Climate Warriors – The Ecofriendly Kondh Tribes People of Muniguda

A Detailed Quantitative Study of the Economy of Five Adivasi Villages

1. Introduction

The Kandha tribes people residing in the five villages of **Arati, Garlagudi, Kandulapada, Gangarabaju** and **Kurukuti** in **Muniguda** Taluka of **Raygada** district in the southern part of the state of **Odisha** in **India** lead an eco-friendly lifestyle. This traditional subsistence lifestyle in harmony with their natural surroundings makes them important actors in the mitigation of climate change like other indigenous communities elsewhere (IISD et al, 2003). This report describes their subsistence economy and quantitatively estimates the economic and environmental sustainability of their ecofriendly lifestyle based on a detailed survey of their agricultural and allied forest based livelihoods.

2. The Study Area

The study villages are situated within 40 kms of the town of Muniguda as shown in Fig. 1 below.

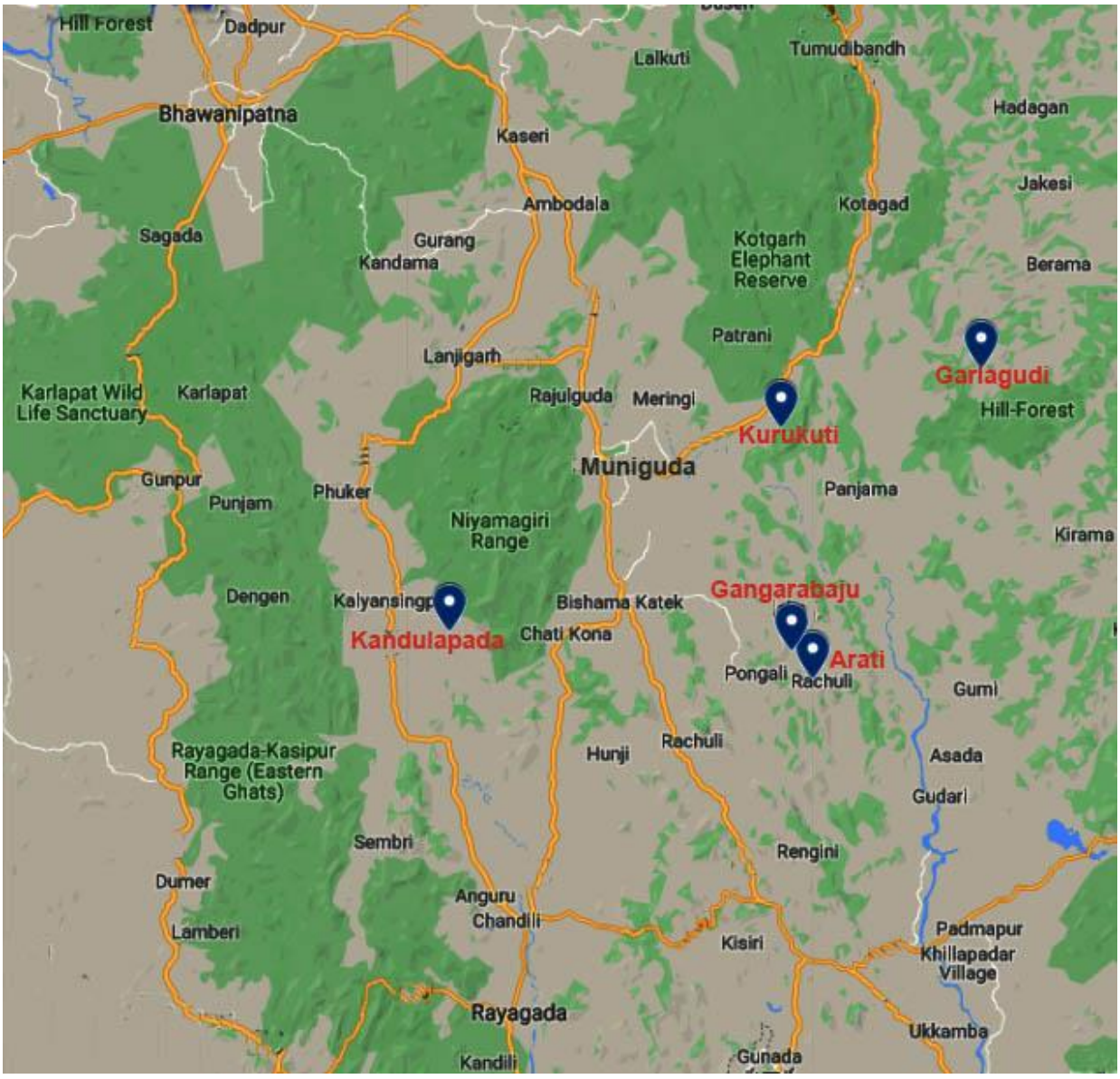

Fig. 1: Map of Muniguda Showing the Location of Study Villages

This area is part of the "KBK" region comprising the erstwhile districts of Kalahandi, Balangir and Koraput that have now been broken up into eight districts, which suffered from lack of development for a long time resulting in entrenched poverty and chronic malnutrition (Priyambada, 2012). As is evident from the map, the study villages are in close proximity to the Niyamgiri hill range which is the abode of the Dongriya Kondh Adivasis who have waged a long battle to retain their ecofriendly lifestyles and their pristine habitat against the depredation of bauxite mining. The Kandha Adivasis of the study villages too respect their natural habitat, which consist of abundant forests and fast flowing streams in the hilly terrain of the Eastern Ghats and use it with considerable prudence. The Kandhas are the most populous scheduled tribe in Odisha. Even though the official name of their tribe is Kandha, they refer to themselves as Kuinga because they speak the Kui language(SCSTRTI, 2013). An earlier study conducted by Living Farms has established that forest foods constituted a major component of the consumption of the Kandhas and consequently they made great efforts to conserve their forests instead of decimating them for timber and agricultural use. While this earlier study documented through a sample survey the extent of this dependence on forests, it did not quantify the relative contribution it makes to the overall subsistence economy of the Kandhas and also the contribution the Kandhas make in conserving their forest habitats (Deb et al, 2014). This study aims to do this and also roughly estimate the carbon footprint of the subsistence lifestyle of the Kandhas.

3. Objectives and Methodology of the Study

The objectives of the study are as follows –

1. Quantitatively Estimate the overall income and consumption from agriculture and forests of the Kandha Adivasis in the five study villages
2. Establish that the residents of the study villages are mitigating climate change through their ecofriendly lifestyle.

The five study villages have been selected at random from all the villages in Muniguda in which all the residents are Kandha Adivasis and are situated in the hilly forested areas of the Taluka. All the households residing in these villages were surveyed. The detailed schedules used to estimate the agricultural and forest income and the household consumption have been given in the annexures. The data collected was digitised and statistically analysed.

4. General Characteristics of the Study Villages

The general characteristics of the study villages are given in Table 1 below.

Table 1: General Characteristics of Study Villages

Village	No. of House-holds	Revenue Area Cultiva-ted (Ha)	Forest Area Cultiva-ted (Ha)	Fallow Area (Ha)	Total Agricul-tural Land (Ha)	Land per House-hold (Ha)	Total Area of Village (Ha)	For-est Area/ Hous ehold	Pop-ula-tion	Sex Ratio	Lite-racy (%)
Arati	19	1.686	65.494	0.000	67.179	3.536	141	3.89	92	840	12.0
Garlagudi	11	8.051	0.000	0.682	8.733	0.794	260	22.82	69	1556	26.1
Kandulapada	9	4.548	2.685	0.000	7.233	0.804	64	6.33	38	900	2.6
Gangarabaju	15	15.141	37.837	3.552	56.530	3.769	164	7.20	88	1200	27.3
Kurukuti	6	4.607	7.094	0.062	11.763	1.960	389	62.83	29	611	20.7
Total	**60**	**34.032**	**113.110**	**4.296**	**151.438**	**2.524**	**1018**	**14.45**	**316**	**1039**	**19.0**

The villages are very small with the total number of households being just 60. While Arati village is the largest with 19 households, Kurukuti is the smallest with 6 households. Arati also has the highest amount of cultivated land at 67.179 Ha of which 65.494 Ha are in the forests. Gangarabaju has the highest amount of cultivated revenue land at 15.141 Ha but there too the cultivated forest land is two and half times in area. A very small proportion of the land in three villages has been left fallow. The total cultivated land is only 151.438 Ha. The average land availability per household is the highest in Gangarabaju village at 3.769 Ha while it is the lowest in Garlagudi at 0.794 Ha. 58 percent of the households fall in the category of small and marginal farmers with less than 2 Ha of land.

Apart from the revenue and forest land under cultivation each village also has land under forests around it on which they depend for forest produce in the form of timber, firewood, mulch and food. The village of Kurukuti has the most amount of forest land of about 377 Ha. The village of Kandulapada has about 57 Ha, however, in terms of the availability of forest lands per household, Kandulapada is better off due to a lower number of households whereas Arati, due to a higher number of households and greater cultivated area, has the lowest availability of forest per household. Kurukuti has the highest availability. Generally the availability of forests is quite good in all the villages with an average of 14.45 Ha per household for the whole sample.

