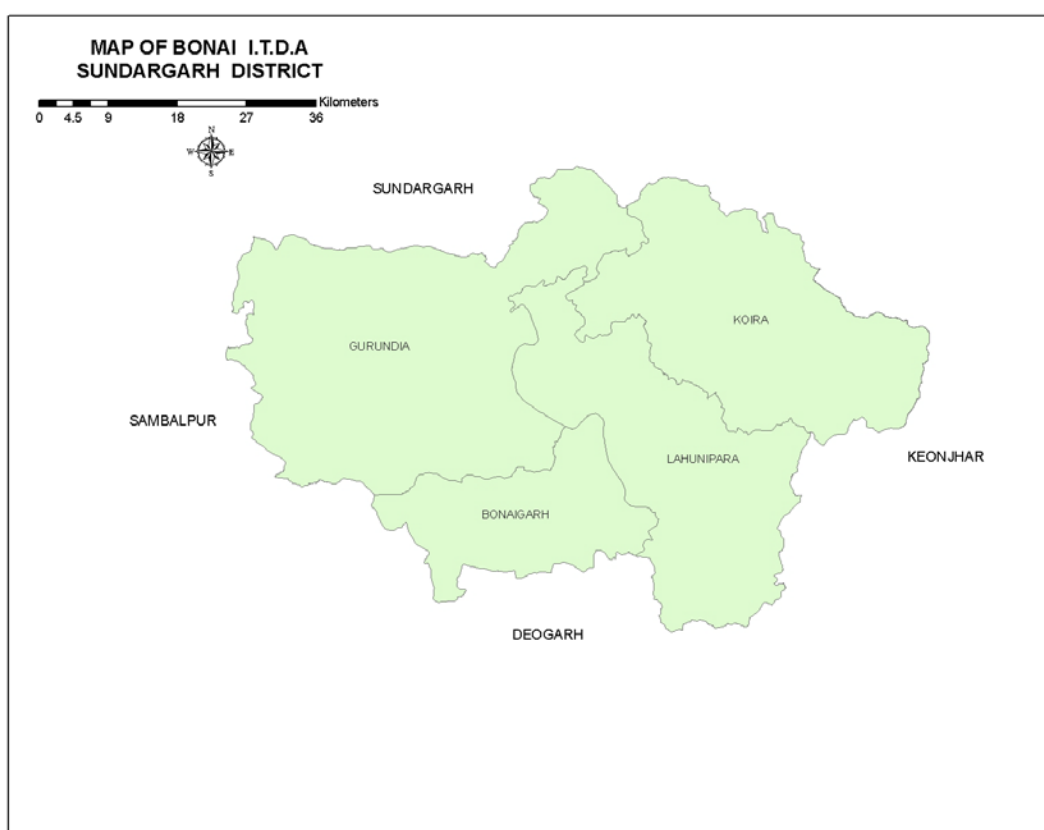
The density of population was 447 persons per sq km. The average population size per village and per household was above 800 and 6 respectively. There were 18,316 ST households with 61,356 population. The STs accounted for 55.66% of the total population of the ITDA area (2001 census). The proportion of ST population shows a marginal rise by 1.79 % in 2001 as compared to 1991. As per 2001 census, the general literacy rate is estimated at 56.60 % as against 43.89 % in 1991. Though there is a rise of literacy of ST from 15.60 % in 1971 to 22.46 % in 1991, still they are educationally lagging far behind the total population and SCs. As per 2001 census the work force in Nilagiri ITDA area comprises about 37 % of its total population. Among the males and females 53.71 % and 18.83 % are workers respectively. The main work force in Nilagiri ITDA area comprises about 32 % of its total population and 77 % of it depend on agro-based economy. The cultivators constitute 34.46 % of the work force, agricultural labourers comprise another 41.44% and 1.12 % earn their livelihood from allied agricultural activities, like 'livestock, forest and fisheries'.

Agriculture is the mainstay of the area and people. It is supplemented by collection and sale of minor forest produce, hunting and food gathering. The shifting cultivation, which was a practice by the STs in the eighties, is not of any concern now. Rice is the principal crop supplemented by mustard and niger oil seed. The people are accustomed now with horticulture including vegetable and other cash crop cultivation. Lac cultivation has been revived and found beneficial. Bee keeping and leaf cup and plate making with value addition have been popularized and also rewarding. Mainly money is the medium of exchange in all the economic transactions; yet barter system is still in vogue in the interior tribal pockets.

Bonai ITDA

Bonai is one of the subdivisions of Sundergarh district having 4 blocks namely Bonaigarh, Lahunipada, Koida and Gurundia. Bonai derives its name from its forest (bana) which covers almost one-tenth of district. The Project area is chiefly an isolated hilly tract with an average elevation of about 800 ft. above the sea level. It is shut on all sides by forest clad hills intersected by a

few passes or gorges which connect it with the surrounding areas. The ITDA area comes under the North Eastern Plateau agro-climatic zone with hot and moist sub-humid climate and mean annual rainfall of 1600 mm. The broad soil groups are red, brown forest, red & yellow, mixed red and black. The major flora of the forest area is Sal, Piasal, Assan, Mahul, Kendu, mango and jackfruit trees. Some cultivated lands in Bonai I.T.D.A. are along the river valleys lying between hill ranges. There are 21 Irrigation Projects in Bonai I.T.D.A. area. These irrigation Projects comprise a catchment area of 459 hectares. These irrigation projects are designed to irrigate 6178 hectares of cultivable land.



As per 2001 census, total population of the ITDA area is 2,77,001 out of which male and female population are 1,39,336 and 1,37,665 respectively. Density of population per square km is 119 and average population per household is 4 in respect of all the four blocks. S.T. population comprises 67.68% of total population with 67.38% of S.T. males and 67.98% ST females. S.T. concentration is the highest (80.37%) in Gurundia block, followed by Koida block (71.95%) and the lowest (54.10/%) in Bonaigarh block. S.C. population who constitute 7.54% of the ITDA population is the highest (12.55%) in

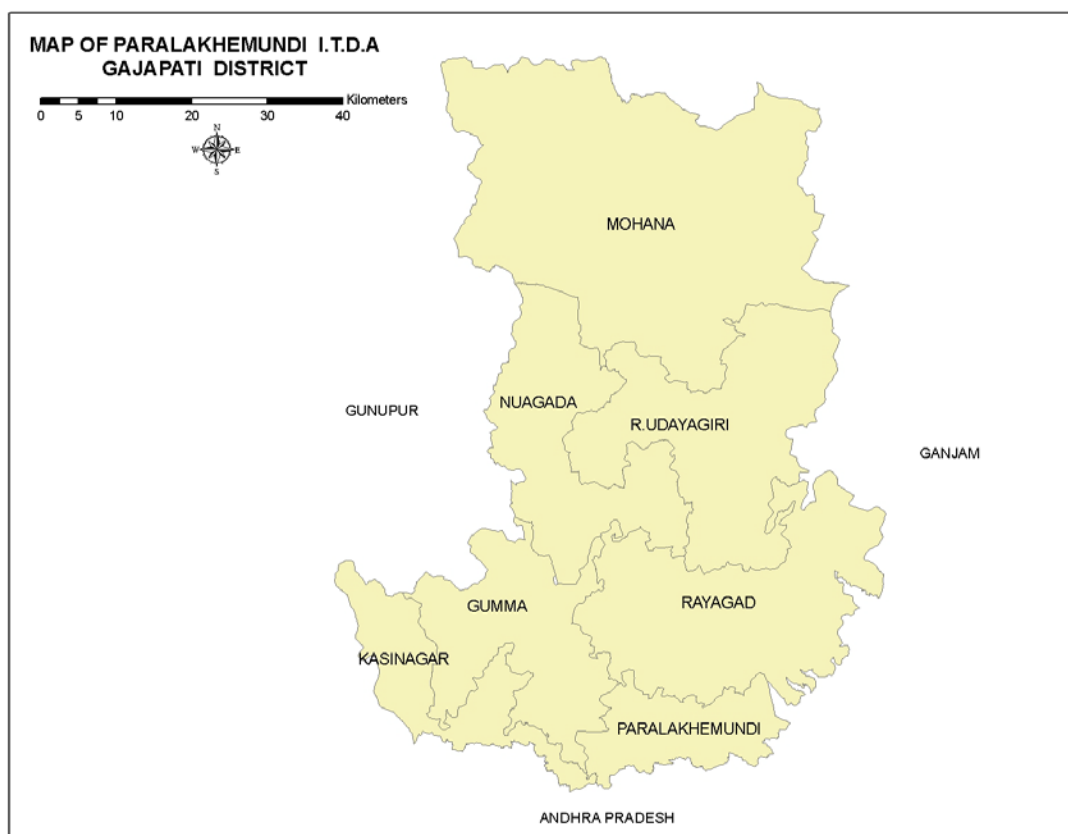
Bonaigarh block and the lowest (4.53%) in Gurundia block. The literacy rate for S.C. population (43.61%) is higher in comparison with that of total population (39.62%) and S.T. population (29.99%). But among STs, the literacy percentage is the highest (36.03%) in Bonaigarh block and the lowest (24.25%) in Gurundia block. In the I.T.D.A. area, the workers constitute 46.57% of the total population. The share of male workers is 53.68% against 39.36% of female workers. Out of total workers, the main workers constitute 54.08% and the marginal workers 11.81%.

In the I.T.D.A. area, the Kisan, Bhuinya, Gond, Kolha are dominant ethnic groups along with Pauri Bhuniya, one Primitive Tribal Group (PTG) of the state. Tribals have household industries like hand pounding of rice, rope making, basket making, pottery etc. The rich forest growth also provides them a source of livelihood. The steel, fertilizer and cement industries also provide them employment facilities. The main economic activities of the tribals of the area are agriculture, supplemented by shifting cultivation, collection and sale of minor forest produce, hunting and food gathering. Rice is their principal crop supplemented by mustard and niger. In course of time, tribal communities have been monetized; however, barter system still prevails in interior areas.

Paralakhemundi ITDA

Paralakhemundi ITDA is coterminous with Gajapati district and it comprises of one revenue subdivision (Paralakhemundi) having 5 blocks (Gumma, Rayagada, Nuagada, R. Udayagiri & Mohana). The ITDA comes under the North Eastern Ghat agro-climatic zone with mean annual precipitation of 1597 mm. The broad soil groups are brown forest, lateritic alluvial, red, mixed red and black. Out of total forest area of 2351.11 sq. kms. in the district, 446.12 sq. kms are reserve forest. The major/ minor forest produce are timber, bamboo, hill broom, soap nut, Marsinga leaf, Dhatuki flowers, Kochila seeds, Genduli gum, Siali leaves etc. Teak, Sal and Gambhari are the main forest species in the area. The soil and climate is suitable for plantation crops and there is a great potential for horticultural development in the district. More than 60% of lands are situated in hilly terrain, which has been treated as

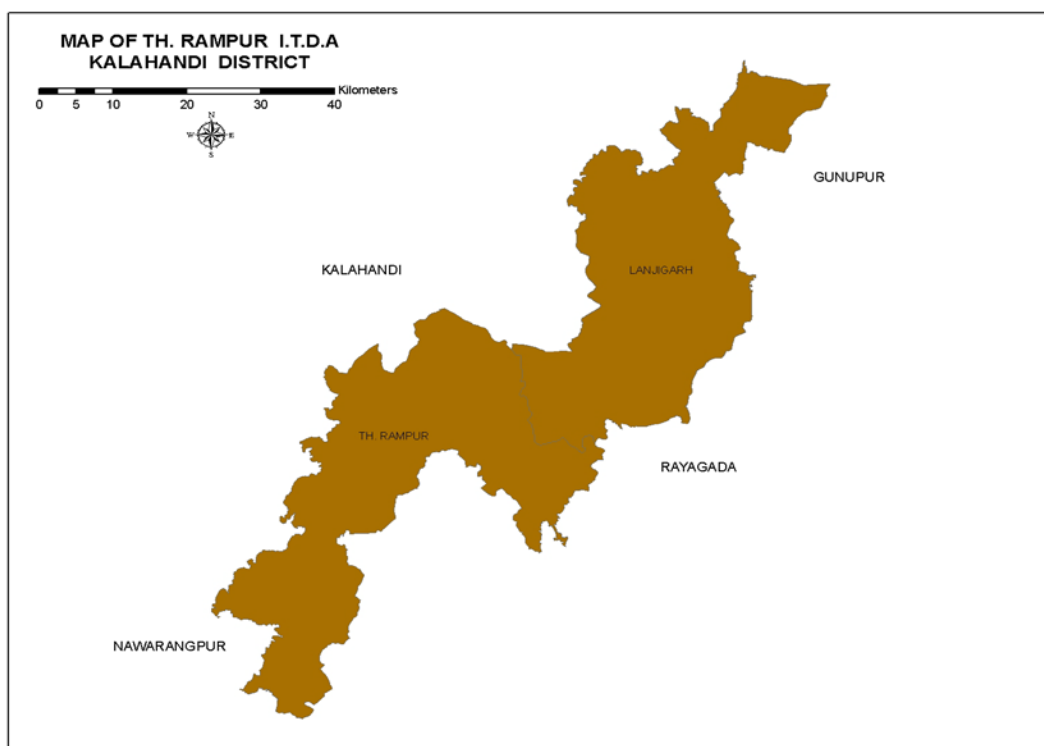
highlands mainly suitable for horticulture plantation. Other cultivable land belongs to the category of medium lands (20%) and low lands (15%).



The total population of the area as per 2001 census is 3,47,422 with 1,70,142 males and 1,76,880 females. Density of population is 97 per square km and average population per household is 5. ST population comprises 68.44% of total population with almost 1:1 male and female population. The SC population is 3.33% of total population. According to 2001 census, the total number of workers in Paralakhemundi ITDA is 1,92,841 with 1:1 ratio of male and female. The total number of main workers is 1,23,625 (61% male and 39% female). The major occupation is cultivation followed by earning from agricultural labour. The Saora tribe has the highest concentration i.e. 1,75,519 persons while Gudia caste with 20 persons has the lowest concentration in Paralakhemundi ITDA. Besides, Kumuti Keuta, Teli are also residing in the area. There is one primitive section of the Saora tribe called Lanjia Saora who have been identified as a PTG.

Thuamul Rampur ITDA

Thuamul Rampur ITDA comprises of 2 blocks (Thuamul Rampur & Lanjigarh), 37 GPs and 778 villages. The total forest area of the ITDA is 42,061 (56.64%) hectares out of which 21,710 hectares lies in Thuamul Rampur block, and 20,351 hectares in Lanjigarh block. The area comes under the western undulating zone with hot & moist sub-humid climate and mean annual rainfall of 1352 mm. Red, Mixed Red & Black and Black are the broad soil groups in the area. The ITDA has broadly two physiographic regions i.e. the hilly region and the plateau region.



The forest area constitutes 5.66% of the project area. The chief species grown in the forest are teak, Sal, Asan, Dharua, Mohul, Harida, Bahada, Kasi, Jamun, Bija, Bandhan, Sisu, Kusuma, Amla, Bel, Simul, etc. Bamboo forests are also found abundantly in the area. Besides, gold mohur, Chandan trees are planted recently in the area by the Government. Village peripheries are covered with mango, jackfruit and tamarind trees. Various tribal communities inhabit the ITDA area. Among them the Kutia Kondh, a primitive section of the Kondh tribe

is identified as a PTG. The Binjhal and Saora tribes are settled agriculturists and agricultural labourers. The other tribal groups, namely the Sounti, Gond and Kandha live in close interaction with the neighboring caste people.

Total population of the ITDA area is 1,40,912 out of which males constitute 49.36% and females 50.64%. Lanjigarh block has larger population (75,145) in comparison to that of Th.Rampur block (65,767). The density of population is 190 per sq. km in the ITDA area. Average population per household in both the blocks is 4. In the ITDA area, the percentage of ST population to total population is 52.90%. ST males constitute 52.53% and females 53.27%. ST concentration is more (57.55%) in Th. Rampur block in comparison to that of Lanjigarh block (48.83%). Total SC population constitutes 24.82% of the ITDA population. The total literacy rate for SC population (17.50%) is higher to that of the total population (14.43%) and ST population (9.70%). Among total population and ST population the literacy rate is higher in Lanjigarh block with respect to total population (14.61%) and ST population (12.49%) in comparison to Th. Rampur block. The total literacy of the ITDA area over a decade (1991-2001) has increased by 8.12%. In the ITDA area, out of total population of 1, 40,912, the workers constitute 71,159 (50.50%). Out of total workers of the ITDA area, the main workers constitute 59.11% and the marginal workers 40.89%.

* * *

CHAPTER – 4

LAND USE PATTERN AND IRRIGATION POTENTIAL OF THE SAMPLE ITDAs

NILAGIRI ITDA

Land Utilisation Pattern

Out of 24,661 hectares of total land area in Nilagiri ITDA, 14,761 hectares (59.85%) are arable land, 956 hectares (3.88%) are forest land, 3032 hectares (12.29%) are cultivable wasteland while 1251 hectares (5.08%) are pasture and grazing land and 332 hectares (1.35%) are covered under trees and groves.

The land use pattern indicates 656 hecets (18.65%) land as barren, 2658 hecets (10.78%) as land put to non-agricultural use and 1014 hecets (14.80%) as current and other fallows.

Land Utilisation Pattern

(Area in hectare)

Block	Fore st area	Misc. tree/ groves	Past ure	Cultiva ble waste	Land put to non- agricultu ral use.	Barr en land	Current fallow	Net area sown	
								Kharif	Rabi
Nilagiri	956	332	1252	656	2658	656	1014	14340	8732

In Nilagiri ITDA, the area under cultivation during *kharif* season is 14,340 hectares. The per capita land comes to 1.53 hecets. Of the total cultivable area, 2248 hectares are (15.68%) high land, 5355 hectares are (37.34 %) medium lands and 6737 hectares are (46.90 %) low lands. The Table below explains the cultivable area in *kharif* season and the area irrigated during *kharif* and *rabi* seasons.

Area under cultivation and Irrigation

(Area in hectare)

Block	Cultivable area				Area irrigated	
	High	Medium	Low	Total	Kharif	Rabi
Nilagiri	2248	5355	6737	14340	4570	1381

The major crop grown in the area is paddy followed by mustard and niger. The other agricultural crops of the area are wheat, maize, *ragi*, green gram, horsegram, til, groundnut, potato, jute and sugarcane.

As many as 266 (3.41%) ST households were depending on shifting cultivation. Of them, 20 (7.52%) households were depending on shifting cultivation fully and 246 (92.48%) households partly to eke out their livelihood (UBMS, 1978-79). At present, shifting cultivation is not of any concern of the area. The injunctions of Forest and Wildlife Conservation laws in and around the Similipal National Park have curbed the practice of shifting cultivation by the tribals.

Some part of the project area consists of open plains, well cultivated land and watered patches during the rainy season only by natural streams and rivers. The river Sono is the major river and the hill streams, like Ghogra, Tangana and Kamla, which provide irrigation facilities to some extent during *kharif* season. As many as 12 MIPs and river lift points operate in this TSP area. The existing Irrigation facility is given below.

Distribution of Existing Irrigation Projects
Area in hectare

Block	Medium Irrigation Project		Minor Irrigation Project		L.I. Point		Dug Well		Total	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Nilagiri	1242	-	2912	1082	351	269	65	30	4570	1381

- *Kharif* and *rabi* irrigation potential in the project area are 4570 hectares are 1381 hectares respectively.
- Minor irrigation projects have major contribution towards creating irrigation potential i.e. 2912 hecets during *kharif* and 1082 during *rabi*. Next to minor irrigation projects, medium irrigation projects irrigate 1242 hecets in *kharif*. LI points and dug wells also have good contribution towards enhancing the irrigation potential of the area.

BONAI ITDA

Land Utilization Pattern

In this ITDA the forest area occupies the highest acreage followed by net area sown. Block wise land utilization pattern is given below.

Block wise Land Utilization Pattern (Area in hectare)

SI No	Block	Forest Area	Misc Tree / Grooves	Pas-ture	Culti Vable Waste	Land put to non agri-cultural use	Barren Land	Current fallow	Other fallow	Net area sown
1.	Bonaigarh	14,709	46	1,027	1,124	1,624	771	2,914	626	9,943
2.	Lahunipada	11,125	40	2,717	2,806	2,442	30,910	3,137	1,665	12,924
3.	Koira	19,221	59	1,538	5,760	2,010	12,144	5,233	2,925	7,297
4.	Gurundia	21,547	23	1,844	5,196	1,948	7,277	3,608	2,551	13,333
	Total	66,602	168	7,126	15,086	8,024	51,12	14,862	7,767	44,497

The Table below shows that out of total cultivable land of 59,383 hecets 6239 hecets are irrigated during *kharif* where as the irrigation potential during *rabi* is 1338 hecets i.e, 22% of *kharif* irrigation potential.

Area under Cultivation and Irrigation

(Area in hectare)

SI No	Block	Total cultivable area	Irrigated area	
			Kharif	Rabi
1.	Bonai	11,067	1,404	308
2.	Lahunipada	16,730	3,351	639
3.	Koida	13,057	1,357	309
4.	Gurundia	18,529	127	82
	Total	59,383	6,239	1,338

The highland in Bonai ITDA is the potential resource for horticultural programme including fruit crops, flowers, spices, roots and tubers, aromatic plants and herbal gardens. The medium lands are suitable for vegetable cultivation. Its agro-climatic condition and soil type support a wide range of

horticultural crops. Under different development programmes, medium land has been developed with fruit trees like banana, mango and lime and equal area has been covered under vegetables like tomato, cauliflower, cabbage, radish, beans, spices like ginger, turmeric, chilli, coriander leaf and tuber crops like yam, colocasia.

Block wise distribution of Existing Irrigation Projects
Area in hectare

SI No	Block	Minor Irrigation Project		Lift Irrigation Project		Total	
		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.	Bonai	1267	100	137	208	1404	308
2.	Lahunipada	3240	530	111	109	3351	639
3.	Koida	1353	300	4	9	1357	309
4.	Gurundia	42	-	85	82	127	82
	Total	5902	930	337	408	6239	1338

- Irrigation potential during *kharif* is 6239 hecets and during *rabi* is 1338 hecets.
- The area irrigated by minor irrigation projects during *kharif* (3240 hecets) as well as during *rabi* (530 hecets) is the highest in Lahunipada block.
- Lift irrigation projects provide maximum irrigation to Bonai block both in *kharif* and *rabi* (137 hecets and 208 hecets respectively) followed by Lahunipada and Gurundia.
- Area under irrigation through lift irrigation projects in Koida block is too low both in *kharif* and *rabi*.
- There is no major and medium irrigation project in the ITDA area.

PARALAKHEMUNDI ITDA

Land Utilization Pattern

According to 2001 Census barren land (1,19,039 hecets) occupies the highest area in terms of land utilization pattern in Parlakhemundi ITDA, while

cultivable waste (3,418 hecets) occupies the least. The forest area is 67,247 hecets and the net area sown is 71,753 hecets in this ITDA.

Block-wise Land Utilization Pattern
(Area in hectare)

Sl. No.	Block	Forest area	Misc trees & groves	Pastures	Cultivable waste	Land put to non agricultural use	Barren land	Current fallow	Other fallow	Net area sown
1.	Mohana	21766	401	3467	1049	2336	43601	3349	1761	13146
2.	R.Udayagiri	9710	66	1948	915	1275	22315	2102	698	7687
3.	Nuagada	20505	497	1522	433	680	14661	585	1556	6078
4.	Gumma	12223	1714	1220	309	1711	15317	918	542	7340
5.	Rayagada	3043	1905	759	712	1029	23145	1827	2283	7502
ITDA Total		67247	4583	8911	3418	7831	119039	8781	6840	71753

A major part of the cultivable area in Parlakhemundi ITDA mostly lies on highlands (40,305 hecets) followed by medium and low lands. *Kharif* irrigation potential (2927 hecets) is almost six times higher than that of *rabi* (494 hecets). As such the proportion of highland is large followed by medium and low land in all the blocks except a little variation in R.Udayagiri where the low land is little higher (1214 hecets) than medium land (1115 hecets).

Area under Cultivation, Irrigation and Per Capita Land holding
(Area in hect.)

Sl. No.	Block	Cultivable area				Irrigated area		Per capita land
		High	Medium	Low	Total	Kharif	Rabi	
1.	Mohana	9790	958	722	11470	503	106	0.09
2.	R.Udayagiri	7566	1115	1214	9895	502	90	0.17
3.	Nuagada	5644	538	433	6615	118	-	0.14
4.	Gumma	9885	1473	1398	12756	1399	126	0.19
5.	Rayagada	7420	1406	1154	9980	405	172	0.15
Total		40505	5490	4291	50716	2927	494	0.15

The major *kharif* crops are paddy, maize and ragi where as during *rabi* pulses like black gram and horse gram are grown under residual moisture.

Block wise distribution of Existing Irrigation Projects

Area in hectare

Sl. No.	Block	Minor Irrigation Project		Lift Irrigation Project		Total	
		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1	Mohana	466	70	37	36	503	106
2	R.Udayagiri	490	78	12	12	502	90
3	Nuagada	118	-	-	-	118	0
4	Gumma	1361	80	38	46	1399	126
5	Rayagada	217	10	188	162	405	172
Total		2652	238	275	256	2927	494

- Gumma block has got maximum irrigation potential both in *kharif* (1361 hecets) and *rabi* (80 hecets) from minor irrigation projects followed by R.Udayagiri and Mohana blocks.
- Lift irrigation projects have created maximum irrigation potential in Rayagada block both in *kharif* and *rabi* followed by Gumma block. Nuagada block does not get any irrigation during *rabi*.
- There is no major and medium irrigation project in the ITDA area.

THUAMUL RAMPUR ITDA

Land Utilization Pattern

Out of 90,075 hectares of the total land area in Th. Rampur ITDA, 36,793 hectares (40.35%) are arable land, 42,061 hectares (46.70%) are forest land, 5,314 hectares (5.90%) are cultivable wasteland while 2,854 hectares (3.17%) are pasture land and 320 hectares (0.36%) are covered under misc trees and groves. Total cultivable land available in the area is 42,107 hectares of which 5,314 hectares are cultivable wasteland and net area sown is 36,793 hectares.

