

Chapter 5

Research Setting: The Social Ecology

In a social research of this kind, it is not possible to know and understand the data and draw the interpretation more accurately unless a fair understanding of the characteristics of the area and socio-demographic behaviour complex are ensured. A research setting is therefore a surrounding where inputs and elements of research are contextually imbibed, interactive and mutually contributing to the system performance. Research setting is immensely important in the sense that it is characterising and influencing the interplays of different factors and components. Thus, a study on impact of watershed development programme for the improvement of the tribal people certainly demands a locale that goes unique with natural set up, demography, crop ecology, institutional set up and other socio-cultural milieus.

4.1: Background

Watershed approach has been followed in India since early sixties with basic aims at controlling filtration in reservoirs for mitigating floods. Subsequently; after announcement of a new 20-point development programme during 1982, the watershed approach was adopted as a national strategy for integrated and comprehensive development of rainfed areas. The National Watershed Development Project for Rainfed Areas (NWDPPRA) was initiated during 7th Plan covering 99 districts in 16 States including Odisha. The bottlenecks experienced in the process of its implementation was assessed and a new approach initiated in 8th Plan

period which radically different from NWDPRA after removing many defects. The programme called as National Watershed Development Project which is currently in operation in twenty-five States and two Union Territories. It is expected that the programme could create models of scientific land use through development of integrated farming system on the principle of Watershed Management. Odisha is one of the potential States where the programme is being carried out in a massive way.

4.2: Brief description of the State

The study was undertaken in the State of Odisha. The State lies in between 17⁰31' to 22⁰27' North latitude and 81⁰27' to 87⁰30' East longitude. It is bounded by the State West Bengal in the North-East, Jharkhand in North, Chhatisgarh in West, Andhra Pradesh in South and Bay of Bengal in the East.

The main features of the State are appeared in table 4.1.

Table 4.1: Main features of Odisha

Sl. No.	Feature	Unit	Magnitude
1	Geographical situation	-	Between 17 ⁰ 31' to 22 ⁰ 27' North latitude and 81 ⁰ 27' to 87 ⁰ 30' East longitude
2	Geographical area	000'ha	15571
3	Population (Census 2011)	000'nos	41947
4	Male population	000'nos	21201
5	Female population	000'nos	20746
6	Density of population	Person/Sq. Kms	269
7	Population decade growth rate	Percentage	13.97
8	Literacy rate	Percentage	73.45
9	Male Literacy rate	Percentage	81.59
10	Female Literacy rate	Percentage	62.46

11	Sex ratio	Female/1000 Male	978
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(Source: Odisha Agriculture Statistics 2011-12)

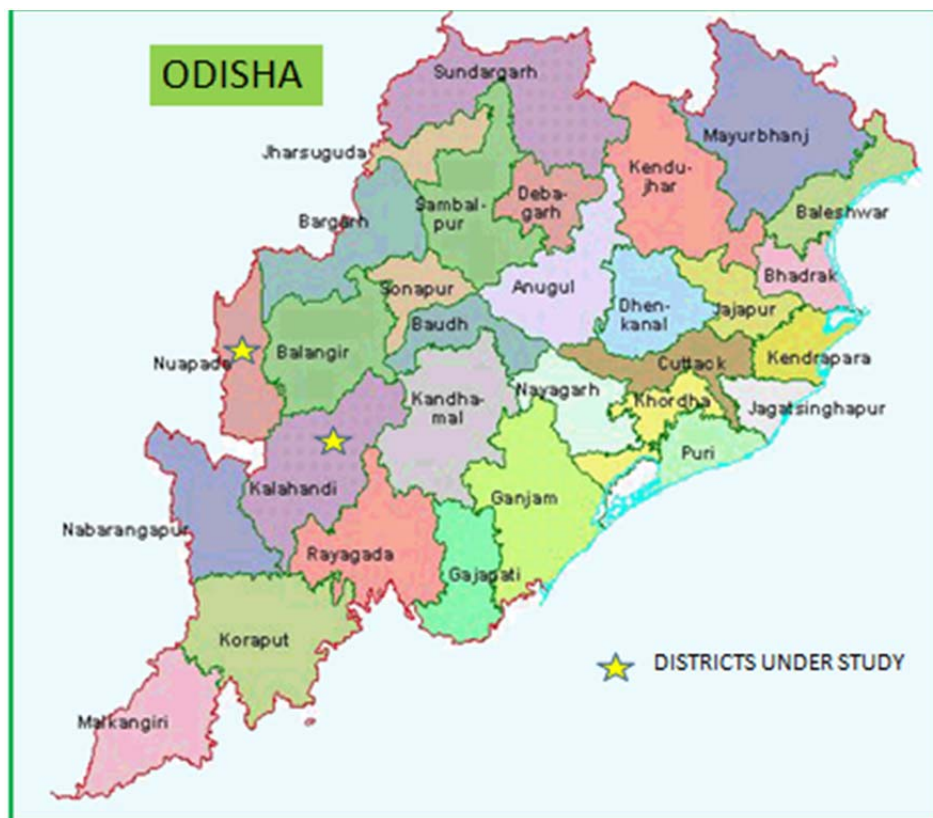


FIG. 3: POLITICAL MAP OF ODISHA

4.3: Physiography of the State

Odisha is an extensive plateau which slopes gently into coastal plain along the Bay of Bengal. The river Mahanadi flowing West to East through the plateau divide the State into two definite parts. The Northern part is an extension of Chhotnagpur Plateau and the Southern part belongs to Eastern Ghat Region. The State has been divided into ten agro-climatic zones. The distinctive features of various zones are as follows.