Overall the sex ratio is 1039 but some villages have an adverse sex ratio while others have hugely favourable sex ratios as far as women are concerned. The overall literacy rate is very low at 19 percent and the literacy of women is half that of men.

5. Farm Characteristics in the Study Villages

All the villages are situated in a similar hilly and forested terrain with similar agricultural lands. Moreover, the villages are very small with a total household count of just 60. Therefore, the farm characteristics have been summarised for the whole sample together in the Tables below.

Table 2: Type of Land

Type of Land	No. of Plots	Proportion (%)
Revenue	114	54.3
Forest	96	45.7
Total	**210**	**100.0**

There are cumulatively 210 separate plots of land with the average plot size being 0.721 Ha. Of these 114 (54.3 %) are revenue plots while 96 (45.7 %) are in the forest. On an average a household has 3 or 4 plots while there are some with more than 10 plots.

Table 3: Type of Title

Type of Title	No. of Plots	Proportion (%)
Self Owned	146	69.5
Leased in	3	1.5
Encroached	61	29.0
Total	**210**	**100.0**

146 (69.5 %) plots are self owned with title whereas 61 (29.0 %) plots are encroached forest land and 3 (1.5 %) plots have been leased in.

Table 4: Topography of Farm Land

Type of Slope	No. of Plots	Proportion (%)
Flat ($<5^0$)	95	45.2
Low(5^0-10^0)	42	20.0
Moderate (10^0-20^0)	48	22.9
High ($>20^0$)	25	11.9
Total	**210**	**100.0**

The topography of 45.2 percent of the plots is flat while another 20 percent of plots have low slope. Only 11.9 percent of the plots have high slope. Therefore, the respondents have judiciously used their land and restricted themselves to flat or low slope lands mostly.

Table 5: Type of Soil

Type of Soil	No. of Plots	Proportion (%)
Red	37	17.6
Black	107	51.0
Reddish Brown	66	31.4
Total	**210**	**100.0**

51 percent of the plots have black soil while the rest have either red or reddish brown soil which is less fertile. The sowing of crops is also done according to the slope and soil quality with rice in the flat lands and the smaller millets in the higher slope and less fertile soils

Table 6: Soil Erosion

Type of Soil	No. of Plots	Proportion (%)
Low	107	51.0
Medium	75	35.7
High	28	13.3
Total	**210**	**100.0**

Given that most plots have low or no slope and also that they have black soil it is not surprising that the level of soil erosion is also less with 51 percent having low erosion and another 35.7 percent having medium erosion. It is only the steeply sloped land that is prone to high erosion.

Table 7: Soil and Water Conservation

Type of Work	No. of Plots	Proportion (%)
None	165	78.6
Bunds	26	12.4
Gully Plugs	13	6.2
Boulder Checks	6	2.8
Total	**210**	**100.0**

There has not been much investment in soil and water conservation with 78.6 percent of the plots having none at all. Farm bunds have been made in 12.4 percent of the plots, while gully plugs and boulder checks are very few. Even though water availability is high from streams and ground water none of the plots are irrigated as the respondents prefer to engage in forest produce collection.

6. Agricultural Production

The respondents have a bio-diverse agricultural production system with as many as 48 different crops grown during the Kharif season. Apart from the paddy which is transplanted in contiguous areas, all the other crops are sown by broadcasting together. The tables below give the details of this production. The average yields in the study villages are compared with the average yields for India.

Table 8 : Production Details for Large Cereals

Sl. No.	Crop	Area (Ha)	Proportion of Total Cropped Area (%)	Production (Quintals)	Average Muniguda Productivity (Quintals/Ha)	Average Indian Productivity (Quintals/Ha)
1	Paddy (Medium Land)	30.91	20.9	1097.34	35.5	35
2	Paddy (Up Land)	22.08	14.9	633.68	28.7	27
3	Paddy (Low Land)	7.36	5.0	265.69	36.1	35
4	Maize	4.42	2.8	134.68	30.5	28
5	Sorghum	4.56	3.1	73.30	16.1	15
	Total	**69.33**	**46.8**			

Medium Land Paddy is the most cultivated cereal crop covering as much as 20.9 percent of the total cropped area of the study villages followed by Up Land Paddy which is sown on 14.9 percent of the cropped area and Low Land Paddy in 5 percent of the cropped area. Maize and Sorghum are relatively much less. Overall large cereal production covers 46.8 percent of the total cropped area. Since only farm manure and forest mulch are used and minimal tilling of the soil is done, the

extensive presence of micro-organisms in the soil ensures high fertility and fairly good yields which are better than the average Indian yields for these crops. Soil moisture retention is also high and this too facilitates higher yields. These higher yields are there for all crops.

Table 9 : Production Details for Millets

Sl. No.	Crop	Area (Ha)	Proportion of Total Cropped Area (%)	Production (Quintals)	Avg. Muniguda Productivity (Quintals/Ha)	Avg. India Productivity (Quintals/Ha)
1	Finger Millet (Long Duration)	22.08	14.9	386.39	17.5	17
2	Finger Millet (Medium)	14.52	9.8	255.59	17.6	17
3	Finger Millet (Small)	7.56	5.1	129.12	17.1	17
4	Foxtail White Millet	1.47	1.0	22.08	15	13
5	Foxtail Red Millet	1.55	1.0	23.38	15.1	13
6	Pearl Millet	0.74	0.5	18.40	25	24
8	Little Millet (Machur)	2.94	2.0	52.99	18	17
9	Little Millet (Dangara)	2.21	1.5	41.95	19	17
10	Koda Millet	1.41	1.0	21.72	15.4	14
	Total	**54.48**	**36.8**			

Finger Millets of three varieties together constitute the largest sown area amounting to 29.8 percent of the total cropped area and are second to paddy cultivation. Overall millets covered 36.8 percent of the total cropped area which is just a little less than the coverage of paddy.

Table 10 : Production Details for Peas, Beans and Legumes

Sl. No.	Crop	Area (Ha)	Proportion of Total Cropped Area (%)	Production (Quin-tals)	Avg. Muniguda Productivity (Quintals/Ha)	Avg. India Produc-tivity (Quintals/Ha)
1	Cow Pea Red	2.94	2.0	45.63	15.5	14
2	Cow Pea White	1.47	1.0	23.26	15.8	15
3	Cow Pea (Aladi)	0.71	0.5	11.26	15.9	15
4	Cow Pea (Dangaradi)	0.77	0.5	11.85	15.4	15
5	Cow Pea (Barbati)	0.72	0.5	11.51	16.0	15
6	Velvet Bean	1.49	1.0	45.78	30.7	30
7	Pigeon Pea	2.96	2.0	44.45	15.0	14
8	Black Gram	1.43	1.0	14.87	10.4	8
9	Legumes	0.78	0.5	17.22	22.1	22
10	White Bean	0.72	0.5	17.37	24.1	21
11	Horse Gram	0.70	0.5	6.99	10.0	8
	Total	**14.69**	**9.9**			

Various kinds of peas constitute the main protein crops together accounting for 6.5 percent of the total sown area and leguminous crops on the whole are sown in 9.9 percent of the total crop area.

Table 11: Production of Oilseeds

Sl. No.	Crop	Area (Ha)	Proportion of Total Cropped Area (%)	Production (Quintals)	Avg. Muniguda Productivity (Quintals/Ha)	Avg. India Productivity (Quintals/Ha)
1	Ground Nut	0.29	0.2	6.24	21.5	20
2	Castor	0.15	0.1	4.62	30.8	30
3	Mustard	0.41	0.3	7.64	18.6	16
4	Niger	0.44	0.3	4.50	10.2	9
5	Seasame (Sweet)	0.74	0.5	5.96	8.1	8
6	Seasame (Bitter)	0.47	0.3	3.89	8.3	8
	Total	**2.50**	**1.7**			

Oilseed production is negligible and constitutes only 1.7 percent of the whole cropped area. The agriculture practiced by the Kandhas is of subsistence nature and is done to provide them with food rather than to earn money by selling in the markets. That is why oilseeds are also sown primarily for home consumption and so the production is less and the need for cooking oil is much less than that of cereals and pulses.

Table 12: Production of Tubers

Sl. No.	Crop	Area (Ha)	Proportion of Total Cropped Area (%)	Production (Quintals)	Avg. Muniguda Productivity (Quintals/Ha)	Avg. India Productivity (Quintals/Ha)
1	Turmeric	0.70	0.5	59.17	84.5	75
2	Tapioca	0.29	0.2	14.81	51.1	45
3	Yam	0.74	0.5	37.02	50.0	50
4	Sweet Patato	0.54	0.4	146.25	270.8	265
5	Taro	0.15	0.1	21.86	145.7	145
	Total	**2.42**	**1.6**			

The production of tubers too is negligible and constitutes only 1.6 percent of the whole cropped area. Once again tubers too are sown primarily for home consumption and there is need is much less than that of cereals and pulses.