The land use pattern show that 24% of the total land area is barren, 7% of land is put to non-agricultural use and 14% is fallow.

Block-wise Land Utilization Pattern
(Area in hectare)

Sl. No.	Block	Forest area	Misc trees & groves	Pastures	Cultivable waste	Land put to non agricultural use	Barren land	Current follow	Other fallow	Net area sown
1.	Th. Rampur	20351	282	2102	3161	3053	8156	5020	1944	21506
2.	Lanjigarh	21710	38	752	2153	3233	13502	1688	3993	15287
Total		42061	320	2854	5314	6286	21658	6708	5937	36793

The area enjoys a short monsoon. Most of the farmers of the area belonging to various communities are small and marginal farmers. The farmers follow mono crop system usually with long duration local paddy. Again the yield rate of different crops in the area is low due to lack of assured irrigation and ignorance of the majority of the cultivators to switch over to scientific method of farming.

Area under cultivation, irrigation and per capita land holding
(Area in hect.)

Sl. No.	Block	Cultivable area	Irrigated area		Per capita land
			Kharif	Rabi	
1.	Th. Rampur	24667	306	152	0.38
2.	Lanjigarh	17440	2406	824	0.23
Total		42107	2792	976	0.30

The area under cultivation is 42,107 hectares. The per capita landholding comes to 0.30 hectares. Only 3768 hectares (10.24%) of the total cultivable area are irrigated. Out of the total irrigated area, 2792 hectares (74.10%) are irrigated in *kharif* season and only 976 hectares (25.90%) in *rabi* season.

The major crop grown in the area is rice, supplemented by *ragi* and *kosala* (minor millet). The other agricultural crops of the area are maize, jowar, pulses like green gram, black gram, horse gram, red gram, cow pea, oil seeds like til, mustard, linseed, castor and groundnut. Besides, vegetables like potato,

tomato, onion, pumpkin and condiments like chilli, coriander, garlic, ginger, turmeric are also cultivated in the area.

The climate and topography of Th. Rampur block and Lanjigarh block are very much suitable for horticultural plantation. In Th. Rampur area mango, banana, pineapple, papaya, etc. are grown in a limited scale. But Lanjigarh area is noted for banana, orange, pineapple, papaya, guava, jackfruit etc. In these days cashewnuts are being grown on hill slopes including those affected by shifting cultivation.

The soil and climatic conditions of Thuamul Rampur area are suitable for coffee plantation. The average elevation of the area varies between 2500 feet to 3000 feet (750 mt. to 900 mt.) which is conducive to the growth of coffee plants. Now the coffee plantation has been taken up in the area as soil conservation measures.

**Block wise distribution of Existing Irrigation Projects
(Area in hectare)**

Sl. No.	Block	Minor Irrigation Project		L.I. Point		Total	
		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1	Th. Rampur	86	20	220	132	306	152
2	Lanjigarh	1726	368	760	456	2486	824
Total		1812	388	980	588	2792	976

- No major and medium irrigation Projects exist in the ITDA area.
- Minor irrigation projects cover 65% of the total irrigated area where as the contribution of LI points is 35%.
- Lanjigarh gets 8 times more irrigation from both the sources when compared to Thuamul Rampur block.

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CHAPTER – 5

PROFILE OF THE PROJECT AREA AND THE PEOPLE

Mini Irrigation Projects

During the period of study, 41 mini irrigation projects like WHS, Diversion Weir, Cross Dam, River Lift Project, Dug Well and Shallow Tube Well as mentioned below were taken into account from four ITDA areas covering 10 blocks and 237 beneficiaries.

Table - 2

Type of Irrigation Projects Selected

ITDA	Block	Type of Irrigation Project	No. of Projects selected	No. of households interviewed
Nilagiri	Nilagiri	Dug well	3	15
		Diversion Weir	3	18
		River Lift Project	2	10
		Shallow Tube Well	2	10
		Water Harvesting Structure	1	7
		TOTAL	11	60
Bonai	Bonai	Cross Dam	1	8
		Diversion Weir	1	8
		Water Harvesting Structure	1	8
	Gurundia	Cross Dam	1	7
		Diversion Weir	2	15
	Lahunipada	Cross Dam	1	5
		Diversion Weir	1	6
		TOTAL	8	57
	Paralakhemundi	Gumma	2	12
		Nuagad	1	6
		Rayagada	1	6
		Cross Dam	1	6
		River Lift Project	1	6
		Water Harvesting Structure	1	6
Paralakhemundi	R.Udayagiri	Diversion Weir	1	6
		River Lift Project	1	6
		Water Harvesting Structure	1	6
		TOTAL	10	60
	Th. Rampur	Diversion Weir	6	30
		Cross Dam	2	10
Th. Rampur	Lanjigarh	Diversion Weir	3	15
		Water Harvesting Structure	1	5
		TOTAL	12	60
		Total of 4 ITDAs	41	237

Project Details

In the selected four ITDAs like Nilagiri, Bonai, Parlakhemundi and Thuamaul Rampur, 41 mini irrigation projects were taken up under the study. The execution of work of almost all the mini irrigation projects covered under the study have been started during the same year of sanction and completed within one year. The actual expenditure has been limited to the estimated cost in all the projects and no excess expenditure has been incurred. The feasibility study has been taken up before sanction of the projects by the ITDAs in all the cases. All the projects have been approved by the Governing Body/ PLC of the ITDA before execution. During the discussion with the beneficiaries, it is understood that most of the beneficiaries have participated during the pre-irrigation survey for selection of location of the project. The interested beneficiaries have also participated during construction of the project as wage earners. These projects have benefited the ST farmers by their ayacuts. It is observed that almost all the projects are in good condition. Extension work of the head of the Water Harvesting Structure at Jharanaghati of Nilagiri block in Nilagiri ITDA and Diversion Weir at Jhankajharan in Gurundia block of Bonai ITDA were in progress during the period of survey. A few projects like WHS at Patbhaleri, Check Dam at Panimunda and Diversion Weir at Similibhata in Lanjigarh block need renovation. The details of the irrigation projects are presented in the Table below.

Sample blocks and villages

The study for Evaluation of Mini Irrigation Projects executed by the ITDAs was confined to 4 ITDAs covering 10 blocks and 39 villages. The following Table represents the list of ITDAs, blocks and villages taken up for the study.

Table - 4
List of Blocks and Villages Selected for the Study

ITDA	Block	No. of villages	Sl. No.	Name of the villages	
Nilagiri	Nilagiri	9	1.	Adiakhunta	
			2.	Jharanaghati	
			3.	Kamarkhalia	
			4.	Kandansahi	
			5.	Kusumia	
			6.	Pandasahi	
			7.	Sagnal	
			8.	Sirsasahi	
			9.	Telipal	
Bonai	Bonai	3	10.	Chandrapur	
			11.	Kasada	
			12.	Khajuribahal	
	Gurundia	3	13.	Jaloi	
			14.	Janda	
			15.	Jhankajharan	
	Lahunipada	2	16.	Gamardihi	
			17.	Mahulata	
			18.	Anjida	
Paralakhemundi	Gumma	2	19.	Rangada	
			20.	Palleri	
	Nuagad	1	21.	Abapur	
			22.	Ghatitala	
	Rayagada	4	23.	Lalusahi	
			24.	Sevakpur	
	R.Udayagiri	3	25.	Anagha	
			26.	Bidyadharpur	
			27.	Paribhata	
			28.	Balisara	
	Thuamul Rampur	Th.Rampur	6	29.	Dhuligada
				30.	Hardkhursi
31.				Ranidumer	
32.				Similipadar	
33.				Thuamul	
34.				Panimunda	
35.				Dengsargi	
	Lanjigarh	6	36.	Jharmunda	
			37.	Rengapali	
			38.	Patbhaleri	
			39.	Similibhata	
4	10	39			

Situation and Location of the Villages

Most of the villages in all the 4 ITDAs are situated either at the foot hills or hill slopes. A few villages are on plain land. Settlement pattern of the villages are varied. Some have scattered housing, some are linear and others have mixed pattern. More than 50% houses are with tiled roof and some houses are *kacha* with thatched roof. In Bidyadharpur village of R.Udayagiri block, Indira Awas houses were found. Most of the villages are well communicated to the bus stop within the distance of 5 kms. Location of most of the villages from GP headquarters is within 5 kms excepting only 6 villages which are at distance of 5 to 10 kms. This helps the farmers for easy accessability and use of inputs like fertilizers and pesticides which are generally available in the GP headquarters. Around 75% villages are located at a distance of more than 10kms from block headquarters which restrict the farmers to keep close liaison with the block headquarters for the purpose of getting modern inputs like improved/ hyv seeds, farm implements and technology. The farmers in 44% villages are within the radius of 5 kms of banking facility.

Distance from Village to Forest and Service Sectors

Around 2/3rd of the villages are close to forest and the villagers are availing the benefit of the forest resources by way of collection of minor forest produce. Only 25% and 64% of the villages are within the distance of 5 kms from Agriculture Extension Officers' headquarters and VAW headquarters respectively. Around 35% of the villages are getting the facility of seed sale centres within 5 kms. Almost 70% villagers have easy access to veterinary dispensary within a distance of 5 kms. Most of the villages are far from Agricultural Research Stations/ Krishi Vigyan Kendras (KVKs) and the services are not within the easy reach of the farmers.

Irrigation Facility

Availability of mini irrigation projects like WHS, Diversion Weir, Check Dam, Shallow Tube Wells, Dug Wells, Ponds and Tanks in the sample villages are presented in the Table below.

Educational Facility

The Primary school and ME school facility is available within the village in most of the cases and in some cases these are around 2 kms from the village. In case of a few villages, ME school is located at a distance of around 5 kms. The high school facility is available within 5 kms in about 70% villages. More than 40% villages do not have higher secondary education facility within 10 kms. Anganwadi facility is available in the close vicinity of the villages. Besides, the following Table gives a picture of the educational institutions established by the STSC Development Department around the villages.

Basic Amenities

Two-third of the villages are not electrified. 33 villages have the facility of internal CC roads in the streets. 5 villages lie close (within 2 kms) to pucca road. In 1/3rd of the villages, NGOs are working for promotion of education, adult literacy, health and sanitation, forest conservation etc. Drinking water facility has been created through open wells and tube wells in all the villages. Besides, natural springs are available in most of the villages in Paralakhemundi, Bonai and Thuamul Rampur ITDA areas.

Processing Industries

64% of the villages are having rice hauler and 20% of the villages have oil extraction units within the village. More than 75% villages have cottage industries like *khali* (paper palte) making and 25% villages have tailoring units. Besides, bamboo work unit, *bidi* making unit and bee keeping units are also available in some of the villages.

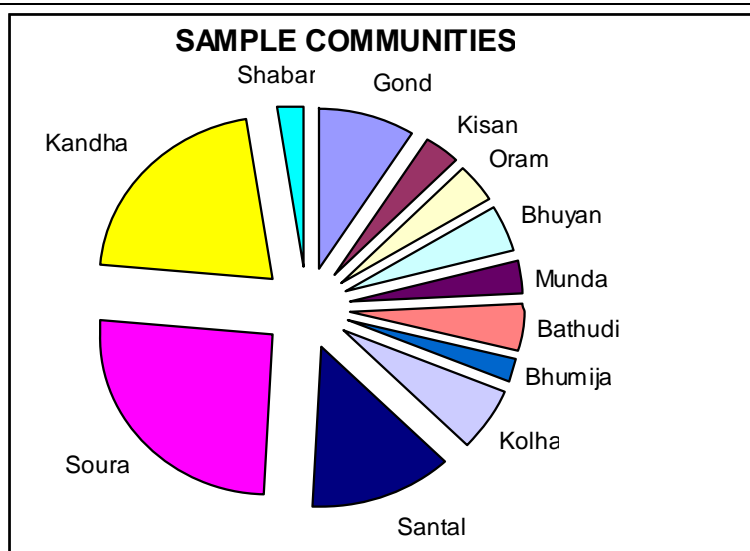
The following six Tables indicate the details of the sample villages with regard to the situation and location of the villages, distance from forest and different service sectors, irrigation facility, educational infrastructures, basic amenities like electrification, drinking water, communication and existence of processing industries like rice hauler, oil extraction units and cottage industries in and around the villages.

Tribal Communities

The following tribal communities were covered under the study in the four ITDAs. The list of the tribal communities along with block-wise number of households and the graphic representation are given below.

Table – 11
Block-wise List of Tribal Communities Studied

ITDA	Block	Tribal Communities	No. of households
Nilagiri	Nilagiri	Bathudi	10
		Bhumija	6
		Kolha	14
		Santal	30
TOTAL			60
Bonai	Bonai	Gond	18
		Kisan	5
		Oraon	1
	Gurundia	Bhuyan	11
		Kisan	3
		Oraon	8
	Lahunipada	Gond	3
		Munda	8
TOTAL			57
Paralakhemundi	Gumma	Soura	12
	Nuagad	Soura	6
	Rayagada	Soura	24
	R.Udayagiri	Soura	18
TOTAL			60
Thuamul Rampur	Th. Rampur	Kandha	30
	Lanjigarh	Kandha	25
		Shabar	5
TOTAL			60



Level of Education

Community-wise as well as block-wise educational status of the respondents is represented in following two Tables that includes illiterate and just literate to graduate.

Table - 12
Education Level of the Tribal Communities

Sl. No.	Tribal Community	Sample size	Illite- rate	Level of Education					Total lite- rates	% of Lite- racy
				Just lite- rate	Prim- ary	HSC	Inter- medi- ate	Gradu- ate		
1.	Gond	21	6	5	7	1	1	1	15	71
2.	Kisan	8	2	3	3	--	--	--	6	75
3.	Oraon	9	5	1	2	1	--	--	4	44
4.	Bhuyan	11	--	2	8	1	--	--	11	100
5.	Munda	8	3	2	2	1	--	--	5	63
6.	Bathudi	10	6	1	3	--	--	--	4	40
7.	Bhumija	6	2	3	1	--	--	--	4	67
8.	Kolha	14	6	3	5	--	--	--	8	57
9.	Santal	30	6	11	13	--	--	--	24	80
10.	Soura	60	25	17	13	3	2	--	35	58
11.	Kandha	50	36	7	11	1	--	--	19	38
12.	Shabar	5	3	2	--	--	--	--	2	40
TOTAL		237	100	57	68	8	3	1	137	58
% to total sample size		100	42	24	29	3	1	1	58	

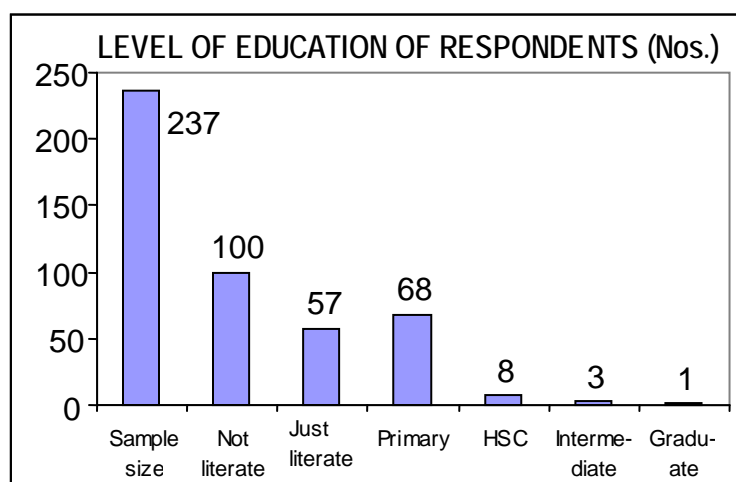
It is revealed from the above Table that 42% of the respondents are illiterates and 24% are just literates. Around 29% of the population has gone up to primary level of education where as the number of persons with HSC and college education is negligible. This is one of the major constraints for non-adoption of improved technologies of farming. The literacy position is highest in case of Bhuyan followed by Santal, Kissan and Gond mostly seen in Gurundia, Nilagiri, Bonai and Lahunipada block. This can be concluded that literacy position is better in Nilagiri and Bonai ITDA areas. This may be due to their proximity to townships like Balasore for the respondents of Nilagiri ITDA and Rourkela for those of Bonai ITDA.

Table – 13

Level of Education of the Respondents - Block-wise

ITDA	Block	Sam- ple size	Illite rate	Level of Education					Total lite- rate	% of Liter- acy
				Just- lite- rate	Pri- Mary	HSC	Inter- med- iate	Gra- du ate		
Nilagiri	Nilagiri	60	20	18	22	--	--	--	40	67
Bonai	Bonai	24	8	6	7	1	1	1	16	67
	Gurundia	22	5	4	11	2	--	--	17	77
	Lahunipada	11	3	3	4	1	--	--	8	73
TOTAL		57	16	13	22	4	1	1	41	72
Paralakhe mundi	Gumma	12	3	8	1	--	--	--	9	75
	Nuagad	6	4	--	1	1	--	--	2	33
	Rayagada	24	11	4	6	1	2	--	13	54
	R.Udayagiri	18	7	5	5	1	--	--	11	61
TOTAL		60	25	17	13	3	2	--	35	58
Thuamul Rampur	Th. Rampur	30	23	3	4	--	--	--	7	25
	Lanjigarh	30	16	6	7	1	--	--	14	47
TOTAL		60	39	9	11	1	--	--	21	35
G. TOTAL		237	100	57	68	8	3	1	137	58
% to total sample size		100	42	24	29	3	1	1	58	

It is seen from the above Table that literacy percentage is highest in Bonai ITDA (72%) followed by Nilagiri ITDA (67%). So far the block is concerned, Gurundia Block in Bonai ITDA has highest literacy percentage (77%) followed by Gumma Block in Paralakhemundi ITDA (75%). The graphic representation of the level of education is shown below.



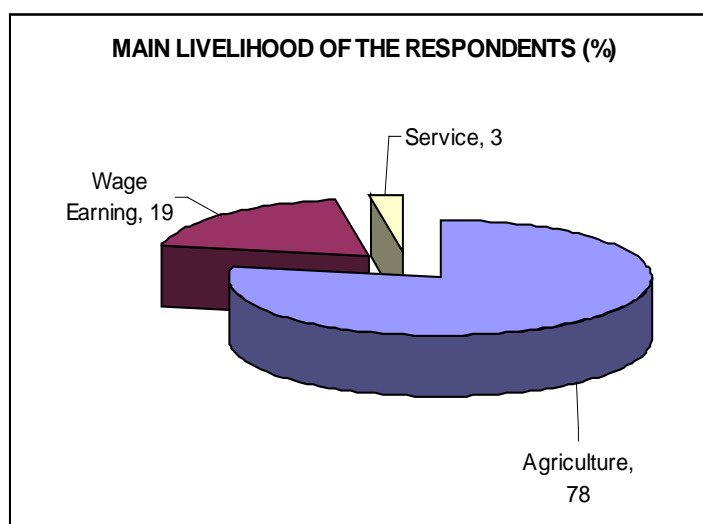
Livelihood

The major sources of livelihood of the tribal communities are agriculture and wage earning. Most of the villagers during group discussion expressed that they are getting labour intensive work through job cards provided to them by Government. Besides, they also engage themselves as agricultural labourers in the fields of neighbouring farmers.

Table – 14
Livelihood of the Respondents

ITDA	Block	Sample size	Main Livelihood		
			Agriculture	Wage Earning	Service
Nilagiri	Nilagiri	60	47 (78)	13 (22)	--
Bonai	Bonai	24	14 (58)	9 (38)	1 (4)
	Gurundia	22	12 (55)	8 (36)	2 (9)
	Lahunipada	11	5 (45)	5 (45)	1 (9)
TOTAL		57	31 (54)	22 (39)	4 (7)
Paralakhemundi	Gumma	12	12 (100)	--	--
	Nuagad	6	5 (83)	1 (17)	--
	Rayagada	24	16 (67)	6 (25)	2 (8)
	R.Udayagiri	18	18 (100)	--	--
TOTAL		60	51 (85)	7 (12)	2 (3)
Thuamul Rampur	Th. Rampur	30	29 (97)	1 (3)	--
	Lanjigarh	30	27 (90)	3 (10)	--
TOTAL		60	56 (93)	4 (7)	--
GRAND TOTAL		237	185 (78)	46 (19)	6 (3)

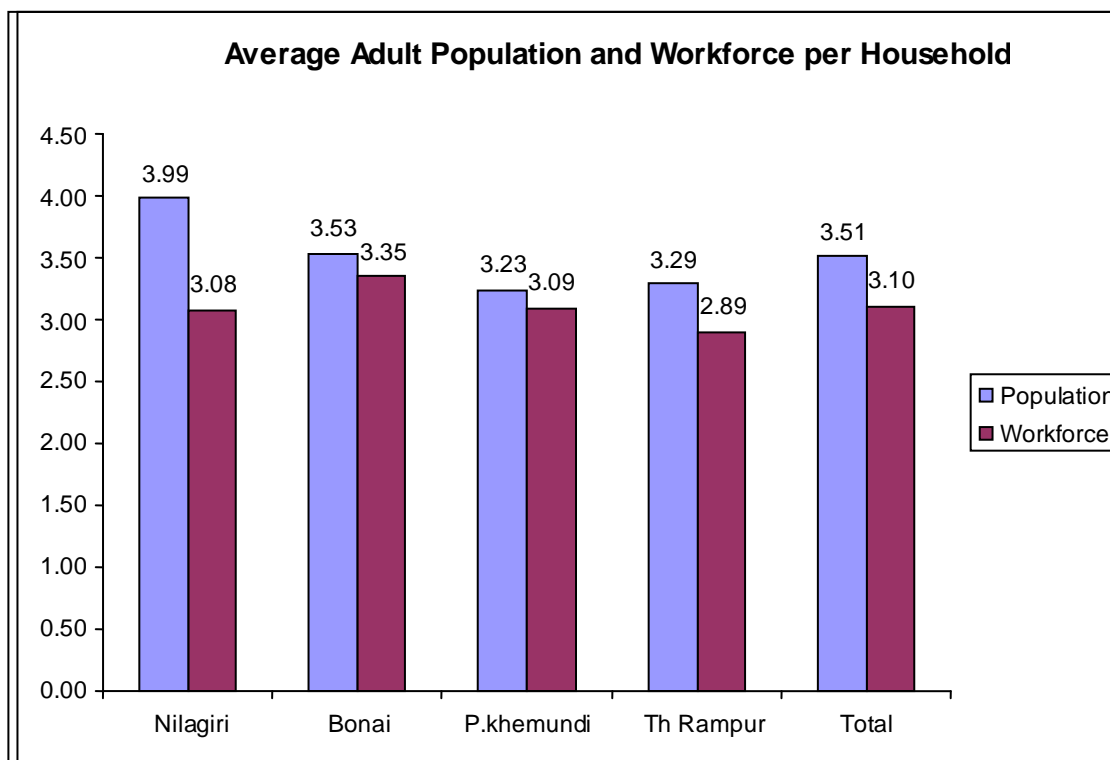
(Figures in the parenthesis indicate percentage)



During the course of study, it was seen that 78% of the tribal population depend on agriculture which is the primary source of their livelihood. About 19% of the tribals depend on wage earning. Only 3% of the sample population is engaged in service especially in Bonai area, which may be due to industrialization in Rourkela. It is revealed from the above Table that the members of Soura tribe in Paralakhemundi (85%) and Kondh and Shabar tribes in Thuamul Rampur ITDA area (93%) are mostly engaged in agricultural activities in comparison to other two ITDAs. The tribals in Bonai ITDA area (39%) are mostly engaged in wage earning in labour intensive work through their job cards. In Lanjigarh block 90% of the beneficiaries depend on agriculture but they have secondary source of income through wage earning in Vedanta Alumina Company which has come up in Lanjigarh.

Average Population, Work Force and Land Holding

The chart below represents the average population and workforce available per household.



The following two Tables represent the average population of the household including children, work force available in each household and the average size of land holding per household including own land and leased in land.

Table – 15
Average Population and Work force per Household

ITDA	Block	Adult		Children		Total	Work Force		% of Work Force		
		Male	Female	Male	Female		Male	Female	Male	Female	Total
Nilagiri	Nilagiri	2.12	1.87	1.07	1.12	6.18	1.70	1.38	80	74	77
Bonai	Bonai	2.04	1.88	1.17	0.71	5.80	2.00	1.63	98	87	93
	Gurundia	1.77	1.36	1.36	1.14	5.63	1.73	1.36	98	100	99
	Lahunipada	1.64	1.82	1.18	1.73	6.37	1.64	1.64	100	90	95
Average		1.86	1.67	1.25	1.07	5.85	1.82	1.53	98	92	95
Paralakhemundi	Gumma	1.17	1.42	1.42	0.67	4.68	1.00	1.25	85	88	87
	Nuagad	1.50	1.33	1.17	1.00	5.00	1.33	1.33	89	100	94
	Rayagada	1.33	1.63	1.08	0.88	4.92	1.25	1.54	94	94	94
	R.Udayagiri	2.28	1.89	1.06	0.78	6.01	2.28	1.89	100	100	100
Average		1.60	1.63	1.15	0.82	5.20	1.52	1.57	95	96	96
Thuamul Rampur	Th. Rampur	1.54	1.60	1.89	1.71	6.74	1.49	1.31	97	82	89
	Lanjigarh	1.72	1.76	1.52	1.56	6.56	1.56	1.44	91	82	86
Average		1.62	1.67	1.73	1.65	6.67	1.52	1.37	94	82	88
Average of 4 ITDAs		1.80	1.71	1.30	1.16	5.97	1.64	1.46	91	85	88

Table - 16
Block-wise Average Land Holding per Household
(Area in acre)

ITDA	Block	Pre-Project Period	Post-Project Period		
			Own land	Lease in land	Total
Nilagiri	Nilagiri	2.41	2.34	0.43	2.77
Bonai	Bonai	2.79	2.79	--	2.79
	Gurundia	2.79	2.80	--	2.80
	Lahunipada	1.96	1.96	--	1.96
Average		2.63	2.63	--	2.63
Paralakhemundi	Gumma	2.29	2.30	--	2.30
	Nuagad	1.34	1.34	--	1.34
	Rayagada	2.79	2.87	--	2.87
	R.Udayagiri	3.78	3.44	0.67	4.11
Average		2.84	2.77	0.20	2.97
Thuamul Rampur	Th. Rampur	3.14	3.14	0.24	3.38
	Lanjigarh	2.40	2.40	0.12	2.52
Average		2.83	2.83	0.20	3.03
Average of 4 ITDAs		2.67	2.64	0.21	2.85

Table – 15 reveals that average population per study household is 5.97 out of which the adult population is 3.51 and child population (below 14 years) is 2.46. The ratio of male and female adult is almost 1:1. The male workforce and female workforce is 1.64 and 1.46 per household which accounts for 91% and 85% respectively. As such the percentage of total workforce to total adult population comes to 88%. The higher percentage of this workforce has significant contribution in the process of farm production and income. The contribution of family labour is as high as 96% in Paralakhemundi area and 95% in Bonai area followed by 88% in Thuamul Rampur area and the lowest of 77% in Nilagiri area.

