Chapter Six

Chhota Udepur: Problems and Prospects of Tribal Agricultural Practices

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6.1. Introduction:

The analysis of socio-economic characteristics, agricultural land use patterns and work participation rates in the tribal areas of Gujarat based on secondary data at larger units of analysis in the preceding chapters have revealed significant changes. It is quite evident from the secondary information that natural resources have plenty of influences over the agricultural practices in the tribal areas of Chhota Udepur district. Forested area, deficient rainfall, undulating hilly surfaces and infertile soil are some of the characteristics in the Chhota Udepur district.

The traditional agricultural pattern is changing in terms of cropping pattern. Area under total cereals and pulses remain unchanged or marginally decreased in most of the districts. But in Vadodara and Surat there is a sharp decline in area under all cereals and all pulses. Vegetables, pulses and oilseeds have not increased much in the area under ST.

Tribal farming in Chhota Udepur (earlier sub-district of Vadodara) district faces the fear of land alienation due to infrastructural development programmes. Year after year cotton, maize and *tur* cultivation from the same field turns the parcel as famished land. Crop cultivation in most of the *talukas* of Chhota Udepur district is confined to only the four months of the rainy season. Though irrigated water from canals is available in Sankheda and Nasvadi *talukas*, crop yield remains low in the *rabi* season. Small land holdings, over use of chemical fertilizers, lack of crop sequencing leads to high nutrient depletion in soil. These fragmented and marginal sizes of land holdings do not support generation of surplus income. Again, periodic movement of the farmers deviously hampers farm attainment, while lesser engagement and interest in farm operations are deteriorating the traditional tribal wisdom on farming.

Although these revelations were corroborated at both district and *taluka* levels, the reality of the issues would remain suppressed unless the unit of reference is lowered. Besides, the limitations of the analysis due to the inherent drawbacks of secondary data, and the time it pertains to (2011 and earlier) make it pertinent to go for detailed analysis of data generated at the ground

level through primary investigation. An attempt has been made in the present chapter to investigate the problems and prospects of tribal agriculture based on data collected from the sample villages of the study district, i.e. Chhota Udepur.

The process of primary investigation in this study has been accomplished with the help of structured household schedules, personal observations, personal interviews and RRA methods. Audio-visual documentation of some of the proceedings of the survey have also been done. Personal interaction with the respondents of the selected villages while administering the household schedules are the major source of primary data of the study. The household schedule is designed to incorporate relevant questions on 17 socio-economic topics and 54 sub-topics. Briefly speaking, the schedule includes questions pertaining to members of the farmer's family, age, gender, marital status, their education and occupational structure, village infrastructure, cropping pattern, income-expenditure related to agriculture, changes in agricultural practices, migration, and details of residential and other building structures, etcetera. In order to ascertain appropriate response from the respondents, the parameters of different questions in the household schedule were thoughtfully formulated.

6.2. Primary Survey Method Adopted:

The primary survey to collect first-hand information on the issue of problems and prospects of agriculture in the tribal areas of Chhota Udepur district was conducted following the steps mentioned below.

a) Analysis of *taluka*-wise village level secondary information and maps available with the Census of India Handbooks.
b) Selection of the sample villages on the basis of distribution of Village-Wise Amenities Score and Backward Region Grant Fund (BRGF) indices.
c) Out of a total 888 villages in the Chhota Udepur district, 13 villages selected for intensive study based on primary household survey.
d) The household schedule designed with both open and close ended questions focused on demography, occupation, agricultural practices, financial resources, material assets, development issues, social and economic status of women etcetera.

e) Pilot survey conducted to verify the appropriateness of the sample design and the household schedule.
f) Thorough training of the survey team members prior to the field visit to extract responses to the questions in the household schedule as well as to note down relevant observations.
g) The fieldwork conducted during the months of November to December, 2022 and, January to April, 2023.
h) Each village transects based on convenience survey method, with an intention to approach the maximum number of farmer households belonging to the ST communities (Tadvi, Nayaka, Rathwa, and Vasava etcetera).
i) Record of the field observation/validation carried out for open ended questions like housing, amenities, women participation, and youth etcetera.
j) Field data entered and processed for sorting, tabulation and coding the responses.
k) Analysis of data done with the help of PSPP software (open source, alternative to SPSS).
l) Research report prepared including data tables, interpretation, reporting, maps and diagrams.

6.2.1. Sampling:

To establish the population parameters and to substantiate secondary data with primary findings, the study follows a multi-stage cluster sampling method. Cluster method is cost-effective, and has been used considering the vastness of the population and its sparse distribution in the eastern part of the Gujarat state. In a cluster analysis, grouping objects intends to show homogeneous variables. Grouping uses more than one characteristic so that the methods of primary findings can be termed as divisive and polythetic clustering. In this study, main aspects are changes in agricultural land use and work participation. Multi-stage sampling was taken into consideration to incorporate sub-population in the spatial frame. With the help of the sampling method, 13 sample villages from six *talukas* of Chhota Udepur district have been selected to investigate the population parameters of the research. To make the respondents feel free to respond, along with multi-stage cluster sampling, a non-probability convenience sampling method was also applied. The easiest/available members of the households, particularly farmer households in the villages were interviewed.

6.2.2. Selection of Sample Villages:

The parameters considered while selecting the villages included literacy, gender, health, agriculture, irrigation, employment, drinking water, and road etcetera, and the indices of the BRGF programme. In addition, parameters such as agro-climatic region, soil, topography, mines, distance to state border, credit societies and awareness about government schemes were used for selecting sample villages. There are three major aspects, which laid the foundation for sample selection - physical background, percentage of tribal population and, amenities. The approach adopted helps to identify outliers and reduce the possibility of false positives. False positives are incorrect positive assumptions of the attributes or factors that are actually not present or might be negative in truth.

The tabulation of amenities available in the villages and their composite scores were prepared for single point estimation based on 2011 Census data. The score included 43 indicators that were aggregated to obtain the composite scores.

Along with the amenity scores of villages, other independent variables like density of ST population, percentage of irrigated land, forest cover and NSA have been taken into account to increase reliability and accuracy of the data used for the samples as well as the population.

Further, to obtain representative sample villages from different ecological setups of the District, the sample village selection process took into consideration the three major physiographic divisions of the District as mentioned below. The basic purpose behind this exercise was to comprehend the ecological setup wise differences (if any) across the micro region.

a) Vindhyan Hill Ranges - Achhala, Ambala, Gabadia and Ferkuva villages of Chhota Udepur *taluka* as representative samples of a hilly topography, which have been relatively more exposed to the neighbouring peasant societies.
b) Orsang-Heran Plains - The representatives of relatively fertile plains are the villages of Aniyadri of Jetpur Pavi *taluka*, Manjrol and Vadadli of Sankheda *taluka* and Dholivav and Jabugam of Bodeli *taluka*.
c) Narmada Gorge Region - In the south-eastern hilly tract of the study area, Nani Chikli and Borchapada villages of Kavant *taluka* and, in the periphery the two villages of Lavakoi and

Amroli villages of the Nasvadi *taluka* are representatives of hilly topography with relatively less exposure to peasant societies.

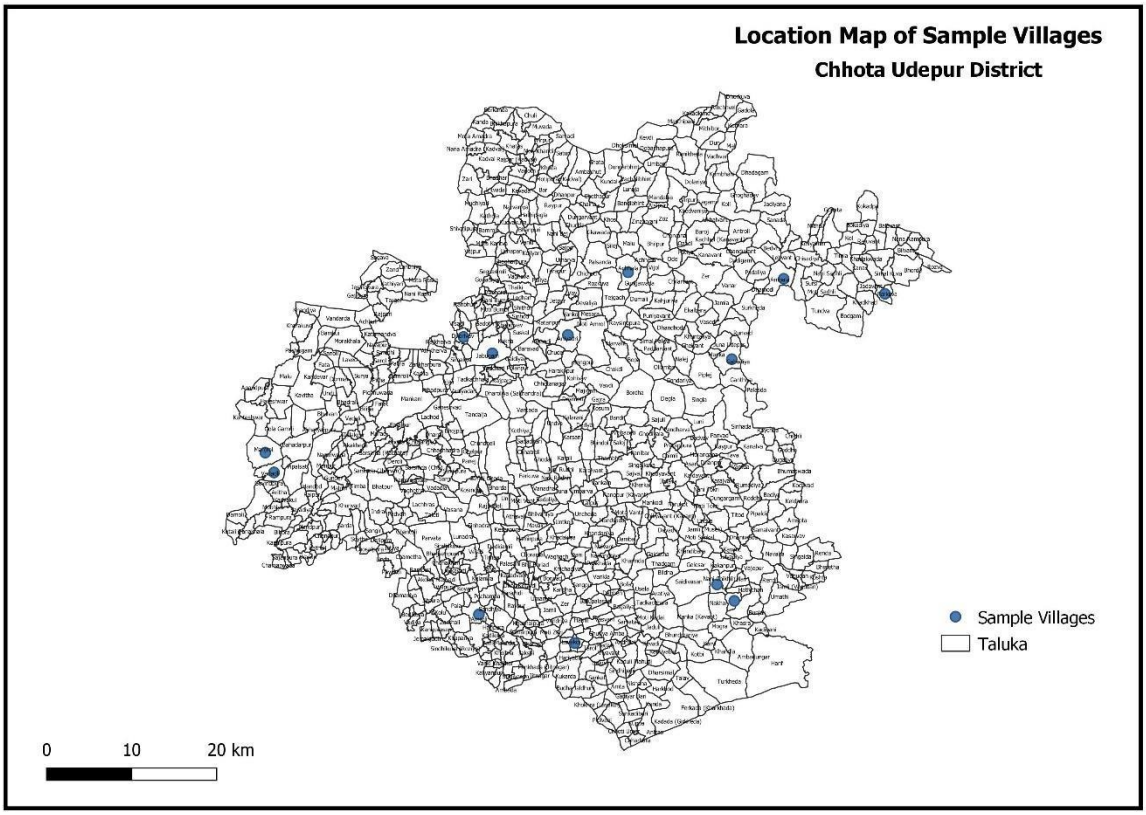
6.2.3. Statistical Tools:

Non-parametric tests like chi-square test and parametric tests, like t test, z-test, and ANOVA have been used. Correlation coefficient has been used to analyze the results from these tests. Graphical representation has enriched the reporting with the help of pie/bar graphs. Software like PSPP, ArcGIS - ESRI and Microsoft Excel have been used for data entry, tabulation and statistical analysis.

6.3 Profile of the Sample Villages:

In the following section, all 13 sample villages and respective village profiles are described along with their location (Map - 6.1) to create an understanding of their characteristics.

Map – 6.1
Chhota Udepur District: Location of Sample Villages



The attention for tribal development surely augments the concern of changes. Changes in economic, social and cultural segments are complementary to each other. To observe the direction of changes, whether positive or negative, primary surveys are conducted. As the area under investigation was rich in mineral and forest resources, it is pertinent to expect changes in its economy from hunting and gathering to agrarian. The resource potentialities of the region have been promoting exogenous involvements and exposing the local inhabitants to unfamiliar forces capable of influencing their social and economic structures and livelihood.

An attempt has been made to appraise the agricultural practices, the socio-economic changes and the status of changes in the study area due to exogenous involvements and influences.

6.3.1 Social Composition:

The 283 households surveyed from the 13 sample villages account for 6.3 per cent of the total 4,520 households in the Chhota Udepur district according to 2011 Census. Social composition-wise the households covered included around 80 (79.15%) per cent ST households, and 16.25, 2.83, and 1.77 per cent households respectively of general, Other Backward Caste (OBC) and Scheduled Caste (SC) population. All the households of the villages of Vindhyan Hill Region and Narmada Gorge Region belong to the ST population, excepting for Amroli village of the latter region where a small proportion (21.7%) of households belongs to the other three communities. The villages of Orsang-Heran Plains have mixed social composition with households belonging to all the four communities in different proportions. While majority of the households covered in Dholivav (87.0%) and Vadadli (73.3%) villages belong to the ST segment, in Jabugam (15.2%) and Manjrol (38.7%) villages such households are relatively less (Table - 6.1).

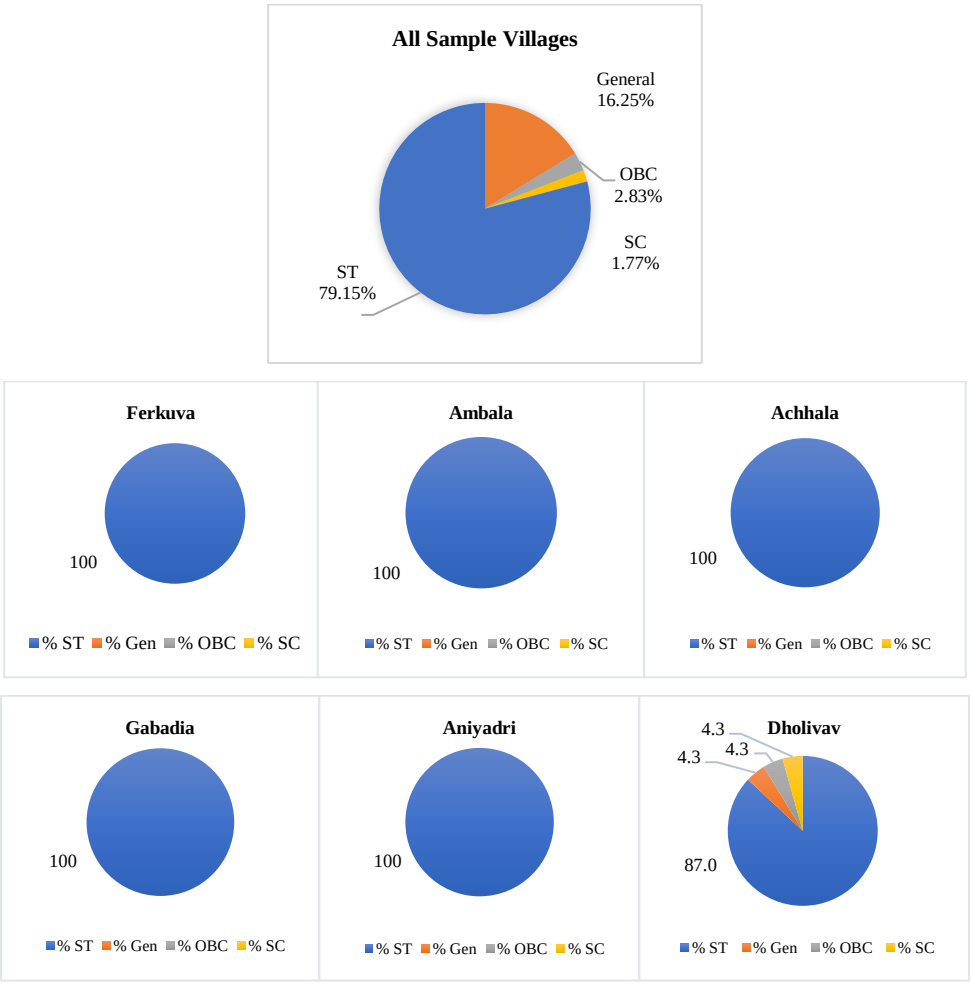
Table - 6.1
Community Profile of Sample Villages

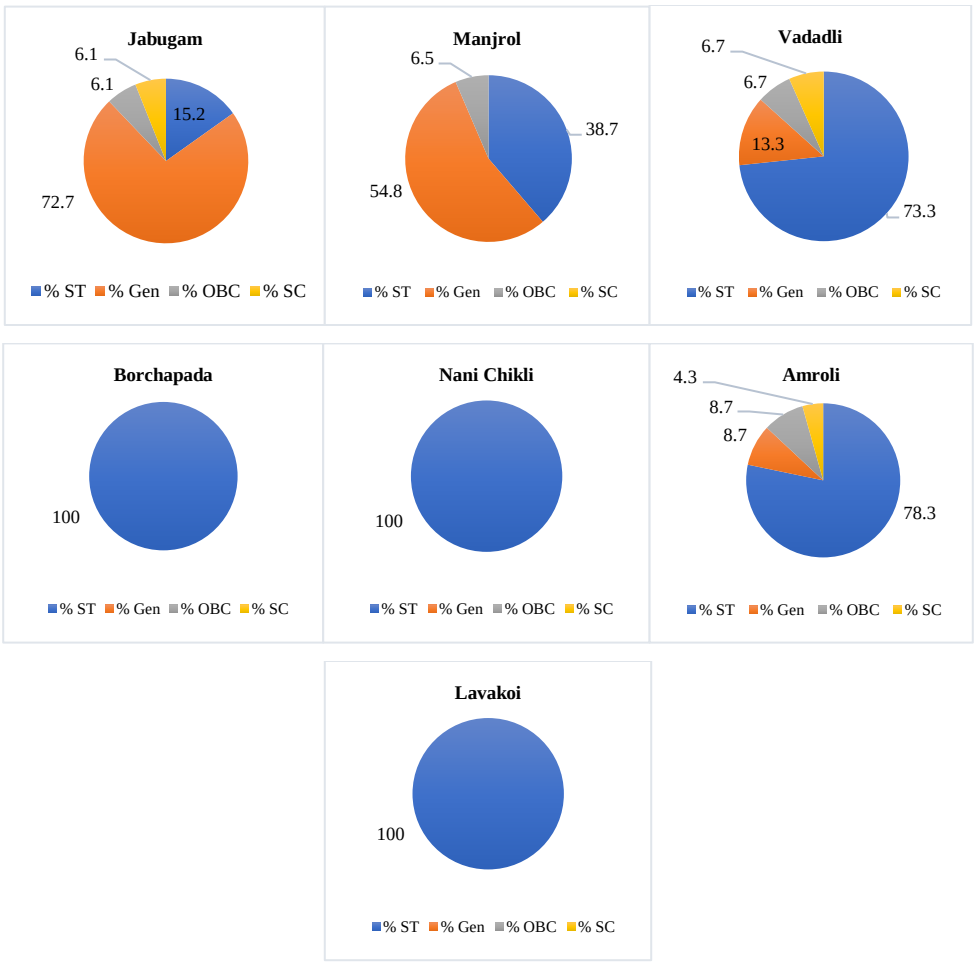
Physiographic Division	Village	Community-Wise Number and Percentage of Households Surveyed						
		Number			Households Surveyed by Community			
		Total	Surveyed	%	ST	Gen	OBC	SC
Vindhyan Hill Ranges	Ferkuva	216	10	4.6	10 (100.0)	-	-	-
	Achhala	396	13	3.3	13 (100.0)	-	-	-
	Ambala	467	24	5.1	24 (100.0)	-	-	-
	Gabadia	215	14	6.5	14 (100.0)	-	-	-
	Total	**1,294**	**61**	**4.7**	**61 (100.0)**	**-**	**-**	**-**
	Aniyadri	422	22	5.2	22 (100.0)	-	-	-

Orsang-Heran Plains	**Dholivav**	356	23	6.5	20 (87.0)	1 (4.3)	1 (4.3)	1 (4.3)
	Jabugam	781	33	4.2	5 (15.2)	24 72.7)	2 (6.1)	2 (6.1)
	Manjrol	597	31	5.2	12 (38.7)	17 (54.8)	2 (6.5)	-
	Vadadli	154	15	9.7	11 (73.3)	2 (13.3)	1 (6.7)	1 (6.7)
	Total	**1,016**	**124**	**5.4**	**70 (56.5)**	**44 (35.5)**	**6 (4.8)**	**4 (3.2)**
Narmada Gorge	**Borchapada**	143	18	12.6	18 (100.0)	-	-	-
	Nani Chikli	172	22	12.8	22 100.0	-	-	-
	Amroli	444	23	5.2	18 (78.3)	2 (8.7)	2 (8.7)	1 (4.3)
	Lavakoi	157	35	22.3	35 (100.0)	-	-	-
	Total	**916**	**98**	**10.7**	**93 (94.9)**	**2**	**2**	**1**
Grand Total		**4520**	**283**	**6.3**	**224 (79.2)**	**46 (16.2)**	**8 (2.8)**	**5 (1.8)**

Note: Figures in the parentheses indicate percentage to total households surveyed.

Figure - 6.1
Social Composition-Wise Share of Households in the Sample Villages





6.3.2. Overview of the Study Area - Sample Villages:

Chhota Udepur is a predominantly tribal district with more than 80 per cent (80.11%) ST population. All the six *talukas* of the District have a very high share of ST population with Kavant *taluka* (87.69%) in the lead. Only the two *talukas* of Bodeli and Sankheda have around one-third of the total population belonging to non-scheduled category. Remaining four *talukas* are predominantly tribal, with less than 20 per cent non-tribal population in their total population. On the basis of geographical area, Chhota Udepur *taluka* is the largest accounting for about 22 per cent, and Sankheda *taluka* is the smallest accounting for about 12 per cent of the total geographical area of the District. Other four *talukas* of Bodeli, Jetpur Pavi, Nasvadi and Kavant, each cover between 15 to 17 per cent area of the District. The general characteristics of the sample villages are presented below:

Vindhyan Hill Ranges:

From the Vindhyan Hill Ranges region, four sample villages have been surveyed. Their characteristics are as mentioned below.

Ferkuva Village:

Ferkuva village is spread over an area of 336.7 hectares. Physical background of the village is not very supportive to cultivation. Proximity to Vindhyan Hills and, type and quality of soil are not suitable for multiple cropping. Percentage of rocky or hard, less fertile soil type constitute 60 per cent of the total area of the village. Only about 10 per cent of the area of the village has fertile alluvial soil and fertile black soil covers 30 per cent of the total farmland. The village has a total population of 1,283, of which 49.5 per cent are males and 50.4 per cent are females. Social composition-wise, it is a ST dominant village with 99.7 per cent ST population. The literacy rate in the village is miserably low (26.4 %), where only 33.6 per cent males and 19.3 per cent females have acquired the literacy skill. Access to education is less as there are only two primary level schools and, no secondary and senior secondary schools in the village. The village has no Primary Health Centre (PHC) or Community Health Centre (CHC) within it. Power supply for domestic, agricultural and commercial usage is available to the residents. Transport facilities like private and public bus services are available near the village. Tribal farmers usually migrate to Vadodara or Bodeli in search of work in the winter and summer months.

Achhala Village:

The village covers 823.49 hectares of land with 396 households. Out of 1,982 persons living in the village, male population is 51 per cent and the female population is 48.5 per cent. Achhala village is inhabited by 100 per cent ST population where rate of male literacy is 41.4 per cent and female literacy is 27.5 per cent. Only one government primary school is serving the students of the entire village. Unlike Ambala and Ferkuva villages, Achhala village of Chhota Udepur district is situated away from the State border. Soil quality is relatively better as 53.8 per cent of the village area is covered with medium fertile black soil, followed by 30.8 per cent of fertile alluvial soil. There is a presence of red or mixed soil which constitutes 15.4 per cent of the village area. Though the main occupation of the tribal villagers is farming, nearly 61 per cent of the land owners belong to the marginal category. They seasonally migrate to Saurashtra region for

sustenance during the agricultural off season. Achhala village is devoid of any type of health care facility. The villagers use untreated water for drinking as well as all other purposes. The village also has poor drainage facilities. Communication with other villages and nearby towns through digital networks and roads are moderately developed. The village is located beside the District Highway, which provides a good transport facility to the villagers in general and to the farmers in particular to transport agricultural products to the Agricultural Produce Marketing Committee (APMC). Although there is no agricultural credit society in the village from which farmers can avail crop and other agricultural loan, the presence of one commercial bank serves their purpose. Achhala village is equipped with an *Anganwadi* and a weekly *haat* (market). Power supply for domestic, agricultural and commercial uses are available in the village.

Ambala Village:

Total area of the village is 898.20 hectares. The area is mostly undulating, without any hill terrain. Out of a total population of 2,934 in the village, 2,270 or 77.37 per cent belong to the ST community. Females outnumber males both among the ST and other communities in the village. Only about 34 per cent of the population is literate, where the percentage of female literates is 29 per cent and male literates is 39.9 per cent (Table - 6.2). Fertile *Gorad* and Rocky hard soils each cover around 33.3 and 29.2 per cent per cent of the village area respectively. Black and mixed soils are also found in the village, each constituting an area of 12.5 and 25 per cent respectively.

Main occupation of the villagers is farming and animal rearing, although livestock population is meagre. Land holdings are highly fragmented. Cotton is the main commercial *rabi* crop. Although there are two primary schools in the village, access to higher level of education is nil. After completing primary level education, students willing to pursue secondary schooling have to commute to a nearby big village, Lehvant. Ambala village is better facilitated with a health care system, with one PHC and one sub-centre with doctors. Sufficient number of hand pumps are available within the village, on an average each catering to 4 to 5 households. The researcher was informed that prior to the installation of hand pumps, people used water from the covered but untreated big community well for all purposes. Today, water from the well is utilized for animals and domestic chores. The waste water drainage system is poorly developed in the village. Transport and communication system in the village is satisfactory with one sub post office, proper mobile coverage and public bus services. Presence of ration shop, weekly *Haat* and a commercial bank

within the village along with good power supply is supporting the tribal marginal and other small farmers in making their livelihood easy. Nevertheless, due to unavailability of irrigated water during the dry winter and summer seasons, tribal farmers periodically move to Vadodara town or places in Saurashtra in search of work mostly in the unorganized sector.

Gabadia Village:

Out of the total population of 1,366 in the Gabadia village, 51.9 per cent are males and 48.1 per cent are females. The ST population constitutes 99.9 per cent of the total population of the village. The total number of literates is only 480, which is 35.1 per cent of the total population. While 44.4 per cent of the males have attained the literacy skill, only about a quarter (25.1%) of the females of the village have done so. Only one primary school is present in the village. Gabadia village spans across an area of 862.44 hectares with 215 households. Though the village has almost plain topography, the quality of soil is poor and rocky in texture. Less fertile mixed soil covers 28.6 per cent of the total village area. Rocky and hard soils cover the maximum portion of the village area constituting 35.7 per cent, while medium fertile black soils and fertile *Gorad* soils constitute 21.4 and 14.3 per cent area respectively. As the village is situated near the state boundary, away from the Orsang River, chances of getting irrigated water from the river is costly. Availability of amenities are significantly poor. Number of covered wells and hand pumps is very less. Tribal women go together to fetch water from the community well every day which is quite arduous. The big community well is near the jungle and there is fear of wild animals like leopards. Devoid of any health care service facility and improper sewage, probability of health hazards remains high. Major district road, other district roads and public bus stops enhance the road transport. No other facilities like APMC, commercial bank, agricultural credit society are available in the village to extend financial help for agricultural purposes.

Orsang-Heran Plain Region:

From this comparatively plain region, 5 sample villages have been surveyed. The 5 villages are Aniyadri from Jetpur Pavi *taluka*. Dholivav and Jabugam villages from Bodeli *taluka*, and Manjrol and Vadadli from Sankheda *taluka*. Orsang and Heran Rivers along with their tributaries have transformed this physiographic region into more fertile than the rest of the regions.

Aniyadri Village:

Aniyadri is a comparatively developed village. The village spans an area of 879.14 hectares. The village has a total population of 2,269, with 51.43 per cent male population and 48.6 per cent female population. ST population makes up 96.1 per cent of the total population. Aniyadri village has 4 government primary schools, which has contributed significantly to enhance literacy level of the village population to 46.8 per cent. While the male segment of the village population has benefitted more and attained 58.1 per cent literacy, the female segment has failed to do so. Only 34.8 per cent of the females of the village are literate. There are a total of 422 households in the village. Aniyadri village is having plain land with more than 40 per cent of alluvial soil, 31.8 per cent black soil and 27.3 per cent of mixed soil. Most of the tribal farmers are trying to produce companion crops. Cereals with vegetables or flower beds are common agricultural practices in Aniyadri. Absence of rocky or hard soil is enabling the tribal farmers to produce vegetables which they sale in the Bodeli town. They try hard to earn more. In summer months they go for subsidiary works in the nearby towns of Bodeli and Vadodara. Primary health sub centers are present in the village. Many hand pumps have been installed in the village to provide drinking water. Transport and communication are average with District Road. Tribal farmers were thronging in the Public Distribution Shop (PDS) for subsidized grains during village survey. Many tribal farmers in the village are still not food sufficient.

Dholivav Village:

Dholivav village in Bodeli *taluka* has an area of 227.2 hectares. It is a very small village with a total population of 1,848 persons, out of which 98 per cent is ST population. One positive characteristic of Dholivav village is people have awareness regarding modern agriculture. Comparing the two surveyed villages of Bodeli *taluka*, Dholivav village is lacking in infrastructural facilities compared to Jabugam village. Tribal farmers approach Bodeli town for different purposes. Literacy rate is 59.5 per cent, and female literacy rate is only 47.2 per cent against 71.2 per cent of male literacy rate. A single government primary school is incapable to accommodate all tribal children in the school premises. For drinking water, tube well is the source of water. Open drainage poses a threat to the health of the population. Along with farming of Maize, fodder production occupies considerable proportion of land in the summer months. In Dholivav village, some large size land owners keep horse carts which they give on hire for

marriage functions. Transport and communication with other villages and power supply for domestic and agricultural usage are helpful for the farmers. Issues with irrigation water and wild boar are mounting nowadays in all villages of the Orsang-Heran Plain region. One co-operative bank is providing loans, which the tribal farmers avail in large numbers.

Jabugam Village:

Jabugam village is one of the prosperous villages not in only Bodeli *taluka* but also in the Chhota Udepur district as a whole. The village is spread over an area of 1,202.2 hectares. Jabugam village is nearer to the agricultural College of Chhota Udepur district. It is a predominantly tribal village. More than 20 per cent of the land owners have more than 10 hectares and above land, and most of them give their land to the share croppers. Principal share of the village area is covered by mixed soil type. Maize, Cotton and Bananas are cultivated as major crops. Alluvial soil constitutes only 30 per cent of the village area. Most of the farm lands are covered by red or mixed soils (51.5 %) with only 18.2 per cent cover of black soils.

Jabugam village has all amenities, which places it at the highest rank among all sample villages with the amenity of 30. The village has a mixed social composition in which the STs account for 40.19 per cent and remaining are SCs and OBCs. Total population of the village is 3,600, out of which 51 per cent are males and 49 per cent are females.

Out of total literates which is 66.3 per cent of total population, Jabugam village has 71.1 per cent male literates and 60.6 per cent female literates. Number of primary schools are 4, while government secondary, senior secondary and vocational training schools are one each in the village. Commercial bank and milk collection centers are working well in the village. The CHC in the village with doctors is treating patients of the village as well as of nearby villages. Tube wells and hand pumps are installed in many parts of the village. Unlike other tribal villages, Jabugam is equipped with covered drainage system. Transport facilities are supported by State Highway number 11. Power supply and mobile coverage in the village highly satisfactory.