The final set of crops is vegetables. These villages are situated at great distances from the town of Muniguda and are in isolated locations in densely forested hilly terrain. Moreover, since the Kandhas have a subsistence lifestyle they do not have much cash income at their disposal to buy things from the market. Consequently, they rely on their own production for their food needs. That is why they engage in very diverse cropping of vegetables but as in the case of the other crops, vegetables also are produced in small quantities for home consumption only as is evident from the table below. Vegetables are grown only in 2.6 percent of the total cropped area.

Thus, this detailed estimation of the agricultural production of the Kondh Adivasis in the five study villages clearly establishes that they produce enough for their all round subsistence needs from the Kharif season itself.

Table 13: Production of Vegetables

Sl. No.	Crop	Area (Ha)	Proportion of Total Cropped Area (%)	Production (Quin-tals)	Average Muniguda Productivity (Quin-tals/Ha)	Average India Productivity (Quintals/Ha)
1	Chilli	0.29	0.2	2.83	9.8	8
2	Ridge Gourd	0.24	0.2	26.64	111.0	85
3	Cucumber	0.15	0.1	81.02	540.1	535
4	Bottle Gourd	0.23	0.2	103.56	450.3	445
5	Pumpkin	0.27	0.2	68.77	254.7	235
6	Brinjal	0.44	0.3	110.53	251.2	245
7	Tomato	0.59	0.4	100.39	170.2	165
8	Bitter Gourd	0.31	0.2	76.72	247.5	245
9	Radish	0.49	0.3	121.97	248.9	245
10	Papaya	0.13	0.1	49.14	378.0	355
11	Evi Gourd	0.16	0.1	2.46	15.4	14
12	Ladies Finger	0.48	0.3	33.53	69.9	68
	Total	**3.78**	**2.6**			

7. Animal Husbandry and Poultry

The respondents engage in minimal animal husbandry and poutry farming also to meet their food needs only as in the case of their agriculture as shown in Table 14 below.

Table 14: Animal Husbandry and Poultry

Type of Livestock	Bullocks	Cows	Buffalo Male	Buffalo Female	Sheep	Goat	Pig	Poultry
No. of Households	46	24	2	1	3	38	5	53
No. of LIvestock	154	53	6	2	15	199	33	297
No. per Household (Taking all 60 hhds)	2.6	0.9	0.1	0.0	0.3	3.3	0.6	5

46 households (76.7 %) have bullocks and the average number of bullocks, both adult and young, is 3 per household taking all the 60 households into account. 24 households (40 %) have cows with 0.9 being the average number per household for the whole sample. 38 households (63.3) have goats with the average number being 5 per household. 53 households (88.3 %) have poultry with the average number being 3.3 per household for the whole sample. Buffaloes, sheep and pigs are reared by a very few households.

8. Forest Produce Collection

The respondents of the study villages do not engage in agriculture in the Rabi season despite the availability of water for irrigation as was mentioned earlier. Instead they spend the winter and

summer seasons in hunting, gathering and fishing of animals, birds, insects, fish and herbs. The tables below give the details of this important activity of theirs which provides both sustenance and enjoyment to them.

Table15: Tuber Collection

Sl. No.	Type of Food	Total Collection (Quintals)	Per Household Collection (Quintals)
1	KARA KANDA	94.8	1.6
2	NANGAL KANDA	44.24	0.7
3	BHATA KANDA	31.6	0.5
4	HIRU KANDA	18.96	0.3
5	NAPA KANDA	25.28	0.4
6	HEMI KANDA	18.92	0.3
7	MUNDI KANDA	18.96	0.3
8	GANI KANDA	12.64	0.2
9	REGA KANDA	12.69	0.2
10	DAKLI KANDA	15.8	0.3
11	KANDU KANDA	6.32	0.1
12	GEDA KELI KANDA	9.48	0.2
13	SINDHI KANDA	6.39	0.1
14	KHAJURI KANDA	6.22	0.1
15	KETA KANDA	9.38	0.2
16	PALERI KANDA	9.51	0.2
17	KULIA KANDA	4.42	0.1

Table17: Miscellaneous Collection

Sl. No.	Type of Food	Total Collec-tion (Quintals)	Per Household Collection (Quintals)
1	HONEY	2.53	0.0
2	PANASA MANJI (JACKFRUIT SEEDS)	12.64	0.2
3	SUKHILA PANASA PATA (DRY JACKFRUIT)	6.26	0.1
4	KARADI (BAMBOO SHOOT)	15.17	0.3
5	KARADI SUKHILA (DRY BAMBOO SHOOT)	3.16	0.1
6	TENTULI MANJI (TAMARIND SEEDS)	63.6	1.1
7	AMBULA (DRIED MANGO)	6.28	0.1
8	AMBA SODA (MANGO CAKE)	6.36	0.1
9	CHAMPETA (DRIED MANGO SLICES)	6.39	0.1
10	AMBO TANKUA (MANGO SEEDS)	9.48	0.2

Table16: Fruit Collection

Sl. No.	Type of Food	Total Collection (Quintals)	Per Household Collection (Quintals)
1	MANGO	50.56	0.8
2	MAHUA	9.35	0.2
3	JACK FRUIT	50.36	0.8
4	CUSTARD APPLE	18.56	0.3
5	TAMARIND	34.53	0.6
6	JAMUN (BLACK PLUM)	22.12	0.4
7	GUAVA	12.64	0.2
8	KENDU FRUIT	18.74	0.3
9	PALM DATE	12.33	0.2
10	KUSUMA	5.69	0.1
11	CHAR FRUIT	6.32	0.1
12	KONTEI KOLI	6.24	0.1
13	BARA KOLI	8.22	0.1
14	ANANGA KOLI	10.11	0.2
15	AMLA	3.16	0.1
16	FOREST CASHEW	8.85	0.1
17	BELA	6.27	0.1
18	ORANGA	3.16	0.1
19	RAM PHALA	6.32	0.1
20	BATASA	7.58	0.1
21	NAHUDI KAYAN	3.79	0.1
22	PIPARADI	5.06	0.1
23	ANKULA PHALA	3.16	0.1
24	BANANA	6.32	0.1
25	KARAMANGA	3.16	0.1
26	DHIMBIRI	22.12	0.4
27	DAHIN PHALA	4.42	0.1
28	CHERA DHIMBRI	1.26	0.0
29	KADAMBA	5.69	0.1
30	ACHARADI	3.16	0.1
31	PATULI	6.26	0.1
32	SIALI	9.48	0.2
33	TANGNA SIALI	7.58	0.1
34	HARIDA	1.26	0.0
35	BAHADA	3.16	0.1
36	DUMBA	3.79	0.1

A wide variety of tubers (5.8 quintals per household), fruits both fresh and dried (6.9 quintals per household), seeds and shoots are collected in considerable quantities, jackfruit and mango being especially notable in all forms.

Table18: Leaf Collection

Sl. No.	Type of Food	Total Collec-tion (Quintals)	Per Household Collection (Quintals)
1	GANDHIRI	18.96	0.3
2	BARADA	22.12	0.4
3	GURUDI	18.96	0.3
4	PATALI	12.64	0.2
5	SAJANA	22.752	0.4
6	AMBILI	12.64	0.2
7	SARISA	12.64	0.2
8	KALAMA	12.64	0.2
9	SUNUSUNIA	6.32	0.1
10	KANTA	4.424	0.1
11	CHAKUNDA	3.16	0.1
12	JABA	3.16	0.1
13	KANSARI	1.896	0.0
14	PITA	3.16	0.1
15	MUSAKANI	1.896	0.0
16	TURUDA	1.896	0.0
17	PIPARADI	3.16	0.1
18	KOTI KUCHA	4.424	0.1
19	HETUA	3.16	0.1
20	RANIKANDA	9.48	0.2
21	KALARA	3.792	0.1
22	BHAJI	7.584	0.1
23	JHUDUNGA	1.896	0.0
24	KUMUDA	9.48	0.2
25	SARU	2.528	0.0
26	PIPALA	1.264	0.0

Table19: Mushroom Collection

Sl. No.	Type of Food	Total Collec-tion (Quintals)	Per Household Collection (Quintals)
1	SRABANA	9.39	0.2
2	BASA CHHATU	6.22	0.1
3	BAUNSA	6.29	0.1
4	PALA	9.44	0.2
5	JAMBA	6.27	0.1
6	BANA CHHATU	4.42	0.1
7	KHUNTA	7.58	0.1
8	TANKU	6.26	0.1
9	AMBA	3.792	0.1
10	MADANGA	4.424	0.1
11	MENDHA	7.584	0.1
12	PUCHIPUYU	9.48	0.2
13	PICHU TALI	10.112	0.2
14	BATI CHHATU	12.64	0.2
15	SARGI CHHATU	18.96	0.3
16	PATI	3.16	0.1
17	KALI BEDU	4.424	0.1
18	TITIRI BIYO	4.424	0.1
19	GACHHA	6.32	0.1
20	KACHI WAHIN	4.424	0.1
21	WIRIPIYU	3.16	0.1

Table 20: Insects Collection

Sl. No.	Local Name	Type of Food	Total Collection (Kgs/Year)	Per Household Collection (Kgs)
1	RED ANT EGG	Insect	1264	21.07
2	KHAJURI POKO	Insect	316	5.27
3	PARADI	Insect	125.7	2.10
4	DIDINGA	Insect	379.2	6.32
5	BUNUKI	Insect	252.8	4.21
6	SALPA POKO	Insect	125.4	2.09
7	BEE EGG	Insect	126.3	2.11

As many as 21 varieties of mushrooms are collected from the forest with the cumulative average annual collection per household being as high as 2.5 quintals and contributing considerably to nutrition. 26 varieties of leaves are also collected with the average annual collection being 3.4 quintals per household. Insects and their eggs are a special delicacy for the Kandhas and the average annual collection per household is a very high 43.2 kgs. Average collection of animal and reptile meat of various kinds is 66.1 kgs per

household. 24 kinds of birds are also eaten by the respondents and the average annual collection per household is 21.6 kgs.