Table – 16 reveals that during the pre-project period the average land holding per household was 2.67 acres and it increased to 2.85 acres during post-project period. Although the increase is only around 7%, this shows positive impact of the irrigation projects by expansion in cultivated area and consequent increase in farm income. Out of the average cultivated land of 2.85 acres, the leased in land is 0.21 acre. The farmers are more inclined to cultivate more land by lease-in process in Nilagiri, R.Udayagiri, Th.Rampur and Lanjigarh blocks.

Classification of Farmers

The Chart and Table below show that most of the tribal farmers (56%) are marginal farmers having land up to 2.5 acres. The share of small farmers having land from 2.5 acres to 5 acres is limited to 37%. The percentage of big farmers having land more than 5 acres is very small i.e, only 7%. Comparatively there are more big farmers in Paralakhemundi and Th. Rampur ITDA areas.

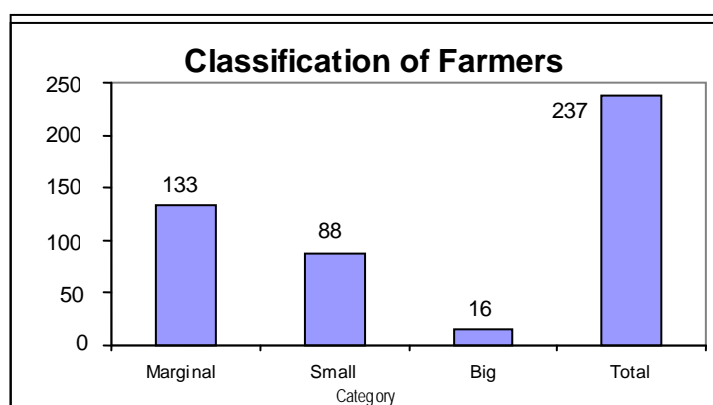


Table - 17
Classification of Farmers According to Size of Land Holding

ITDA	Block	Number of Farmers			
		Marginal <=2.5 ac.	Small >2.5 to 5 ac	Big > 5 ac.	Total
Nilagiri	Nilagiri	38 (63)	19 (32)	3 (5)	60 (100)
Bonai	Bonai	13	10	1	24
	Gurundia	10	10	2	22
	Lahunipada	8	3	--	11
Total		31 (55)	23 (40)	3 (5)	57 (100)
Paralakhemundi	Gumma	9	3	--	12
	Nuagad	5	1	--	6
	Rayagada	12	8	4	24
	R.Udayagiri	3	14	1	18
Total		29 (49)	26 (43)	5 (8)	60 (100)
Thuamul Rampur	Th. Rampur	15	11	4	30
	Lanjigarh	20	9	1	30
Total		35 (59)	20 (33)	5 (8)	60 (100)
Total of 4 ITDAs		133 (56)	88 (37)	16 (7)	237 (100)

Figures in the parenthesis indicate percentage.

Cultivated area and Irrigated area

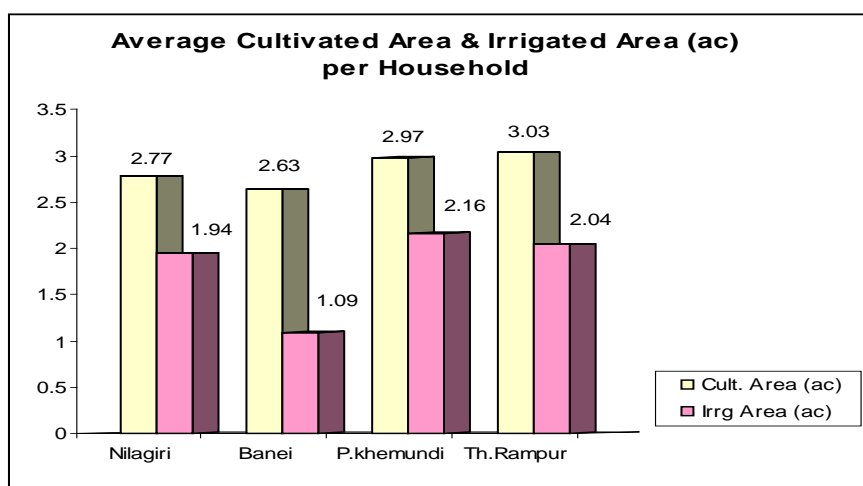
Block-wise and ITDA-wise average cultivated area per household along with irrigated area are presented below. The irrigated area contributes towards increasing cropping intensity resulting higher farm production and higher income.

Table - 18
Average Cultivated Area and Irrigated Area

ITDA	Block	Cultivated area in acre per household	Irrigated area in acre per household	% of irrigated area
Nilagiri	Nilagiri	2.77	1.94	70
Bonai	Bonai	2.79	1.04	37
	Gurundia	2.80	1.02	36
	Lahunipada	1.96	1.32	67
Average		2.63	1.09	41

ITDA	Block	Cultivated area in acre per household	Irrigated area in acre per household	% of irrigated area
Paralakhemundi	Gumma	2.30	1.96	85
	Nuagad	1.34	1.17	87
	Rayagada	2.87	2.36	82
	R.Udayagiri	4.11	2.36	57
Average		2.97	2.16	73
Thuamul Rampur	Th. Rampur	3.38	2.18	64
	Lanjigarh	2.52	1.84	73
Average		3.03	2.04	67
Average of 4 ITDAs		2.85	1.81	64

The average size of cultivated area and irrigated area per household in the sample studied is 2.85 acres and 1.81 acres respectively and as such 64% of the cultivated area is covered under irrigation through Mini Irrigation Projects. Cultivated area per household is maximum in Thuamul Rampur ITDA area (3.03 acre) followed by Paralakhemundi ITDA area (2.97 acre). The percentage of irrigation is 73% in Paralakhemundi area followed by 70% in Nilagiri area and 67% in Thuamul Rampur area. The percentage of irrigated area is lowest in Bonai area (41%). Comparison of cultivated area with irrigated area is represented in the following chart.



Source of Information

Before execution of the irrigation projects, the villagers got the firsthand information about the project from different sources which include extension personnel of Government departments, NGOs and neighbouring farmers. The Table below indicates the different sources of information.

Table - 19
Source of Information

ITDA	Block	Sample size	Source of Information						
			WEO	PRI	Other Deptt	NGO	Other beneficiaries	TV/ Radio	Print Media
Nilagiri	Nilagiri	60	42	--	2	--	16	--	--
Bonai	Bonai	24	5	--	9	--	10	--	--
	Gurundia	22	--	--	10	--	12	--	--
	Lahunipada	11	--	--	4	--	7	--	--
Average		57	5	--	23	--	29	--	--
Paralakhemundi	Gumma	12	7	--	--	--	5	--	--
	Nuagad	6	1	2	--	--	3	--	--
	Rayagada	24	--	18	1	--	5	--	--
	R.Udayagiri	18	7	6	--	--	5	--	--
Average		60	15	26	1	--	18	--	--
Thuamul Rampur	Th. Rampur	30	7	3	2	8	9	--	--
	Lanjigarh	30	10	5	2	1	11	--	--
Average		60	21	8	4	9	18	--	--
Average of 4 ITDAs		237	83	34	30	9	81	--	--
% to total sample size		100	35	14	13	4	34	--	--

It is observed that most of the beneficiaries could be able to know the information regarding the irrigation project to be executed from the Welfare Extension Officer (35%) and other neighbouring beneficiaries (34%). Other beneficiaries got information from Panchayti Raj Institutions (PRI), extension personnel of other departments and NGOs to the extent of 14%, 13% and 4% respectively. No farmer has got information from electronic media or print media.

* * *

CHAPTER - 6

IMPACT ON AGRICULTURE

Impact of Irrigation on Agriculture

The impact of mini irrigation projects on crop coverage was studied in the sample villages. Since paddy is the major crop of the State, impact analysis was taken up in detail for paddy vis-à-vis non-paddy crops. The impact on coverage of paddy as well as non-paddy crops during kharif and rabi/summer and the cropping intensity was analysed for pre and post project period which is presented below.

Table - 20
Impact of Irrigation on Crop Coverage

(Area in acre)

ITDA	Block	Pre-Project Period						
		Kharif			Rabi/Summer			Cropping Intensity (%)
		Paddy	Non-Paddy	Total	Paddy	Non-Paddy	Total	
Nilagiri	Nilagiri	142.90		142.90				100
Bonai	Bonai	67.00		67.00				100
	Gurundia	61.50		61.50				100
	Lahunipada	21.50		21.50				100
Total		150.00		150.00				100
Parlakhemundi	Gumma	23.00	4.50	27.50				100
	Nuagad	7.00		7.00				100
	Rayagada	61.00	19.50	80.50		0.50	0.50	101
	R.Udayagiri	29.00	25.00	54.00		1.00	1.00	102
Total		120.00	49.00	169.00		1.50	1.50	101
Th. Rampur	Th. Rampur	100.00		100.00				100
	Lanjigarh	74.00	1.00	75.00				100
Total		174.00	1.00	175.00				100
Total of 4 ITDAs		586.90	50.00	636.90		1.50	1.50	100.2

ITDA	Block	Post-Project Period						Cropping Intensity (%)
		Kharif			Rabi/Summer			
		Paddy	Non-Paddy	Total	Paddy	Non-Paddy	Total	
Nilagiri	Nilagiri	160.40		160.40	2.00	3.50	5.50	103
Bonai	Bonai	67.00		67.00		9.50	9.50	114
	Gurundia	61.50		61.50		16.50	16.50	127
	Lahunipada	21.50		21.50		16.00	16.00	174
Total		150.00		150.00		42.00	42.00	128
Parlakhemundi	Gumma	24.00	3.50	27.50	22.50	3.50	26.00	195
	Nuagad	6.50	0.50	7.00	7.00	1.00	8.00	214
	Rayagada	63.50	22.50	86.00	59.00	13.50	72.50	184
	R.Udayagiri	26.00	28.00	54.00	27.00	6.00	33.00	161
Total		120.00	54.50	174.50	115.50	24.00	139.50	180
Th. Rampur	Th. Rampur	99.00		99.00	38.50	16.00	54.50	155
	Lanjigarh	78.00		78.00	33.50	8.50	42.00	154
Total		177.00		177.00	72.00	24.50	96.50	155
Total of 4 ITDAs		607.40	54.50	661.90	189.50	94.00	283.50	143

It is revealed from the above Table that on the whole *kharif* paddy area has increased during post-project period especially in Nilagiri and to some extent in Lanjigarh block. Non-paddy area during *kharif* remains almost constant except a little increase in Paralakhemundi ITDA area when pre and post project period are compared. When *Rabi*/Summer cropping season is analyzed, it is observed that only 1.50 acre of non-paddy crop like black gram was grown in Rayagada and R.Udayagiri during Rabi. The paddy area during Rabi/Summer has increased from zero to 189.50 acre. Similarly there is also increase in coverage of non-paddy crops during Rabi/Summer up to 94 acres against 1.50 acres during pre-project period. Due to provision of life saving irrigation, the farmers have developed confidence to increase the paddy area during *kharif*. During *Rabi*/Summer, there is additional coverage of 282 acres of paddy as well as non-paddy crops. The non-paddy crops include wheat, ragi, maize, pulses, mustard, groundnut, sunflower and vegetables. The cropping Intensity during the Post-project period has increased to 143% against 100% during Pre-project period.

Table - 21
Crop Coverage during Pre and Post Project
(Area in acre)

ITDA	Block	Pre-Project			Post Project			% increase
		Kharif	Rabi	Total	Kharif	Rabi	Total	
Nilagiri	Nilagiri	142.90		142.90	160.40	5.50	165.90	16
Bonai	Bonai	67.00		67.00	67.00	9.50	76.50	14
	Gurundia	61.50		61.50	61.50	16.50	78.00	27
	Lahunipada	21.50		21.50	21.50	16.00	37.50	74
Total		150.00		150.00	150.00	42.00	192.00	28
Paralakhemundi	Gumma	27.50		27.50	27.50	26.00	53.50	95
	Nuagad	7.00		7.00	7.00	8.00	15.00	114
	Rayagada	80.50	0.50	81.00	86.00	72.50	158.50	96
	R.Udayagiri	54.00	1.00	55.00	54.00	33.00	87.00	58
Total		169.00	1.50	170.50	174.50	139.50	314.00	84
Th. Rampur	Th. Rampur	100.00		100.00	99.00	54.50	153.50	54
	Lanjigarh	75.00		75.00	78.00	42.00	120.00	60
Total		175.00		175.00	177.00	96.50	273.50	56
Total of 4 ITDAs		636.90	1.50	638.40	661.90	283.50	945.40	48

The above Table reveals that the gross cropped area has increased from 638.40 acre to 945.40 acre between pre and post-project periods. The increase of 48% in gross cropped area is the contribution of irrigation which ultimately adds to the farm income.

Adoption and productivity of paddy

The number of farmers who adopted cultivation of *kharif* and summer paddy and the productivity (yield rate) of paddy during pre and post project period is given below.

Kharif

Table – 22
Adoption and Yield rate of Kharif Paddy

ITDA	Block	Pre-Project Period		Post-Project Period		% increase in yield rate
		No. of farmers	Yield rate in Q/ac	No. of farmers	Yield rate in Q/ac	
Nilagiri	Nilagiri	57	4.95	60	10.29	108
Bonai	Bonai	24	4.79	24	9.67	102
	Gurundia	22	4.85	22	9.27	91
	Lahunipada	11	6.23	11	9.86	58
Average		57	5.02	57	9.46	88
Paralakhemundi	Gumma	12	7.57	12	9.33	23
	Nuagad	6	8.57	6	9.38	09
	Rayagada	28	6.33	28	9.44	49
	R.Udayagiri	14	8.21	14	9.90	21
Average		60	7.15	60	9.53	33
Thuamul Rampur	Th. Rampur	31	3.38	29	6.12	81
	Lanjigarh	29	3.35	30	5.97	78
Average		60	3.37	59	6.06	80
Average of 4 ITDAs		234	4.95	236	8.67	75

It is observed from the above Table that the number of farmers growing kharif paddy during pre and post project period remaining almost constant, the yield rate per acre has increased considerably during the post project period. As a whole, the yield rate has gone up by 75% with the maximum increase recorded in Nilagiri (108%) followed by 88% in Bonai ITDA area. Increase in yield rate in Nuagad, R.Udayagiri and Gumma block is less than 25% as these farmers have already adopted high yielding varieties earlier. However, these areas need more focus on motivation and technology dissemination.

Summer

The Table-23 below reveals that the sample beneficiaries were not growing paddy during summer before execution of the irrigation projects due to want of irrigation. After getting assured irrigation, 101 farmers out of 237 sample farmers have adopted cultivation of high yielding summer paddy and produced more than 9 Q/acre except Th.Rampur area where the yield rate is 6.42 Q / acre. The productivity in Parlakhemundi ITDA area is highest in comparison to other areas that range from 10 to 12 Q/acre. It indicates that the

farmers in Paralakhemundi area are really interested in farming. It is observed that the farmers in Bonai ITDA area have not opted for rice cultivation during summer and they rather utilize 41% irrigation potential for more remunerative non-paddy crops like wheat, mustard and vegetables.

Table – 23
Adoption and Yield rate of Summer Paddy

ITDA	Block	Pre-Project		Post-Project		% increase in yield rate
		No. of farmers	Yield rate in Q/ac	No. of farmers	Yield rate in Q/ac	
Nilagiri	Nilagiri	--	--	1	9.50	--
Bonai	Bonai	--	--	--	--	--
	Gurundia	--	--	--	--	--
	Lahunipada	--	--	--	--	--
Average		--	--	--	--	--
Paralakhemundi	Gumma	--	--	12	11.11	--
	Nuagad	--	--	6	12.14	--
	Rayagada	--	--	29	10.31	--
	R.Udayagiri	--	--	13	11.30	--
Average			--	60	10.90	
Th. Rampur	Th. Rampur	--	--	21	6.78	--
	Lanjigarh	--	--	20	6.00	--
Average		--	--	41	6.42	--
Average of 4 ITDAs		--	--	101	9.12	--

Adoption of High Yielding Paddy

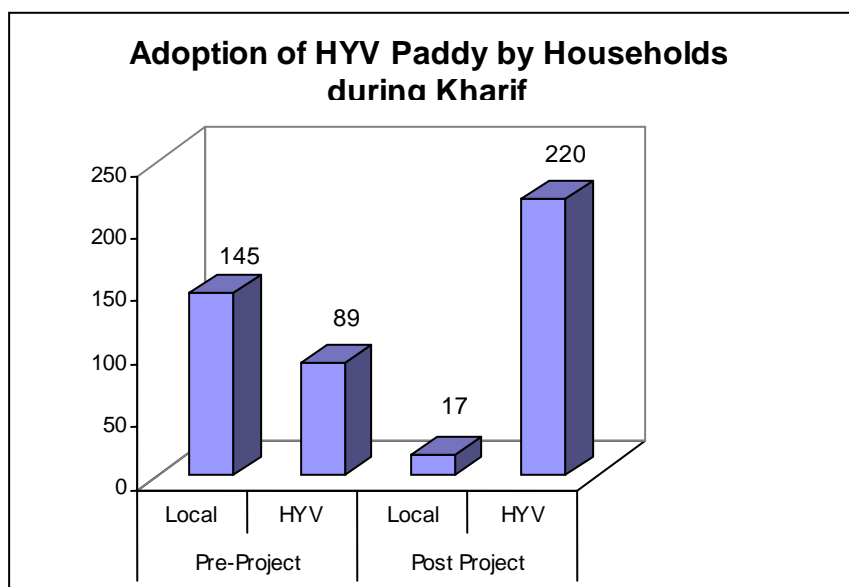
The tribal farmers are aware of the yield potential of high yielding paddy and hence, adoption of HYV paddy has gained popularity among them. It was understood during group discussion that the farmers have collected the high yielding varieties from the Agriculture Department sale centres but it is not a regular practice to replace the seeds every three years. The farmers lack knowledge on seed replacement and its impact on yield enhancement.

It is revealed from the following Table that during the pre-project period adoption of high yielding paddy was limited to 89 farmers which has increased to 220 during post-project period and accounts to 147% increase. Use of local varieties of paddy has been discouraged during the post-project period and the rate of adoption has decreased from 145 farmers to 17 farmers only. This

decrease is about 88%. This shows the positive trend of adoption of innovative technology of enhancing production through seed replacement from local to high yielding varieties during the post project period. The high yielding varieties like Swarna, Lalata, Khandagiri, CR-1009, CR-1030, Jagannath have gained popularity. It is seen that the adoption of local paddy has been reduced from 61% to 7% where as the adoption of HYV paddy has been increased from 38% to 93% for the total sample size. Of course during rabi/summer, the farmers are growing only high yielding paddy as there is no alternative.

Table - 24
Adoption of High Yielding Varieties of Paddy during Kharif

ITDA	Block	No. of house-holds	Pre-Project Period		Post-Project Period	
			No. of farmers adopted		No. of farmers adopted	
			Local paddy	HYV paddy	Local paddy	HYV paddy
Nilagiri	Nilagiri	60	57	0	16	44
Bonai	Bonai	24	16	8	0	24
	Gurundia	22	7	15	0	22
	Lahunipada	11	5	6	0	11
Average		57	28	29	0	57
Paralakhemundi	Gumma	12	0	12	0	12
	Nuagad	6	0	6	0	6
	Rayagada	24	0	24	0	24
	R.Udayagiri	18	0	18	0	18
Average		60	0	60	0	60
Thuamul Rampur	Th. Rampur	30	30	0	1	29
	Lanjigarh	30	30	0	0	30
Average		60	60	0	0	59
Total of 4 ITDAs		237	145	89	17	220
			(61%)	(38%)	(7%)	(93%)



Consumption and sale of paddy

The annual consumption of paddy in the family and the quantity sold per acre and per household are given below. The analysis shows the trend of commercialization after getting advantage of assured irrigation.

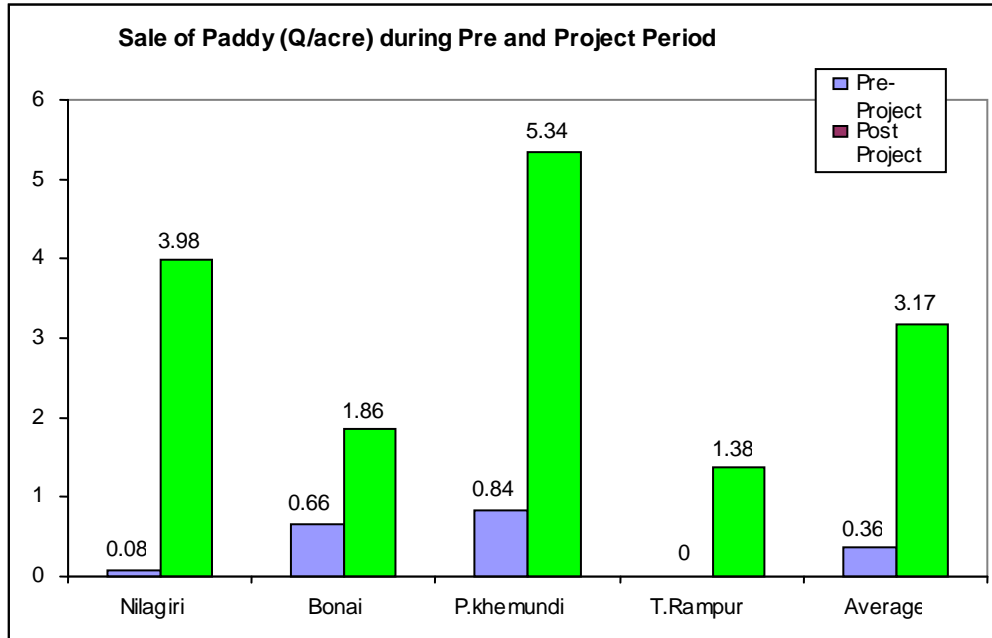


Table - 25
Annual Consumption and Sale of Paddy per Acre

(Fig in Q / acre)

ITDA	Block	Pre-Project		Post-Project	
		Own consumption	Sale	Own consumption	Sale
Nilagiri	Nilagiri	4.86	0.08	6.31	3.98
	Bonai	3.99	0.81	4.96	4.71
	Gurundia	4.24	0.60	4.59	4.68
	Lahunipada	5.86	0.37	6.37	3.49
Average		4.36	0.66	5.09	4.37
Paralakhemundi	Gumma	5.96	1.61	6.11	4.08
	Nuagad	8.57	--	9.28	1.53
	Rayagada	5.56	0.77	5.95	3.91
	R.Udayagiri	7.62	0.59	8.38	2.23
Average		6.31	0.84	7.04	3.16
Thuamul Rampur	Th. Rampur	3.38	--	4.73	1.57
	Lanjigarh	3.35	--	4.85	1.13
Average		3.37	--	4.78	1.38
Average of 4 ITDAs		4.59	0.36	5.82	2.96

During the pre-project period the average consumption of paddy in the family was limited to only 4.59 Qtl per acre and that has increased to 5.82 Qtl per acre during the post project period. During the pre-project period, the sale

of paddy was almost negligible where as it has increased to 2.96 Qtl per acre during the post project period. Sale of paddy per acre is maximum (4.37 Q/acre) in Bonai ITDA area and minimum (1.38 Q/acre) in Thuamul Rampur ITDA area.

The annual household consumption of paddy is 19.57 Q where as sale is 9.95 Q during the post-project period. The consumption has increased from 11.50 Q to 19.57 Q which is 170% when compared to pre-project period. The sale of paddy during pre-project period was less than 1 Q per household which has increased to 9.95Q per household. It is positive impact of irrigation on paddy production and marketing of the surplus. The average sale of paddy per household is highest in Paralakhemundi area (12.40 Q) and lowest in Thuamul Rampur area (5.73 Q). The increase in sale of paddy has shown positive trend of the farmers towards commercialization of agriculture.

Table - 26
Annual Consumption and Sale of Paddy per Household

Fig in Q/household

ITDA	Block	Pre-Project Period		Post-Project Period	
		Own consumption	Sale	Own consumption	Sale
Nilagiri	Nilagiri	12.19	0.21	17.08	10.77
Bonai	Bonai	11.13	2.25	13.85	13.15
	Gurundia	11.86	1.68	12.83	13.08
	Lahunipada	11.45	0.73	12.45	6.82
Average		11.47	1.74	13.39	11.50
Paralakhemundi	Gumma	11.42	3.08	23.68	15.81
	Nuagad	10.00	--	20.88	3.44
	Rayagada	12.11	1.68	30.37	19.96
	R.Udayagiri	15.79	1.21	24.67	6.57
Average		12.62	1.68	27.63	12.40
Thuamul Rampur	Th. Rampur	10.90	--	21.68	7.20
	Lanjigarh	8.55	--	18.03	4.20
Average		9.77	--	19.84	5.73
Average of 4 ITDAs		11.50	0.91	19.57	9.95

NON-PADDY CROPS

Among the non-paddy crops millets like maize and ragi, pulses like black gram, horse gram and red gram (locally Kandula), oilseed like mustard, sugarcane and vegetables are mostly cultivated next to paddy although the area and number of sample farmers growing the above non-paddy crops is too low in comparison to paddy. The following Tables show the number of farmers growing non-paddy crops, area under the crops and yield rate of the crops.

