WATER MANAGEMENT OPTIONS FOR INCREASING IRRIGATION EFFICIENCY IN K.B.K(Koraput,Bolangir, Kalahandi)AREAS ON ODISHA

A DISSERTATION

Submitted in partial fulfilment of the

requirements for the award of the degree

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WATER RESOURCES DEVELOPMENT & MANAGEMENT

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By

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CANDIDATE'S DECLARATION

I hereby declare that the dissertation titled **" WATER MANAGEMENT OPTIONS FOR INCREASING IRRIGATION EFFICIENCY IN K.B.K(Koraput, Bolangir, Kalahandi) AREAS ON ODISHA"** which is being submitted for fulfilment of the requirement for the award of the Degree of Master of Technology with specialization in Water Resource Development(Civil) and submitted to the Department of Water resources Development and Management (WRD&M), Indian Institute of Technology, Roorkee. This is an authentic record work carried out during the period from July 2015 to May2016, under the supervision and guidance of **Dr S. K. Tripathi**, Professor, WRD&M, IIT Roorkee, Uttarakhand, India.

I have not submitted the matter embodied in this dissertation for the award of any other degree.

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Place : Roorkee. Enrolment No. 14548007

CERTIFICATE

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

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Date : 10th May 2016 **CHANDRA SEKHARA SETHY**

Place : Roorkee

ABSTRACT

In the current study an attempt has been made to assess the effect of water management through a community participation and emergency of Pani Panchayat in a case study of Laxmi Narasima Pani Panchayat under Lift Irrigation Project of the Indravati Command Area (ICA) in Nawarangpur district of Odisha state in the Eastern part of India.The participating farms are more technically efficient in the production of kharif crop than the non participating farms. To examine the functions and otherwise of Water User Association (WUA) or Pani Panchayat promoted by the districts and the local traditional irrigation area institutions in the ICA, Odisha and to evaluate their functioning & characteristics in the context water management in local areas. The number of canal irrigation application and yield realization are higher on the participating farms than non participating farms. The main objectives are; (1) To assess the understanding of PIM (participatory Irrigation Management) in KBK districts of Odisha. (2) To assess the impact of PIM in increasing the irrigation efficiency, (3)To suggest the ways & means to improve water irrigation in KBK. It seems that the Pani Panchayat act as regulatory institutions in taking charge for distribution of water on equitable basis and their performance has been practically weak and unsuccessful . Even if the Pani Panchayat is initiating and endorsing in the State for more than a couple of years but the acceptance of the model have been poor. As Pani Panchayat is a new concept which needs enough experiment and experience before finalizing its content and constituent in greater detail, the irrigation agency is not in a position to checkout the different components of the programme in concrete forms and the farmers should be informed accordingly. Otherwise frequent changes in the provisions will make a confusing situation to the farmers and they will lose the confidence in the irrigation authority. A feasibility study should be under taken by examining the caste class confliction , groupism, political differences and history of local conflicts. The bottom up approach is more necessity than that of the top-down for sustainability, to ensure that the benefits of the project are equally distributed among all concern stakeholders for timely supply of good quality agricultural inputs along with irrigation water management.

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ABBREVIATIONS

AIBP - Accelerated Irrigation Benefit Programme

ADB -Asian Development Bank

BCM - Billion Cubic Metres

BKVY -Biju Krushak Vikash Yojana.

CAD -Command Area Development

CAD&WM- Command Area Development & water Management.

CPR - Common Property Resources

DOWR – Department Of Water Resources

FOT -Farmers Organization and Turnover

FO - Farmers Organisation

Ha. m -Hectare metre.

HH -HouseHolds

IMT - Irrigation Management Transfers

IMP - Irrigation Management Programme

K.B.K - Koraput , Bolangir, Kalahandi districts

Km -Kilometre.

LTAP - Long Term Action Plan

m - metre

MCM – Million Cubic Metre.

mm Millimitre.

MSL - Mean scale level

NGO - Non- Governmental Organization (NGOs)

NWP – National Water Policy.

OCTMP -Odisha Community Tank management Project

OIIMWMIP - Odisha Integrated Irrigated Agriculture and Water Management Investment Projects

O& M – Operation and Maintenance

OWRCP-Odisha Water Resources Consolidation Project

PIM - Participatory Irrigation Management

PP - Pani Panchayat

RIDF – Rural Infrastructure Development Fund

RLTAP -Revised Long Term Action Plan

SC -Scheduled Caste

ST – Scheduled Tribe

TII -Taraditional Irrigation Institutions

TSP -Tribal- Sub Plan areas

WUA - Water User Association

CHAPTER 1

INTRODUCTION :-

1.1 GENERAL SCENARIO:-

Odisha is one of the few states in the Country, which is flowing various rivers with abundant water resources. But the natural resources is very unevenly distributed in all districts over the time and the space. The rainfall which is the main source of water resources varies from about 1200 mm to 1700 mm from southern regions to northern plateau. The long-term annual rainfall of all the state is 1482 mm which is equivalent to 235.76 BCM (Billion Cubic Metres) of water resources of the state . The substantial quantity of 78% of the above is received in the monsoon season (from June month to September) and the remaining 22% water is available in 8 months. Out of the total precipitation, a part is lost by evaporation, by transpiration and by deep percolation of water in to the soil and the part stored in the form of groundwater reserve and remaining part appears as surface runoff . The groundwater is the prime source and the surface runoff constitute to the water resources of the state.

Odisha is primarily an agrarian state and is dependent on economic development and poverty alleviation as more than 2/3rd of the population . The state has cultivable land of 61.67 lakh hectares. It is observed that irrigation potential of different irrigation is largely restricted to Kharif season. The irrigation potential in Rabi season is less than half of Kharif irrigation potential. Currently irrigation in Kharif season is available to only 34% of cultivable land . Hence, irrigation scenario in Odisha is protective in Kharif rather than productive irrigation in Rabi season . During Rabi season assured majority of irrigation of the farmers are keeping their land fallow and during Rabi season up to the end of March 2015, irrigation facilities of 33.13 lakh hectares have been created out of the total cultivable land of 61.67 lakh hectares. The balance cultivable land area of 28.54 lakh hect. irrigation potential created by the end of March 2015 through different sources ,

Major & Medium - 13.82 lakh ha. Minor (Flow) - 6.05 lakh ha.

Deep Bore well - 1.39 lakh ha. Minor (Lift) - 5.69 lakh ha

The KBK district is one of the most backward tribal area of the country. The Geographical coordination is **18° 13' to 19° 10' North latitude and 82° 5' to 83° 23' East longitude** and the elevation is **969** mt(MSL). According to 2011 census Koraput district has a population of **1,376,934**. This reveals that it covers a ranking of 356th in India (out of a total of 640). The district has a population density is about **156 inhabitants per Sq Km** (400/sq mi). The problems of KBK districts and the poverty conditions prevailing in the area is a matter of concern. To solve the above problems, Government has introduced, a Long Term Action Plan (LTAP) which was launched during the year 1995-96. For all practical purposes Government of India, has launched the scheme RLTAP which focuses on all key sectors of rural development. Irrigation is one of the key sectors. Govt. of India has modified AIBP (Accelerated Irrigation Benefit Programme) guidelines which agreed to provide the central assistance under relaxed norms and conditions. To provide sufficient irrigation to mitigating the chronic drought problem places, some new irrigation projects is proposed .As a result of which 10 new Major and Medium Irrigation Projects and 25 Minor Irrigation Projects are approved under AIBP and two major projects namely Upper Indravati and Upper Kolab started in AIBP scheme during the year 1996-97 & 1997-98 has also been inserted under the RLTAP scheme .These projects are now executed under a special scheme named ”BKVY”(Biju Krushak Vikash Yojana).

1.2 CONCEPT OF PARTICIPATORY IRRIGATION MANAGEMENT (PIM)

To make water management efficient, all irrigation systems are to be restructured. However increasing the demand of water in all the sectors of irrigation made to be imperative and then the efficiency of irrigation water management will be increased. At the tertiary level of the canal systems for alleviation of management Problems, On a pilot basis of Farmers Organization and Turnover (FOT) and Odisha Water Resources Consolidation Project(OWRCP), water users association is renamed as Pani Panchayats. From its inception to till date a lot of efforts have been made for increasing the acceptance of the programme ,through a massive awareness campaign by several NGOs, through capacity building training, workshops, interactive workshops are conducted at the regular intervals of time with the office bearers of Pani Panchayats, officials of the concerned departments and with the local farmers.

Table No-1.1: Geographical and Administrative Units of the KBK Districts

SI No.	Districts	Area (Sq.Km)	Number of				
			Sub-divn.	Tahsils	Blocks	Tribal-SubPlan	Villages
1	Balangir	6575	3	14	14	-	1794
2	Kalahandi	7920	2	13	13	2	2236
3	Koraput	8807	2	14	14	14	2028
4	Malkangiri	5791	1	7	7	7	1045
5	Nabarangpur	5291	1	10	10	10	901
6	Nuapada	3852	1	5	5	-	663
7	Rayagada	7073	2	11	11	11	2667
6	sonepur	2337	2	6	6	-	959
	KBk	47,646	14	80	80	44	12,293

The old districts of Koraput, Balangir and Kalahandi is popularly known as KBK districts of Odisha since from 1992-93, have been divided 3 districts into 8 no. of districts ie. Koraput, Malkangiri, Balangir ,Nabarangpur, Rayagada,Kalahandi and Nuapada, Subarnapur. These eight districts comprises of 80 Tahsils, 14 Sub- divisions and Blocks Total 12,293 revenue villages.

1.3 AGRICULTURE SCENARIO OF THE DISTRICT

1.3.1 Rainfed Condition

1. The crops available mainly in the high land are Maize, ragi. Sugarcane, oilsheeds, vegetables Spice crop, Fibre crop .
2. Crops like paddy and Sugarcane are grown in medium lands.
3. In Low land- Paddy is grown.

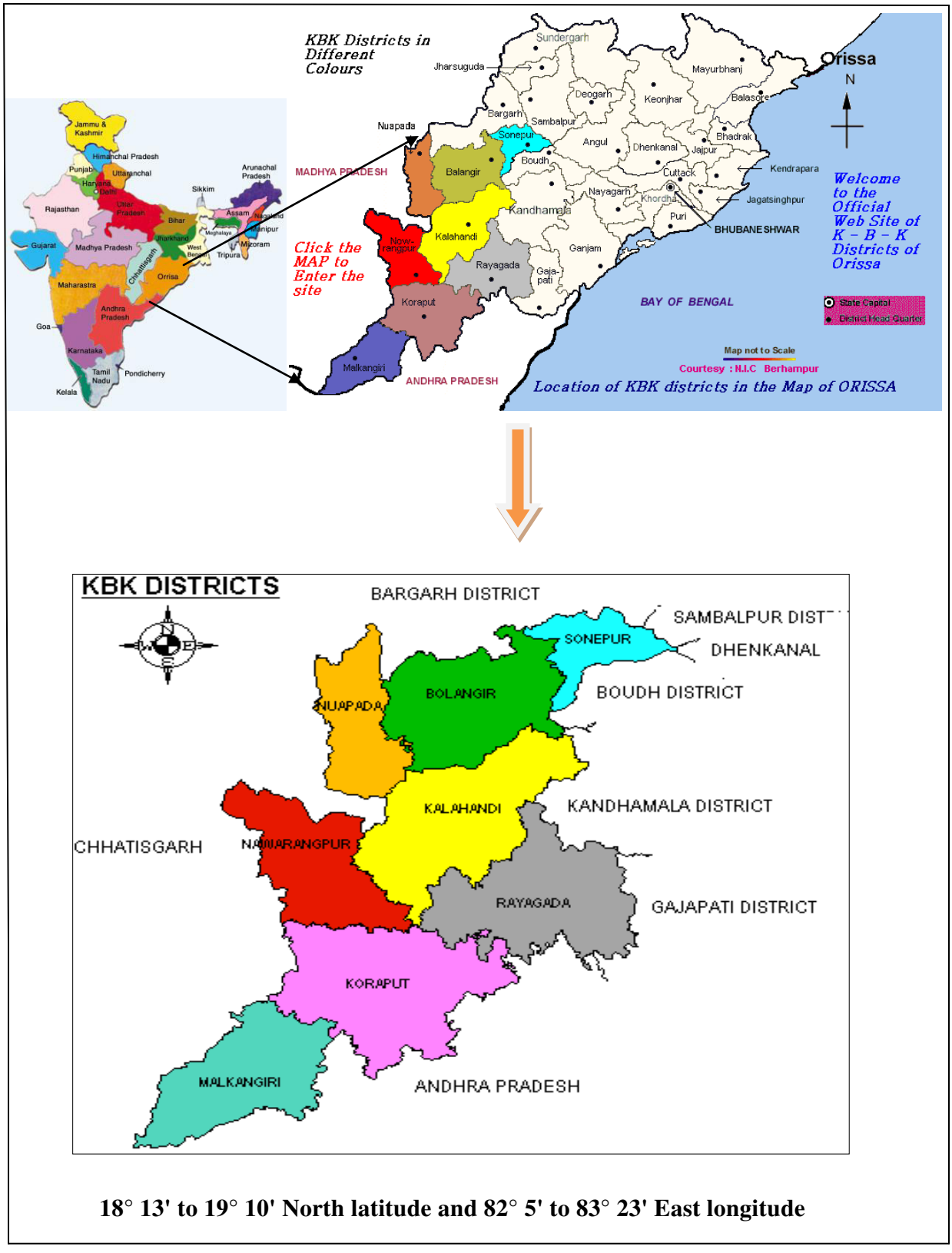
1.3.2 Types of Crop Cultivated

1**. Upland** – Paddy, Ragi, Maize, Niger,Vegetable, Sugarcane, Spices like Ginger, Turmeric.

2. **Medium Land** - Paddy and Sugarcane

3. **Low land** - Paddy

4. **Special crop -** Ginger ,Turmeric



18° 13' to 19° 10' North latitude and 82° 5' to 83° 23' East longitude

Fig.1.1 (Maps Showing INDIA, ODISHA and KBK Districts of ODISHA)

. The KBK district areas has a pair of opposites in the field of agriculture. The number of dams and rivers are flowing in the perennial sources of nalahs are able to make cultivation practices in the command areas of Upper Kolab of koraput district, Indravati of Nabarangpur and Kalahandi district, Mahandi river on Sonepur district. Commercial crops such as Maize and Cotton are popular in large volumes.A majority of Tribal communities continue to depends upon the subsistence of agriculture and shifting cultivation in terrain areas.

The KBK district possessing a varied topographical and extensive ranges of hills and covered with forests, uplands and extensive drainage systems. The tribal districts are mainly hilly, criss-crossed and covered with dense forest and nalahs. Main resources are cromite , bauxites are available

Fig.1.2: (Varied tropographical view with hilly regions of KBK Area)

Agricultural production fluctuates from one year to another under the impact of natural calamities such as droughts and floods which faced frequently in this region every year. A large proportion of Tribal peoples are facing food insecurity and depend upon the forests for their daily livelihood and for survival. Degradation of forests are of varying degrees on account of intensive use by the people. Severe biotic pressure and shifting of cultivation, mining, diversion of new projects and adequate investments for their Sustanable managements due to weak agro climatic conditions, poor connectivities of village Ghat roads ,undeveloped Infrastructure, physical isolation at distance places, low economical value, social capacities among the tribals are characterized this region more. Which suffers from multiple deprivations and backwardness such as, due to severe natural calamities, tribal backwardness, hilly area backwardness are the main reason of this underdeveloped KBK District.

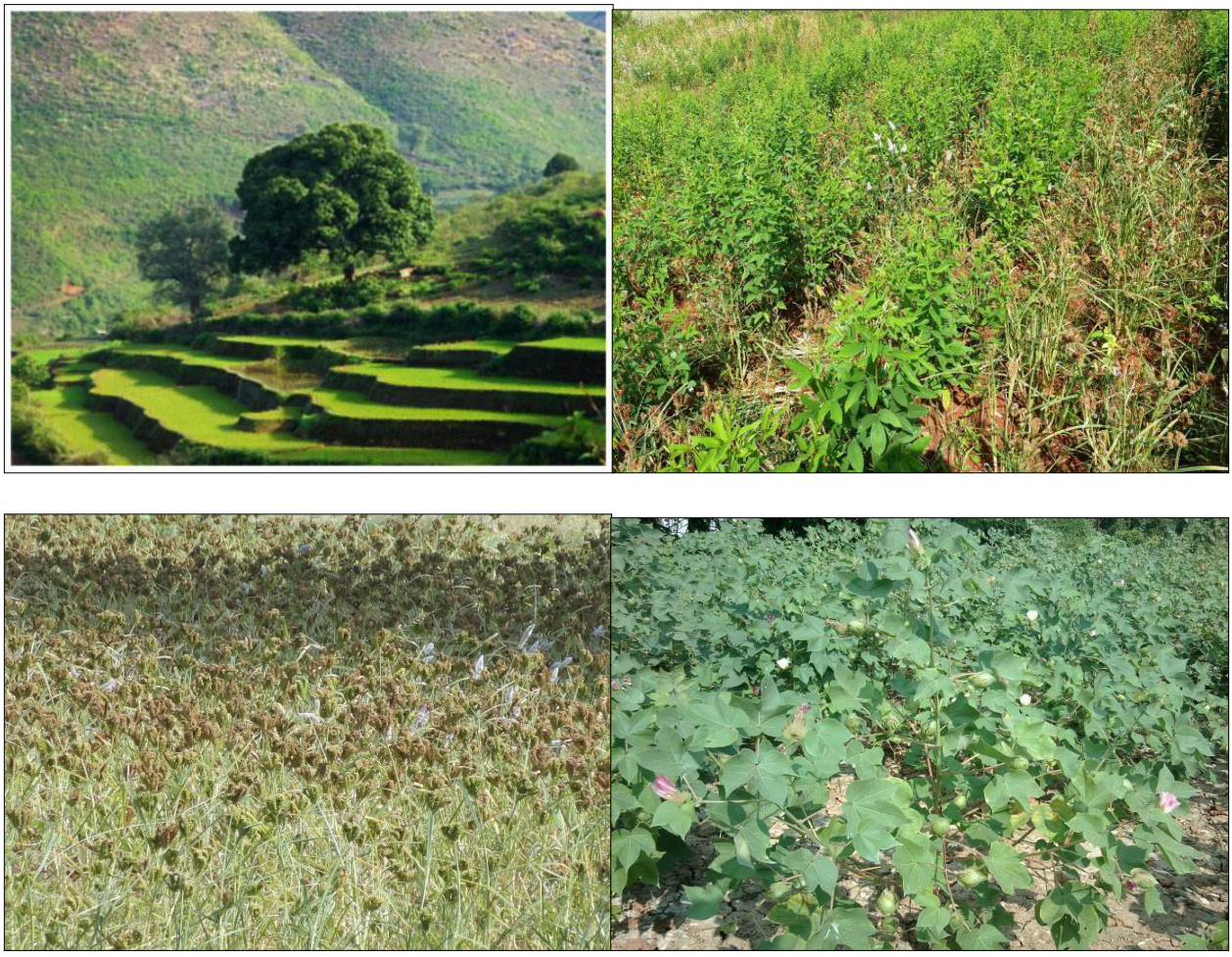


Fig.1.3: (Showing Different Agricultural Crops of KBK districts)

1.4. FARMS

There are two Govt Farms located near Dabugaon Block having 25.58 ha and Umekote on Nabarangpur District . mainly seed productionand crop training programmes are taken up in these farms during Khariff and Rabi seasons. Foundation seeds are produced in this farms and are supplied to individual farmer by help of Odisha State Seed Corporation limited(OSSCL).

1.4.1 DEMOGRAPHIC STATUS:

1. **Big farmers** : 1160 Nos **2. Small Farmers :** 63730 Nos
3. Marginal Farmers : 83688 Nos **4. Land less** : 204789 Nos

Average size of individual holding: 1.65 Hect.

