HOUSEHOLD ECONOMY AND NUTRITIONAL STATUS AMONG THE SHABAR TRIBE LIVING IN A PROTECTED FOREST AREA OF ORISSA, INDIA

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ABSTRACT

In developing countries like India where rural and remote populations suffer socio-economic inequities, protected areas have further narrowed down their livelihood options. The objective of the present study is to understand the household economic condition and nutritional status among the Shabar tribe living in a protected forest area of Orissa. A total of 154 families from three selected Shabar (tribe) villages inside Chandaka-Dompara sanctuary area were investigated to collect household information and included, adult height, weight and household dietary survey. Information regarding forest conservation strategies was collected from the respective forest department and secondary sources. Per capita food consumption and body mass index were computed to understand nutritional status. Regression analysis was used to understand the associations. Chandaka-Dompara forest area was designated as sanctuary during 1984, which was drastically influenced in economic activity and dietary habit among the Shabar tribe. The manifestation of forest conservation strategies was prohibited to use of natural resources and made more dependent into cash economy. These were forced to engage in wood cutting and selling. The agricultural land was only cultivated once in a year during the monsoon season to produce food for their own consumption. As a result, 52.02 percent of families from lower economic sub-groups were not able to get optimal calories. Consumption of calorie among females was significantly lower in the lower economic group compared to their higher economic counterpart. This reflection was observed in nutritional status (BMI <18.5 kg/m^2) among adult Shabar, where significantly (p<0.01) higher percentage of undernutrition were observed among females than males. Females in the lower economic group were more likely to be undernourished [OR = 1.93] than those in the higher economic group. Poor household economy and undernutrition was observed among the Shabar tribe living in protected forest habitats of Orissa.

Key words: Sanctuary, Economic group, Food Uncertainty, Nutrients, Shabar, Tribe

INTRODUCTION

The *Wildlife Protection Act* of 1972 is the legal framework created for designating certain areas as sanctuaries in order to conserve wildlife by restricting the entry of

private or commercial interests (Wildlife Protection Act, 1972). Since then 509 wildlife sanctuaries have been established in different parts of India (Ministry of Environment and Forest, 2007). However, since the creation of this Act there have been situations where needs are curtailed among local communities' or specifically Indian tribal communities' and also their economic constricted, which has always lead to food insecurities (Hegde and Enters, 2000). In 1988, the *National Forest Policy* made a significant shift in forest policy by stating the need to consider local community interests for utilization of forest resources and for involvement of local communities in protection and regeneration of forests (National Forest Policy, 1988). However, the deforestation and violation of local community interests continued to be endangered due to dual interests as conserving endangered natural resources and promoting economic development in forest community, which often result in conflicting policies that fail to protect forests (FAO, 2003). In view of the above difficulties, a draft was formulated- *Recognition of Forest Rights, Rules, 2007* for the scheduled tribes and other traditional forest dwellers regarding conservation of their forest rights and also documenting biodiversity and wildlife and delineation of areas significant from the perspective of biodiversity such as heritage sites, ecologically sensitive areas, sanctuaries and national parks (Recognition of Forests Rights, 2007).

There is growing evidence that failure reduce people's dependence on forests resources, will make it difficult to conserve protected areas or natural forests (Gunatilake, 1998; Hegde and Enters, 2000) as the demand drive for resources for agriculture, energy, nutrition, medicinal, and other needs (Putz, 1988). Furthermore, in countries like India where remote populations endure social and economic inequities, protected areas have further narrowed down their livelihood options (Salafsky and Wollenberg, 2000). Studies show that subsistence activities and sustenance have become the major problems of the Kadars, as their traditional habitat became a Wildlife Sanctuary (Mahendrakumar, 2005). The restrictive biodiversity conservation strategies also affect livelihoods of indigenous communities in Mudumalai Wildlife Sanctuary, Southern India (Hegde and Enters, 2000). These studies have mainly focused on resource use pattern and socio-cultural change among communities but hardly documented their ultimate reflection with respect to nutritional status. Therefore, in search of proper understanding of forest conservation and livelihood strategies among forest living communities and also documenting the two major components like household economy and nutritional status in restricted