Manjrol Village:

The village spans 1,213.94 hectares of area. The total population in the village is 2,715 with 51 per cent males and 49 per cent females. Manjrol is also a mixed village. The ST segment

of the population accounts for 46.67 per cent of its total population. Literacy rate of the village is 66.26 with 73.5 per cent male and 58.8 per cent female literates.

Social segregation in the village is clearly perceptible. While the tribal households occupy the village outskirts, the central part of the village is occupied by Patel community. Large land holders are having capital intensive agricultural practices. Rich fertile alluvial soil covers more than 54.8 per cent of the land, followed by black soil with 35.5 per cent of the total village area. Only a small proportion of the village farm lands are covered by mixed soils (9.7 %). 'Drones' are used for spraying pesticides. Big households are having individual tractors. Very significant difference exists in the economic standards of the two communities. The tribal households mostly depend on agricultural labour work. The temporary and fragile structures of the tribal houses portray their general poor economic condition. Very few tribal labourers could avail money from Pradhan Mantri Awas Yojana. Only one primary school and one PHC are situated in the village. Most of the big non-tribal land owners send their children to Bodeli or Vadodara for school education and abroad for higher education. Untreated tube well and hand pumps are available in the village for drinking water. Power driven electric pumps are used to extract ground water. Irrigation facilities support long duration commercial crops like Banana and Cotton. Information from household survey revealed that land owners can afford to face crop failure or bear with the long gestation period of the crops, as they get remittances from children settled abroad.

Vadadli Village:

The village has an area of 621.40 hectares with 154 households. Total population of the Vadadli village is 713 and ST population comprises of 90.9 per cent of the total population. General literacy rate of the village is 58.63 per cent where male literates comprise 62.2 per cent and female literates 54.9 per cent. Black soil covers 60 per cent of the total farm land. Alluvial soil (20 %), mixed soil (13.3 %) and rocky or hard soil (6.7%) cover the remaining. The small agricultural plots in possession of the tribal households are mostly in the infertile, rocky and hard soil parts of the village. Due to infertile rocky soil, tribal farmers are earning very less. Their agricultural produce is mostly for household consumption and insufficient for their subsistence. Poverty and backwardness can be observed from their house structures also. Only two primary schools are there. Untreated tube wells are utilized for drinking water. Absence of drainage facility forces them

to live in unhealthy environment. Power supply and transport and communication system are well developed.

Narmada Gorge Region:

Kavant and Nasvadi *talukas* belong to this physiographic region. Borchapada and Nani Chikli villages of Kavant *taluka,* and Amroli and Lavakoi villages of Nasvadi *taluka* have been studied from this region. Proximity to the Narmada River makes the southern part of Kavant *taluka* relatively more moist, and presence of Narmada canal provides irrigation facility to the western parts of Nasvadi *taluka*. However, the two villages of Borchapada and Nani Chikli in Kavant *taluka* are exposed to the hilly terrain and completely dependent on rainfall for farming.

Borchapada Village:

Village spans an area of 285.89 hectares with a total population of 885 where, female population outnumbers male population. The total number of households in the village is 143. ST population comprises 99.77 per cent of the total population. Out of the total population, 30.6 per cent are literates. Male literacy rate (39.9 %) is almost double than the female literacy rate (21.9%) in the village. Though soil quality is infertile with rocky and hard substances, tribal farmers are practicing terrace farming. Patches of alluvial, black and mixed soils are also present in the village. Crop production is the main occupation and due to dearth of good farm land, tribal farmers are utilizing every corner of the hills and valleys. Health services are almost nil in the village. Only one primary school is available. Hand pumps are rarely functional particularly in the summer months. Getting drinking water in the summer season is a major problem faced by the villagers. Although drainage is not very satisfactory, gradient of the surface drains out most of the water naturally. District roads are well developed. Only one sub-post office is there. The village is lacking in banking facilities and agricultural market, where tribal farmers can sale their produce. Eco-tourism may be a good choice for enhancing tribal farmer's income in the agricultural off season.

Nani Chikli Village:

The village spans an area of 369.87 hectares with 172 households. The total population of the village is 975. The entire population of Nani Chikli village belongs to ST community. Less than one-third (30.97%) of this population has attained literacy. Male literates are 40.8 per cent

and percentage share of female literates is 20.4 per cent. Both Nani Chikli and Borchapada villages have very low female literacy and large gap between male and female literacy rates. Compared to other two physiographic regions, Narmada Gorge region needs more efforts from the local administration to uplift female literacy rate. Sparsely distributed population of the village is having major problem of irrigation. In the rainy season controlling rain water is troublesome as the water gushes down the surrounding high land. Cutting channel type structures in the middle of the village is a significant innovative flood mitigation measure adopted by the inhabitants. But after rainy season getting water for irrigation is very difficult. Soil quality is very poor with nearly 56 per cent of the farm land covered with infertile red soil. Percentage share of farm lands covered with alluvial (12.5%) and black soils (31.3%) are considerably low Even growing fodder crops becomes difficult with the available soil type. The ecological conditions also make raising of domestic animals difficult. Under these circumstances, the only life sustaining alternative available to the population is to migrate out seasonally in search economic avenues. This village is well facilitated by district roads, village roads and drinking water facilities. Nani Chikli has potentiality to develop dry farming, if awareness programmes are initiated by local administration.

Amroli Village:

The village covers an area of 600.88 hectares in which 2,234 persons reside in 444 households. Out of total population, 65.48 per cent are literates, where male and female literacy rates are 74.7 per cent and 55.9 per cent respectively. Percentage of ST population in the village is 87.3 per cent of the total population, where 50.69 and 49.30 per cent are males and females respectively. Black soil covers the 56.5 per cent of the total farm land of the village followed by mixed soil type (30.4 %). Irrigation facilities are well developed from the Narmada Main Canal. Amroli village has exceptional health services with PHC, CHC and permanent resident doctors. The village has proper road, drinking water, power supply and commercial bank facilities.

Lavakoi Village:

Lavakoi village is spread across an area of 287.73 hectares. The village is inhabited by 741 people out of which ST population constitutes 97.3 per cent of the total population. Literacy rate in the village is 70.9 per cent. Interestingly, male (70.9%) and female (70.8%) literacy rates are equal in the village. Black soil covers 65.7 per cent of the area of the village farms. Farmers

take up other works as subsidiary income generating activities as their agricultural produce does sustain them for the entire year. Drainage facilities and sanitation are moderately developed in the village.

Plate - 6.1: Ambala Village - (a) Hand pump for drinking water. (b) Fuel wood.

Table - 6.2
Demography of Sample Villages
(2011)

Physiographic Division	*Talukas*	Sample Village	Area (in Hect.)	Population		Sex Ratio		% of Literates - Total	Amenity Score
				Total	ST	Total	ST		
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	336.7	1,283	1,279	1,017	1,017	26.4	15
		Achhala	823.5	1,982	1,982	941	941	34.7	15
		Ambala	898.2	2,934	2,270	1,058	1,069	34.3	21
		Gabadia	862.4	1,366	1,365	927	928	35.1	13
	Total		**2920.8**	**7,565**	**6,896**	**995**	**993**	**33.2**	
Orsang Heran Plains	Jetpur Pavi	Aniyadri	879.1	2,269	2,180	944	934	46.8	19
	Bodeli	Dholivav	227.2	1,848	1,806	937	936	59.6	13
		Jabugam	1202.3	3,600	1,447	944	901	66.0	30
	Sankheda	Manjrol	1213.9	2,715	1,267	959	940	66.3	15
		Vadadli	621.4	713	648	970	982	58.6	11
	Total		**4143.9**	**11,145**	**7,348**	**948**	**933**	**60.6**	
Narmada Gorge	Kavant	Borchapada	285.9	885	883	1,063	1,063	30.6	13
		Nani Chikli	369.9	975	975	931	931	31.0	15
	Nasvadi	Amroli	600.9	2,234	1,951	967	973	65.5	21
		Lavakoi	287.7	741	721	940	938	70.9	16
	Total		**1,544.4**	**4,835**	**4,530**	**972**	**975**	**53.0**	

Table - 6.2 depicts that sex ratio is comparatively better in Narmada Gorge region followed by Vindhyan Hill Ranges and Orsang Heran Plains. Generally, sex ratio for STs is in a good position compared to total sex ratios of the State. With regard to literacy rates, the pre-dominantly

tribal villages are lagging behind the non-tribal villages. For instance, the villages belonging to Sankheda, Nasvadi and Bodeli *talukas* with substantial share of non-tribal population have higher literacy rates compared to the villages with absolute dominance of tribal population in Chhota Udepur, and Kavant *talukas*. Jabugam village of the plain region has the highest amenities score among the 13 sample villages.

6.4 Occupation:

Forest is an important element for tribal community as their social and cultural life is weaved around it. However, all the *talukas* have lesser percentage of area under forest cover than the prescribed norm of 33 per cent. Being mostly characterized by plain topography, Sankheda (6.96%) and Bodeli (4.64%) *talukas* have the least proportion of area under forests. These two *talukas* have relatively greater proportion of non-tribal population and larger proportion of land under cultivation. Out of all the *talukas* of Chhota Udepur district, Nasvadi *taluka* has the highest percentage (30.68%) of forest area followed by Kavant, Chhota Udepur and Jetpur Pavi *talukas*. Since these are mostly hilly and dominated by the tribes, around one-fourth of the area in these *talukas* have remained under forest cover.

Traditionally, tribal economies were centered around forest and its resources. With gradual depletion of forest and imposition of official restrictions debarring free access and use of forest resources, the tribes are left with no option other than cultivating crops on the land in their possession, which are basically unsuitable for agricultural purposes. Contemporarily, majority of the former tribal foragers, gatherers and shifting cultivators have adopted settled agriculture and other unskilled wage labour, both inside and outside their village, as the means of livelihood. Formerly, their life and livelihood were simple with subsistence farming and collection of forest products for household needs. Today, the condition of the tribes, particularly without cultivable land in possession, is miserable in the study area due to reduction of forest cover as well as prevailing restrictions on the use of forest products. Members of such households expressed dependence on cultivation. Most tribal farmers with small land holdings attached to their homestead, produce much less than their requirements. In general, majority of the land owing households work as agricultural labourers or as migrant labourers.

More than 80 (81.97%) per cent households of the Vindhyan Hill Ranges region (Chhota Udepur *taluka*) are in possession of cultivable land. However, all households excepting one in Gabadia village are marginal, small and semi-medium size land owners. In fact, all the land owner households in Ferkuva village possess marginal size lands. While, all the households of Achhala and Gabadia villages are land owners, around one-third households of Ferkuva (30%) and Ambala (33.33%) villages are landless and depend on wage earnings. Considering the average family size of the households in the region, it is highly improbable to expect the single crop production practice of these households to produce enough for their sustenance.

Proportionately, the land-owning households in the Orsang-Heran Plains (91.13%) is higher than the Vindhyan Hill Ranges region. Only in Aniyadri (Jetpur Pavi *taluka*) and Dholivav (Bodeli *taluka*), all households have some land in their possession. The share of households across different land size categories in this region is almost similar to the Vindhyan Hill region, excepting for the presence of 15 or 12.1 per cent medium and one or 0.8 per cent large size land owner households in the Orsang-Heran Plains region. The share of marginal land owner households (48.4%) is also lower in the region compared to the other two regions. All households without land depend on working as agricultural labour (8.1%) and business (0.8%). None registered as daily wage labourer in the region. In Jetpur Pavi and Bodeli *talukas* percentages of households having own land are more than Sankheda *taluka*. Manjrol (22.6%) and Vadadli (13.4%) villages of Sankheda *taluka* have higher percentage of landless households. The landless households mostly belong to the non-tribal communities.

The sample villages of Kavant and Nasvadi *talukas* in the remote, hilly and undulating terrain of the Narmada Gorge region, have the highest proportion (95.92%) of land owner households. However, majority (79.6%) of the households have marginal and small land holdings, and large size land owners are completely absent in the villages. Only one household each in all the villages of the region accounting for 4.1 per cent of the total households of the region are in possession of medium size lands. All the households in these three 100 per cent tribal villages own land. Only in Amroli village of Nasvadi *taluka*, around five (4.8%) per cent sample households are landless who take up labour work and business for sustenance. It is noteworthy that Amroli has 21.7 per cent of population belonging to non-tribal communities, who are landless and depend on labour or business.

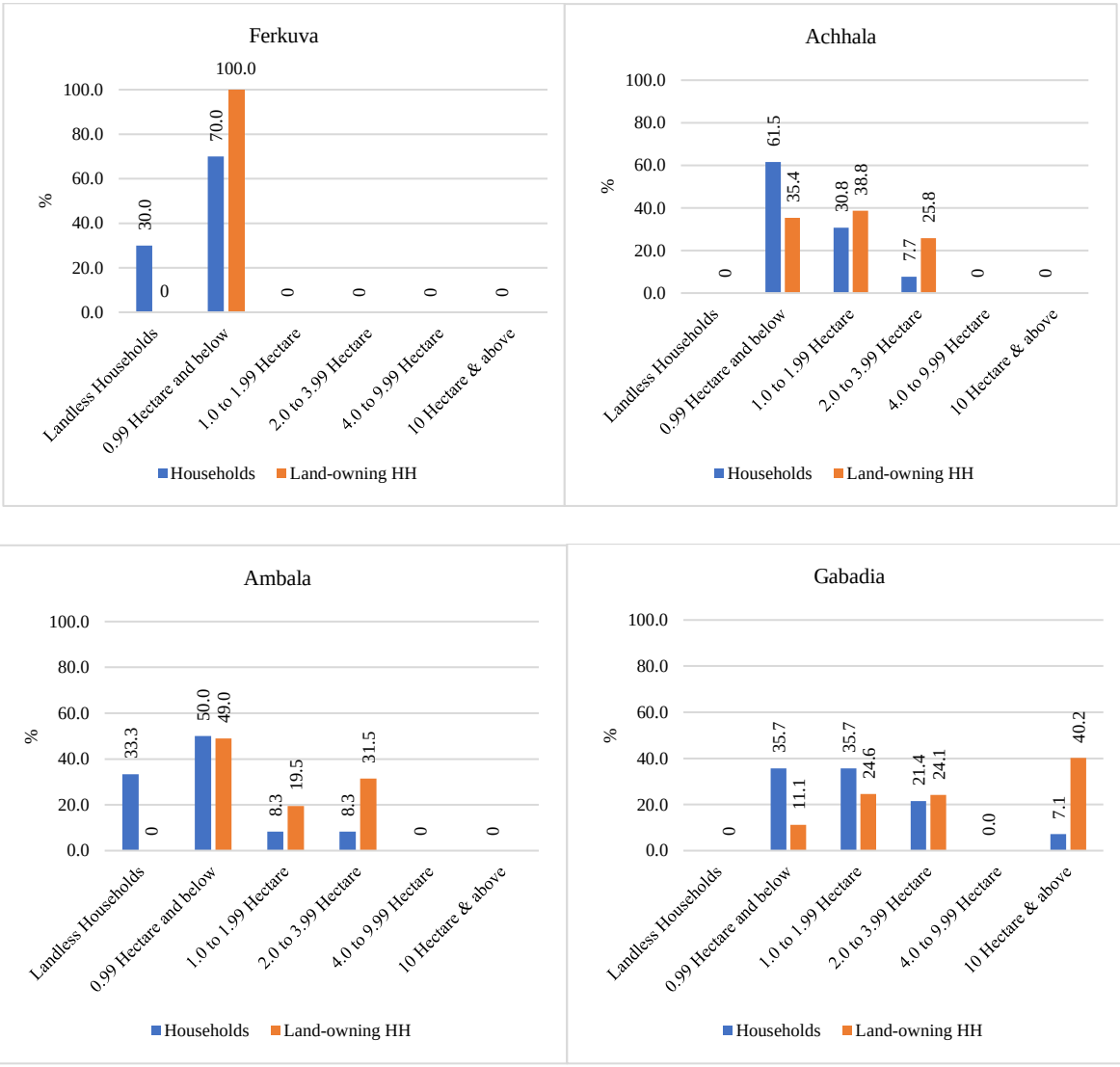
Table - 6.3
Primary Occupation in Sample Villages

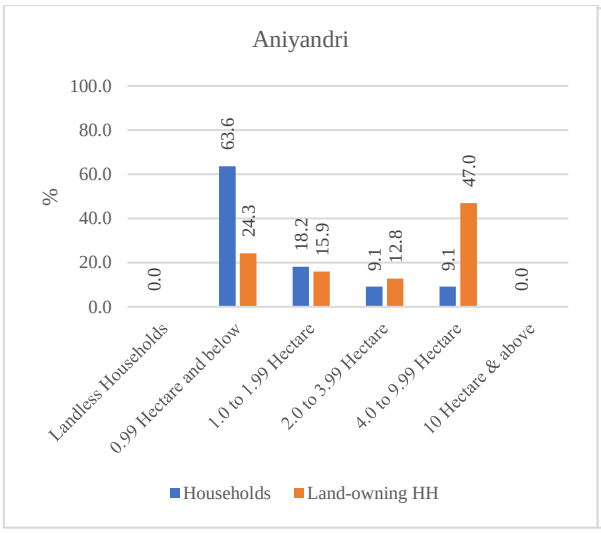
Physiographic Division	*Taluka*	Village	A	B	Primary Occupation							
					No. & % of Land Owner Households					No. & % of Landless Households		
					Land Size Category					WL*	AL	BN
					M	S	SM	MD	L			
Vindhyan Hill Ranges	**Ch. Udepur**	**Ferkuva**	10	7	7 (70.0)	-	-	-	-	1 (10.0)	2 (20.0)	-
		Achhala	13	13	8 (61.5)	4 (30.8)	1 (7.70)	-	-	-	-	-
		Ambala	24	16	12 (50.0)	2 (8.3)	2 (8.3)	-	-	3 (12.5)	5 (20.8)	-
		Gabadia	14	14	5 (35.7)	5 (35.7)	3 (21.4)	-	1 (7.1)	-	-	-
		Total	**61**	**50 (81.9)**	**32 (52.5)**	**11 (18.0)**	**6 (9.8)**	**-**	**1 (1.6)**	**4 (6.6)**	**7 (11.5)**	**-**
Orsang Heran Plains	**Jetpur Pavi**	**Aniyadri**	22	22	14 (63.6)	4 (18.2)	2 (9.1)	2 (9.1)	-	-	-	-
	Bodeli	**Dholivav**	23	23	16 (69.6)	4 (17.4)	2 (8.7)	1 (4.3)	-	-	-	-
		Jabugam	33	31	16 (48.5)	7 (21.2)	4 (12.1)	3 (9.1)	1 (3.0)	-	1 (3.0)	1 (3.0)
	Sankheda	**Manjrol**	31	24	6 (19.4)	3 (9.7)	7 (22.6)	8 (25.8)	-	-	7 (22.6)	-
		Vadadli	15	13	8 (53.3)	-	4 (26.7)	1 (6.7)	-	-	2 (13.3)	-
		Total	**124**	**113 (91.1)**	**60 (48.4)**	**18 (14.5)**	**19 (15.3)**	**15 (12.1)**	**1 (0.8)**	**0.0**	**10 (8.1)**	**1 (0.8)**
Narmada Gorge	**Kavant**	**Borchapada**	18	18	11 (61.1)	4 (22.2)	2 (11.1)	1 (5.6)	-	-	-	-
		Nani Chikli	22	22	13 (59.1)	6 (27.3)	2 (9.1)	1 (4.5)	-	-	-	-
	Nasvadi	**Amroli**	23	19	12 (52.2)	6 (26.1)	-	1 (4.3)	-	1 (4.3)	2 (8.7)	1 (4.3)
		Lavakoi	35	35	12 (34.3)	14 (40.0)	8 (22.9)	1 (2.9)	-	-	-	-
		Total	**98**	**94 (95.9)**	**48 (49.0)**	**30 (30.6)**	**12 (12.2)**	**4 (4.1)**	**-**	**1 (1.02)**	**2 (2.04)**	**1 (1.02)**

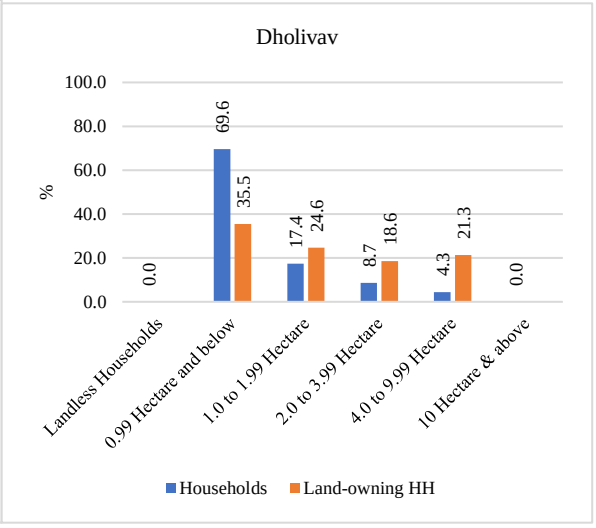
Note: **A** - Number of Sample Household: **B** - Number of Landowner Household; **M** - Marginal (less than 1 Ha); **S** - Small (1 to 1.99 Ha); **SM** - Semi Medium (2 to 3.99 Ha); **MD** - Medium (4 to 9.99 Ha); **L** - Large (More than 10 Ha); **WL** - Wage Labour; **AL** - Agricultural Labourer; **BN** - Business.

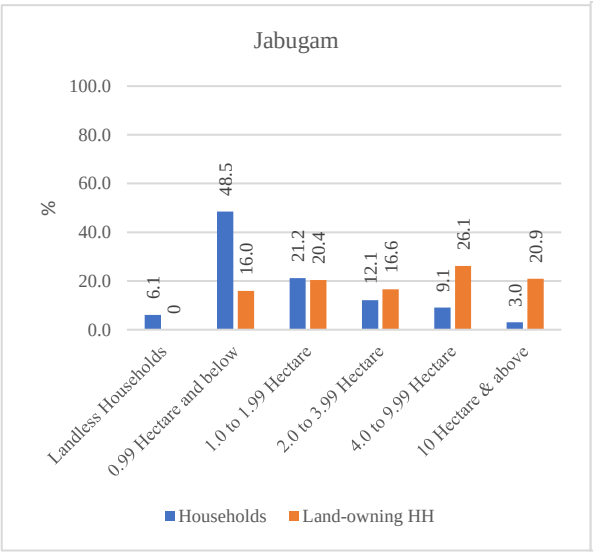
***** Wage labourer is one whose primary means of income is from selling his/her labour only.

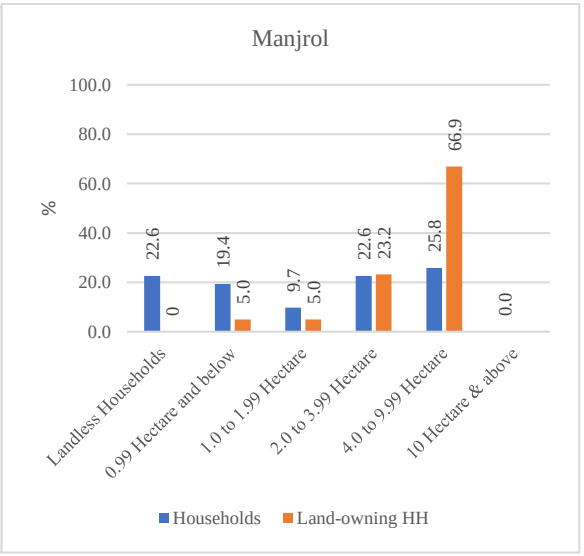
Figure - 6.2
Percentage of Households and Ownership of Land by Land-size Category - Sample Villages

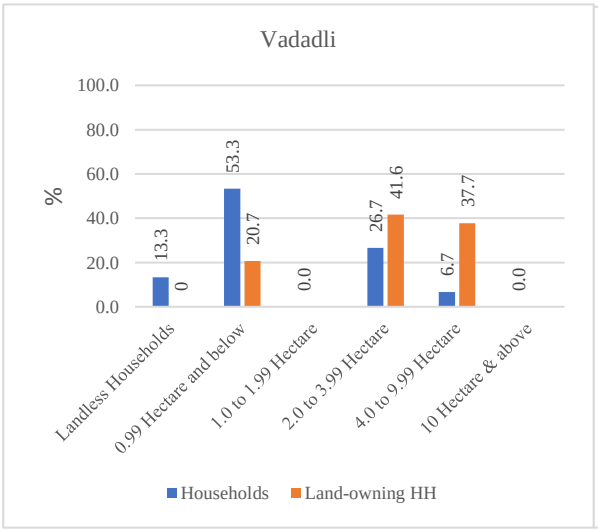


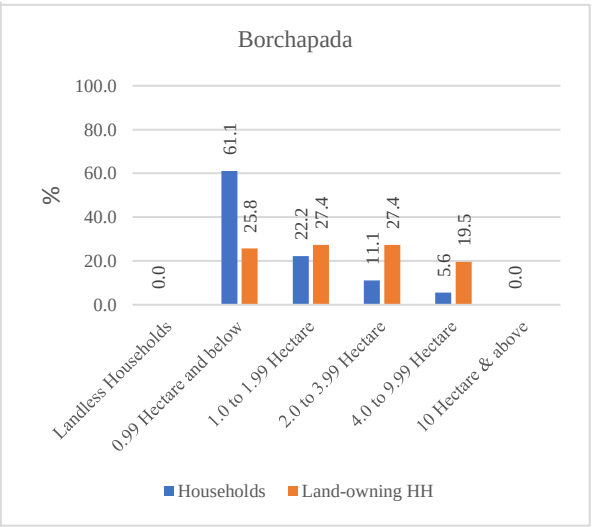

Aniyandri
100.0
80.0
60.0
40.0
20.0
0.0
%
0.0
63.6
24.3
18.2
15.9
9.1
12.8
9.1
47.0
0.0
Landless Households
0.99 Hectare and below
1.0 to 1.99 Hectare
2.0 to 3.99 Hectare
4.0 to 9.99 Hectare
10 Hectare & above
Households
Land-owning HH

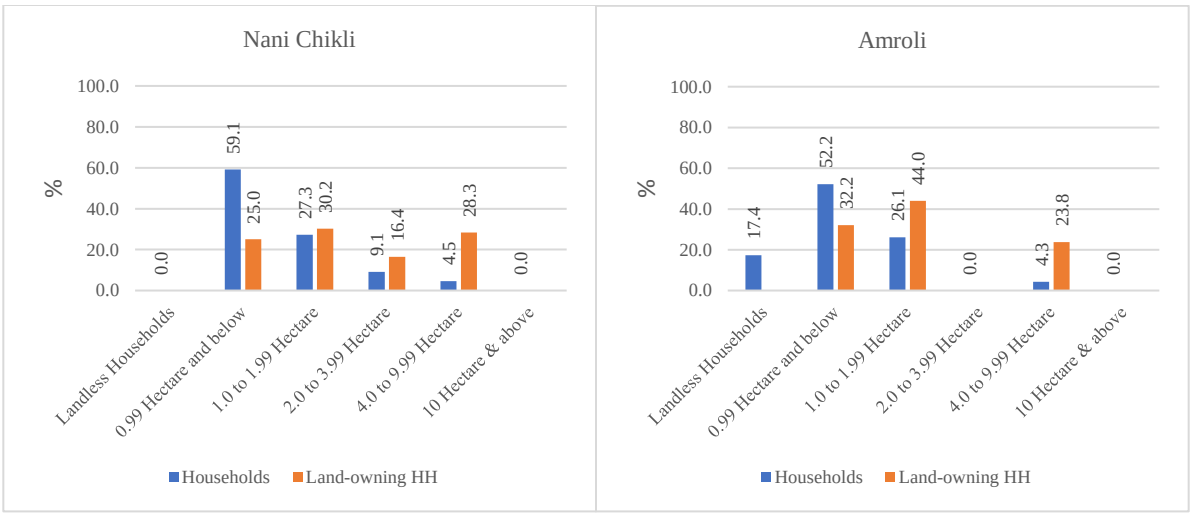

Dholivav
100.0
80.0
60.0
40.0
20.0
0.0
%
0.0
69.6
35.5
17.4
24.6
8.7
18.6
4.3
21.3
0.0
Landless Households
0.99 Hectare and below
1.0 to 1.99 Hectare
2.0 to 3.99 Hectare
4.0 to 9.99 Hectare
10 Hectare & above
Households
Land-owning HH

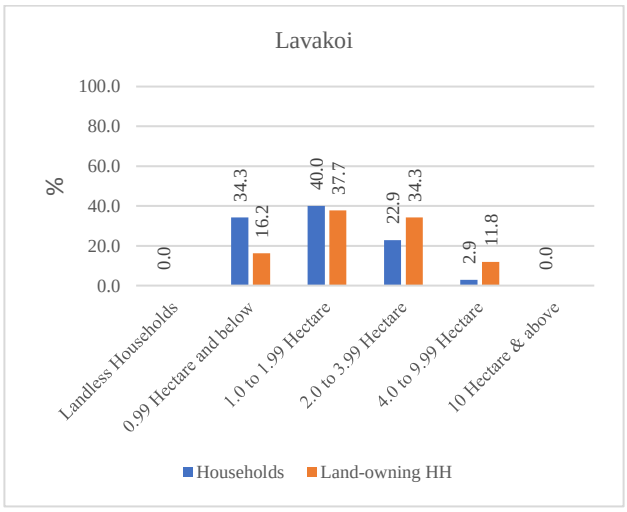

Jabugam
100.0
80.0
60.0
40.0
20.0
0.0
%
6.1
0
48.5
16.0
21.2
20.4
12.1
16.6
9.1
26.1
3.0
20.9
Landless Households
0.99 Hectare and below
1.0 to 1.99 Hectare
2.0 to 3.99 Hectare
4.0 to 9.99 Hectare
10 Hectare & above
Households
Land-owning HH


Manjrol
100.0
80.0
60.0
40.0
20.0
0.0
%
22.6
0
19.4
5.0
9.7
5.0
22.6
23.2
25.8
66.9
0.0
Landless Households
0.99 Hectare and below
1.0 to 1.99 Hectare
2.0 to 3.99 Hectare
4.0 to 9.99 Hectare
10 Hectare & above
Households
Land-owning HH


Vadadli
100.0
80.0
60.0
40.0
20.0
0.0
%
13.3
0
53.3
20.7
0.0
26.7
41.6
6.7
37.7
0.0
Landless Households
0.99 Hectare and below
1.0 to 1.99 Hectare
2.0 to 3.99 Hectare
4.0 to 9.99 Hectare
10 Hectare & above
Households
Land-owning HH


Borchapada
100.0
80.0
60.0
40.0
20.0
0.0
%
0.0
61.1
25.8
22.2
27.4
11.1
27.4
5.6
19.5
0.0
Landless Households
0.99 Hectare and below
1.0 to 1.99 Hectare
2.0 to 3.99 Hectare
4.0 to 9.99 Hectare
10 Hectare & above
Households
Land-owning HH





6.5 Agricultural Land Use:

Number and area of land holding determines the farm mechanization, productivity and to some extent, choice of crops. As observed earlier, between 85 to 90 per cent of cultivated area in all the *talukas* of the District during the five time periods in reference (1995-96 to 2015-16) is operated under small (1 to 1.99 ha.) to medium (4.0 to 9.99 ha.) size land holdings. Besides, the proportion of area to total area of all holdings of the marginal and small holdings in all *talukas* has been increasing, and the same for the larger land size categories is decreasing.