Soil Type of the District -: Soil type of the District varies from sandy clay to clay loam depending upon the Topography .

Category	**Male**	**Female**	**GEN**	**SC**	**ST**	**OBC**
% of Category	51%	49%	15%	13%	50%	22%

Vegetable ,Maize, Sugarcane, ginger are the prominent crops other than the paddy cultivation. The following crops are being cultivated one after another such as: Paddy,Maize,Sugarcane, Ground nut, Ragi ,Biri, Mung, Arhar, and Seasamum, Other Crops.

1.5 IRRIGATION POTENTIAL CREATION AND UTILIZATION

The irrigation potential created and utilised in Odisha, by the end of March 2015 are shown below. The total irrigation potential created is 5053.92 thousand hectares and total irrigation potential utilized is 3585.0 thousand hectares. From this it is found that there is a gap between irrigation potential created and utilized. This is due to many factors such as defunct Lift irrigation projects, Minor irrigation projects, deterioration of distribution irrigation projects etc. By the help of World Bank funded named OWRCP and Government of India funded named AIBP scheme are running in KBK. System improvement works in

the major and medium irrigation projects have already been completed during the end the the year 2015 .

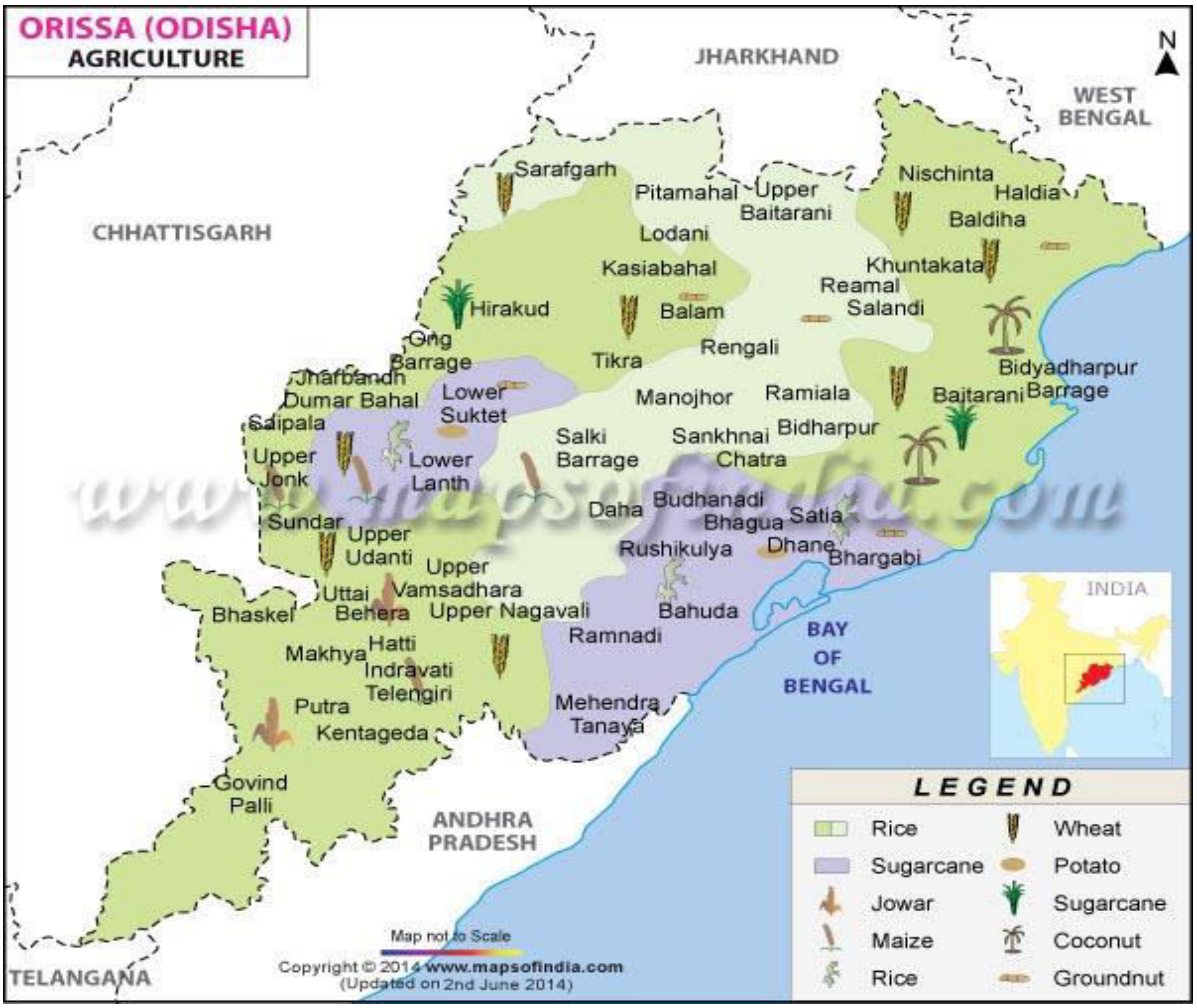


Fig.1.4 (Showing Variety of Agricultural crops in Odisha)

The number of organizations which was registered or formation process are used as the scale of success of PIM. But institutional aspects of such farmer's participation in irrigation receives a less attention in the current PIM . Similarly many other countries and states of India are looking for, to involve more farmers in this operation and maintenance work ,to optimise higher levels through of PIM and irrigation Management Transfer (IMT) Programs .have made their presence to felt CPR (Common Property Resources), focussing on the participatory forms of development .The Command Area Development Programme, which was launched within the Sixth Five Year Plan, 1980-81, to adopt the formation of irrigation associations is one of the

strategies for the improvement of the systems. Ten years of failed attempts and exaggerated claims of PIM success have already been convinced to many experts, that programmes in this area are not worth pursuing.

A full census is not available and connot guess the size and nature of the PP and where they are indeed to functioning. PP is introduded and promoted in Odisha for more than a years. The acceptance and concept is still lithergic. In this new plan, the caste power to replace the indigenous practices , informa;l societies and other serve political purpose. To look out new institutions sustainable in long term run process a much more talk with people is required, which shows the transfer of rights and responsibility of farmers at tertiary level.

CHAPTER 2

LITERATURE REVIEW

2.1 OBJECTIVES

In view of this the objectives proposed for the study is as follows,

- To assess the understanding of PIM (participatory Irrigation Management) in KBK districts of Odisha.
- To assess the impact of PIM in increasing the irrigation efficiency.
- To suggest the ways & means to improve water irrigation in KBK.

2.1.1 DIFFERENT RIVERS FLOWING IN ODISHA

2.1.2 RIVER BASINS OF ODISHA

The main rivers flowing in Odisha are Subarnarekha, Bahuda, budhabalanga, Indravati, Jambira, Bharhami ,Mahandi, Vansadhara, Kolab, Baitarini, Rushikulya, Nagavali..

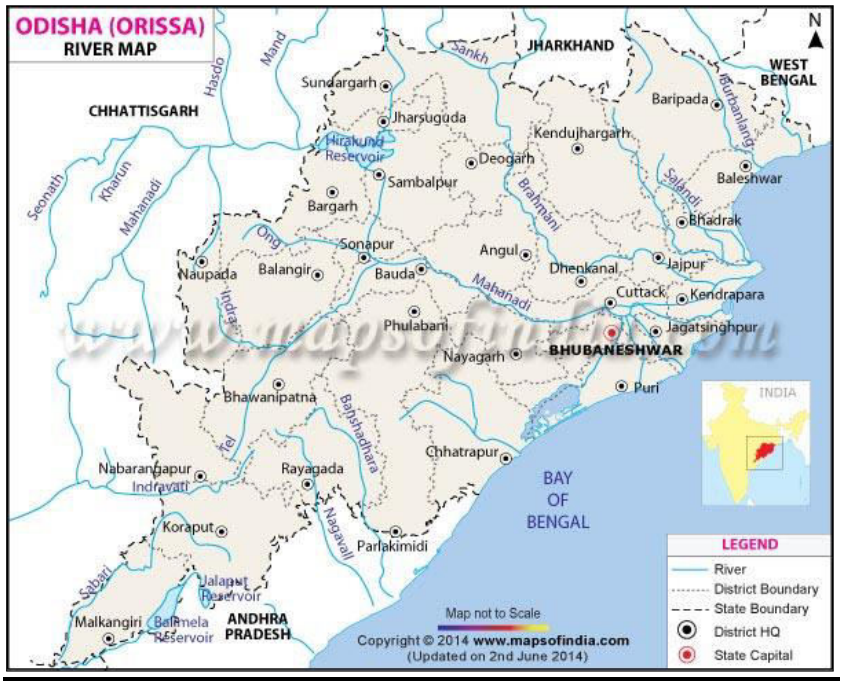


Fig.2.1: (Different rivers flowing in Odisha)

2.1.3 Rainfall pattern:

1. Average rainfall in (mm).: 1567.2mm
2. No. of rainy days : 83.9

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall	5.7	8.6	18.3	55.2	81.9	206.8	375.6	393.6	256.3	126.1	32.6	6.5	1567.2
Rainy Days (Norml)	0.4	0.9	1.5	3.9	5.5	10.6	18.6	19.3	13.9	6.7	2.1	0.5	83.9

2.2. Initiation and challenges of Pani Panchayat In Odisha.

The Government of India has adopted the National Water Policy in the year 1987, the same was updated and reviewed in the year 2002.Guidelines of the policy are issued to all the states of PIM attaching to the utmost farmers involvement in various irrigation management systems particularly in collection of water rates and water distribution in equitable manner. In the Govt. policy of PIM emphasizes that to transfer irrigation management to all farmers are being a mere provider of water. Massive management of farmers towards water management are created and funded by world Bank project. And the project named (OWRCP) Odisha water Consolidation project is taking necessary managements to PaniPanchayat. The Farmers organization & Turnover programme (FOT) which gives much significance action towards tertiary segments at down streams part of the canal systems such as minors and sub minor projects which are handed over to the farmers for Operation and maintenance by forming PPs. The purposes of FOT programme is to enable the responsibilities of farmers through Pani Panchayats. The PPs are created in a three tier basis systems with one formal association and two informal association and one hudraulic boundaries ranging from 300 ha to 600 ha of Command area. At the lower level , there is chak committee which is formed by taking three farmers , each one of them from Head reach, tail reach and middle reach of the ayacut area of that outlet. Chak leader is a representative of chak committee is a member of the Executive Committee of the PP. The presidents , vice presidents, and secretary are elected by the executed body of the concerned PP. All Water users are the members of the PP committee .

2.3 Organisation Structure of Pani Panchayat.

Farmers Organisation is forms three tier for Medium and Minor Irrigation projects, where as for Major irrigation projects it is Four tier as indicated in the below figure 2.2. At primary level of WUAs / Pani Panchayat consisting of several Chak committees and at secondary level of distributary committee it is a federation of all WUAs/ Pani panchayat. A project committees at project level is a federaton of all distributary committees for major projects. Similarly for Medium irrigation projects it is a federation of all WUA/Pani panchayats.

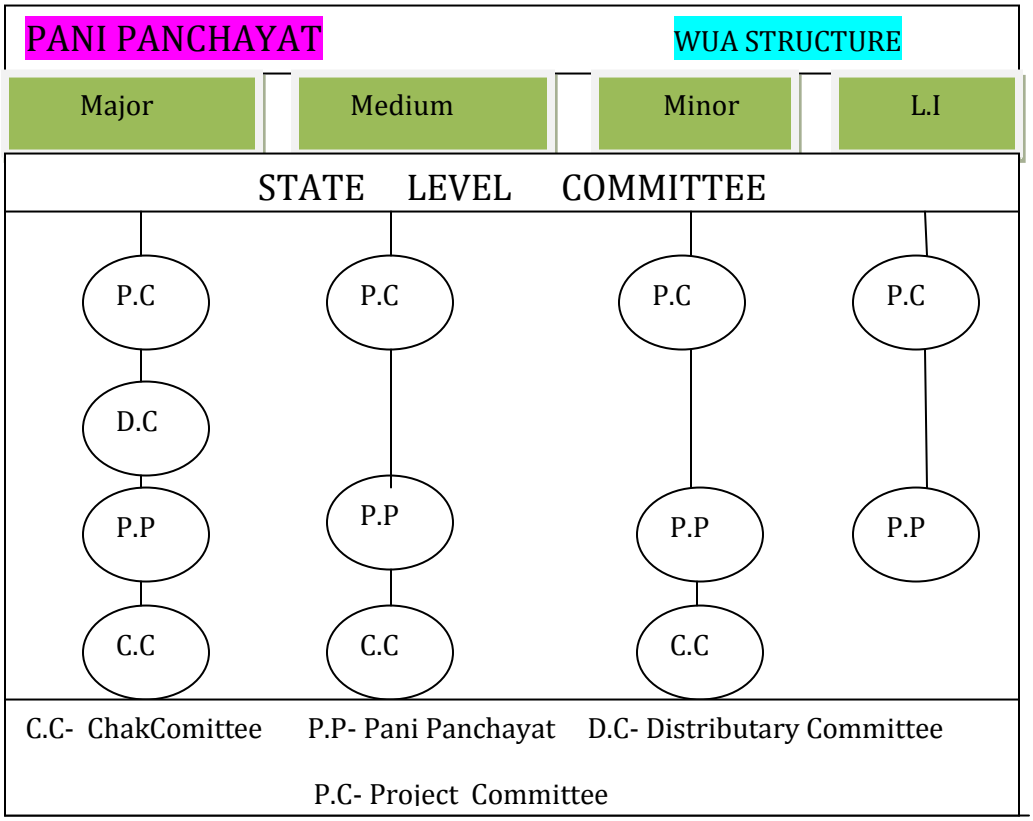


Fig.2.2 (Organisation Structure of Farmer in Pani Panchayat)

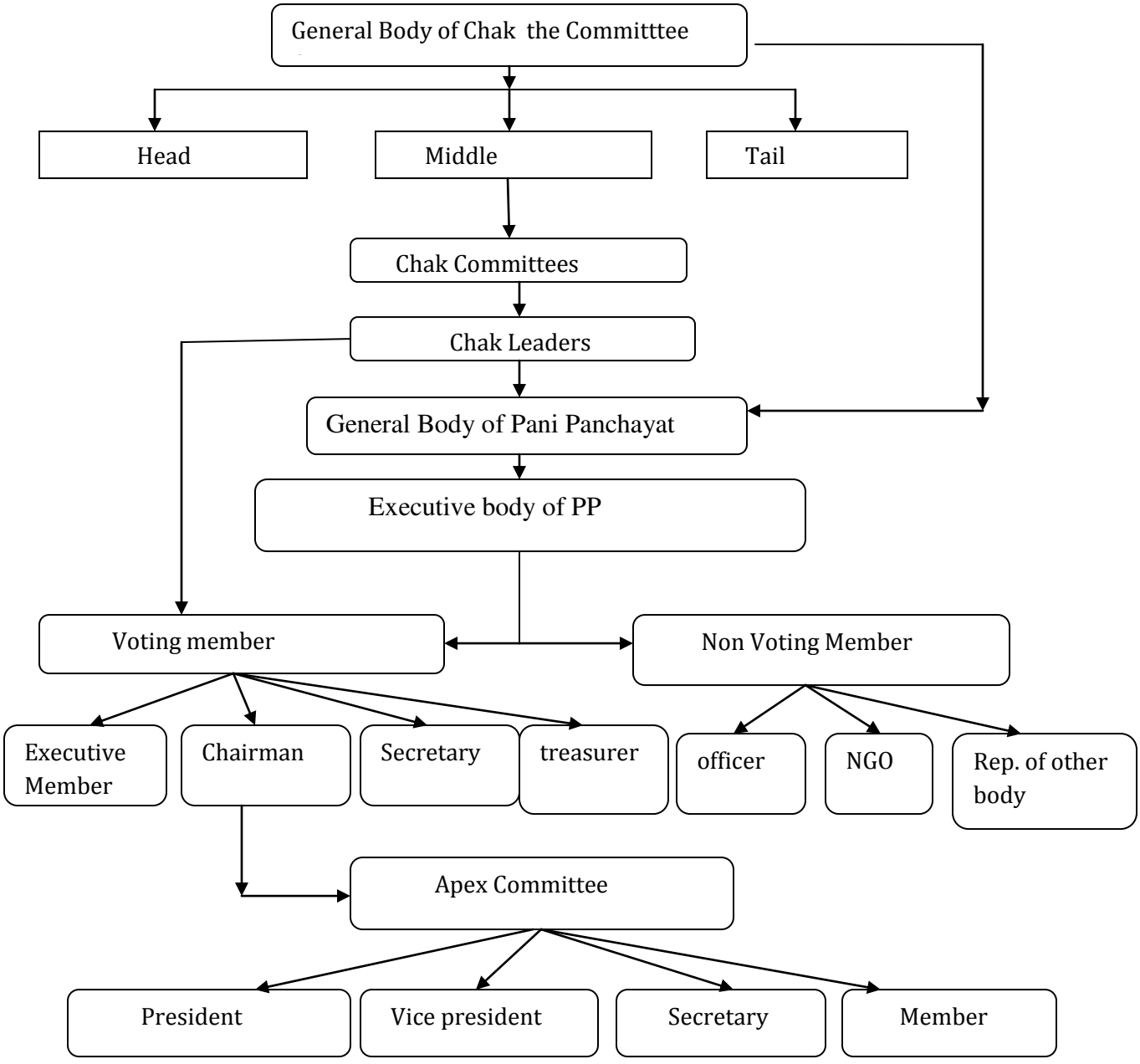


Fig.2.3. (Organisational Structure of the Pani Panchayat in Odisha)

The Odisha farmers Management of irrigation is called as " Odisha Pani Panchayat Act, 2002 which is facilitating toll to all the a farmers and PIM starts a major role covering all the irrigation Projects in the districts as a well as in the state The first step in the this process of reformation is to hand over to a part of network of the canal system for operation and maintenance cost to the farmers through the beneficiaries in PP . The farmers are demonstrated clearly about the utility and the benefits of the PP. Farmers are suggested for taking of minimum maintenance of work by themselves for ensuring free flow of water to the tal end reaches and also helps to organize water distribution systems in their own jurisdiction. The PP are registered as legal bodies to provide the requirements and identity of the f farmers.

2.4 Characterization of pani panchayat.

The Act may called as " Odisha Pani Panchayat Act- 2002 and It extends to the whole of the KBK districts as well as the state .Farmers Organisation includes the following ,that

1. the PP at primary level consists of water users constituted within a specific boundary of irrigation sectors.
2. By notification of Govt. without having to vote at least one officer from each Department of Water Resources, Department of Agriculture and from Revenue deptt. As a member of the Pani Panchayat without having the right to vote

2.5 Emergency Act of PP

Odisha farmers managements Irrigation Act says that, the establishment of farmers organization of irrigation system for their operation and maintenance in all sectors. The Act has 43 sections and is divided into 7 chapters. Each chapter provides a specific provision for specific activity. The Odisha Pani Panchayat Act provides for participation of farmer in irrigation management system and for the connected matters therewith. Where as in Odisha it is essential an Agricultural state depends on an efficient and equitable manner of supply and distribution of water throughout the year. Which is National Wealth and ensuring toan optimum utilization of water by the farmers for improvement of agricultural activities and outmost needs of their productivity.

2.6 Resources and function of PP

The farmers organization is getting an access of funding by the state and central Govt. from their operational and maintenance works**.** The executive committee of farmers Organisation is maintaining a sinking fund to view the facilating repayment towards borrowed funding and other developmental works. The resources mobilization includes cash from central and local Governments. The labour contributions are mainly from the command areas in emergency cases. The PP systems look for augmenting assuring and minimizing the labour requiring and maintaining for increasing the volume of water flow in the outlet of the canal flow. Farmers Organisation (FO) may levy and collect fees from time to time. In case of Lift Irrigation, the farmers organisation shall fix a water rate which covers the cost of the energy and maintenance of the Project. In case a water is not utilize in a season, the farmers Organisation are fixing such an amount which may be decided by the committee of FO and which will be a minimum charge .