Table - 27

Area and Yield rate of major Non-paddy Crops

Area in acre; Yield rate in Q/acre

Wheat

ITDA	Block	Rabi					
		Pre Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate
Bonai	Bonai	--	--	--	5	6.00	4.67
	Gurundia	--	--	--	3	4.50	4.46
Total		--	--	--	8	10.50	4.58

Maize

ITDA	Block	Kharif						Rabi		
		Pre Project			Post Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate	No. of families	Area	Yield rate
Parlakhe-mundi	Gumma	3	3.00	3.27	3	2.50	4.12			
	Rayagada	10	8.50	3.38	12	9.50	3.92			
	R.Udayagiri	12	10.00	2.82	12	11.00	3.76			
Total		25	21.50	3.10	27	23.00	3.63			
Th. Rampur	Th.Rampur							6	3.00	4.38
	Lanjigarh							5	2.50	4.00
Total								11	5.50	4.18
G.Total		25	21.50	3.10	27	23.00	3.63	11	5.50	4.18

Ragi

ITDA	Block	Kharif					
		Pre Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate
Parlakhemundi	Gumma	2	1.50	2.62	2	1.00	3.10
	Nuagad				1	0.50	2.92
	Rayagada	12	9.50	3.09	14	11.00	3.23
	R.Udayagiri	12	14.00	2.38	11	12.50	2.65
Total		26	25.00	2.66	28	25.00	2.93
Th. Rampur	Lanjigarh	1	1.00	2.88			
G.Total		27	26.00	2.67	28	25.00	2.93

Black Gram

ITDA	Block	Kharif						Rabi		
		Pre Project			Post Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate	No. of families	Area	Yield rate
Parlakhemundi	Gumma							2	3.00	1.80
	Nuagad							1	1.00	1.80
	Rayagada							6	5.50	1.75
	R.Udayagiri	1	1.00	1.50	2	2.00	1.70	2	2.00	1.60
Total		1	1.00	1.50	2	2.00	1.70	11	11.50	1.74

Red Gram (Local variety – Kandula)

ITDA	Block	Kharif					
		Pre Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate
Parlakhemundi	Rayagada	--	--	--	2	1.50	2.00
	R.Udayagiri	--	--	--	3	2.50	2.20
Total		--	--	--	5	4.00	2.12

Horse Gram

ITDA	Block	Rabi					
		Pre Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate
Parlakhemundi	Rayagada	--	--	--	3	2.50	1.40
	R.Udayagiri	1	1.00	1.00	1	1.00	1.20
Total		1	1.00	1.00	4	3.50	1.35

Mustard

ITDA	Block	Rabi					
		Pre Project			Post Project		
		No. of families	Area	Yield rate	No. of families	Area	Yield rate
Nilagiri	Nilagiri				2	3.00	1.20
Parlakhemundi	Rayagada	1	0.50	1.60	1	0.50	1.30
	R.Udayagiri				1	1.00	1.10
Total		1	0.50	1.60	2	1.50	1.17
Bonai	Bonai				1	0.50	1.20
	Gurundia				4	4.50	1.07
	Lahunipada				6	11.00	1.01
Total					11	16.00	1.03
Th.Rampur	Th.Rampur				3	1.50	2.00
Grand Total		1	0.50	1.60	18	22.00	1.13

Vegetables

ITDA	Block	Rabi			
		Pre Project		Post Project	
		No. of families	Area	No. of families	Area
Bonai	Bonai			6	3.00
	Gurundia			9	7.50
	Lahunipada			6	5.00
	Total			21	15.50
Parlakhemundi	Gumma			1	0.50
	Rayagada			6	5.00
	R.Udayagiri			2	2.00
	Total			9	7.50
Th. Rampur	Th. Rampur			16	9.00
Grand Total				46	32.00

Use of Fertilisers

It has been experienced from different field trials and studies that application of fertilizer has got positive impact on crop productivity. Productivity and use of chemical fertilizers are positively correlated. A comparison of fertilizer consumption along with productivity of rice and food grain during 2005-06 of Orissa and few other states is given below.

State	Fertiliser consumption in Kg/ha	Productivity of rice in kg/ha	Productivity of food grain in kg/ha
Orissa	46	1554	1211
West Bengal	128	2509	2423
Haryana	167	3051	3045
Tamilnadu	184	2546	1847
Andhra Pradesh	204	2939	2365
Punjab	210	3858	3986

The following Tables indicate the crop area and per acre fertilizer use during pre and post project period.

Table - 28
ANNUAL FERTILISER CONSUMPTION

ITDA	Block	Pre-Project Period		Post-Project Period		% increase in fertilizer use
		Crop Area (ac)	Fertiliser use (Kg/ac)	Crop Area (ac)	Fertiliser use (Kg/ac)	
Nilagiri	Nilagiri	142.90	7.91	165.90	31.05	293
Bonai	Bonai	67.00	7.15	76.50	29.48	312
	Gurundia	61.50	5.81	78.00	28.44	390
	Lahunipada	21.50	4.02	37.50	24.98	521
Average		150.00	6.15	192.00	28.18	358
Paralakhemundi	Gumma	27.50	13.65	53.50	35.57	161
	Nuagad	7.00	14.71	15.00	32.93	124
	Rayagada	84.00	16.61	158.50	26.90	62
	R.Udayagiri	52.00	13.28	87.00	36.58	175
Average		170.50	15.04	314.00	31.35	108
Thuamul Rampur	Th. Rampur	100.00	--	153.50	6.90	--
	Lanjigarh	75.00	--	120.00	5.24	--
Average		175.00	--	273.50	6.17	--
Average of 4 ITDAs		638.40	7.23	945.40	23.37	223

The above Table reveals that the fertilizer consumption was as low as 7.23 kg per acre during pre-project period and has considerably increased by more than 3 times and reached the level of 23.37 kg per acre during post project period. Total crop area inclusive of *kharif* and *rabi* / summer has also increased considerably from 638.40 acres to 945.40 acres after provision of irrigation. It is observed that the tribal farmers in Thuamul Rampur area were not using any chemical fertilizer when there was no assured irrigation and it is mainly because they were growing local paddy only. Fertiliser use was more in Paralakhemundi area both during the pre and post project period i.e, 15.04 kg/ac and 31.35 kg/ac respectively and percentage increase is low (108%) because of their previous practice of using fertilizer during the pre-project period due to 100% adoption of high yielding varieties of paddy.

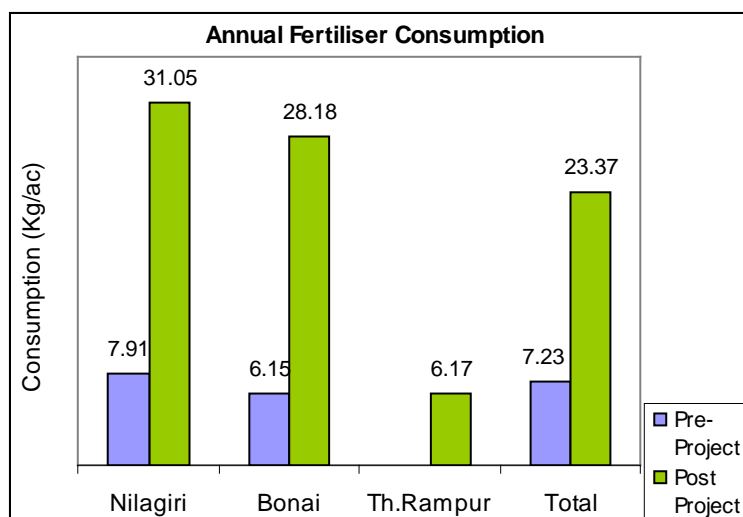


Table - 29
ANNUAL FERTILISER USE IN PADDY AND NON-PADDY CROPS

ITDA	Block	Paddy				Non-paddy			
		Pre-Project		Post-Project		Pre-Project		Post-Project	
		Area (ac)	Fert use (Kg/ac)	Area (ac)	Fert use (Kg/ac)	Area (ac)	Fert use (Kg/ac)	Area (ac)	Fert use (Kg/ac)
Nilagiri	Nilagiri	142.90	7.91	162.40	31.27	--	--	3.50	21.14
Bonai	Bonai	67.00	7.15	67.00	30.40	--	--	9.50	18.98
	Gurundia	61.50	5.81	61.50	31.91	--	--	16.50	15.50
	Lahunipada	21.50	4.02	21.50	30.22	--	--	16.00	17.93
	Average	150.00	6.15	150.00	30.99	--	--	42.00	17.21
Paralakhe-mundi	Gumma	23.00	19.38	46.50	36.13	4.50	--	7.00	17.46
	Nuagad	7.00	14.71	13.50	36.59	--	--	1.50	--
	Rayagada	61.00	21.81	119.50	31.48	20.00	--	36.00	11.28
	R.Udayagiri	29.00	26.57	56.00	43.99	26.00	--	34.00	25.02
Average		120.00	22.08	235.50	36.1	50.50	--	78.50	17.57
Thuamul Rampur	Th. Rampur	100.00	--	137.50	5.78	--	--	16.00	16.51
	Lanjigarh	74.00	--	111.50	4.39	1.00	--	8.50	16.45
Average		174.00	--	249.00	5.16	1.00	--	24.50	16.49
Average of 4 ITDAs		586.90	8.01	796.90	24.50	51.50	--	148.50	17.37

Assured irrigation has encouraged the tribal farmers to go for higher use of fertilizer and it has resulted in more than 3 times increase in fertilizer use in paddy when compared to rainfed farming during the pre-project period. This increase is the contribution of assured irrigation resulting adoption of high yielding varieties of paddy which are fertilizer responsive. The tribal farmers of Thuamul Rampur and Lanjigarh block have raised their fertilizer use in paddy to around 5 kg/acre against no use during the pre-project period. This is mainly due to unavailability of fertilizer within the vicinity and also the forest soil in the area is rich in organic matter that limits the additional application of chemical fertilizer. In case of non-paddy crops there was no use of fertilizer prior to creation of irrigation facility and afterwards the fertilizer use has increased to the extent of 17.37 kg/acre when all the 4 ITDAs are taken together. Although in case of Nilagiri block, application of fertilizer in non-paddy crops during *rabi* seems to be higher as compared to other ITDAs, but the figure is hardly significant because of extremely low crop coverage of non-paddy in *rabi* season (3.50 acres). Among the non-paddy crops, fertilizers are mainly used in vegetables and maize during both *kharif* and *rabi* season.

Table - 30
SEASON-WISE FERTILISER USE
(Fig in Kg/acre)

ITDA	Block	Kharif		Rabi		Total	
		Pre Project	Post Project	Pre Project	Post Project	Pre Project	Post Project
Nilagiri	Nilagiri	7.91	31.33	--	22.84	7.91	31.05
Bonai	Bonai	7.15	30.97	--	18.98	7.15	29.48
	Gurundia	5.81	31.91	--	15.50	5.81	28.44
	Lahunipada	4.02	30.22	--	17.93	4.02	24.98
Bonai ITDA		6.15	31.25	--	17.21	6.15	28.18
Paralakhemundi	Gumma	13.65	34.64	--	36.56	13.65	35.57
	Nuagad	14.71	35.94	--	30.29	14.71	32.93
	Rayagada	16.61	25.47	--	28.57	16.61	26.90
	R.Udayagiri	13.28	34.96	--	39.35	13.28	36.58
Paralakhemundi ITDA		15.04	31.49	--	32.76	15.04	31.35
Thuamul Rampur	Th. Rampur	--	5.04	--	10.27	--	6.90
	Lanjigarh	--	5.30	--	5.14	--	5.24
Th. Rampur ITDA		--	5.16	--	8.04	--	6.17
Total of 4 ITDAs		7.23	24.03	--	21.85	7.23	23.37

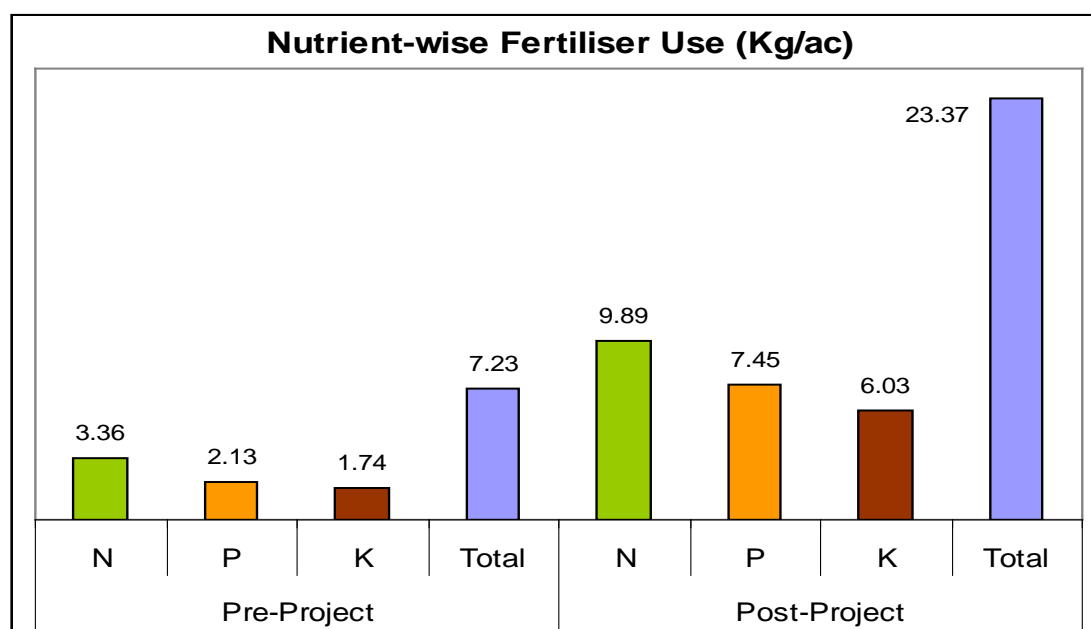
Average fertilizer use for all the four ITDAs during *kharif* has increased from almost 7.23 kg/acre during pre-project period to 21.85 kg/acre during post project period that accounts for a little more than 200% increase. During *rabi* no instance of fertilizer use was recorded during pre-project period but during post project period the rate of fertilizer consumption is estimated to about 22 kg/acre. Excepting Thuamul Rampur ITDA area, *kharif* consumption of fertilizer is around 31 kg/acre in other ITDAs. During *rabi*, overall average consumption is about 22 kg/acre, but the consumption is maximum in Paralakhemundi (32.76 kg/acre) followed by Nilagiri (22.84 kg/acre) and minimum in Thuamul Rampur block (8.04 kg/acre).

Table – 31

ANNUAL FERTILISER USE IN TERM OF PLANT NUTRIENTS
(Fig in Kg/ac)

ITDA	Block	Pre-Project				Post-Project			
		N	P ₂ O ₅	K ₂ O	Total	N	P ₂ O ₅	K ₂ O	Total
Nilagiri	Nilagiri	3.34	2.45	2.12	7.91	13.39	10.07	7.59	31.05
Bonai	Bonai	3.37	1.96	1.82	7.15	11.42	11.86	6.20	29.48
	Gurundia	2.62	1.91	1.28	5.81	10.78	10.32	7.34	28.44
	Lahunipada	1.99	1.09	0.94	4.02	10.43	9.11	5.44	24.98
Average		2.86	1.82	1.47	6.15	10.96	10.70	6.52	28.18
Paralakhemundi	Gumma	6.57	3.96	3.12	13.65	13.47	10.66	11.44	35.57
	Nuagad	6.94	4.18	3.59	14.71	14.97	7.36	10.60	32.93
	Rayagada	7.56	4.86	4.19	16.61	11.48	9.06	6.36	26.90
	R.Udayagiri	7.23	3.63	2.42	13.28	18.78	8.90	8.84	36.58
Average		7.27	4.32	3.45	15.04	14.10	9.22	8.03	31.35
Thuamul Rampur	Th. Rampur	--	--	--	--	2.62	1.50	2.78	6.90
	Lanjigarh	--	--	--	--	1.98	1.62	1.64	5.24
Average		--	--	--	--	2.34	1.55	2.29	6.17
Average of 4 ITDAs		3.36	2.13	1.74	7.23	9.89	7.45	6.03	23.37

Enhancing the fertilizer use is not the only consideration to achieve higher productivity; rather balanced use of fertilizer has a positive impact on crop production. The ideal ratio of balanced nutrient use is 4:2:1 of N, P and K. The ratio of NPK use during the pre-project period is around 4:2:3 and during post project period is about 4:3:2. During the post project period, the use of phosphatic and potassic fertilizers have increased but the excess increase beyond the balanced dose is detrimental to the crop growth, soil health and responsible for yield reduction. It is observed during the survey that only 5 farmers have gone for soil testing in Thuamul Rampur and Lanjigarh blocks. The farmers need to be motivated for fertilizer application basing on the soil test report which would lead to balanced use of fertilizers. Adequate steps may be taken by the Government for soil test drive in mass scale through awareness generation. The graphical representation of nutrient-wise annual fertilizer use by the respondents is given below.



Use of Organic Manure and Adoption of Plant Protection Measures

Although application of fertilizer and crop production are positively correlated, but application of only chemical fertilizer deteriorates the soil structure, water holding capacity, microbial population and in turn soil fertility status. This has an adverse effect on crop growth, production and productivity. Hence, it is always suggested to maintain the soil health through application of organic manure, compost, green manure along with chemical fertilizer i.e,

adopting Integrated Nutrient Management (INM) practices. The tribal farmers, of course, apply manure in the crop field. Almost every household maintains a compost pit but the process of composting is always not done in a scientific manner. The farmers need proper training on compost making and may be encouraged to go for vermi-composting. Neither there is any farmer in the sample who has vermi-compost unit of its own nor it also applies vermi-compost.

Table - 32
USE OF MANURE AND PESTICIDES (ANNUAL)

ITDA	Block	Organic manure (Cart load/ac)		Pesticides (Liquid) Ltr/ac		Pesticides (Dust/Granule) Kg/ac	
		Pre- Project	Post- Project	Pre- Project	Post- Project	Pre- Project	Post- Project
Nilagiri	Nilagiri	1.58	1.69	0.01	0.17		0.04
Bonai	Bonai	1.61	1.74	0.01	0.16		0.01
	Gurundia	1.48	1.62		0.12		
	Lahunipada	1.65	1.82		0.19		
Bonai ITDA		1.56	1.71	0.01	0.15		0.01
Paralakhemundi	Gumma	1.31	1.40	0.04	0.13		0.04
	Nuagad	1.59	1.75		0.17		
	Rayagada	1.14	1.21	0.01	0.10	0.06	0.11
	R.Udayagiri	1.92	1.73		0.18	0.02	0.09
Paralakhemundi ITDA		1.42	1.49	0.01	0.13	0.04	0.09
Thuamul Rampur	Th. Rampur	1.46	1.32		0.09		
	Lanjigarh	1.17	1.15		0.05		
Th. Rampur ITDA		1.34	1.25		0.07		
Total of 4 ITDAs		1.47	1.50	0.01	0.12	0.01	0.04

The above Table reveals that the farmers are applying organic manure @ 1.47 cartloads per acre during the pre-project period and 1.50 cartloads per acre during the post project period. There is no significant increase in per acre use of organic manure but the farmers have maintained the same level of organic manure although there is increase in cropping intensity to 143% because of consciousness regarding benefits of using organic manure. Besides direct application of organic manure, the farmers allow their cattle to stay in the crop field after harvesting of the crop that leads to further addition of organic manure. Use of pesticides during pre project period is negligible where as there is a little increase during post project period. It seems that the farmers lack

knowledge on plant protection aspects and do not take adequate steps to save the crop from pests and diseases.

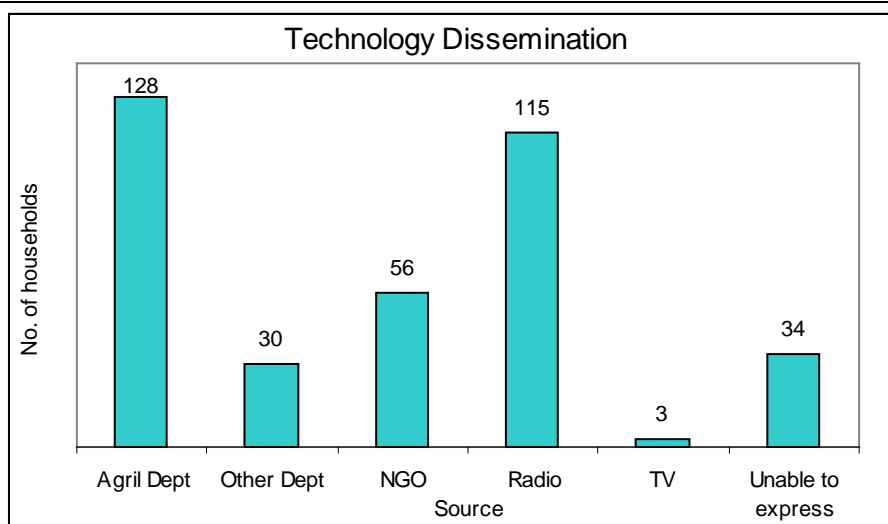
Technology Transfer

Technology transfer plays a vital role in the process of crop production. Appropriate technology and its timely dissemination have positive impact on crop production and productivity. Technology in crop production includes land preparation, maintenance of soil health, variety selection, input use, water management, weed management, plant protection measures and post harvest technology. Technology transfer can be done through field visit, group discussion, training, crop demonstration, awareness campaign etc.

Table - 33

TECHNOLOGY DISSEMINATION

ITDA	Block	Agril Dept	Other Dept	NGO	Ra- dio	TV	Unable to express
Nilagiri	Nilagiri	26	8	16	14		6
Bonai	Bonai	10	4	4	13	1	5
	Gurundia	13	3	3	16		3
	Lahunipada	5	2		8		4
Total		28	10	7	37	1	12
Paralakhemundi	Gumma	9	3	6	9		2
	Nuagad	6	2	1	3		--
	Rayagada	15	--	5	16	2	4
	R.Udayagiri	11	2	5	15		--
Total		41	7	17	43	2	6
Thuamul Rampur	Th. Rampur	19	4	9	12		6
	Lanjigarh	14	1	7	9		4
Total		33	5	16	21		10
Grand Total		128	30	56	115	3	34
% to total sample (237)		54%	13%	24%	49%	1%	14%



The above Table reveals that the farmers are getting improved technology on agriculture from different sources. Out of 237 sample farmers, majority of the farmers to the extent of 54% and 49% are receiving technology from the field functionaries of Agriculture Department and radio respectively. Besides, 13% farmers get the guidance from other department extension personnel including ITDA, WEO and 24% farmers from the NGOs operating in the area. Only 1% farmers get technology from TV. Around 14% of the sample farmers could not express the source of technology received. The technology provided to the farmers is not sufficient and quality of technology dissemination can be improved through farmers' training, technology demonstration and awareness camps.

Table - 34
ADOPTION OF NEW TECHNOLOGY
(No. of households)

ITDA	Block	Sample size	Technology				
			Compost Pit	Soil Test	Training	Exposure Visit	Demonstration
Nilagiri	Nilagiri	60	56	--	--	--	--
Bonai	Bonai	24	24	--	--	--	--
	Gurundia	22	22	--	--	--	--
	Lahunipada	11	11	--	--	--	--
Total		57	57	--	--	--	--
Paralakhe-mundi	Gumma	12	12	--	--	--	--
	Nuagad	6	5	--	--	--	--
	Rayagada	24	24	--	--	--	--
	R.Udayagiri	18	18	--	--	--	--
Total		60	41	--	--	--	--
Th. Rampur	Th. Rampur	30	26	3	1	1	2
	Lanjigarh	30	28	2	2	2	1
Total		60	57	5	3	3	3
Grand Total		237	229	5	6	3	3

It is observed from the above Table that 229 farmers out of 237 have developed compost pit. Although the compost making is not followed in scientific manner, the farmers are aware of the advantages of organic manure and they use compost to make up the deficit of chemical fertilizer. They need proper training on preparation of compost keeping the organic status of the

product in tact. The farmers do not know about the advantage of soil testing and application of manure and fertilizer basing on soil test reports. Only 5 farmers of Thuamul Rampur and Lanjigarh block have gone for soil testing which indicates that the benefits of technology of soil testing has not reached the tribal farmers in interior areas. Only 6 farmers have undergone training in Nilagiri on grafting during 2002, Thuamul Rampur and Lanjigarh block on paddy crop production technology during 2006. Only 3 farmers in Th. Rampur ITDA have gone for exposure visit within the ITDA area during 2006. In the same ITDA, 3 farmers were provided with demonstration of banana by the ITDA personnel during 2007. It is observed that Th. Rampur ITDA has taken much interest although in a small scale for the farmers to raise their income through technology transfer through different methods like soil test, training, exposure visit and crop demonstration. The other ITDAs may take similar steps for improving the farm income status of the farmers.

Knowledge on Input Availability

Adoption of new technology needs to be associated with availability of inputs within the reach of the farmers. The following Table shows the knowledge of the farmers regarding availability of different inputs.

Table - 35
KNOWLEDGE ON INPUT AVAILABILITY
(No. of households)

ITDA	Block	Sample size	Imp/ HYV seeds	Fertiliser	Pesticides	Farm Imple-ments	Farm machi-neries	Service for machineries/ pumpsets	Credit
Nilagiri	Nilagiri	60	60	60	60	60	59	34	57
Bonai	Bonai	24	24	24	24	24	23	13	24
	Gurundia	22	22	22	22	22	22	12	22
	Lahunipada	11	11	11	11	11	11	4	11
Total		57	57	57	57	57	56	29	57
Paralakhemundi	Gumma	12	12	12	12	12	12	6	12
	Nuagad	6	6	6	6	6	6	5	6
	Rayagada	24	24	24	24	24	24	18	24
	R.Udayagiri	18	18	18	18	18	18	11	18
Total		60	60	60	60	60	60	40	60
Thuamul Rampur	Th. Rampur	30	30	30	30	30	30	16	30
	Lanjigarh	30	30	30	30	30	30	15	30
Total		60	60	60	60	60	60	31	60
Grand Total		237	237	237	237	237	235	134	234

It is revealed from the above Table that almost all the farmers have knowledge with regard to availability of agricultural inputs like HYV and improved seeds, fertilizers, pesticides, farm implements and farm machineries as well as credit. About 57% farmers have knowledge on availability of service for the farm machineries and pump sets although all of them do not use these. The HYV/improved seeds and farm implements are available in Government sale centres located at block headquarters and in additional sale centre located at an easily accessible place within the block area which is very well known to the farmers. All the sample farmers are aware of the availability of fertilisers and pesticides in most of the GP headquarters and all block headquarters. Although the farmers are not using farm machineries but they have knowledge with regard to availability of the same at district headquarters. They get the service of pump sets mostly in the block headquarters and credit within their reach from commercial banks, cooperatives and Regional Rural Banks (RRBs).