4.3.1: North Western Plateau

The zone comprises the agricultural districts of Sundargarh, Baneigarh and Panpose in Sundargarh district, Deogarh district and Kuchinda under Sambalpur district. The climate is hot, moist and sub-humid having mean annual rainfall of 1600 mm, maximum temperature of 38⁰C and mean minimum temperature of 15⁰C. The soil is light textured with red and yellow soils. Major crops grown are rice, toria, wheat and vegetables.

4.3.2: North Central Plateau

It consists of the agricultural districts of Rairangpur, Baripada, Karanjia in Mayurbhanj district, Champua and Keonjhar in Keonjhar district. The climate of the zone is hot, moist and sub-humid. The mean annual rainfall is 1534 mm with mean maximum and mean minimum temperature of 36.6⁰C and 11.1⁰C respectively. Red loam and light textured soils are mostly found in the zone. Rice, niger, maize, horse gram, black gram, arhar, sesamum and vegetables are the major crops grown.

4.3.3: North Eastern Coastal Plain

Agricultural district of Anandapur under Keonjhar district, Balasore, Bhadrak and Jajpur districts are coming under this zone. The climate of the zone is moist and sub-humid with annual rainfall of 1568 mm. The mean maximum and minimum temperature are 36⁰C and 14.8⁰C respectively. Alluvial soils and narrow strip of sedimentary sandy loam to clay structured soils are the characteristics of this zone. Major crops grown are rice, jute, groundnut, toria, vegetables, black gram, green gram and betel vine.

4.3.4: South and South-Eastern coastal plain

Cuttack and Banki agricultural districts in Cuttack district, Jagatsinghpur, Kendrapara, Puri, Khurda, Nayagarh districts and Berhampur, Chhatrapur agricultural districts of Ganjam district comprises this zone. The climate is hot and humid with mean annual rainfall of 1577 mm. The mean maximum as well as minimum temperature are 39⁰C and 11.5⁰C respectively. The soils of the zone are mainly loamy, clay loam and coastal alluvial with a narrow strip of saline inundated areas. Rice, green gram, black gram, groundnut, jute, sesamum and vegetables are the major crops grown in this zone.

4.3.5: North Eastern Ghat

The zone consists of Kandhamal, Gajapati districts, Rayagada and Gunupur agricultural districts of Rayagada district as well as Aska agricultural district of Ganjam district. The climate of the zone is hot, moist, and sub-humid with mean annual rainfall of 1597 mm. The mean maximum and minimum temperature of the zone are 37⁰C and 10.4⁰C respectively. The soils of the zone are brown forest soil, sandy loam, loam and clay with medium texture. Rice, ragi, black gram, green gram, til, groundnut, sugarcane, toria, turmeric and vegetables are the major crops grown.

4.3.6: Eastern Ghat High Land

Koraput and Nabarangapur district except Dabugaon area are under this zone. The climate is warm and humid with mean annual rainfall of 1521.8 mm. The mean maximum and minimum temperature of the zone are 34.1⁰C and 7.5⁰C respectively. The zone consists of mostly red soils with low organic matter content. Major crops such as ragi, rice, small millets, vegetables, maize, arhar, niger, toria and sweet potato are grown in this zone.

4.3.7: South Eastern Ghat

The agricultural district Jeypore in Koraput district and Malkangiri district are included in this zone. The zone is having warm and humid climate. The mean annual rainfall, maximum and minimum temperature are 1710.4 mm, 34.1⁰C and 13.2⁰C respectively. Red and red yellow mixed soils are the characteristics of the zone. Rice, arhar, niger, toria, maize, wheat, sweet potato and vegetables are the major crops grown.

4.3.9: Western Central Table Land

Sambalpur, Bargarh, Bolangir, Jharsuguda, Boudh and Sonepur districts are coming under this zone. The climate is hot, moist and sub-humid with mean maximum temperature of 40⁰C and minimum temperature of 12.4⁰C. The average annual rainfall of the zone is 1282 mm. Red, heavy textured calcareous and light to medium textured soils are mostly seen in this zone. Major crops grown are rice, til, black gram, green gram, wheat, groundnut, sugarcane and vegetables.

4.3.10: Mid-Central Table Land

The zone consists of the districts of Dhenkanal, Angul, Athagarh agricultural district of Cuttack district and Sukinda block of Jajpur district. The climate of the zone is hot, dry and sub-humid. The mean annual rainfalls with mean maximum and minimum temperature are 1421 mm, 38.7°C and 14°C respectively. Light textured lateritic, medium textured red loam, mixed red and black soils are found in this zone. Rice, groundnut, black gram and vegetables are the major crops grown in this zone

4.4: Climate and Environmental situation

The State of Odisha lies in the sub-tropical belt. The chief characteristics of the climate are high temperature and high rainfall. Three defined seasons are prevailed in the State i.e. hot dry summer (March to May), monsoon (June to October) and winter (November to February).