Sanctuary condition, the present study is to understand the household economic condition and nutritional status among the Shabar tribe living in protected forest area. Who have been received the negative impact of forest conservation in their way of living for few decades within Chandaka-Domapara Elephant Sanctuary (Nayak et al., 1996). This relation helps in understanding the economic and nutritional problem due to restricted habitats among the tribal communities.

MATERIALS AND METHODS

Study population and area

Shabar is a widely populated scheduled tribe in Orissa (Census of India, 2001). They speak regional *Oriya* language and inhabit in different geographical location like urban, rural and forest areas (Patnaik, 2004). The forest living Shabar are distinct from others because they inhabit in exclusively a monoethnic villages. The present study area was located in a forest area of the boundaries of Khurda and Cuttack districts in Orissa, India, which was later named as Chandaka-Domapara Elephant Sanctuary and now the Asian Elephant Research Centre (Figure 1).
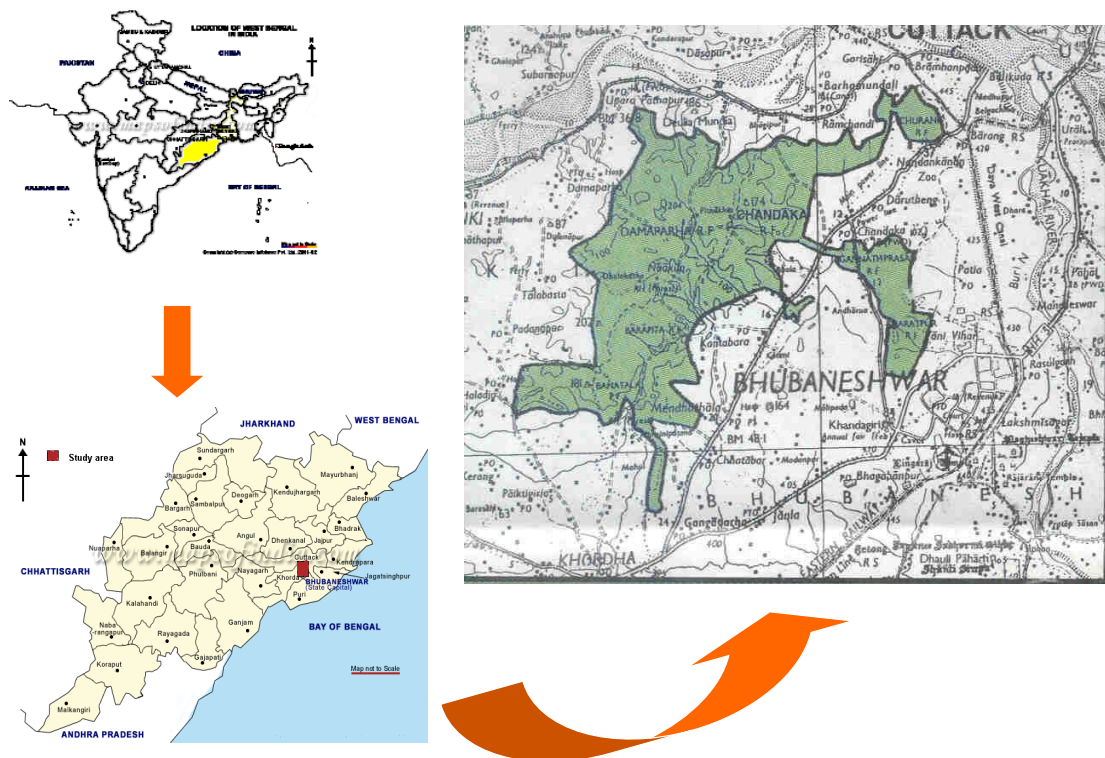

