Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

2018, Special Issue, Page 27-35

Influence of Socio-Economic Factors on Attitude of Ethno-Botanical Users among Forest Fringe Communities in Sub-Himalayan Region of West Bengal, India

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ARTICLE INFO

Article history:
Received 15 June 2017
Revision Received 24 December 2017
Accepted 6 January 2018

Key words:

Traditional, variable, income, attitude, sampling, material possession

ABSTRACT

In the present study attitude of forest fringe communities around Chilapatta reserve forest in northern part of West Bengal towards use of ethno-medicinal plants in comparison to different socio-economic factors like gender, age, income, education and material possession etc. has been addressed. The eight villages from district Alipurduar and Chilapatta forest division were purposively selected due to the availability of forest ecosystem and profuse number of people who are residing within the forest area and maintain their livelihood and fulfilling their other needs with the help of forest resources. Primarily, the purposive and random sampling procedure was followed in case of selecting the area and respondents. A total of hundred respondents were selected randomly from each village for personal semi-structured interview schedule. Amongst the respondents 91% were male and 49% were of young age (i.e. 33-52 years). Majority of the respondents (95%) were schedule tribe or belong to indigenous community, literate (71%) and farmers (68%) with medium family size (52%) and marginal (low) land holding (78%). The variable gender is positively and significantly contributing in case of characterizing the predicted variable, attitude of ethno-botanical plant users. In presence of other predictor variable, the variable gender contributes 23% in case of delineating the attitude. One unit change in the variable gender can change 1.97 units in attitude towards positive direction. The R^2 value of 0.163 indicates that the eleven predictor variables put together have explained 16.30% variations embedded with the predicted variables attitude of ethno-botanical plant users. Still 83.70% variations within the predicted variable are left unexplained. This study also reported that, there is vertical transfer of ethno-botanical plant knowledge which is due to the interest among the younger generation to learn and practice it.

1. Introduction

The rural households and forest dependent communities interact closely with forest; derive their economic livelihood and often their cultural and spiritual identity (Byron and Arnold 1999). World Bank reported that 25% of the world's poor directly or indirectly depend upon forests for their better livelihood (Anon 2000). India has forest dwelling population of over 100 million belonging to 550 communities of 227 ethnic groups, of which some 60% live in forest areas and depend on forests for sustenance (Lynch 1992; Maikhuri and Gangwar 1993; Nautiyal et al. 2000). Forests play an important role in the viability and survival of tribal households in India, by virtue of their importance in social, cultural and economic survival (Tewari 1989).

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Ethnobotany is a research field of science that highlights the people-plants relationships widely used especially in Asian countries for the documentation of indigenous knowledge on the use of plants and for providing an inventory of phyto resources content of the local flora (Kendler et al. 1992; Cotton 1996; Cunninqham 2001; Palit and Gurung 2008; Sharma and Kumar 2013). The different traditions, beliefs, needs and cultures of the various tribes and the diversity of flora richly contribute to the folklore (Jain 1981). The distinct tribes in the area which live closely related with the forest have rich indigenous traditional knowledge systems on the uses of available natural resources for their daily sustenance like food, fodder, shelter and healthcare (Kumar et al. 2012). The traditional knowledge about the various uses of plant species i.e. food, medicine *etc.* is preserved from generation to generation and they depend mainly on the forest resources for their survival (Narzary et al. 2013). Traditional societies are ideal example of traditional knowledge system which is derived from their ancestors (Kirtikar and Basu 1993; Hebbar et al. 2004; Katewa et al. 2004). Traditional knowledge can be adaptive and resilient (Reyes-García et al. 2014; Kujawska and Pardo-de-Santayana 2015). The practices of medicine among tribal people and villagers in India today follow the same pattern it did 2000 years ago, and there is hardly any change (Anita et al. 2013).