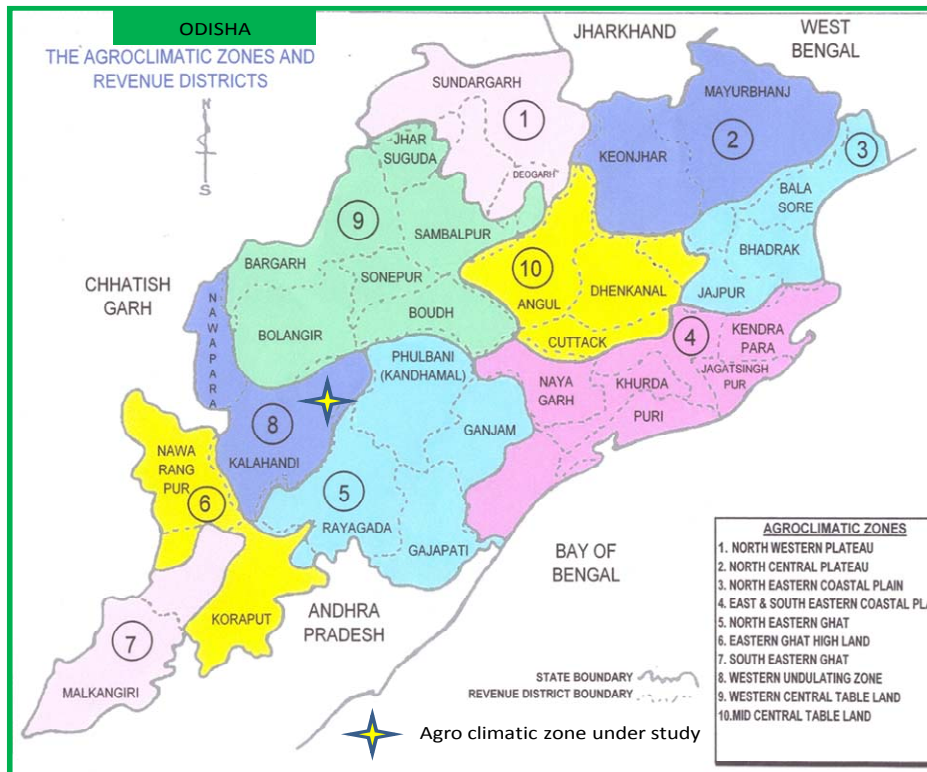


Fig. 4: The Agro Climatic Zones of Odisha

4.5: Rainfall

The average annual rainfall of the State is 1500 mm with an average of 73 rainy days out of which 1386 mm rain received during monsoon season i.e. June to October with average of 14-18 rainy days per month. The fluctuation in rainfall from year to year ranges from 600 to 800 mm in some districts. Drought, flood and cyclone are the usual calamities of the State. As the rainfall concentrated during Kharif season, the concentration of cropping is more during the season. The high coefficient of variability in rainfall compel the farmers to bring the high lands under short duration rice or other low moisture requirement crops like millets, pulses, oilseeds, fibre crops or vegetables. The amount of rainfall during winter season is practically negligible.

4.6: Temperature

Temperature is one of the limiting factors in crop production. The mean temperature, the range of diurnal variation and temperature fluctuations influence both the duration and growth patterns of the crops. The mean annual maximum temperature varies from 27⁰C in December and 42⁰C in May. In case of Northern Plateau and other interior areas, maximum temperature even goes up to 48⁰C. The lowest temperature is recorded during later part of December and early part of January. The mean minimum temperature during the period varies from 6⁰C to 9⁰C in interior regions and 12⁰C to 15⁰C in the coastal areas. The diurnal variation of temperature for most of the interior areas of the State is high and ranges from 15⁰C to 20⁰C except in monsoon where the same varies from 10⁰C to 15⁰C.

4.7: Humidity

The average annual relative humidity at 8 A.M is 79 per cent. Maximum humidity of 84 per cent is recorded in August and minimum of 74 per cent in May, the difference in annual range being only 10 per cent. The Central Table Land Zone has the lowest humidity during March-May and is the driest part of the year. There is great variation in humidity in the different parts of the Eastern Ghat regions. In Koraput district, the relative humidity ranges from 92 per cent during monsoon and 60 per cent during summer. The humidity in the coastal tract remains high throughout the year and never falls below 70 per cent due to proximity to the sea.

4.8: Evaporation

The rate of evaporation is an indicator of the vegetative possibilities of a given area. The rate of loss of water from plant surface exposed to the air is always lower than the rate of evaporation from an equal area of water surface under the same environmental condition. The total annual losses of water surface have been estimated to be 2142 mm or about 85 inches of water.

4.9: Sunshine

Light plays an important role in photosynthesis activities of plants. Performance of a crop variety is assessed by its capacity for minimum utilisation of light energy. There are two distinct seasons of growing crops in Odisha i.e. wet in Kharif and dry in Rabi season. Kharif season starts from June with nearly 13 hours of day length. Rabi season starts from November with 10 hours day length and extended towards summer season up to May with day length of around 12 hours. The mean sunshine hours in Kharif ranges from 2.3 to 5.2 hours and in Rabi season 7.9 to 9.8 hours per day.