2.7 Role of Government Over PP

In order to supervise the functions the Govt. officers including the Collectors, the Government of Odisha appoints a Commissioner and give him the full powers for carrying out all necessary functions specified by the Government. Every farmers Organization shall extend such cooperation, by the competent authority and to follow such directions are required by the competent authority from time to carryout the purpose of PP Act. The Government has powers to give directions to competent authorities and the farmers associations to take such an actions as may be specified. The Government appoints officers from the Department of Water Resources as special an officers or as competent authorities for taking decisions and they have power of direction or instruction for carrying out the works within the Act.

2.8 State-wide Initiation of PP Programme

The Government of Odisha is providing command areas of PP throughout the State in awareness form equitable, timely and assured irrigation facility to introduce the concept of PPs through the farmer's awareness programs in the irrigated areas. The concepts are finally lead to transfer the tertiary irrigation networks to the registered PP. The responsibility of operation and maintenance of Dam, Spillways, sluices in primary and secondary distribution canal networks

rests with the Govt. DOWR (Department Of Water Resources), and the responsibilities of 'O & M' of the tertiary systems is below minor and sub-minor system of irrigation. The geographical extent of the programme covers towards 18.25 Lakh ha of Major, medium & Minor irrigation command areas out of 30 districts of Odisha.

2.8 Penalties and Recovery In PP

Those who are violating the provisions of PP Act, are convicted, and be punished as per PP Act and imprisonment for one month or with more than fine month ,which may be extend upto Rs 200/- or both . Section-30 of chapter 7 of the PP Act says that ,for recovery of money from a Farmers Organisation of the PP in Land revenue ariar form.

2.9 An Assessment of P.P Act 2002

2.9.1 Supportive Sides of PP.

The Act enables the farmers participation not only at a lower level of system but also in a registred ways at the main system level .The Act provides autonomous management to the irrigation system by the farmers in their respective areas. A major management of farmers organizations are vasted with powers to recall leaders and restrain from mismanagement. The annual grant allocated is utilized in better way by PP. The act is endowed with the legal framework for a better participation of farmers in water management. The PPs have legal powers to collect additional water charges, which enhances the financial positions. So this provision is a way in improving the cost recovery. Then the Court is forbidden to entertain any further appeal. A major management of Farmers Organisation is vested with powers to recall the committee members. This provision is contributed for the accountability of the elected leaders and restrain from mismanagement. The farmers' collective action is enabling the PPs formation, the office bearers are elected in democratic process. So this provision is a way in improving the cost recovery.

2.9.2 The Harmful Sides of PP.

The decision of Apex committee for any disputes coming from the members as per section 26 PP act, is decided from the managing committee, whose decision is final and

After the decision of the Water users is final, the final decision are in the hands of the Department of Water Resources, Odisha.

- To make a new institution is essential through legislation of existing structure.
- To alter norms and institutional practices it can empower over involvement of long time period .
- Through this act, the state is imposing a malfunction and non functional irrigation system.
- It is not cleared that to how much extent the people accepts this and what kind of collection process imposed through the law of the state.
- To make a new institution is essential through legislation of existing structure.

The matters related to Water disputes are resolved by the local Institutional mechanisms and the main ideas of the 73 rd amendments of Panchayat Raj Deptt.

2.10. Study of Socio economic value In PP

The socio economic character of PP members explains that it includes classification of class of Households, family size, working members in a HH, education level , characteristics of holding, provision of cropping intensity pattern , electricity and the condition of house etc.

Table-2.1: Household classification as per different castes in a PP

Land Size class of HHs (In Acrea)	Scheduled Caste(%)	Scheduled Tribe(%)	Other Caste(%)	TOTAL (%)
1	**2**	**3**	**4**	**5**
Landless- (0.00- 0.00)	5		2	7 (10)
Marginal- (0.01-2.50)	13	4	7	24 (34.3)
Small (2.51-5.00)	6	3	11	20 (28.6)
Medium (5.01- 10.00)			10	10 (14.3)
Large Farmer (10.01 & above)		1	8	9 (12.9)
Overall	24 (34.30 %)	8 (11.40%)	38 (54.30%)	70 (100.0 %)

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Table- 2.2: Demographic and socio economic characteristics of different groups of the PPs

Land size holding (In Acres)	No of HHs	Average family size (per HH)	Average Male (per HH)	Average female (%)	Working e male (%)	Working female (%)	Illiteracy in HH	Thatched house(%)	Kutchha house (%)	Pucca (%)	Electrified house (in %)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0.00-0.00	07	5.20	2.60	2.60	66	34	55	100	-	-	-
0.01-2.50	24	5.85	3.27	2.58	91	13	58	54	46	-	100
2.51-5.00	20	5.39	2.50	2.89	97	05	22	57	27	22	100
5.01-10.00	10	4.50	2.50	2.00	100	-	-	-	32	72	100
10.01 & above	09	4.20	2.15	2.05	-	-	-	-	20	80	100
Overall	70	5.24	2.77	2.47	89	15	37	51	35	20	92

Table- 2.3: Average amount of crop income earned by different size group of members under Pani Panchayat and Non Pani Panchayat Land

Size class of land holdings (in Acres)	No of HHs	Average crop income of HH In PP (in Rs)	Paddy contribution(%)	Average crop income of HH In Non PP (in Rs	Paddy contribution(%)	Pulses contribution(%)	Oilsheeds contribution(%)	Vegetable contribution(%)	other
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0.00-0.00	07	13511	1.08	1820.08	1.20	-	-	-	-
0.01-2.50	24	23621	15.20	9810.59	10.25	1.43	0.56	1.14	-
2.51-5.00	20	49990	25.18	15711.81	18.89	-	2.54	3.18	-
5.01-10.00	10	70090	33.50	35440.6	24.66	3.15	-	-	1.82
10.01 & above	09	94450	25.24	45890	36.18	-	-	-	-
Overall	70	45888.57	100per cent	19712.09	91.18	4.58	3.10	4.32	1.82

The Table-2.1 this indicates that, the household farmers are belonged to landless ar 12%, marginal farmers group belongs to 36%, and small group farmers belongs to 31%. On a contrary, small and marginal farmers are not able to afford to invest in private lift schemes, due to their shortage of surplus capital value . ST and SC population constituted together upto 46 percent of the total no of households and the rest of 54 % belongs to other castes groups of HH population. Thus, in terms of membership, it is biased towards upper classes.

2.11 Land parttern of House holds in a PP

The Table- 2.3 shows that, the pattern of ownership of land holding of PP member is provided and for the overall PP members ,the average area owned per households is 4.57. The landless labourers has an average size of land owned for marginal farmer is 141, The analyses revealed that the distribution of ownership of land is high in different groups, is also seen that the medium farmer those who are not cultivating their land by themselves , they are given leased out by leased and the land of landless farmers have increased their operated area. Thus ,the inequality in the land owner is expected that many poor land HHs are trying to lease land to expand .

2.11.1 Demonstration and Training of PP:

It has been very much appreciated by the cultivators after making the farmers' conversant with the diversified cropping benefit. The Field Channel networks constructed in the farmers' field below the canal outlet are immensely availablity of irrigation water uniformly throughout outlet of the command area of the farmers. During drought water management, crop demonstrations and equitable use of available irrigation water, are undertaken in the field of the farmers and under the programme training programme is imparted at village level adaptive trial in the Command Area Development Program.

2.11.2 Financial norms and Funding pattern Of PP

The activities under CAD&WM programmes are implemented in Odisha and the financing norms & funding pattern are given below, .

Table No-2.4(General Cost norms of CAD&WM scheme components in Odisha)

Sr No	Items	Cost per Ha	From Cetral share	From State share	From farmers
1	Costn of field channel	Rs 30000, is for non KBK and Rs50000 for KBK	50%	40%	10%
2	Costn of field drain	Rs 15000, is for non KBK and Rs20000 for KBK	50%	50%	10%
3	Reclamation of waterlogged area	Rs. 35000	50%	40%	
4	Crop Demonstration	As per location of specific need	75%	25%	
5	Farmers Training	As per location of specific need	75%	25%	
6	Correction of system Rs.10000/- for deficiencies above outlet up to Distributaries of capaciry150 Cusec	Rs.10000/-	50%	50%	
7	Functional grant to WUAs	Rs.3000/-	45%	45%	10%

2.11.3 Impact of Command Area Development Programme

This has been proved to be the best method of managing water below the irrigation outlets. The impact of the programme since it's starting has been very much appreciated by the cultivators. The Field Channel networks which are constructed in the farmers' field below the canal outlet, provides available irrigation water uniformly throughout the command area of the outlet and benefited the farmers more. During drought situation, the presence of Field Channels are helped more to the farmers to a great large extent of crop loss at the tail end. The need of Field Channels are so felt by the farmers that they are now coming forward to donate the required land for construction of Field Channel and Field Drains. Independent impact evaluation studies have also pointed that CADWM activities increase the utilization of created potentials in irrigation systems, increase in cropped area and productivity and more prominently the increase in yield per unit volume of water to a great extent. Study indicates 15% increase in utilization of irrigation potential and up to 125% increase in the water use efficiency in terms of yield per unit volume of water in kg/m3 in the command of Indravati Irrigation project in 2007. The Benefit Cost ratio of the Command Area Development measures taken in the area was worked out to be as high as 4.56 : 1. The On-Farm-Development activities through the CADWM programme should therefore be extended to more and more irrigation projects to get the maximum results of the created irrigation potentials of the state.

2.12 Farmer's Participation

Lack of participation of farmers in the process of irrigation management has been said to be the most important factors in under utilization of the created potentials. Irrigation is a community subject and unless all the farmers in a given area adopt a common approach in selecting varieties of crops, showing time and cropping sequence the water delivery would not match exactly with crop water requirements for obtaining maximum yield. More emphasis is therefore given to farmers participation in irrigation water in all irrigation projects of the state. The Odisha Pani Panchayat Act has been enacted in 2002 and Odisha Pani Panchayat Rules have also been framed in 2003 giving substantial rights to the Water Users' Associations in managing the water resources. Only formation of Pani Panchayat is not the solution for better functioning of CAD projects. The entire Govt. machinery relating to the Water Resources should be involved seriously for involving the farmers' actively in the process of management of available water,

maintenance of sub minor and field channel systems and better crop management process for achieving the ultimate aim of better production and productivity. On the other hand, the farmers should also be conscious of their rights and responsibility on the available of water and the distribution system within their Pani Panchayat with a view to provide uniform irrigation water to the entire area of the Pani Panchayat by mutual equitable sharing method. In the Command Area where On-Farm Development work has not been taken up, it is the duty of the Pani Panchayat to motivate farmers to donate land required for construction of the field channel and field drains under the Command Area Development programme and actively participate for their construction and maintenance.

CHAPTER 3

STUDY AREA AND DATA ACQUISITION

3.1 Description of study area

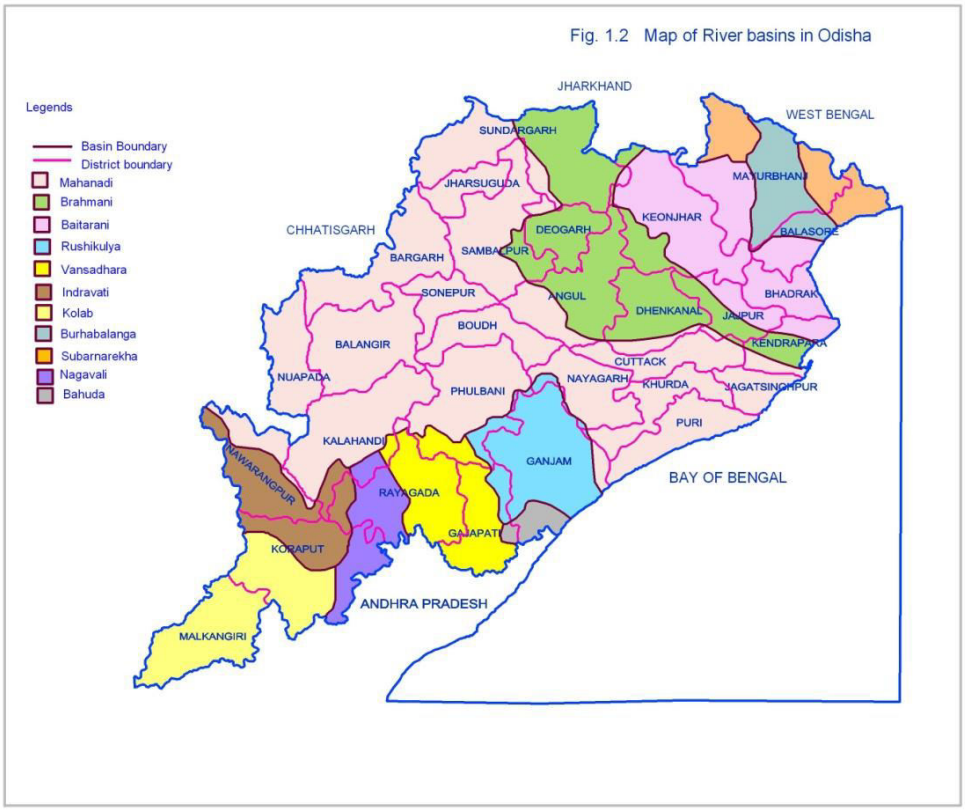


Fig.3.1: (Study area Of Indrabati Basin in Nabarangpur District Of KBK)

The total catchment area of Indravati river and its tributaries intercepted at the Dam sites is 2630 Sq Km consisting (Lat.180’ 36”N and 190’40” N and longitude 820’4” and 830’9”E), fairly rectangular in shape and bounded by steep hills in the west, almost parallel to the river and in the North East and South with high plateaus more than 2000 high. The hills are mostly

covered with dense forest and sloping in to the valley. The catchment can be turns as a good one. There are ten no of raingauge stations in this catchment area ie. Thuamul Rampur, Sunger, Chandragiri, Kasipur, Gorakhpur, Mandigumma, Dasamantpur, Kakiriguma, Mathalput, Kurumuli in some of the areas of Nabarangpur.

Table No-3.1 (General Data Sheet of KBK Districts)

SlNo	Unit	Rayagada	Nuapada	Subarnapur	Balangir	Nawarangpur	Malkangiri	Koraput	Kalahandi
1	Geographical Area in (Sq.Kms)	7073	3852	2337	6575	5294	5791	8807	7920
2	Total forest area in (Sq.Kms)	2812.33	1849	422.75	1543.85	2462.73	3355.88	1879.53	2538.01
3	Normal rainfall(M.M)	1285.9	1286.4	1418.5	1290	1569.5	1096.9	1567.2	1365
4	Actual Avg. rainfall 2012(M.M)	1192	1122.4	1315.3	1215.6	1685.6	1521.8	1505.8	1330.5
5	Density of Population(person per square Kilometer) - 2011	136	158	261	251	231	106	157	199
6	No of Sub Divisions	2	1	2	3	1	1	2	2
7	No of Tahasils	11	5	6	14	10	7	14	13
8	No of CD Blocks	11	5	6	14	10	7	14	13
9	No of Municipality	1	0	1	2	2	1	3	1
10	No of NACs	2	3	2	3	0	1	1	3
11	No of PS including Mahila PS	15	7	9	16	13	12	24	12
12	No of GPs	171	108	96	285	169	108	226	273
13	No of Fire station	1	3	5	4	4	4	4	13
14	No of Assembly Constituencies	3	2	2	5	4	2	5	5
15	No of Village (Total)	2667	663	959	1794	901	1045	2028	2236

16	Inhabited	2467	648	829	1764	876	979	1922	2099
17	Un habited	200	15	130	30	25	66	106	137
18	Population (Total) - 2011	961959	610382	610183	1648997	1220946	613192	1379647	1576869
19	Male - 2011	469672	301962	311312	830097	604812	303624	678809	787101
20	Female - 2011	492287	308420	298871	818900	616134	309568	700838	789768
21	Urban population - 2011	115404	5.60%	8.20%	197381	7.18%	8.10%	16.40%	121987
22	Rural population-2011	715702	94.40%	91.80%	1451616	92.82%	91.90%	83.60%	1454882
23	SC population -2011	139514	13.50%	25.60%	294777	14.53%	22.60%	14.20%	286580
24	ST population-2011	541905	33.80%	9.40%	347164	55.79%	57.80%	50.60%	449456
25	Population in 0-6 age groups-2011	147892	88344	74821	216320	207911	109092	225126	222570
26	Decadal growth (2001-2011)	15.74%	15.02%	12.60%	23.30%	18.81%	17.77	16.9	18.07%
27	Sex Ratio (No of female per 1000 male) - 2011	1048	1021	960	987	1019	1020	1032	1003
28	Rural	1064	983	961	992	1021	1028	1046	802036
29	Urban	967	1024	945	948	990	925	966	484177
30	(0-6) Yrs Sex Ratio Total-2011	1046	983	952	955	997.66	941	970	317859
31	Literacy Rate (Total Population)-2011	50.88%	57.35%	74.40%	64.70%	48.20%	48.50%	49.20%	63%
32	Literacy rate (Male) - 2011	62.67%	70.29%	84.40%	75.80%	59.45%	59.10%	60.30%	85%
33	Literacy Rate (Female))- 2011	39.27%	44.76%	64.00%	53.50%	37.22%	38.30%	38.60%	45.76%
34	Literacy rate (Rural)	45.45%	56.04%	73.60%	50.32%	43.90%	46.10%	42.40%	57.04%
35	Literacy rate (Urban)	79.20%	78.99%	83.00%	76.75%	77.90%	78.90%	81.80%	79.99%

3.2 SUGGESTION FOR INCREASING IRRIGATION EFFICIENCY

The necessary suggestions are to be given for getting maximum efficiency in a Pani panchayat. That,

Suggesting people for cropping programme considering the soil and agro climatic conditions with crop diversification. Also a plan for maintenance of irrigation systems in the areas of operation and maintenance at the end of each crop season to carryout the maintenance works with the available funds. And also suggesting to farmers for regulating the use of water among the various pipe outlets according to the warabadi schedule of systems as per demand sat canal outlet for maximum efficiency.

CHAPTER 4

WATER AND LAND RIGHTS IN PANI PANCHAYAT

4.1 GENERAL

4.1.1 Water Rights and Land Rights in PP.

The beneficiaries those who have land as per PP Act is a sole owner of that land. The poor and landless peoples are not supplied water which is a common poverty of resources in PP. In a PP , for landless peoples there is still 25% cost is investing by Govt. of Odisha. Rainfall belongs to the entire village community and is equal to all in a PP to use water. Water is free for all religions and communities and not in a relation to the right of the land. Hence natural rights for irrigation water becomes insecure and ineffective. Big farmers have captured the whole water course at outlet level. The PP idea has failed in all idea villages as it does not imply the sense of cultural, social, and economical value of the farmers in PP participations. Water is common for all in PP point of view and water rights are equal to all women, men and landless peoples those who have right In villages.

4.2 Farmers Assessment Of Pani Panchayat.

Insufficiency of water is only due to the Old and unlined canals which exaggerates full supply and formation in the village are less and many farmers idea about PP is not awarenes fully. Some little information about function of PP responses that no change in irrigation area after irrigation in the field activities. For better control devices like construction of sluices, repairs of shutters are surveyed during the field work which changes the water availability after formations of PPs. 75 per cent of the sample farmer recommends to improve regulate and installation of shutters and about 66 per cent of farmer wishes for disciplinary action against violators. Technical structures like shutters had been installed at these points during the initial stages for controlling the flow into these inlets. The flow could be reduced or totally cut off depending on the water available and the requirements of equal distribution within the command areas. This is done through instituting a system of rotation of water supply. Institution functioning of the rotation system however requires complementary technical function of the control structures, unauthorized withdrawals of water by upstream farmers using engines for

pumping water, further accentuate the unequal distribution, which is to some extent inbuilt in the delivery systems due to increased losses route.