Table 21: Animals, Reptiles and Fish Collection

Sl. No.	Local Name	Type of Food	Total Collection (Kgs/Year)	Per Household Collection (Kgs)
1	GAI	Beef	311	5.18
2	GHUSURI	Pork	125.3	2.09
3	CHHELI	Meat	254.6	4.24
4	MENDHA	Meat	125.4	2.09
5	BARIHA	Wild Pig	251.8	4.20
6	KUTRA	Deer	312	5.20
7	THEKUA	Rabit	188.7	3.15
8	MUSA	Rat	125.8	2.10
10	JHINKA	Porcupine	125.4	2.09
11	KOPATA	Pangolin	62.7	1.05
12	MACHHA	Fish	758.4	12.64
13	KANKADA	Crab	632	10.53
14	GENDA	Snail	188.6	3.14
15	Godhi sapa	snake	126.1	2.10
16	MANKADA	Monkey	189.6	3.16
17	BADUDI	Bat	63.9	1.07
18	DRY FISH	Fish	125.8	2.10

Table 22: Birds Collection

Sl. No.	Local Name	Type of Food	Total Collection (Kgs/Year)	Per Household Collection (Kgs)
1	PECHA	Owl	63.7	1.06
2	RAMBI	Bird	31.6	0.53
3	PIDISU	Bird	15.8	0.26
4	KIRA	Parrort	63.7	1.06
5	SUA	Parrort	63.2	1.05
6	MACHHA RANKA	King Fisher	62.6	1.04
7	JHIPURI	Bird	31.6	0.53
8	PANI KAU	Bird	30.9	0.52
9	MURGI	jungle fowl	123.2	2.05
10	BAJARA KAPTA	Bird	31.2	0.52
11	PARA	Pigoen	62.1	1.04
12	GUNDRI	Bird	124.0	2.07
14	DHAHUKA	Bird	62.4	1.04
15	BAGA	Stork	62.8	1.05
16	KAU	Crow	31.4	0.52
17	KUMUTI KAU	Crow	63.8	1.06
18	KATHA CHADHEI	Bird	62.2	1.04
19	KAINCHA	Bird	124.4	2.07
20	PIPARADI	Bird	31.2	0.52
21	GUTKATI	Bird	30.9	0.52
22	AKUPATA	Bird	31.8	0.53
23	DESKI	Bird	30.7	0.51
24	PIYU PATA	Bird	30.3	0.51
25	PIYUKA	Bird	30.8	0.51

9. Housing

The distribution of the type of housing and the plinth area of the sample is given in Table 23 below

Table 23: Type and Size of Housing

Type of House	Area of House (square meters)					Total	Proportion (%)
	>10 & <20	>20 & <30	>30 & <40	>40 & <50	>50 & <60		
Mud Walls with Tiled Roof	1	8	17	8	10	44	73.3
Brick Walls with Sheet Roof	2	6	5	2	1	16	26.7
Total	3	14	22	10	11	60	100
Proportion (%)	5.0	23.3	36.7	16.7	18.3	100	

The mud walled and tiled roof houses constitute 73.3 percent of the sample and their average area too is higher at 34.6 square meters as compared to 26.8 square meters for the brick walled and sheet roofed houses. Once again this indicates that the Kandhas have a subsistence lifestyle that is more ecologically sustainable.

10. Income and Expenditure Comparison

The agricultural, livestock, forest, labour and miscellaneous income has been estimated as has been the consumption expenditure and then compared. The respondents mostly consume the forest produce that is collected and sell only a little. Since they were not able to recall exactly how much they had sold, the amount being negligible, the value of the forest produce collection has been taken in both the income and the expenditure of the households in the calculations. The monthly per capita expenditure (MPCE) for food and non food items has been compared to that for rural Odisha as estimated by the Government of Odisha based on National Sample Survey Organisation data for 2011-12 (GoO, 2014), suitably adjusted for inflation upto 2018-19. The average results are summarised in the tables below. The detailed data for each household are given in Annexure- IV.

Table 24: Average Household Income

Annual Crop Inc (Rs)	Annual Forest Prod Income (Rs)	Annual Labour Income(Rs)	Total Annual Income (includes Misc. Inc also) (Rs)	Forest Inc/ Total Inc (%)	Labour Inc/ Total Inc (%)	Crop Inc/ Total Inc (%)
107572	114758	15983	243574	47.1	6.6	44.2

The most important result is that the income from forest produce is higher than that from crops and that is the reason why the Kandhas of the study villages prefer to do forest collections to agriculture in the winter and summer. The labour income is very low as it is restricted to working on each other's farms at a very low wage rate of Rs 100 per day.

Table 25: Average Household Consumption Expenditure

Annual Food Exp (Rs)	Food MPCE (Rs)	Muniguda/ Odisha Food MPCE Ratio	Annual Non durable Exp (Rs)	Annual Durable Exp (Rs)	Total Exp (Rs)	Non food MPCE (Rs)	Food/ Non-food Ratio	Muniguda/ Odisha Non food MPCE Ratio
165731	2853	3.4	179980	10018	189998	474	9.9	0.8

The food expenditure of the study villages is a healthy 3.4 times that for Rural Odisha whereas the non-food expenditure of the study villages is 0.8 of the Rural Odisha figure once again confirming that the Kandhas of the study villages live a frugal life which does not have many of the consumer durables that have become common features of modern civilisation. This is further confirmed by the fact that the ratio of food to non-food expenditure is a very high 9.9 and that of non-durable goods to durable goods expenditure is an even higher 18. The average household income to expenditure ratio of the study villages is 1.28 mainly on the strength of the very good forest produce collection. Thus, even though the Kandhas of the study villages lead a subsistence forest based lifestyle practising organic agriculture, they are economically viable households in addition to enjoying a healthy labour intensive life.

11. Mitigation of Climate Change by Residents of the Study Villages

Agriculture is a significant contributor to greenhouse gas emissions at 20 percent of total emissions (FAO, 2019). The main sources are methane from livestock, nitrous oxide from agricultural soils, and carbon dioxide - primarily from energy and fuel use. Importantly, these emissions often also represent the loss of valuable resources from farming systems and therefore opportunities for enhancing productivity and livelihood opportunities. The main sources of green house gases arising from modern agriculture are as follows -

1. Carbon dioxide emissions from the heavy use of gasoline-powered agricultural machinery that modern techniques require.
2. Carbon dioxide emissions from the deforestation and burning of land to convert it for intensive agriculture.
3. Loss of soil and forests as carbon sinks. Natural vegetation acts as a huge reservoir, soaking up atmospheric carbon, as does the soil. Destruction of the plants and the disruption of the soil that occurs when land is converted to agriculture decrease the available of these sinks, meaning more carbon is left in the atmosphere. Conventional farming techniques also increase soil erosion and the leaching of soil nutrients, which decrease the use of soil as a sink. Rough estimates are that man-made changes in land-use have produced a cumulative global loss of carbon from the land of about 200 thousand million tonnes.
4. The use of synthetic fertilizer releases huge amounts of N_2O – it is the single largest source of N_2O emissions in the world. The application of fertilizers accounts for 36% of the total emissions of N_2O. According to the IPCC, if fertilizer applications are doubled, N_2O emissions will double, all other factors being equal. Since regular applications of fertilizer are an integral part of modern farming, and as the developing countries adopt more of these industrialized agricultural practices, this is a realistic situation. Remembering that N_2O has over 300 times the warming potential of CO_2 and can stay in the atmosphere for about 120 years, the effect on global warming could be devastating.
5. Methane released from animals and manure piles. Manure storage and treatment systems equal 9% of total CH_4 emissions and 31% CH_4 emissions from the agricultural sector. Most of the CH_4 emissions come from the liquid-based manure management systems that are commonly found in modern livestock farms with large populations of animals.