* * *

CHAPTER - 7

IMPACT ON SOCIO-ECONOMIC CONDITION

Socio-Economic Status

The Government have taken up development works in the tribal areas with the objective to upgrade the socio-economic status of the tribals through implementing different income generating schemes out of which mini irrigation project is of primary importance. The improvement in socio-economic status of the tribals in form of acquisition of modern assets during post-project period as per the study findings is presented below.

Table - 36
SOCIO-ECONOMIC STATUS
Pre-project

(No. of household)

ITDA	Block	Acquisition of Modern Movable Assets					
		Electric Fan	Mobile Phone	Cycle	Two wheeler	Radio	TV
Nilagiri	Nilagiri			27			
Bonai	Bonai			11		19	
	Gurundia			17		13	
	Lahunipada			3		6	
Total				31		38	
Paralakhemundi	Gumma			7		7	
	Nuagad			4		2	
	Rayagada			17		20	
	R.Udayagiri			12		17	
Total				40		46	
Thuamul Rampur	Th. Rampur			2			
	Lanjigarh						
Total				2			
Grand Total				100		84	

Table - 37
SOCIO-ECONOMIC STATUS

		Post-project					
		(No. of household)					
ITDA	Block	Acquisition of Modern Movable Assets					
		Electric Fan	Mobile Phone	Cycle	Two wheeler	Radio	TV
Nilagiri	Nilagiri			77		12	
Bonai	Bonai	1	3	24	3	21	3
	Gurundia		3	22	4	13	
	Lahunipada			9	1	6	
Total		1	6	55	8	40	3
Paralakhemundi	Gumma			11		7	
	Nuagad			6		3	
	Rayagada	2	2	24	3	23	5
	R.Udayagiri	2	2	18	1	17	3
Total		4	4	59	4	50	8
Thuamul Rampur	Th. Rampur			22		9	
	Lanjigarh			15		8	
Total				37		17	
Grand Total		5	10	238	12	119	11

Table – 36 and Table - 37 reveal that during the pre-project times the tribal farmers possessed few varieties of Modern Assets in shape of bicycles and transistor radio sets only. To be specific, 100 farmers had bicycles and 84 farmers were listening to their own radio sets in those days. In the post project period, the number of bicycles increased to 238 and radio sets, to 119. Besides, new items like electric fan, mobile phone, two-wheeler and television were added. During the study 5, 10, 12 and 11 families were found to be using electric fan, mobile phone, two-wheeler and television respectively. There is limited use of electric fan and TV as there is no electricity in most of the villages. Use of mobile phone and two-wheeler is gradually gaining popularity in order to overcome the problem of communication and minimize the communication gap.

Table – 38

SOCIO-ECONOMIC IMPACT ON PERMANENT ASSET CREATION AND EDUCATION

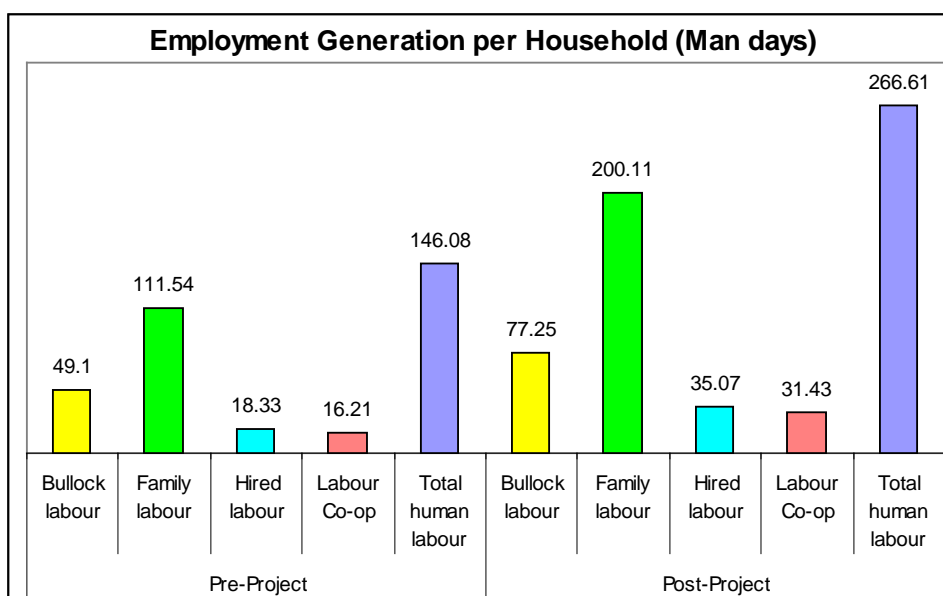
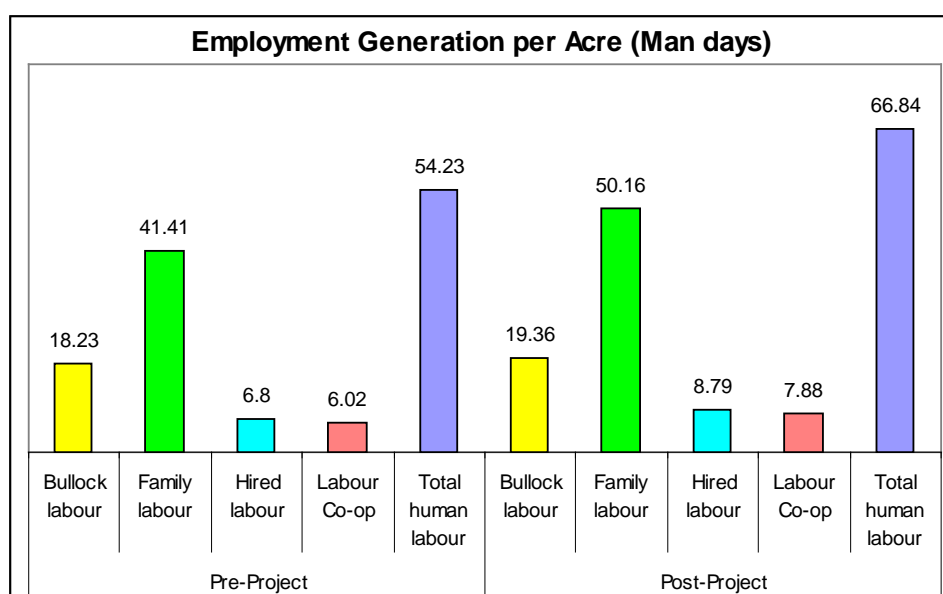
(No. of household)

ITDA	Block	Permanent Asset Creation		Education		
		Asbestos roof	Pucca house	Primary/ ME	High School	College
Nilagiri	Nilagiri		1	35	4	1
Bonai	Bonai		6	9	11	4
	Gurundia		4	13	10	7
	Lahunipada		2	6	3	2
Total			12	28	24	13
Paralakhemundi	Gumma	2	3	8	1	
	Nuagad	1		4		
	Rayagada	4	8	9	4	1
	R.Udayagiri	4	2	10	2	
Total		11	13	31	7	1
Thuamul Rampur	Th. Rampur			23	1	
	Lanjigarh			24	1	
Total				47	2	
Grand Total		11	26	141	37	15

With the improvement in the socio-economic status, the tribal farmers have taken care for improving their housing and education status. During the post-project period, only 11 farmers in Paralakhemundi and 26 farmers mostly in Bonai and Paralakhemundi have improved the condition of their houses by having asbestos roof and pucca house respectively. They have shown interest for educating their children and they are availing the facility provided by the Government to make their children educated. It is observed from the above Table that 141 households take the opportunity to send their children to Primary and ME schools and 37 families, to High School. There are college-going children from 15 families. The tribal farmers of Bonai are more responsive to provide high school and college education to their children. 24 and 13 families send their children to high school and college respectively.

Employment Generation

The mini irrigation projects contribute towards enhancing gross cropped area, crop production and productivity and farm income of the beneficiaries. At the same time these projects have contribution towards employment generation in the field of agriculture. There is considerable increase in the use of hired labour, family labour and bullock labour after increasing the irrigation potential. The graphic presentations of employment generation per acre and per household during post project are as follows.



The following Tables describe the employment generated per acre as well as per household after implementation of the mini irrigation projects in the tribal area.

Table – 39

EMPLOYMENT GENERATION PER ACRE

(Figures in man days)

ITDA	Block	Pre-project					Post-project					% increase	
		Bullock Labour	Human Labour				Bullock Labour	Human Labour				Bullock labour	Human Labour
			Family Labour	Hired Labour	Labour Coop	Total Human Labour		Family Labour	Hired Labour	Labour Coop	Total Human Labour		
Nilagiri	Nilagiri	17.96	33.10	12.98	5.62	51.70	18.60	41.52	14.07	7.58	63.17	4	22
Bonai	Bonai	16.18	34.15	6.66	5.34	46.15	17.96	49.65	10.88	7.03	67.56	11	46
	Gurundia	17.02	39.41	2.93	5.46	47.80	17.69	56.63	4.50	6.40	67.53	4	41
	Lahunipada	18.77	45.00	3.42	6.49	54.91	20.77	60.80	4.75	6.83	72.38	11	32
Average		16.90	37.86	4.67	5.55	48.08	18.25	54.11	7.39	6.74	68.24	8	42
Paralakhemundi	Gumma	19.71	31.56	3.05	7.64	42.25	19.89	50.75	6.11	8.64	65.50	1	55
	Nuagad	18.00	49.14	4.66	5.71	59.51	19.50	60.00	4.17	6.00	70.17	8	18
	Rayagada	17.57	45.14	4.90	9.62	59.66	20.13	51.06	5.54	8.43	65.03	15	9
	R.Udayagiri	20.74	39.23	5.91	9.13	54.27	21.61	48.25	6.95	8.65	63.85	4	18
Average		18.90	41.31	4.90	8.99	55.20	20.52	50.52	6.01	8.43	64.96	9	18
Th. Rampur	Th. Rampur	18.38	50.82	6.48	5.20	62.50	19.41	51.99	8.46	9.05	69.50	6	11
	Lanjigarh	19.67	52.00	4.07	2.05	58.12	20.37	55.50	8.33	7.90	71.73	4	23
Average		18.93	51.33	5.45	3.85	60.62	19.82	53.49	8.40	8.56	70.46	5	16
Average of 4 ITDAs		18.23	41.41	6.80	6.02	54.23	19.36	50.16	8.79	7.88	66.84	6	23

Table - 40

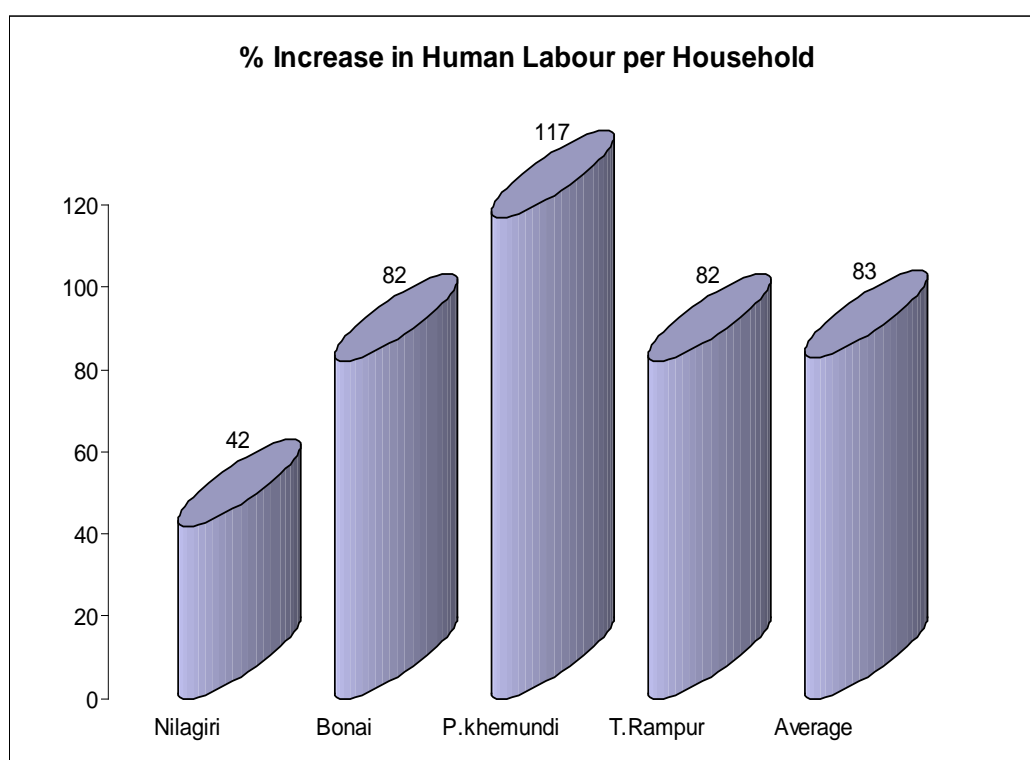
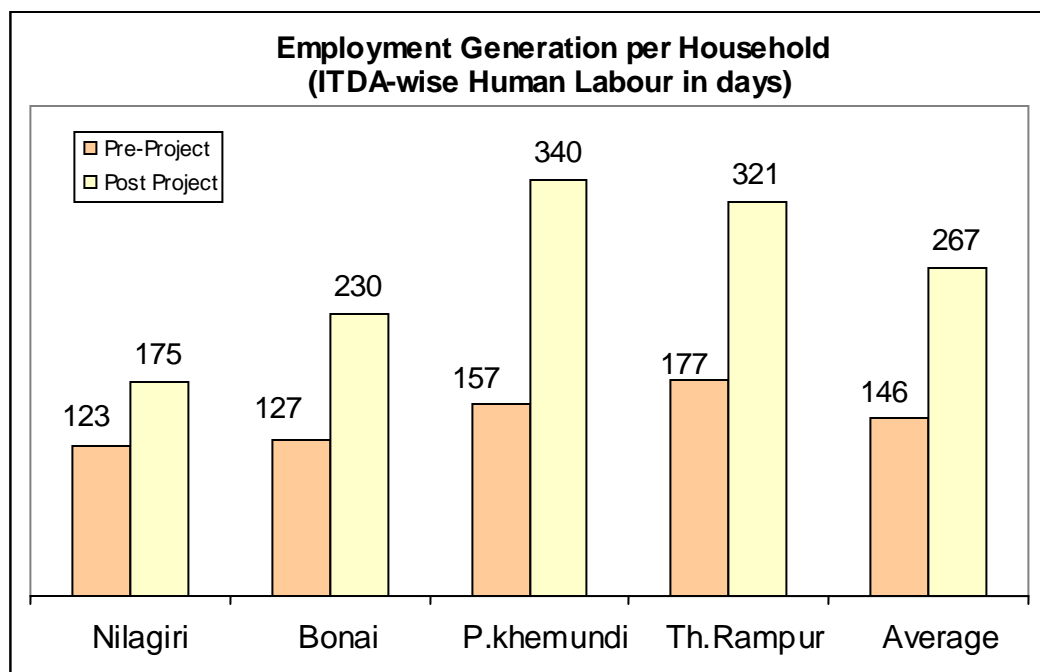
EMPLOYMENT GENERATION PER HOUSEHOLD**(Figures in man days)**

ITDA	Block	Pre-project					Post-project					% increase	
		Bullock Labour	Human Labour				Bullock Labour	Human Labour				Bullock labour	Human Labour
			Family Labour	Hired Labour	Labour Coop	Total Human Labour		Family Labour	Hired Labour	Labour Coop	Total Human Labour		
Nilagiri	Nilagiri	42.77	78.83	30.91	13.38	123.13	51.43	114.80	38.90	20.96	174.67	20	42
Bonai	Bonai	45.17	95.34	18.59	14.91	128.84	57.25	158.26	34.68	22.41	215.35	27	67
	Gurundia	47.58	110.17	8.19	15.26	133.62	62.72	200.78	15.95	22.69	239.42	32	79
	Lahunipada	36.69	87.95	6.68	12.69	107.32	70.81	207.27	16.19	23.28	246.75	93	130
Average		44.46	99.64	12.28	14.62	126.53	61.48	182.27	24.88	22.71	229.86	38	82
Paralakhemundi	Gumma	45.17	72.33	6.99	17.51	96.82	88.68	226.26	27.24	38.52	292.02	96	202
	Nuagad	21.00	57.33	5.44	6.66	69.43	48.75	150.00	10.43	15.00	175.43	132	153
	Rayagada	61.50	157.99	17.15	33.67	208.81	132.94	337.21	36.59	55.67	429.47	116	106
	R.Udayagiri	59.92	113.33	17.07	26.38	156.78	104.45	233.21	33.59	41.81	308.61	74	97
Average		53.71	117.39	13.92	25.55	156.87	107.37	264.39	31.43	44.12	339.94	100	117
Th. Rampur	Th. Rampur	52.51	145.20	18.51	14.86	178.57	85.13	228.01	37.10	39.69	304.81	62	71
	Lanjigarh	59.01	156.00	12.21	6.15	174.36	97.78	266.40	39.98	37.92	344.30	66	97
Average		55.22	149.70	15.89	11.23	176.82	90.35	243.84	38.31	39.01	321.16	64	82
Average of 4 ITDAs		49.10	111.54	18.33	16.21	146.08	77.25	200.11	35.07	31.43	266.61	57	83

When per acre use of bullock labour and human labour are analysed, it is observed from Table – 39 that there is increase of 6% and 23% respectively when compared to pre-project period. This is because of adoption of high yielding paddy and other labour intensive non-paddy crops like maize, vegetables and sugarcane. There is marginal increase in use of bullock labour from 18.23 to 19.36 days per acre. Employment of human labour has increased from 54.23 to 66.84 days per acre. The contribution of family labour has increased from 41.41 to 50.16 days per acre.

As regards employment of bullock labour and human labour per household, Table - 40 reveals that there is increase in bullock labour as well as human labour during the post project period. The bullock labour has increased from 49 to 77 days per year per household that counts to 57% increase over pre-project period. This has doubled in Paralakhemundi ITDA area followed by Thuamul Rampur and Bonai accounting to 64% and 38% respectively. Similarly engagement of human labour has increased by 83% when average of all the 4 ITDAs are taken together. However, there is maximum increase in Paralakhemundi (117%) followed by Thuamul Rampur, Bonai (82% each) and Nilagiri (42%). Out of the total human labour employment, family labour has the lion's share of 75% followed by hired labour (13%) and labour cooperative (12%). Labour cooperative is a traditional system of mutual exchange of labour followed by the tribals for labour intensive agricultural and non-agricultural operations. It may be concluded that there is additional employment generation of 57% of bullock labour and 83% of human labour over the pre-project period per household. The family labour engagement per household has increased by 88 days over pre-project period.

The following two diagrams represent the employment generation of human labour in term of man-days and in term of percentage increase over the pre-project period.



The additional employment generation in term of human labour is highest in Paralakhemundi ITDA because of cultivation of labour intensive crops like high yielding paddy, maize and vegetables.

Farm Income

The entire study on impact of the mini irrigation projects can be summarised in term of farm income. The Farm Business Income (FBI) has been estimated during pre and post project period for each block and ITDA. Farm Business Income refers to Gross Return excluding the Cost A where as Cost A is Total Expenditure – (Family Labour Wages + Interest on owned Capital). The impact of irrigation is directly proportionate to the Farm Business Income. The investment and return in monetary term both during pre project as well as post project periods have been calculated as per the present rate prevailed in the market around the producers. The following Table represents the Gross Return, Investment made by the farmers and Net Return per acre during the pre and post project periods. The incremental net return due to availability of assured irrigation is also estimated.

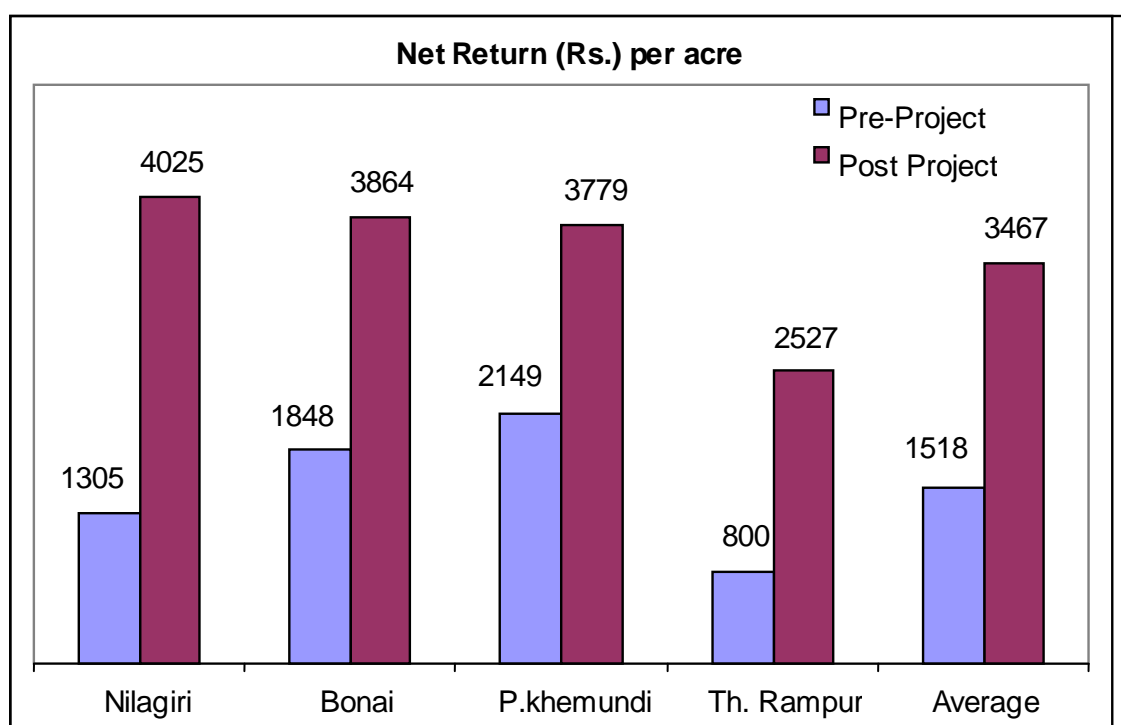
Table – 41
Farm Business Income per Acre

(In Rupees)

ITDA	Block	Pre-Project			Post Project			
		Gross Return/acre	Invest/acre	Net Return/acre	Gross Return/acre	Invest/acre	Net Return/acre	Incremental Net Return/acre
Nilagiri	Nilagiri	2964	1659	1305	6106	2081	4025	2720
					(206)	(125)	(308)	
	Bonai	2880	1177	1703	5919	1900	4019	2316
	Gurundia	2904	1082	1822	5182	1532	3650	1828
	Lahunipada	3738	1165	2573	5616	1651	3965	1392
	Bonai Average	3013	1165	1848	5574	1710	3864	2016
					(185)	(147)	(209)	
	Gumma	4099	1329	2770	5900	1742	4158	1388
	Nuagarh	5142	1337	3805	6487	1606	4881	1076
	Rayagada	3370	1356	2014	5646	1676	3970	1956
P.khemundi	R.udayagiri	3329	1518	1811	4996	1917	3079	1268
	Average	3549	1400	2149	5545	1766	3779	1630
					(156)	(126)	(176)	
	T.Rampur	2028	1243	785	4365	1480	2885	2100
	Lanjigarh	2006	1187	819	3561	1508	2053	1234
Th. Rampur	Average	2019	1219	800	4019	1492	2527	1728
					(199)	(122)	(316)	
Average of 4 ITDAs		2871	1353	1518	5209	1742	3467	1949
					(181)	(129)	(228)	

(The figures in the parenthesis indicate percentage over pre-project)

It is revealed from the above Table that the Gross Return, Investment and Net Return per acre have increased in each block during the post project period. On an average for all the four ITDAs taken together the increase in net return is more than double during the post project period in comparison to pre project period. Again there is ample scope to increase the return and the beneficiaries should take initiatives with the guidance of the field functionaries to get maximum return by optimum utilization of the irrigation resources and the technology. In the present study, the percentage increase in Net Return is highest in Thuamul Rampur followed by Nilagiri ITDA. The investment per acre is highest in Nilagiri ITDA and lowest in Thuamul Rampur ITDA.



The Table below represents the Farm Business Income per household during pre and post project period. The average net return per household comes to Rs.13,321/-. Net return per household is highest in Paralakhemundi followed by Bonai, Thuamul Rampur and Nilagiri ITDA. The graphical representation of net return per household during pre and post project period is also given below.