Table-4.1 : Field Response survey of Farmers

Sr no	Problems faced	Option	Response (%)
1	Selection of PP	satisfactory	36
		Not satisfactory	66
2	Maintenance of PP	repeat	73
		Ok	---
		Need improvement	29
3	Change if area after PP formation	yes	23
		no	79
4	Change of yield rice (In acre)	yes	15
		no	87
5	Have you been paying water dues as per PP act.	Revised rates	29
		Old rates	35
		Not paying	39
6	Suggestions for controlling water distribution	Installation of Shutters	76
		Disciplinary action	67
		Miscellaneous	
7	Women involvement in PP	Yes	19
		No	83
8	Preference for	pp	46
		Office personel	19
		Traditional Water Body	24
		Insufficient	15
9	Knowing the name of your PP president	Yes	43
		No	59
10	General body meeting in the pp	Two- Four	19
		More than four	9
		None	35
		Do not know	41
11	Were you informed about the GB meetings	attended	9
		Informed and not attend	23
		Not informed	71
12	Formal Pp function in villages	yes	31
		no	71
13	Water availability	plenty	36
		Not plenty	66

CHAPTER 5

PIM IN PUBLIC IRRIGATION SCHEMES

5.1 GENERAL

The examples given below are mainly illustrative of the diversity cases.This section is following the three responsibilities that is, water managements, water savings charged by PIM or IMT policies and investigation issues of maintenance and financial management , because of the sketchy nature of evidence available.

5.2 Financial Management

Financial management is a key issue of PIM, and this is at two levels. First, the WUAs as associations need to be financially sustainable and to cover their running costs . Second they must also cover the expenditures related to their duties (e.g. tertiary level infrastructure).The choice is between giving more to the WUAs (eg through state subsidies or authorization to generate additional income) so that they be able to achieve more (eg improving and expanding their maintenance works), and adopting measures to increase farmers‟ direct contributions”.

5.3 Reduction of governmental expenses

As mentioned earlier the most common reason behind PIM is the lack of public funds to cover O&M costs and the expectation parts of these costs could/should be shifted onto farmers. The first objective for states is to reduce administrative costs, especially those related to staff salaries. for example, savings primarily came from reduced wage bill for system O&M personnel due to lower staffing intensity and operation expenses. This decrease of state expenditures was paralleled with an increase in farmers‟ contributions, as observed also in past days. Policy documents acknowledge that this is bound to happen but generally add that these O&M costs are expected to decrease as farmers deal with them at a cost lower than the agency.

5.4 Maintenance and physical sustainability

In most countries, ensuring the maintenance and the sustainability of hydraulic structures is one of the main responsibilities ascribed to WUAs. Here, again the situation is extremely varied, in state managed irrigation scheme canal maintenance was better compared to WUAs managed schemes especially due to the availability of more funds, machinery and other equipment. In transferred irrigation systems, scheduling of maintenance activities became more dependent on fee collection rates. Indeed, water fees were generally said to be insufficient to cover operation and maintenance expenses at an adequate level. But an increase of water fees would be rejected by farmers.

5.5 RESULTS AND CONCLUSSIONS

There is no follow-up action considered due to lack of motivation and leadership of the members. In some situations the irrigation water is not reaching up to the tail end of fields either because the intermediary non-members do not allow the watercourse to pass or the lands is at a higher elevation to supply . water. In some cases, it is observed that due to wrong technical decisions in some cases, though there is relatively an easier availability of water, the water lifting capacity and to that extent the intensity of farming over the two/three seasons in a year cannot be achieved due to limited capacity. In absence of right to decide on dead storage, the occupational groups, leads to inefficient and unutilisation of PPs.

. **CHAPTER 6**

EFFIENCY OF IRRIGATION

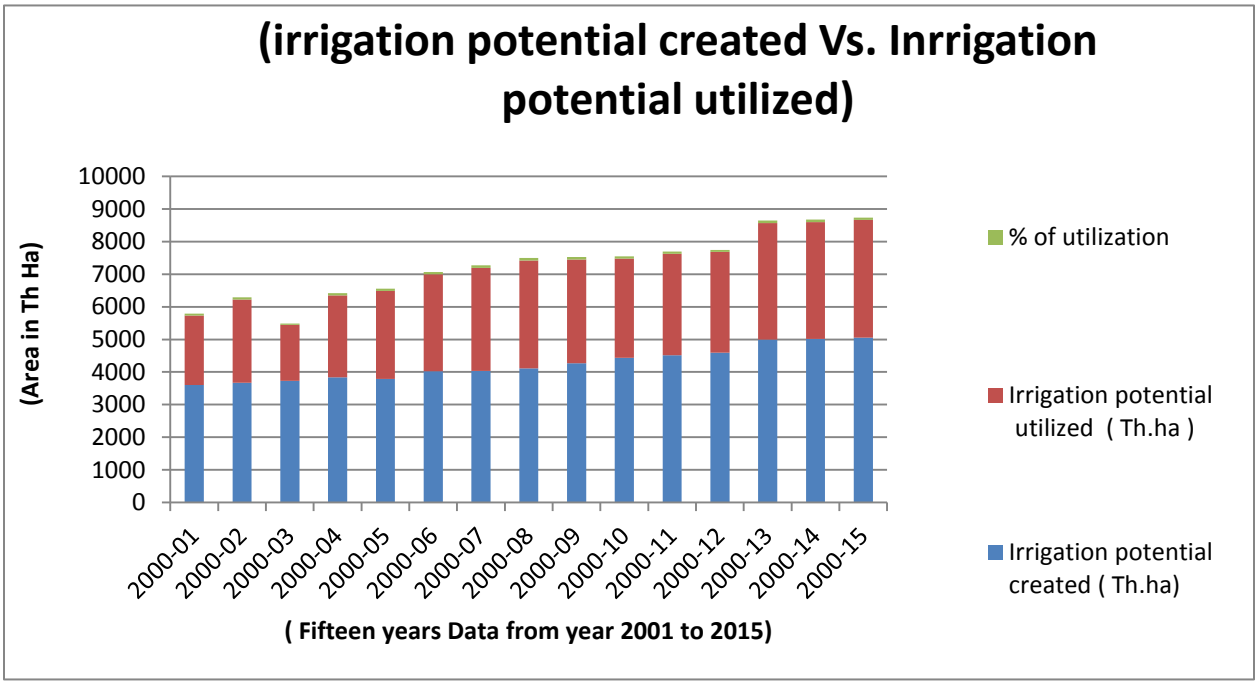
6.1 Irrigation Potential Creation and utilization :

The irrigation potential created and utilised in Odisha from 2000-01 to 2014-15 is given in the table below. By the end of March 2015 the total irrigation potential created is 5053.92 thousand hectares and total irrigation potential utilized is 3585.0 thousand hectares. From this it is found that there is a gap between irrigation potential created and utilized. This is due to many factors such as defunct Lift irrigation projects, Minor irrigation projects, deterioration of irrigation projects etc..Atpresent schemes namely RIDF(Rural Infrastructure Development Fund) Funded by NABARD and OCTMP funded by World bank for modernization Major and Medium projects , deep borewells, minor and lift irrigation projects and other sources of management Investment projects (OIIMWMIP). The CAD&WM work is used to minimize the gaps in between Irrigation potential created and Irrigation potential utilization in the PPs.

The gap between the irrigation potential created and utilized is a thought of barrier for agricultural development at the district level and much emphasis is laid to remove these deficiencies and to optimize the agricultural production. A programme is launched for integrated development of command areas during the 5th five year plan of Odiha and Command Area Development Authorities is set up for identified the new projects. The programme is continuing and constructing micro level distribution systems through a network of field drains, field channels and also educates the farmers on scientific water management practice ways, for better water utilization and higher productivity. The programme has been renamed as CAD&WM (Command Area Development and Water Management Programme) by the The Govt. and the programme is being implemented in most of the irrigation projects of the KBK districts with a agriculture cultivable command area of about 0.788 Mha.

Table.6.1:Irrigation potential created and Utilization during Kharif and Rabi season.

	Irrigation potential creation in (Th ha)			Irrigation potential utilized in (Th Ha)			% of utilisation
Year	Kharif	Rabi	Total	Kharif	Rabi	Total	
2001-02	2533.83	1071.99	3605.82	1589.88	535.84	2125.72	58.95%
2002-03	2554.26	1117.63	3671.89	1752.27	793.64	2545.91	69.34%
2003-04	2608.59	1123.75	3732.34	1246.81	465.21	1712.02	45.87%
2004-05	2674.12	1161.21	3835.33	1737.49	780.87	2518.36	65.66%
2005-06	2707.27	1266.22	3793.49	1845.79	844.87	2690.66	67.72%
2006-07	2731.50	1294.92	4026.42	1922.70	1042.79	2965.49	73.65%
2007-08	2720.46	1318.52	4038.98	2001.98	1147.47	3149.45	77.98%
2008-09	2765.73	1342.06	4107.79	2027.00	1281.46	3308.46	80.54%
2009-10	2867.01	1407.18	4274.19	2081.13	1096.03	3177.16	74.33%
2010-11	2962.21	1476.81	4439.02	2058.85	979.67	3038.52	68.45%
2011-12	3035.85	1477.97	4513.82	2085.21	1020.70	3105.92	68.81%
2012-13	3089.34	1501.43	4590.77	2078.90	1009.18	3088.08	67.27%
2013-14	3315.5	1678.1	4993.6	2278.9	1295.6	3574.6	71.6%
2014-15	3325.41	1688.2	5013.61	2285.5	1299.5	3585.0	71.5%
Total	3355.42	1698.5	5053.92	2298.4	1312.2	3610.6	71.44%



Graph.6.1 (showing the percentage of Irrigation potential Created and Utilization)

Table No. 6.2 Total Kharif potential created in different years from 2002-03 to 2003-04

2002-03				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated	Rice	Total Cropped area
1	Bolangir	338	236.79	356.91
2	Kalahandi	371	136.42	315.45
3	Koraput	302	91.79	134.59
4	Malakangiri	141	152.64	222.15
5	Nabarangpur	216	105.43	199.86
6	Nuapada	178	67.53	159.2
7	Rayagada	194	86.55	102.13
8	Subarnapur	111	58.11	188.85
	Total	1851	877.15	1490.29

2003-04				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	227.31	360.88
2	Kalahandi	371	118.28	286.06
3	Koraput	302	98.04	165.12
4	Malakangiri	141	164.75	241.72
5	Nabarangpur	216	105.43	129.4
6	Nuapada	178	107.68	200.31
7	Rayagada	194	63.79	183.3
8	Subarnapur	111	58.11	188.85
	Total	1851	885.28	1566.79

Table No. 6.3 Total Kharif potential created in different years from 2004-05 to 2005-06

2004-05				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	235	324.34
2	Kalahandi	371	53	115.8
3	Koraput	302	117	280.2
4	Malakangiri	141	88	128.43
5	Nabarangpur	216	158	221
6	Nuapada	178	100	121.66
7	Rayagada	194	103	170.42
8	Subarnapur	111	58.11	188.85
	Total	1851	854	1361.85

2005-06				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	237.16	398.65
2	Kalahandi	371	57.14	122.99
3	Koraput	302	113.5	283.74
4	Malakangiri	141	84.82	143.78
5	Nabarangpur	216	160.1	233.36
6	Nuapada	178	46.38	168.76
7	Rayagada	194	104.46	184.01
8	Subarnapur	111	98.74	125.16
	Total	1851	803.56	1535.29

Table No. 6.4 Total Kharif potential created in different years from 2006-07 to 2007-08

2006-07				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated	Rice	Total Cropped area
1	Bolangir	338	225.109	371.527
2	Kalahandi	371	57.422	125.447
3	Koraput	302	133.658	146.302
4	Malakangiri	141	113.91	284.384
5	Nabarangpur	216	98.74	125.16
6	Nuapada	178	46.38	168.76
7	Rayagada	194	103.17	204.42
8	Subarnapur	111	84.771	148.688
	Total	1851	863.16	1574.688

2007-08				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	225.75	369.18
2	Kalahandi	371	98.74	125.16
3	Koraput	302	236.87	404.76
4	Malakangiri	141	103.17	204.42
5	Nabarangpur	216	120.56	295.1
6	Nuapada	178	95.02	160.98
7	Rayagada	194	167.4	246.22
8	Subarnapur	111	46.38	168.76
	Total	1851	1093.89	1974.58

Table No. 6.5 Total Kharif potential created in different years from 2008-09 to 2009-10

2008-09				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	211.42	355.11
2	Kalahandi	371	104.06	130.77
3	Koraput	302	221.1	395.26
4	Malakangiri	141	105.46	203.98
5	Nabarangpur	216	114.33	289.41
6	Nuapada	178	88.39	151.35
7	Rayagada	194	163.6	243.09
8	Subarnapur	111	61.2	183.46
	Total	1851	1069.56	1952.43

2009-10				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	213.43	364.56
2	Kalahandi	371	99.15	127.39
3	Koraput	302	220.96	402.56
4	Malakangiri	141	105.69	206.09
5	Nabarangpur	216	111.14	284.33
6	Nuapada	178	91.47	157.05
7	Rayagada	194	149.24	227.54
8	Subarnapur	111	67.45	194.46
	Total	1851	1058.53	1963.98

Table No. 6.6 Total Kharif potential created in different years from 2010-11 to 2011-12

2010-11				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated	Rice	Total Cropped area
1	Bolangir	338	210.73	351.68
2	Kalahandi	371	97.21	124.01
3	Koraput	302	218.17	407.67
4	Malakangiri	141	101.66	199.16
5	Nabarangpur	216	114.72	288.29
6	Nuapada	178	92.92	159.38
7	Rayagada	194	157.17	235.08
8	Subarnapur	111	60.98	187.92
	Total	1851	1053.56	1953.19

2011-12				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	209.4	358.02
2	Kalahandi	371	100.44	132.54
3	Koraput	302	226.01	386.8
4	Malakangiri	141	99.71	200.17
5	Nabarangpur	216	114.28	289.82
6	Nuapada	178	96.04	165.4
7	Rayagada	194	144.59	232.83
8	Subarnapur	111	56.67	184.55
	Total	1851	1047.14	1950.13

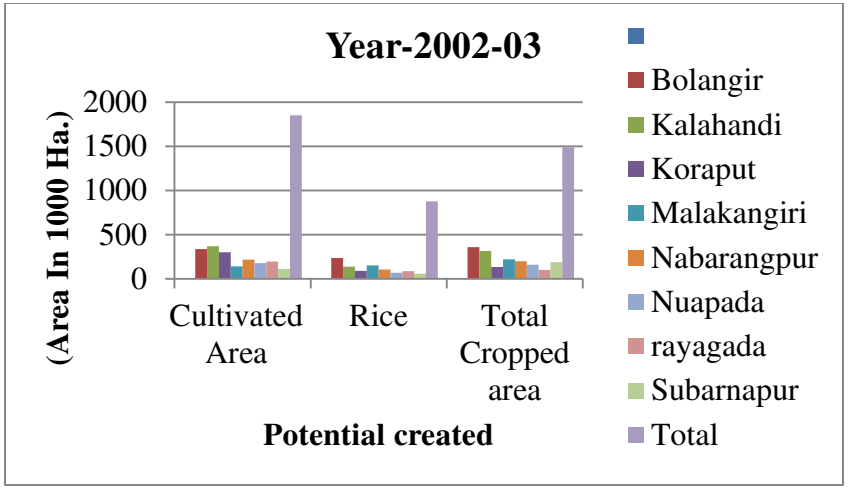
Table No. 6.7 Total Kharif potential created in different years from 2012-13 to 2013-14

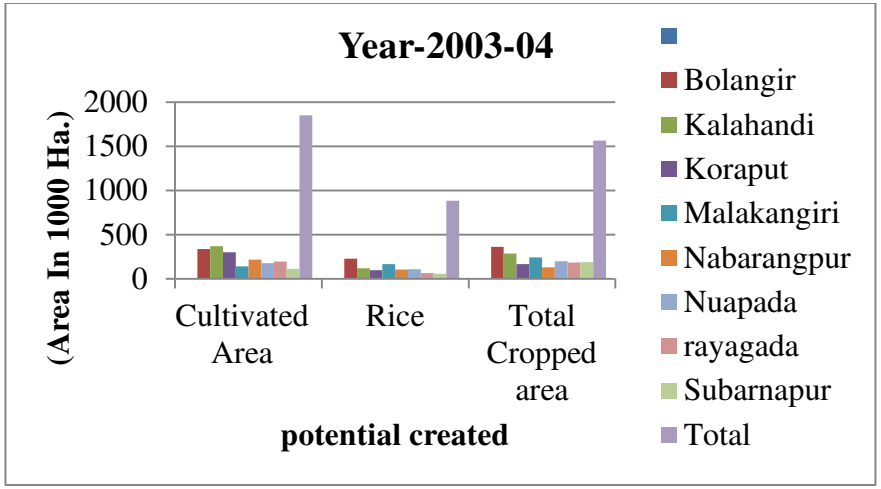
2012-13				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	170.4	321.74
2	Kalahandi	371	100.92	143.42
3	Koraput	302	202.33	370.67
4	Malakangiri	141	95.09	204.19
5	Nabarangpur	216	104.86	279.01
6	Nuapada	178	93.58	163.54
7	Rayagada	194	139.81	227.54
8	Subarnapur	111	58.11	188.85
	Total	1851	965.1	1898.96

2013-14				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated Area	Rice	Total Cropped area
1	Bolangir	338	194.59	349.22
2	Kalahandi	371	101.5	143.07
3	Koraput	302	210.28	381.85
4	Malakangiri	141	94.9	201.86
5	Nabarangpur	216	103.07	273.93
6	Nuapada	178	94.96	159.56
7	Rayagada	194	143.51	228.51
8	Subarnapur	111	54.46	184.2
	Total	1851	3748.53	5776.17

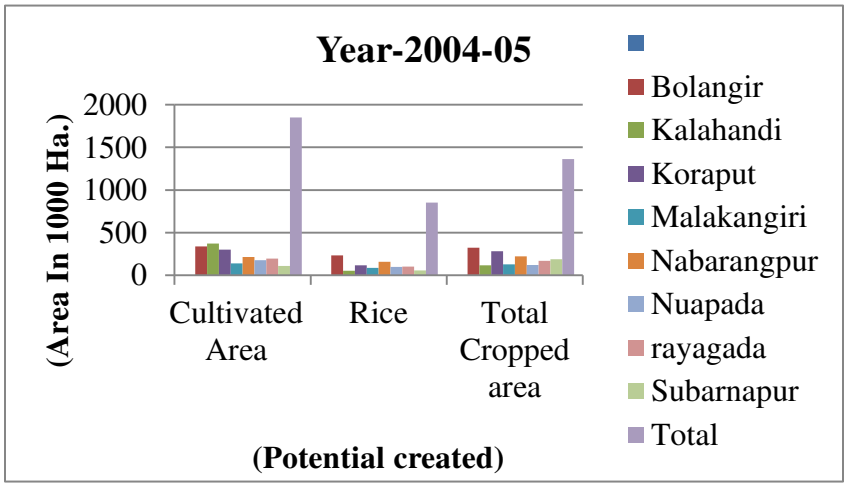
Table No.6. 8 Total Kharif potential created in different years from 2014-15 t