4.10: Soil

The soils of different agro-climatic zone of Odisha are discussed earlier in this chapter. In general, the residual soils of the uplands are predominantly lateritic, highly leached acidic (P^H 5.0-6.5), low in organic matter and nitrogen. The soils tend to be shallow, sandy and erodible in the uplands associated with lower water holding capacity. The transplanted soils of the alluvial plains are moderately fertile, less acidic and generally more productive.

4.11: Water Health

Odisha has enormous water wealth in its many rivers which are scattered all over the State. They cover an annual flow of 121 million acre feet of water. Irrigation facilities have been expanded considerably since 1977. Over 20.81 lakh hectares of land have been brought under irrigation through major, medium and minor irrigation projects including lift irrigation points.

4.12: Tribal communities of Odisha

The tribal communities in Odisha can be classified on the basis of geophysical zones, geographical regions, ethno language and crude techno-economic development. They are mostly settled in the Northern Plateau and Eastern Ghat regions. The tribal have rich social institutions, dwellings, natural habitats, folk dance, folk music, musical instruments, festivals and festive occasions, folk art and artifacts, a nature based economy and life skills. Major tribes are Kondh, Gond, Santhal, Saora, Bhuiyan, Paraja, Koya, Oraon, Gadaba, Juanga and Munda along with several smaller tribal communities like Chenchus, Mankiridia Kharia, Biga, Birhor, Ghana etc. In spite of the impact of outside forces on the socio-cultural process, many tribal communities are trying to maintain their ethnic boundaries. These communities by and large possess certain common characteristics like animism, use of crude technology, concentrated habitations, use of dialects, subsistence economy etc. The tribal populations in different districts of Odisha have been presented in table 4.2.

Table 4.2: Scheduled Tribe population in Odisha (000'nos)

Sl. No.	District	Total Population	Scheduled Tribe Population	Percentage	Rank
1	Angul	1272	132.99	11.67	XIX
2	Bolangir	1648	275.82	20.63	XIV
3	Balasore	2317	228.45	11.28	XX
4	Baragarh	1479	260.69	19.36	XV
5	Boudh	440	465.58	12.47	XVIII
6	Bhadrak	1507	25.14	1.88	XXVIII
7	Cuttack	2619	83.59	3.57	XXV
8	Deogarh	312	92.10	33.60	XI
9	Dhenkanal	1193	136.50	12.79	XVII
10	Gajapati	576	263.48	50.78	V
11	Ganjam	3520	90.92	2.88	XXVI
12	Jagatsinghpur	1137	8.64	0.82	XXVIII

13	Jajpur	1826	125.99	7.76	XXII
14	Jharsuguda	579	159.76	31.34	XII
15	Kalahandi	1573	375.80	30.42	XIII
16	Kandhamal	732	6.27	14.22	XVI
17	Kendrapara	1440	6.82	0.52	XXIX
18	Keonjhar	1803	644.96	47.81	VIII
19	Khurda	2246	97.19	5.18	XXIV
20	Koraput	1377	585.83	49.62	VII
21	Malkangiri	613	289.54	57.43	I
22	Mayurbhanja	2514	1258.46	56.60	II
23	Nabarangapur	1219	546.48	55.03	IV
24	Nayagarh	962	50.836	5.88	XXIII
25	Nuapada	606	184.22	34.71	IX
26	Puri	1698	4.48	0.30	XXX
27	Rayagada	962	463.42	55.76	III
28	Sambalpur	1044	322.77	34.50	X
29	Sonepur	652	52.98	9.78	XXI
30	Sundargarh	2081	918.90	50.19	VI

(Source: Economic Survey, Government of Odisha 2011-12)

It is observed from the table that the districts Kalahandi and Nuapada under Western undulating agro-climatic zone have 30.42% and 34.71% occupying 13th and 9th position on the tribal population respectively.

4.13: Land tenure and land use system of tribal societies

Shifting cultivation is the primitive farming technique followed by the tribal. Increased population pressure has not discouraged the shifting cultivation much because of the non-availability of better farming and multi-cropping unit land proved to be more productive and agriculturally viable for tribal people. But over the years, the growth of population, restricted Government Forest Policies, commercial plantations, deforestation, land alienation, non-availability of suitable hilly slopes and availability of viable livelihood alternatives have reduced the cycle of shifting cultivation.

In general, tribal communities cultivate valley bottoms as paddy lands, kitchen gardening and practise shifting cultivation in uplands. Whatever land, the tribal people cultivate, only a negligible percentage is recorded in their name. In most cases, the rights of the tribal people prescribed in the FA/927 audit amendments in 1954 were not followed and forests were created on adhoc survey as well as settlement process leading to gradual decline of land under cultivation. Hence, Watershed Development Programme will definitely beneficial for the farmers ensuring water availability for raising crops successfully enabling them to produce more to meet their food security.