Fig.1 Map of India showing the study area

Sanctuary profile of Asian Elephant Research Centre

Variable	Profile
Forest	Chandaka-Dompara wildlife sanctuary or Asian Elephant Research Center
Block	Bhubaneswar and Cuttack
District	Cuttack and Khurda
Area	195.6 km^2
Altitude	40m- 225m MSL
Climate	Sub-tropical
Rainfall	1200mm-1400mm
Temperature	10^0C- 41^0C
Edaphic factors	Laterite soil: clay to sandy loam. Degraded soil without humus
Legal status	Vide no. 13482/FFAH dated 10.12.88 previous notification no. 35500/FFAH dated 21.12.82

Source: Department of Forest (Chankada-Dompara Elephant Sanctuary, Ghatakhia, Bhubaneswar, Orissa, India)

Data

Data of the present study was collected from three forest villages (Dahangadia, Behenta *Shai* and Nuakua), which are located in the core forest area. Complete enumeration was performed during socio-economic data collection from 154 families. But for the other investigations, complete enumeration was not possible due to unavailability of people in the house or unwillingness of people. Statistical sampling of individuals was also not feasible because of obvious operational difficulties in the field; all those who agreed to corporate were included in the sample. The present sample was drawn from 94 families including 106 adult males and 100 adult females aged 20-60 years for nutritional analysis. Information regarding forest conservation strategies was collected from the respective forest department and secondary sources (Nayak et al., 1996). The study was approved by the ethical committee of the Indian Statistical Institute, Kolkata, India.

Data collection

The present data are cross sectional in nature. Various methods were employed to collect data, as dictated by the differences in the types of data as described below.

a. Socio-economic

The pre-tested household schedule was used to collect information on age, sex, marital status, place of birth, occupation, education, income, sources of income, annual paddy production, expenditure, household assets among others. Information was collected from the head of household, or where absent, from some other elderly member of the household.

Adult age was calculated through horoscope or in relation to specific festival or to some important local events, natural calamities.

b. Diet survey

One day dietary survey was conducted in each household (94 households). Each raw food item to be cooked for each meal was weighed in a Salter pan type balance prior to cooking. Household members not taking meal at home or guest (s) taking meals in the household were also recorded. Respondents were asked on the next day, whether any food had been left over or consumed by their livestock or shared with neighbour. If yes, the amounts were recorded. Approximate amounts (weight) of food items consumed by member (s) outside home during that day were also recorded. Information on seasonal food items (type and time) specifically non-timber forest product (NTFP) and wild meat was also recorded.

c. Anthropometry

Anthropometric measurements including height (cm) and weight (kg) were taken following the standard techniques (Weiner and Lourie, 1981). Measurements of both sexes were taken by single individual (SC). Anthropometric rod has been used to take height measurement and weight was measured by using weighing machine with minimum clothing. Height and weight were recorded to the nearest 0·1 cm and 0·5 kg, respectively.

Analytical procedure

Economic classification of households

Monthly family income was recorded in Rupees (Rs). The households were grouped into the following two economic sub-groups based on 50th (median) percentile:

i) Lower economic sub-group – Per capita income less than Rs. 325.00 or less than 50th percentile

ii) Higher economic group – Per capita income Rs. 325.00 and above

It would have been better to use a composite index incorporating both income status and land-ownership for classification, but the above classification was calculated after incorporating paddy production in terms of current market value for its simplicity.

Assessment of uncertainties

The measure of uncertainty in food supply used here was the number of months in a year for which food (paddy) was produced by the household members, working on the household's own land. The principle responses considered in their nutrient intake mostly came from carbohydrate or rice. It was based on the assumption that consumption of carbohydrate was evenly distributed both qualitatively and quantitatively throughout the years even in better time period. Those households were belonged to uncertain food supply, they were tried to under eat in order to save uncertain periods (Bharati and Basu, 1988).