Apart from this the indirect contributions of modern farming are even greater. The manufacture of synthetic fertilizer is one of the most intensive energy processes in the chemical industry, which itself is a primary energy user globally. Add into this the need for the fertilizer to be transported to the farmer, and we find that synthetic fertilizer is the largest producer of CO_2 emissions in the

agricultural industry – even considering all the tractors and equipment belching out exhaust fumes. The use of synthetic fertilizer tends to acidify the soil, which then requires the application of lime to balance the pH; manufacture of lime also produces CO_2 emissions. Finally, synthetic fertilizers suppress the soil's natural micro-organisms that break down methane in the atmosphere, which leads to higher levels of methane than otherwise. The soil micro-organisms are largely responsible for controlling soil temperature and water run-off, production of vitamins, minerals and a host of plant hormones, not to mention that soil micro-organisms provide much of a plant's immune system so reducing their population is harmful. Thus modern agriculture is unsustainable from the point of view of its harmful contribution to global warming.

Another problem arising from the adoption of modern agriculture has been that of the increasing scarcity of water. Most of the water needed for irrigation in India is being provided by groundwater extraction and this has led to a situation of "water mining" wherein water collected in the deep confined aquifers over hundreds of thousands of years were used up in the space of a decade and large parts of the country have been facing a ground water drought from the nineteen nineties onwards. Since then there has been less and less ground water available for not only irrigation but also for drinking and the cost of its extraction is continually going up.

Finally, modern agriculture drastically reduces the agricultural bio-diversity with its stress on mono-cultures. This combined with the greater monetisation of the rural economy has forced the marginal Adivasi farmers to buy their food from the market instead of getting it cheaply from their farms and has reduced their nutritional levels well below healthy standards.

Consequently, the respondents of the study villages by avoiding chemical agriculture and irrigated Rabi season cropping altogether have significantly reduced their carbon footprint. They have also done away with water stress as they do not extract water for irrigation. Their housing too is mostly of mud and so there is minimal use of cement which is a highly carbon negative product. They also do not use much of consumer durables and motorised vehicles and this also keeps their carbon footprint low. Most importantly since they depend so heavily on forest produce for their livelihoods, they take care of their forests and make sure that they are not denuded. They harvest their forests sustainably and so these act as a carbon sink. They are thus providing an important eco-system service (CGIAR, 2019) through this conservation work on 867 Ha of dense forests.

12. Conclusion

The study conclusively establishes that the subsistence forest based lifestyle of the Kandha Adivasis of the sample villages provides them with an economically viable and healthy livelihood. Compared to Rural Odisha their food consumption is much better as are their incomes. Thus, they do not suffer from the problems of chronic hunger that bedevil the lives of Adivasis in other areas who have lost their traditional agriculture and their forest habitats.

Moreover, their frugal living combined with their sustainable consumption of forest produce, low use of consumer durables, practice of organic agriculture only in the kharif season, no use of irrigation and forest conservation efforts result in not only a low carbon footprint for themselves but also in a huge contribution towards mitigation of climagte change through the eco-system service of conserving the dense forests in their villages and using them sustainably. Further research needs to be done to quantify this important contribution being made by the Kandha Adivasis of the study villages towards climate change mitigation.

References

CGIAR (2019): *What are Ecosystem Services,* Consultative Group for International Agricultural Research, at url https://wle.cgiar.org/content/what-are-ecosystem-services accessed on 20.11.2019

Deb, D, Kurganti, K, Rao, V R & Salome, Y (2014): *Forests as Food Producing Habitats: An Exploratory study of Uncultivated Foods and Food & Nutrition Security of Adivasis in Odisha,* Living Farms, Bhubaneshwar.

FAO (2019): *Organic Agriculture and Carbon Emissions,* Food and Agriculture Organisation, at url http://www.fao.org/3/y4137e/y4137e02b.htm , accessed on 20.11.2019

GoO (2014): *Level and Pattern of Consumer Expenditure of Odisha:District Level Patterns,* Directorate of Economics and Statistics, Government of Odisha, Bhubaneshwar.

IISD, IUCN & SEI (2003): *Livelihoods and Climate Change: Combining Disaster Risk Reduction, Natural Resource Management and Climate Change Adaptation in a New Approach to the Reduction of Vulnerability and Poverty*, International Institute for Sustainable Development (IISD), International Union for Conservation of Nature andNatural Resources (IUCN) and Stockholm Environment Institute (SEI), at url https://www.iisd.org/library/livelihoods-and-climate-change-combining-disaster-risk-reduction-natural-resource-management accessed on 20.11.2019

Priyambada, S (2012): *KBK Poverty,* International Journal of Social Science Tomorrow, Vol 1 No4

SCSTRTI (2013): *Kandha,* Scheduled Caste and Scheduled Tribe Research and Training Institute, Bhubaneshwar.

Annexure - I: Villagewise Names of Survey Respondents

Table A1 below gives the names of the survey respondents along with the household codes for the five study villages

Table A1: Names of Survey Respondents with the Household Codes

Village	Householder Name	Household Code
Arati	LALITA KADAMAKA/ GUNDIMAJHI	101
	LEBDU KADAMAKA / MUDA	102
	DASARA GUMUTIKA/ WATI	103
	MADI KANDAMAKA/ PITAK	104
	TAKU HIKABADI	105
	KRISHNANGA HIKAKA / JIMI	106
	KILA PALAKA	107
	JAUTI PALAKA / LIMA	108
	SHAMBU PALAKA / BILE	109
	GAGELI PALAKA	110
	SUBA PALAKA / MUDRINGI	111
	KAPALI PALAKA / TAPE	112
	MAMBALU KADAMAKA / BANA	113
	MANGU KASAMAKA / DHANA	114
	HIKABADI KADAMAKA / MALI	115
	KUMBRI MAMBLAKA	116
	SARA PALAKA / CHANDRA	117
	JAGUTI MAMBLAKA / RAMA	118
	LAXMI SRAMBUTIKA / KIRASA	119
Garlagudi	Derpa Saraka/ Supuri	201
	MOHANA SARAKA	202
	LAKIRAM PRASKA	203
	JAYARAM PRASKA	204
	NIDAMAJHI SARAKA	205
	GAMANA SARAKA	206
	DIPAI GUDUMBAKA	207
	KUMBHARI PRASKA	208
	SANIBARI SARAKA	212
	SUKRU NUNDRUKA	213
	NIRI PIDIKAKA	217
Kandulapada	BARIGUDA SAKAKA / BIBA	301
	MALATI SUKUKA / BILU	302
	SANURJYA SUKAKA / JHILUPADU	303
	DIPADU SUKAKA / JOGI	304
	RAM SUKAKA / SUMATRI	305
	JHIMADU SIKAKA / DUKARA	306
	BUDU DULKIA	307

Village	Householder Name	Household Code
	KATELA DULKIA	308
	KITINA ANDIKIA	309
Gangarabaju	KASRI MAMBLAKA	401
	DASIRATHI PALAKA/SANTI	402
	MEENA KUMBRUKA	403
	BIDU MAMBLAKA	404
	MARANGA PALAKA	405
	DRAILA PALAKA	406
	LINGI MAMBLAKA	407
	PURNNA MAMBLAKA	408
	RAMA DIBAKA	409
	SAIBA GUMITIKA / TAJURI	410
	HARI PALAKA	411
	BISINATH PALAKA	412
	BUDURA PALAKA	413
	SAHEBA KUMBRUKA	414
	KALIA MAMBLAKA	415
Kurukuti	MITALA HIKABADI	501
	PENTI KIMBAKA	502
	BATRI BREKBEDA	503
	BUDUNA BREKBREDA	505
	ARJUN BREKBEDA	506
	RUPA BREKBREDA	510

Annexure - II: Schedule for Survey of Consumption Expenditure
Name **Code no.**

Village Codes :Arati-1, Garlagudi -2, Kandulpada -3, Ghongadabaju -4, Kurkuti -5

(1) Description of family			
1.1 – Main source of income	Description	1.2 - way of cooking (code)	
		1.3 - Souce of light	
1.4- If anyone is doing a job, how much is his salary?			
1.5- Ration card			
1.6- Adult	Male	Female	
1.7 - Children			
1.8- Literate			

Code:

Items 10 Ways of cooking: Coal- 1, firewood-2, Gas- 3, Biogas-4, Cowdung cake-5, Charcoal – 6, Kerosene-7, Electricity-8, other-9, No facility-10

Items11 source of light: Kerosene- 1, Oil lamp- 2, Gas- 3, Candle-4, Electricity-5, Other-9, No facility- 6

Items 15- Type of ration card: AAY-1, BPL- 2, Other- 3

(2) Consumption of Cereals, Pulses, Milk, Milk products, sugar and salt for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
2.1	Rice (PDS)					
2.2	Rice (Other source)					
2.3	Puffed rice					
2.4	Sorghum and its products					
2.5	Pearl Millet and its products					
2.6	Maize and its products					
2.7	Little millet and its products					
2.8	Finger millet and its products					

(2) Consumption of Cereals, Pulses, Milk, Milk products, sugar and salt for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
2.9	Others cereals					
2.10	Tuber and roots					
2.11	Pigeon pea					
2.12	Pulses and nuts (Split)					
2.13	Pulses and nuts (not split)					
2.14	Moong					
2.15	Horsegram					
2.16	Green peas					
2.17	Others					
2.18	Products made out of Nuts					
2.19	Gram flour					
2.20	Products made out of Pulses					

All units are in KG
Source code: Purchase-1, Self produced-2, Purchase and self produced-3, Collected-4, Bartered-5, Offered-6, Other-9 For column-1,2, 3 and 4 codes can't be used. Things cooked in house like puffed rice will be mentioned instead of rice.