Table – 42

Farm Business Income per Household
(Fig in Rupees)

ITDA	Block	Pre-Project		Post Project	
		Gross Return/ household	Net Return/ household	Gross Return/ household	Net Return/ household
Nilagiri	Nilagiri	7059	3108	16831	11095
Bonai	Bonai	8040	4754	18865	12809
	Gurundia	8118	5093	16605	11695
	Lahunipada	7306	5029	16593	11715
Average		7928	4863	17554	12169
Paralakhemundi	Gumma	9393	6347	25713	18121
	Nuagad	5999	4439	14595	10982
	Rayagada	11162	6670	35358	24862
	R.Udayagiri	10173	5535	23511	14491
Average		9995	6052	27799	18945
Thuamul Rampur	Th. Rampur	6760	2617	21971	14522
	Lanjigarh	5016	2048	13533	7803
Average		5888	2332	17752	11162
Average of 4 ITDAs		7715	4079	20015	13321

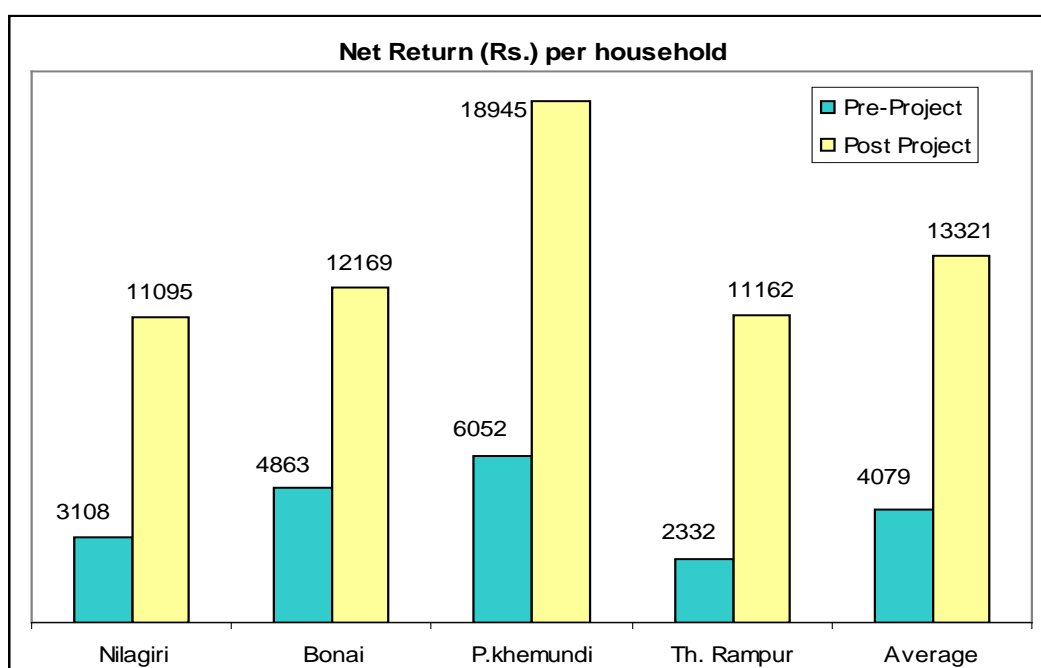
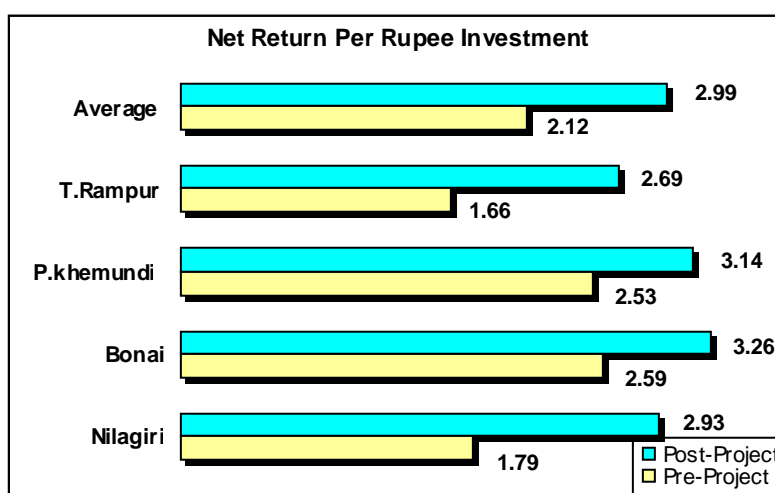


Table - 43
Return per Rupee Investment

ITDA	Block	Gross Return per Rupee Investment		Percentage increase
		Pre Project	Post Project	
Nilagiri	Nilagiri	1.79	2.93	64
	Bonai	2.45	3.12	27
	Gurundia	2.68	3.38	26
	Lahunipada	3.21	3.40	6
Bonai Average		2.59	3.26	26
P.khemundi Average	Gumma	3.08	3.39	10
	Nuagarh	3.85	4.04	5
	Rayagada	2.49	3.37	35
	R.udayagiri	2.19	2.61	19
T.Rampur Average		1.66	2.69	62
Average		2.12	2.99	41

The above Table reveals that the average per rupee return of Rs.2.12 over investment during the pre project has been enhanced to Rs.2.99. The return per rupee investment is highest in Bonai followed by Paralakhemundi ITDA. As per the estimate for pre and post project periods with the prevailing prices of the inputs and outputs, there is overall increase of return per rupee investment by 41% during the post project over the pre project period. The percentage increase is highest in Nilagiri and lowest in Paralakhemundi ITDA.



There is no substantial increase in return per rupee investment in Lahunipada, Gumma, Nuagarh and R.Udayagiri blocks. These areas need more attention for better farm management practices with respect to optimum use of resources and inputs.

CHAPTER – 8

A

FEW

CASE STUDIES

BATISAH RIVER LIFT PROJECT IN NILAGIRI BLOCK – A CASE STUDY

Batisahi River Lift Project has been constructed on the river 'Tangana' in Batisahi of Nilagiri block with the financial assistance of Nilagiri ITDA and executed by the Orissa Agro Industries Corporation, Balasore. The construction work started on 23rd February 2006, completed within six months and inaugurated on 14th August, 2006. The estimated cost of the project was Rs.5,26,000/- and it was completed without any cost escalation. The ayacut of the project is 50 acres in *kharif* and 30 acres in *rabi*. Forty farmers families



belonging to Santal community have been benefited by this project. They have formed a Pani Panchayat (Water Users' Association). Shri Purna Chandra Hembram has been elected as President of the Pani Panchayat. The irrigated ayacut has medium type of land with clay loam soil texture. Before the execution of the project, the farmers were growing only one crop i.e, local paddy. They were applying very little quantity of fertilizer especially urea depending on the rain. The yield of paddy was only around 4-5 qtls/ acre which was not adequate enough to sustain them for the whole year. There fore they had to depend on wage earning to supplement their livelihood. After getting irrigation, all of them have been motivated for adopting high yielding varieties of paddy during *kharif*. Of course they use their own seeds for paddy and thus the seed replacement rate in the area is almost zero. During the last *kharif* (2007), Lalat was grown by all the farmers of the Pani Panchayat and the yield was about 8 Qtls/ acre with minimum application of fertilizer (Gromor 50kg/acre).

During last Summer (2006-07), the farmers also took up Lalat variety of paddy and yielded about 12 Qtl/ acre. They have increased fertilizer use in Summer paddy in comparison to *kharif* paddy (20:16:10 of NPK in form of Gromor, SSP, Urea and MoP). Although the fertilizer application is not balanced, the farmers have knowledge of use of phosphatic and potassic fertilizer and their impact on plant growth. The farmers are using pesticides to overcome the pest situation which was not the case while they were cultivating local paddy during the pre-project period. During the post-project period, while adopting HYV paddy, the farmers are generally using Thimet @ 1.5 kg/ acre for *kharif* paddy and 3 kg/acre for Summer paddy mostly to control stem borer which is responsible for reducing grain production. It is observed that the farmers have increased the paddy yield from 5 Q/acre during pre-project period to 8 Q/acre in *kharif* and 12 Q/acre in *rabi* during the post-project period. During the current *rabi* season (2007-08), the farmers have planned to grow vegetables like pumpkin, bitter gourd, okra, cucumber, brinjal etc. Horticulture Extension Personnel have already contacted the farmers and suggested the package of practices and will provide vegetable seeds. The cultivators fully utilize their family labour for crop production in their own land instead of going outside for wage earning. The farmers will send their produce to the nearby markets like Nilagiri, Balasore and Kaptipada. It is obvious that vegetable production will definitely increase the level of farm income of the beneficiaries. Simultaneously they are now in a position to utilize their family labour in the process of crop production in their own field instead of moving outside the village for wage earning. There is a Women Self Help Group (Sechedahala Mahila SHG) with 12 members started during 2003. Malati Murmu and Hiramani Murmu are the President and the Secretary of the SHG respectively. After execution of the irrigation project, the SHG has also procured one Power Tiller on 17.8.2007. The hiring charge of the Power Tiller is Rs.160/- per hour and this is mostly utilized by the farmers of the project area. The farmers have experienced that the use of power tiller is more convenient and cheaper than that of bullock labour, which is Rs.60/- per day. This river lift project also provides drinking water to the villagers through taps at different locations of the village. It is observed that the irrigation project will be successful in enhancing the socio-economic status of the beneficiaries soon.

RANIDUMER DIVERSION WEIR IN THUAMUL RAMPUR BLOCK – A CASE STUDY

Ranidumer Diversion Weir is constructed in Ranidumer Village of Kaniguma GP in Thuamul Rampur Block. The Project was executed by Thuamul Rampur ITDA during 2006-07. About 30 tribal farmers of Kandha community are benefited by this mini irrigation project. The project is a perennial source of irrigation and provides irrigation to about 55 acres of land during *kharif* and 7 acres of land during *rabi*-summer. The farmers including Shri Gededa Majhi, the Ward Member and Shri Lalar Nayak, Ex-Nayeb Sarpanch narrated the pre-project and post-project activities. Before execution of the irrigation project, the farmers were growing rainfed crops like local paddy, ragi, and minor millets like *kosla* (local name) during *kharif* only. After execution of the diversion weir, the farmers adopted high yielding varieties of paddy like Parijat, Khandagiri, Lalat, Swarna and non-paddy crops like maize and



vegetables during *kharif*. For obtaining hyv and improved seeds the farmers take advantage of Agriculture Department Sales Centre at Kaniguma which is about 6 kms away. During *rabi*-summer, they grow high yielding paddy like Khandagiri, Parijat, Lalat, non-paddy crops like maize, mustard, pulses (*kandula* and other local varieties), vegetables like potato, brinjal, tomato,

cauliflower etc. Because of high fertility status of the land, the crops yield better without application of chemical fertilizers. Paddy (Swarna) yields about 25Q/acre even without fertilizer application. The farmers allow their cattle to stay in the crop field after harvesting in order to add cowdung directly to the field especially for paddy. The ITDA has leveled the land in the project area during 2006-07 under the Land Development Scheme, which is quite beneficial to the farmers, and they expressed their satisfaction for controlling of the soil and water runoff thereby increasing crop yield. The production from Swarna paddy is as much as 20 Q/acre after irrigation as against 5-6 Q/acre of local paddy. The farmers consume paddy, pulses, millets and minor millets in their family and sale the vegetables in the nearby market in Jaipatna, Dasigaon, Kalampur, Dumerpadar, Rampur, Gopalpur and Mukhiguda. They do not encourage the middlemen for marketing their vegetables, rather the growers take their produce to the market in a vehicle, stay there for 2 to 3 days and sell directly to the consumers. The farmers are aware of the compost making and compost pits are seen in most of the vegetable growers' field. But the farmers have not yet realised the benefits of soil testing and therefore need more motivation.

With an innovative idea, the farmers grow high yielding paddy along with local paddy during summer season under irrigated condition. They sow the seeds of Swarna variety (145 days duration) along with local paddy during December and harvest Swarna during April-May and simultaneously the local paddy is also harvested which is in vegetative stage. The remaining part of the local paddy acts as ratoon crop and starts tillering during *kharif*. This local crop matures during next December. From both the HYV and local paddy, they get about 30 Q/acre without applying any chemical fertilizer as the forest soil is rich in organic matter. This method of cultivation enables the farmers to minimize the cost of land preparation and acts as soil conservation measure against soil runoff. This package of practices needs more research.

DHULIGUDA DIVERSION WEIR IN THUAMUL RAMPUR BLOCK – A CASE STUDY

Farm lands in Dhuliguda village in Kaniguma GP of Thuamul Rampur block gets some irrigation through Dhuliguda Diversion Weir executed by the ITDA to the extent of 23 acres during *kharif* and 10 acres during rabi/summer.

The tribals in the village belong to Kandha community. The village have 95 farmer families of whom 22 tribal farmers have been benefited by the project. Before irrigation, the main crops were local paddy, ragi, minor millets and niger. Farming has become the major source of income for the villagers after execution of the irrigation project. Most of the villagers are literates because of existence of one primary school in the village. This diversion weir is providing irrigation since 1992-93.

Shri Jhari Majhi is one the villagers benefited by the irrigation project. He has 11 acres of cultivated land. During, 2006-07, ITDA has implemented the Land Development Scheme in the village with the financial provision of Rs.20,000/- per acre out of which subsidy is Rs.10,000/- and the rest Rs.10,000/- is the contribution by the beneficiary by way of labour. Shri Jhari Majhi has also availed this assistance from the ITDA. Prior to execution of the irrigation project, Shri Majhi was growing local paddy, ragi, minor millet, local pulses and niger. From local paddy he was getting only 4-5 Q/ acre and less than 1 qtl niger per acre. It was barely enough to meet the food requirement of his family and there was no surplus. There was no scope for rabi-summer crops due to want of irrigation. After execution of the project, he is growing 5 acres of HYV Swarna paddy during *kharif* and getting a return of about 10 Q per acre. In the rest 6 acres of rainfed land he is cultivating ragi, minor millets and niger as usual. Because of irrigation facility, he has brought 5 acres of land under cultivation during summer also. During summer, he grows Lalat paddy in 4 acres and diversified the rest one acre to cultivation of vegetable like tomato, brinjal, green pea etc. Irrigation facility has increased the cropping intensity to more than 140%. The vegetables are sold in the nearby markets. Production of paddy during summer is about 8 qtls per acre. The return is not encouraging as no chemical fertilizer is applied and no plant protection measures have been taken against pest menace. By selling the surplus in the market he gets Rs.450/- per qtl of paddy and Rs.2800/- per qtl of niger. He could have raised his production through application of chemical fertilisers, but it there is no scope because of unavailability of fertilizer sale point in his vicinity and the technical guidance for better crop production. Matarini SHG is operating in the village, which is promoting vegetable cultivation. The NGOs like Gram Vikash and Soubhagya Vikash Kendra provide vegetable seeds and guidance and

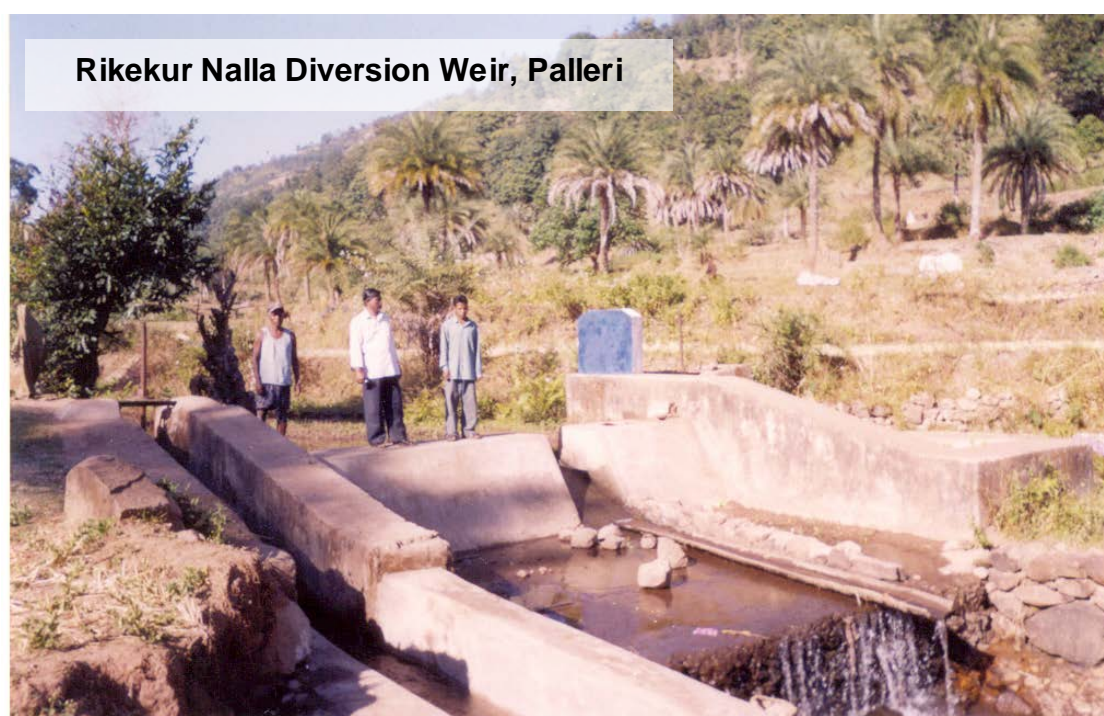
encourage for vegetable cultivation. Although, there is one seed sale center of Agriculture Department at Gunupur within the accessible area, the farmers are not aware of seed replacement and they generally use their own seeds. Even after provision of irrigation and land development, some barren lands were found in the command area during field visit. During discussion, it was revealed that out of 95 farmer families in the village, only 15 families have bullocks. Unavailability of bullock labour for primary tillage and land preparation is a major drawback, which compels the farmers to keep the irrigated land uncultivated. Also the cost of bullock labour (Rs.50/- per day without any human labour) and human labour cost of Rs.50 to Rs.70/- per day depending upon the demand is also another factor for keeping the land fallow.

JHARMUNDA CHECK DAM IN LANJIGARH BLOCK – A CASE STUDY

The mini irrigation project executed by the ITDA, Thuamul Rampur at Jharmunda village in Pokharibandh GP of Lanjigarh block is known as Jharmunda Check Dam which has an ayacut of 33 acres during *kharif* only and benefits 26 tribal farmers. The check dam constructed during 1993-94 has a sluice gate and concrete field channel to carry water to the field. The tribals in the village belong to Shabar community. The village has 75 families out of which 35 families depend on agriculture. Shri Rabindra Sabar and Shri Padmanav Sabar are two leading farmers of the village benefited by the irrigation project. Each of them has got 2 acres of land in the command area. Before execution of the project the main crops of the village were local paddy, black gram, ragi, minor millets and cotton to some extent. The production was not sufficient to meet their family needs. They had to depend upon wage earning for about 5 months in a year and collection of forest produce like firewood and *mahula*. After getting irrigation facility the farmers have gone for cotton a highly remunerative commercial crop. Both the farmers of Shabar community have cultivated cotton in 1 acre each. On an average they are getting 3 qtls of cotton per acre. But due to monkey menace, the production sometimes goes down even to 1 qtl per acre. They have applied fertilizers like urea, DAP, SSP, MoP. Also they are aware of pest problem and use of pesticides in cotton crop. The cotton is procured from the village by CCI at a cost of Rs.2200/- per qtl. After introduction of irrigation, the yield from cotton has increased because it has

been life saving irrigation. Also the farmers have shifted to high yielding varieties of paddy like Lalat and Swarna in the irrigated lands from local paddy and getting higher yield in comparison to the local varieties. During the current *kharif* (2007), the production of hyv paddy was limited to 6-8 qtls per acre and it was not encouraging due to late sowing resulting gall midge infestation. However, the farmers have knowledge of factors responsible for enhancing production like transplanting, fertilizer application under irrigated condition. The farmers are getting hyv/ improved seeds from the block headquarters and fertilizers from GP headquarters at a distance of 4 kms. There is a Primary School in the village and High School and Colleges are at a distance of 10 kms from the village which hinders higher education of the children. There are three SHGs namely; Maa Bhairabi SHG, Maa Banjari SHG, Alaka SHG which are not very active. The SHGs may procure a pump set and provide on hire to the farmers for optimum utilization of the irrigation water and check water loss due to flow irrigation. The farmers, during rabi-summer season, go for wage earning as the irrigation project provides water during *kharif* only. Most of the villagers posses Job Cards under NREGS.

RIKEKUR NALLA DIVERSION WEIR PROJECT IN NUAGADA BLOCK A CASE STUDY



Mini Irrigation Project has been constructed across Rikekur Nalla (a perennial stream) in Palleri Village of Antarda GP of Nuagada block. The project has been constructed by the ITDA, Parlakhemundi. The construction work started on 26th December 1995 and completed on 6th February, 1997. It was completed within the estimated cost of Rs.93,000/-. The ayacut of the project is 79.91 acres in *kharif* and 20 acres in *Rabi*. Fifty Soura and 5 non tribal families have been benefited by the project. The beneficiaries have formed Pani Panchayat (Water Users' Association) with fifty members. The land type in the project ayacut is medium land with clay loam soil texture. Before the execution of the project, the farmers were growing only one crop i.e, local paddy. They were applying very little quantity of fertilizers especially urea depending on the rain. The yield of paddy was only around 4-5 qtls/acre which was not adequate to feed their families for the whole year. There fore they were supplementing their livelihood by wage earning.

After getting irrigation, the farmers have been motivated for adopting high yielding varieties of paddy during *kharif*. Now almost all the farmers are growing HYV paddy like Pooja, CR-1009 etc during *kharif*. Of course they are using their own seeds and so, the seed replacement rate in the area is almost nil. During the last *kharif* (2007), the yield was about 8 Qtls/ acre with minimum application of fertilizers (urea and gromor). During last *rabi* season (2006-07), the farmers also produced high yielding paddy, vegetables and pulses. Though they use cow-dung manure, they have also increased fertilizer use in *kharif* paddy as well as summer paddy to almost 40kg/acre from 25 kg/acre for *kharif* paddy during pre-project period. Although the fertilizer application is not balanced, the farmers have knowledge of use of fertilizers and impact of each major nutrient like N, P₂O₅, K₂O on plant growth. The farmers are also using pesticides to combat the pest situation which was not so while they were cultivating local paddy during the pre-project period. It is observed that the paddy yield has increased from 5 Q/acre during pre-project period to 8 Q/acre in *kharif* and 12 Q/acre in summer during the post-project period. During the current *rabi* (2007-08), the farmers have started cultivation of vegetables like cauliflower, brinjal, cucumber, tomato, chilly, potato, carrot etc in addition to paddy and oil seeds. Horticulture Extension Officers have already contacted the farmers and suggested the package of practices and will provide vegetable

seeds. The cultivators fully utilize their own labour and family labour for crop production in their own land and this has reduced their dependence on wage earning. This is a positive impact of the irrigation project. The farmers will send their produce to the nearby markets like Nuagada block. It is obvious that vegetable production will definitely increase the level of farm income of the beneficiaries. Simultaneously they are now in a position to concentrate their family labour in the process of crop production in their own land instead of moving outside the village for wage earning. The women of the village have formed one Self Help Group. It is observed that the irrigation project will be a success in enhancing the socio-economic status of the beneficiaries.

RANGIAMBBA WATER HARVESTING STRUCTURE IN R.UDDAYAGIRI BLOCK - A CASE STUDY



WHS in Rangiamba

Rangiamba (Bidyadharpur) Water Harvesting Structure (Mini Irrigation Project) is constructed in the same Village of Chheligada GP in R. Uddayagiri Block. The Project was executed by Parlakhemundi ITDA during 1997 within the estimated cost of Rs. 95,000/-. About 35 tribal farmers of Soura community are benefited by this project. The project is a perennial source of irrigation to

38.67 acres of land during *kharif* and 22 acres of land during *rabi*-summer. As narrated by the farmers namely Shri Binod Chandra Karjee and Shri Paaul Bhuyan, before execution of the irrigation project, the farmers were growing rain-fed crops like local paddy, ragi and minor millets during kharif only. After execution of the project, the farmers adopted high yielding varieties of paddy like Jajati, CR-1009, Lalat, Pooja and non-paddy crops like maize and vegetables during kharif. The farmers avail the benefit of Agriculture Department Sales Centre at Cheligada which is about 3 kms for getting HYV and improved seeds. During Rabi-summer, they grow HYV paddy like Lalat & Pooja and non-paddy crops like maize, mustard, pulses of improved and local varieties, vegetables like potato, brinjal, tomato, cauliflower etc. Because of fertile land, the yield is better without or with little application of chemical fertilizers. The farmers keep their cattle in the crop field after harvesting to add cow dung directly in the field especially for paddy. The farmers consume the crops in their family and sale the vegetables in the nearby market in Cheligada. From vegetable only they get net profit of Rs.6,000 to Rs.8,000 per acre. The farmers are aware of compost making and compost pits are seen in most of the vegetable growers' field.



Beneficiaries of Rangiamba WHS

As an innovative idea, the farmers grow high yielding paddy along with local paddy during *rabi* season in irrigated fields. They sow the seeds of Pooja variety along with local paddy during December and harvest during April. This local crop matures during next December. From both the HYV and local paddy, they get about 16Q/acre without applying any chemical fertilizer. This method of cultivation enables the farmers to minimize the cost of land preparation and acts as soil conservation measure against soil

SALADEUL NALA DIVERSION WEIR IN GUMMA BLOCK - A CASE STUDY



Saladeul Nala Diversion Weir irrigates 16.94 acres land of Rangada village in Ukhura GP of Gumma block. It has been executed by the Parlakhemundi ITDA. The tribals in the village belong to Soura community. The village have 20 farmer families. Before irrigation, the main crops were local paddy, ragi, minor millets and niger. Farming is the major source of income for the villagers after execution of the irrigation project. Most of the villagers are literates. This diversion weir is providing irrigation since 2004-05. Shri Kaleba Nayak is one of the villagers who is benefited by the irrigation project. He has 2.50 acres of cultivated land. Prior to execution of the irrigation project, Shri

Nayak was growing high yielding paddy, ragi, minor millet, local pulses and niger. The yield from paddy was about 7.5Q/acre. He just met the food requirement of his family from paddy, ragi and minor millets and there was no marketable surplus. There was no scope for *rabi*-summer crops in the village due to want of irrigation. After execution of the project, he is growing HYV paddy in 2 acres of and getting a return of about 10 Q per acre during *kharif* and 12.5 Q/acre during summer. In the rest 0.5 acres of rainfed land he is cultivating ragi and pulses as usual during *kharif*. He could have raised his production through application of chemical fertilizer, but there is no fertilizer sale point in his vicinity and no technical guidance with respect to crop production. SHG, *khali* making unit and tailoring unit are operating in the village. Although, one seed sale center of Agriculture Department is available at Gumma within the accessible area, the farmers are not aware of seed replacement and they generally use their own seeds.