Nutritive value estimation

Nutrients content of food intakes were estimated following the standard food charts prepared by Indian Council of Medical Research (Gopalan et al., 2007). The nutrient intake per consumption unit was computed by dividing the total household intake of a given nutrient by the "consumption unit" of the same household based on moderate worker.

Classification of nutritional status

Nutritional status was estimated in two ways:

i) Recommendatory Dietary Allowance: 2875 kcal per consumption unit per day have been used a cut-off level for understanding nutritional status at household level. Those households below that level were designated as less than RDA group (ICMR, 2004).

ii) Body Mass Index (BMI): Body mass index was computed using the standard equation: BMI= weight (kg) /height (m^2). Nutritional status was evaluated using internationally accepted World Health Organization BMI guidelines (WHO, 1995). The cut-off points were used as BMI less than 18.50 kg/m^2 (Undernourished) and BMI 18.50 kg/m^2 and above (Normal and above).

Statistical analysis

ANOVA was used to evaluate the difference of nutritional status between two economic sub-groups. Chi-square was used to understand the association between nutritional groups and economic sub-groups. Regression analyses were used to understand the association between economic condition and nutritional status. All the analyses were done using SPSS 11.0 version and Excel 2000.

RESULTS

Forest conservation strategies

Table 1 shows some of the forest conservation strategies in Chandaka-Dompara Elephant Sanctuary during different time periods since its establishment in 1984.

Table 1: Some of the strategies for forest conservation in Chandaka-Dompara Elephant Sanctuary at different time periods

SL NO.	Strategies†
1	Relocation of villages from inside Sanctuary area to outside area
2	Encroachment of cultivable land with proper compensation
3	Cutting of trench outside boundaries
4	Plantation of tree for sustaining bio-diversity and specifically for Elephant diet
5	Fire protection
6	Random rubble all to replace electric fencing
7	Water and salt security during summer for Elephant
8	Anti depredation measures
9	Silvicultural felling is stopped as there is no harvestable crop available
10	Strict enforcement of protection measures for habitation protection and development
11	Restriction of human movement
12	Application may grant for investigation, photography, research, tourism, etc purposes

† Information based on FD record

Considering the area as Sanctuary, the different type of Sanctuary laws have been implemented by the forest department, within which relocation of human habitation outside the Sanctuary is the major one for restricting unwanted human movement

inside the area. The first step is implemented as encroachment of cultivable land from household with proper compensation. As the Sanctuary is declared elephant conservation, the department is implemented some of the strategies related to elephant benefit and habitat fragmentation like plantation of trees, cutting of trench, fire protection, electric fencing, water and salt consumption securities for elephant, stop of silviculture and strict enforcement for protection of forest and promoted the forest area as investigation, photography, research, tourism, etc.

Socio-economic status

In understanding the impact of conservation strategies on humans beings living inside the sanctuary, it is vital to document the current socio-economic conditions at individual and household level. At individual level, 45.33 percent are illiterate, where females (69.91%) are more illiterate than males (21.52%). Majorities of the adult males (87.45%) and females (79.63%) engaged in wood cutting and selling activities in most of the time in a year (table 2). The household level socio-economic variables

Table 2: Variation of literacy levels and occupational status among genders

Variable	Male		Female		Total	
Educational status	**n**	**%**	**n**	**%**	**n**	**%**
Illiterate	48	21.52	151	69.91	199	45.33
Primary (Upto class IV)	68	30.49	45	20.83	113	25.74
Secondary (Class V- X)	107	47.98	20	9.26	127	28.93
Total	223	100.00	216	100.00	439	100.00
Occupational status						
Agriculture	11	4.93	17	7.87	28	6.38
Exclusive household duties	5	2.24	25	11.57	30	6.83
Service	10	4.48	2	0.93	12	2.73
Business	2	0.90	0	0.00	2	0.46
Wood cutter and seller	195	87.45	172	79.63	367	83.60
Total	223	100.00	216	100.00	439	100.00
Mean age (years)	**37.45 ± 11.02**		**37.34 ± 10.71**			