The three different physiographic regions have varying proportions of arable land not utilized. The reasons for this unattended land mostly in *rabi* and summer seasons are due to less amount of water availability, lack of dry farming and migration time for farmers. From Table 6.4 it is seen that the arable lands of the land owner households in Ferkuva and Achhala of Vindhyan

Hill Ranges, Dholivav and Vadadli of Plain region, and Lavakoi of Narmada Gorge region remain completely unutilized during the entire summer season (March-June). Surprisingly, in all three regions, the percentage of arable land left unutilized can be found in the *kharif* season also. Narmada Gorge region has nearly 65 per cent of arable land unutilized because, torrential rains in Kavant *taluka* and water logging in Nasvadi *taluka* hinder ploughing.

Table - 6.4
Extent of Arable Land Utilization

Region	*Taluka*	Village	No. of Sample Household	No. of Land Owner Households	Percentage of Arable Land not utilized for Land owning Households		
					Kharif	Rabi	Summer
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	10	7	0.0	0.0	100.0
		Achhala	13	13	4.8	56.1	100
		Ambala	24	16	0.0	19.5	97.1
		Gabadia	14	14	36.8	72.8	92.0
Orsang Heran Plains	Jetpur Pavi	Aniyadri	22	22	13.3	48.6	92.2
	Bodeli	Dholivav	23	23	0.0	54.3	100
		Jabugam	33	31	12.2	86.1	92.6
	Sankheda	Manjrol	31	24	10.8	80.9	94.1
		Vadadli	15	13	7.04	86.7	100.0
Narmada Gorge	Kavant	Borchapada	18	18	42.4	85.7	79.7
		Nani Chikli	22	22	19.8	42.9	59.3
	Nasvadi	Amroli	23	19	3.53	87.9	92.9
		Lavakoi	35	35	0	88.9	100.0

The cropping pattern of tribal villages is much focused on cereal crops. This is particularly so with the marginal farmers of the villages of Vindhyan Hill Ranges, where all the households belong to the ST community. As is clear from Table - 6.5, all the land owner households of Ferkuva village devote their entire cultivable land to cereal cultivation, and all of them are marginal land owners. While about 61.5 per cent marginal land owners in Achhala village are producing cereal crops devoting 80 to 100 per cent of their total land, more than 30 per cent (31.8%) small farmers use 60 to 80 per cent of their land to do the same. Marginal farmers of Ambala village give less importance to cereal crops with 75 per cent of them using less than 40 per cent of their land for cereal cultivation. Cereal crops occupy a larger (80 to 100%) proportion of cultivable area of the

small and semi-medium land owners of this village. On the other hand, around 36 per cent marginal and small, and more than 20 per cent of the semi-medium farmers produce cereal crops in 40 to 60 per cent area of their arable land in Gabadia village. The single large land-owning farmer of Gabadia village has devoted 80 to 100 per cent of his land to cereal cultivation. So, it can be concluded that the majority of the smaller land holders are giving greater prominence to cereal crop production by using 40 to 100 per cent of land to it in the Vindhyan Hill Ranges region. With increase in the size of land holding the share of land under cereal crop cultivation decreases.

Cereal crops are relatively less dominant in the sample villages of Orsang-Heran Plains. It is only in the Aniyadri village that about 30 per cent households belonging to small (18.2%) and medium (9.1%) size land holding category cultivate cereals in 80 to 100 per cent of their holdings. However, majority of the marginal farmers of Aniyadri, Dholivav and Jabugam villages cultivate such crops in 60 to 80 per cent of their land. On the other hand, in Manjrol and Vadadli villages, households of all land size categories cultivate cereals in less than 40 per cent of their holdings. Instead, most farmers in these two villages give preference to the cultivation of Banana and Cotton taking advantage of the suitable ecological characteristics of the region

Cereal crop cultivation is also preferred less in the Narmada Gorge region. Cereal crops are cultivated in less than 60 per cent cultivable land in the four villages of the region. All the farmers of Amroli and Lavakoi villages cultivate cereals in less than 40 per cent of their land in possession. The availability of irrigation facility in these two villages of Nasvadi *taluka* has encouraged the farmers to go for cash crops replacing the traditional cereal crops. Overall, it can be observed that proportion of land devoted to the cultivation of cereal crops is higher among the smaller sized land holder households. In other words, with increase in the size of land holding, the area under cereal crops decreases.

The dependence on cereal crops for tribal farmers in the District is reducing and this is reflected in all the three regions under investigation. Wherever there is a little advantage of irrigated water, the farmers switch over to crops other than cereal. Under the situation, it would not be wrong to apprehend issues pertaining to food security and environmental degradation in the future.

Table - 6.5
Level of Dependence on Cereal Crops

Region	Village	% of Land-Owning HH Producing Cereal Crops	Land Size Class (In Hectares)				
			Up to 1	1.01 to 1.99	2.0 to 3.99	4.0 to 9.99	10 & above
Vindhyan Hill Ranges	Ferkuva	Less than 40					
		40 to 60					
		60 to 80					
		Above 80	100 (7)				
	Achhala	Less than 40					
		40 to 60					
		60 to 80		30.8 (4)			
		Above 80	61.5 (8)		7.7 (1)		
	Ambala	Less than 40	75 (12)				
		40 to 60					
		60 to 80					
		Above 80		12.5 (2)	12.5 (2)		
	Gabadia	Less than 40					
		40 to 60	35.7 (5)	35.7 (5)	21.4 (3)		
		60 to 80					
		Above 80					7.1 (1)
Orsang Heran Plains	Aniyadri	Less than 40					
		40 to 60			9.1 (2)		
		60 to 80	63.6 (14)				
		Above 80		18.2 (4)		9.1 (2)	
	Dholivav	Less than 40					
		40 to 60					
		60 to 80	69.6 (16)	17.4 (4)	8.7 (2)		
		Above 80				4.3 (1)	
	Jabugam	Less than 40		22.6 (7)	12.9 (4)		3.2 (1)
		40 to 60				9.7 (3)	
		60 to 80	51.6 (16)				
		Above 80					
	Manjrol	Less than 40	25 (6)	12.5 (3)	29.2 (7)	33.3 (8)	
		40 to 60					
		60 to 80					
		Above 80					
	Vadadli	Less than 40	61.5 (8)		30.8 (4)	7.7 (1)	
		40 to 60					
		60 to 80					
		Above 80					
		Less than 40		22.2 (4)	11.1 (2)	5.5 (1)	

Narmada Gorge	Borchapada	40 to 60	61.1 (11)				
		60 to 80					
		Above 80					
	Nani Chikli	Less than 40		27.3 (6)		4.5 (1)	
		40 to 60	59.1 (13)		9.1 (2)		
		60 to 80					
		Above 80					
	Amroli	Less than 40	63.1 (12)	31.6 (6)		5.3 (1)	
		40 to 60					
		60 to 80					
		Above 80					
	Lavakoi	Less than 40	34.3 (12)	40.0 (14)	22.8 (8)	2.8 (1)	
		40 to 60					
		60 to 80					
		Above 80					

Note: Figures in parenthesis indicates number of Land-owning Households

6.5.1 *Kharif* Crops:

For selection of crops, tribal farmers prefer food crops as the first priority during the *kharif* season. As most tribal farmers depend on the monsoon rains (C*houmasa*), they devote their full energy and investment to achieve maximum production of crops. All the three regions have different cropping patterns mostly Corn (Maize), Paddy, *Tuar*, Cotton and Wheat are their common choice as the main crops. Along with main food crops, commercial crops and pulses are grown as subsidiary *kharif* crops to balance crop failure and to utilise every single inch of the land.

Maize is grown in all the *talukas* except Sankheda as main *kharif* crop followed by irrigated Paddy and Wheat. Mung (Green Gram), Tuar (Pigeon Pea) and *Urad* (Black Gram) are the important pulses grown in all *talukas* except Bodeli and Sankheda. Major cash crops for main *kharif* season are Banana, Cotton, Chilli and *Arenda* (Castor Bean). Soybean is cultivated in Bodeli. This is a new *kharif* crop in the District. Out of all main *kharif* crops, Maize (Corn) and *Tuar* as food crops and Cotton as cash crops are very important for tribal farmers in the District. For the limited 4 months of rainy season, they produce Maize and *Tuar* for subsistence and Cotton for sale.

A notable observation is the problem of water logging in certain low-lying areas in Orsang-Heran Plains and western portions of the Narmada Gorge regions. Conversely, tribal farmers

residing in the Vindhyan Hill Ranges and the more exposed hill areas of the eastern Narmada Gorge encounter no such waterlogging issues. This can be attributed to the hilly and undulating terrain, which facilitates efficient rainwater drainage. Consequently, these farmers are able to effectively cultivate rain-fed *kharif* crops, both main and subsidiary varieties.

Along with main *kharif* crops, crops like Sorghum, Soybean, and Vegetables, Onion etcetera are grown as subsidiary *kharif* crops. Farmers cultivate these crops along with the main crops. Subsidiary *kharif* crops have following characteristics:

- Tribal farmers grow these crops along with the main crop to utilize farm resources like water, farm inputs and labour.
- The selection of subsidiary crops is in such a way that it can save crop failure and supplement the daily requirement of food of the tribal households. Subsidiary crops are also called as companion crops (https://agri-bsc.kkwagh.edu.in/uploads/department_course/Cropping_system.pdf accessed on 20th July 2023).
- Intercropping of subsidiary crops in rows along with main *kharif* crops is a common practice. The choice of main and subsidiary crop packages differs from farmer to farmer. While a few choose Maize + Pigeon Pea, others choose Maize + Sorghum, or Cotton + Vegetables.

  Without affecting the yield of main *kharif* crops, these subsidiary crops are very important for the cropping pattern in this District.
- During the last ten years, no change has taken place in the type and pattern of crops, limiting crop diversification to the minimum. As agriculture is mainly rain fed in Chhota Udepur district, significance of effective *kharif* season is very limited and crucial. Each and every household in the sample villages tries to utilize every inch of the moistened land during these four months of rainy season.

6.5.2 *Rabi* Crops:

From November to March, *rabi* season prevails in the District. In this *rabi* season, scanty and occasional rainfall occurs, but general condition of climate is dry. Chhota Udepur district experiences semi-arid climatic condition lying within the Central Gujarat Agro-Climate Zone 3 (https://kiosk.nau.in/KIOSK_KRUSHI/content.php?grp=1&pid=835 accessed on 20th July 2023).

Annual average range of temperature is from 8.9° C to 30° C. The climate is extremely dry and relatively cold in January due to northerly winds during this season.

Xerophyte crops like Bajra (Pearl millet), Jowar (Sorghum), Groundnut, and Peanut are additional crops along with regular Pigeon pea, Soybean, Maize, Cotton and Pulses. In the Rabi season, growing fodder grass and selling in the market are profitable for the farmers. Growing of long duration crops as companion crops or subsidiary crops along with main crops are becoming less in all the physiographic regions due to inadequate supply of water from wells and river. Information gathered on *rabi* crops was inadequate as the respondents could recollect with difficulty. Actually, many farmers start migrating to other *talukas* or districts in search of casual employment during this season. Inadequate irrigation, dry climate, and pressure to repay the loan, compel them to migrate periodically. Female members of the households stay back to look after the *rabi* crops (if any). Getting enough suitable land for sowing *rabi* and summer crops is the major issue. Long duration of Cotton and Pigeon Pea take more than 8 months to mature and cover more than 65 per cent of the available area partly encroaching upon the *rabi* season. Delay in sowing of *rabi* crops encounters the summer heat, which eventually affects the yield.

Throughout the District, the weather is extremely dry with average maximum temperature of 43.2° C during the summer months of March to June. Farmers generally cultivate Bajra, Jowar and Maize for subsistence, which can survive the scarcity of water and high temperature. Fetching drinking water and nurturing animals become difficult. Many farmers, especially of the north eastern *talukas* of the District either sale or bear the loss of livestock due to lack of water.

Currently cropping patterns are influenced by availability of irrigation water during the *rabi* and summer months. Maize and Cotton are gaining importance day by day. Agriculture with animal husbandry and horticulture (vegetables) is the main cropping system. However, crop diversification and introduction of new variety crops are not very popular in the District in general, and especially among the marginal and small farmers.

In spite of gradual shift of land-use from agriculture to non-agriculture, especially in the predominantly non-tribal *talukas* of Sankheda and Bodeli, agriculture remains the predominant occupation in the District. The need of hour in the district is to focus on sustainable agriculture, which can boost farmer's income along with judicious use of resources. Besides, encouraging

females to take decisions in the farm operations could help the communities to strengthen the resource mobilization process and, increase the level of productivity.

6.6. Ownership of Plough and Bullocks:

Earlier the number of ploughs and bullocks in possession defined how well equipped a farmer is. Contemporary agricultural practices have become less dependent of traditional equipment including animal power. Hence, such implements may not be considered as development indicators. Tribal farmers of Chhota Udepur district have started using technologically advanced agricultural tools and implements specially in the villages of Orsang-Heran Plains region where some households have replaced iron ploughs with modern tractors. However, in the other two regions, and in case of the marginal and farmers with smaller holdings of all the three regions, the situation remains by and large unaltered. Therefore, it would not be irrational to consider the possession of traditional agricultural tools and implements in assessing the economic status of the farmers of the study area.

As is evident from Table - 6.6, farmer households of all the villages under study have at least one plough, and a few also have more than one plough in possession. Possession of more than plough is more evident in all the villages of Orsang-Heran Plains villages, and in Narmada Gorge region excepting for the Nani Chikli village Kavant *taluka*. Gabadia is the only village in Vindhyan Hills region, where only one household is in possession of more than one plough.

Along with iron plough, the other inevitable agricultural asset is the number of bullocks. A pair of bullock determines the status of tribal farmers against a single bullock. One household each in Ambala village in Vindhyan Hill Ranges region and Nani Chikli, Lavakoi villages of Narmada Gorge region reported possession of a pair of bullocks. From the door-to-door survey it was revealed that between 42 to 100 per cent of the households across the villages of all the three regions do not own bullocks. Only in Gabadia village of Vindhyan Hill Ranges region around 58 per cent of the households possess at least one bullock. On the other hand, in Achhala village of this region and Jabugam village of Orsang-Heran Plains region, no household owns a bullock. Lack of surplus agricultural production hampers the prospect of purchasing and nurturing bullocks. Most of the time they hire from the rich landowner.

However, it would be wrong to consider the villages of Orsang-Hiren Plains region backward due to the absence of bullocks with 60 to 100 per cent of the households. Majority of the non-tribal households, particularly of Jabugam in Bodeli *taluka,* and Manjrol and Vadadli villages of Sankheda *taluka* of this region, are in possession of all types of modern tools and implements for agricultural operations.

Table - 6.6
Ownership of Plough

Physiographic Division	*Taluka*	Village	Percentage of Households by Number of Plough Owned		
			Number of Plough		
			NIL	One	> One
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	30.0 (3)	70.0 (7)	
		Achhala	38.5 (5)	61.5 (8)	
		Ambala	58.3 (14)	41.7 (10)	
		Gabadia	50.0 (7)	42.9 (6)	7.14 (1)
Orsang-Heran Plains	Jetpur Pavi	Aniyadri	31.8 (7)	50.0 (11)	18.2 (4)
	Bodeli	Dholivav	34.8 (8)	52.2 (12)	13.0 (3)
		Jabugam	45.4 (15)	45.4 (15)	9.1 (3)
	Sankheda	Manjrol	61.3 (19)	35.5 (11)	3.2 (1)
		Vadadli	53.3 (8)	33.3 (5)	13.3 (2)
Narmada Gorge	Kavant	Borchapada	61.1 (11)	27.8 (5)	11.1 (2)
		Nani Chikli	45.45 (10)	54.55 (12)	
	Nasvadi	Amroli	60.8 (14)	30.4 (7)	8.7 (2)
		Lavakoi	45.7 (16)	45.7 (16)	8.57 (3)

Table - 6.7
Ownership of Bullocks

Physiographic Division	*Taluka*	Village	Percentage of Households by Number of Bullocks Owned			
			Number of Bullocks owned			
			NIL	One	Pair	> a Pair
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	80.0 (8)	10.0 (1)	10.0 (1)	
		Achhala	100 (13)			
		Ambala	66.7 (16)	4.2 (1)	25.0 (6)	4.2 (1)
		Gabadia	42.8 (6)	7.2 (1)	50.0 (7)	
Orsang Heran Plains	Jetpur Pavi	Aniyadri	72.7 (16)		27.3 (6)	
	Bodeli	Dholivav	73.9 (17)	13.04 (3)	13.04 (3)	
		Jabugam	100 (33)			
	Sankheda	Manjrol	96.8 (30)		3.2 (1)	
		Vadadli	93.3 (14)		6.7 (1)	
	Kavant	Borchapada	61.1 (11)		38.9 (7)	

Narmada Gorge		Nani Chikli	59.0 (13)	22.7 (5)	13.6 (3)	4.5 (1)
	Nasvadi	Amroli	86.9 (20)	8.7 (2)	4.3 (1)	
		Lavakoi	65.7 (23)	20.0 (7)	11.4 (4)	2.8 (1)

6.7. Modernization of Agriculture:

Percentage of landowner households having tractors are highest in Manjrol (75%) village of Sankheda *taluka* in Orsang-Heran Plains region. Dholivav is the only village in this region where ownership of tractors is limited to 4.35 per cent land owner households. The remaining three villages have reasonable proportion (16 to 23 %) of land-owning households with tractors. In Amroli and Lavakoi villages of Nasvadi *taluka* in Narmada Gorge region, the percentage of households having tractors are 21 and 16 per cent respectively. While the villages of Kavant *taluka* in the same region show only 5 per cent of households having tractors. It may be recollected that the topography of these villages is undulating, where use of tractor would be difficult and uneconomical. Besides, it also depends on the purchasing capacity of the farmers. Possession of tractors in the Vindhyan Hill Ranges is limited to around seven per cent households in Achhala and Gabadia villages and around 19 per cent in Ambala village. Ferkuva village, where all the land-owning households are marginal farmers, has no household in possession of tractor.

Plate 6.2: Undulating farmlands - Borchapada village (Kavant *taluka*).

No clear-cut pattern can be discerned with regard to use of other modern methods by the households of the sample villages under investigation. Proportion of households using water pumps, HYV seeds, fertilizers and pesticides vary widely both within and across the three regions.

However, it is interesting to note that the use of HYV seeds, fertilizers and pesticides is proportionately higher in the villages with higher proportion of households in the smaller land size categories. For example, all the farmers of Ferkuva village reported use of fertilizers and pesticides, although the majority of them refrain from using HYV seeds. Use of water pumps is also the highest (71.4%) in Ferkuva village, followed by Manjrol (66.7%) village in Orsang Heran Plains. Less than 20 per cent of the households in other villages use water pumps. Lesser use of water pumps to irrigate fields may be due to the practice of rain fed single crop agricultural practice in the villages. Pesticides and fertilizers are applied by most of the tribal and non-tribal households, to increase productivity and mitigate crop failure. Percentage of household using HYV seeds is 60 to 88 per cent in the villages of Narmada Gorge region. The least percentage (18.75%) of households in Ambala village of Vindhyan Hill Ranges region use HYV seeds.

Table - 6.8
Modernization of Agriculture

Physiographic Division	*Taluka*	Village	Percentage of Households Using Modern Methods in Agriculture to all Households having Own Land				
			Tractor	Water Pump	HYV Seeds	Fertilizer	Pesticide
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	-	71.4 (5)	42.86 (3)	100 (7)	100 (7)
		Achhala	7.69 (1)	61.5 (8)	84.6 (11)	92.3 (12)	84.6 (11)
		Ambala	18.75 (3)	18.75 (3)	18.75 (3)	50.0 (8)	31.25 (5)
		Gabadia	7.14 (1)	14.29 (2)	71.43 (10)	92.86 (13)	57.14 (8)
Orsang-Heran Plains	Jetpur Pavi	Aniyadri	18.18 (4)	45.46 (10)	90.9 (20)	95.46 (21)	95.46 (21)
	Bodeli	Dholivav	4.35 (1)	13.04 (3)	56.5 (13)	100.0 (23)	78.26 (18)
		Jabugam	16.1 (5)	58.1 (18)	48.4 (15)	83.87 (26)	64.52 (20)
	Sankheda	Manjrol	75.0 (18)	66.7 (16)	54.2 (13)	83.33 (20)	45.83 (11)
		Vadadli	23.1 (3)	15.4 (2)	69.23 (9)	84.6 (11)	46.15 (6)
Narmada Gorge	Kavant	Borchapada	5.9 (1)	17.65 (3)	88.2 (15)	88.2 (15)	94.1 (16)
		Nani Chikli	5.3 (1)	10.53 (2)	84.21 (16)	100.0 (19)	68.4 (13)
	Nasvadi	Amroli	21.05 (4)	15.8 (3)	73.68 (14)	89.47 (17)	57.9 (11)
		Lavakoi	16.13 (5)	25.8 (8)	61.3 (19)	87.1 (27)	45.2 (14)

6.8. Extent of Irrigated Area:

More than 50 per cent households of the villages in Vindhyan Hill Ranges region have irrigated land, with Ferkuva village in the lead with (85.7%). It was revealed during the field visit that the marginal farmers of Ferkuva village procure water for irrigation by tankers on payment

from the neighbouring villages in Madhya Pradesh. Gabadia village with the least percentage of households with irrigated land, also has the least percentage (57.5%) of the total cropped area irrigated. Although the entire cropped area is not irrigated in none of the villages, around 90 (88.4%) of the cropped area in Achhala village is irrigated.

Among all the villages of the three regions under study, the villages of Orsang-Heran Plains region have the maximum proportion of irrigated land. All the households in the three villages of Dholivav, Jabugam and Manjrol of the region have fully irrigated agricultural land holdings. Out of the other two villages of the region, majority (77.3%) households in Aniyadri village own irrigated lands, and the same is only around two-fifths (38.5%) in Vadadli village. The percentage of area irrigated out of the total cropped area in all villages of this region, excepting in Vadadli village (67.4%), is 100 or nearly 100 per cent.

The sample villages in Narmada Gorge region have the least percentage of households with irrigated land. The percentage of households with irrigated lands vary between 33.3 per cent in Borchapada village. and 64.5 per cent in Lavakoi village. While around 52.2 per cent of the total cropped area is irrigated in Borchapada village, the other three villages of the region have around 70 per cent of such area irrigated.

Table - 6.9
Extent of Irrigated Area

Physiographic Division	*Taluka*	Village	Percentage of Household having Own land				
			Unirrigated	Irrigated	Irrigated area as percentage to Total Cropped area		
					0 to 60	61 to 90	91 to 100
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	14.3 (1)	85.7 (6)	-	78.8 (6)	-
		Achhala	15.4 (2)	84.6 (11)	-	88.4 (11)	-
		Ambala	37.5 (6)	62.5 (10)	-	63.1 (10)	-
		Gabadia	50.0 (7)	50.0 (7)	57.5 (7)	-	-
Orsang Heran Plains	Jetpur Pavi	Aniyadri	22.7 (5)	77.3 (17)	-	-	90.0 (17)
	Bodeli	Dholivav		100 (23)	-	-	100 (23)
		Jabugam		100 (31)	-	-	100 (31)
	Sankheda	Manjrol		100 (24)	-	-	100 (24)
		Vadadli	61.5 (8)	38.5 (5)	-	67.4 (5)	-
Narmada Gorge	Kavant	Borchapada	66.7 (12)	33.3 (6)	52.2 (6)	-	-
		Nani Chikli	45.5 (10)	54.5 (12)	-	74.6 (12)	-
	Nasvadi	Amroli	42.1 (8)	57.9 (11)	-	66.9 (11)	-
		Lavakoi	35.5 (11)	64.5 (20)	-	70.4 (20)	-

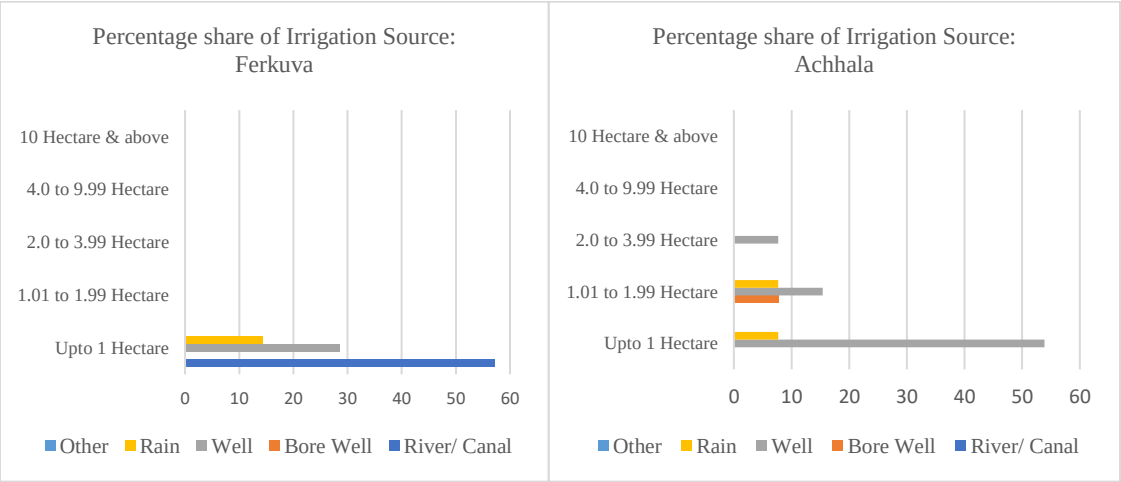
6.9. Source of Irrigation:

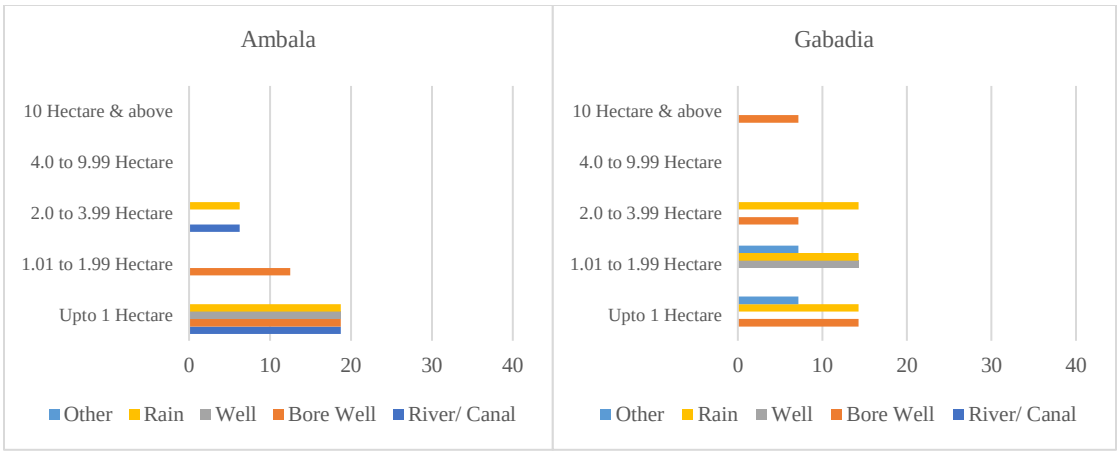
The sources of irrigation for the households of the villages in Vindhyan Hill Ranges region are wells and bore wells. Unfortunately, however, due to gradual increase in the depth of the water table, the farmers find it difficult to utilize these sources without pumps. In the final analysis, all households have to rely on the rains to cultivate crops. As mentioned earlier, the farmers of Ferkuva village on the Madhya Pradesh border, manage with water purchased for the purpose.

The villages in the Orsang-Heran Plains region have relatively better agricultural performance due not only for the fertile soils of the plains, but also for the well-developed irrigation infrastructure. Majority of the farmers of the region irrigate their fields with the help of electric pumps. Even the marginal farmers of Aniyadri village have this facility.

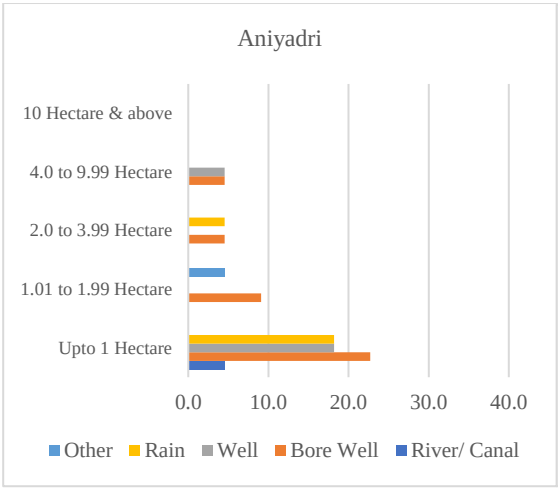
Households of all land size categories are completely dependent on rain water for cultivation in the Narmada Gorge region. As explained in Chapter 2, this region is the recharge region of the geological aquifer underneath. Due to the gradient of the base rock structure towards the river basin in the west, underground water flows down without getting stored. The limited proportion of cropped area is irrigated by pumping water from bore wells and the nearby river.