4.14: Watershed Development Programme

The Watershed Development Programme is being implemented in all the districts of Odisha. All total 20079 Watersheds are being identified with an area of 11, 55,858 ha for implementation of Watershed Development Programme. From the identified watersheds, total area of 8, 44,328 ha had been earmarked for treatment where only 24.20% area i.e. 2, 04,360 ha treated so far. The details of the watershed in the districts of Odisha have been reflected in table 4.3.

Table 4.3: Watersheds in Odisha

Sl. No.	District	Total Nos. of Watershed identified/ delineated	Nos. of Watersheds implemented so far
1	Angul	874	61
2	Bolangir	824	641
3	Balasore	547	45
4	Baragarh	637	223
5	Boudh	340	65
6	Bhadrak	198	06
7	Cuttack	482	51
8	Deogarh	385	34
9	Dhenkanal	732	149
10	Gajapati	596	111
11	Ganjam	1316	93
12	Jagatsinghpur	213	5

13	Jajpur	371	45
14	Jharsuguda	247	72
15	Kalahandi	1049	610
16	Kandhamal	935	442
17	Kendrapara	146	19
18	Keonjhar	1220	105
19	Khurda	383	50
20	Koraput	955	340
21	Malkangiri	662	216
22	Mayurbhanja	1694	175
23	Nabarangapur	594	259
24	Nayagarh	581	102
25	Nuapada	464	316
26	Puri	311	17
27	Rayagada	838	272
28	Sambalpur	838	46
29	Sonepur	245	147
30	Sundargarh	1402	139
	TOTAL	20079	4836

(SOURCE –Watershed Development Mission Report, Government of Odisha, 2001)