 (table 3) reveal that they have possessed enough cultivable land (91.56%) but only 41.84 percent of household manage to cultivate 1-2 acres of land once in a year. The

mean cultivable land of that area is 2.01 acres. Based on the previous year estimation of the amount of cultivable products, 59.57 percent of the households produce paddy between 0-1200 kg per year. 66.88 percent of households possessed livestock for their cultivation as well as domestication. Inside the forest area, bicycles constitute the most important mode of transportation. It is observed that 82.47 percent of the

Table 3: Household level socio-economic variable of the Shabar people

Variables	N	%
Cultivable land (n = 154)		
No	13	8.44
Yes	141	91.56
Amount of cultivable land (n = 141)		
1-2 acres	59	41.84
2-3 acres	48	34.04
Above 3 acres	34	24.11
Amount of paddy production (annual) (n = 141)		
0-1200 kg	84	59.57
Above 1200 kg	57	40.43
Live stock (n = 154)		
Absent	51	33.12
Present	103	66.88
Bicycle (n = 154)		
No	27	17.53
Yes	127	82.47
	Mean	**SD**
Cultivable land (n = 141)	2.01	1.30
Family size (n = 154)	5.16	2.02
Per capita income (monthly) (n = 154) (Rs)	439.31	252.11
Per capita expenditure (monthly) (n = 154) (Rs)	372.41	147.23
Per capita food expenditure (monthly) (n = 154) (Rs)	329.41	91.33
Per capita income from agriculture(monthly) (n = 141) (Rs)	110.21	59.95
Per capita income from wood cutting (monthly) (n = 154) (Rs)	343.43	238.24
Economic group (n = 154)	**N**	**%**
Lower (Per capita monthly income < Rs325.00)	64	41.56
Higher (Per capita monthly income ≥ Rs325.00)	90	58.44
Income from agriculture (n = 141)		
≤ 20.00 percent	48	34.04
20.01-39.99 percent	79	56.03
≥ 40.00 percent	14	9.93

household possessed bicycle. Their monthly per capita income is Rs. 439.31, where major income is based on wood selling (Rs. 343.43) compared to agricultural products

mainly paddy (Rs. 110.21) the per capita expenditure is Rs. 372.41 and major portion spent as food expenditure is (Rs. 329.41). Only 9.93 percent of the households earned their annual income from agricultural product as paddy. When per capita income has been classified as lower and higher economic sub-group based on the 50th percentile values, it is observed that 41.56 percent of the households belong to the lower economic sub-group compared to 58.44 percent in higher economic sub-group.

Uncertainty in food supply based on annual paddy production

Table 4 shows that less than one-third (29.35%) of the total number of the households produced rice for 12 months in a year, while 22.83 percent produce enough rice for only 0-6 months and, therefore, presumably suffer from acute uncertainty of food supply and 47.83 percent of the households suffer moderate uncertainty. Considering the two economic sub-groups separately, it appears that in the low economic sub-group, only 18.18 percent of the households produce food for only 12 months plus, compared to 35.59 percent in the high economic sub-group.

Table 4: Degree of uncertainty in food supply by economic group

Economic group	Degree of uncertainty (monthly)							
	0-6		6-11		12 plus		Total	
	n	%	N	%	n	%	n	%
Lower	8	24.24	19	57.58	6	18.18	33	100.00
Higher	13	22.03	25	42.37	21	35.59	59	100.00
Total	21	22.83	44	47.83	27	29.35	92	100.00

Nutrient consumption

Table 5 reveals that average daily consumption (per consumption unit) of carbohydrate, protein and calories is significantly ($p<0.01$) higher among economically higher groups compared to the lower sub-group. The magnitude of differences is higher in regards to calorie consumption (F= 21.58) rather than on the basis carbohydrate (13.84) and protein (9.56) consumption separately.