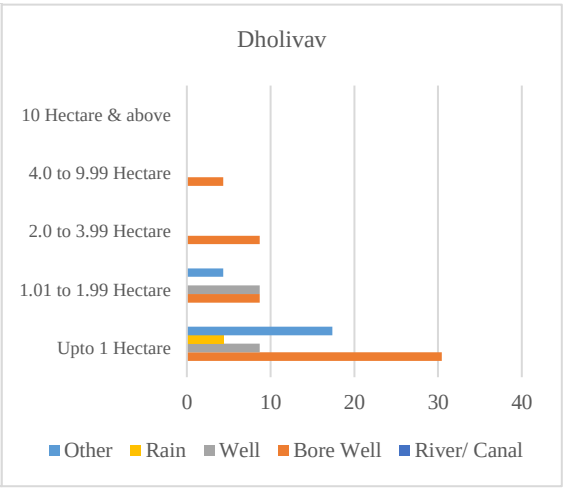
Figure - 6.3
Source of Irrigation and Percentage of Land-owning Households

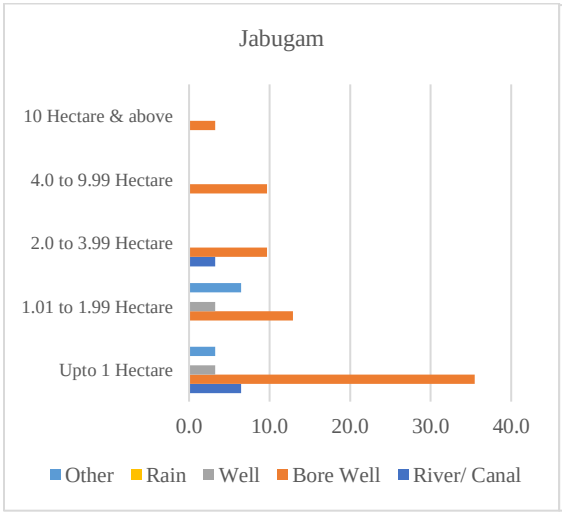


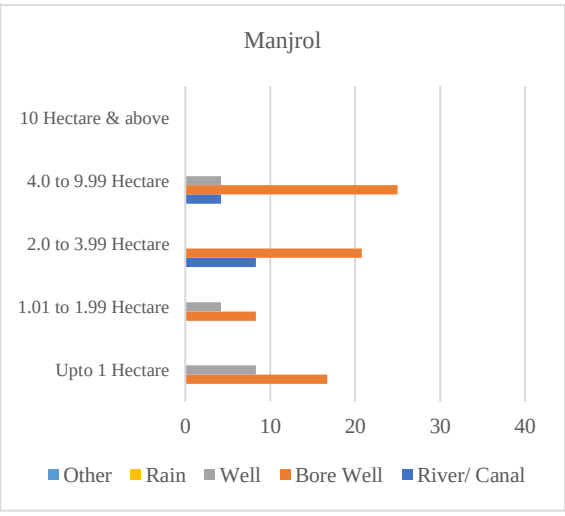

Ambala
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal

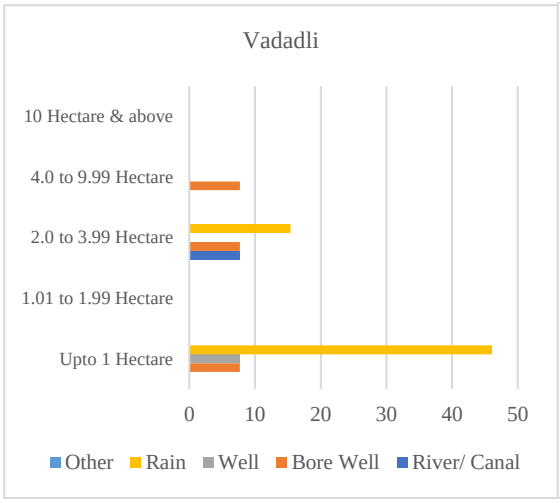
Gabadia
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal


Aniyadri
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0.0
10.0
20.0
30.0
40.0
Other
Rain
Well
Bore Well
River/ Canal


Dholivav
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal


Jabugam
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0.0
10.0
20.0
30.0
40.0
Other
Rain
Well
Bore Well
River/ Canal


Manjrol
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal


Vadadli
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
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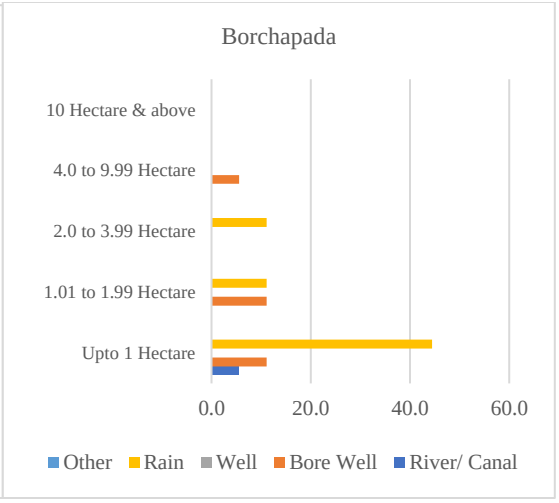
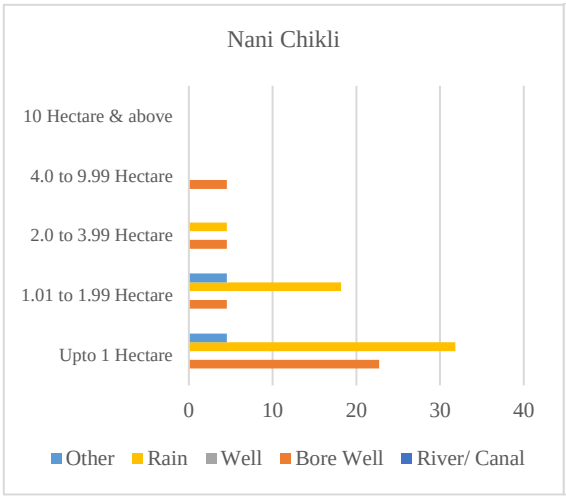
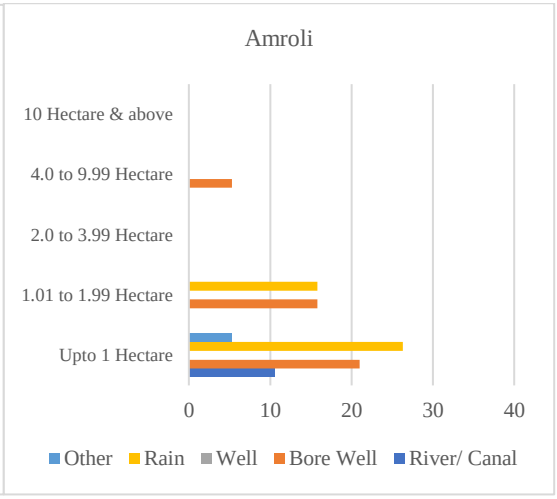
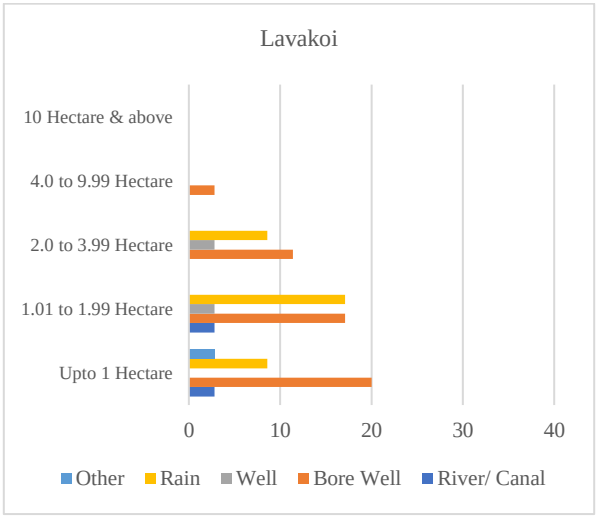
10
20
30
40
50
Other
Rain
Well
Bore Well
River/ Canal


Borchapada
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0.0
20.0
40.0
60.0
Other
Rain
Well
Bore Well
River/ Canal


Nani Chikli
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal


Amroli
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal


Lavakoi
10 Hectare & above
4.0 to 9.99 Hectare
2.0 to 3.99 Hectare
1.01 to 1.99 Hectare
Upto 1 Hectare
0
10
20
30
40
Other
Rain
Well
Bore Well
River/ Canal

6.10. Intensity of Cropping by Land Size Category:

Cropping intensity in the tribal villages generally demonstrate close correspondence with the size of land holdings. The primary survey revealed that marginal farmers are growing double crops with indiscriminate use of groundwater in all the physiographic regions.

More than 85 per cent of the marginal farmers in Ferkuva village of Vindhyan Hill Ranges region display more than 150 per cent Cropping Intensity (CI), while the remaining cultivate less than 110 per cent of their land more than once. CI is better in Ambala village compared to other 3 villages. Together 81.3 per cent of marginal, small and semi-medium land owners are having more than 150 per cent CI. Less than 10 CI can be observed for 14 per cent marginal farmers and 6.3 per cent of semi-medium households.

CI is more in Aniyadri village compared to other villages of Orsang-Heran Plains region. There is one assumption that though irrigation facilities are better in Jabugam and Manjrol villages, but due to long duration of commercial crops cultivated over here CI is average for all land size categories.

Condition of double cropping is negligible among all land size categories in the villages of Narmada Gorge region except Nani Chikli village. Due to controlled irrigation usage and less wastage of irrigated water, a good percentage of households of Nani Chikli village are able to go for double cropping. Comparing the two sample villages of Nasvadi *taluka,* Amroli village show better result with more than 150 per cent CI for 15 per cent of households belonging to marginal and small land size categories taken together. Village Amroli falls in the western side of Nasvadi *taluka* where, proximity to Narmada Canal enables double cropping. One important observation regarding large land size category is that except Borchapada village all large land owners have CI less than 110 perhaps due to they could not get enough irrigated water in the *rabi* and summer season. Even if they can afford to buy irrigated water but physical constraints restrict multiple cropping. Marginal and small farmers utmost try to produce at least a few crops to survive, resulting in comparatively more percentage of households with better CI.

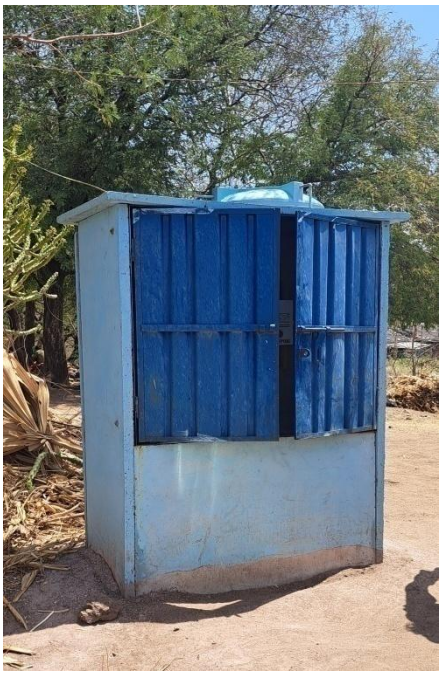


Plate 6.3: Water meter control system - Nani Chikli village (Kavant *Taluka*)

Table - 6.10
Intensity of Cropping by Land Size Category

Region	Village	Cropping Intensity (in %)	Percentage of Households by Land Size Class (In Hectares)				
			Up to 1	1.01 to 1.99	2.0 to 3.99	4.0 to 9.99	10 & above
Vindhyan Hill Ranges	Ferkuva	Less than 100	14.3				
		Between 100 to 130					
		Between 130 to 150					
		Above 150	85.7				
	Achhala	Less than 110	30.8	7.7			
		Between 110 to 130	7.7				
		Between 130 to 150		7.7	7.7		
		Above 150	23.1	15.4			
	Ambala	Less than 110	12.5		6.3		
		Between 110 to 130					
		Between 130 to 150					
		Above 150	62.5	12.5	6.3		
	Gabadia	Less than 110	14.3	28.6	7.1		7.1
		Between 110 to 130			7.1		
		Between 130 to 150	7.1				
		Above 150	14.3	7.1	7.1		

Orsang Heran Plains	Aniyadri	Less than 110	18.2	9.1	4.5	4.5	
		Between 110 to 130	9.1		4.5		
		Between 130 to 150	4.5				
		Above 150	31.8	9.1		4.5	
	Dholivav	Less than 110	39.1	13.0	4.3		
		Between 110 to 130					
		Between 130 to 150	8.7	4.3			
		Above 150	21.7		4.3	4.3	
	Jabugam	Less than 110	32.3	9.7	9.7	9.7	3.2
		Between 110 to 130					
		Between 130 to 150		3.2	3.2		
		Above 150	19.4	9.7			
	Manjrol	Less than 110	20.8	12.5	25.0	16.7	8.3
		Between 110 to 130					
		Between 130 to 150					
		Above 150	4.2		4.2	8.3	
	Vadadli	Less than 110	38.5		30.8		7.7
		Between 110 to 130	7.7				
		Between 130 to 150					
		Above 150	15.4				
Narmada Gorge	Borchapada	Less than 110	55.6	22.2	11.1		
		Between 110 to 130					
		Between 130 to 150					
		Above 150	5.6				5.6
	Nani Chikli	Less than 110	27.3	13.6	4.5		
		Between 110 to 130	4.5				
		Between 130 to 150		4.5	4.5		
		Above 150	27.3	9.1		4.5	
	Amroli	Less than 110	52.6	26.3		5.3	
		Between 110 to 130					
		Between 130 to 150					
		Above 150	10.5	5.3			
	Lavakoi	Less than 110	22.9	40.0	11.4	2.9	
		Between 110 to 130			8.6		
		Between 130 to 150	5.7				
		Above 150	5.7		2.9		

6.11. Sufficiency of Agricultural Production:

The primitiveness of agricultural practices influenced by physiography of the region is by and large reflected in the higher proportion of food deficient households. Around 77 to 90 per cent

of households are food deficient in the villages of Vidhyan Hill Ranges region. Among the four sample villages of the region, the proportion of food deficient households is relatively less in Achhala (76.9%) and Gabadia (78.6%) villages, where terrain is less undulating and more fertile. There are also a few food surplus households in these two villages. The same scenario can be observed in the Narmada Gorge region, where the Borchapada, Amroli and Lavakoi villages with agriculturally unsuitable topography are completely devoid of food surplus households. However, Nani Chikli village in this region, with relatively more plain topography has 14 per cent food surplus households. Compared to the villages of Vidhyan Hill Ranges, the villages of Narmada Gorge region have higher proportion of food sufficient households.

The proportion of food deficient households in the villages of Orsang-Heran Plains region is by and large comparable with the corresponding proportions in the villages of the other two regions. However, unlike in the villages of the latter regions, every village of this region has some food surplus households. Particularly the two mixed villages of Jabugam (12.12%) of Bodeli *taluka* and Vadadli (13.33%) of Sankheda *taluka* have the highest percentage of food surplus households among all sample villages. The net irrigated area and the proportion of food surplus households is higher in this region compared to the other two physiographic regions. However, all the tribal households of this region are food deficient. In other words, the non-tribal households of Orsang-Heran Plains region have performed better than their tribal counter parts in the villages. However, it was observed during the field survey that in Vindhyan Hill Ranges and Narmada Gorge regions, tribal farmers may be food deficient but they live a peaceful life. The intervening exogenous influences in the Orsang-Heran Plains region are comparatively more than the other two regions.

Table - 6.11
Agricultural Production Sufficiency

Region	*Taluka*	Village	Percentage of Households to all Households		
			Food Deficient	Self Sufficient	Food Surplus
Vindhyan Hill Range	Ch. Udepur	Ferkuva	90.0 (9)	10.0 (1)	-
		Achhala	76.9 (10)	7.7 (1)	15.4 (2)
		Ambala	87.5 (21)	12.5 (3)	-
		Gabadia	78.6 (11)	14.3 (2)	7.14 (1)
Orsang Heran Plain	Jetpur Pavi	Aniyadri	72.7 (16)	22.7 (6)	4.6 (1)
	Bodeli	Dholivav	82.6 (19)	8.7 (2)	8.7 (2)

		Jabugam	75.76 (25)	12.12 (4)	12.12 (4)
	Sankheda	Manjrol	74.2 (23)	16.1 (5)	9.67 (3)
		Vadadli	86.67 (13)	-	13.33 (2)
Narmada Gorge	Kavant	Borchapada	83.33 (15)	16.67 (3)	-
		Nani Chikli	72.7 (16)	13.6 (3)	13.6 (3)
	Nasvadi	Amroli	69.6 (16)	30.4 (7)	-
		Lavakoi	74.3 (26)	25.7 (9)	-

6.12. Cropping Pattern by Size of Land Holding:

Cropping pattern of any region displays influences of climate, soil and topography or in a nutshell, access to resources. Cropping pattern also varies by size of the land under the plough. Marginal and small land holders mostly produce food crops for subsistence, while large land holders venture producing cash crops with higher inputs.

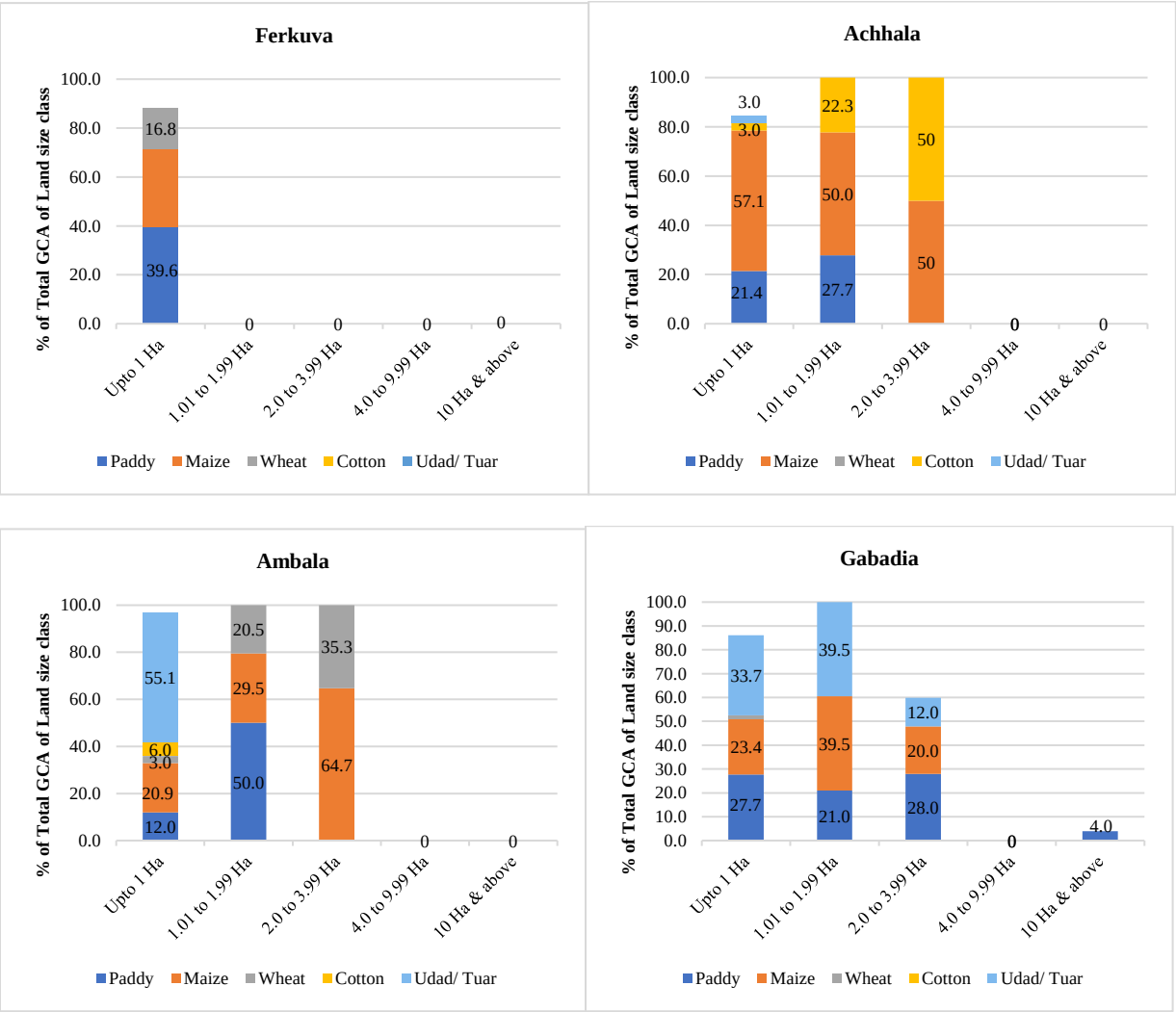
In Ferkuva village of Vindhyan Hill Ranges region Maize and wet Rice are major crops. The marginal land owners of the village cultivate only cereal crops. Other three villages in this hilly region mainly produce Maize, Rice, Cotton and Pulses, but in case of marginal to semi-medium land sizes percentage of area under Wheat and Cotton cultivation is less as these crops are capital intensive and have longer gestation period. Gabadia is the only village where farmers are producing Paddy, Maize and *Udad* with more or less in a parity between marginal, small and semi medium land sizes.

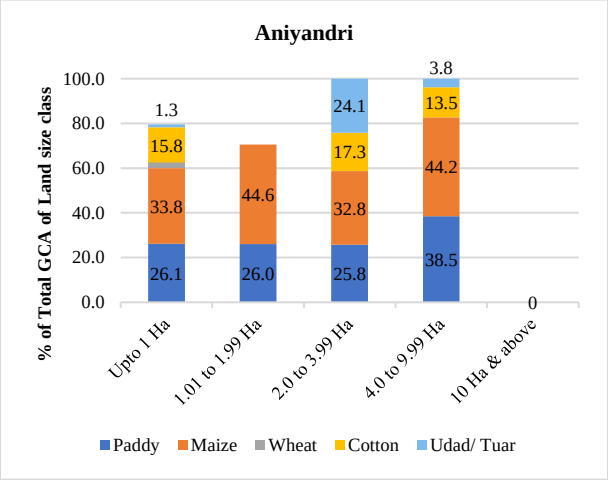
Excepting the predominantly tribal villages of Aniyadri (100%) and Dholivav (87%) in the Orsang-Heran Plains region, the other three villages with relatively less proportion of tribal population display dominance of commercial crops like Cotton and Banana in all land size categories. The large land holders are dependent on Cotton and Maize. They can afford to keep their land under cotton, which takes almost six to eight months to mature.

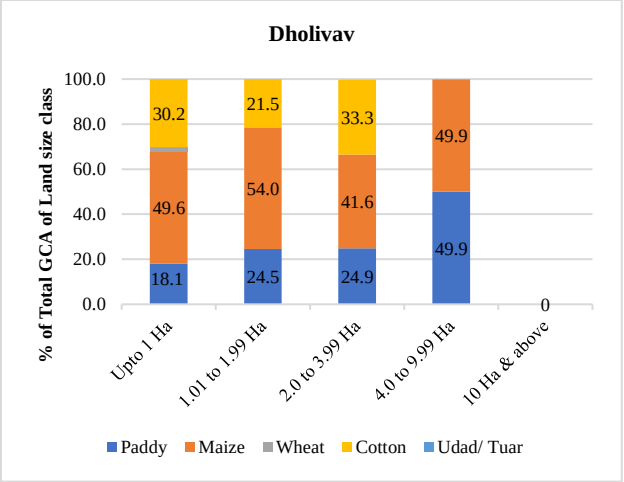
The sample villages of Narmada Gorge region display different cropping pattern. Cultivation of Maize, Cotton and commercial crops is common to all land size categories of the villages of the region. Recently the farmers of the region have started cultivation of new commercial crops. For example, Nani Chikli village has reported cultivation of Soyabean as a new commercial crop. Excepting the large farmers of Lavakoi and Amroli villages of Nasvadi *taluka,* all other farmers are invariably producing cash crops such as, Cotton, Pulses, Banana and fodder

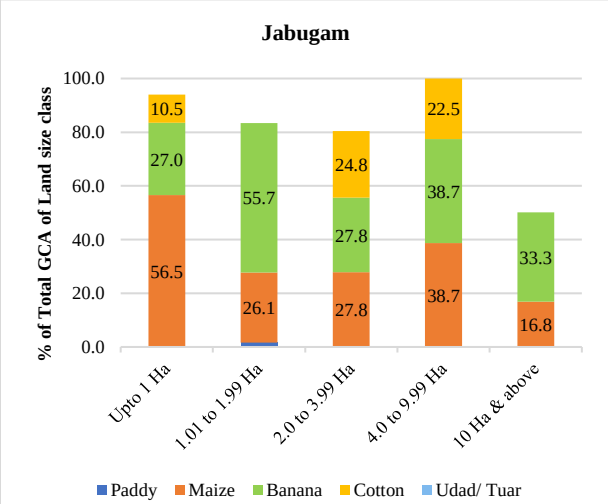
crops. Amroli village has achieved exceptional development of only Banana cultivation by farmers of the 2 to 3.99 hectares land sizes.

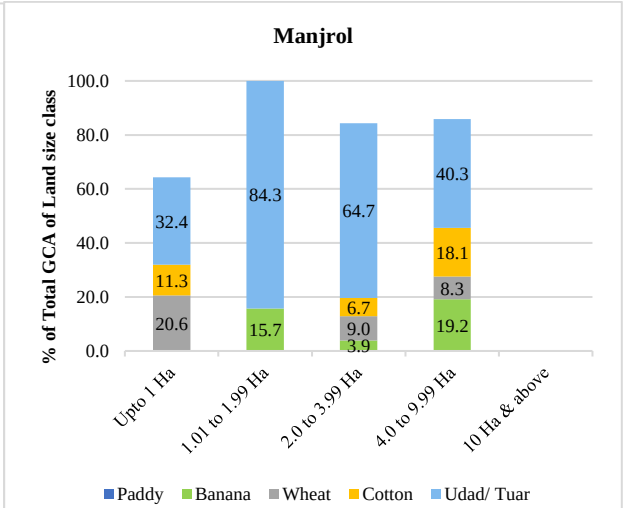
Figure - 6.4
Cropping Pattern by Size of Land Holding

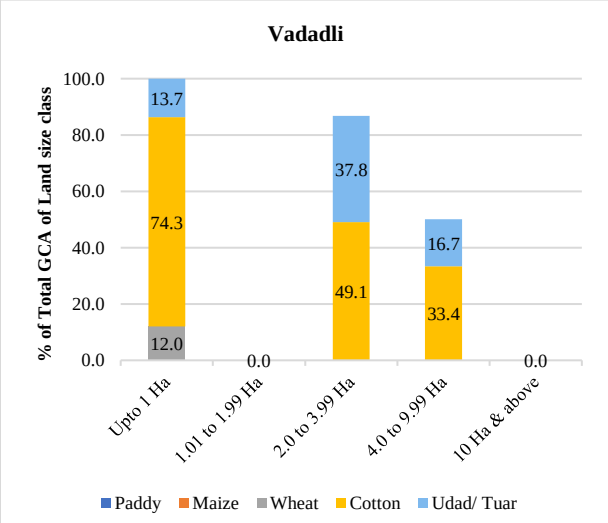


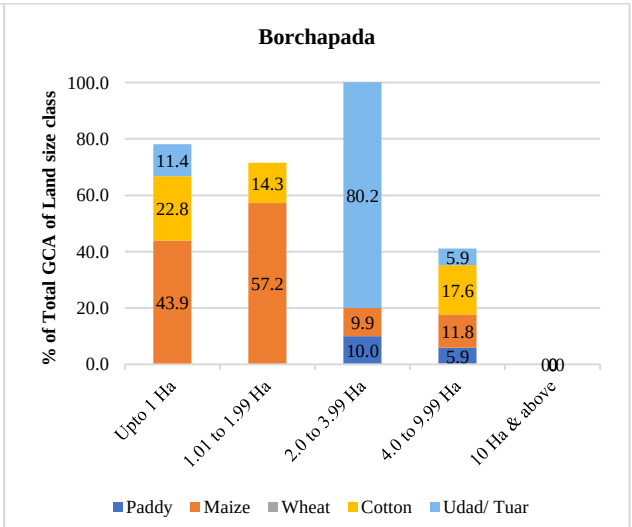

Aniyandri
% of Total GCA of Land size class
100.0
80.0
60.0
40.0
20.0
0.0
1.3
15.8
33.8
26.1
44.6
26.0
24.1
17.3
32.8
25.8
3.8
13.5
44.2
38.5
0
Upto 1 Ha
1.01 to 1.99 Ha
2.0 to 3.99 Ha
4.0 to 9.99 Ha
10 Ha & above
Paddy
Maize
Wheat
Cotton
Udad/ Tuar

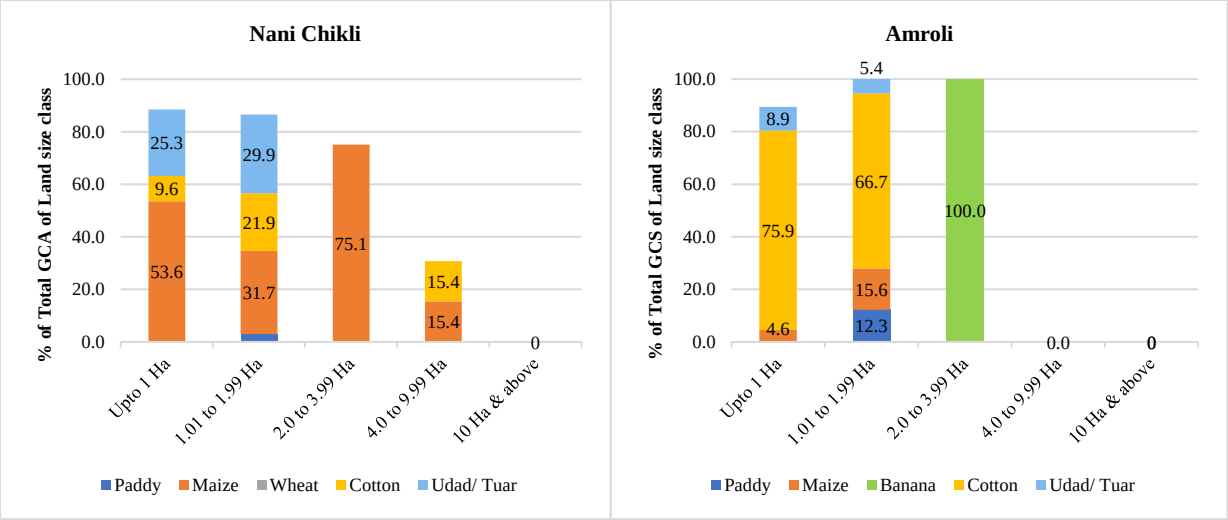

Dholivav
% of Total GCA of Land size class
100.0
80.0
60.0
40.0
20.0
0.0
30.2
49.6
18.1
21.5
54.0
24.5
33.3
41.6
24.9
49.9
49.9
0
Upto 1 Ha
1.01 to 1.99 Ha
2.0 to 3.99 Ha
4.0 to 9.99 Ha
10 Ha & above
Paddy
Maize
Wheat
Cotton
Udad/ Tuar

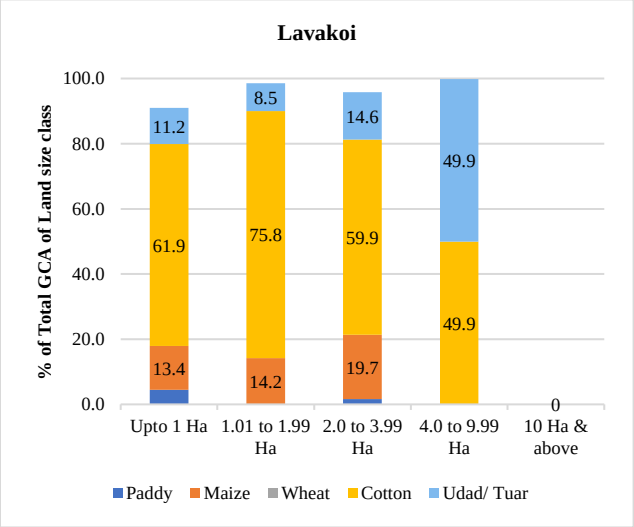

Jabugam
% of Total GCA of Land size class
100.0
80.0
60.0
40.0
20.0
0.0
10.5
27.0
56.5
55.7
26.1
24.8
27.8
27.8
22.5
38.7
38.7
33.3
16.8
Upto 1 Ha
1.01 to 1.99 Ha
2.0 to 3.99 Ha
4.0 to 9.99 Ha
10 Ha & above
Paddy
Maize
Banana
Cotton
Udad/ Tuar


Manjrol
% of Total GCA of Land size class
100.0
80.0
60.0
40.0
20.0
0.0
32.4
11.3
20.6
84.3
15.7
64.7
6.7
9.0
3.9
40.3
18.1
8.3
19.2
Upto 1 Ha
1.01 to 1.99 Ha
2.0 to 3.99 Ha
4.0 to 9.99 Ha
10 Ha & above
Paddy
Banana
Wheat
Cotton
Udad/ Tuar


Vadadli
% of Total GCA of Land size class
100.0
80.0
60.0
40.0
20.0
0.0
13.7
74.3
12.0
0.0
37.8
49.1
16.7
33.4
0.0
Upto 1 Ha
1.01 to 1.99 Ha
2.0 to 3.99 Ha
4.0 to 9.99 Ha
10 Ha & above
Paddy
Maize
Wheat
Cotton
Udad/ Tuar


Borchapada
% of Total GCA of Land size class
100.0
80.0
60.0
40.0
20.0
0.0
11.4
22.8
43.9
14.3
57.2
80.2
9.9
10.0
5.9
17.6
11.8
5.9
0.0
Upto 1 Ha
1.01 to 1.99 Ha
2.0 to 3.99 Ha
4.0 to 9.99 Ha
10 Ha & above
Paddy
Maize
Wheat
Cotton
Udad/ Tuar





6.13. Occupation and Structure of Workforce:

Based on the 2011 Census figures, total workforce ranges between 30 to 65 per cent of the total population of the respective sample villages. On the extreme ends are the two villages of Narmada Gorge region; Lavakoi of Nasvadi *taluka* with 64.51 per cent, and Nani Chikli of Kavant *taluka* with 29.13 per cent of population participating in economically gainful activities. While between 43 to 69 per cent of the males are registered as workers, the worker segment among the females of the regions range between a meagre 1.68 per cent in Dholivav village of Orsang-Heran Plains and 64.62 per cent in Lavakoi village of Narmada Gorge region. The population of the sample villages mostly work as cultivators, agricultural labourers both within and outside the villages, and causal migrant labourers in unorganized sectors of the neighbouring urban centers. A

small proportion is also engaged in business, mining activities, services in government and semi-government organizations. The variations in the percentage of workers across villages are related to the availability of these employment opportunities and economic structure of the population. With reference to the latter, it is observed that the landless and households with smaller land holdings of the sample villages work as casual agricultural labourers both within and outside the villages during the cropping season and during the off season migrate out to in search of wage labour.