(3) Consumption of Icecream Salt, Sugar, Chocolates for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
		1	2	3	4	5
3.1	Ice-cream					
3.2	Salt					
3.3	Sugar (PDS)					
3.4	Sugar (Other source)					
3.5	Jaggery					
3.6	Rock candy/ Chocolates					

3.7	Honey					

All units are in KG
Source code: Purchase-1, Self produced-2, Purchase and self produced-3, Collected-4, Bartered-5, Offered-6, Other-9
For column-1,2, 3 and 4 codes can't be used._ Things made out of above items can be mentioned in the same.
Items offered by others should not be considered.

(4) Consumption of vegetables, oil, Eggs, Fish, Meat, etc for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
		1	2	3	4	5
4.1	Castor oil					
4.2	Mustard oil					
4.3	Mahua oil					
4.4	Coconut oil					
4.5	Refined oil(Sunflower, soybean, Saffola)					
4.6	Niger oil					
4.7	Egg					
4.8	Fish and prawns					
4.9	Meat					
4.10	Beef					
4.11	Pork meat					
4.12	Chicken					
4.13	Other meat (Birds, tortoise, crab, shells)					
4.14	Potato					
4.15	Onion					
4.16	Tomato					
4.17	Brinjal					
4.18	Raddish					
4.19	Carrot					
4.20	Green Leafy vegetables					

(4) Consumption of vegetables, oil, Eggs, Fish, Meat, etc for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
4.21	Green Chilly					
4.22	Ladies Finger					
4.23	Peer gourd					
4.24	Caulifower					
4.25	Cabbage					
4.26	Bottle gourd / Pumpkin					
4.27	Green peas					
4.28	Cow pea					
4.29	Lemon (No.)					
4.30	Other vegetable					

All units are in KG
Source code: Purchase-1, Self produced-2, Purchase and self produced-3, Collected-4, Bartered-5, Offered-6, Other-9
For column-1,2, 3 and 4 codes can't be used._ Things made out of above items can be mentioned in the same. Items offered by others should not be considered.

(5) Consumption of fruits, spices, fluids, tobacco and intoxicants for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
		1	2	3	4	5
5.1	Banana (No.)					
5.2	Jackfruit					
5.3	Watermelon					
5.4	Pineapple					
5.5	Coconut					
5.6	Guava					
5.7	Water chestnut(Singhara)					
5.8	Orange					
5.9	Sweet Lime					

(5) Consumption of fruits, spices, fluids, tobacco and intoxicants for 30 days						
	Items	Self produce		Market		Source
		Quantity	Cost	Quantity	Cost	
5.10	Papaya					
5.11	Mango					
5.12	Muskmelon					
5.13	Nuts					
5.14	Apple					
5.15	Grapes					
5.16	Other fruits					
5.17	Groundnut					
5.18	Palm Date					
5.19	Cashew					
5.20	Other Nuts					
5.21	Other dry fruits					
5.22	Ginger					
5.23	Garlic					
5.24	Cumin seeds					
5.24	Corriander					
5.25	Turmeric					
5.26	Black pepper					
5.27	Dry chilly(red)					
5.28	Tamarind					
5.29	Curry Powder					
5.30	Oil seeds					
5.31	Other spices					

All units are in KG

Source code: Purchase-1, Self produced-2, Purchase and self produced-3, Collected-4, Bartered-5, Offered-6, Other-9
For column-1,2, 3 and 4 codes can't be used._ Things made out of above items can be mentioned in the same. Items offered by others should not be considered.

(6) Consumption of packed food, fried food, etc in 30 days								
	Items	Self produce			Market			Source
		Quantity		Cost	Quantity		Cost	
		1		2	3		4	5
6.1	Biscuit, chocolate, etc.							
6.2	Papad, namkeen, Bhajia							
6.3	Pickle							
6.4	Other packaged food							
6.5	Gutkha							

All units are in KG
Source code: Purchase-1, Self produced-2, Purchase and self produced-3, Collected-4, Bartered-5, Offered-6, Other-9
For column-1,2, 3 and 4 codes can't be used._ Things made out of above items can be mentioned in the same.
Items offered by others should not be considered.
Items like chat, bhelpuri, etc can be considered.

(7) Consumption of tobacco, intoxicants, etc in 30 days								
	Items	Self produce			Market			Source
		Quantity		Cost	Quantity		Cost	
		1		2	3		4	5
7.1	Tobacco leaf							
7.2	Hookkah							
7.3	Palm wine							
7.4	Country liquor							
7.5	Beer							
7.6	Country liquor							
7.7	Other intoxicants							

(8) Consumption of power, fuel, light, home appliances, etc in 30 days								
	Items	Self produce			Market			Source
		Quantity		Cost	Quantity		Cost	
		1		2	3		4	5
8.1	Firewood and leaves							
8.2	Electricity							
8.3	Kerosene (PDS)							
8.4	Match sticks							
8.5	Gas cylinder(except transportation charges)							

All units are in KG/ltr
Source code: Purchase-1, Self produced-2, Purchase and self produced-3, Collected-4, Bartered-5, Offered-6, Other-9 For column-1,2, 3 and 4 codes can't be used.

(9) Requirement of Clothes, bedsheets, etc		Items	For 365 days		
			Quantity		Cost
9.1	Dhoti				
9.2	Saree				
9.3	Cloth for Shirt, Payjama, kurta, salwar				
9.4	Trouser				
9.5	Shawl, blanket, etc				
9.6	School uniform (boys)				
9.7	School uniform (girls)				
9.8	Kurta, pyjama, suits (Male)				
9.9	Payjama, Salwar (Female)				
9.10	Shirt, t-shirt,etc (No.)				
9.11	Frock, skirt, etc (No.)				
9.12	Blouse, Duppatta, Scarf, Muffler (No.)				
9.13	Lungi				
9.14	Other clothings				
9.15	Baniyan, socks, underwear, etc				

9.16	Towel, handkerchief				
9.17	Cloths for babies				
9.18	Cap, belt, etc				
9.19	Dress (New)				
9.20	Dress (old)				
9.21	Bedsheet				
9.22	Blanket				
9.23	Pillow				
9.24	Curtain				
9.25	Mosquito net				
9.26	Other cloth items				

*Include all the night wear

(10) Footwear		Items	**For 365 days**	
			Quantity	Cost
10.1	Rubber, plastic footwear			
10.2	Other footwear			
10.3	Old footwear			

(11) Expenditure for education, medical, etc		
	Items	**Cost For 365 days**
11.1	New Books	
11.2	Old Books	
11.3	Stationary and photo copy	
11.4	Medicine	
11.5	X-ray, EGC, blood test, etc	
11.6	Doctor fees	
11.7	Clinic and hospital fees	
11.8	Other medical expenses	

(12) Expenditure for household things		
	Items	**Cost For 365 days**
12.1	Cinema, Fair	
12.2	Picnic	
12.3	Toys and other sport items	
12.4	Entertainment items	
12.5	Photography	
12.6	VCD, DVD rent	
12.7	Dish TV	
12.8	Other entertainment	
12.9	Spectacles	
12.11	Torch	
12.12	Lock	
12.13	Umbrella, raincoat	
12.14	Other household items	
12.15	Brush, Toothpaste, Comb	
12.16	Talcum powder, fairness cream	
12.17	Shampoo, hair oil, clips	
12.18	Razor and other shaving items	
12.19	Sanitary napkin	
12.20	Bulb, tubelight	
12.21	Charging Battery	
12.22	Other electronics	
12.23	Earthen items	
12.24	Local ropes	
12.25	Detergent, soaps	
12.26	incense sticks	
12.27	Other small items	
(13) Other expenses		
	Items	**For 365 days**
		Cost

13.1	Tailor	
13.2	Mobile recharge	
13.3	Maintenance	
13.4	Internet	
13.5	Other related expenses	
13.6	Train	
13.7	Bus, tramp	
13.8	Taxi, auto	
13.9	Petrol for bike, car	
13.10	Other expenses for bike, car	

(14) Expenditure of Household stuff and other maintenance work		**For 365 days**						**For previous year**
		New			Raw material for repair and rent for labour	Old		
		No. of items	Rent (Yes/No)	Cost		No. of items	Cost	Cost
		7	8	9	10	11	12	
14.1	Bed							
14.2	Chair, table, stool, bench,							
14.3	Suitcase, trunk, handbag,							
14.4	Foam, rubber							
14.5	Carpet							
14.6	Paintings, artwork, etc							
14.7	Radio, tape recorder, etc							
14.8	TV							
14.9	VCD, DVD							
14.10	Music system							
14.11	Utensils							
14.12	Other metal items							
14.13	Fan							