Nutritional status

When intake of calories and protein are classified as per recommended dietary allowances (RDA) based on moderate worker (table 6), then 80 percent of the studied household in economically higher sub-group consumed above optimal level of RDA (2875 kcal per day) compared to only 20 percent in lower economic sub-group. The

Table 5: Average per day consumption (per consumption unit) of carbohydrate, protein and energy by economic group

	Economic group				
	Higher (n = 60)		Lower (n = 34)		
Nutrient	Mean	SD	Mean	SD	F- value
Carbohydrate (gm)	576.82	102.33	497.38	94.21	13.84**
Protein (gm)	74.31	19.67	62.10	15.82	9.56**
Calories (kcal)	3056.91	506.46	2572.32	446.65	21.58**

** $p < 0.01$

proportion of economic sub-group and RDA group based on calories consumption is statistically significant ($p < 0.01$). Similar trend is observed in consumption of protein intake but the proportion is not significant. The reflection of consumption is clearly manifested on mean weight and BMI, where individuals in higher economic sub-group (both male and female) had higher mean weight and BMI compared to those in the economically lower sub-group, but the differences are not statistically significant

Table 6: Intake of Calories and protein as per RDA by economic group

	Economic group				
	Higher (n = 60)		Lower (n = 34)		
Nutrient	N	%	n	%	Chi-square
Calories					
<RDA	24	48.97	25	51.02	9.77**
≥RDA	36	80.00	9	20.00	
Protein					
<RDA	18	52.94	16	47.05	2.74[ns]
≥RDA	42	70.00	18	30.00	

** $p < 0.01$, [ns] not significant; RDA = Recommended Dietary Allowances

(table 7). BMI is classified as undernourished and normal and above (table 8), where 50 percent of adult males are undernourished (< 18.5 kg/m^2 BMI) in the lower economic sub-group compared to 47.06 percent in the higher economic sub-group. The higher proportion of undernourished prevalence is observed among females than

males. 74.29 percent of adult females suffer undernutrition in lower economic sub-group compared to 60 percent in the higher economic group. However, the distribution of proportion of undernutrition with economic sub-group is not statistically significant although females in lower economic group are more likely to be undernourished [OR = 1.93] than those higher economic group.

Table 7: Mean weight and BMI among adult by economic group

| | Economic group | | | | |
| | Higher | | Lower | | |
Variable	Mean	SD	Mean	SD	F- value
Male					
Height (cm)	160.06	6.03	159.99	6.55	0.04
Weight (kg)	48.61	6.95	47.24	5.51	1.11
BMI (kg/m^2)	18.95	2.36	18.41	1.31	1.68
Female					
Height (cm)	149.58	4.55	150.09	5.39	0.25
Weight (kg)	41.02	5.58	39.63	4.58	1.60
BMI (kg/m^2)	18.32	2.27	17.59	1.82	2.70

Table 8: Nutritional status among adult by economic group

| Economic group | Nutritional status | | | | | | |
| | Undernourished | | Normal and above | | Total | | OR (95%CI) |
Male	n	%	n	%	n	%	
Lower	19	50.00	19	50.00	38	100.00	1.19 (0.539-2.619)
Higher	32	47.06	36	52.94	68	100.00	
Total	51	48.11	55	51.89	106	100.00	
Female							
Lower	26	74.29	9	25.71	35	100.00	1.93 (0.778-4.765)
Higher	39	60.00	26	40.00	65	100.00	
Total	65	65.00	35	35.00	100	100.00	