Between 45 to 100 per cent of the workers have registered as main workers in 2011. However, percentage of main workers remain exceptionally high, varying between 63.74 per cent in Dholivav and 100 per cent in Vadadli villages of Orsang-Heran Plains. Almost all (99.16%) workers of Lavakoi village of Narmada Gorge region are also main workers. Male workers in all excepting a few villages are main workers. On the other hand, the percentage share of female main workers is exceptionally low in majority of the villages. Particularly in the fully tribal villages of Ferkuva, Gabadia, Nani Chikli and Amroli villages, less than 10 per cent of the female workers are main workers. Besides, majority of the females in all the sample villages prefer to work in agriculture and related activities. One particular case is Vadadli village, where all the female workers are engaged in agricultural operations. This may be ascribed to the activities in which females engage themselves. Female work participation is generally restricted to agricultural activities, which are available for only a few months in a year.

Among the main workers, percentage share of cultivators and agricultural labourers is much higher than non-agricultural workers, i.e. in household industries and other workers. As suitable opportunities in other sectors are not available, the tribal workers prefer to seek employment as agricultural labourers both within and outside the village, and/or as migrant wage earners in the unorganized sectors of the neighbouring urban-industrial centers.

Table - 6.12
Sample Villages – Percentage Share of Total Workers and Main Workers

Region	*Taluka*	Village	Total Workers*			Main Worker**		
			Persons	Male	Female	Persons	Male	Female
Vindhyan Hill Ranges	Chhota Udaipur	Ferkuva	46.77	42.92	50.54	46.00	90.84	8.56
		Achhala	54.24	53.18	55.36	52.93	83.79	21.43
		Ambala	43.90	50.07	38.06	78.73	91.32	63.07

		Gabadia	42.53	52.75	31.51	46.64	67.11	9.66
Orsang - Heran Plain	Jetpur Pavi	Aniyadri	51.78	61.95	41.02	86.72	98.48	67.92
	Bodeli	Dholivav	33.28	62.89	1.68	63.74	64.50	33.33
		Jabugam	39.14	59.13	17.96	89.71	92.88	78.66
	Sankheda	Manjrol	57.72	68.83	46.12	80.66	91.51	63.78
		Vadadli	54.14	63.26	44.73	100.00	100.00	100.0
Narmada Gorge	Kavant	Borchapada	54.24	56.64	51.97	56.88	84.77	28.27
		Nani Chikli	29.13	47.52	9.36	61.27	70.83	9.09
	Nasvadi	Amroli	54.83	63.82	45.54	45.14	72.97	4.80
		Lavakoi	64.51	64.40	64.62	99.16	100.00	98.28

Note: * As percentage to total population. ** As percentage to total workers. Source: Census of India, 2011.

Table - 6.13
Sample Villages –Share of Main Agricultural and Non-Agricultural Workers

Region			**Agricultural Workers**						**Non-Agricultural Workers**					
			Cultivators			**Agricultural Labour**			**Household Industries**			**Other workers**		
	Taluka	**Village**	**P**	**M**	**F**	**P**	**M**	**F**	**P**	**M**	**F**	**P**	**M**	**F**
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	94.9	98.4	64.3	2.54	0.40	21.4	0.0	0.0	0.0	2.5	1.1	14.3
		Achhala	61.3	73.2	14.0	37.4	25.5	85.1	0.0	0.0	0.0	1.2	1.0	0.88
		Ambala	44.1	35.7	59.1	34.0	35.3	31.8	5.2	7.9	0.3	16.7	13.5	8.84
		Gabadia	59.8	62.1	30.00	27.7	25.5	55.0	0.0	0.0	0.0	12.5	11.4	15.0
Orsang - Heran Plains	Jetpur Pavi	Aniyadri	32.8	44.6	5.2	61.1	48.9	89.6	3.3	3.8	2.3	2.7	1.8	2.9
	Bodeli	Dholivav	75.3	75.7	40.0	21.2	20.7	60.0	0.5	0.5	0.0	3.1	3.1	0.0
		Jabugam	22.5	24.6	13.8	30.9	25.1	55.1	1.6	1.7	1.6	44.9	39.2	29.5
	Sankheda	Manjrol	22.9	30.0	6.9	74.4	66.2	92.6	0.0	0.0	0.0	2.8	2.6	0.5
		Vadadli	2.8	4.8	0.0	96.6	94.3	100.0	0.0	0.0	0.0	0.5	0.5	0.0
Narmada Gorge	Kavant	Borchapada	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
		Nani Chikli	40.2	41.2	0.0	55.2	55.3	50.00	0.6	0.6	0.0	4.0	2.9	50.0
	Nasvadi	Amroli	24.9	25.7	8.3	56.1	56.5	45.83	0.9	0.9	0.0	18.1	16.1	45.8
		Lavakoi	45.6	82.1	6.1	51.5	13.8	92.1	0.0	0.0	0.0	2.9	2.1	1.7

Source: Census of India, 2011.

Marginal workers account for a relatively higher proportion of workers in Vindhyan Hill Ranges region. More than half of the worker population in Ferkuva (54.0%) and Gabadia (53.36%) villages of the region have returned themselves as marginal workers in 2011. Excepting for

Lavakoi village (0.84%), similar situation can also be observed in the villages of Narmada Gorge region. Amroli village of this region has the highest (54.86%) percentage of marginal workers. The marginal workers in the Orsang-Heran Plains region are very less in proportion. Vadadli village distinctly stands out without a single marginal worker. Excepting Dholivav (36.26%), other villages of the region have registered less than 20 per cent of workers as marginal workers. It is worthy to note that the share of female marginal workers extraordinarily outnumbers the share of male marginal workers in all sample villages. Excepting for Gabadia village (32.89%) in Vidhyan Hill Ranges region, Dholivav village (35.50%) in Orsang-Heran Plains region, and Nani Chikli (29.17%) and Amroli (27.03%) village in Narmada Gorge region, the percentage of male marginal workers is less than 20 per cent in all the sample villages. In some of the villages this share is by and large insignificant. On the other hand, the share of female marginal workers is rarely insignificant in the sample villages, excepting in the two villages of Vadadli (0.00%) and Lavakoi (1.72%). The percentage of female marginal workers vary between 21.34 per cent (Jabugam) and 95.20 per cent (Amroli) across the sample villages. It is also worthy to note that majority of the marginal workers of all villages under study are engaged in the agricultural sector. This generalization is more appropriate in case of the female marginal workers. Excepting for the three villages of Ferkuva (33.95%), Ambala (40.15%) and Jabugam (38.62%), all sample villages have registered less than 20 per cent marginal workers in the non-agricultural activities, which is nil or insignificant in some cases.

Table - 6.14
Sample Villages - Share of Marginal Agricultural and Non-Agricultural Workers

Region	*Taluka*	Village	Total Marginal Workers			Agricultural Workers						Non-Agri. Workers		
						Cultivators			Agri. Labourers					
			P	M	F	P	M	F	P	M	F	P	M	F
Vindhyan Hill Range	Ch. Udepur	Ferkuva	54.0	9.2	91.4	1.8	8.0	1.3	64.2	92.0	61.9	33.9	0.0	36.8
		Achhala	47.1	16.2	78.5	26.3	26.1	26.3	73.1	73.9	72.9	0.6	0.0	0.72
		Ambala	21.2	8.7	36.9	12.4	3.2	15.1	47.4	58.1	44.3	40.1	38.7	40.6
		Gabadia	53.3	32.9	90.3	1.9	1.6	2.1	78.4	55.3	93.6	19.7	43.1	4.3
Orsang Heran Plain	Jetpur Pavi	Aniyadri	13.3	1.5	32.1	4.5	18.2	3.5	82.7	54.5	84.8	12.8	27.3	11.7
	Bodeli	Dholivav	36.3	35.5	66.7	4.5	3.8	20.0	78.9	80.7	40.0	16.6	15.5	40.0
		Jabugam	10.3	7.1	21.3	8.3	8.9	7.5	53.1	52.6	53.7	38.6	38.5	38.8
	Sankheda	Manjrol	19.3	8.5	36.2	26.4	18.5	29.3	70.9	75.3	69.4	2.6	6.2	1.3
		Vadadli	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Narmada Gorge	Kavant	Borchapada	43.1	15.2	71.7	3.4	8.1	2.3	96.6	91.9	97.6	0.0	0.0	0.0
		Nani Chikli	38.7	29.2	90.9	0.9	1.4	0.0	95.4	94.3	97.5	3.6	4.3	2.5
	Nasvadi	Amroli	54.8	27.0	95.2	1.6	2.0	1.5	95.7	90.8	97.7	2.7	7.1	0.8
		Lavakoi	0.8	0.0	1.7	0.0	0.0	0.0	100	0.0	100	0.0	0.0	0.0

Source: Census of India, 2011.

Majority of the tribal population of Gujarat lives in the hilly, forested and agriculturally unsuitable tracts. The ecology of their habitat was suitable for hunting and food gathering mode of economy with minor dependence on primitive agriculture. Through the processes of development starting from the British era, the tribes are bereft of their traditional resource base, and are left with no option other than depending on cultivation of crops in their agriculturally not so suitable habitats. Agricultural unsuitability of the tribal habitats and lack of required awareness and skill of the tribes about crop cultivation, render insufficient returns. As performance of agriculture and related activities in the region is poor, complete dependence on it for survival is impossible excepting for a few large land holders. The single crop cultivation practice by the farmers, whether involving food crops or cash crops, does not yield enough for the entire year. To compensate meagre earnings from agriculture and related activities, majority of the households from across different land size categories in the sample villages seek employment in the urban unorganized sector as casual daily wage labourers. A countable number also gets absorbed in the service sector as school teachers, bank employees, workers in the *Panchayat* office and *Anganwadi*. A very insignificant proportion of households also operate small business. While the landless completely depend on such works other than working during the agricultural season as agricultural labourers, members of the land-owning families work as cultivators as well as agricultural labourers, and take up other jobs after the cropping season to compensate the shortfall of their agricultural produce.

Orsang-Heran Plains region being an area dominated by non-tribal population, which has better levels of literacy and education as well as awareness, display higher percentage workers in the service sector particularly in skill-based activities, like services, tailoring, transport and shops. Contribution of secondary and tertiary sectors for sustenance of tribal farmers in the villages of Vindhyan Hill Ranges and Narmada Gorge regions are negligible. Agro-climatic conditions and

marginal land holdings are threats for tribal farmers, which often drive them to opt for labour work as migrants for a season.

The field observations revealed the following pertaining to the subsidiary works taken up by the tribes to make a living:

- Majority of the female marginal workers are engaged in the agricultural sector as wage labourers.
- Higher proportion of non-agricultural works taken up as subsidiary occupations are as other workers, implying thereby lack of scope for the tribes to work in the household industries.
- Non-agricultural labourers usually take up construction and mining works as subsidiary occupation.
- A few members of the landless and small size land owners are engaged in different shops in nearby towns or in the village itself for livelihood.

Plate 6.4: Banks in Jabugam – providing employment opportunity in Tertiary sector

- Some of the educated members have joined the government and semi-government operated establishments in the village like, commercial banks, health centers etcetera.
- Majority of the migrants or commuters in search of subsidiary works go to nearby towns of Vadodara, Surat and Bodeli.

There are a few observations regarding the outcomes of land size category-wise workplace of the sample households in Chhota Udepur district. During agricultural season two significant workplaces are coming out from all land-size categories, within village and outside village. But majority of the farmers are working within village during four months of agricultural season.

Ferkuva, Gabadia, Jabugam and Manjrol are four villages where hundred per cent households work within the village. For Jabugam and Manjrol, landowners from all land size categories are working inside village as they are getting enough jobs. Even marginal and small farmers are engaged within the village. In Gabadia and Ferkuva villages of Vindhyan Hill Ranges region, hundred per cent of households are working within the village with all efforts and capital to produce sufficient cereal crop for the whole year.

Except Amroli village of Narmada Gorge region, all landless households from all the three regions are working within the villages during the agricultural season. They get suitable job opportunities as agricultural labourers of land-owning households. In Amroli village of Nasvadi *taluka*, only 25 per cent of landless category households go outside the District for earning their livelihood.

Aniyadri, Dholivav and Vadadli villages of Orsang-Heran Plains region and all the four villages of the Narmada Gorge region show that farmers from the sample households migrate to places outside the village or District during the agricultural season. Though in these villages the percentage of households migrating are much less compared to the percentage of households working inside the village. Perhaps due to permanent jobs or government jobs, members of a few households opt to work outside the village or outside the District during farming season.

During the agricultural off-season, some tribal farmers migrate to other districts due to inhospitable weather conditions in the summer months. Landless and marginal farmers migrate to distant districts within the State in search of jobs like agricultural labour, construction worker or other works in unorganized sectors.

One important observation is that, large land-owning households usually do not migrate to other districts due to less requirement of additional income.

Marginal and small land size category landowners mostly travel with their families as contract labourers to Saurashtra, Kathiawad and Surat. Their migration period usually lasts for about 6 months. Observations regarding the number of family members in the households, size of land and quantity of crops produced suggests that food production is not sufficient for sustenance of the family for the whole year. Off-season migration is utmost necessary for tribal farmers,

especially for small and marginal farmers, as it provides them with opportunities of procuring more money to sustain their livelihood.

Table - 6.15

Workplace of Households and Migration

Region	Village	Land Size Class	Land Size-Wise Percentage of Households by Workplace During Agricultural Season					Land Size-Wise Percentage of Households Reporting Migration of Members During Off Season
			Within Village	Outside Village	Within *Taluka*	Outside *Taluka*	Outside District	
Vindhyan Hill Ranges	Ferkuva N=10	Landless	100 (3)	0	0	0	0	67 (2)
		Below 1.00 hectare	100 (7)	0	0	0	0	57 (4)
		Total	**100 (10)**	**0**	**0**	**0**	**0**	**60 (6)**
	Achhala N=13	Below 1.00 hectare	87.5 (7)	0	0	0	12.5 (1)	12.5 (1)
		1.00-1.99 hectare	50 (2)	25 (1)	0	0	25 (1)	50 (2)
		2.00-3.99 hectare	100 (1)	0	0	0	0	0
		Total	**76.9 (10)**	**7.7 (1)**	**0.0**	**0.0**	**15.4 (2)**	**23.1 (3)**
	Ambala N=24	Landless	100 (8)	0	0	0	0	25 (2)
		Below 1.00 hectare	91.7 (11)	0	0	0	8.3 (1)	0
		1.00-1.99 hectare	100 (2)	0	0	0	0	50 (1)
		2.00-3.99 hectare	100 (2)	0	0	0	0	100 (2)
		Total	**95.8 (23)**	**0**	**0**	**0**	**4.2(1)**	**20.8 (5)**
	Gabadia N=14	Below 1.00 hectare	100 (5)	0	0	0	0	7.14 (1)
		1.00-1.99 hectare	100 (5)	0	0	0	0	7.14 (1)
		2.00-3.99 hectare	100 (3)	0	0	0	0	14.3 (2)
		Above 10 hectares	100 (1)	0	0	0	0	0
		Total	**100 (14)**	**0**	**0**	**0**	**0**	**28.57 (4)**
Orsang Heran Plains	Aniyadri N=22	Below 1.00 hectare	85.7 (12)	7.14 (1)	7.14 (1)	0	0	14.3 (2)
		1.00-1.99 hectare	100 (4)	0	0	0	0	25 (1)
		2.00-3.99 hectare	100 (2)	0	0	0	0	50 (1)
		4.00-9.99 hectare	100 (2)	0	0	0	0	0
		Total	**90.9 (20)**	**4.5 (1)**	**4.5 (1)**	**0**	**0**	**18.2 (4)**
	Dholivav N=23	Below 1.00 hectare	93.7 (15)	6.25 (1)	0	0	0	14.3 (2)
		1.00-1.99 hectare	75 (3)	0	25 (1)	0	0	0
		2.00-3.99 hectare	100 (2)	0	0	0	0	50 (1)
		4.00-9.99 hectare	100 (1)	0	0	0	0	0
		Total	**91.3 (21)**	**4.3 (1)**	**4.3 (1)**	**0**	**0**	**13.0 (3)**
	Jabugam N=33	Landless	100 (2)	0	0	0	0	50 (1)
		Below 1.00 hectare	100 (16)	0	0	0	0	31.2 (5)

		1.00-1.99 hectare	100 (7)	0	0	0	0	28.6 (2)
		2.00-3.99 hectare	100 (4)	0	0	0	0	50 (2)
		4.00-9.99 hectare	100 (3)	0	0	0	0	0
		Above 10 hectares	100 (1)	0	0	0	0	100 (1)
		Total	**100 (33)**	**0**	**0**	**0**	**0**	**33.3 (10)**
	Manjrol N=31	Landless	100 (7)	0	0	0	0	28.6 (2)
		Below 1.00 hectare	100 (6)	0	0	0	0	50 (3)
		1.00-1.99 hectare	100 (3)	0	0	0	0	33.3 (1)
		2.00-3.99 hectare	100 (7)	0	0	0	0	28.6 (2)
		4.00-9.99 hectare	100 (8)	0	0	0	0	75.0 (6)
		Total	**100 (31)**	**0**	**0**	**0**	**0**	**45.2 (14)**
	Vadadli N=15	Landless	100 (2)	0	0	0	0	0
		Below 1.00 hectare	100 (8)	0	0	0	0	25 (2)
		2.00-3.99 hectare	75 (3)	25 (1)	0	0	0	25 (1)
		4.00-9.99 hectare	100 (1)	0	0	0	0	0
		Total	**93.3 (14)**	**6.7 (1)**	**0**	**0**	**0**	**20 (3)**
Narmada Gorge	Borchapada N=18	Below 1.00 hectare	81.8 (9)	0	9.1 (1)	0	9.1 (1)	60 (6)
		1.00-1.99 hectare	75 (3)	0	0	0	25 (1)	100 (4)
		2.00-3.99 hectare	100 (2)	0	0	0	0	100 (2)
		4.00-9.99 hectare	0	0	100 (1)	0	0	0
		Total	**77.8 (14)**	**0**	**11.1 (2)**	**0**	**11.1 (2)**	**66.7 (12)**
	Nani Chikli N=22	Below 1.00 hectare	84.6 (11)	15.4 (2)	0	0	0	23.1 (3)
		1.00-1.99 hectare	100 (6)	0	0	0	0	33.3 (2)
		2.00-3.99 hectare	100 (2)	0	0	0	0	50 (1)
		4.00-9.99 hectare	100 (1)	0	0	0	0	0
		Total	**90.0 (20)**	**10 (2)**	**0.0**	**0.0**	**0**	**30 (6)**
	Amroli N=23	Landless	75 (3)	25 (1)	0	0	0	25 (1)
		Below 1.00 hectare	100 (12)	0	0	0	0	25 (3)
		1.00-1.99 hectare	100 (6)	0	0	0	0	16.7 (1)
		4.00-9.99 hectare	100 (1)	0	0	0	0	0
		Total	**95.6 (22)**	**4.3 (1)**	**0**	**0**	**0**	**17.4 (4)**
	Lavakoi N=35	Below 1.00 hectare	100 (12)	0	0	0	0	41.7 (5)
		1.00-1.99 hectare	92.8 (13)	0	0	0	7.1 (1)	42.8 (6)
		2.00-3.99 hectare	100 (8)	0	0	0	0	25 (2)
		4.00-9.99 hectare	100 (1)	0	0	0	0	0
		Total	**97.1 (34)**	**0**	**0**	**0**	**2.9 (1)**	**37.1 (13)**

Utilization of available resources with continuity and sustainability depends not only on the customs and beliefs of the society, but also on the level of awareness among people. With reference to the awareness level of a society, literacy and level of education serve as the most appropriate parameters. These two are the most crucial skills required in the contemporary society.

Without these two, it is difficult to judiciously utilize the available resources. It is assumed that the population with higher level of awareness and understanding can make best use of the land suitable for crop cultivation, explore and venture into alternative economic avenues in agriculturally not so suitable areas, and improve their marketability in other sectors of the economy both within and outside the village. The levels of literacy and education in the sample villages located in three different natural settings can shed some light on the type of work the population is engaged in, the place of their work, and the economic prospects they may have. The predominantly non-tribal villages of Amroli, Dholivav, Manjrol, Jabugam and Vadadli in Narmada Gorge and Orsang-Heran Plains regions record more or less the same condition of literacy (59-66%).

The villages of Vidhyan Hill Ranges region and the fully tribal villages of other two regions record 20 to 40 per cent literacy except Lavakoi village (70.85%) of Narmada Gorge region, which has the highest literacy rate among all sample villages. Female literacy is invariably low especially in the tribal villages of all regions. Literate females of the fully tribal villages constitute 19 to 38 per cent of their respective total female populations, while 50 to 60 of their counterparts in the villages dominated by non-tribal populations do so.

Though the literacy drive programme under *Sarva Shiksha Avhiyan* has equipped all tribal villages with primary schools, still there are 69 per cent illiteracy in Ambala village of Vindhyan Hill Ranges region. The percentage share of children going to primary schools is increasing, but there is a descending order of children attending school above primary level. Level of education in the villages of Orsang-Heran Plains region is however relatively more balanced.

Table - 6.16
Sample Villages - Share of Percentage Literacy

Region	*Taluka*	Village	Persons	Male	Female
Vindhyan Hill Ranges	Chhota Udaipur	Ferkuva	26.42	33.65	19.32
		Achhala	34.66	41.43	27.47
		Ambala	34.29	39.90	28.98
		Gabadia	35.14	44.43	25.11
Orsang-Heran Plains	Jetpur Pavi	Aniyadri	46.76	58.10	34.75
	Bodeli	Dholivav	59.58	71.17	47.20
		Jabugam	66.00	71.11	60.58
	Sankheda	Manjrol	66.26	73.45	58.77
		Vadadli	58.63	62.15	54.99

		Borchapada	38.60	38.60	38.60
	Kavant	Nani Chikli	30.97	40.79	20.43
		Amroli	65.49	74.74	55.92
Narmada Gorge	Nasvadi	Lavakoi	70.85	70.94	70.75

Source: Census of India, 2011

Table - 6.17
Education Level of Sample villages

Region	***Taluka***	**Village**	**Illiterate**			**Primary School**		
			P	**M**	**F**	**P**	**M**	**F**
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	57.69	51.85	64.00	30.77	37.04	24.00
		Achala	55.10	45.83	64.00	6.12	8.33	4.00
		Ambala	69.44	71.15	67.86	14.81	9.62	19.64
		Gabadia	25.00	20.51	30.30	30.56	33.33	27.27
	Total		**51.81**	**47.34**	**56.54**	**20.57**	**22.08**	**18.73**
Orsang-Heran Plains	Jetpur Pavi	Aniyadri	26.09	20.97	32.08	17.39	11.29	24.53
	Bodeli	Dholivav	18.35	12.28	25.00	17.43	14.04	21.15
		Jabugam	6.09	6.78	5.36	19.13	23.73	14.29
	Sankheda	Manjrol	13.18	9.84	16.18	14.73	11.48	17.65
		Vadadli	13.24	12.82	13.79	25.00	28.21	20.69
	Total		**15.39**	**12.54**	**18.48**	**18.74**	**17.75**	**19.66**
Narmada Gorge	Kavant	Borchapada	42.98	41.82	44.07	21.05	20.00	22.03
		Nani Chikli	43.28	28.95	62.07	19.40	21.05	17.24
	Nasvadi	Amroli	24.68	15.79	33.33	36.36	44.74	28.21
		Lavakoi	31.03	27.87	34.55	18.97	19.67	18.18
	Total		**35.49**	**28.61**	**43.50**	**23.95**	**26.37**	**21.42**

Region	***Taluka***	**Village**	**Secondary School**			**Higher Secondary School**			**Graduate and Others**		
			P	**M**	**F**	**P**	**M**	**F**	**P**	**M**	**F**
Vindhyan Hill Ranges	Ch. Udepur	Ferkuva	0.0	0.0	0.0	9.6	7.4	12.0	1.9	3.7	0.0
		Achala	16.3	16.7	16.0	20.4	25.0	16.0	2.0	4.2	0.0
		Ambala	10.2	11.5	8.9	1.8	3.8	0.0	3.7	3.8	3.6
		Gabadia	27.8	23.1	33.3	11.1	17.9	3.0	5.6	5.1	6.1
	Total		**13.6**	**12.8**	**14.6**	**10.8**	**13.5**	**7.8**	**3.3**	**4.2**	**2.4**
Orsang Heran Plains	Jetpur Pavi	Aniyadri	31.3	33.9	28.3	19.1	27.4	9.4	6.1	6.5	5.7
	Bodeli	Dholivav	33.0	31.6	34.6	15.6	22.8	7.7	15.6	19.3	11.5
		Jabugam	27.8	18.6	37.5	16.5	11.9	21.4	30.4	38.9	21.4
		Manjrol	29.5	29.5	29.4	19.4	26.2	13.2	23.3	22.9	23.5

	Sankheda	Vadadli	45.6	43.6	48.3	11.8	7.69	17.24	4.41	7.7	0.0
	Total		**33.4**	**31.4**	**35.6**	**16.5**	**19.2**	**13.8**	**15.9**	**19.1**	**12.4**
Narmada Gorge	Kavant	Borchapada	16.7	20.0	13.6	10.5	10.9	10.2	8.8	7.3	10.2
		Nani Chikli	14.9	15.8	13.8	16.4	23.7	6.90	5.9	10.5	0.0
	Nasvadi	Amroli	28.6	23.7	33.3	10.4	15.8	5.13	0.0	0.0	0.0
		Lavakoi	31.9	36.1	27.3	12.1	11.5	12.73	6.0	4.9	7.3
	Total		**23.0**	**23.9**	**21.9**	**12.4**	**15.5**	**8.7**	**5.2**	**5.7**	**4.4**

6.14. Modernization of Agriculture:

Apart from education, the three natural regions are experiencing unprecedented transformation in terms of modern household assets and facilities such as, motor cycle, television, internet access, mobile phones, flour grinding machine etcetera. Other than these, the tribal farmers are also getting exposed to the modern methods of agriculture and implements, like fertilizers, pesticides, tractors etcetera.

6.15. Use of Fertilizers:

Fertilizer enhances the soil nutrients and supports crop production, and pesticides protect plants from pests and insects. According to soil type N: P_2O_5: K_2O combination varies. Together or separately farmers use N: P_2O_5: K_2O and other chemical fertilizers to increase crop yield and to get enough profit from the market to sustain livelihood. Fertilizers and pesticides are being used by the all farmers of the sample villages in varying quantities per unit area. Use of both the inputs is the highest among the farmers with smaller land holdings. With increase in the size of holding, use of the two inputs tend to decrease in the sample villages. Some of the medium and large land owners do not use pesticides at all. The marginal farmers of Manjrol (1170 Kg/He) followed by Aniyadri (1160.2 Kg/Ha) villages of Orsang-Heran Plains region use the highest per unit area fertilizer. Similarly, the marginal farmers of Achhala (549.1 Lt/Ha) village in Vindhyan Hill Ranges region followed by small farmers of Lavakoi (157.9 Lt/Ha) of Narmada Gorge region use the highest quantity of pesticides. Perusal of fertilizer and pesticide use in the villages across the three regions reveals that the villages of Orsang-Heran Plains are in the lead in terms of fertilizer use, and villages of Narmada Gorge region are in the lead in terms of pesticide use.