PARIVATA NALLA RIVER LIFT IRRIGATION POINT IN R. UDAYAGIRI BLOCK – A CASE STUDY



The River Lift Irrigation point executed during 2005-06 by the ITDA at Parivata village in R.Udayagiri GP of R.Udayagiri Block has an ayacut of 50 acres for *kharif* only. 40 ST, 2 SC and 23 OC farmers are benefited by this project. Irrigation water is carried to the field through a pipe installed with the L.I. Point. Majority of the families including the Souras residing in the village

depend on agriculture. Shri Mango Gomango and Smt Ilimi Gomango are among the beneficiaries of this irrigation project. Both of them have got 4 and 3 acres of land respectively in the project area. Before execution of the project the main crops of the village were paddy (hyv), maize, ragi and minor millets. The yield was not enough to meet family requirement. They have to depend upon wage earning and collection of MFPs for about 5 months in a year to sustain themselves. They have knowledge on application of fertilizers like urea, DAP, gromor and potash along with compost. The popular high yielding varieties of paddy are Jaganath, Jajati during pre project period and Jaganath, Pankaj, CR-1009, Pooja during post-project period. During the current *kharif* season (2007), the production of hyv paddy has been raised to 8-10 Q/acre against 6-7 Q/acre before getting irrigation. The present yield level is not encouraging due to late sowing resulting in gall midge infestation. The yield of summer paddy is about 13-15 Q/acre. Due to impact of the irrigation project the production from summer paddy is an addition to the farm income. The farmers have knowledge on factors responsible for enhancing production like seed replacement, transplanting, maintenance of plant population, fertilizer application etc under irrigated condition. The farmers are getting quality seeds from the block headquarters and fertilizers and pesticides from GP headquarters. There is a Primary School in the village and High School and Colleges are at a distance of 5 kms which hinders higher education of the children. SHGs are functioning in the village. Most of the villagers possess Job Cards under NREGS.

CHANDRAPUR WATER HARVESTING STRUCTURE IN BONAI BLOCK – A CASE STUDY

The Water Harvesting Structure was executed during 1997-98 by the ITDA on Bagdiha Nala at Chandrapur village in Jiradapalli GP of Bonai Block. It has an ayacut of 55 acres during *kharif* and provides life saving irrigation to 30 acres during *rabi*. About 100 farmers including 60 ST and 22 SC are benefited by the project. The Project is located at about 1 km away from the village. It is constructed during 1997-98 with a cost of 2.47 lakhs.

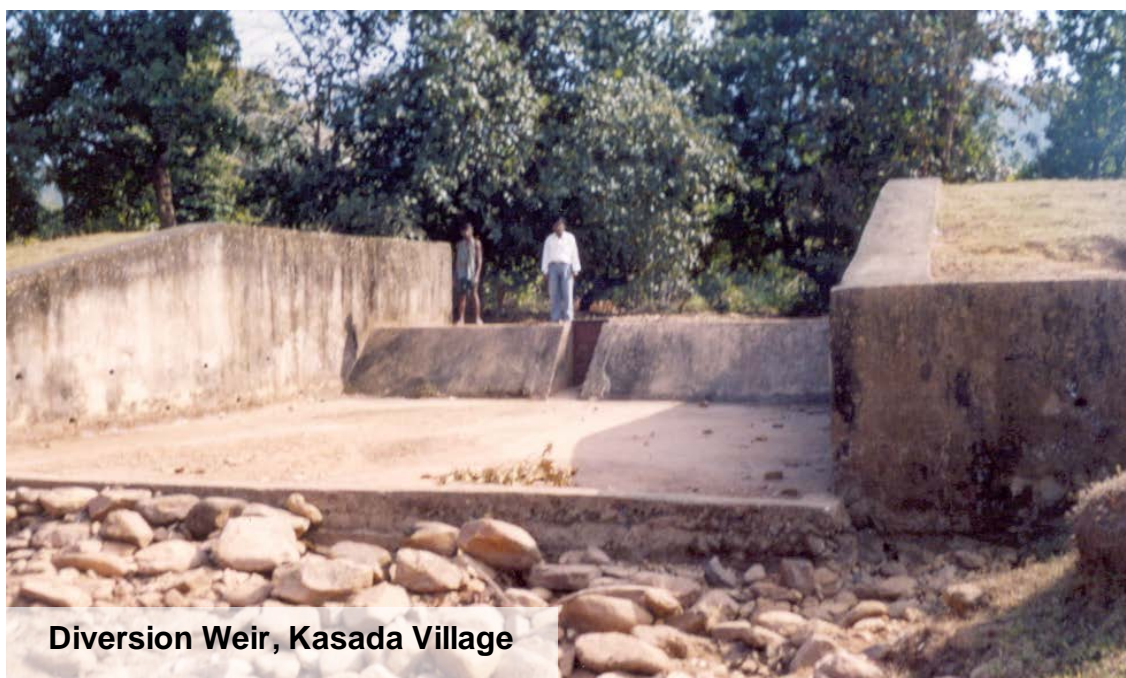
The village is located on plain land and houses are constructed in two rows. Most of the houses are tiled roofs. Soil type is loam and clay-loam. . The village is electrified. There is a primary school in the village.



SHGs are functioning in the village. The village has adequate drinking water facility. Some of the villagers have cottage industries like earthen doll making and tailoring. Further the village needs street road, school building and a store house. The tribals in the village belong to Kisan community. The majority of the families depend on agriculture. Shri Anaga Oram and Smt Rambhabati Nayak are two leading farmers of the village and who are also benefited by the irrigation project. They possess 2 acres and 2.5 acres of land respectively out of which 1.5 acres each are irrigated. Before execution of the project *kharif* paddy of local varieties was the main crop. The average production of 5Q/acre of paddy was not even sufficient to meet family requirement. They had to depend upon wage earning for about 5 months in a year and collection of forest produce like firewood, tubers, seeds and fruits. After getting irrigation facility, they have adopted some production enhancing technologies like adoption of high yielding varieties, transplanting, application of fertilizers and pesticides where as in absence of irrigation only organic manure was being used. They also have awareness on pest problem and the interest to know the pest control measures and seek guidance from the field level agriculture extension workers. Khandagiri and Lalat are the popular varieties of paddy and the farmers have got incremental yield of 3Q/acre over the local paddy in *kharif*. The yield was

reduced due to late sowing resulting gall midge infestation. During *rabi*, both of them have gone for cultivation of wheat and vegetables. The production of wheat is about 4Q/acre and the gross return is around Rs.4500/- per acre against the investment of Rs.1000/- excluding the family labour. During *Rabi*, they are growing vegetables in small patches under irrigation mainly for their own consumption in addition to paddy and wheat which also has contribution towards enhancing the farm income of the farmers. The farmers are getting hyv/ improved seeds from the block headquarters and fertilizers and pesticides from GP headquarters at a distance of 18 and 5 kms respectively. There is a Primary School in the village. High School and Colleges are about 5kms and 18 kms respectively from the village which hinders higher education of the children. Most of the villagers possess Job Cards under NREGS.

KASADA DIVERSION WEIR IN BONAI BLOCK – A CASE STUDY



Kasda Diversion Weir executed by the ITDA in Kasada village in Kasada GP of Bonai Block has an ayacut of 48.19 acres during *kharif* only and 110 farmers are benefited by the project. It has been constructed during 2003-04 at an estimated cost of 5.00 lakhs. The village is located on plain land and most of the houses are constructed in two rows and have tiled roofs. Soil type is sandy loam with hard strata of lateritic stone. The village is electrified. A primary school is functioning in the village. An NGO namely, Vikash Pratisthan Kalyani

Club, which works for the wage earners, is operating in the village and benefiting 25 families. Seven SHGs are also operating there. Pani Panchayat has been formed with Shri Judhistar Nayak as its elected Secretary. The tribals in the village belong to Gond and Kisan community. The main livelihood of the people is agriculture. Shri Nayak- the Secretary of Pani Panchayat and Shri Bhajamana Patar are the two leading farmers of the village having 5 acres and 3 acres of farmlands respectively who have been benefited by the irrigation project. Each of them has got 1 acre of land in the ayacut of the project. They use low water lifting device like *Tenda* to irrigate the land from the canal. Before execution of the project the main crop was local paddy. The production of 4 - 4.5 Q per acre was not even sufficient to meet their family needs. They had to depend upon wage earning for about 5 months a year and collection of forest produce like firewood, tubers and seeds and fruits (*Mahul*, tamarind, *kendu*, mango, honey, *harida*, *bahada*, *aonla*, broom stick etc). Shri Judhisthir Nayak was applying a small quantity of fertilizer ie, about 8 kg per acre along with organic manure in local paddy during pre-project period where as Shri Patar was not using any chemical fertilizer but organic manure only.

In the post project period both of them have adopted HYV paddy like Swarna and Konark. The yield is about 12 Q/acre from irrigated land and 6 Q/acre from the rainfed land. For want of irrigation during *rabi*, the land remains fallow and the cropping intensity, unchanged. The farmers are ignorant of seed replacement and they use their own seeds or exchange seeds with other farmers.

DENGSGARGI DIVERSION WEIR IN LANJIGARH BLOCK – A CASE STUDY

Dengsargi village of Lanjigarh block is irrigated by a Diversion Weir to the extent of 25 acres during *kharif* and 7 acres during *rabi* season. The project was executed during 1984-85 with an expenditure of Rs.80,000/- and was subsequently repaired with a cost of Rs.36,000/- during 1990-91. Again during 2003-04, the project was renovated with an expenditure of Rs.2.75 lakhs. It has total 40 beneficiaries, of which 23 are tribal farmers belonging to Kondh community. The village is situated on the foot hill. It is not electrified. The farmers are fetch drinking water from a perennial spring. The villagers participated in pre-project discussions and also worked as wage earners during its construction.



The major livelihood of the villagers is farming followed by wage earning and collection of MFP. Prior to irrigation, local paddy was the main crop during *kharif* and there was no scope for *rabi* cultivation. Shri Dingu Majhi, a farmers was getting an yield of about 2.5 Q/acre. After operation of the irrigation project, he has shifted from local paddy to high yielding paddy. During *kharif* and gets about 5Q/acre and during *rabi* it is about 8Q/acre. The yield is not encouraging as the farmer is not applying any chemical fertilizer. The varieties like Swarna, Jajati, Lalat have gained popularity in the area. In addition to paddy during *rabi*, he has also grown maize and green peas in about 0.5 acres. Kutia Kondh Development Agency (KKDA) has given assistance for 0.5 acre of banana demonstration of dwarf Cavendish variety to Shri Majhi with all inputs including 600 suckers and fertilizers like 264 kg urea, 180 kg SSP, 312kg MOP, 300 kg *neem* oilcake and 250g of seed treating chemical (Dithane M-45). ITDA has also provided Rs.600/- towards fencing for each 0.5 acre demonstration. All the plants were in fruiting stage. He expects a good return from banana. The neighboring farmers have also been encouraged with banana cultivation which can enhance the farm income level of the farmers. In Lanjigarh block 10 acres and in Thuamul Rampur block 20 acres banana demonstrations have been given by KKDA and ITDA respectively.

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CHAPTER – 9

SOME EFFECTIVE FOCUS GROUP DISCUSSIONS

Focus Group Discussion : Sagnal, Nilagiri Block



**FGD at Sagnal
Diversion Weir**

The discussion was made with the farmers of Sagnal village in Nilagiri block benefited by the Diversion Weir. The farmers like Shri Durga Majhi, Jadunath Tudu, Mirza Marandi, Musu Hembram, Rasik Murmu, Baidhar Hembram and others took part in the discussion. All the 44 beneficiaries of the project belong to tribal (Santal) community. Agriculture is the primary and wage earning is the secondary occupation of the villagers. Besides, they collect forest produce like *sal* leaf,

siali leaf, honey, resin, fuel wood, date palm leaf, mushroom, rhizomes etc and also grow silk (*tassar*) cocoon which they sell at their door step. The village is situated in forest area. It is not electrified. Only one perennial spring flowing close to the village meets their drinking water needs. The houses are scattered. The area irrigated by the project is 32 acres. The villagers were consulted before execution of the project. Some of them also worked as labourers during its execution. They grow local paddy and HYV paddy like Swarna and Lalat and use the produce mainly for their family consumption. The sale price of paddy is Rs.550/Qtl. The farmers proposed extension of 500 ft length of canal as the existing 150 ft canal is not sufficient to irrigate. Also they demanded for installation of a bore well for expanding irrigation facility to additional 25 acres of land in the village. The beneficiaries also suggested increasing the depth of the project and renovating the canal to carry more water.

Focus Group Discussion : Telipal (Nuasahi) – Nilagiri Block

The Focus Group Discussion was made in the village Telipal (Nuasahi hamlet) of Telipal GP in Nilagiri block. Shri Purna Chandra Majhi, Ex-Sarapanch, Ward Member and other farmers like Shri Braja Kishore Murmu,

Shri Ramesh Majhi, Shri Krushna Chandra Majhi, Shri Chamuru Majhi and Shri Bahadur Majhi participated in the discussion.

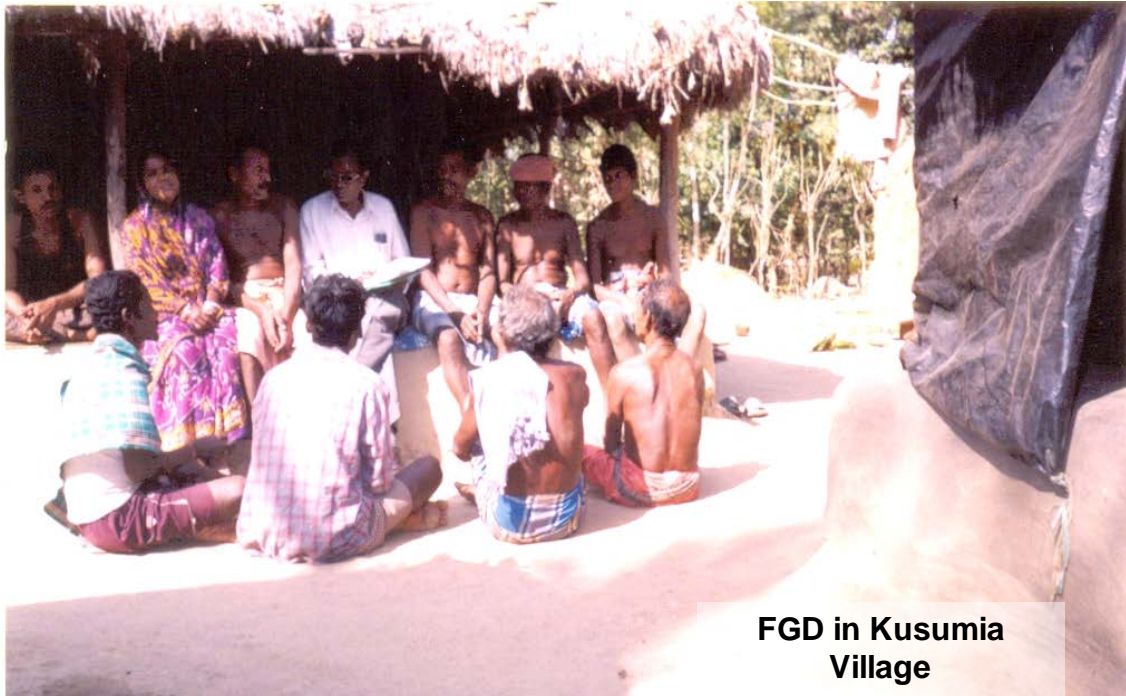
The farmers of the village are benefited by a Diversion Weir. Around 300 beneficiaries are getting irrigation during *kharif* out of which 24 are Santal farmers. The beneficiaries were not consulted prior to implementation of the project or identification of the project site. But they have worked as wage earners during construction of the project. Agriculture is the main occupation of the villagers followed by wage earning. During *kharif* they grow local paddy and high yielding paddy. Swarna and Lalat are the most popular varieties. The produce is mainly utilized for their own consumption. The agricultural inputs like seeds, fertilizers and pesticides are available within the reach of the farmers. The main problem is unavailability of timely and adequate technology as no extension personnel is available in the village at the time of need. The beneficiaries were of the opinion that the project has helped in generating additional income and hence, the migration of the villagers to other distant places has been reduced and limited to one male member of the family where as during pre-project times almost all the family members were going out in search of wage. This is a positive impact that the beneficiaries felt and expressed their satisfaction.

In order to increase the irrigation potential, the villagers suggested for a sluice gate in between Sudiamba and Nuasahi which may increase irrigation potential of Nuasahi and benefit additional 30 tribal farmers. The villagers also suggested for installation of a bore well in the village which may provide irrigation to additional 30 acres of land.

Focus Group Discussion : Kusumia, Nilagiri block

The FGD was conducted with the participation of the following beneficiaries in Kusumia village in Sajanagada GP of Nilagiri block which has a shallow tube well (STW) installed during 2002-03.

- Madhu Manika
- Baishnab Manika
- Narendra Madhei
- Jadu Manika
- Brahmananda Khandei
- Bharat Khandei



FGD in Kusumia Village

All these farmers belong to Bathudi tribe. The STW provides irrigation to about 4 acres during *kharif* and 0.5 acres during *rabi* and 7 tribal farmers are benefited with the project. It also provides drinking water to the villagers. Keeping in view the rainfed condition and problem of drinking water, the STW project was sanctioned. The villagers were informed about the installation of the project through group meeting. Before execution of the project, only local paddy was grown. After getting assured irrigation, the farmers have adopted HYV paddy like Swarna and also cultivate local paddy. The sale price of paddy is Rs.600/ql in the locality although they do not sell and rather utilize the entire produce for their own consumption. Besides, they grow vegetables like okra, chilli, tomato, pumpkin and greens during *rabi* season. The villagers primarily depend on farming and also on forest collection. The village is not electrified and the shallow tube well is operating in diesel. The STW has got some technical problem resulting low discharge which needs immediate rectification. The farmers demand another shallow tube well in the village.

Focus Group Discussion : Jamuna (Jharanaghati), Nilagiri block

Jharanaghati hamlet of Jamuna village comes under the Nilagiri block. The FGD was conducted in the village with the participation of Gajendra Sing, Rajendra Sing, Gopinath Sing, Kuna Sing, Ram Chandra Hembram, Mansing

Hembram, Bhagbat Hembram and other farmers. They belong to Kolha and Santal tribe. Two Dug wells are available in the village which irrigates about 5 acres during *kharif* and around 0.5 acres during *rabi* and benefits 16 tribal farmers. The beneficiaries were consulted and they had participated as wage



Jharanaghati Dug well

earners during execution of the project. They are growing local variety of paddy and high yielding paddy like Swarna, Lalat during *kharif*. They have not given up cultivation of local paddy because their need for straw for thatching purpose. The produce is mainly utilized for their own consumption. During *rabi*/summer, they grow maize and vegetables like brinjal, tomato and greens in small scale in 0.5 acres of land and sale the produce in the local market. They have invested Rs.1500/- (excluding family labour) in this land and got return of about Rs.7500/-. They are not getting technical guidance on crop production. They are using organic manure and chemical fertilizer especially for paddy cultivation. They have suggested to increase the depth of the dug wells up to 10 feet to get sufficient discharge and also to provide pipe on subsidy to carry the irrigation water. They know about vermi-compost through radio only but have not got any scope to adopt the same. They were advised to contact Agriculture Officer to meet their demand of plant protection equipment and mould board plough. They also need financial assistance for land leveling for increasing the area under irrigation.

Focus Group Discussion : Adiakhunta, Nilagiri block



The FGD was made in Adiakhunta in Narsinghpur GP of Nilagiri block where River Lift Project has been executed on Suna river. Shri Harekrushna Bag, President of the RLP, Banamali Sing, Secretary, Dibakar Sing, Brahamananda Bag, Birendra Rout and other beneficiaries of the project participated in the discussion.

The village has a scattered settlement pattern. There are cottage industries like *khali* making and tailoring in the village. The village is electrified. The villagers are getting drinking water from pond, river and tube well.

The project was executed during 2005-06 and irrigates about 50 acres during *kharif* and 54 tribal farmers mainly of Kolha and Bhumija community are benefited by the project. During *kharif*, local paddy as well as high yielding paddy like Khandagiri, Lalat, Annapurna are grown for own consumption by the farmers. The farmers are guided by the VAW with regard to technology interventions. The farmers are getting inputs like seeds and fertilizers within their reach. They have planned to grow vegetables during the *rabi* season and dispose the produce in the local market at Remuna and Sajanagarh. Pucca latrine facility has been provided to the villagers through an NGO. The beneficiaries suggested for providing irrigation channel of about 500 ft to carry irrigation water to the plots. The irrigation water during *rabi* is not sufficient. The villagers also demand a bore well to bring additional area under irrigation and also requested for construction of concrete road in the village.

Focus Group Discussion : Similipadar, Th.Rampur block

The village Similipadar in Gunupur GP of Thuamul Rampur block is getting irrigation through a Diversion Weir which was executed during 1995-96.



FGD in Similipadar Diversion Weir

It provides irrigation to 44 acres during *kharif* and about 6 acres during *rabi*. 39 tribal farmers belonging to Kandha community have been benefited by the project. The village is situated on the hill slope. There is no electricity in the village and a perennial spring meets the need of drinking water. The group discussion was made in presence of Lili Majhi, Sumangal Majhi, Sursu Majhi, Budera Majhi, Sukru Majhi and others. The villagers were consulted by the executing agency prior to execution of the project and they also participated as wage earner during construction of the project. The major livelihood of the villagers is farming and wage earning. They also depend on forest produce collection like mango, *mahula*, *sal* leaf, *siali* leaf, resin, honey and fire wood. The major crop in *kharif* is paddy both local and hyv grown in the irrigated land. The varieties like Swarna, Jajati, Lalat, have gained popularity for their high yielding characteristics. Besides, they grow pulses like *kandula* and maize to some extent in the rainfed area. They also use the irrigation facility during *rabi* by cultivating mustard, vegetables like tomato, cauliflowers, cabbage, peas etc. They sell their produce especially vegetables in nearby market at Kaniguma and Th.Rampur. The villagers have been blessed with the boon of perennial source of irrigation. The excess water of Swajala Dhara is utilized by the villagers to grow banana provided by ITDA as demonstration in one acre of land. The ITDA has provided all inputs including suckers and fertilizers for the

demonstration. The crop is in fruiting stage. The farmers are encouraged to go for banana cultivation through demonstrations. The farmers demanded for repairing of the field channel of the diversion weir to increase its efficiency which frequently damages due to flow of excess water during rains.

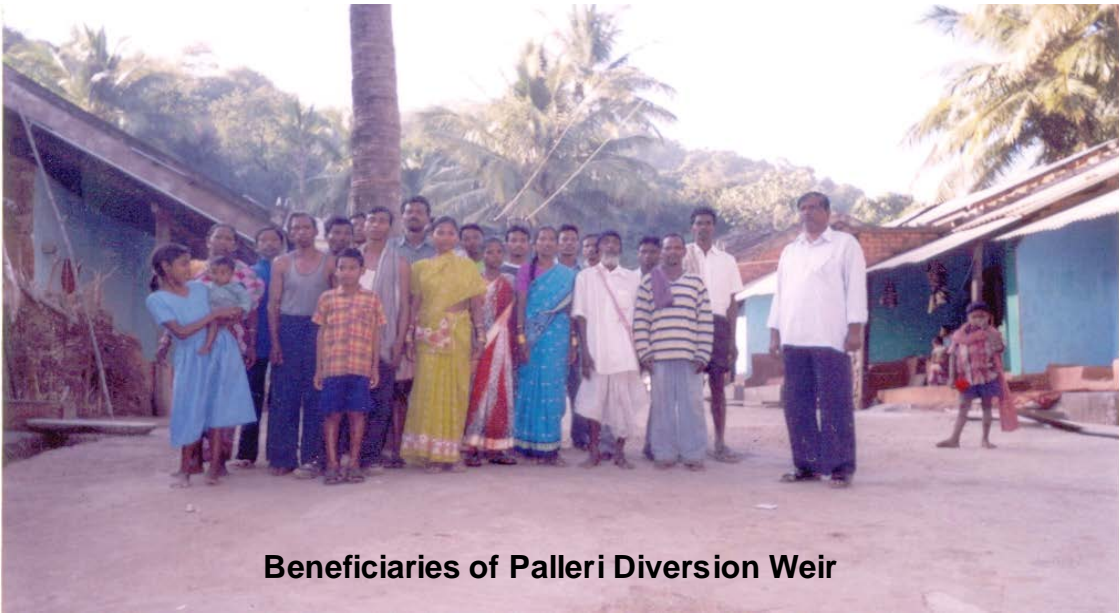
Focus Group Discussion : Dengsargi, Lanjigarh Block

The discussion was organized in Dengsargi village of Lanjigarh block which is irrigated by a Diversion Weir having command of 25 acres during *kharif* and 7 acres during *rabi* season. The project executed during 1984-85 was completely damaged and it was reconstructed during 2003-04 with an expenditure of Rs.2.75 lakhs. 23 tribal farmers belonging to Kondh community are benefited by the project. The villagers participated during pre-project discussions and also worked as wage earners in the project.

Shri Gobinda Majhi, Shri Dungu Majhi, Shri Sadan Majhi, Shri Arjun Majhi, Shri Landa Majhi and others participated in the discussion. The village is situated on the foot hill. The village is not electrified. The farmers are getting drinking water from a perennial spring. The major livelihood of the villagers is farming followed by wage earning. Besides, they collect forest produce like fuel wood, mango, *sal* leaf. The major crop during the post project period is paddy both local and *hyv* during *kharif*. Paddy varieties like Swarna, Jajati, Lalat have gained popularity. Prior to irrigation, local paddy was the main crop during *kharif* and there was no scope for *rabi* cultivation. At present mustard and vegetables like tomato, potato, cauliflower is grown in the village under irrigated condition. The vegetable is marketed in Lanjigarh bazar. ITDA has made 0.5 acre banana demonstration in the village with all inputs including 600 suckers and fertilizers viz, 264 kg urea, 180 kg SSP, 312 kg MOP and 300 kg *neem* cake. Besides, 250g of seed treating chemical (Dithane M-45) has been provided. ITDA has also provided Rs.600/- towards fencing for each 0.5 acre demonstration. All the plants were in fruiting stage. The farmer expects a good return from banana. The farmers opined that banana plantation will be profitable and there is scope to increase the area under banana plantation in the village involving other farmers. The farmers suggested for construction of concrete canal to the fields.

Focus Group Discussion : Palleri , Nuagada Block

Rikekur Nalla Diversion Weir was constructed by the ITDA, Parlakhemundi during 1996-97 on Rikekur Nalla (a perennial stream) in Palleri Village of Antarda GP in Nuagada block in Gajapati district with an estimated cost of Rs.93,000/-. The ayacut of the project is 79.91 acres in *kharif* and 20 acres in *rabi*. The project irrigates the lands of 50 Soura families and 5 non tribal families of the village. The beneficiaries have formed a Pani Panchayat (Water Users' Association) with fifty members.