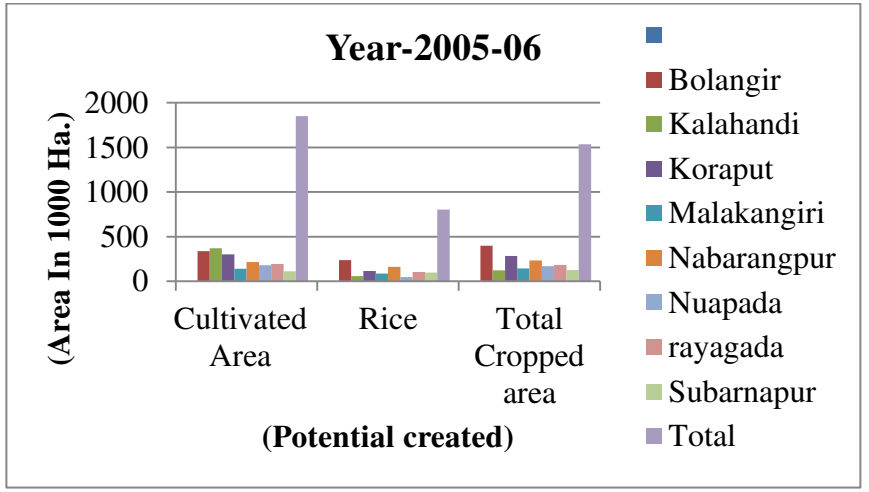
2014-15				
		(in 1000Ha)	(in 1000Ha)	(in 1000Ha)
Sl No.	Name of the District	Cultivated	Rice	Total Cropped area
1	Bolangir	338	200.3	353.88
2	Kalahandi	371	209.01	381.26
3	Koraput	302	111.86	274.07
4	Malakangiri	141	97.97	160.9
5	Nabarangpur	216	145.83	230.57
6	Nuapada	178	99.69	210.82
7	Rayagada	194	64.23	194.99
8	Subarnapur	111	109.15	145.7
	Total	1851	1038.04	1952.19



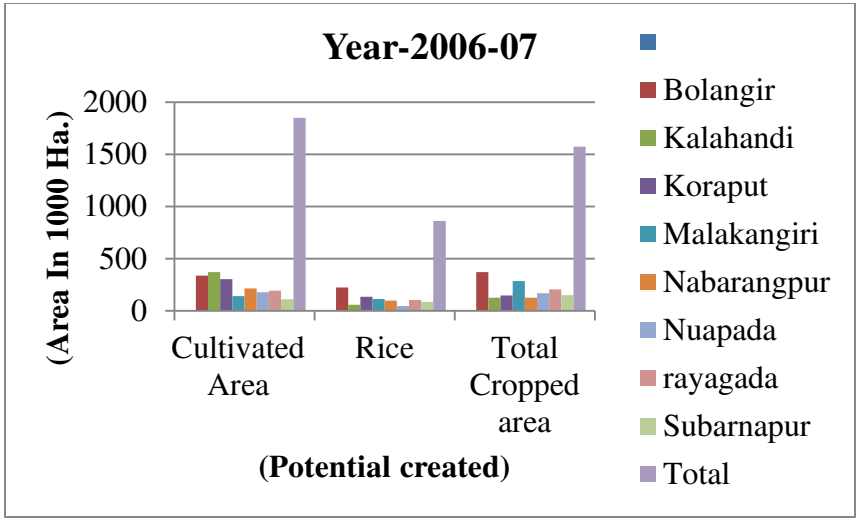


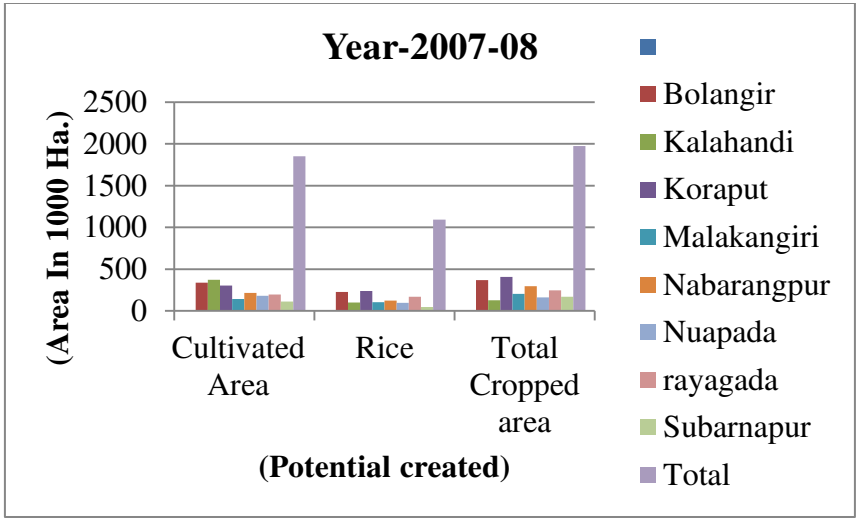
Graph No. 6.2 Total Kharif potential created in different districts from years 2002-03 to 2003-04



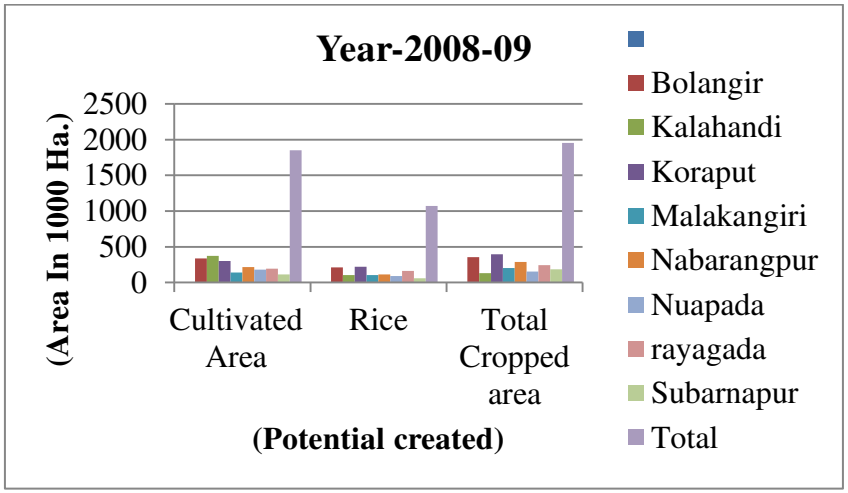


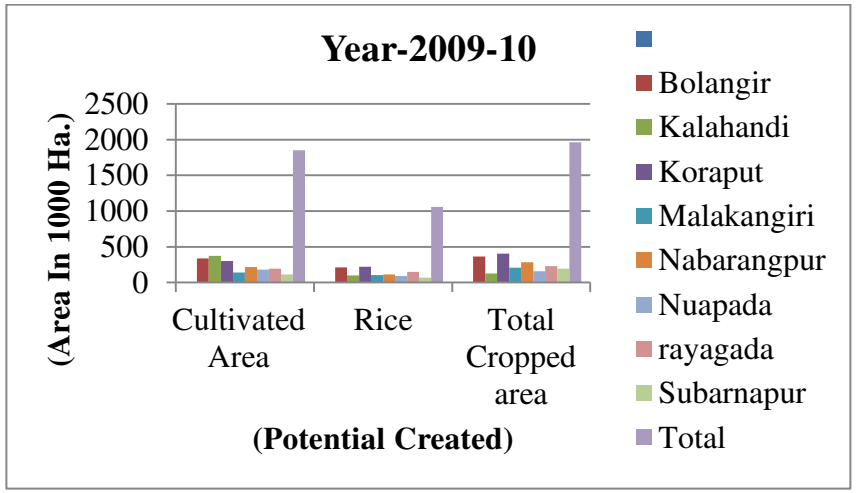
Graph No. 6.3 Total Kharif potential created in different districts from years 2004-05 to 2005-06



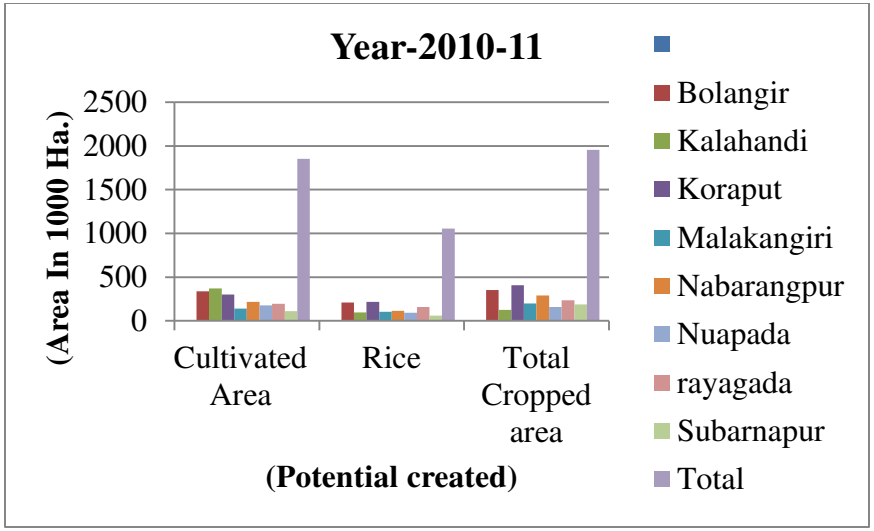


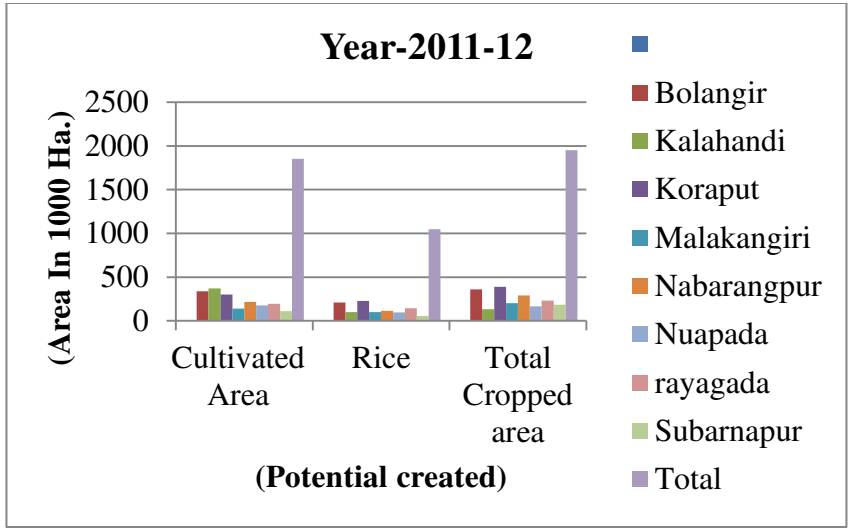
Graph No. 6.4 Total Kharif potential created in different districts from years 2006-07 to 2007-08



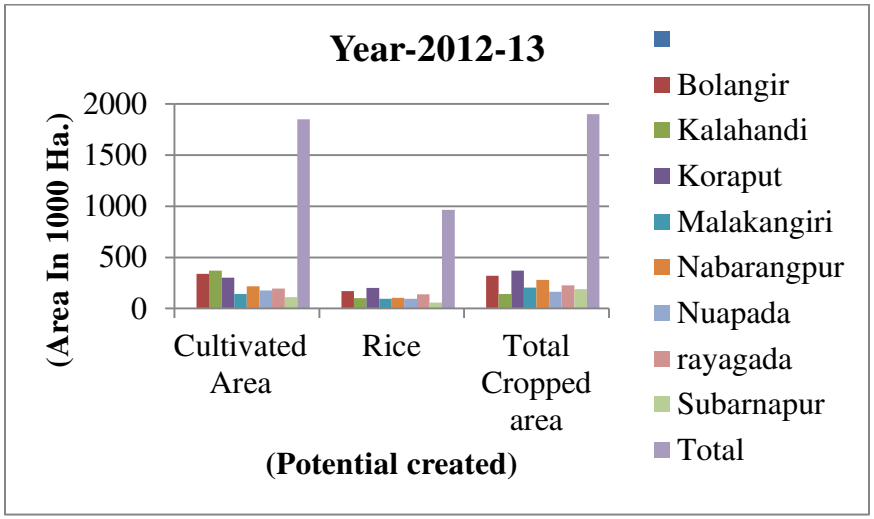


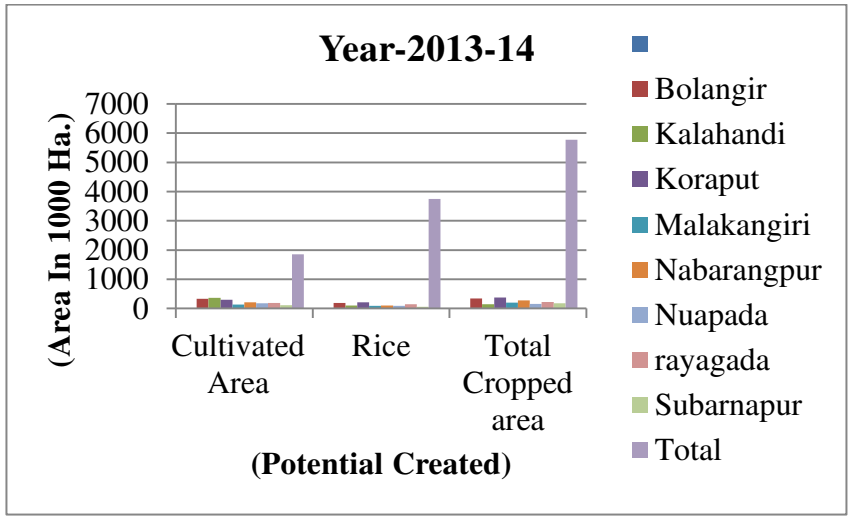
Graph No. 6.5 Total Kharif potential created in different districts from years 2008-09 to 2009-10



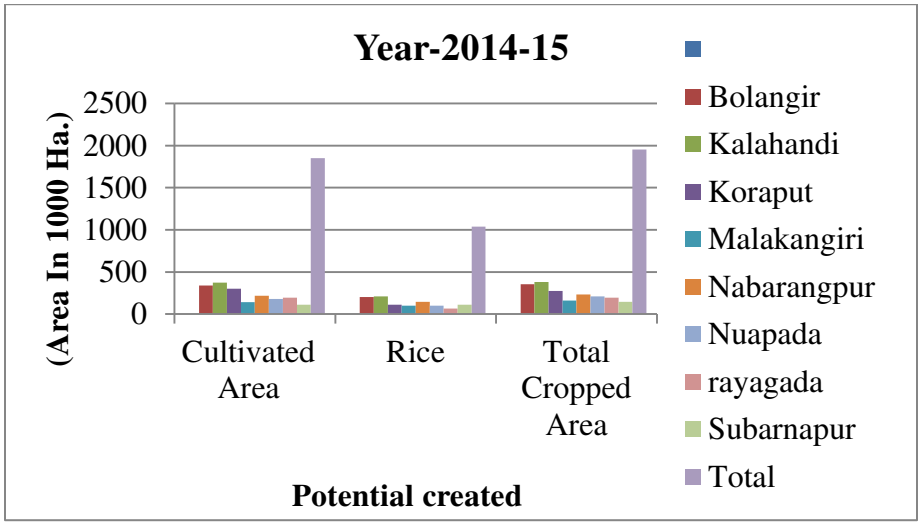


Graph No. 6.6 Total Kharif potential created in different districts from years 2010-11 to 2011-12





Graph No. 6.7 Total Kharif potential created in different districts from years 2012-13 to 2013-14



Graph No. 6.8 Total Kharif potential created in different districts from years 20014-15

Table.6.9 Field survey data of Irrigation Potential Created & Utilized in KBK district from the year 2008-09 to 2009-10

2008-09				
District	*Cultivated Area ('000 ha.)	Kharif	Rabi	Total
Kalahandi	371.00	160.614	100.152	260.766
Koraput	302.00	99.452	64.340	163.792
Malkangiri	141.00	84.965	39.991	124.956
Nabarangpur	216.00	41.903	26.673	68.576
Nuapada	178.00	55.442	19.009	74.451
Sonepur	111.00	90.018	43.593	133.611
Rayagada	194.00	61.925	25.007	86.932
Bolangir	338.00	80.029	30.318	110.347
KBK	1851.00	674.348	349.082	1023.430

2009-10				
District	*Cultivated Area ('000 ha.)	Kharif	Rabi	Total
Kalahandi	371.00	167.779	103.794	271.573
Koraput	302.00	101.688	64.922	166.610
Malkangiri	141.00	85.805	40.011	125.816
Nabarangpur	216.00	43.612	26.889	70.501
Nuapada	178.00	65.352	21.700	87.052
Sonepur	111.00	90.630	43.855	134.485
Rayagada	194.00	62.939	25.231	88.170
Bolangir	338.00	82.659	31.984	114.643
KBK	1851.00	700.464	358.384	1058.848

Table.6.10 Field survey data of Irrigation Potential Created & Utilized in KBK district from the year 2010-11 to 2011-12

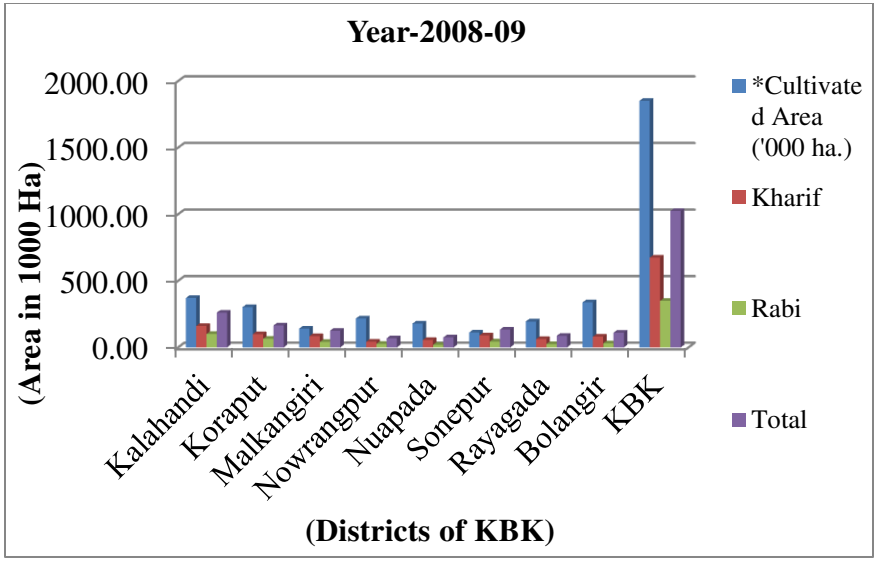
2010-11				
District	*Cultivated Area ('000 ha.)	Kharif	Rabi	Total
Kalahandi	371.00	175.602	111.834	287.436
Koraput	302.00	102.015	67.231	169.246
Malkangiri	141.00	81.414	40.369	121.783
Nabarangpur	216.00	46.590	25.880	72.470
Nuapada	178.00	67.271	18.869	86.140
Sonepur	111.00	92.583	43.053	135.636
Rayagada	194.00	62.908	24.868	87.776
Bolangir	338.00	89.844	33.093	122.937
KBK	1851.00	718.227	365.197	1083.424

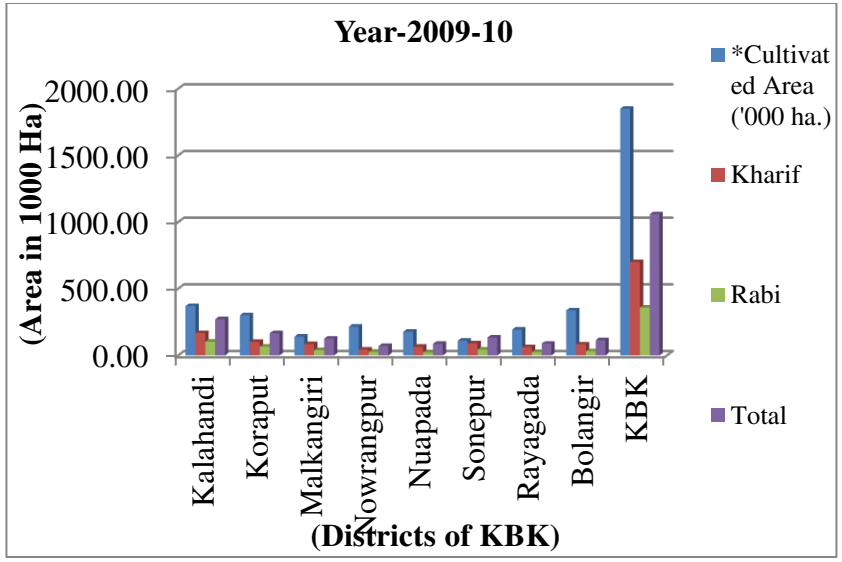
2011-12				
District	*Cultivated Area ('000 ha.)	Kharif	Rabi	Total
Kalahandi	371.00	180.973	101.614	282.587
Koraput	302.00	110.602	77.784	188.386
Malkangiri	141.00	81.091	40.637	121.728
Nabarangpur	216.00	48.038	26.912	74.950
Nuapada	178.00	69.217	22.344	91.561
Sonepur	111.00	92.921	43.200	136.121
Rayagada	194.00	64.581	25.656	90.237
Bolangir	338.00	91.637	34.850	126.487
KBK	1851.00	739.060	372.997	1112.057