Moreover, the indigenous knowledge on the use of lesser-known medicinal plants is also rapidly declining (Kala 2005_a). Conversely, because information on the use of plant species for therapeutic purpose has been passed from one generation to the next through oral tradition, this knowledge of therapeutic plants has started to decline and become obsolete through the lack of recognition by younger generations as a result of a shift in attitude and on-going socio-economic changes (Kala 2000). In addition to this, most of the medicinal plants have slow growth rates, low population densities, and narrow geographic ranges (Kala, 1998, Nautiyal et al. 2002). Therefore, they are more prone to extinction (Jablonski 2004). Traditional medicine system includes the knowledge, skills and practices based on the theories, beliefs and experiences of folk communities to maintain their health problems. The present study has addressed one of the main issues of these forest fringe communities of northern part of West Bengal *i.e.* attitude towards use of ethno-medicinal plants. The attitude is addressed in comparison to different socio-economic factors like gender, age, income, education and material possession etc.

2. Materials and Methods

2.1 Study area

The present study was carried out at the fringe villages in and around Chilapatta Reserve Forest under Terai agro-climatic zone of West Bengal, India from December 2014 to May 2016. These villages are Uttar Simlabari, Uttar Chaukakheti, Andu Basty, Bania Basty, Dakshin Mendabari, Uttar Mendabari, Kodal Basty, Kurmai Basty and Chilapatta Kumarpara. Chilapatta Reserve Forest spreading over 41 km^2 that lies within the forests of Cooch Behar Wildlife Division (Anon 2001) in Alipurduar district (recently separated out from Jalpaiguri district and as such no separate records is available till now for this new district) of West Bengal is located at northern fringe of the state in foothills of the sub-Himalayan mountain belts. The forest is about 45 km away from Cooch Behar town, head quarter of Cooch Behar district well connected with National Highway no. 31C (highway cut across the forest). The villages are also well connected with all-weather roads. The elevation of the working site as measured by GPS was latitude 26^{o} 32.85' N and longitude 89^{o} 22.99' E. Mean altitude of the area was 47 m above MSL. The region is sub-tropical receiving average annual rainfall of 250-300 cm from south-west monsoon of which 80% is received from June to August. The summer and winter temperature are mild with 34°C as the highest in the month of May while the lowest temperature is 7.5°C in the month of January.

The total geographical area of Jalpaiguri district is 6245 km^2 and proportion under forest is 48.5 %. The district also has Chapramari and Buxa sanctuaries and Jaldapara National Park. The forest is inhabited by divergent communities with Indo-Mongoloid tribes consisting Raj Bangshis, Mech, Ravas, Totos, Limbus, Lepchas, Nageshias, Uraons and Mundas dependent directly or indirectly on its forest and are mainly agrarian subsistently growing paddy, jute and maize. All these various tribes have their distinct culture and beliefs (www.jalpaiguri.gov.in).

2.2 Sampling Design

Primarily, the purposive and random sampling procedure was followed in case of selecting the area and respondents for the present study. The district Alipurduar and Chilapatta forest division were purposively selected due to the availability of forest ecosystem and profuse number of people who are residing within the forest area and maintain their livelihood and fulfilling their other needs with the help of forest resources.

An exhaustive list of villagers was prepared from the fringe villages with the active cooperation of local forest Department. From this exhaustive list, a total number of hundred forest fringe area respondents were selected randomly from each village for personal semi-structured interview schedule.

2.3 The Schedule

The data collection in this study was through questionnaire based personal interviews (Frechtling et al. 1997). On the basis of the objectives of study, pre-tested semi-structured both open and close ended personal interview schedule was designed and developed for with three sub-schedules. Schedule 'A' contained the socio-economic profile of the respondents like caste, age, gender, education, occupation, land holding, family size, house type, material possession, annual income and annual expenditure. Schedule 'B' contained 16 close ended questions (equal positive and negative) about attitude towards the use of ethnobotanical plants with corresponding score from 1-5 (negative score for negative question and positive for positive question. Schedule 'C' contained eight open ended questions on ethnobotanical plant use. The attitude statements were tested against a slightly modified five point Likert scale (Kerlinger 1973) according to the need of the study with responses of strongly agree, agree, undecided, disagree and strongly disagree.