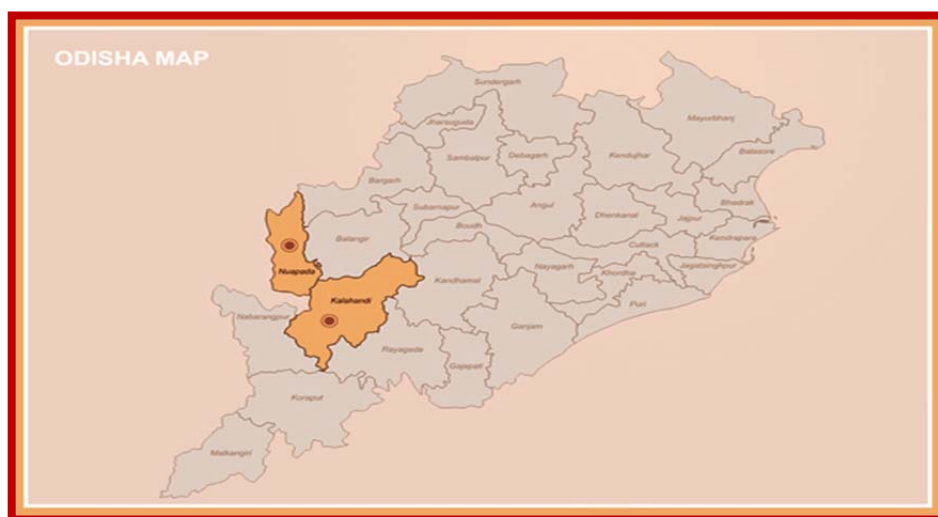


Fig. 5: Map of Odisha showing districts under study STATE – ODISHA

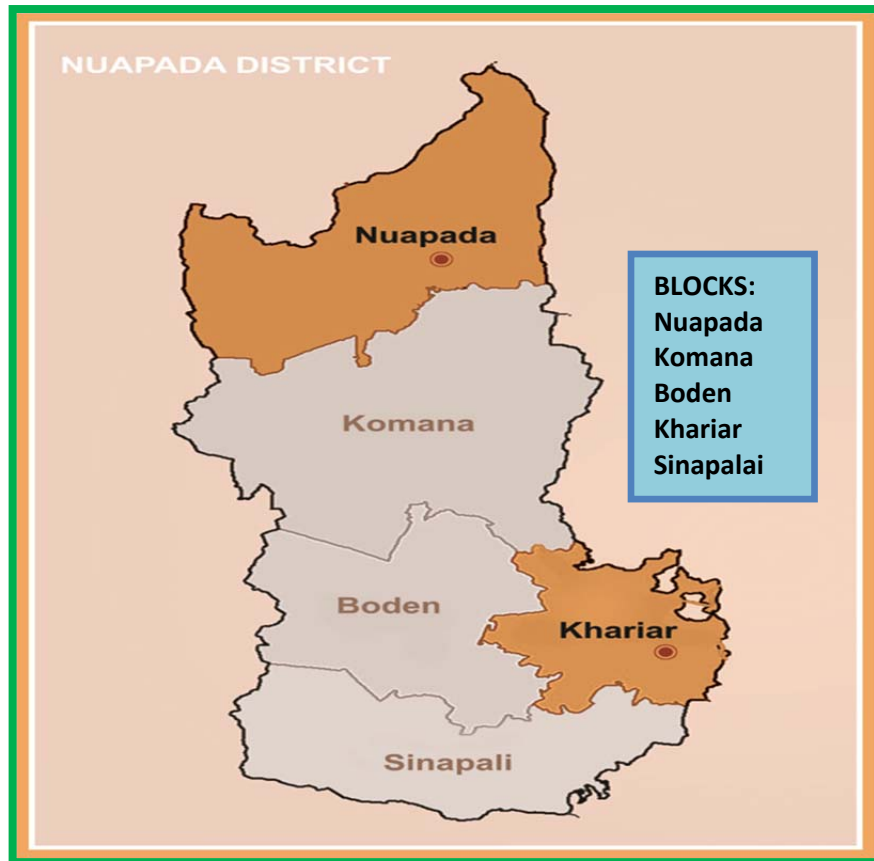


Fig. 7: Map of Nuapada district indicating blocks under study

4.15: Brief description of the study districts

District Kalahandi and Nuapada under Western Undulating Agro-climatic zone of Odisha have been selected for the study. Draught is the common phenomena and tribal people mostly suffered from food security. Numbers of attempts have been made by both Central and State Government for the improvement of the people. Moreover, these districts had more number of watersheds in comparison to other districts. Hence; both the districts have been selected purposively for the study.

District Kalahandi lies between $19^{\circ}03'$ N to $21^{\circ}18'$ N North latitude and $E82^{\circ}20'$ to $E 83^{\circ}47'$ East longitude. The district is bounded by

Nabarangapur in East, Nuapada in the West, Kandhamal in the North East, Bolangir in North West and Chhatishgarh in the West. District Nuapada lies in between 20° N to 21° N North latitude and 82°20'E and to 82°50' E East longitudes. The district is bounded by Chhatishgarh in West and South, Bolangir in North as well as Kalahandi in the East. The ecological status of the State and study area has been presented in table 4.4.

Table 4.4: Ecological status of the State and study area

Sl. No.	Status	Odisha State	Kalahandi district	Nuapada district
1	Geographical area (000'ha)	15571	792	385
2	Average annual rainfall (mm)	1451.20	1330.50	1286.40
3	Average rainy days (No.)	69.30	61.20	60.90
4	Maximum Temperature (°C)	42.00	40.70	42.00
5	Minimum Temperature (°C)	6.90	11.10	10.2
6	Average relative humidity (%)	83.71	66.54	67.17
7	Net cropped area (000'ha)	5792.68	370.67	204.19
8	Gross cropped area (000'ha)	8801.08	561.28	279.72
9	Cropping intensity (%)	166	168	172

(Source: Odisha Agriculture Statistics, 2011-12)

The State Odisha comprises of 30 districts. The administrative set up of the State and districts under study have been presented in table 4.5.

Table 4.5: Administrative set up of the study area

Sl. No.	Set up	Odisha State	Kalahandi district	Nuapada district
1	Sub-division	58	2	1
2	Tahasil	171	13	4
3	Municipality/NAC	103	3	5
4	Agriculture district	314	4	2
5	C.D. Blocks	314	13	5
6	Gram Panchayat	6234	273	109
7	Village	51349	2236	659

(Source: Odisha Agriculture Statistics, 2011-12)



Fig. 6: Map of Kalahandi district indicating blocks under study

Odisha is an extensive plateau gentle slopes into coastal plain along the Bay of Bengal. The river Mahanadi flowing West to East through the plateau divide the State into Chhotnagpur Plateau and parts of Eastern Ghat regions. According to 2011 census, the population of Odisha is 4.19 crores out of which 22.13% are Scheduled Tribe and 16.53% Scheduled Caste people. The demographic features of the State and study area have been indicated in table 4.6.

Table 4.6: Demographic features of the study area (Census-2011)

Sl. No.	Feature	Odisha State	Kalahandi district	Nuapada district
1	Total population (000' nos.)	41947	1573	606

2	Male population (000' nos.)	21201	785	300
3	Female population (000' nos.)	20746	788	306
4	Scheduled Tribe (000' nos.)	7698	382.573	184.22
5	Scheduled Caste (000' nos.)	6082	236.019	72.296
6	Density of population (per sq. Kms.)	269	199	157
7	Population decadal growth rate (%)	13.97	17.79	14.28
8	Literacy rate (%)	73.45	60.22	58.20
9	Average size of holding (ha.)	1.15	1.52	1.37

(Source: Odisha Agriculture Statistics, 2011-12)

Odisha is predominantly an agrarian State. The main feature of the state is high temperature and high rainfall. The land utilisation pattern of the State and districts under study has been presented in table 4.7.

Table 4.7: Land utilisation pattern of the study area (000'ha)

Sl. No.	Pattern	Odisha State	Kalahandi district	Nuapada district
1	Geographical area	15571	792	385
2	Forest area	496	254	185
3	Miscellaneous trees and groves	342	8	1
4	Permanent pasture	494	23	2
5	Cultivable waste	375	21	2
6	Land put to non-agricultural use	1298	35	3
7	Barren and uncultivable land	840	57	2
8	Current fallow land	888	43	26
9	Other fallow land	229	16	1
10	Net area sown	5292	335	163
11	Cultivated area	6180	378	189
12	High land	2914	228	133
13	Medium land	1755	82	28
14	Low land	1511	68	28

(Source: Odisha Agriculture Statistics, 2011-12)

As revealed from the table, the study districts Kalahandi and Nuapada have comparatively more area under forest, barren, fallow and high lands in comparison to state average. Hence, Watershed Development Programme can able to bring more area under crops along with increase in cropping intensity for the livelihood security of the tribal people.