(14) Expenditure of Household stuff and other maintenance work		For 365 days						For previous year
		New			Raw material for repair and rent for labour	Old		
		No. of items	Rent (Yes/No)	Cost		No. of items	Cost	Cost
14.14	Lamp, lantern, etc							
14.15	Stitching machine							
14.16	Other utensils							
14.17	Cycle							
14.18	Motorcycle, scooter							
14.19	Tyre, tube							
14.20	Other tranport items							
14.21	Watch, wall clock							
14.22	Other kitchen items							
14.23	Mobile set							
14.24	Other personal items							
14.25	Bathroom fittings							
14.26	Plug,switch electric items							
14.27	House and plots							
14.28	Maintenance for house							
14.29	Other property							
14.30	Gold ornaments							
14.31	Silver ornaments							
14.32	Pearl ornaments							
14.33	Other Ornaments							

15. Details of house:

Type of house: 1 - mud house(Kaccha), 2 - Cement house(Pakka), 3 - Cement with RCC.	Length(Mtr)	Width (Mtr)	Height(Mtr)
1	2	3	4

Annexure - III: Agricultural Questionnaire

Village Codes : Arati - 1, Gorlagudi -2, Kondulpada -3, Ghongadabaju - 4, Kurkuti - 5

Name - Code -
Khatian number -
Owner of the land -

1 – Plot Details

Plot no					
Plot area					
Forest land area					

2 - Land utilisation, ownership & soil and water conservation

		Plot no.	Plot no.	Plot no.	Plot no.
		1	2	3	4
2.1	Latittude				
2.2	Longtude				
2.3	Height from sea level				
2.4	amount of land (hectare)				
2.5	Type of land (1 - agriculture, 2- forest)				
2.6	Type of land owner (1 - own, 2 - taken on lease, 3 - given on lease, 4 - encroached				
2.7	Distance from the house				
2.8	Topography (1 - flat, 2 – low slope, 3 - Moderate slope, 4 – High Slope)				
2.9	Type of soil (1 - red, 2 - black, 3 - reddish brown)				
2.10	Fertility of soil (1 - high, 2 - medium, 3 - low)				
2.11	Soil erosion (1 = low, 2 - medium, 3 - high)				
2.12	State of Soil and water conservation (0 – None, 1 - bunds, 2- gully plugs, 3 – boulder checks, 4 – farm ponds, 5 - All, 6 - other)				
2.13	Is there a water resource near the land (1 - yes, 0 - no)				
2.14	Is there a check dam near the land (1 = yes,0 - no				
2.15	is the land near the pond (1 - yes, 0 - no)				

Since irrigation is not practiced in the study villages and Rabi crop is not taken questions related to irrigation were not asked. Also since water availability is abundant throughout the year, questions regarding this were also not asked.

3 -_Utilisation land for crops according to season:

Additional page can be attached for extra land, if needed

3.1	PLot no.	C1	C 2	C3	C 4	C5	C 6	C 7
		1	2	3	4	5	6	7
3.2	Season 1 – M, 2 – W, 3 - S							
3.3	Area of cultivation							
3.4	Name of crop							
3.5	Quantity produced							
3.6	Quantity sold							
	Selling cost							
3.7	Fertilisers(Qty per plot)							
	Cost of fertiliser							
3.8	Manure(Quantity per plot)							
	Cost of Manure							
3.9	Pesticides(Qty per plot)							
	Cost of Pesticides							
3.10	Herbicide(Qty per plot)							
	Cost of Herbicide							
3.11	Seeds (Quantity per plot)							
	Cost of seeds							
3.12	Labour(or own)							
	Labour cost							
3.13	Labour (from outside)							
	Labour cost							
3.14	Exchange labour							
3.15	Time required for tractor							
	Cost per hour							
3.16	Time for ploughing							
	Cost per day							

4-_ list of cattle for previous year

	Type of cattle	Quantity	Sell		Purchase	
		No.of	Qtity	Price	Qty	Price
		1	2	3	4	5
4.1	Bullock (Young / old)					
4.2	Young Bullock (1 to 3 yrs)					
4.3	Male					
4.4	Country Cow(Big ones)					
4.5	Young cow (1 to 3 years)					
4.6	Female					
4.7	Buffalo (Male)					
4.8	Big Buffalo					
4.9	Small Buffalo (1 to 3 years)					
4.10	Buffalo (Female)					
4.11	Sheep (Male)					
4.12	Big Sheep (Female)					
4.13	Young sheep (4 to 8 years)					
4.14	Small Sheep (below 4 years)					
4.15	Goat (Big one)					
4.16	Big Goat (Female)					
4.17	Young Goat (4 to 8 years)					
4.18	Small Goat					
4.19	Pig (Male)					
4.20	Pig (Female)					
4.21	Small pig (3 to 12 months)					
4.22	Small pig (less than 3 months)					
4.23	Hen only					
4.24	All type of Hen and cock					

5- Fish, Cattle Fodder, Forest food

5.1	**Fish**				
5.1.1	Fish obtained by fishing(kg)				
5.1.2	Fish Consumed by themselves by fishing				
5.1.3	Fish sold (kg)				
	Price of fish sold				
5.1.4	Time required to collect those fishes				
5.1.5	Cost of net and other required things (as per last year)				
5.2	**Cattle Fodder and Forest food**				
	Cattle food / forest food	Collection/production	Own utilisation	No of sold items	Price of sold items
		1	2	3	4
5.2.1	Firewood				
5.2.2	Cattle food				
5.2.3	Fruits, roots, tubers, medicinal plants, etc				

6- How much one earns in a year by labour work

	Type of work	Days	Earnings
		1	2
6.1	Agricultural work in own village		
6.2	Construction work in own village		
6.3	Agricultural work in other places		
6.4	Construction work in other places		
6.5	MGNREGA		
6.6	Others		

Annexure – IV: Area, Population and Income and Expenditure Details of Study Households

The crucial income and expenditure comparison for all the households is given below. The monthly per capita expenditure (MPCE) for food and non food items has been compared to that for rural Odisha as estimated by the National Sample Survey Organisation for 2011-12 suitably adjusted for inflation upto 2018-19. The respondents mostly consume the forest produce that is collected and sell only a little. Since they were not able to recall exactly how much they had sold, the value of the forest produce collection has been taken in both the income and the expenditure of the households in the calculations below. The results clearly show that –

i. The food MPCE of the Muniguda sample is much better than that of the average Odisha value indicating that the respondents derive tremendous nutrition from their food which is a combination of their agricultural produce and forest produce.
ii. The forest produce income constitutes a bigger proportion of their total income and that is why they prefer not to do a second crop and spend their time in forest produce collection.
iii. The non food MPCE is very low which means that they do not have many material possessions and lead a very simple low carbon life.
iv. Mostly their income is more than their expenditure with only 17% households with incomes marginally below expenditure which can be due to reporting error by the respondents.

Table A2: Household Area, Population, Income and Expenditure

Hhd. No.	Sown Area (Ha)	Area /capita (Ha)	Population	Annual Crop Inc (Rs)	Annual Forest Prod Income (Rs)	Annual Labour Income(Rs)	Total Annual Income (includes misc. inc also) (Rs)	Forest Inc/ Total Inc (%)	Annual Food Exp (Rs)	Food MPCE (Rs)	Muniguda / Odisha Food MPCE (%)	Annual Non durable Exp (Rs)	Annual Durable Exp (Rs)	Total Exp (Rs)	food/ nfood	Non food MPCE	Muniguda / Odisha Non food MPCE (%)	Inc / Exp (%)
101	4.5633	1.14	4	174699	68000	9900	231917	29.32	136364	2841	3.42	160400	8630	169030	4.17	680	1.1	137.2
102	6.4979	1.08	6	236264	122300	14800	344474	35.50	226340	3144	3.79	313376	6420	319796	2.42	1298	2.1	107.7
103	2.2028	0.55	4	878296	94090	9800	183105	51.39	137890	2873	3.46	151366	4630	155996	7.62	377	0.6	117.4
104	2.4282	0.30	8	95912	130332	19700	238104	54.74	173532	1808	2.18	193200	6980	200180	6.51	277	0.4	118.9