It was noticed during the field investigation that although the tribal farmers are aware of different fertilizers and pesticides, their knowledge to use them in appropriate proportion is extremely poor. Specially, the marginal and small size land owners apply fertilizers and pesticides indiscriminately with the expectation of getting maximum returns from their small holdings. Use of manures among them is almost nil. Rather, the medium and large land owner households use more manures and less fertilizers and pesticides. The case of the smaller size land owners is a matter of serious concern, as in the long run their small plots of land would suffer due to such indiscriminate use of chemicals. Therefore, making them aware of fertilizers and pesticides in appropriate proportions is of utmost importance. They should also be advised to use organic manure which are less expensive, environment friendly and easily available.

Table - 6.18
Use of Fertilizers and Pesticides by Land Size Category in Sample Villages

Item	Land Size Category (in Ha.)				
	Up to 1	1.01 to 1.99	2.0 to 3.99	4.0 to 9.99	10 & above
Ferkuva					
Fertilizer (Kg/Ha)	224.6				
Pesticide (Lt/Ha)	48.5				
Achhala					
Fertilizer (Kg/Ha)	394.1	454.4	46.3		
Pesticide (Lt/Ha)	549.1	10.7	15.4		
Ambala					
Fertilizer (Kg/Ha)	187.9	0	11.2		
Pesticide (Lt/Ha)	21.7	0	5.6		
Gabadia					
Fertilizer (Kg/Ha)	177.8	147.0	63.4	34.6	
Pesticide (Lt/Ha)	54.1	75.9	28.0	0	
Aniyadri					
Fertilizer (Kg/Ha)	1160.2	668.9	23.3	924.1	
Pesticide (Lt/Ha)	39.8	20.6	10.5	6.3	
Dholivav					
Fertilizer (Kg/Ha)	246.6	116.2	24.7	376.3	
Pesticide (Lt/Ha)	90.0	103.2	12.3	0	
Jabugam					
Fertilizer (Kg/Ha)	510.4	201.7	365.4	10.0	4.2
Pesticide (Lt/Ha)	34.9	36.6	48.0	5.0	2.1
Manjrol					
Fertilizer (Kg/Ha)	1170.0	427.6	114.1	170.4	
Pesticide (Lt/Ha)	31.6	67.4	10.1	0.9	
Vadadli					
Fertilizer (Kg/Ha)	620.3		74.6	5.15	
Pesticide (Lt/Ha)	32.9		9.3	2.6	
Borchapada					

Fertilizer (Kg/Ha)	402.6	206.7	365.2	44.5	
Pesticide (Lt/Ha)	53.3	11.2	1.8	12.4	
Nani Chikli					
Fertilizer (Kg/Ha)	750.8	180.9	49.4	21.5	
Pesticide (Lt/Ha)	126.5	70.7	24.7	0	
Amroli					
Fertilizer (Kg/Ha)	739.1	80.5	12.3		
Pesticide (Lt/Ha)	104.9	113.5	6.2		
Lavakoi					
Fertilizer (Kg/Ha)	695.9	260.3	144.1	73.5	
Pesticide (Lt/Ha)	124.5	157.9	4.5	0	

6.16. Expenses on Agricultural Inputs:

Total agricultural expenses for any region could be estimated by including all probable inputs. And by getting this expenditure for each region, the analysis can bring the desired result of awareness gap of the tribal farmers. The problems of poor infrastructural facilities like seed banks, roads, water and electricity and expenditure related to those are a good indicator for the development planners as well as researchers for future planning.

Use of technically efficient tools and implements, and different inputs can help in increasing the level of productivity. In India, technology and bio-chemical inputs have made a significant impact on agricultural productivity and cropping pattern (Singh, 1990: 105). Wooden plough, tractors, irrigation pump sets, plant protection equipment like dusters and sprayers and threshers are some of the examples of tools and equipment of farming. Except wooden plough all other farm equipment needs reasonable capital for owning or hiring them, which makes the farming capital intensive. Farm inputs are helpful for the farmers as it increases productivity of different crops, saves time and toil, reduces wastage of resources and ensures timely operations (Govt. of Gujarat, 2020: 56).

From the field investigation, information regarding farm inputs depicts continuation of traditional agricultural practices in Chhota Udepur. In addition, many farmers were apprehensive about revealing the use of inputs whether mechanical or bio-chemical.

Tilling land for cultivation as a part of land preparation needs tools. Land can be ploughed using either primitive or modern methods. Close association can be seen between use of a method and economic status of the household in Chhota Udepur district. Tilling land with tractor is capital

intensive so owning a tractor in tribal *talukas* invariably low in proportion except in the sample villages of Sankheda *taluka* in Orsang-Heran Plains region. Among all the sample villages, maximum proportion of farmers in the sample villages of Sankheda *taluka* are in possession of tractors, water pumps, and threshers.

Investment and management of critical input like seed is one of the major threats in Chhota Udepur district. For quality seed, farmers need to get awareness regarding investment and management of it. However, tribal farmers in most of the *talukas* lack in both. During the field investigation, no public or private seed bank or seed farm, and seed processing unit was noticed in any of the sample villages. The respondents not only confirmed this, but also informed the researcher about the absence of any such facility in the vicinity. Only intermittently, some seed research programmes are conducted at Jabugam village of Bodeli *taluka* by Anand Agricultural University (AAU) and Krishi Vigyan Kendra (Sankheda). Nevertheless, to increase awareness on seeds among the tribal farmers of the District and ease their availability in the market, there is an urgent need to conduct such programmes more frequently at different locations, and simultaneously give entry to the private farms in this sector.

Traditional seed management and it's use in the next cropping season is a significant characteristic of Indian farming. Before introduction of Green Revolution technologies in 1966-68, Indian farmers used seeds saved during the previous season. It has been seen that yield of crops increases following seed replacement technique. Seed Replacement Ratio (SRR) referrers to the percentage of area sown by using certified or quality seed in the total area of cropped area in a season (Pandey et. al., 2017: 88). With the understanding that increase in SRR will eventually increase the yield, several projects have been initiated in the country to enhance SRR for each crop. In the tribal *taluka*s of Chhota Udepur district, the agricultural farming practices are getting modernized, but at a slower pace. Farm land covered under quality seeds are increasing slowly. Main constraint in this regard is poverty and lack of awareness.

Nowadays, use of electric water pump is an inevitable tool for farming. Most of the farmers throughout India depend on water pump for irrigation in non-rainy season. For Chhota Udepur district, water pump is required by the tribal farmers for fetching water from deep level well and bore well. Water level going down in the drier month (nearly 8 months) is a major issue in all

talukas of the District. However, possessing water pump as a farm input is difficult for marginal and other small land-owning farmers.

Agricultural expenditure on pesticides is increasing day by day. This is due to high price of per liter cost of Di-chloro Diphenyl Trichloroethane (DDT). Haphazard use of insecticide and pesticide enhances pest population and is also hazardous to human health. Besides, application of unsuitable insecticides and pesticides, increases cost of cultivation and contaminates soil and water (Govt. of Gujarat, 2020: 55).

There is an utmost requirement to control menaces created by rodents, monkeys, and wild boar, which spoil the standing crops and devastates tribal farmer's farm income. Almost all households surveyed in the District reported wild boar jeopardy and stressed on installation of electrified fences by the authorities.

Transport network plays an important role in the agricultural production process. For this, transport infrastructure created by State or Central governments contribute significantly. National and State Highways connecting village roads facilitate easy transfer of farm products. The transport network is well developed connecting almost all villages of Chhota Udepur district to nearby markets, APMCs, towns and other districts. There are six APMCs in the District where crops are bought and sold at government prescribed prices. However, the cost of transporting crops from the field to the APMC or any other market, has to be borne by the farmer. *Chagra* is the most popular vehicle for transporting crops, vegetables, commuters and other products in the District. Trucks, motorbikes and tractors are the other vehicles used by farmers to transport the produce to the market.

6.17. Agricultural Markets:

Considering the choices for selling the product there is a general tendency of tribal farmers to sell in local or private market. Selling their products APMC is a new event for tribal households. More than 49.5 per cent households bring their products to local market or private market to sell. STs trust and follow traditional way of selling products. Members of OBC and SC communities have negligible impact on preference of selling products. First of all, in Chhota Udepur district percentage of ST population is quite high and other communities also follow their path. Additionally, most of the tribal farmers keep majority of their farm produce for subsistence as they

want to be food sufficient. Overall, majority of the farmers in the district, irrespective of their community background, prefer local or private market, rather than APMC for selling their products.

6.18. Agricultural Expenses:

Marginal farmers in Gabadia, Aniyadri, Lavakoi and Nani Chikli villages spend more than Rs.10 to 24 thousand in a year per hectare on agricultural inputs. Expenditure on agricultural inputs is the highest in Manjrol village of Sankheda *taluka*. From the field survey it is experienced that in Manjrol village non-tribal households belong to Patel community are utilizing 'drone' technology for spraying fertilizer and pesticides. Per unit area expenditure on inputs by large farmers is lesser compared to that of the marginal and small farmers. In this reference, it may be recollected that fertilizer and pesticide use is not only indiscriminate, but also much high among the marginal and small farmers of the sample villages. Out of all agricultural inputs, expenses for water, transport and tools take the major portion. To hire a tractor, one marginal land holding household has to pay Rs.700 per hour.

Table - 6.19
Agricultural Expenses by Land Size Category

Village	Expense Head	Land Size Category (in Ha.) / Expense in Rs.				
		Up to 1	1.01 to 1.99	2.00 to 3.99	4.00 to 9.99	10 & Above
Ferkuva	Electricity (per HH)	0				
	Water (Per HH)	0				
	Hired Labour (Number)	1				
	HYV Seeds (Per Ha.)	813.7				
	Fertilizer (Per Ha.)	1579.2				
	Pesticide (Per Ha.)	107.1				
	Others (Per Ha.)	321.2				
Achhala	Electricity (per HH)	87.5	187.5	0		
	Water (Per HH)	450	500	0		
	Hired Labour (Number)	0	1	0		
	HYV Seeds (Per Ha.)	4716.2	8549.4	495.4		
	Fertilizer (Per Ha.)	2816.2	3216.0	334.4		
	Pesticide (Per Ha.)	1204.9	3220.2	0		
	Others (Per Ha.)	765.8	4074.0	0		
Ambala	Electricity (per HH)	0	0	0		
	Water (Per HH)	0	0	0		
	Hired Labour (Number)	0	0	0		
	HYV Seeds (Per Ha.)	809.2	0	0		
	Fertilizer (Per Ha.)	1001.5	0	80.9		

	Pesticide (Per Ha.)	101.1	0	0		
	Others (Per Ha.)	57.8	0	0		
Gabadia	Electricity (per HH)	0	0	0		0
	Water (Per HH)	600	0	0		0
	Hired Labour (Number)	0	0	0		1
	HYV Seeds (Per Ha.)	1326.2	775.4	2421.7		158.1
	Fertilizer (Per Ha.)	1537.6	1583.2	494.2		249.0
	Pesticide (Per Ha.)	430.1	339.3	428.3		0
	Others (Per Ha.)	2365.6	1486.3	378.9		0
Aniyadri	Electricity (per HH)	964.3	1000	600	9150	
	Water (Per HH)	592.9	750	2000	50000	
	Hired Labour (Number)	1	0	0	0	
	HYV Seeds (Per Ha.)	9790.9	3483.1	2517.5	1267.4	
	Fertilizer (Per Ha.)	8354.2	4816.5	223.8	6654	
	Pesticide (Per Ha.)	5430.5	3370.8	326.3	1901.1	
	Others (Per Ha.)	2908.9	2247.2	314.7	7604.6	
Dholivav	Electricity (per HH)	581.2	0	1750	5000	
	Water (Per HH)	993.7	3000	50	7000	
	Hired Labour (Number)	3	1	0	0	
	HYV Seeds (Per Ha.)	3483.9	4089.2	0	10752.7	
	Fertilizer (Per Ha.)	1919.4	739.8	177.8	2150.5	
	Pesticide (Per Ha.)	2600	1040.9	172.8	0	
	Others (Per Ha.)	2761.3	529.7	172.8	13333.3	
Jabugam	Electricity (per HH)	781.2	1485.7	694	0	0
	Water (Per HH)	75	1014.3	0	0	0
	Hired Labour (Number)	8	2	1	3	1
	HYV Seeds (Per Ha.)	9267.8	2691	1156.7	53.4	66.7
	Fertilizer (Per Ha.)	1081.9	619.7	2003.1	72.1	30
	Pesticide (Per Ha.)	131.1	366.5	1577.3	0	0
	Others (Per Ha.)	2360.7	7262	3932.7	0	0
Manjrol	Electricity (per HH)	833.3	400	714.3	0	0
	Water (Per HH)	2333.3	400	142.9	2583.3	0
	Hired Labour (Number)	2	2	5	3	1
	HYV Seeds (Per Ha.)	6495.5	7303.4	1330.8	98.8	0
	Fertilizer (Per Ha.)	14321.4	9146.0	823.5	1806.8	18.5
	Pesticide (Per Ha.)	4933.0	808.9	2314.4	24.7	0
	Others (Per Ha.)	25267.9	1348.3	964.3	2310.4	0
Vadadli	Electricity (per HH)	0		0	0	
	Water (Per HH)	0		0	0	
	Hired Labour (Number)	1		2	1	
	HYV Seeds (Per Ha.)	2307.7		960.8	0	
	Fertilizer (Per Ha.)	3174.5		1302.2	37.1	
	Pesticide (Per Ha.)	3489.7		466.4	0	
	Others (Per Ha.)	281.4		1679.1	0	
Borchapada	Electricity (per HH)	0	105.8	0	300	
	Water (Per HH)	0	0	0	18000	
	Hired Labour (Number)	0	0	0	0	
	HYV Seeds (Per Ha.)	3439.2	1650.8	1904.8	2469.1	
	Fertilizer (Per Ha.)	3068.0	1493.5	2624.3	98.8	
	Pesticide (Per Ha.)	1043.0	846.6	529.1	321.0	

	Others (Per Ha.)	1121.5	723.1	405.6	493.8	
Nani Chikli	Electricity (per HH)	192.3	0	0	0	
	Water (Per HH)	246.1	0	0	3000	
	Hired Labour (Number)	2	2	1	0	
	HYV Seeds (Per Ha.)	4368.9	3860.6	1111.1	1430.6	
	Fertilizer (Per Ha.)	4873.8	1568.4	888.9	457.8	
	Pesticide (Per Ha.)	404.5	254.7	617.3	0	
	Others (Per Ha.)	8207.1	214.5	1338.3	28.6	
Amroli	Electricity (per HH)	100	0	0		
	Water (Per HH)	1630.8	16916.7	0		
	Hired Labour (Number)	1	4	1		
	HYV Seeds (Per Ha.)	2541.1	2269.7	198.0		
	Fertilizer (Per Ha.)	4727.6	3679.6	89.1		
	Pesticide (Per Ha.)	2577.7	5380.5	0		
	Others (Per Ha.)	2979.9	3217.6	0		
Lavakoi	Electricity (per HH)	1672.5	50	1375	0	
	Water (Per HH)	1283.3	212.1	2750	0	
	Hired Labour (Number)	1	7	2	0	
	HYV Seeds (Per Ha.)	4090.3	2400.3	1217.3	0	
	Fertilizer (Per Ha.)	5170.3	2449.6	1185.6	530.0	
	Pesticide (Per Ha.)	1548.4	271.3	426.1	0	
	Others (Per Ha.)	8651.6	2750.8	2538.0	0	

Agricultural expenses set aside for hiring labourers are very less in all the sample villages. Observations make it evident that expenditure on fertilizers and pesticides is higher in marginal and semi-medium land sizes compared to medium and large land size categories. Farmers rely heavily on their natural habitat. Hence, to accommodate the unsuitable natural conditions for cultivation, they use fertilizers extensively. This abundant use of farm inputs increases their agricultural expenses. Unsatisfactory crop yield despite such measures forces them to opt for migration. The tribes need to be trained to adopt the practice of dry farming and usage of organic manure. Household agricultural expenses for such inputs are higher in Orsang-Heran Plains region followed by Narmada Gorge region and Vindhyan Hill Ranges region.

6.19. Ownership of Livestock:

Disparity in the distribution of livestock as a wealth for the tribal farmers in the three physiographic regions are quite high. We cannot sum up with a generalization that live-stocks are increasing consistently with size of land ownership. Sample households with landless and marginal land mostly possess livestock which shows their alternate opportunities for survival. One particular

household with semi-medium land holding possesses 60 cows in Vadadli village (Sankheda *taluka*) of Orsang-Heran Plains region.

Excessively greater number of livestock in the fully tribal villages indicates their relatively greater dependence on domestic animals and importance of livestock in their life. In the fully tribal villages, tribal groom pays a bride-price with domestic animals. Tribal people face problems with livestock rearing as a secondary occupation due to scarcity of cattle feed. Depletion of forest cover, restricted entry to the forest and insufficient fodder from the common property resources (CPR) in the Vidhyan Hill Ranges region, and specially in Kavant *taluka* of Narmada Gorge region is an issue which forces the tribal farmers to sell out their livestock.

Table - 6.20
Ownership of Livestock by Land Size Category in Sample Villages

	Village	Land Size Class	Land Size Category-wise Number of Animals per Households						
			Bullock	Cow	Calf	Buffalo	Goat	Hen	Horse
Vindhyan Hill Ranges	**Ferkuva** N=10	Landless	0.67				3.33	0.33	
		Below 1.00 hectare	0.14	0.14		0.14	1.0	1.0	
		Total	0.3	0.1		0.1	1.7	0.8	
	Achhala N=13	Below 1.00 hectare		0.38	0.13	0.38			
		1.00-2.00 hectare		1.25		1.5	0.5		
		2.00-4.00 hectare						2	
		Total		0.62	0.08	0.69	0.15	0.15	
	Ambala N=24	Landless	1.25	0.63		0.63		4.38	
		Below 1.00 hectare	0.5	0.83		0.08	2.50	1.08	
		1.00-2.00 hectare	0.5				3.00	2.00	
		2.00-4.00 hectare		0.5			2.00	0.5	
		Total	0.71	0.67		0.25	1.88	2.21	
	Gabadia N=14	Below 1.00 hectare	1.60	0.8		1.6		3.00	
		1.00-2.00 hectare	1.2	0.2		0.2			
		2.00-4.00 hectare	0.67	3.00		2.67			
		Above 10 hectares	1.00						
		Total	1.21	1.00		1.21			
Orsang Heran Plains	**Aniyadri** N=22	Below 1.00 hectare	0.43	0.71		1.5			
		1.00-2.00 hectare	0.5			1.0			
		2.00-4.00 hectare	1.00	0.5		1.5			
		4.00-10.00 hectare	1.00	3.00		7.00			
		Total	0.55	1.00		1.91			
	Dholivav N=23	Below 1.00 hectare	0.31	1.06	0.06	1.44			
		1.00-2.00 hectare	0.75	1.75		0.25			
		2.00-4.00 hectare	0.5	2.00		1.00			

		4.00-10.00 hectare		3.00		12			3
		Total	0.39	1.35	0.04	1.65			0.13
	Jabugam N=33	Landless							
		Below 1.00 hectare		0.19		1.44			
		1.00-2.00 hectare		0.86					
		2.00-4.00 hectare				2.5			
		4.00-10.00 hectare				0.67			
		Above 10 hectare							
		Total		0.27		1.06			
	Manjrol N=31	Landless		0.29		0.29		1.71	
		Below 1.00 hectare	0.33	0.33					
		1.00-2.00 hectare		0.33					
		2.00-4.00 hectare		0.29		0.43			
		4.00-10.00 hectare		0.63					
		Total	0.06	0.39		0.16		0.39	
	Vadadli N=15	Landless	0.5			0.5			
		Below 1.00 hectare		0.63		0.63			
		2.00-4.00 hectare		15.00		0.5			
		4.00-10.00 hectare		20.00		2.00			2.00
		Total	0.07	5.67		0.73			0.13
Narmada Gorge	**Borchapada** N=18	Below 1.00 hectare	0.91	0.18	0.36	0.36	1.18		
		1.00-2.00 hectare	0.5	5.25	0.5	5.00	1.75		
		2.00-4.00 hectare	2.00	0.5		0.5			
		4.00-10.00 hectare		1.00	2.00	1.00			
		Total	0.89	1.39	0.44	1.44	1.11		
	Nani Chikli N=22	Below 1.00 hectare	0.69	0.46	0.08	0.62	1.00	1.69	
		1.00-2.00 hectare	0.67	1.67		0.67			
		2.00-4.00 hectare	1.00	0.5		0.5	1.5		
		4.00-10.00 hectare	1.00	1.00					
		Total	0.73	0.82	0.05	0.59	0.73	1.00	
	Amroli N=23	Landless					6.50		
		Below 1.00 hectare	0.25			0.58			
		1.00-2.00 hectare	0.17	0.17		0.5			
		4.00-10.00 hectare							
		Total	0.17	0.04		0.43	1.13		
	Lavakoi N=35	Below 1.00 hectare	0.33	1.33		0.58			
		1.00-2.00 hectare	0.5	0.86		0.36	0.43		
		2.00-4.00 hectare	1	1.13		0.5			
		4.00-10.00 hectare							
		Total	0.54	1.06		0.46	0.17		

Animal and poultry rearing is a prominent economic activity in Narmada Gorge region. This may be due to the undulating terrain of the region with sufficient grass cover which makes raising of animals easy. Animal raising as an economic activity is common to most of the tribal communities. Possessing animals as livestock is common for both Vindhyan Hill Ranges region and Narmada Gorge region. In Orsang-Heran Plains region, Manjrol, Vadadli and Jabugam villages show less ownership of livestock per household involved as compared to the other two

villages. Households which are agriculture oriented, devote less time and expenses on domestic animals and livestock. Marginal and small land-owning tribal households of Vindhyan Hill Ranges region and Narmada Gorge region have more access to forests, which supports the rearing of animals. Moreover, in the summer months, goats, hens and buffaloes become the basis of secondary income of such households. There is a notable feature regarding landless category. For that particular tribal population keeping all sorts of livestock are more than land owning households. Without land they depend on animal rearing for survival and this is more visible in Vindhyan Hill Ranges region.

6.20. Household Income in Sample Villages:

Average annual household income in the fully tribal sample villages of the three regions is more or less similar. The non-tribal villages display relatively higher average annual income. To understand the income level of tribal farmers, the APL and BPL cards were taken into consideration in this research. Farmers having *Antodaya* card is again a favourable outcome of tribal welfare development programme. Decreasing percentage of BPL and *Antodaya* card holding households signifies that socio-economic condition of the tribal households is increasing but sluggishly.

Table - 6.21
Household Income (in Rs.) by Land Size Category in the Sample villages

Region	Village	Landless	Land Size Category (in Ha.)				
			Up to 1	1.01 to 1.99	2.0 to 3.99	4.0 to 9.99	10 & above
Vindhyan Hill Ranges	Ferkuva	58,667	53,646				
	Achhala		55,000	132,500	90,000		
	Ambala	39,180	59,167	77,500	56,000		
	Gabadia		58,400	54,000	40,000		20,000
Orsang-Heran Plains	Aniyadri		76,429	57,500	32,500	50,000	
	Dholivav		56,075	77,250	63,000	536,000	
	Jabugam	35,000	117,187	118,571	157,800	466,667	600,000
	Manjrol	44,286	151,667	253,333	301,428	245,500	
	Vadadli	57,000	74,642		300,500	1,200,000	
Narmada Gorge	Borchapada		73,182	80,000	95,000	40,000	
	Nani Chikli		43,846	90,833	52,500	25,000	
	Amroli	70,750	46,940	105,000		250,000	
	Lavakoi		96,237	109,283	64,313	50,000	

6.21. Household Income T test:

H0: The average annual income is equal to Rs.60,000
H1: The annual income of tribal families in the three regions under consideration is less than Rs. 60,000

Vindhyan Hill Ranges:

Level of Significance:
$\alpha = 0.05$
p value =0.856
p value > α
0.856 > 0.05

As per Socio-Economic Caste Census (SECC) of 2011, the monthly average income of 86.53 per cent ST families in India is less than Rs. 5,000 per month or Rs. 60,000 per annum. Only around 10 per cent (8.95%) of them have an income between Rs. 60,000 and Rs.1,20,000 per annum (Yadav and Sahoo, 2019: 102). Considering the proposed hypothesis for the study, i.e. the average annual income of tribal families in the three regions under consideration is not equal to Rs. 60,000. Our null hypothesis is that the average income is equal to Rs. 60,000.

t test results -

Vindhyan Hill Ranges region:

```
T-TEST /TESTVAL=60000
        /VARIABLES= HHINCOME    /MISSING=ANALYSIS
        /CRITERIA=CI(0.95).
```

One-Sample Statistics

	N	Mean	Std. Deviation	S.E. Mean
HHINCOME	61	59081.31	39266.84	5027.60

One-Sample Test

	Test Value = 60000					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
HHINCOME	-.18	60	.856	-918.69	-10975.4	9138.02

As it can be observed, the t-value for Vindhyan region here is negative, which shows that average annual income value is less than Rs.60,000. The 95 per cent confidence interval contains 0 and the p value is also more than 0.05, hence our null hypothesis cannot be rejected. This shows that on an average, most households have an average annual income of approximately Rs.60,000, corroborating the census data.

Orsang Heran Plains region:

Level of Significance:
$\alpha = 0.05$
p value =0.000
p value $< \alpha$
$0.000 < 0.05$

One-Sample Statistics

	N	Mean	Std. Deviation	S.E. Mean
HHINCOME	124	144407.6	192799.5	17313.91

One-Sample Test

	Test Value = 60000					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
HHINCOME	4.88	123	.000	84407.58	50135.76	118679.4

Narmada Gorge region:

Level of Significance:
$\alpha = 0.05$
p value =0.033
p value $< \alpha$
$0.033 < 0.05$

One-Sample Statistics

	N	Mean	Std. Deviation	S.E. Mean
HHINCOME	98	77301.84	79085.74	7988.87

One-Sample Test

	Test Value = 60000					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
HHINCOME	2.17	97	.033	17301.84	1446.15	33157.52

However, it is interesting to note that the results are quite different in Orsang-Heran Plains and Narmada Gorge regions. The annual average household income is more than Rs. 60,000, and the p value for both the regions is less than 0.05. The 95 per cent confidence interval does not contain 0, hence rejecting the null hypothesis and challenging the claim that most tribal families

have average annual income less than Rs.60,000. Hence, in these two regions, the average annual income is more than Rs.60,000.

6.22. Household Income Z test:

In the first t test for the Vindhyan Hill Ranges region, we saw that the average annual household income is not very different from our assumed mean. The t test value was negative; it does not clearly indicate what per cent of incomes are less than or greater than the assumed mean or it is distributed equally. By computing the z scores of the income values, we can see that 65.5 per cent of the sample has income less than the mean, while 34.42 per cent has income higher than the mean.

The z test has not been applied in case of the in Orsang-Heran Plains and Narmada Gorge regions, since the mean average annual income is much higher than the assumed mean, and the 95 per cent confidence interval along with the t test value is higher than 0, which indicates most of the values are higher than the assumed mean.

6.23. Family Type and Main work of Household Chi Square test:

H0: There is no relation of between type of family and household main work.

H1: There is a significant relation of between type of family and household main work.

Vindhyan Hill Ranges region:

Level of Significance:

$\alpha = 0.05$

p value =0.000

p value < α

0.000<0.05

Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
FAMTYPE × HH_WRKMain	64	100.0%	0	.0%	64	100.0%

FAMTYPE × HH_WRKMain

			HH_WRKMain					
				Agricultural Labour	Cultivation	Daily wage Labour	Labor	Total
FAMTYPE		Count	3	0	0	0	0	3
		Row %	100.0%	.0%	.0%	.0%	.0%	100.0%
		Column %	100.0%	.0%	.0%	.0%	.0%	4.7%
		Total %	4.7%	.0%	.0%	.0%	.0%	4.7%
	Joint	Count	0	4	28	1	1	34
		Row %	.0%	11.8%	82.4%	2.9%	2.9%	100.0%
		Column %	.0%	57.1%	56.0%	100.0%	33.3%	53.1%
		Total %	.0%	6.3%	43.8%	1.6%	1.6%	53.1%
	Nuclear	Count	0	3	22	0	2	27
		Row %	.0%	11.1%	81.5%	.0%	7.4%	100.0%
		Column %	.0%	42.9%	44.0%	.0%	66.7%	42.2%
		Total %	.0%	4.7%	34.4%	.0%	3.1%	42.2%
Total		Count	3	7	50	1	3	64
		Row %	4.7%	10.9%	78.1%	1.6%	4.7%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		Total %	4.7%	10.9%	78.1%	1.6%	4.7%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	65.48	8	.000
Likelihood Ratio	26.00	8	.001
N of Valid Cases	64		

Orsang Heran Plains region:

Level of Significance:
$\alpha = 0.05$
p value =0.000
p value $< \alpha$

$0.000 < 0.05$

Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
FAMTYPE × HH_WRKMain	127	100.0%	0	.0%	127	100.0%

FAMTYPE × HH_WRKMain

			HH_WRKMain					Total
				Agricultural Labour	Business	Cultivation	Service	
FAMTYPE		Count	3	0	0	0	0	3
		Row %	100.0%	.0%	.0%	.0%	.0%	100.0%
		Column %	100.0%	.0%	.0%	.0%	.0%	2.4%
		Total %	2.4%	.0%	.0%	.0%	.0%	2.4%
	Joint	Count	0	3	0	62	0	65
		Row %	.0%	4.6%	.0%	95.4%	.0%	100.0%
		Column %	.0%	30.0%	.0%	55.9%	.0%	51.2%
		Total %	.0%	2.4%	.0%	48.8%	.0%	51.2%
	Nuclear	Count	0	7	1	49	2	59
		Row %	.0%	11.9%	1.7%	83.1%	3.4%	100.0%
		Column %	.0%	70.0%	100.0%	44.1%	100.0%	46.5%
		Total %	.0%	5.5%	.8%	38.6%	1.6%	46.5%
Total		Count	3	10	1	111	2	127
		Row %	2.4%	7.9%	.8%	87.4%	1.6%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		Total %	2.4%	7.9%	.8%	87.4%	1.6%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	132.99	8	.000
Likelihood Ratio	35.44	8	.000
N of Valid Cases	127		

Narmada Gorge region:

Level of Significance:
$\alpha = 0.05$
p value =0.000
p value $< \alpha$
0.000<0.05

Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
FAMTYPE × HH_WRKMain	101	100.0%	0	.0%	101	100.0%

FAMTYPE × HH_WRKMain

			HH_WRKMain					Total
				Agricultural Labour	Business	Cultivation	Non Agricultural Labour	
FAMTYPE		Count	3	0	0	0	0	3
		Row %	100.0%	.0%	.0%	.0%	.0%	100.0%
		Column %	100.0%	.0%	.0%	.0%	.0%	3.0%
		Total %	3.0%	.0%	.0%	.0%	.0%	3.0%
	Joint	Count	0	1	0	42	1	44
		Row %	.0%	2.3%	.0%	95.5%	2.3%	100.0%
		Column %	.0%	50.0%	.0%	45.2%	100.0%	43.6%
		Total %	.0%	1.0%	.0%	41.6%	1.0%	43.6%
	Nuclear	Count	0	1	2	51	0	54
		Row %	.0%	1.9%	3.7%	94.4%	.0%	100.0%
		Column %	.0%	50.0%	100.0%	54.8%	.0%	53.5%
		Total %	.0%	1.0%	2.0%	50.5%	.0%	53.5%
Total		Count	3	2	2	93	1	101
		Row %	3.0%	2.0%	2.0%	92.1%	1.0%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		Total %	3.0%	2.0%	2.0%	92.1%	1.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	103.97	8	.000
Likelihood Ratio	31.02	8	.000
N of Valid Cases	101		

There is a clear relationship between the type of family and main work done per household. Statistically, the results are significant since the p value obtained is less than 0.05 or 5 per cent threshold. Both joint families as well as nuclear families are mostly engaged in cultivation. However, in the Vindhyan Hill Ranges and Orsang-Heran Plains regions, there are more occupations apart from cultivation and business. These occupations have comparatively low strength, yet hold a significant count. The results show that there is a steady relationship between the type of family and the main work done by the household.