Table.6.11 Field survey data of Irrigation Potential Created & Utilized in KBK district from the year 20012-13 to 20013-14

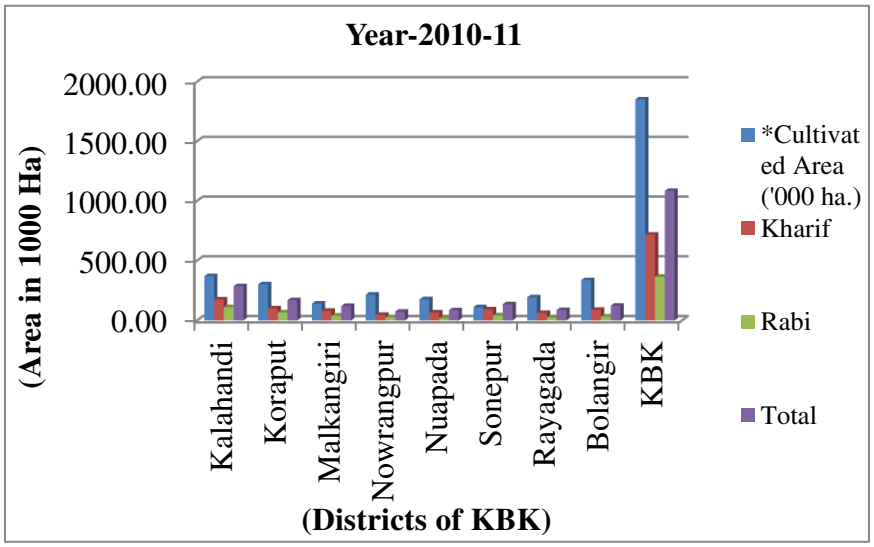
2012-13				
District	*Cultivated Area ('000 ha.)	Kharif	Rabi	Total
Kalahandi	371.00	200.157	107.342	307.499
Koraput	302.00	107.213	82.042	189.255
Malkangiri	141.00	87.433	41.285	128.718
Nabarangpur	216.00	56.115	30.128	86.243
Nuapada	178.00	75.767	24.526	100.293
Sonepur	111.00	101.949	45.773	147.722
Rayagada	194.00	68.942	27.046	95.988
Bolangir	338.00	106.157	39.660	145.817
KBK	1851.00	803.733	397.802	1201.535

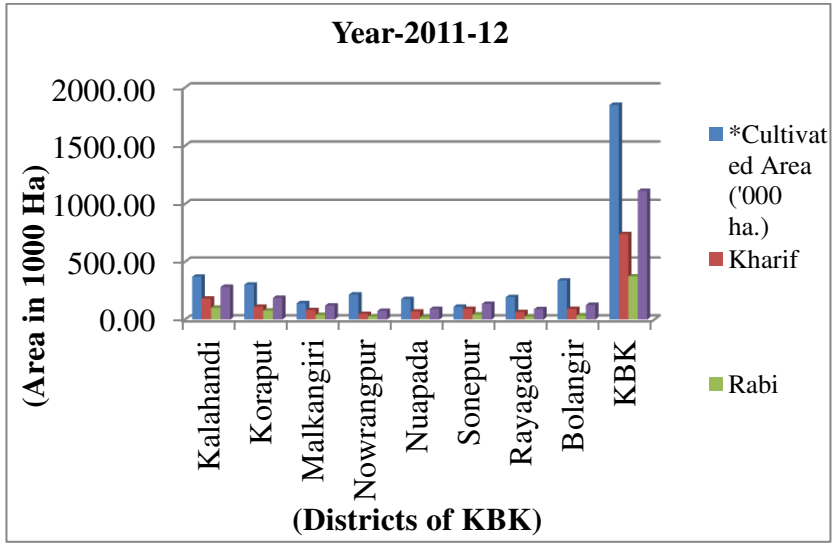
2013-14				
District	*Cultivated Area ('000 ha.)	Kharif	Rabi	Total
Kalahandi	371.00	208.220	111.768	319.988
Koraput	302.00	110.244	83.505	193.749
Malkangiri	141.00	91.069	42.946	134.015
Nabarangpur	216.00	59.665	31.775	91.440
Nuapada	178.00	78.951	25.489	104.440
Sonepur	111.00	107.978	48.524	156.502
Rayagada	194.00	71.567	28.046	99.613
Bolangir	338.00	113.548	42.759	156.307
KBK	1851.00	841.242	414.812	1256.054



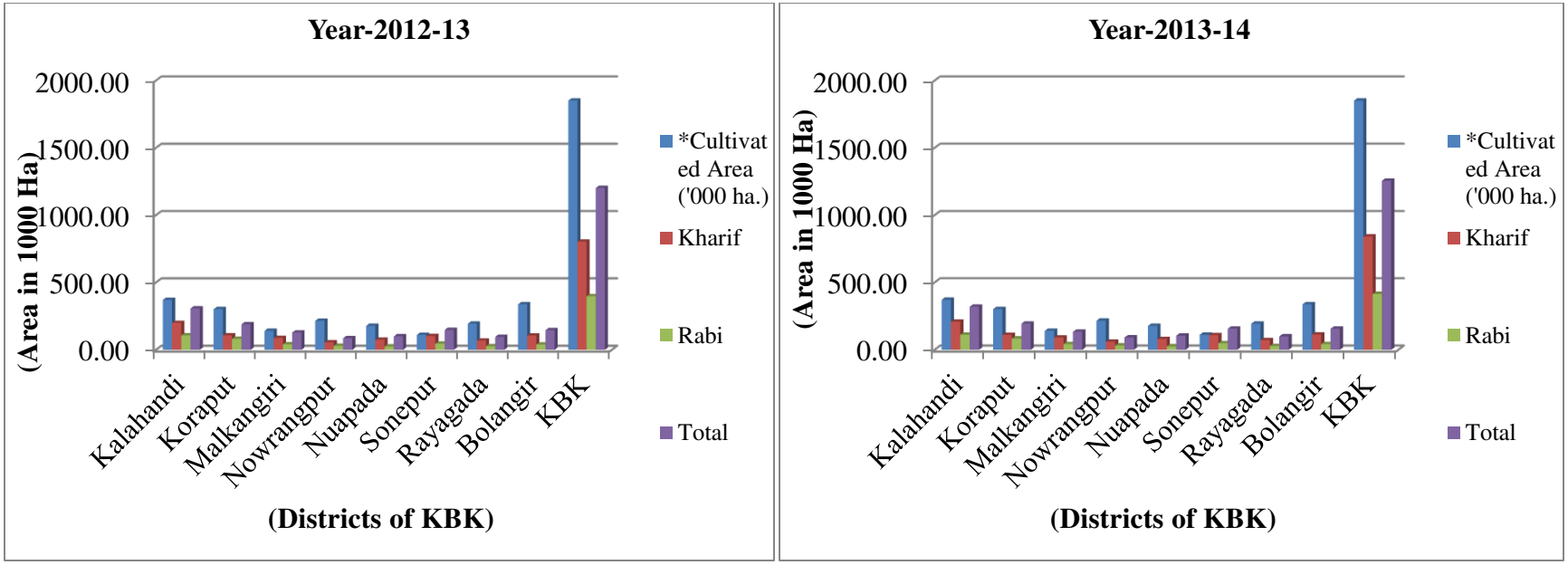


Graph.6.9 (Field survey data of Irrigation Potential Created & Utilized in KBK district from the year 2008-09 to 2009-10)





Graph.6.10 (Field survey data of Irrigation Potential Created & Utilized in KBK district from the year 2010-11 to 2011-12) .



Graph 6.11 (Field survey data of Irrigation Potential Created & Utilized in KBK district from the year 2012-13 to 20013-14)

Table No.6.12 District Wise Kharif Cropped Area During 2000-01

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	237	14.74	251.53	62.64	313.77	22.79	2.45	16.49	1.41	356.91
2	Kalahandi	136	105.8	242.17	9.76	251.93	46.15	10.64	1.53	5.2	315.45
3	Koraput	91.8	27.64	119.43	4.67	124.1	1.43	7.02	0	2.04	134.59
4	Malakangiri	153	37.04	189.68	8.18	197.86	11.22	8.14	3.57	1.36	222.15
5	Nabarangpur	105	10.39	115.82	42.08	157.9	32.09	6.19	2.79	0.89	199.86
6	Nuapada	67.5	34.09	101.62	19.92	121.54	22.52	5.59	7.34	2.21	159.2
7	Rayagada	86.6	0.39	86.94	10.36	97.3	2.08	1.67	0.51	0.57	102.13
8	Subarnapur	58.1	39.89	98	39.58	137.58	15.21	10.29	23.39	2.38	188.85
	Total	877	230	1107.2	157.61	1264.4	138.3	41.7	32.23	13.68	1490.29

Table No.6.13 District Wise Kharif Cropped Area During 2001-02

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	227	13.92	241.23	65.45	306.68	19.14	7.88	25.34	1.84	360.88
2	Kalahandi	118	96.2	214.48	10.73	225.21	41.11	13.73	1.94	4.07	286.06
3	Koraput	98	26.17	124.21	7.58	131.79	20.04	8.74	3.1	1.45	165.12
4	Malakangiri	165	32.92	197.67	15.77	213.44	10.2	10.95	5.56	1.57	241.72
5	Nabarangpur	105	3.21	108.64	9.31	117.95	6.34	3.72	0.74	0.65	129.4
6	Nuapada	108	10.46	118.14	38.65	156.79	29.25	9.7	3.76	0.81	200.31
7	Rayagada	63.8	45.19	108.98	28.53	137.51	25.08	8.66	10.67	1.38	183.3
8	Subarnapur	58.1	39.89	98	39.58	137.58	15.21	10.29	23.39	2.38	188.85
	Total	885	228.1	1113.4	176.02	1289.37	151.2	63.38	51.11	11.77	1566.79

Table No.6.14 District Wise Kharif Cropped Area During 2002-03

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	235	13.74	248.74	41.04	289.78	13.49	6.58	11.56	2.93	324.34
2	Kalahandi	53	17.06	70.06	10.64	80.7	9.87	10.81	0.34	14.08	115.8
3	Koraput	117	93.5	210.5	9.98	220.48	38.54	15.73	0.63	4.82	280.2
4	Malakangiri	88	23.55	111.55	1.78	113.33	3.39	7.74	2.44	1.53	128.43
5	Nabarangpur	158	33.61	191.61	12.04	203.65	5.57	9.07	1.7	1.01	221
6	Nuapada	100	5.43	105.43	5.93	111.36	1.64	3.83	0.71	4.12	121.66
7	Rayagada	103	7.5	110.5	43.14	153.64	8.49	4.8	1.23	2.26	170.42
8	Subarnapur	58.1	39.89	98	39.58	137.58	15.21	10.29	23.39	2.38	188.85
	Total	854	194.4	1048.4	124.55	1172.94	80.99	58.56	18.61	30.75	1361.85

Table No.6.15 District Wise Kharif Cropped Area During 2003-04

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	237	12.74	249.9	101.96	351.86	24.99	6.59	12.96	2.25	398.65
2	Kalahandi	57.1	16.88	74.02	10.54	84.56	13.09	10.83	0.25	14.26	122.99
3	Koraput	114	92.24	205.74	10.48	216.22	43.15	15.76	1.09	7.52	283.74
4	Malakangiri	84.8	20.41	105.23	6.5	111.73	21.09	7.75	1.75	1.46	143.78
5	Nabarangpur	160	39.32	199.42	13.72	213.14	8.58	9.08	1.56	1	233.36
6	Nuapada	46.4	41.2	87.58	33.63	121.21	21.57	7.35	17.42	1.21	168.76
7	Rayagada	104	5.73	110.19	40.03	150.22	25.29	4.81	1.1	2.59	184.01
8	Subarnapur	98.7	0.33	99.07	16.09	115.16	3.3	5.99	0.3	0.41	125.16
	Total	804	228.5	1032.1	216.86	1248.94	157.8	62.17	36.13	30.29	1535.29

Table No.6.16 District Wise Kharif Cropped Area During 2004-05

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	225	12.34	237.45	85.276	322.726	24.11	6.625	15.86	2.205	371.527
2	Kalahandi	57.4	18.04	75.466	11.426	86.892	12.94	11.02	0.231	14.37	125.447
3	Koraput	134	0.071	133.73	0.077	133.806	0	9.215	1.875	1.406	146.302
4	Malakangiri	114	93.93	207.84	10.738	218.574	41.16	15.812	1.235	7.608	284.384
5	Nabarangpur	98.7	0.33	99.07	16.09	115.16	3.3	5.99	0.3	0.41	125.16
6	Nuapada	46.4	41.2	87.58	33.63	121.21	21.57	7.35	17.42	1.21	168.76
7	Rayagada	103	8.31	11.48	51.27	162.75	34.36	4.5	1.35	1.46	204.42
8	Subarnapur	84.8	21.32	106.09	5.886	111.977	25.57	7.825	1.775	1.539	148.688
	Total	863	195.5	958.7	214.39	1273.1	163	68.337	40.05	30.2	1574.69

Table No.6.17 District Wise Kharif Cropped Area During 2005-06

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	226	9.88	235.63	68.75	304.38	28.94	9.43	24.38	2.05	369.18
2	Kalahandi	98.7	0.33	99.07	16.09	115.16	3.3	5.99	0.3	0.41	125.16
3	Koraput	237	12.33	249.2	102.88	352.08	26.87	6.18	17.44	2.19	404.76
4	Malakangiri	103	8.31	11.48	51.27	162.75	34.36	4.5	1.35	1.46	204.42
5	Nabarangpur	121	94.33	214.89	14.91	229.8	41.38	15.08	1.23	7.61	295.1
6	Nuapada	95	16.67	111.69	9.58	121.27	30.32	7.42	0.45	1.52	160.98
7	Rayagada	167	46.26	213.66	17.09	230.75	5.34	8.62	0.54	0.97	246.22
8	Subarnapur	46.4	41.2	87.58	33.63	121.21	21.57	7.35	17.42	1.21	168.76
	Total	1094	229.3	1223.2	314.2	1637.4	192.1	64.57	63.11	17.42	1974.58

Table No.6.18 District Wise Kharif Cropped Area During 2006-07

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	211	9.68	221.1	70.36	291.46	27	9.28	25.33	2.04	355.11
2	Kalahandi	104	0.34	104.4	16.53	120.93	3.24	5.87	0.32	0.41	130.77
3	Koraput	221	18.15	239.25	100.72	339.97	24.7	6.32	21.98	2.29	395.26
4	Malakangiri	105	9.9	115.36	54.64	170	26.19	4.57	1.76	1.46	203.98
5	Nabarangpur	114	94.26	208.59	15	223.59	41.93	14.94	0.98	7.97	289.41
6	Nuapada	88.4	15.59	103.98	9.62	113.6	28.64	7.4	0.19	1.52	151.35
7	Rayagada	164	47.15	210.75	17.26	228.01	4.93	8.63	0.55	0.97	243.09
8	Subarnapur	61.2	40.28	101.48	33.81	135.29	23.85	7.27	15.85	1.2	183.46
	Total	1070	235.4	1304.9	317.94	1622.85	180.5	64.28	66.96	17.86	1952.43

Table No.6.19 District Wise Kharif Cropped Area During 2007-08

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	213	10.15	223.58	73.57	297.15	27.1	16.25	22.04	2.02	364.56
2	Kalahandi	99.2	0.32	99.47	16.23	115.7	2.87	8.26	0.31	0.25	127.39
3	Koraput	221	22.05	243.01	101.66	344.67	26.03	11.39	19.06	1.41	402.56
4	Malakangiri	106	7.85	113.54	58.63	172.17	23.82	6.13	2.21	1.76	206.09
5	Nabarangpur	111	95.9	207.04	15.45	222.49	39.97	13.4	0.75	7.72	284.33
6	Nuapada	91.5	17.7	109.17	10.54	119.71	27.73	7.48	0.6	1.53	157.05
7	Rayagada	149	47.73	196.97	17.75	214.72	3.12	7.78	0.54	1.38	227.54
8	Subarnapur	67.5	44.99	112.44	37.19	149.63	22.45	8.63	11.97	1.78	194.46
	Total	1059	246.7	1305.2	331.02	1636.24	173.1	79.32	57.48	17.85	1963.98

Table No.6.20 District Wise Kharif Cropped Area During 2008-09

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	211	8.99	219.72	70.82	290.54	24.31	9.26	26.04	1.53	351.68
2	Kalahandi	97.2	0.33	97.54	16.51	114.05	2.88	6.34	0.31	0.43	124.01
3	Koraput	218	22.96	241.13	106.84	347.97	28.16	8.96	20.71	1.87	407.67
4	Malakangiri	102	8.39	110.05	58.28	168.33	23.63	3.83	2.17	1.2	199.16
5	Nabarangpur	115	96.15	210.87	15.7	226.57	40.15	13.39	0.7	7.48	288.29
6	Nuapada	92.9	17.33	110.25	10.11	120.36	30.81	6.46	0.55	1.2	159.38
7	Rayagada	157	49.09	206.26	17.19	223.45	2.37	7.73	0.51	1.02	235.08
8	Subarnapur	61	43.68	104.66	38.36	143.02	20.82	9.35	13.44	1.29	187.92
	Total	1054	246.9	1300.5	333.81	1634.29	173.1	65.32	64.43	16.02	1953.19

Table No.6.21 District Wise Kharif Cropped Area During 2009-10

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	213	10.15	223.58	73.57	297.15	27.1	16.25	22.04	2.02	364.56
2	Kalahandi	99.2	0.32	99.47	16.23	115.7	2.87	8.26	0.31	0.25	127.39
3	Koraput	221	22.05	243.01	101.66	344.67	26.03	11.39	19.06	1.41	402.56
4	Malakangiri	106	7.85	113.54	58.63	172.17	23.82	6.13	2.21	1.76	206.09
5	Nabarangpur	111	95.9	207.04	15.45	222.49	39.97	13.4	0.75	7.72	284.33
6	Nuapada	91.5	17.7	109.17	10.54	119.71	27.73	7.48	0.6	1.53	157.05
7	Rayagada	149	47.73	196.97	17.75	214.72	3.12	7.78	0.54	1.38	227.54
8	Subarnapur	67.5	44.99	112.44	37.19	149.63	22.45	8.63	11.97	1.78	194.46
	Total	1059	246.7	1305.2	331.02	1636.24	173.1	79.32	57.48	17.85	1963.98

Table No.6.22 District Wise Kharif Cropped Area During 2010-11

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	209	7.1	216.5	75.7	292.2	13.49	19.55	31.69	1.09	358.02
2	Kalahandi	100	0.27	100.71	15.1	115.81	1.42	13.92	0.9	0.49	132.54
3	Koraput	226	20.51	246.52	83.22	329.74	17.73	8.98	27.84	2.51	386.8
4	Malakangiri	99.7	10.91	110.62	57.67	168.29	20.87	5.87	3.22	1.92	200.17
5	Nabarangpur	114	98.21	212.49	14.8	227.29	40.06	14.49	0.47	7.51	289.82
6	Nuapada	96	17.08	113.12	10.27	123.39	30.19	9.1	0.55	2.17	165.4
7	Rayagada	145	61.56	206.15	12.07	218.22	1.79	11.31	0.48	1.03	232.83
8	Subarnapur	56.7	42.53	99.2	41.78	140.98	15.63	10.59	14.95	2.4	184.55
	Total	1047	258.2	1305.3	310.61	1615.92	141.2	93.81	80.1	19.12	1950.13