Hhd. No.	Sown Area (Ha)	Area /capita (Ha)	Population	Annual Crop Inc (Rs)	Annual Forest Prod Income (Rs)	Annual Labour Income(Rs)	Total Annual Income (includes misc. inc also) (Rs)	Forest Inc/ Total Inc (%)	Annual Food Exp (Rs)	Food MPCE (Rs)	Munigudа / Odisha Food MPCE (%)	Annual Non durable Exp (Rs)	Annual Durable Exp (Rs)	Total Exp (Rs)	food/ nfood	Non food MPCE	Munigudа / Odisha Non food MPCE (%)	Inc / Exp (%)
105	3.2271	1.08	3	125425	68373	3400	182862	37.39	122291	3397	4.09	127271	7289	134560	9.97	340	0.5	135.9
106	7.6175	1.27	6	270438	118400	3200	357550	33.11	240755	3344	4.03	245087	6749	251836	21.72	154	0.2	141.9
107	3.4822	0.87	4	134659	76877	9700	206225	37.28	125597	2617	3.15	139253	800	140053	8.69	301	0.5	147.2
108	2.0216	0.50	4	81209	103516	22200	196516	52.68	166455	3468	4.18	180675	4710	185385	8.79	394	0.6	106.0
109	2.2596	0.56	4	89881	93326	9500	182869	51.03	152365	3174	3.82	167941	2950	170891	8.22	386	0.6	107.0
110	3.2618	0.65	5	126687	86090	3300	202767	42.46	147646	2461	2.96	157966	3511	161476	10.68	231	0.4	125.6
111	6.0829	1.22	5	223108	91200	3100	289994	31.45	173802	2897	3.49	194802	10246	205048	5.56	521	0.8	141.4
112	2.906	0.48	6	113659	97621	14600	214951	45.42	172321	2393	2.88	186757	6760	193517	8.13	294	0.5	111.1
113	0.8361	0.17	5	35221	137081	41700	212002	64.66	184541	3076	3.71	209897	3870	213767	6.31	487	0.8	99.2
114	1.664	0.55	3	67825	80202	7200	148707	53.93	121661	3379	4.07	131297	2290	133587	10.20	331	0.5	111.3
115	6.2252	0.69	9	227649	184600	3200	387033	47.70	248920	2305	2.78	272956	7600	280556	7.87	293	0.5	137.9
116	1.5984	0.23	7	65324	150663	17200	229395	65.68	175922	2094	2.52	203954	4860	208814	5.35	392	0.6	109.9
117	4.2879	1.07	4	163168	65749	3200	212578	30.93	136693	2848	3.43	148729	4060	152789	8.49	335	0.5	139.1
118	3.8373	1.92	2	147347	48956	3100	180067	27.19	97113	4046	4.88	110313	2418	112731	6.22	651	1.0	159.7
119	2.1795	0.73	3	86984	76300	7100	160487	47.54	112540	3126	3.77	136576	5140	141716	3.86	810	1.3	113.2
201	2.5987	0.37	7	102252	109448	3100	203507	53.78	174075	2072	2.50	183399	2817	186216	14.34	145	0.2	109.3
202	0.135	0.02	9	5843	213013	40500	264082	80.66	257653	2386	2.87	259825	8100	267925	25.08	95	0.2	98.6
203	0.1201	0.02	8	5201	186102	41400	236562	78.67	217437	2265	2.73	222021	18933	240954	9.25	245	0.4	98.2
204	0.0611	0.01	11	2652	225000	34500	268446	83.82	252668	1914	2.31	255080	13080	268159	16.31	117	0.2	100.1
205	0.6238	0.08	8	26497	213882	28200	269800	79.27	250782	2612	3.15	253074	8840	261914	22.53	116	0.2	103.0
206	2.4289	0.22	11	95938	128528	27100	246022	52.24	193880	1469	1.77	195932	10180	206112	15.85	93	0.1	119.4

Hhd. No.	Sown Area (Ha)	Area /capita (Ha)	Population	Annual Crop Inc (Rs)	Annual Forest Prod Income (Rs)	Annual Labour Income(Rs)	Total Annual Income (includes misc. inc also) (Rs)	Forest Inc/ Total Inc (%)	Annual Food Exp (Rs)	Food MPCE (Rs)	Munigudа / Odisha Food MPCE (%)	Annual Non durable Exp (Rs)	Annual Durable Exp (Rs)	Total Exp (Rs)	food/ nfood	Non food MPCE	Munigudа / Odisha Non food MPCE (%)	Inc / Exp (%)
207	0.4096	0.14	3	17543	89694	13500	119990	74.75	101514	2820	3.40	103506	11950	115456	7.28	387	0.6	103.9
208	0.2036	0.10	2	8789	61178	13400	83549	73.22	79238	3302	3.98	82310	2100	84410	15.32	216	0.3	98.9
212	0.2512	0.08	3	10824	90893	11700	113423.9	80.14	111183	3088	3.72	111843	2218	114060	38.63	80	0.1	99.4
213	0.9857	0.25	4	41280.59	110464	3200	152416.7	72.48	146403	3050	3.67	147363	4884	152247	25.05	122	0.2	100.1
217	0.2328	0.08	3	10038.64	90326	12400	112081	80.59	109762	3049	3.67	110170	2391	112561	39.21	78	0.1	99.6
301	0.6912	0.08	9	29283.79	200358	19200	250786.5	79.89	228984	2120	2.55	247644	2448	250092	10.85	195	0.3	100.3
302	0.2496	0.08	3	10756.26	90905	21500	123713.8	73.48	111497	3097	3.73	123521	2080	125601	7.91	392	0.6	98.5
303	0.0832	0.08	1	3608.264	30861	46400	81053.8	38.08	50721	4227	5.09	74145	5403	79548	1.76	2402	3.8	101.9
304	3.5781	1.19	3	138104.7	65716	3300	189680.5	34.65	92584	2572	3.10	129652	3256	132908	2.30	1120	1.8	142.7
305	1.4769	0.74	2	60655.32	56895	5000	115516.3	49.25	87099	3629	4.37	98331	6530	104861	4.90	740	1.2	110.2
306	0.4675	0.23	2	19978.18	60290	35200	113811.3	52.97	90770	3782	4.56	104606	1505	106111	5.92	639	1.0	107.3
307	0.2173	0.04	5	9376.483	150089	34100	194609.5	77.12	175169	2919	3.52	185669	8570	194239	9.19	318	0.5	100.2
308	0.3544	0.06	6	15211.96	174861	40700	232600.9	75.18	217581	3022	3.64	226641	7060	233701	13.50	224	0.4	99.5
309	0.1147	0.02	7	4968.453	211794	36300	256139.6	82.69	246774	2938	3.54	255102	3130	258232	21.54	136	0.2	99.2
401	4.93	0.55	9	185177	174500	3200	343057	50.87	261931	2425	2.92	290059	7925	297984	7.27	334	0.5	115.1
402	4.8839	1.22	4	183618	58019	3100	222717	26.05	101816	2121	2.56	119924	4082	124006	4.59	462	0.7	179.6
403	4.9497	0.45	11	185842	213000	3200	383894	55.48	286306	2169	2.61	314650	4280	318931	8.78	247	0.4	120.4
404	4.1427	0.59	7	158104	141740	3100	285981	49.56	189966	2262	2.72	210114	4240	214354	7.79	290	0.5	133.4
405	1.8087	0.23	8	73292	150116	3400	222565	67.45	199138	2074	2.50	208870	2391	211261	16.43	126	0.2	105.4
406	3.9144	0.49	8	150076	150540	31200	308844	48.74	261960	2729	3.29	283056	24781	307837	5.71	477	0.8	100.3
407	1.7373	0.58	3	70602	79647.04	7700	151063	52.72	131127	3642	4.39	138399	9470	147869	7.83	465	0.7	102.2

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408	0.6209	0.12	5	26377	141605.2	40200	207878	68.12	184085	3068	3.70	192533	18820	211353	6.75	454	0.7	98.4
409	2.0104	0.40	5	80796	112395.8	28600	213150	52.73	196755	3279	3.95	206955	7390	214345	11.19	293	0.5	99.4
410	4.4557	1.11	4	168981	63779.98	2700	214503	29.73	138013	2875	3.46	140365	13620	153985	8.64	332	0.5	139.3
411	4.3194	0.72	6	164262	112740	12300	249105	45.26	173130	2405	2.90	183966	65316	249281	2.27	1058	1.7	99.9
412	4.6165	0.77	6	174511	115349	3100	273477	42.18	187219	2600	3.13	206527	19698	226225	4.80	542	0.9	120.9
413	2.02878	0.34	6	81473	124175.8	14400	234805	52.88	186095	2585	3.11	199103	11754	210857	7.52	344	0.6	111.4
414	5.2942	1.76	3	197380	52729.31	2700	227728	23.15	99108	2753	3.32	118368	16392	134760	2.78	990	1.6	168.9
415	3.266	1.09	3	126839	68078.22	2800	183088	37.18	111341	3093	3.73	122213	23944	146158	3.20	967	1.5	125.3
501	4.3095	1.44	3	163919	60181.27	2300	204353	29.45	123409	3428	4.13	127513	26010	153523	4.10	837	1.3	133.1
502	1.2906	0.26	5	53401	127527.1	18200	202675	62.92	171207	2853	3.44	189255	13445	202700	5.44	525	0.8	99.9
503	0.3766	0.06	6	16151	174188.9	41300	232897	74.79	212168	2947	3.55	219176	17600	236776	8.62	342	0.5	98.4
505	1.7985	0.90	2	72908	55813.84	43200	173019	32.26	135745	5656	6.81	147853	27680	175533	3.41	1658	2.7	98.6
506	1.9669	0.39	5	79188	113310.2	12300	218994	51.74	158550	2643	3.18	179598	38520	218118	2.66	993	1.6	100.4
510	1.95859	0.24	8	78880	142050.2	3400	217958	65.17	186283	1940	2.34	198643	18323	216967	6.07	320	0.5	100.5