6.24. Fertilizer Usage in Kilogram/Hectare:

There is a similar trend in this case as was seen in case of average annual household income. The fertilizer use is almost equal to the current mean of 145 kg/hectare in Vindhyan Hill Ranges region, but it is quite higher in Narmada Gorge and Orsang-Heran Plains regions.

Vindhyan Hill Ranges region:

H0: The fertilizer use is almost equal to the current mean of 145 kg/hectare in Vindhyan Hill Ranges region.

H1: The fertilizer use is not equal to the current mean of 145 kg/hectare in Vindhyan Hill Ranges region.
Level of Significance:
α = 0.05
p value =0.981
p value > α
0.981>0.05

One-Sample Statistics

	N	Mean	Std. Deviation	S.E. Mean
INPQ_FERT_KG	61	144.18	272.80	34.93

One-Sample Test

	Test Value = 145					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
INPQ_FERT_KG	-.02	60	.981	-.82	-70.69	69.05

Orsang-Heran Plains region:

H0: The fertilizer use is almost equal to the current mean of 145 kg/hectare in the Orsang-Heran Plains region.
H1: The fertilizer use is not equal to the current mean of 145 kg/hectare in the Orsang-Heran Plains region.

Level of Significance:
α = 0.05
p value =0.001
p value < α
0.001<0.05

One-Sample Statistics

	N	Mean	Std. Deviation	S.E. Mean
INPQ_FERT_KG	124	542.23	1301.98	116.92

One-Sample Test

	Test Value = 145					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
INPQ_FERT_KG	3.40	123	.001	397.23	165.79	628.67

Narmada Gorge region:

H0: The fertilizer use is almost equal to the current mean of 145 kg/hectare in Narmada Gorge region.
H1: The fertilizer use is not equal to the current mean of 145 kg/hectare in Narmada Gorge region.

Level of Significance:
α = 0.05
p value =0.000
p value < α

0.000<0.05

One-Sample Statistics

	N	Mean	Std. Deviation	S.E. Mean
INPQ_FERT_KG	98	300.90	353.61	35.72

One-Sample Test

	Test Value = 145					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
INPQ_FERT_KG	4.36	97	.000	155.90	85.01	226.80

In the Vindhyan Hill Ranges region, fertilizer use is close to but less than the assumed mean fertilizer usage of 145 kg/hectare (Shukla et. al., 2022: 26) since the t value is less than 0. Since the 95 per cent confidence interval includes 0, the null hypothesis cannot be rejected. But, in the Orsang-Heran Plains and Narmada Gorge regions, the mean usage exceeds the average fertilizer consumption rate. Our 95 per cent confidence interval does not include 0, for both regions it is a positive range and the p value is less than 0.05 as well. Hence, it statistically signifies that fertilizer consumption in these regions is more than average usage.

6.25. Source of Irrigation with Household Income:

Vindhyan Hill Ranges region:

H0: There is no relation between irrigation source and household income.

H1: There is a significant relation between irrigation source and household income.

Level of Significance:

α = 0.05

p value =0.147

p value > α

0.147>0.05

Orsang-Heran Plains region:

Null (H0) and Alternative Hypothesis (H1)

H0: There is no relation between irrigation source and household income.

H1: There is a significant relation between irrigation source and household income.

Level of Significance:

α = 0.05, p value =0.026

p value < α, 0.026<0.05

Narmada Gorge region:

Null (H0) and Alternative Hypothesis (H1)
H0: There is no relation between irrigation source and household income.
H1: There is a significant relation between irrigation source and household income.

Level of Significance:
α = 0.05
p value =0.001
p value < α
0.001<0.05

The Chi-Square test carried out between the irrigation source and household income shows a promising statistical significance in only Orsang-Heran Plains and Narmada Gorge regions, since the p value is less than the threshold value. Thus, the null hypothesis can be rejected, which indicates that there is a relation between the irrigation source and the household income values. However, in the Vindhyan Hill Ranges region, it is not so as the p value exceeds the threshold. Hence, it cannot be said that there is a relationship between the two variables for this region.

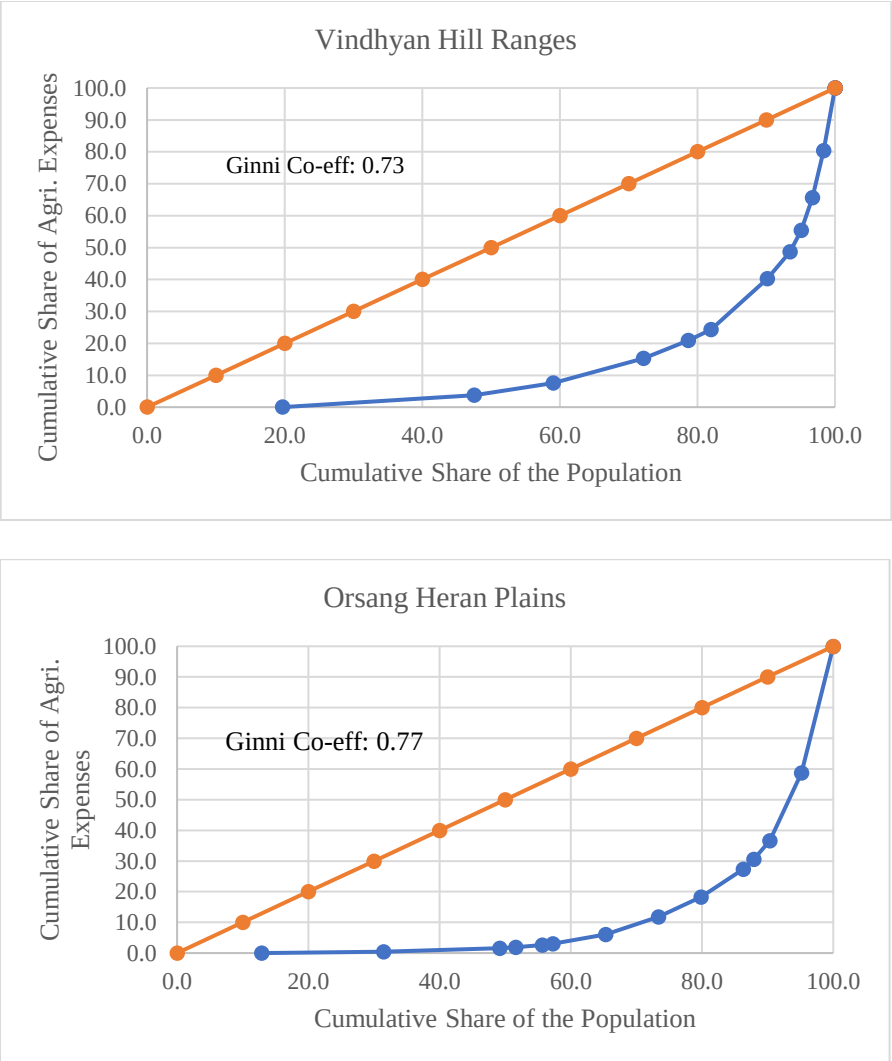
6.26. Inequality Analysis of Expenditure on Agricultural Inputs:

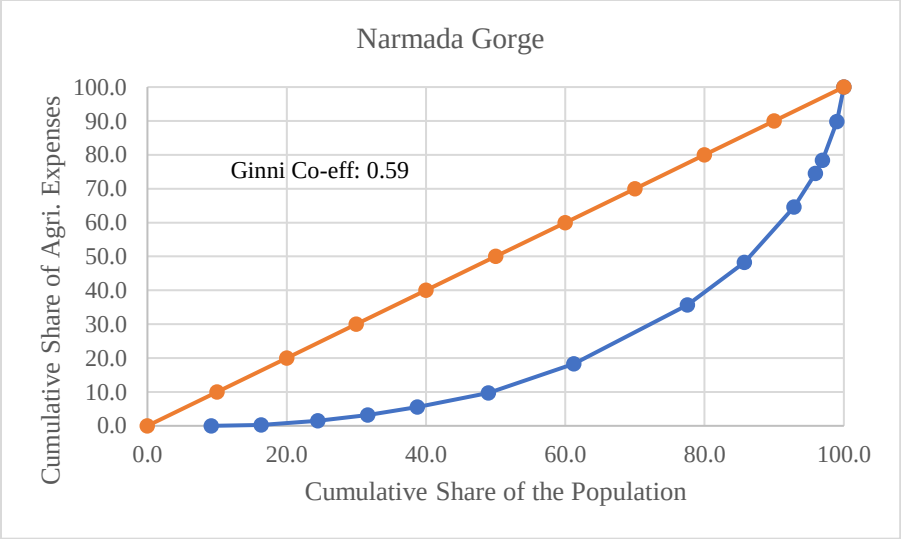
Lorenz Curves[11] for each physiographic region are presented below. These graphs show the cumulative percentage of *taluka*-wise total agriculture expenditure plotted against the cumulative percentage of the total agricultural expenditure of the corresponding *taluka*. An

[11]Inequality calculations are inexact or an estimate and depends on data sets used – the primary survey data-based Lorenz curves may differ from the Lorenz curves and Gini coefficients produced using other data sets.

increasing 45-degrees straight line from 0 per cent to 100 per cent indicates an ideal system with no inequality – for every 1 per cent increment in the population on the X-axis, there is a corresponding 1 per cent increase in the total expenditure on the Y-axis. Therefore, the extent to which a plotted curve of population versus expenses falls below a straight diagonal line indicates the degree of inequality of input expenditure in agriculture in the system. The Gini Coefficient is the ratio of the area between the line of perfect equality and the observed Lorenz Curve. The higher the coefficient, the more unequal the distribution of input cost in agriculture.

Figure - 6.5
Lorenz Curve of Agricultural Expenses





Results of Inequality Analysis:

(a) The farmers in Vindhyan Hill Ranges and Narmada Gorge regions have lower capacity to spend on agriculture and display lower inequality.

(b) In the Orsang-Heran Plains region, the inequality observed between the farmers is high and most of the households with medium and large land sizes are having high expenditure. This can be attributed to input cost regarding high production of cash crops, mainly Cotton, Banana and oil seeds.

(c) The hilly regions of Chhota Udepur and Kavant *talukas* have below average agricultural expenditure than the line of equity represented from the total farmers/households surveyed.

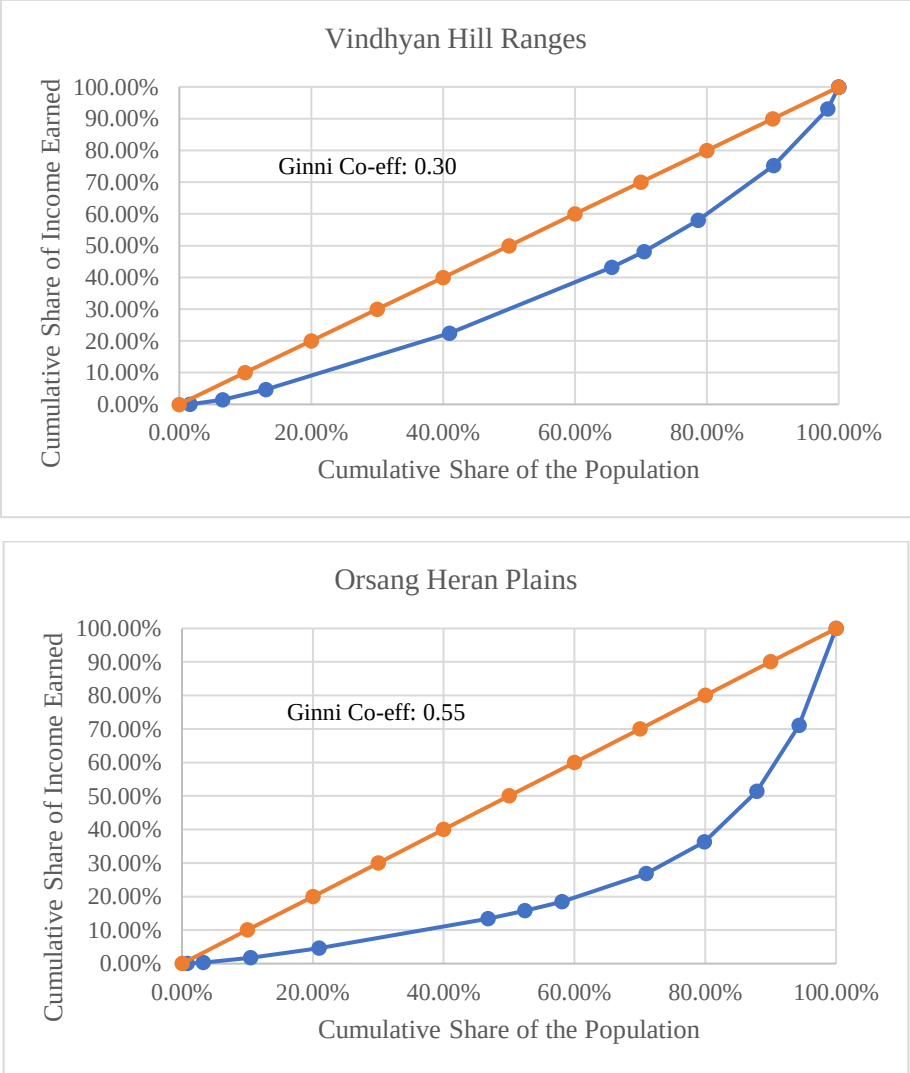
(d) Gini Coefficient shows inequality between the farmers. A separate analysis resulted in a ratio of total expenditure by high-income households in relation to impoverished households in the same *taluka.* It can be described as the average total agricultural input cost for financially stable households divided by the average total agricultural expenditure of very poor households in each *taluka*. A higher ratio indicated a bigger difference in agricultural input expenditure.

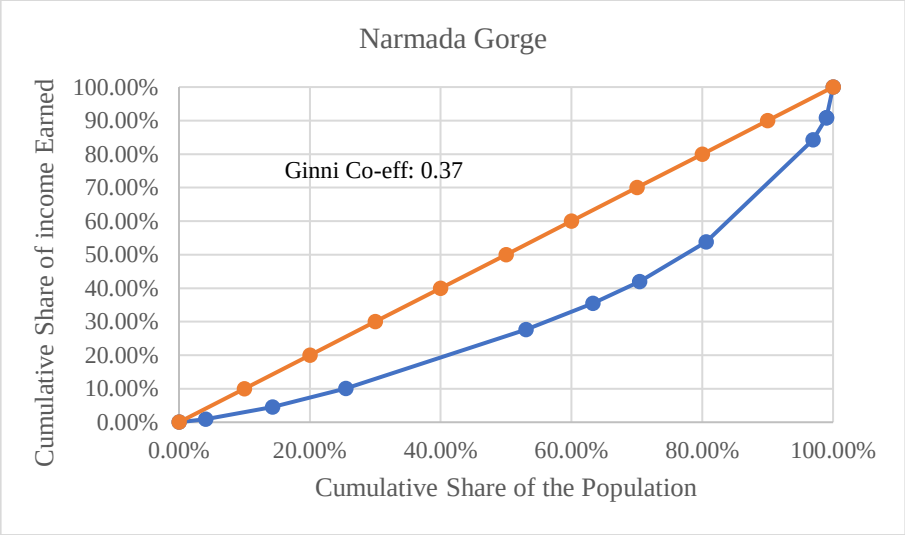
(e) Inequality Analysis of Household Income:

The Lorenz curves for each physiographic region are presented below. These graphs show the cumulative percentage of region-wise total household income. The household income

inequality is comparatively low in Narmada Gorge region followed by Orsang-Heran Plains and Vindhyan Hill Ranges regions. The Vindhyan Hill Ranges region displays a peculiar pattern of tribal farmers' income, wherein the marginal land holders and landless labourers sometimes earn more than Rs.1,00,000 income per annum. Reason for this inequality between households could be the income earned through migration.

Figure - 6.6
Lorenz Curve of Household Income





Results of Inequality Analysis:

a) In Vindhyan Hill Ranges region and Narmada Gorge region, 40 per cent of the population has 20 per cent of the total wealth of the respective region. Remaining 60 per cent of the population own 80 per cent of the total wealth.

b) The Gini coefficient is 0.37 for Narmada Gorge region while for Vindhyan Hill Ranges region the same can be found as 0.30. So, the ratio for inequality in income distribution are more or less the same in the above two regions.

c) In Orsang-Heran Plains region, the inequality is prominent as 80 per cent of the total population has 35 to 40 per cent of total income while the upper 20 per cent of population (80 to 100 per cent) owns 60 per cent of total income of the region.

6.27. Importance of Crop Loan:

Tribal farmers are uncertain how to repay back crop loan. Taking crop loan to meet agricultural expenses is a common practice among the tribal households for all the three physiographic regions of Chhota Udepur district. Both marginal farmers and large tribal farmers avail crop loans under different schemes of the State as well as Central Government against easy pay back terms. The level of awareness about the availability and the procedures as well as the repayment capacity of the tribal farmers seem to be determining factors in availing a loan particularly from government sources. This is reflected in the very small proportion (9.8%) of

households of Vindhyan Hill Ranges region, where the level awareness is relatively lower. On the other hand, the households in all land size categories of the other two regions have availed crop and other loans in different proportions. The percentage of households (23.4%) availing loans is also the highest in the most exposed Orsang-Heran Plains region with substantial share of non-tribal population. All households in the largest land size category of the region have availed crop loan in this region. It was revealed during the field investigation that due to procedural difficulties and lack of awareness, the landless and households with smaller size lands prefer to go to the local money lenders rather than nationalized banks.

Table - 6.22
Percentage of Households Availing Crop and Other Loans by Land Size Category

Land Size Category	Vindhyan Hill Ranges		Orsang-Heran Plains		Narmada Gorge	
	Crop loan	Other loan	Crop loan	Other loan	Crop loan	Other loan
Landless	NIL	NIL	27.0 (3)	9.0 (1)	50.0 (2)	NIL
below 1 Hectare	12.5 (4)	NIL	26.7 (16)	5.0 (3)	29.0 (14)	8.0 (4)
1-2 Ha	NIL	NIL	16.7 (3)	5.6 (1)	3.3 (1)	6.7 (2)
2-4 Ha	33.0 (2)	NIL	21.0 (4)	NIL	33.0 (4)	8.3 (1)
4-10 Ha	-	-	13.0 (2)	6.7 (1)	NIL	NIL
Above 10 Ha	NIL	NIL	100.0 (1)	NIL	-	
Total	9.8 (6)	NIL	23.4 (29)	4.8 (6)	21.4 (21)	7.1 (7)

Note: Figures in parentheses indicate number of households.

6.28. Issues related to Socio Economic Changes:

Selected economic variables like land, irrigation, inputs, income, expenditure, cropping pattern, loan availability and their relationships have been analyzed in the previous segment. An attempt has been made in the following segment to envisage some of the social aspects, directly or indirectly related to agriculture in the tribal areas under investigation in particular and other parts of the State and the country in general.

6.28.1 Drinking Water:

There is a remarkable improvement in the provision of drinking water in the villages. Most of the villages in all the regions have tube wells and tap water connections apart from community bore wells for drinking water. However, much is yet to be done in the context. Only around 50 per

cent of the households declared that they do not face any problem in fetching drinking water. Despite steady progress in the provision of drinking water facilities, the highest percentage (43%) of households is still dependent on creeks or rivers for drinking water. Hand pumps provide drinking water to the second highest proportion of households. Tapped drinking water facility is limited. To fetch water from the limited number of taps, people have to travel long distances. Some of the other problems like scarcity, salinity and contamination of water are still prevalent in the area. Although the drinking water facilities created during the last few decades are satisfactory, much is yet to be done in the matter.

Figure - 6.7
Source of Drinking Water

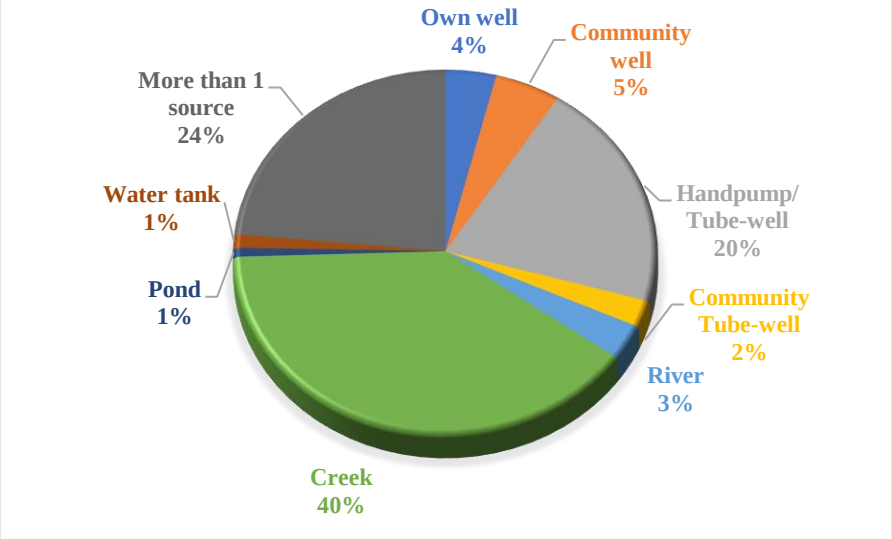
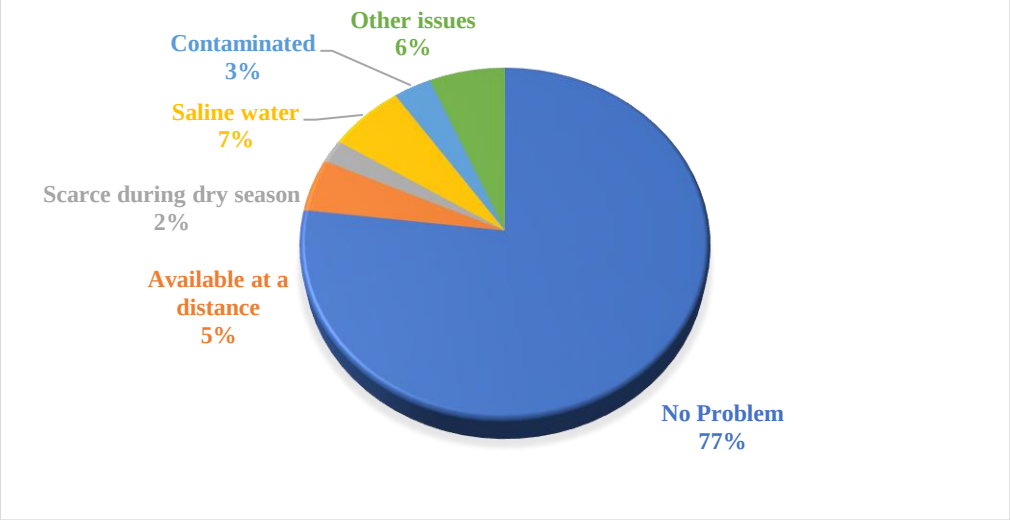


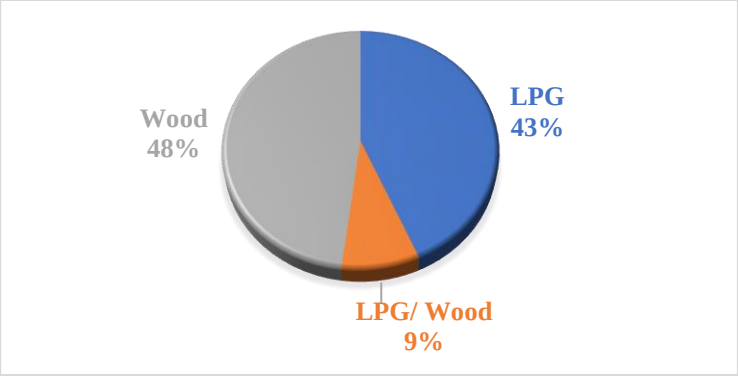
Figure - 6.8
Issues Related to Drinking Water



6.28.2 Kitchen Fuel:

Traditionally, the tribes completely depended on the forests for several household requirements including fuel wood. Through government initiatives like Pradhan Mantri Ujjwala Yojana (PMUY), and due to decreased access to forest resources, increased exposure, awareness and economic standards of living, use of modern kitchen fuel has been increasing in the country. However, in the study area, a significant percentage (48%) of the households are still using fuel wood and dung cakes as kitchen fuel. Use of LPG cylinders has been adopted by 43 per cent households. The remaining 9 per cent use both LPG and fuel wood. The households using fuel wood, mostly collect it from the CPR of their respective villages. About 37 per cent of households expressed that there is no change in the use of kitchen fuel during the last 10 years. A lesser percentage of about 24 per cent households believe that there is a change of type of fuel. Bearing the cost of LPG cylinders every month is difficult for the poorer households. Consequentially, majority of the landless and smaller size land owner households depend on the village CPR for kitchen fuel.

Figure - 6.9
Use of Fuel in Kitchen

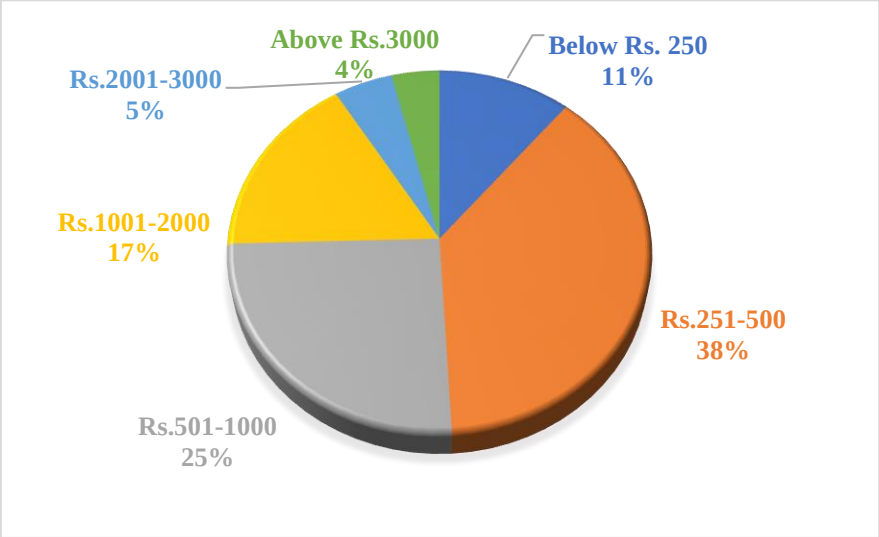


6.28.3 Consumption of Electricity:

Electric power consumption is one of the fundamental indicators of development in any society, especially in backward areas like tribal areas. Electricity is required as a source of energy for both economic and domestic purposes. Large number of households having electric connection for domestic and agricultural use is considered a strong indicator of development. It is heartening to note that all the 283 households surveyed in the present study, have electricity connection. Out of these households, the bi-monthly amount spent on consumption of electricity of around three-

fourth (74%) of the households is less than Rs.1,000. While only 17 per cent of the households spend between Rs.1,000 to Rs.2,000. The share of households spending between Rs.2,000 and Rs.3,000 (5%) and more than Rs.3,000 (4%) for the same period is very less.

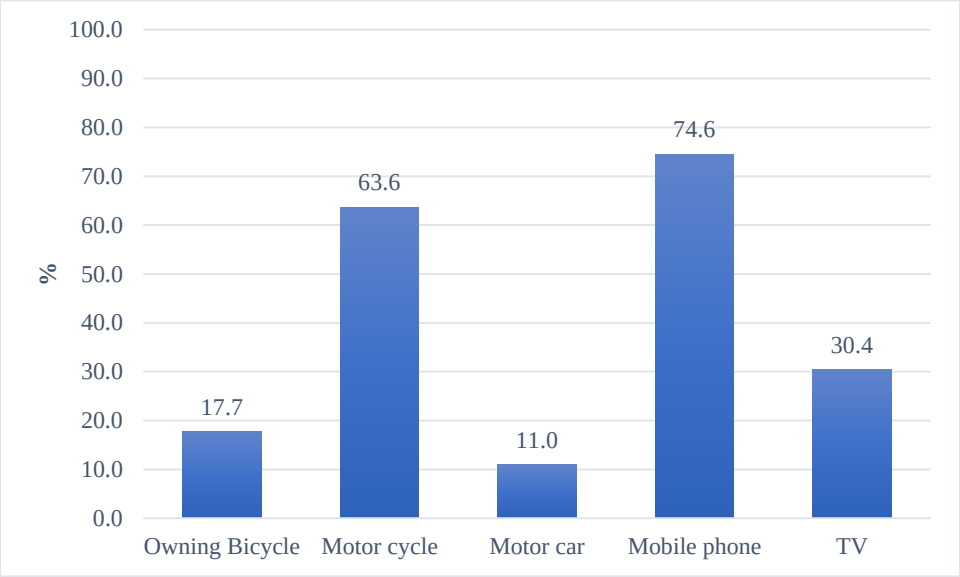
Figure - 6.10
Expenditure on Domestic Electricity consumption



6.28.4. Material Possessions:

Material assets and capital inputs are unequally distributed in the study region. Most of the modern inputs and material assets like tractors, pesticide sprayer and motor cars are common to most of the households in the non-tribal population dominated villages of Jabugam and Manjrol of Bodeli and Sankheda *talukas* respectively. Material assets like mobile phones and motorcycles are possessed by more than 60 per cent of the households in all three physiographic regions. During door-to-door surveys, commodities like television were found in most of the non-tribal households of Bodeli, Sankheda and Nasvadi *talukas*. For fully tribal households in the Vindhyan Hill Ranges region and Narmada Gorge region, struggle for existence and more than 6 months of periodic migration hardly encourages tribal communities to possess electronic assets. Only 30 per cent of the households possesses television in the villages of these two regions. However, households with larger size land holdings in these predominantly tribal villages, have more material assets and consumer products.