Beneficiaries of Palleri Diversion Weir

The village is located at a distance of 7 kms from block head quarters. Settlement pattern of the village excepting a few scattered houses, is almost linear having houses in two rows with a path (road) in between. Most of the houses are tiled or tin roofed. 16 families have constructed houses under IAY. It is electrified. There is a Primary School, two rice hullers, store house, tube wells, pipe water supply, village tank in the village. SHG and NGO are also functioning in the village.

Discussion was made with Shri Gurta Gomango, Shri Ayub Dalabehera, Shri Bangali Dalebhera, Shri Gurendra Raita and Shri Jisaya Mandala. Most of the villagers are literate. Prior to execution of the project, *kharif* paddy, mostly local and ragi were the main crop of the village. The level of production was around 4-5Q/acre due to cultivation in rainfed condition and use of no or very little fertilizer like urea. The farmers were mostly dependant on wage earning for maintaining the livelihood. After execution of the project, they have adopted

hyv paddy during *kharif* and during *rabi*/ summer they grow hyv paddy, vegetables and pulses. The popular hyv of paddy are Pooja, CR-1009, Swarna, Jajati. During the current *rabi* (2007-08), the farmers have started cultivation of vegetables like cauliflower, brinjal, cucumber, tomato, chilli, potato, carrot etc in addition to paddy with the guidance of the Horticulture Extension Officer.

The farmers suggested taking up repair of the Diversion Weir to minimize the water loss and also suggested for extension of irrigation channels. The farmers are also interested for getting technology on crop production through trainings and group discussions.

Focus Group Discussion : Anagha, R.Udayagiri Block



A focus group discussion was conducted in Anagha village of Anagha GP in R.Udayagiri block with participation of Shri Krushna Chandra Badamuneli, Shri Dandapani Pradhan, Shri Bhaskar Nayak, Shri Hari Chandra Pradhan, Sri Ram Chandra Pradhan, Smt Phulabati Pradhan, Smt Chandrama Karji and others. Most of the villagers are literate. The village is irrigated by Goudalinga Nala Diversion Weir. The project was constructed during 2005-06 with a cost of Rs.2.00 lakh. The ayacut of the project is 50 acres during *kharif* and about 20 acres during rabi season. 35 tribal farmers of Soura community are benefited by the project. The village is 43 kms away from block headquarters and 3 kms from the main road and bus stop. Settlement pattern

of the village is linear and the village is situated on the foot hill close to the forest. The village is not electrified. Drinking water requirement is met from two tube wells in the village. The village is having one primary school. In addition to agriculture, the villagers also go for wage earning for their livelihood.

Prior to provision of irrigation, *kharif* paddy and ragi were the main crops of the village. The yield from *kharif* paddy was limited to 5 -6 Q/acre and the farmers have knowledge on growing of HYV paddy with application of fertilizer but not as per recommended dose. The production of ragi was not encouraging and limited to about 2Q/acre under rainfed condition without proper package of practices and fertilizer use. After getting irrigation, the farmers are growing hyv paddy during *kharif* by applying fertilizers and it have raised the production level to around 9-10 Q/acre. Besides, maize and ragi are grown in *kharif* under rainfed condition. During *rabi*, they cultivate hyv paddy and get production of 10-12 Q/acre and also grow vegetables like cole crops, brinjal etc which adds to their income. Jagannath, Swarna, Lalat are the popular varieties of paddy.

The villagers suggested for construction of new canal on the left side of the project to properly utilize the runoff water of the project. Besides, height of the project needs to be raised to accommodate more water during rainy season and increase irrigation efficiency.

Focus Group Discussion : Sevakpur, Rayagada Block



Beneficiaries of Sevakpur RLP

The River Lift Project in Sevakpur village of Narayanpur GP in Rayagada block has an ayacut of 50 acres during *kharif* and 40 acres during *rabi* depending on availability of water. 150 farmers including 127 tribal farmers of Soura community and 5 SC farmers are getting benefit out of the project. The project was executed during 2000-01 with an estimated cost of Rs.7,62,300/-.

The group discussion was made with the participation of Shri Braja Sundar Badhei, Shri Bhimsen Bhuian, Shri Ganapati Rout, Shri Arjan Rout and other villagers. Although the village is 22 kms away from block headquarters, communication is not a problem since the village is situated on the bus route. Most of the houses have tiled roof and some villagers have been allotted with houses under IAY. Electricity is provided for domestic use. Two SHGs namely Sarala Mahila Samity and Pujarini Nari Samity are working in the village. Besides, one NGO works for agricultural development and sanitation. Two Pani Panchayats (Water Users Association) have been formed in the village. Before the project, *hyv* paddy was being cultivated during *kharif* with the average yield of 8-10 Q/acre. In the post project period, *hyv* paddy is the main crop with productivity of around 12-14 Q per acre. The popular varieties are Jagannath and Mahsuri during *kharif* and Pooja during *rabi*/summer. After introduction of irrigation project, the cropping intensity is more than 160%. They have also increased fertilizer use and apply pesticides to enhance the production.

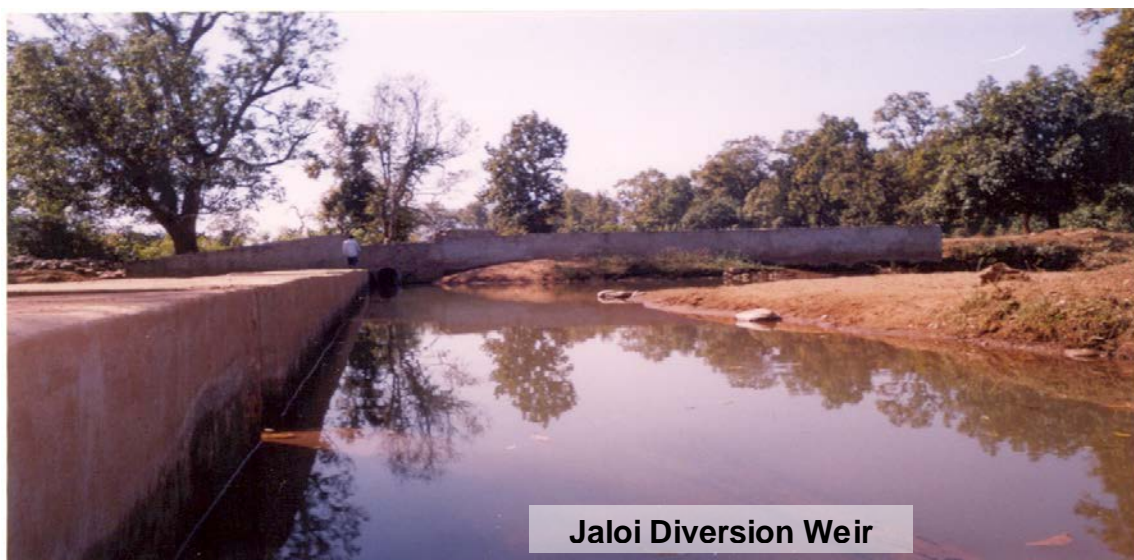
Supply of electricity is a problem for the RLP that can be overcome by upgrading the sub-station as stated by the beneficiaries.

Focus Group Discussion : Jaloi, Gurundia Block.

Shri Khirod Nayak, a traditional leader, Shri Niladri Patra, Shri Pulasta Sahu, Shri Dhanu Adha and some other villagers participated in the group discussion in Jaloi village of Tamperkela GP in Gurundia block. They belong to Bhuiyan tribe. The farmers in the village are benefited by a diversion weir executed during 2006-07 by the ITDA with an expenditure of Rs1.675 lakh. It irrigates about 30 acres during *kharif*.

The village is about 5 kms from the bus stop, 8 kms from GP headquarters and 24 kms from block headquarters. The settlement pattern is linear with *kacha* houses. The village is not yet electrified. The main source of livelihood of the villagers is farming followed by wage earning. They also partially

depend on collection of forest produce like fuel wood, honey, resin, *siali* leaf. Some villagers also earn from *khali* making. The village has one Anganwadi, one primary school and one upper primary school but the high school is about 8 kms from the village. One NGO (*Ama Orissa*) is working in the village for education of the dropout SC, ST students of 6 to 14 years age group. During the pre-project period paddy was the main crop of the village and the farmers were growing high yielding paddy but the yield was restricted to 4-5 Q/acre with no or very little application of fertilizer. The whole produce was mainly being utilized for home consumption. After getting assured irrigation, the farmers were motivated for application of fertilizer along with compost and adoption of transplanting method to enhance crop production. For field irrigation, they use



low water lifting device (*Tenda*). The increase in *kharif* paddy production up to 7 Q/acre even with application of chemical fertilizer is marginal compared to pre-project period because of technological gap and lack of awareness on crop production technology like age of seedlings for transplanting, maintenance of plant population, quantity and time of application of fertilizer and balance use of plant nutrients, weed control and pest problem. During *rabi*, they grow vegetables for their own consumption as well as sell in the village market. There is one rice huller in the village. The farmers suggested to extend the length of canal up to 400 metres so that the water will reach the tail end and there would be better coverage of irrigation and also for renovation of the diversion weir by excavating the sand deposit to increase the efficiency of the project.

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CHAPTER – 10

INTERACTIONS WITH THE BENEFICIARIES

Farmers' Participation, Benefits derived and Suggestions for improvement

Participation in selection of Location and Execution of the Project

- Most of the farmers have participated during construction of the irrigation projects as wage earners.
- A few farmers have participated in discussion and offered their suggestions during the planning and execution of the project.
- In some cases the farmers have participated in selection of the location of the project.

Benefits derived from the Projects by the Farmers

- Almost all the farmers have the opinion that the projects have benefited them by providing irrigation to the crop and enhancing the farm production and farm income as well as socio-economic status of the farmers.
- In most of the projects the irrigation facility has encouraged the farmers to take up HYV paddy and vegetables during *rabi* season and there by raise their farm income.

Suggestions given by the Beneficiaries for increasing efficiency of the Projects.

1. Nilagiri ITDA

- The beneficiaries of Sirsasahi Diversion Weir in Garadihi GP of Nilagiri block suggested obstructing the water at the sluice gate so that it will facilitate irrigation during *rabi* season.
- Beneficiaries of dug well in Jharanaghati village of Pithahata GP in Nilagiri block suggested to increase the depth of the reservoir by 10 feet further to enhance the irrigation potential of the project. They suggested for execution of shallow tube well instead of dug wells for better irrigation.
- The beneficiaries of RLP in Jamuna village (Batisahi) of Pithahata GP in Nilagiri block suggested for development of additional 100 feet field channel and also for timely supply of seeds.

- The beneficiaries In Telipal village/GP in Nilagiri block suggested for a sluice gate in Bandribandha Diversion Weir at Sudiamba Sahi to facilitate irrigation in additional 30 acres of land.
- The beneficiaries of Jharanaghati WHS in Kandansahi village suggested for adopting pisciculture in the project head.

2. Bonai ITDA

- The height of the Check Dam in Gamardihi village in GP/ Block Lahunipada needs to be raised to provide irrigation to additional area.
- Villagers of Mahulata in Talabadi GP in Lahunipada block suggested for a LIP utilizing water from Khandadhar waterfall.
- Construction of an embankment on the left side of the Check Dam was suggested by the villagers of Khajuribahal in Kasada GP of Bonai block which will provide irrigation to the field on the left side of the project and check the wastage of water.
- Canal of Jhankajharan Diversion Weir has been damaged and needs new construction as suggested by the villagers of Jhankajharan in Tamara GP in Gurundia block.
- The farmers of Jaloi in Tamperkela GP of Gurundia block suggested to increase the length of canal of the Diversion Weir up to 400 metres so that the water will reach the tail end and there would be better coverage of irrigation. It was also suggested for renovation of the diversion weir by excavating the sand deposit to increase the efficiency of the project.

3. Paralakhemundi ITDA

- The beneficiaries of Andhariguma Diversion weir of Abapur village suggested increasing the height of the head and repairing the canal to enhance the irrigation potential.
- The beneficiaries of Lalusahi Check Dam in Narayanpur GP of Rayagada block suggested for another canal to the right side of the head to facilitate irrigation to that side.
- The beneficiaries of Ghatitala WHS in Jirango GP of Rayagada block suggested for repair of the project to increase efficiency.

- The beneficiaries of the River Lift Project at Sevakpur village in Narayanpur GP of Rayagada block suggested for upgrading the electric sub-station to overcome the problem of low voltage and irregular supply of electricity.
- Excavation of canal on the left side of the Palleri Diversion Weir in Antrada GP of Nuagada block was suggested.
- Parivata RLP is working efficiently as stated by the beneficiaries in Parivata village of R.Udayagiri GP/block. The potential of the project can be increased by making a provision in the river (Ghodasala Nala) for accumulation of sufficient water during *rabi* season.
- The villagers of Anagha village/GP in R.Udayagiri block suggested for construction of new canal on the left side of the project to properly utilize the runoff water of the project. Besides, height of the project is to be raised to store more water during rainy season and increase irrigation efficiency.
- The beneficiaries of Saladeul Nala Diversion Weir of Rangada village, Ukhura GP of Gumma block suggested for construction of side embankment to reserve sufficient water during rainy season which can provide irrigation during *rabi* also.

4. Thuamul Rampur ITDA

- Beneficiaries of Hadkhursi Diversion Weir in Gunupur GP of Th. Rampur block suggested for extension of field channel in order to increase the irrigation potential. This suggestion was also given by the beneficiaries of Similipadar Diversion Weir in Th. Rampur block, Rajamunda check dam, Dengsargi Diversion Weir in Lanjigarh block.
- Renovation of the Bhaluchanchara WHS in Patvaleri village of Lanjigarh block as well as Balisura Diversion Weir in Th Rampur Block is required.
- Farmers suggested for execution of bore well for supply of water during *kharif* as well as *rabi* season for Dhuliguda Diversion Weir in Th. Rampur block and Similibhata Diversion weir in Lanjigarh block.

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CHAPTER – 11

Summary, Recommendations & Conclusion

SUMMARY

Irrigation is the artificial application of water to farmland for the purpose of agricultural production. Effective irrigation will influence the entire growth process from seedbed preparation, germination, root growth, nutrient utilisation, to plant growth and regrowth, yield and quality.

Major objectives of the Impact Evaluation Study are to assess the impact of the project on the following sectors.

- Enhancement of productivity of the land brought under irrigation.
- The extent of increase in input use.
- The level of employment generation for both family labour and hired labour.
- Increase in farm income of the beneficiaries.
- Improvement in socio-economic status of the beneficiaries.

The study was conducted in four ITDA areas during December, 2007 to March, 2008. The four ITDAs like Nilagiri, Bonai, Paralakhemundi and Thuamul Rampur were selected for the study. In these areas, the farmers benefited by the mini irrigation projects like Water Harvesting Structures (WHS), Diversion Weirs, Cross Bunds, Weir Dams, River Lifts, Shallow Tube Wells, Dug Wells etc executed by the ITDAs in the selected villages were taken into purview of the study. 41 mini irrigation projects were taken into account from four ITDA areas covering 10 blocks, 39 villages and 237 beneficiaries.

The summary of the study findings are as follows.

1. During the study, there are no instances of complete failure of the irrigation projects noticed but the farmers have experienced decrease in the estimated ayacut in some cases. The damaged irrigation canals, field channels and decrease in the depth of the reservoir due to silting are some of the reasons for low and reducing irrigation efficiency of the projects. There is also gap in the real ayacut and the estimated ayacut especially during *Rabi* season, which primarily depends on the intensity of rain received during rainy season. Also installation of additional sluice

gate in some projects may help to check the run off of excess water during rainy season and there by increase the irrigation potential.

2. 42% of the respondents are illiterates and 24% are just literates. 29% of the respondents have gone up to primary level of education where as the percentage of persons with HSC and college education is negligible. This appears to be a hindrance for adoption of improved technologies of farming.
3. It was observed that 78% of the tribal population depends on agriculture which is the primary source of their livelihood. About 19% of the tribals depend on wage earning. Only 3% of the sample population has gone for service especially in Bonai area may be due to industrialization in Rourkela.
4. Average household size in the sample is 5.97 out of which the adult population is 3.51 and child population (below 14 years) is 2.46. The male workforce and female workforce is 1.64 and 1.46 per household which is computed to 91% and 85% respectively. As such the percentage of total workforce to total adult population comes to 88%. The higher percentage of this workforce has significant contribution in the process of farm production and income.
5. During the pre-project period the average land holding per household was estimated to be 2.67 acres and increased to 2.85 acres during post-project period. Most of the tribal farmers (56%) are marginal farmers having land size up to 2.5 acres. The share of small farmers having land size from 2.5 acres to 5 acres is limited to 37%. The percentage of big farmers having land more than 5 acres is very negligible i.e, only 7%.
6. The Cropping Intensity during the post-project period has increased to 143% from 100% during pre-project period. The gross cropped area has expanded by 48% from 638.40 acre during pre-project to 945.40 acre during post-project. This increase is the contribution of irrigation which ultimately adds to the farm income and employment generation.

7. The number of farmers growing *kharif* paddy during pre and post project periods remaining almost constant, the yield rate per acre has increased from 4.95 Q/acre to 8.67 Q/acre (75% increase) in the post project period.
8. After getting assured irrigation, 101 farmers out of 237 have adopted cultivation of high yielding summer paddy and produced more than 9 Q/acre. The productivity in Paralakhemundi ITDA area that ranges from 10 to 12 Q/acre is the highest in comparison to other areas. It is observed that the farmers in Bonai ITDA area utilize 41% irrigation potential for more remunerative non-paddy crops like wheat, mustard and vegetables in stead of paddy cultivation during summer.
9. During pre-project period adoption of high yielding *kharif* paddy was limited to 89 farmers and that has increased to 220 during post-project period. Use of local varieties of paddy has remarkably gone down to 7% during the post-project period against 61% during pre-project. This shows the positive trend of adoption of innovative technology for enhancing production through crop diversification from local to high yielding varieties during the post project period.
10. During the pre-project period the average household consumption of paddy was limited to only 4.59 Qtl per acre and that has increased to 5.82 Qtl per acre during post project period. Likewise, the sale of surplus paddy which was almost negligible during the pre project period has increased to 2.96 Qtl per acre during the post project period.
11. The fertilizer use was as low as 7.23 kg per acre during the pre-project period. This has considerably increased by 223% and reached the level of 23.37 kg per acre during the post project period. Increase in irrigation potential leads to use of higher doses of fertilizer and adoption of high yielding varieties resulting increase in production and productivity of crops. The ratio of NPK use during the post project period is around 4:3:2 against the ideal ratio of 4:2:1.
12. There is no significant increase in use of organic manure but the farmers have maintained the same level of application of organic manure during

pre and post project periods although there is increase in cropping intensity by 143% because of their consciousness regarding benefits of using organic manure. Almost every household maintains a compost pit but the process of compost making is not always done in a scientific manner.

13. Majority of the farmers to the extent of 54% and 49% are receiving technology from the field functionaries of Agriculture Department and radio respectively. Besides, 13% farmers get the guidance from other department extension personnel including ITDA and Block and 24% of farmers from the NGOs operating in the area. The technology provided to the farmers is not sufficient and quality of technology dissemination can be improved through farmers' trainings, technology demonstrations and awareness camps.
14. Almost all the farmers know about the availability of agricultural inputs like HYV and improved seeds, fertilizers, pesticides, farm implements and farm machineries as well as credit.
15. During the post project period, there is increase in acquisition of modern assets by the farmers by 138 bicycles and 35 radio sets over the pre-project. There is limited use of electric fan and TV as there is no electricity in most of the villages. Use of mobile phone and two-wheeler is gradually gaining popularity as it helps to minimize the communication gap. With the improvement in the socio-economic status, the tribal farmers have taken care for improving their housing and education status.
16. The interest for providing education to their children has also grown with increase of income and they are availing facility provided by the Government to make their children educated. It is observed that 126 families are sending their children to Primary and ME schools and 37 families to High Schools. There are college-going children from 15 families.
17. When per acre use of bullock labour and human labour are analysed, it is seen that there is rise of 6% and 23% respectively over the pre-project

- period. This is because of adoption of high yielding paddy and other labour intensive non-paddy crops like maize, vegetables and sugarcane.
18. The bullock labour has increased from 49 to 77 days per year per household that counts to 57% increase over pre-project period. Similarly, engagement of human labour has increased by 83%. Out of the total human labour employment, family labour has the lion's share of 75% followed by hired labour (13%) and labour cooperative (12%). The family labour engagement in a year has increased by 88 days over pre-project period per household. The additional employment generation in term of human labour has resulted due to increase in cropping intensity as well as adoption of labour intensive remunerative crops facilitated by the irrigation.
19. The impact of irrigation is directly proportionate to the Farm Business Income. The Gross Return, Investment and Net Return per acre have increased in each block during the post project period. When pre and post project period are compared, the Gross Return has increased from Rs.2871/- to Rs.5209/- (81%) per acre, Investment from Rs.1353/- to Rs.1742/- (29%) per acre and Net Return from Rs.1518/- to Rs.3467/- (128%) per acre. On an average for all the four ITDAs taken together the increase in net return is more than double during the post project period in comparison to pre project period. The average net return per household comes to Rs.13,321/- during post project as compared to Rs.4079/- during pre-project. The average per-rupee return of Rs.2.12 over investment during the pre project has been enhanced to Rs.2.99. The beneficiaries can derive higher return by optimum utilization of the irrigation resources and the technology with the guidance of the extension personnel.

RECOMMENDATIONS

1. The beneficiaries may be encouraged to form Water Users' Association to facilitate optimum use of irrigation water through effective crop planning in the entire ayacut.

2. In some cases the irrigated land remains fallow due to unavailability of bullock labour during land preparation. The farmers may be provided with credit for purchase of bullocks. Besides, farm mechanization equipments especially for primary and secondary tillage operations and threshing need to be popularised. The SHGs formed in the villages may go for procurement of tillage equipments and provide on hire. This activity has been found successful in Batisahi RLP in Nilagiri Block.
3. Dissemination of adequate and timely technology on crop production including selection of varieties, seed replacement, water management, application of chemical fertilizer basing on soil test results, inter cultural operations, Integrated Pest Management (IPM) and post-harvest technology are to be given priority through personal contacts, group discussions and field visits by the agriculture and horticulture extension personnels.
4. Adequate steps may be taken by the Government for soil test drive in mass scale through awareness generation.
5. Required technology demonstrations on field crops as well as vegetables, farmers' trainings and exposure visits may be organized to bridge the gap between innovations and technology adoption. Banana demonstration in Dengsargi of Lanjigarh block is a success which may be extended to other areas.
6. The successful farmers/ beneficiaries may be encouraged through felicitation in block/ district level exhibitions and awareness camps.
7. Availability of inputs like HYV and improved seeds, fertilizers and plant protection chemicals within the farmers reach through the SHGs and Water Users Associations (Pani Panchayats) needs to be ensured.
8. The plant protection equipments and simple & low cost farm implements like mould board plough, weeder, improved sickle paddy thresher, winnower etc need to be popularized in large scale through provision of subsidy.
9. Financial assistance may be provided for land leveling through Land Development Schemes in order to bring additional area under irrigation that has been successful in Ranidumer village in Kaniguma GP of Thuamul Rampur block.

10. The water storage capacity of the reservoirs may be enhanced by raising the height of the dam wherever possible as observed in Jharanaghati WHS in Nilagiri block to facilitate irrigation during *rabi* season which in turn will enhance the cropping intensity resulting increase in farm return and income.
11. In most of the irrigation projects, the farmers' demand to increase the length of the irrigation channel may be considered in order to increase the efficiency as well as coverage of irrigation.
12. To check the runoff of excess water during rainy season and bring additional area under irrigation, the farmers' proposal for installation of additional sluice gates may be examined in some of the projects.
13. The cases of low discharge of water in shallow tube wells may be detected and rectified. The discharge of dug wells can be increased by increasing the depth as suggested by the dug well beneficiaries in Jharanaghati village in Nilagiri block.
14. Supply of High Density Poly Ethylene (HDPE) pipes on subsidy may be examined for improving the efficiency of delivery system in case of lift irrigation through shallow tube wells and dug wells to minimize the loss of water during flow in earthen channels.
15. Repairing of the field channels of the irrigation projects which is frequently damaged due to flow of excess water during rains may be done to increase the irrigation efficiency. The diversion weir in Similipadar village in Gunupur GP of Thuamul Rampur block is one of such projects where repair of field channels can increase the command area as well as irrigation efficiency.
16. The feasibility for introducing pisciculture in the project head through SHGs may be studied as observed in Rajamunda Check Dam in Lanjigarh block of Thuamul Rampur ITDA.
17. The problem of low voltage of electricity impiring the efficiency of the River Lift Projects needs to be rectified by upgrading the transformer.

CONCLUSION

No doubt, the mini irrigation projects executed in the tribal areas by the ITDAs for the benefit of agriculture have positive impact on cropping intensity, crop production, crop productivity, employment generation, farm business income, socio-economic status of the beneficiaries. During the study, no instances of complete failure of the irrigation project were noticed, but the projects sometimes irrigate less than the estimated ayacut as experienced by the cultivators. There is wide gap during *Rabi* season in actual irrigated area and estimated area which depends on the frequency and quantum of rainfall received during the monsoon. However, efficiency of some projects can not be explored to the full extent because of damaged irrigation canals, field channels and decrease in the depth of the reservoir due to silting. Also installation of additional sluice gate in some projects may help to check the run off of excess water during rainy season and increase the irrigation potential during *kharif* and to some extent during *rabi*. Installation of shallow tube wells and bore wells are integrated part of private irrigation that need to be encouraged by way of providing subsidy where the beneficiaries can use the water and simultaneously earn by providing water to neighbouring farmers. Moreover the farmer will have a choice to select his own suitable cropping pattern in consultation with the extension functionaries which may not be possible in a community irrigation project. It is now high time to give a thought to improve the field extension system for dissemination and adoption of the innovative technologies in the field of agriculture, horticulture, soil conservation, pisciculture and animal husbandry to make the optimum use of the irrigation projects in order to achieve the maximum benefit out of the investment made by the Government. Involvement of the NGOs, SHGs, Water Users Association (Pani Panchayats) is to be strengthened for effective multi-disciplinary extension. Exposure visit of farmers to the successful irrigation projects will definitely have positive impact on cropping pattern and crop diversification. The successful beneficiaries may be encouraged through felicitation in public gatherings like agricultural exhibitions and awareness camps.

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