Table No.6.23 District Wise Kharif Cropped Area During 2011-12

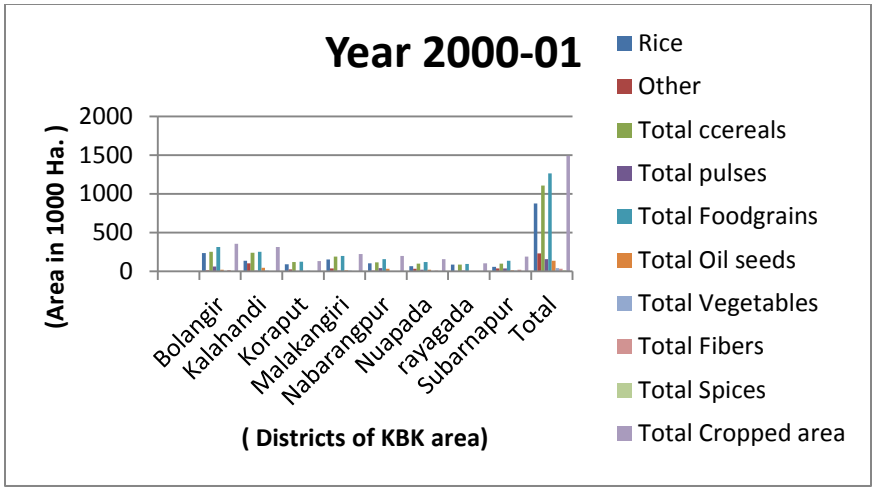
Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	170	6.88	177.28	77.67	254.95	9.4	19.15	37.15	1.09	321.74
2	Kalahandi	101	1.27	102.19	21.93	124.12	3.3	13.51	1.99	0.5	143.42
3	Koraput	202	17.99	220.32	84.23	304.55	16.72	8.88	38	2.52	370.67
4	Malakangiri	95.1	11.32	106.41	60.51	166.92	25.06	6.03	4.22	1.96	204.19
5	Nabarangpur	105	98.17	203.03	17.48	220.51	35.82	14.05	0.82	7.81	279.01
6	Nuapada	93.6	17.15	110.73	10.09	120.82	30.12	9.86	0.55	2.19	163.54
7	Rayagada	140	62.79	202.6	10.91	213.51	1.41	11.12	0.45	1.05	227.54
8	Subarnapur	58.1	39.89	98	39.58	137.58	15.21	10.29	23.39	2.38	188.85
	Total	965	255.5	1220.6	322.4	1542.96	137	92.89	106.6	19.5	1898.96

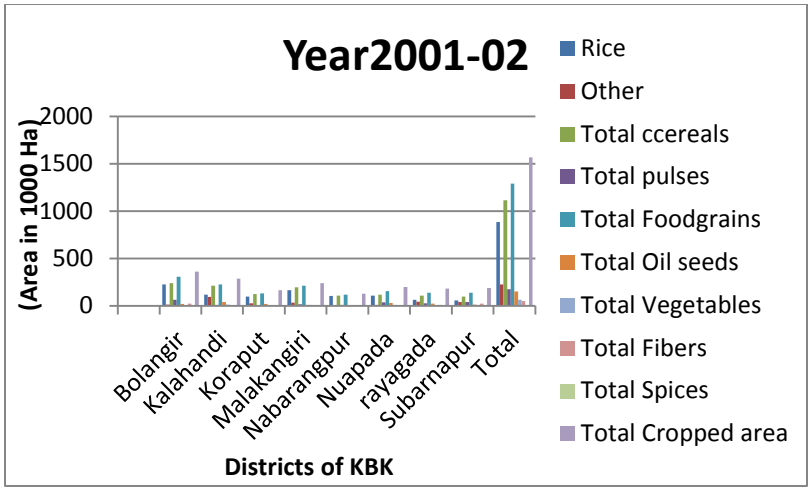
Table No.6.24 District Wise Kharif Cropped Area During 2012-13

Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	194.6	6.89	201.48	76.44	277.92	9.05	21.38	39.78	1.09	349.22
2	Kalahandi	101.5	1.14	102.64	21.5	124.14	2.84	13.22	2.46	0.41	143.07
3	Koraput	210.3	21.53	231.81	82.44	314.25	15.27	5.57	44.14	2.62	381.85
4	Malakangiri	94.9	12.27	107.17	58.35	165.52	20.34	8.91	5.42	1.67	201.86
5	Nabarangpur	103.1	103.33	206.4	17.22	223.62	29.82	10.76	1.55	8.18	273.93
6	Nuapada	94.96	17.08	112.04	9.56	121.6	28.29	7	0.55	2.12	159.56
7	Rayagada	143.5	65.27	208.78	8.86	217.64	0.94	8.42	0.31	1.2	228.51
8	Subarnapur	54.46	39.54	94	36.06	130.06	15.23	10.8	25.98	2.13	184.2
	Total	3749	459.45	4207.98	722.89	4930.87	333.2	284.1	148.2	79.81	5776.17

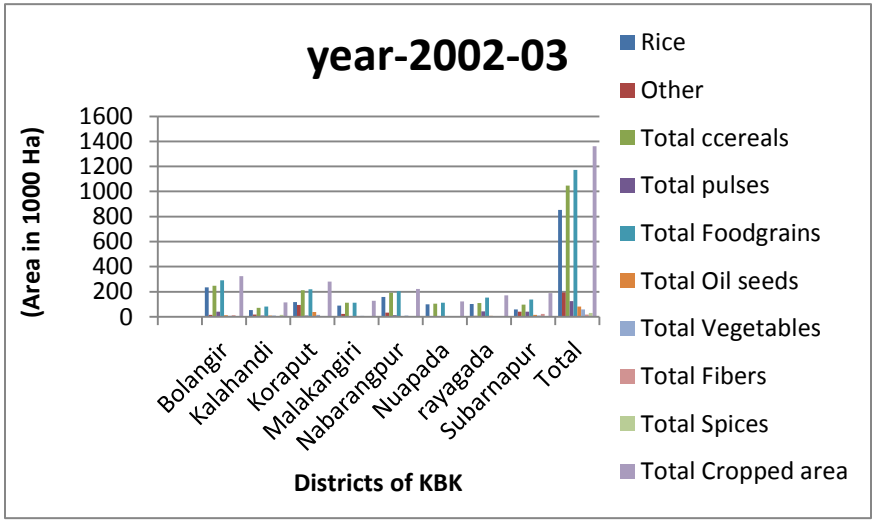
Table No.6.25 District Wise Kharif Cropped Area During 2013-14

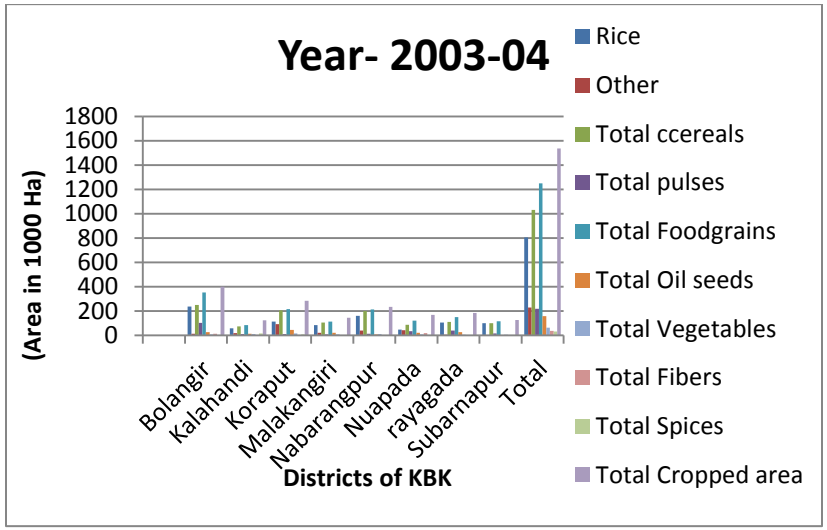
Sl No.	Name of the District	Rice	Other Cereals	Total cereals	Total pulses	Total Food grains	Total Oil seeds	Total Veg	Total Fibers	Total Spices	Total Cropped area
1	Bolangir	200.3	7.31	207.61	73.77	281.38	8.78	21.43	40.84	1.45	353.88
2	Kalahandi	209	22.84	231.85	83.16	315.01	14.72	5.38	44.53	1.62	381.26
3	Koraput	111.9	100.82	212.68	16.37	229.05	24.61	10.59	1.62	8.2	274.07
4	Malakangiri	97.97	16.62	114.59	9.29	123.88	28.43	5.87	0.55	2.17	160.9
5	Nabarangpur	145.8	66.09	211.92	8.22	220.14	0.86	8.03	0.32	1.22	230.57
6	Nuapada	99.69	13.75	113.44	59.43	172.87	21.95	8.84	6.05	1.11	210.82
7	Rayagada	64.23	39.04	103.27	36.44	139.71	13.93	10.78	28.37	2.2	194.99
8	Subarnapur	109.2	1.12	110.27	15.87	126.14	2.53	13.01	3.6	0.42	145.7
	Total	1038	267.59	1305.63	302.55	1608.18	115.8	83.93	125.9	18.39	1952.19



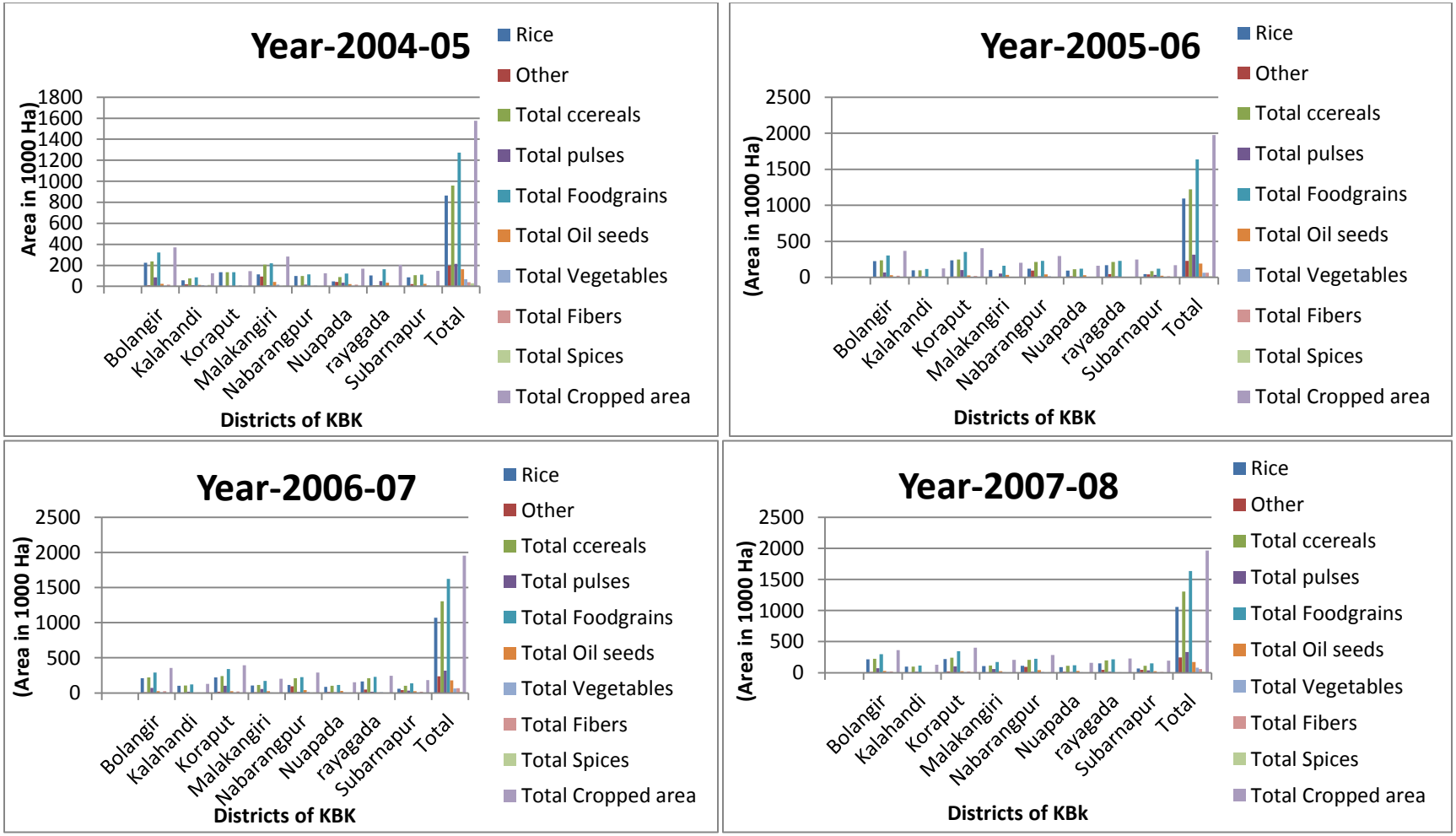


Graph No-6.12 Different Kharif products of KBK districts In different Years 2000-2001

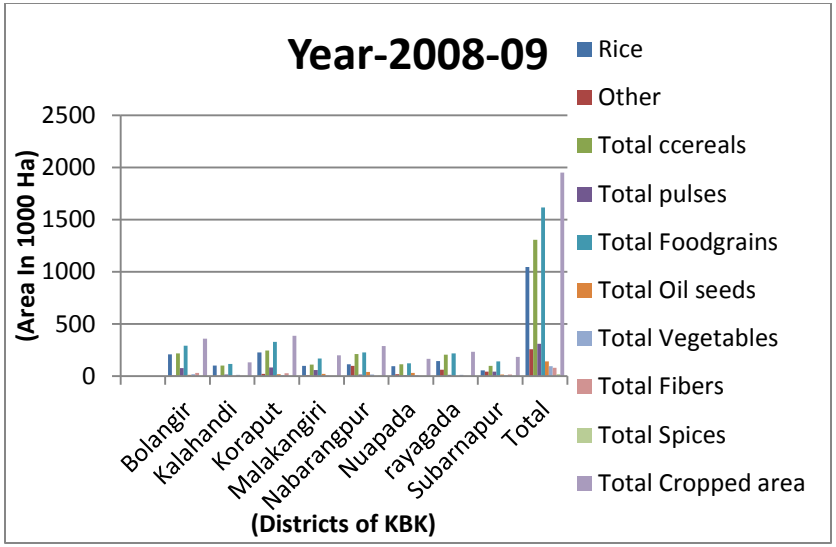


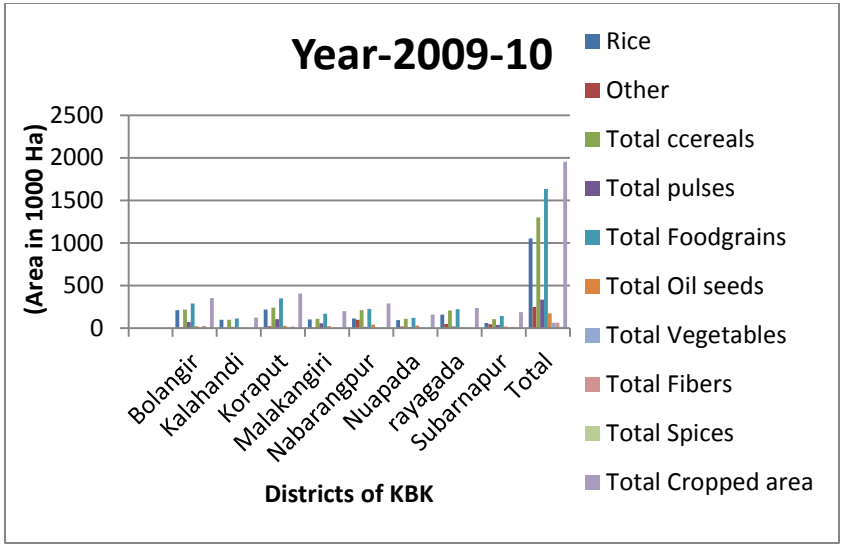


Graph No-6.13 Different Kharif products of KBK districts In different Years 2002-03 to 2003-04

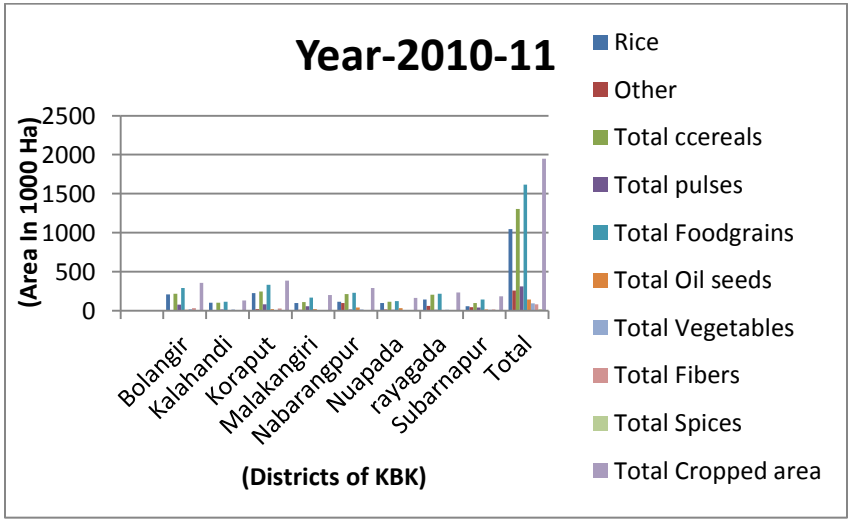


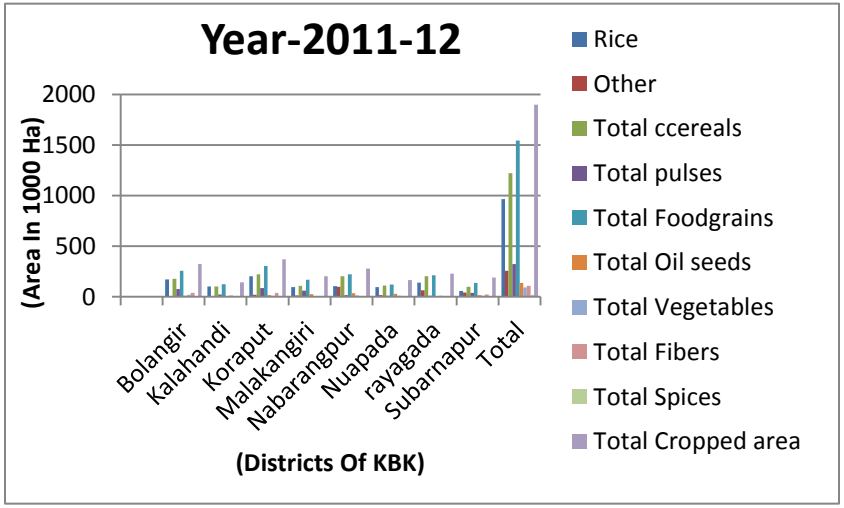
Graph No-6.14 Different Kharif products of KBK districts In different Years 2004-05 to 2007-08