Figure - 6.11
Material Possession of the Households



6.29 Perception of the Population Regarding Socio-Economic Conditions:

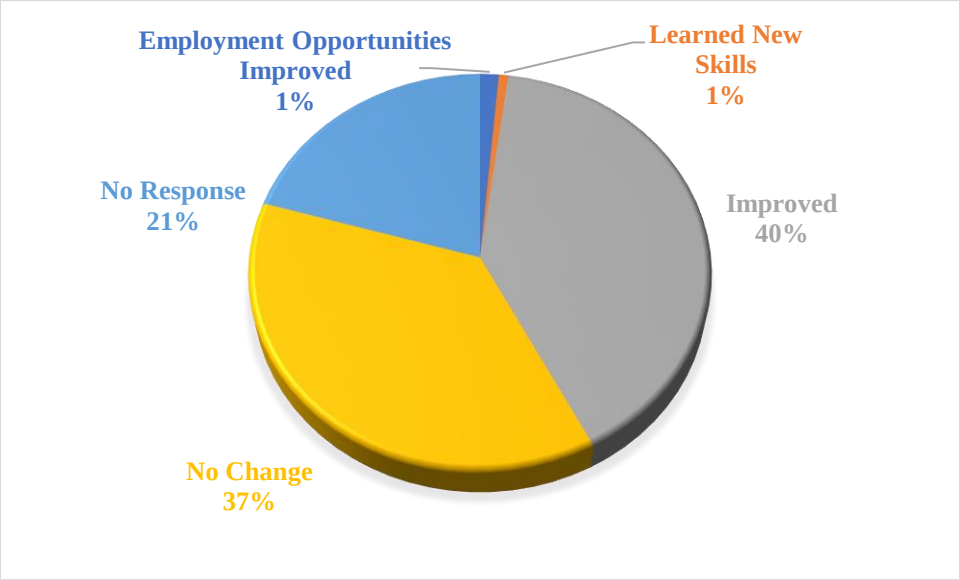
An attempt was made during the field investigation to comprehend the perceptions of the investigated regarding the ongoing processes of socio-economic development in their respective villages in particular and the area in general. Except for about a fifth (58 or 21%) who abstained from providing any opinion due to reluctance or ignorance, the respondents had a free and frank discussion about the employment opportunities, skill development and status of socio-economic development. Wide variations in the perceptions of the tribal farmers were noted during the survey.

6.29.1 Overall Development:

A small proportion (only 1%) of the farmers believe that employment opportunities have improved and there has been improvement in their skill, and a substantial proportion (40.28%) seems to be satisfied with the contemporary socio-economic changes in the area. On the other hand, however, a similar proportion (37%) of the respondents negated this opinion and suggested that the socio-economic circumstances in their area remains unaltered. It was observed during the field investigation that most of the respondents forwarding negative opinion belonged to the landless and smaller size land owner households, where illiteracy and ignorance is relatively higher. The researcher believes that due to lack of understanding, the less aware segment of the

respondents is yet to understand and appropriate the benefits of the prevailing schemes, plans and policies for the development of tribal areas. The researcher also believes that the success of the government initiatives depends to a great extent on the level of awareness of the target population. Concerted and planned efforts to enlighten the target population about the schemes, plans and policies, their benefits, terms and conditions etcetera would enhance the prospects of achieving the set goals and their sustainability.

Figure - 6.12
Perception on Overall Development



6.29.2 Women Work Participation, Empowerment and Status:

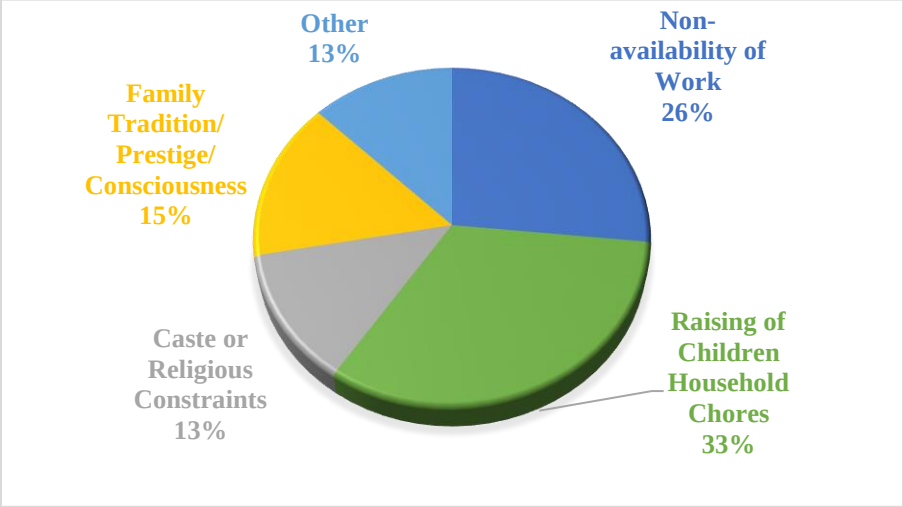
Awareness and acknowledgement of the participation of women in different economically remunerative activities both within and outside home is another important issue. The researcher tried to gather opinions of the respondent households regarding the issue.

Swami Vivekananda said that, *"All nations attained greatness by paying proper respect to women. That country and that nation which do not respect women have never become great, nor will ever be in future."* He also said "*it is not possible for a bird to fly only on one wing"* (Viveka Vani, 2019). Traditionally in majority of tribal societies, gender discrimination and gender-based division of labour was absent. However, with gradual penetration of social traditions and customs of the non-tribal peasant societies, the social order among the tribes is undergoing changes. To

understand the changes, a few relevant and related aspects were discussed with the respondents individually and in groups during the field survey.

As has been observed earlier, sex ratio in the study area is better than the average sex ratio in the State. Besides, there is no taboo on the work participation of tribal women. Tribal women permitted to work both in and outside the village. These women even work in the farmland of the other farmers. The women of the villages do not consider the *purdah* (veil) system as derogatory. Women of a few villages continue with the *purdah* system but the practice is not mandatory. They can go and collect firewood from forest, and attend village meetings, although it is not clear how far their decisions are honoured. Attainment of education is one of the major problems faced by the tribal females. Enhanced general awareness and development of skill pertaining to farming, choice of crops, soil types, and water management methods of the tribal women could yield better results from agriculture in the area eventually improving tribal livelihood conditions.

Figure - 6.13
Women Work Participation Challenges



However, the percentage of female cultivators is measurably low. Majority of them work as marginal workers in the agricultural sector as agricultural labourers. Taking active part in farm decisions by the female members of the family are negligible. Less than half (47%) of the respondents expressed that the social status of women in the study area has improved. About 14 per cent households have a negative impression about this transformation. Personal views shared by the women of the villages is that only minor changes have taken place.

Plate 6.5: Primary Survey in Progress in village Gabadia

Other constraints obstructing women folk of the villages (15.90% households) to participate in economically gainful activities as suggested by around 16 (15.90%) per cent households, include household chores, religious issues, lack of opportunities and family prestige. During group discussions with the females of the villages, it was revealed that they appreciate the importance of economic independence, and have realized that structural progress is not achievable without it.

Figure - 6.14
Positive Reasons Behind Empowerment of Women

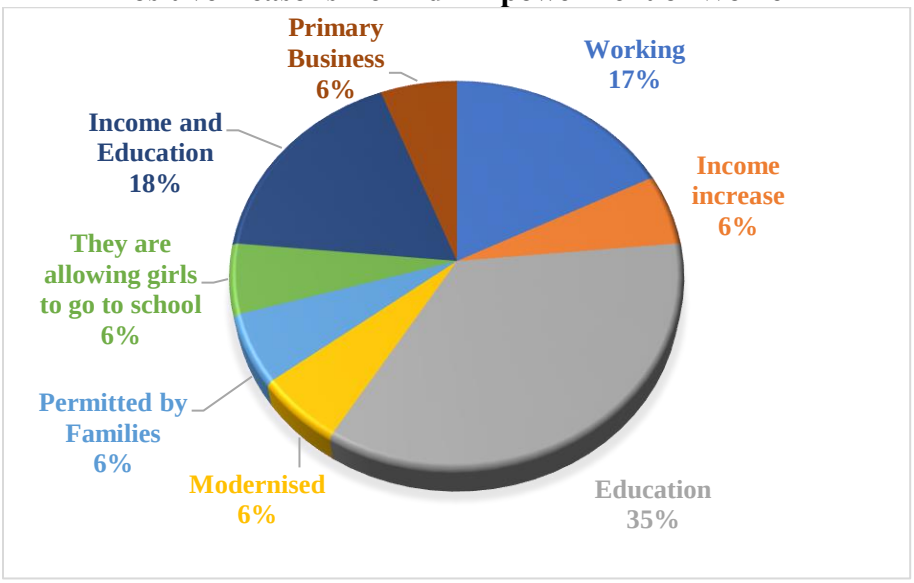
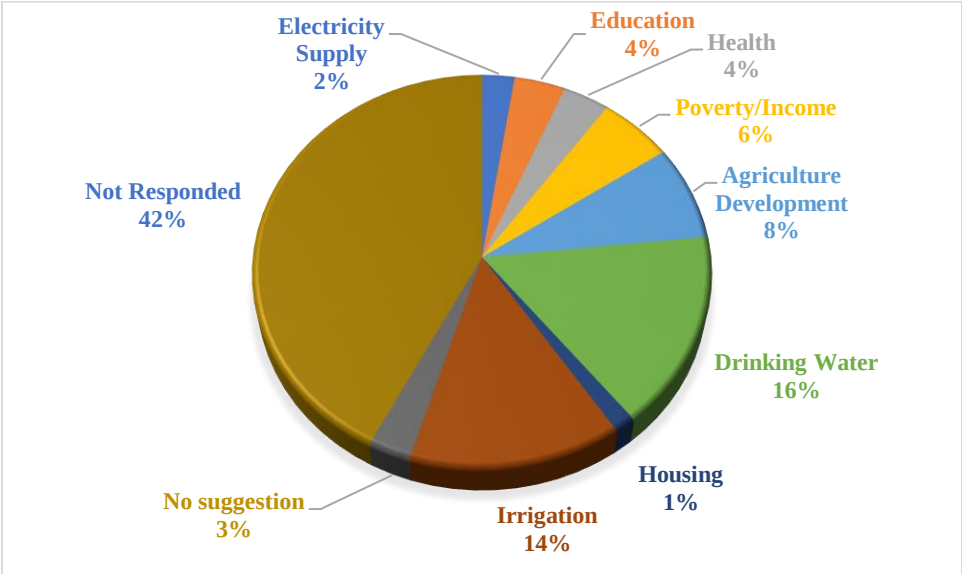


Plate 6.6: Primary Survey being conducted in (a) Achhala and (b) Gabadia villages

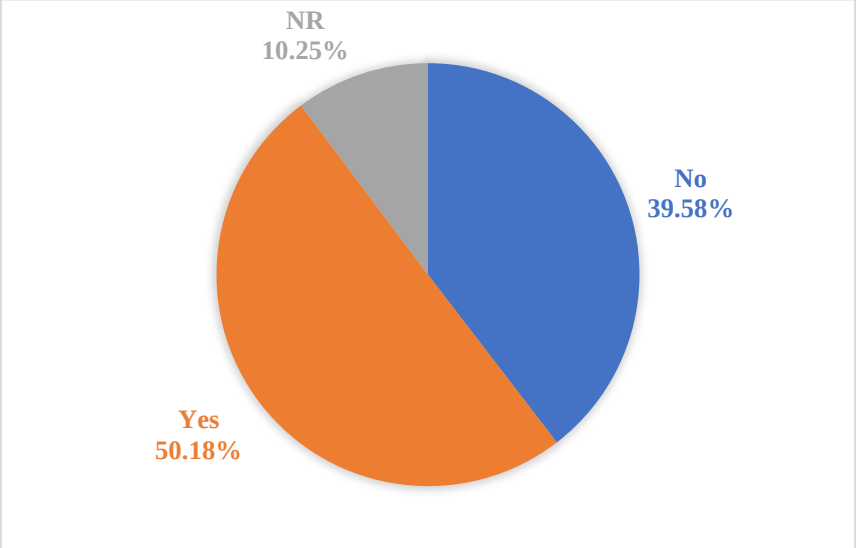
Major decisions regarding agriculture and family are taken by the elderly male members in 51 per cent of the households. Decisions are taken jointly by male and female members in 40 per cent of the households. Family size and type of family are gradually changing from large to small and from joint to nuclear like in the urban areas. Large joint families are being replaced by nuclear families, so also the farm lands. This is one of the reasons for fragmented land sizes in the area. Changes in the family structure seems to be transforming the traditional egalitarian tribal societies into materialistic societies. Further research on the issue can throw light on the processes behind the changes in the family structure and their repercussions in the tribal areas.

Figure - 6.15
Suggestions for Village Development



Respondents were requested to opine on the importance of different aspects of development in their socio-economic condition. While a significant proportion of about 45 per cent of the respondents could not provide any suggestion, the maximum proportion of those who opined (55%), stressed on the provision of drinking water (16%), followed by water for irrigation (9%), and aspects pertaining to agriculture (8%). Out of the remaining aspects of development, health and educational infrastructure has been given preference by about 4 per cent of the 283 households. It may be pointed out here that majority of the respondents considered all the aspects suggested by the researcher important for the development of the area and the people. Out of the 45 per cent respondents who did not provide any suggestion, about 3 per cent abstained from commenting, and around 42 per cent could not respond due to ignorance. In response to the question regarding awareness about the prevailing government schemes and programmes in their areas in particular and in the tribal areas in general, the reply of only about 50 (50.18%) per cent of the respondents was in affirmative. While around 10 (10.25%) did not respond, about 40 (39.58%) of the respondents expressed their ignorance. Some of the respondents, despite being aware about some of the ongoing schemes in their area, lamented for not being able to benefit out of these due to ignorance about the modalities. A matter of serious concern which needs to be attended through concerted plans is, the level of awareness regarding the prospects of development among a very high proportion of the tribes is very poor in the area under investigation.

Figure - 6.16
Awareness of Development Programmes



6.30 Rapid Rural Appraisal:

Tribal women play a major role in the co-management of their natural, social, economic resources and agricultural development including crop production, livestock rearing, but they remain backward due to traditional values, illiteracy, superstitions, lack of dominant roles in decision-making, social evils and many other cultural factors. The participatory role of tribes in improving their living conditions by fully exploring natural endowments and alternative uses must find an appropriate place in strategic approach (Mohanta, 2017: 749).

The need for empowerment of tribal women hardly needs justification. Their primitive way of life, economic and social backwardness, low level of literacy, outdated system of production, sparse physical infrastructure in backward tribal areas and demographic quality of tribal population make the development of tribes and tribal areas essential. Even after industrialization and the resultant commercialization swamped the tribal economy, tribal women continue to play a significant role. Particularly in several household chores as well as in farm operations like levelling of field, nursery raising, sowing, transplanting, irrigation, harvesting and threshing, tribal women contribute significantly.

The RRA method was used in this study to interact with the local communities particularly women, and understand and learn from them. It was a process to involve the women for indigenous knowledge building exercises. It helped women participants to put forward their point of view about their issues, and enabled them to analyze the issues.

Group 1:

Gabadia Village, Chhota Udepur *Taluka*

Discussion Agenda of Meeting: Awareness and understanding of current agricultural practices.

The team set out for the village early in the morning from the base station with team of researchers, experts in socio-economic studies (2), field team (six members, who had been conducting questionnaire survey in the villages) and facilitators from the village. The village elders greeted us after learning our purpose of visit.

The team had initial discussion with villager elders and leaders (ex-*Sarpanch* and his team) in the premises of a house where pre-marriage ceremony had just concluded. While Group 2 proceeded for preparing the profile of the key respondents for questionnaire survey, Group 1 members started the meeting with village elders along with village transect. The subsequent meeting was scheduled for the afternoon, which included female members of Gabadia village. The SHG members (who were also female farm workers) participated with other females from the locality, also participated in the afternoon RRA process.

Pre-Noon - Village Transect:

The team travelled within village settlement areas and fringe fields to ascertain the nature of life and livelihood in the village with the facilitator and other participants of the meeting in the forenoon. The cultural markers, facilities in the village including primary school, health facility, shops and PDS shops. The villagers took us to various habitations (also known as *falia* in Gujarati) to understand who lives where in these localities.

The houses of village headman, government employees, teachers, graduate students, migrants who have travelled outside and coordinator of the women SHG were shown to the team. During the transect, the team could interact with the villagers wherever possible. These interactions with the people and exposure to the locality helped the team to understand the situation in the village in order to generate appropriate key questions during the RRA process.

Meeting 1: Discussion with village elders and male members

Date: 09-04-2023 Time: 10.00 am onwards Duration: 1.5 hours

Participant (10 members)

The team was introduced by the facilitators at Gabadia village; the discussion started with the introduction and statement about objective of the field visit. Initially, the villagers gathered were hesitant to talk due to the earlier experience with visitors who had offered false promises to them. We talked about the development work done in last five years by the *Panchayat*, projects undertaken, projects completed, and general well-being of the people. General discussion about agricultural changes, subsidies and improvements needed in the approaches was held.

Findings/Observation:

(a) Community gathering during the social and cultural functions are essential and members or representatives from each family in the village must participate in rituals and feasts.

(b) The village elders are decision makers in the village affairs and the family.

(c) The youth according to them are now busy in their mobiles (playing games, listening songs, watching videos etc.), which has distracted them from the education and other productive activities.

(d) Post COVID, the school has not restricted the use of mobile in its premises. The participants however do realize the usefulness of the mobile for the students, particularly in case of those who go outside the village for higher levels of education (secondary and above standard students).

(e) The students of the villages have benefitted from the direct transfer of scholarships, grants and subsidies by the government.

(f) They are still uncertain about the water for irrigation, drinking and their animals.

(g) They look forward to have a milk cooperative in their village, since in the hilly regions milk processors (namely Amul) do not collect it.

(h) Girls are now getting more educated in the village. Unfortunately, the dropout rate among them is relatively higher due to their marriage at an early age.

(i) Village needs many development projects such as internal roads, water supply and puce houses, which they have represented to the *taluka* headquarters (*taluka Mamlatdars*).. According to some, they have promised several times but no steps have been taken as on date.

(j) They expressed concern about the insufficient of crop production, growing use of fertilizers and erosion of top soil due to excessive watering or rainfall.

(k) They suggested bringing the watershed projects in the village to store and distribute the water to the farmers, when the cost of the bore well and electricity has been increasing over time.

Post Noon:

Meeting 2: Discussion with village elders and male members

Date: 09-04-2023 Time: 14.00 pm onwards Duration: 1.5 hours

Participants: All women, 10 members of Gabadia Village and 6 female members from the research team.

Age group of the respondents: Mostly between 18 -35 years and only one of 50 years.

Marital Status: Eight of them were married and two were unmarried at the time of meeting.

Education: 30 per cent of the participants were illiterate mostly from 30 plus age group. All the younger females were literates.

Community: All the participants belonged to the *Rathwa* community of the village.

Venue: Common meeting place of the village, which is was an extended part of the village Head-man's house.

Findings/Observations:

The RRA process was initiated by the researcher at about 2pm with 10 female members of the farmers households of Gabadia village. They were all excited and participated with enthusiasm. As an introductory conversation, they were told about the field visit of the research team and about RRA in a nutshell, followed by each other's introduction. All the participant females were well conversant with Hindi language and social media. Their social status may not be farm decision makers but they have a clear understanding of the Gabadia village.

(a) Placement of Key Infrastructure

After the brief introductory session, the team provided them with chart paper and coloured pens. The participants were asked to draw a sketch of the village. Three women got engaged in drawing, while the rest of the womenfolk supported them with necessary information. The entire village infrastructure and their location are in the fingertips of the participants. They could pen every detail of the village, such as the location of school, common meeting place, PDS shop, *gouchar* or common property resources for fodder, river, water tank, well and their respective

houses with much ease and expertise. Though the RRA was new to them, they participated smartly with expertise.

(a) Agricultural Practices and Role of Women:

Tribal female participants expressed the advantages and disadvantages of current farming practices in the village. However, they do not take part in major farm decisions, but their role as agricultural labourers is quite important. From weeding and to sowing to harvesting, and taking care of livestock are some of the important farm operations they indulge in . After cultivation of cereals, especially Maize they manage the stock for future requirements of fodder and fuel. Protecting agricultural production from the wild boar is one of the issues for every single tribal villager in Gabadia.

(b) The Issue of Water:

In the summer months from March to June, all the water sources inside the village dry up and this situation compels all women to fetch water from the nearby river or community well in the village periphery for both household chores and livestock. In the scorching sun and heat, this additional work makes their health vulnerable. When fetching drinking water is so difficult then water for irrigation is next to impossible. Overhead water tanks are limited in number throughout the village. In the rainy season (July to October) due to over flooding of the adjacent village *nullah,* communication of inter- village and intra-village becomes very difficult. So female participants are eagerly waiting for watershed development of the Gabadia village so that when water is needed in the summer months they can easily get, and in the rainy season the water flow can be regulated and stored with the help of check-dams. In this regard, their male family members have already applied to the district administrator.

(c) Issues Pertaining to Women:

- They have obtained Liquid Petroleum Gas (LPG) connections, but the cost of one gas bottle is little expensive as against their farm income.
- One of the toughest things they need to do every day is to fetch water from the common village well in the summer months. In addition, while approaching the community well in the summer months they group together to proceed due to the fear of wild boar and leopard.

- Early marriages of adolescent girls from the village community thwart educational progress of tribal females.
- Pursuing higher studies after Senior Secondary (SS) level is difficult for women as after marriage much of their time is spent in completing household chores along with farm works. However, during after the RRA meeting, they expressed their strong desire for further studies.
- Number of SS schools in and around the village is not satisfactory for girls.
- Percentage of tribal women having land rights are very less in this village as there is a patriarchal culture among the Rathva community. Daughters getting married off loose the inheritance right by tradition
- Types of entertainment after work are changing very fast for these women farmers. Invasion of social media is adversely affecting the traditional tribal folk culture and its authenticities.

Plate 6.7: Sketch of Gabadia Village being Prepared by Members of RRA Group

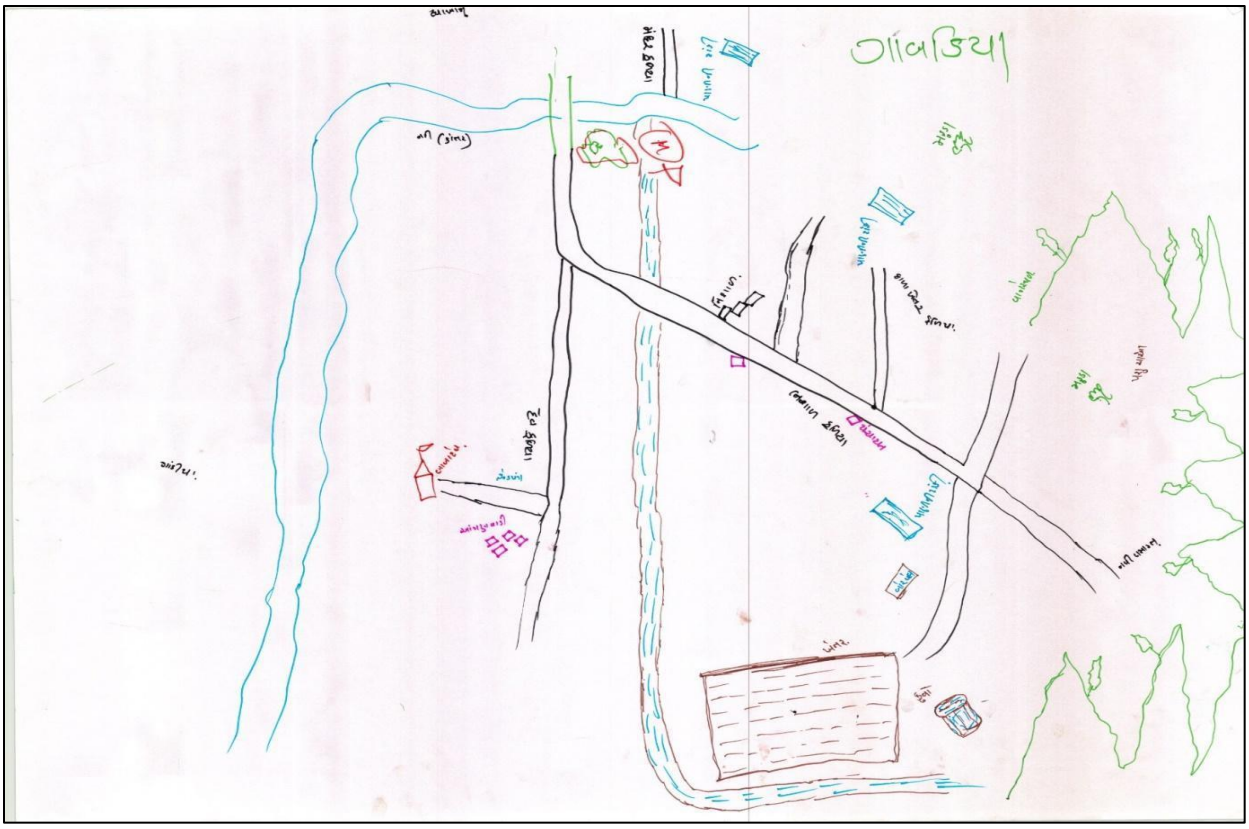


Plate 6.8: Gabadia Village Sketch (Drawn by the Lady in Plate 6.7)

6.31 Conclusion:

Changes in any discipline of livelihood is an inevitable circumstance for any society. From the field survey, the tribal communities show a change in social structure. In the entire district 80 per cent of the sample households belong to ST community making the District a major tribal district in the State. Family size of the tribal villages as well as the social structures are changing from joint to nuclear. Even before twenty years, tribal households were joint in structure and very much inclined towards egalitarian thinking. Currently, nuclear families have become a common feature in all the 13 sample villages.

Most of the households surveyed in the Chhota Udepur district were of land owners. Irrespective of land size, they wanted to be identified as cultivators. Majority of the households are in possession of marginal and small land holdings, which compel them to take up farm labour for sustenance.

Despite owning land, most of the time their occupation as cultivators needs to be supported by subsidiary earnings obtained by working as agricultural labourers or by other casual jobs. Farming of ST community and their needs demand more focus from the policy makers and administrators.

Cultivation is the prime focus for all the tribal farmers, and if there are no opportunities in farming activities, then only they are working in secondary and tertiary sectors. Other than main occupation, subsidiary work for tribal community in all the *talukas* is to work as agricultural labourer. Service, *Panchayat* operator, *Anganwadi* workers are some of the activities they get engaged in.

There is a prominent correlation between the percentage share of households and the size of land holdings, either increasing or decreasing. This particular situation could be attributed to factors such as physical, social, cultural and economic.

Agriculture is mainly rainfed. Rest of the year, irrigation is not possible due to the particular structures of ground water holding aquifers. Though all the sources of irrigation like river, canal, well, bore well and ponds are present in the District, these dry up in the winter and summer months. Excessive withdrawal of groundwater and river water with the help of electric pump leaves the water level at vulnerable stage.

Crop cultivation is possible only during *kharif* season. Season after season, year after year recurrent crop combination leads to less diversification of crops, which reduce the quality of soil, and yield less. Maize, Cotton, Pigeon Pea, *Arenda* and irrigated Paddy are the major crops. Most of the *rabi* and summer crop production is for subsistence. Yield of the crops are not profitable. Apart from marginal land size, less expenditure on farm implements, HYV seeds and transport are characteristics of tribal farming. Agricultural expenses are more than income, and this inequality due to over expenditure on chemical fertilizers, pesticides, tractor, interests on crop loan etcetera, keeps the tribal household poverty stricken. There are income inequalities in almost all the physiographic regions, but is much pronounced in Orsang-Heran Plains region. Disguised unemployment and proletarianization of labour are the characteristics of the District. There are two distinct situations for work places of the tribal households. Higher percentage of households work within village during agricultural season and only a few farmers go outside the village to work as agricultural labourers. Secondly, a large number of the smaller size land owner tribal

households choose to migrate in search of work during agricultural off season. This behaviour is uncommon among the medium and large land size category households.

Social structure of the ST households in Chhota Udepur district are much influenced by the inter mixing with nearby urban livelihood. Periodic migration sways the authenticity of the forest dwellers and their livelihood. Most of the sample villages display negligence of female literacy and female work participation as cultivators or decision makers.

A comprehensive conception about the tribal farming in Chhota Udepur district needs to treat some of the issues with proper care and planning jointly by administration, agricultural university, NABARD, Non-Government Organizations, commercial and nationalized banks, researchers and STs themselves. Tribal people need hands-on training and awareness workshops for input management. Proper uses of seed replacement, fertilizers, modern machines, and short duration crop varieties are few arenas of training. The awareness programmes must include the concept of judiciously applying chemical fertilizers and pesticides. Since their habitat is located in ecologically fragile regions, the use of artificial agricultural inputs should be environment friendly. To extract groundwater resources, tribal farmers need knowledge about the adverse effects of over-exploitation. The tribes need to be guided about schemes like '*Jyotigram*' for subsidized electricity and 'DBT' schemes for fertilizers and pesticides. Actually, these are the indirect exogenous influences which affect the cropping pattern and practices overruling the traditional wisdom. Migrants bring these influences from places of their visit. Campaigning programmes for changing monotonous cropping pattern to weather specific diversification of crops could be beneficial. Pre-market research to sale the products with highest price could be a solution for extra income. Organic farming and package farming like crop production-animal husbandry-flowers or crop production -horticulture or crop production- dairy and vegetables farming are examples.

We need more filed based researches by scholars belonging various social science disciplines, and agricultural and biological sciences. Moreover, application of green technology should be given priority for the sustainability of tribal agriculture.