The people of Odisha are having diversified occupation although farming as the primary occupation. Occupational distribution of the people in the State and study area has been presented in table 4.8.

Table 4.8: Occupational distribution in the study area (Census-2011)

Sl. No.	Distribution	Odisha State	Kalahandi district	Nuapada district
1	Total farm families	4356392	187238	93643
2	Marginal farmer (< 1 ha)	2597164	80161	42321
3	Small farmer (1-2 ha)	11561621	60740	32448
4	Semi-medium farmer (2-4 ha)	472129	33034	14848
5	Medium farmer (4-10 ha)	119529	11892	3739
6	Large farmers (> 10 ha)	11408	1411	287
7	Cultivator	3435170	152795	65134
8	Agril. Labourer	2098158	126538	29363
9	House hold industry worker	404208	11533	5197
10	Other workers	3651733	91184	31867

(Source: Odisha Agriculture Statistics, 2011-12)

Analysis of data from the table indicated that the study district Kalahandi and Nuapada have comparatively more of weaker communities for which water availability through implementation of Watershed Development Programme could able to engage the people more in farming for livelihood support.

Odisha occupies 9th position in terms of area in the country. The area and productivity of major crops have been analysed and presented in table 4.9.

Table 4.9: Area and productivity of major crops in the study area

Sl. No.	Crop	Area (000' ha)			Productivity (Q/ha)		
		Odisha State	Kalahandi district	Nuapada district	Odisha State	Kalahandi district	Nuapada district
1	Cereals	4479.22	234.48	110.53	14.95	11.82	8.39
2	Pulses	2003.57	187.20	104.76	4.60	5.34	4.48
3	Oilseeds	765.09	51.76	33.82	8.67	10.50	9.73
4	Fibres	134.31	38.0	4.22	6.16	5.16	4.10
5	Vegetables	690.07	24.15	13.11	137.89	126.09	146.72
6	Spices and condiments	154.94	5.28	3.24	30.81	19.00	17.04
7	Sugarcane	38.73	1.82	0.04	720.00	719.85	645.20

(Source: Odisha Agriculture Statistics, 2011-12)

The study districts Kalahandi and Nuapada have proportionate area in all the major crops grown in the State. But, the productivity is comparatively low in almost all the crops mentioned in the table. Water availability is the major constraints in area expansion and increasing productivity which can only be possible with Watershed Development Programme.

Only 34% of the cultivated area in Odisha is irrigated. The irrigation sources available in the study district have been reflected in table 4.10.

Table 4.10: Irrigation sources in the study area (000' ha)

Sl. No.	Source	Odisha State	Kalahandi district	Nuapada district
1	Major and medium project	1364.197	102.000	29.390
2	Minor project	576.226	30.937	12.882
3	Lift irrigation	533.929	20.880	8.647
4	Other sources	589.323	18.527	17.090

5	Total	3063.675	172.344	68.009
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(Source: Odisha Agriculture Statistics, 2011-12)

Irrigated areas in the study districts are comparatively low than the State average. It is one of the main reasons for low production and yield.

Fertilizer management regulates the production and productivity of crops grown. Consumption of fertilisers in the study districts and State as a whole are reflected in table 4.11.

Table 4.11: Consumption of fertilisers in the study districts

Sl. No.	Fertiliser	Consumption (kg/ ha)		
		Odisha State	Kalahandi district	Nuapada district
1	Nitrogen	39.12	36.39	22.93
2	Phosphorous	16.39	14.07	6.62
3	Potash	6.75	6.98	3.79
	Total	62.26	57.44	33.34
4	Consumption during Kharif	60.86	66.99	32.90
5	Consumption during Rabi	65.50	36.83	36.88

(Source: Odisha Agriculture Statistics, 2011-12)

Analysis of data in the table indicated that the fertilizer consumption in both Kalahandi and Nuapada districts are very low. This may be due to less irrigation facilities resulting low productivity.

Use of agricultural implements and machineries in farm operation reduces drudgery, time, labour, cost and control weeds resulting yield enhancement. Farm mechanisation status have also been analysed and presented in table 4.12.

Table 4.12: Farm mechanisation status in the study area (Number)

Sl. No.	Distribution	Odisha State	Kalahandi district	Nuapada district
1	Tractor	5317	236	137
2	Power tiller	11257	584	54

3	Reaper	693	12	4
4	Transplanter	45	14	9
5	Power thresher	3480	8	7
6	Special power operated implements	537	82	78
7	Pump sets	28490	200	250
8	Manual implements	7553	280	170

(Source: Odisha Agriculture Statistics, 2011-12)

As observed from the table, Kalahandi district had better farm mechanisation status than Nuapada district. Though farm mechanisation is progressing, still more efforts are required by the State Department of Agriculture to motivate tribal people for use of the implements in various farm activities.