DISCUSSIONS

It is therefore suggested that the Shabar households living inside the Wildlife area have been forced to halt their subsistence activities specifically agriculture with the establishment of the Wildlife Sanctuary and forest policies since 1984. Firstly their rights to live in the forest are violated. In order to rehabilitate them out side the forest area, the Forest Department encroached on their agricultural land with proper compensation (Nayak et al., 1996). Although the overall implementation is not yet completed, but human movements and factors of way of living like occupation, education, communication, nutrition and its sources like gather tubers and roots, hunt small games, fish in the reservoir, collect fire wood from the forest, construct traditional huts may substantially be restricted among forest dweller. As a result, these have always conflicted with the Forest Department. A similar situation has been noticed among the Kadar tribal community in Kerela, who also live inside a wildlife sanctuary (Mahendrakumar, 2005). The restriction may be reflected in higher level of illiteracy among forest adult, which may be due to restrict movement and fear from attack by free living elephant, because they have to go outside forest area for their secondary education. However, their literacy is not influenced by occupation. Although they have enough agricultural land, majority of the families have not been able to cultivate optimal amount of rice throughout the year. this may be due to insufficient irrigation and manure, lack of investment capital for agricultural inputs, destruction of paddy by elephants, small amount of preserved seed for next year planting and unwillingness of members to cultivate. As a result, they engage in wood cutting and selling activities in most of the time through the year and are therefore forced to depend on the market economy for their income as well as nutrition. Major portion of their income come from selling wood in the nearby market, which is a legal offence inside the sanctuary area, as it causes habitat fragmentation which is ultimately manifested in loss of biodiversity. It is obvious that forest living humans have simple way of living and their main motivation for survival is based on consumption as the study found their maximum investment to be on food expenditure. However, the situation is most devastating among those households who belong to the lower economic sub-group. Besides minimum paddy production, they are also not able to sell sufficient amount of wood.

The adverse situations have reflected in the uncertainty of rice production. If there is assumption that they consume similar amount of rice throughout the year, then only

less than one-third of the total number of the households produce rice for 12 months plus in a year. The rest of the households depended on market for rice, atleast once in a year. Here also uncertainty is appeared as burden among lower economic sub-group for their optimum consumption (Bharati and Basu, 1988). The reflection of that situation is visible in daily consumption (per consumption unit), where lower economic sub-groups consume significantly less carbohydrate, protein and calories than their higher counterparts. Beside, they collect and consume roots and tubers like *Tunga, Koroba, Pitta alu, Nua alu,* from the forest, which contain high amount of carbohydrate and calories. However, these non-timber forest products are not often available throughout the year. Specifically, they collect roots and tubers from June - July (mature stage) and October – November (early stage).

The reflection of forest conservation and uncertain economic conditions and its production is noticed even in under eating of calories and protein consumption based on recommendatory dietary allowances (RDA). The households of lower economic sub-group consume significantly lower calories from their higher counterparts. As a result, both adult males and females of higher economic sub-group have higher mean weight and BMI compared to economically the lower sub-group. However about 50 percent of the population suffer undernutrition, where females in the lower economic sub-group are the most affected.

CONCLUSION

Protection of Chandaka-Dompara forest following forest conservation measures for the area as an Elephant Sanctuary may have negatively influenced household economy of the Shabar people, particularly in terms of food security and income. Overall, poor household economy and undernutrition was observed among the Shabar tribe living in the protected forest habitat of Orissa. To combat these problems, necessary action should be taken to conserve habitat fragmentation as well as human survival through the following recommendation:

i)   Involve the local forest people in the forest conservation activities through application of the indigenous knowledge.

ii) Holding specific awareness camps to emphasise on the importance of conserving both floral and faunal community.

iii) Halting encroachment into the agricultural land while establishing reliable irrigation channels from the nearest water reservoirs.

iv) In order to stop wood cutting, necessary action should be taken after arranging secondary sources of income like encourage the domestication of non-timber forest product in their cultivable land.

v) Finally, proper rehabilitation strategies should be adopted rather than displacing forest inhabitants outside the forest.

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