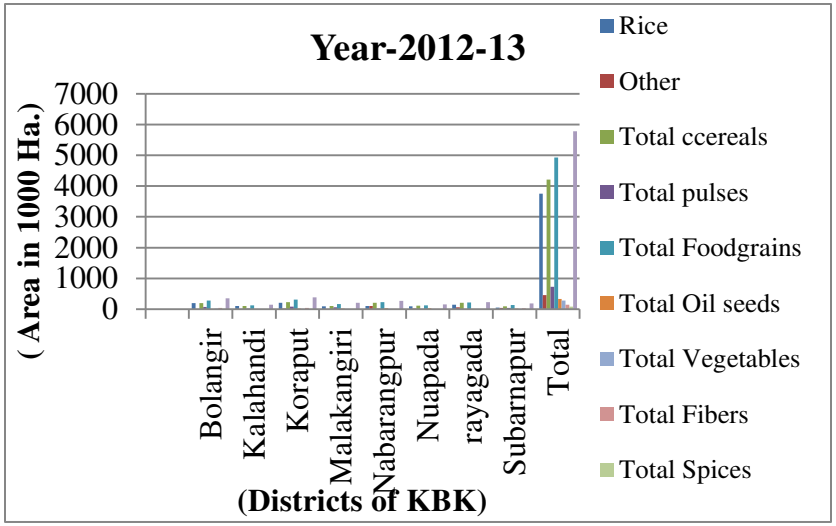


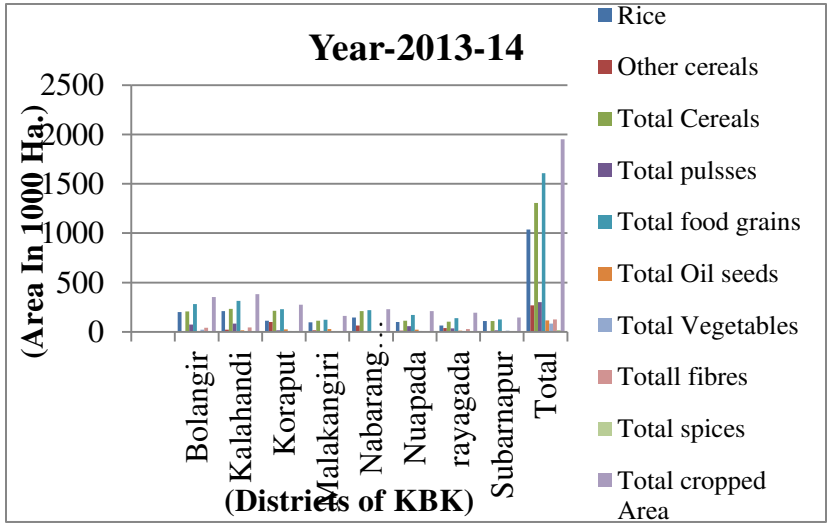
Graph No-6.15 Different Kharif products of KBK districts In different Years 2008-09 to 2009-10





Graph No-6.16 Different Kharif products of KBK districts In different Years 2010-11 to 2011-12





Graph No.6.17 Different Kharif products of KBK districts In different Years 2012-13 to 2013-14

Table No: 6.26 Statement showing the value of farm produce before irrigation INDRAVATI CANAL SYSTEM

season	Name of the crop	Area (Ha)	Input Cost					Total Rate of Cultivation Rs./Ha.)	Total cost(rs. In Lakhs)	Yield (Qntl /Ha.)	Rate of produce(Rs/ Qntl)		Grain receipt (Qntl)	Value of Farm produce		Total value of farm produce R.s In lakhs
			Seed	Manure	Fert. & Other	Pesticides	Labour (Human, Bullock, Mech)				Levy	Market		Levy 10% Rs. In lakhs	Market 90% Rs. In lakhs	
									3 x9				3 x 11	(0.1x14 x12)	(0.9x14 x13)	(15+16)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
	Paddy	10630	1200	3000	1470	1600	22610	29880	3176.2	20	1200	1400	212600	255.12	2678.8	2933.88
	Maize	318	600	3000	1960	1400	28000	34960	111.17	20	0	1800	6360	0.00	114.48	114.48
	Millet	787	600	3000	1960	1400	28000	34960	275.14	5		1800	3935	0.00	70.83	70.83
	Pulses	7082	750	3000	1240	1250	14130	20370	1442.6	10		4500	70820	0.00	3186.9	3186.9
	Ground Nut	814	5250	3000	1500	1800	26770	38320	311.92	10	0	4500	8140	0.00	366.3	366.3
	oil seeds	2095	1500	3000	2880	2950	22500	32830	687.79	3.09	0	5000	6473.55	0.00	323.68	323.68
	Fib-crops	278	1000	3000	2940	3600	40050	50590	140.64	4.19		4500	1164.82	0.00	52.42	52.42
	spices	139	1500	3000	2880	2950	22500	32830	45.63	3		4500	417	0.00	18.77	18.77
	Sugarcane	535	10000	3000	4820	2500	95530	115850	619.8	682	0	1000	364870	0.00	3648.7	3648.7
	vegetables	1207	1000	3000	2650	4000	47500	58150	701.871	120		2500	144840	0.00	3621	3621
Total		23885	23400	30000	24300	23450	347590	448740	7512.81	877.28			819620.37	255.12	14081.8	14336.96

Table No:6.27 **Statement showing the value of farm produce after irrigation INDRAVATI CANAL SYSTEM**

season	Name of the crop	Area (Ha)	Input Cost					Total Rate of Cultivation Rs./Ha.)	Total cost(rs. In Lakhs)	Yield (Qntl /Ha.)	Rate of produce(Rs/ Qntl)		Grain receipt (Qntl)	Value of Farm produce		Total value of farm produce R.s In lakhs
			Seed	Manure	Fert. & Other Charges	Pesticides	Labour (Human, Bullock, Mech.)				Levy	Market		Levy 10% Rs. In lakhs	Market 90% Rs. In lakhs	
									3 x9				3 x 11	(0.1 X14 X12)	(0.9 X14 X13)	(15+16)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Kharif	E.Paddy	2625	1200	3000	3160	2500	35550	45410	1192	35	1200	1400	91875	110.25	1157.6	1267.88
	M.paddy	4725	1200	3000	2560	1600	28810	37170	1756.3	45	1200	1400	212625	255.15	2679.1	2934.23
	L.paddy	3150	1200	3000	2560	1600	28810	37170	1170.9	50	1200	1400	157500	189	1984.5	2173.50
	Millet	787	750	3000	3760	1600	31340	40450	318.34	10	0	1800	7870	0	141.66	141.66
	Maize	787	750	3000	3760	1600	31340	40450	318.34	40	0	1800	31480	0	566.64	566.64
	Pulses	2625	1600	3000	3500	1600	16000	25700	674.63	20	0	4500	52500	0	2362.5	2362.50
	Oil seeds	1312	1500	3000	3780	2950	25135	36365	477.11	20	0	5000	26240	0	1312	1312.00
	vegetables	8662	1000	6000	8650	4000	55000	74650	6466.2	170	0	2500	1472540	0	36814	36813.50

Rabi	vegetables	6037	1000	6000	8650	4000	55000	74650	4506.6	170	0	2500	1026290	0	25657	25657.25
	Dalua paddy	3675	1200	3000	4140	3000	28810	40150	1475.5	40	1200	1400	147000	176.4	1852.2	2028.60
	Pulses	4200	1800	3000	3000	1110	16000	24910	1046.22	20	0	4500	84000	0	3780	3780.00
	G.Nut	4462	5250	3000	3300	2300	32550	46400	2070.39	20	0	4500	89240	0	4015.8	4015.80
Total		43047	18450	42000	50820	27860	384345	523475	21472.5	640	4800	32700	3399160	730.8	82322.8	83053.56

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions and Observations

Under PP the overall cropping intensity is 200 %. Paddy crop which is produced both in Kharif and Rabi seasons. The cropping intensity for all types of farmers in a PP is equal. The PP members who have land out the PP have cropping intensity of 222.77%. Comparing between PP area and Non PP area, it is found that the cropping intensity under PP scheme is lower than that of Non PP land. From the foregoing discussion one can conclude that the PP acts as a regulatory institution in charge of water distribution in equitable ways.

It also reveals that the farmers are coming forward for formation of WUAs and ready to take up the additional responsibility with benefits due to PP management which is exceed their cost of participation. Most the farmers are not well educated so special cares are to be taken to motivate the farmers. They have to convinced that the benefits due to participation is substantial, and quick yielding .PP is an unexecutable and unacceptable.

Huge investigations are made through the development of water resources by construction of irrigation projects but the major chunk of the resources remain still unutilized because of lack of outlet level managements. On farm development activities through the CADWM program has been proved to the most effective method for reducing inequality in distribution of irrigation water below the canal outlet for irrigation efficiency. The activities should therefore be extended to all the irrigation projects of the state. The climatological and geomorphological situation accelerates to surface and sub surface of flow in higher elevations and is the best option to increase the irrigation efficiency and also extensively practiced in all canal systems. These programs can be effectively implemented with involvement of farmers as a group called WUAs in the process of operation . PP can emerge as socio economic institute to provide a single window platform from all developmental activities of irrigation and agriculture permeate to other developmental areas for multiplier effects, by checking the migration of labour from rural to the urban areas . It will help to preserve the rural harmony and strengthening the rural economy of the state.

7.2 Implication of policy and Conclusions from canal Irrigation.

The process success of WUAs depends upon various plans such as group of actions and members effort , capacity building, training of farmers, effective management and irrigation officials and political suggestions. The overall participation index is found satisfactory and the participation increased as the farm size increased and vice versa. Canal user farmers are more active than the other irrigation farmers. The performance of WUAs on account of advanced technology, input supply is observed very more. Farmers participation is directly influenced by the size of operational holdings, educational level and inversely to the distance from the canal to the field.

7.3 RECOMMENDATIONS

As per the study of PIM in Indravati basin area, it has been resulted that farmers participation is increasing at a lower rate during the taken period. Following recommendations can be given for future scenario such as:

- Here slight increase in farmers participation is noticed and it leads to increase the irrigation potential. Therefore PP formation in the study area can be developed for various uses.
- The irrigation water in the Rabi period in the study area is not sufficient, to obtain optimum results of irrigation more and more awareness of PP formation and conjuctive use of irrigation is to be adopted.
- The economic development of the area can be achieved by use of water through PP managements.

7.4 FUTURE SCOPE OF THE STUDY

From the present study it was noticed that PIM have been increasing at a lower rate and indicates future scope for its development. Further study should be performed with more observed file data over a long period , as the collected data was for a small period of study. Therefore proper management strategies should be followed from the year onwards.

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APPENDIX

Table-1.A Cropping Intensity in Odisha from economic survery of India 2014

Year	Net area shown (in '000 hect.)	Gross cropped area (in'000 hect.)	Cropping Intensity (%)
2000-01	5,829	7,878	135
2001-02	5,845	8,798	151
2002-03	5,680	7,853	138
2003-04	5,796	8,637	149
2004-05	5,739	8,718	152
2005-06	5,691	8,928	157
2006-07	5,654	8,960	158
2007-08	5,624	9,016	160
2008-09	5,604	9,071	162
2009-10	5,574	9,074	163
2010-11	5,407	8,565	158
2011-12	5,292	8,799	166
2012-13	5,331	8,879	167
2013-14	5,424	9,054	167

Table-2.A: Cropping Pattern &Cropping intensity by different size groups under PaniPanchayat.

Size class of Land holdings (in Acres)	No. of HH	Average Gross Cropped area under PP (in acres)	Of the total Gross Cropped of Kharif, per centage of area devoted to Paddy	Of the total Gross Cropped of Rabi, per centage of area devoted to Paddy	Cropping Intensity (CI) =[Gross cropped area(GCA)/Net shown Area(NSA)]x 100
1	**2**	**3**	**4**	**5**	**6**
Landless ,0.00-0.00	7	1.05	100	100	200
Marginal=0.01-2.50	24	3.11	100	100	200
Small= 2.51-5.00	20	5.56	100	100	200
Medium 5.01-10.00	10	6.66	100	100	200
Large farmers,10.01 & above Overall	9	7.86	100	100	200
	70	4.82	100	100	200

Table-3. A: cropping pattern and cropping Intensity by different groups under Non Pani Panchayat

size class of landHoldings(in Acres)	No of HH	Average Gross Cropped area under Non-PP(in acres)	Total Gross cropped of **kharif**, per cent of area devoted to					Total	Total Gross cropped of **Rabi**, per cent of area devoted to						CI
			Paddy (in per cent)	Pulses (in per cent)	Vegetables (in per cent)	Oil seeds (in per cent)	Others (in per cent)		Paddy (in per cent)	Pulses (in per cent)	Vegetables (in per cent)	Oilseeds (in per cent)	Others (in per cent)	Total	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
0.00-0.00	07	0.15	3.47	-	-	-	-	3.47	3.47	-	-	-	-	3.47	201
0.01-2.50	24	1.45	15.52	2.57	1.00	1.26	-	19.35	15.52	2.37	0.87	1.18	-	18.94	210
2.51-5.00	20	2.53	18.69	-	-	1.00	-	19.69	18.69	-	-	-	-	18.69	247.44
5.01-10.00	10	3.45	21.26	2.02	1.97	-	-	24.25	22.26	2.23	-	2.13	1.00	25.62	236.55
10.01 & above	09	5.36	32.18	-	-	-	1.06	33.25	32.18	-	1.10	-	-	33.28	205.65
Overall	70	2.41	91.12	4.59	2.97	2.26	1.06	100	92.12	4.60	1.97	3.31	1.00	100	222.77
		(168.5)	(153.52)	(6.06)	(3.32)	(3.81)	(1.79)	(168.5)	(153.52)	(6.06)	(3.32)	(3.90)	(1.68)	(168.5)	

Table- 4.A: Average amount of crop income earned by different size group of members under Pani Panchayat and Non Pani Panchayat Land

Size class of Land holdings (in Acres)	No. of HH	Average crop income per HH under PP land (in Rs.)	Paddy Contribution (in per cent)	Average crop income per HH under Non PP land (in Rs.)	Paddy Contribution (in per cent)	Pulses Contribution (in per cent)	Oilseeds Contribution (in per cent)	Vegetables Contribution (in per cent)	**Others**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0.00-0.00	07	13510	1.08	1820.08	1.20	-	-	-	-
0.01-2.50	24	23620	15.20	9810.59	10.25	1.43	0.56	1.14	-
2.51-5.00	20	49990	25.18	15711.81	18.89	-	2.54	3.18	-
5.01-10.00	10	70090	33.50	35440.6	24.66	3.15	-	-	1.82
10.01 & above	09	94450	25.24	45890	36.18	-	-	-	-
Overall	70	45888.57	100per cent	19712.09	91.18	4.58	3.10	4.32	1.82

PANI PANCHAYAT REGISTER MAINTENANCE FORMS (C – L)

FORM C

[See rule 23 (e)]

REGISTER OF ADMINISTRATIVE APPROVAL

Name of the Pani Panchayat :

Name of the Minor/sub minor:

Sr No.	**Name of the work**	**Estimated Amount Rs.**	**Approval details**		**Remarks**
			Meeting No	Date	
1	2	3	4	5	6

FORM D

[See rule 23 (e)]

REGISTER OF LAND HOLDER

Name of the Pani Panchayat :

Name of the Minor/sub minor:

Sr No.	**Outlet No.**	**Name of The Land Holder**	**Father's Name**	**No. Of the Holdings**	**Plot No.**	**Total Area (Ha/AG)**	**Remarks**
1	2	3	4	5	6	7	8

FORM E

[See rule 30 (iv)]

REGISTER OF DEMAND AND COLLECTION OF WATER RATE

Name of the Pani Panchayat : pani Panchayat Command Area(ha) :

Name of the Minor/sub minor:

R.D Of OFF taking : Actual croped Area(ha) :

Name of parrent canal : Season (khariff/ rabi/ summer) :

Outlet No.	**R.D Of the Outlet**	**Total service area under the outlet**	**Name of the farmer**	**Area Cultivation type of**		**Type of crop growth**	**Water Rate(Rs/Ha)**			**Amount of Demand (Rs.)**			**Amount Collected(Rs.)**			**Balance (Rs)**		
				Plot no	Area(Ha)		Khariff	Rabi	summer	Khariff	Rabi	summer	Khariff	Rabi	summer	Khariff	Rabi	summer
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

FORM F

[See rule 30 (v)]

BILL REGISTER

Name of the Pani Panchayat :

Sr No.	Bill No & Date	Name of The work	Name Of the Executants	Amount (Rs.)	Date of submission Of Bill	Amount Passed for Payments	Amount Paid
1	2	3	4	5	6	7	8

FORM G

[See rule 30 (vi)]

CASH BOOK

Name of the Pani Panchayat :

Month :

SL No.	Date	CASH BOOK		CASH PAYMENTS	
		Particulars	Amount Received (Rs.)	Particulars	Amount Paid(Rs.)
1	2	3	4	5	6

FORM H

[See rule 30 (vii)]

RECEIPT BOOK

Name of the Pani Panchayat :

Name of the Minor/ Sub minor:

Receipt Book No……Sl No……Date……

Received with Thanks Rs./Items……. From Smt./ shri/Messers……

For……And taken into …… Account of Panipanchayat.

Rs…….

Items Quantity Authorised Signatory

Secretary……..Panchayat

FORM I

[See rule 30 (viii)]

REGISTER OF ASSET

Name of the Pani Panchayat : Month:

Name of the Minor/sub minor: Year :

Sr No.	**Date**	**Particular of ITEm**	**Opening Balance (Quantity)**	**RECEIPT (Quantity)**	**ISSUE (Quantity)**	**Mode of transaction (puschase/ sale /Trasfer/ Donatiom**	**Closing Balance (Quantity)**	**Remarks/ Reference**	**Signature**
1	2	3	4	5	6	7	8	9	10
1									
2									
3									
4									
5									
Immovable Assets									
1									
2									
3									
4									
5									

FORM J

[See rule 31 (3)]

DEMAND NOTICE

To

Shri/Smt.

You are hereby informed to deposit an amount of Rs…… towards payments of rate and Rs…….

…….. for clearance of arear dues for the area……. Acre of outlet…….situated under……..

Panipanchayat foe the year……..within onemonth from the date of issue of this notice.

Signature of Secretary

FORM K

[See rule 30 (ix)]

REGISTER REGISTER FOR RECEIPT AND MAINTENANCE OF CANALS

Name of the Pani Panchayat :
Name of the Minor/sub minor:
RD of off taking (m)

Month:
Year :
Season (khariff/summer):

Date of inspection	**Name of inspecting persons**	**indentified repair Needs canal/earth work/Structures etc.**		**Type of rapair**	**Estimated cost(Rs.)**	**Maintenance can be undertaken by members (Rs)**	**Requirement of external support (Rs)**	**Undertaking Repair and maintenance**		**Undertaking Repair and maintenance**	**Remarks and signature of competent office bearer**
		location R.D (M)	**Particulars**					**Date**	**By Members (Rs.)/Man Days**	**By pani panchayat (Rs.)**	
1	2	3	4	5	6	7	8	9	10	11	12

FORM L

[See rule 25]

BUDGET

Annual Budget for the year…….. :

RECEIPTS	EXPENDITURE
(i) Grant -in aid from central Government. (ii) Grant -in aid from state Government. (iii) Resources from financing agency. (Iv) income from properties and assets. (v) fees collected by farmer's organisation. (vi) MLA LAD (vii)MP LAD (viii)Miscellaneous	(i) Payments Of Electricity Bill, water bill, office expenses and contingency etc., of the project committee (ii) Payment of office expenses and contingency etc., of Pani Panchayat. (iii) Payment for maintenace works:- (a) Silt clearance from Distributary /minors/Sub- Minors/Water Courses/ field channels/ field drains (b) Removal of Weeds including grass, shurbs and bushes from the canal embankment and canal beds etc. © Closing of Breach of Distributary/Minor/Sub- Minors. (d) Greasing and painting of shutters etc. (e)Maintenance of inspection Path and service roads. (f) Maintenance of head regulator and cross regulators, outlets and gates etc. (g)Earthwork to restore bank. (h)Repair of lining painting , plastering replacing etc. (i)Development of Ayacut etc. (iv)Miscellanceous.