4.16: Watershed Development Programme

The Watershed management implies the judicious use of the resources i.e. land, water and vegetation in an area for improving an answer to alleviate drought, moderate floods, prevent soil erosion, improve water availability as well as increase food, fodder, fuel and fibre on sustained basis. Watershed has to achieve maximum production with minimum hazard to the natural resources and for the well being of people. Watershed programme is reckoned as the engine of agricultural growth and development in fragile and marginal rainfed area. The main objective of the watershed approach is to minimise adverse effects of drought on the production of crops, livestock and productivity of land to promote overall economic development as well as improve the socio-economic conditions of the resource poor and disadvantaged sections of inhabitants. The Watershed programmes operating in different districts of Odisha have been presented in table 4.13.

Table 4.13: Watershed programmes implemented in Odisha

Sl. No.	District	Total Watershed	Watershed programmes
1	Angul	61	NWDPRA, IWDP, IWDP, NWDPRA NWDPRA, IWMP

2	Bolangir	641	ACA,WORLP(DFID- Assisted), IWDP,DPAP, NWDPR, IWMP
3	Balasore	45	IWDP, NWDPR, IWMP
4	Baragarh	223	WORLP(DFID -Assisted), IWDP, DPAP, NWDPR, IWMP
5	Boudh	65	IWDP, DPAP, NWDPR, IWMP
6	Bhadrak	06	NWDPR
7	Cuttack	51	NWDPR, IWMP
8	Deogarh	34	IWDP, RVP, IWMP
9	Dhenkanal	149	IWDP, DPAP, RKVY, IWMP
10	Gajapati	111	IWDP, RKVY, IWMP
11	Ganjam	93	IWDP, IWMP
12	Jagatsinghpur	5	NWDPR
13	Jajpur	45	IWDP, NWDPR
14	Jharsuguda	72	IWDP, NWDPR, IWMP
15	Kalahandi	610	WORLP(DFID Asisted), ACA, IWDP, DPAP, NWDPR, IWMP
16	Kandhamal	442	DPAP, NWDPR, RKVY, IWMP
17	Kendrapara	19	NWDPR
18	Keonjhar	105	IWDP, RVP, NWDPR, RKVY, IWMP
19	Khurda	50	IWDP, NWDPR, IWMP
20	Koraput	340	ACA, IWDP, RVP, NWDPR, IWMP, Indo-Danish Comprehensive Watershed Development Project
21	Malkangiri	216	ACA, IWDP, RVP, NWDPR, IWMP/ Indo-Danish Comprehensive Watershed Development Project
22	Mayurbhanja	175	IWDP, NWDPR, RKVY, IWMP
23	Nabarangapur	259	ACA, IWDP, NWDPR, IWMP
24	Nayagarh	102	IWDP, NWDPR, RKVY, IWMP
25	Nuapada	316	WORLP(DFID- Assisted), ACA, DPAP, NWDPR, IWMP
26	Puri	17	NWDPR

27	Rayagada	272	ACA, IWDP, NWDPR, IWMP
28	Sambalpur	46	IWDP, RVP, NWDPR, IWMP
29	Sonepur	147	ACA, IWDP, DPAP, NWDPR, IWMP
30	Sundargarh	139	IWDP, RVP, NWDPR, RKVY, IWMP
	TOTAL	4836	

(Source- Annual report of watershed mission, 2011-12. Odisha)

4.17: Project Implementing Agency (PIA)

The Project Implementing Agency has the key role in effective implementation of the programme. It has to provide technical guidance to the Gram Panchayats, Watershed Committees, user groups, self help groups and other institutions engaged in the preparation of detailed action plan through Participatory Rural Appraisal (PRA) exercise, undertake community organisation and training for the village communities, supervise watershed development activities, inspect and authenticate project accounts, encourage adoption of low cost technologies and build upon indigenous technical knowledge, monitor and review the overall project implementation and set up institutional arrangements for post project operation and maintenance as well as further development of the assets created during the project period.

Project Implementing Agency working in the study districts has been presented in table 4.14.

Table 4.14: Project Implementing Agency (PIA) in Kalahandi district

Sl. No.	Organisation/ Department	No. of PIA selected	No. of Watershed undertaken	Status of PIA
1	Soil conservation Department	6	136	Asst. Soil Conservation Officer
2	Non Government Organisation	1	6	Luthern World Service
3	Non Government Organisation	1	6	SVS- Gram Vikash

(Source- DRDA report, Kalahandi, 2014)

Table 4.15: Project Implementing Agency (PIA) in Nuapada district

Sl. No.	Organisation/ Department	No. of PIA selected	No. of Watershed undertaken	Status of PIA
1	Soil conservation Department	5	119	Asst. Soil Conservation Officer
2	Non Government Organisation	1	6	NGO –CPSW
3	Non Government Organisation	1	7	NGO –CBDA (Chakotia Bundia Development Agency)

(Source- DRDA report, Nuapada,2014)

It is revealed from both the tables that maximum Project Implementing Agencies have been selected from the soil conservation department in both Kalahandi and Nuapada district. Department of soil conservation is implementing watershed development activities since long. The officials working in the district have accumulated experiences and skill competency in designing, programming and implementing watershed activities effectively.

It has therefore apprehended that significant impact might have done towards socio-economic development of the tribal people through watershed development programme.