2.4 Pilot Study

Before entering into the final data collection procedure a pilot study was conducted into the selected villagers to understand the area, people, institution and communication channels which have the resemblance with the need of the study. An outline of the synoptic background of the ethno botanical plant users in the concerned villagers was obtained which helps in construction of the working tour.

2.5 Hypothesis

The association exists among the socio-economic attributes of the forest fringe area people with the attitude of the people towards the ethno botanical plant use.

2.6 Socio-economic factors

Gender was classified into two categories and measure with the help of assigned score like male=2 and female=1.The number of years rounded in the nearest whole number the responded lived since birth at the time of interview is taken as a measure of age of the respondents.

Caste is a social stratification attribute and is used to classify a community into different strata. In the present study the variable caste is categorized into four categories and score assigned as schedule tribe (ST) -1, schedule caste (SC)- 2, other backward classes (OBC)-3 and general- 4.Education of the respondents was measured with the help of slightly modified scale (illiterate -0; primary-1; middle school-2; high school-3; graduate and above-4). The primary occupation was conceptualized as the way of livelihood through which the maximum amounts are earning occurred. It was measured with the three primary categories and the score assigned as agriculture 3, service 2 and other than agriculture 1. Land holding was measured by considering the total land owned by the respondents during the study in bighas (1 bigha = 330 m^2). House type is the indicator of economic affluence on the basis of the monitory value, the house is categorised in three categories and measures with the help of score assigned as katcha 1, pucca 2 and mixed 3. The materials possession were assigned with the following score, cycle 1, motorcycle 3, car 5, improved implements 7 and none 0.

2.7 Field Data Collection

The data were collected during March, 2015 to March, 2016 with the help of the semi-structured interview schedule constructed for the study through personal interview method. In each village, before starting the interview, a few days were devoted to establish rapport with the respondents. The schedule was administered to the respondent in local language and the responses were recorded in English on the schedule. The interview was carried out by the researcher himself.

2.8 Statistical Tools

The important statistical measures that are used to analyze the survey or research data are percentage, range, mean, standard deviation, coefficient of variation, Karl Pearson's coefficient of correlation, multiple regressions analysis (Panse and Sukhatme 1967).

Karl Pearson's coefficient of correlation

$$r = \frac{\sum (Xi - \overline{X})(Yi - \overline{Y})}{n.\ \sigma_x\ .\ \sigma_y}$$

Where Xi = i^{th} value of X variable, Y_i = i^{th} value of Y variable

$\overline{X}$ = mean of X

$\overline{Y}$ = mean of Y, n = number of pairs of observations of X and Yσ_x = Standard deviation of X, σ_y = standard deviation of Y.

Multiple regression equation assumes the form

$Y = a + b_1X_1 + b_2X_2$

Where X_1 and X_2 are two independent variables and Y being the dependent variable, and the constants a, b_1 and b_2 was solved by solving the following three normal equations:

$$\sum Yi = na + b_1\sum X_{1i} + b_2\sum X_{2i}$$

$$\sum X_{1i}Y_i = a\sum X_{1i} + b_1\sum X^2_{1i} + b_2\sum X_{1i}X_{2i}$$

$$\sum X_{2i}Y_i = a\sum X_{2i} + b_1\sum X_{1i}X_{2i} + b_2\sum X^2_{2i}$$

Statistical tests were performed with software package SPSS ver. 11 (2001) and differences were considered significant at p value of 0.01 and 0.05.

3. Results and Discussion

3.1 Profile of the Respondents

The majority of the inhabitants of the forest fringe villages were indigenous tribes of Mech, Rava, Oraon, Chikbaraik and Cherwa along with some Nepali, Bengali and Bihari communities. The distribution of respondents according to their age, gender, caste and education is given in table 1. Amongst the respondents 91 % were male indicating that male members in the family were responsible for dealing with ethnobotanical plants.

Table 1. Distribution of respondents according to their personal aspects

Category	Score	%	Statistics
Age Class			
Young	33-52	49	Range=33-92; Mean=55.91 SD=13.56; CV=24.26
Middle	53-72	39	
Old	73-92	12	
Gender			
Male	2	91	Range=1-2; Mean=1.90 SD=0.302; CV=15.87
Female	1	9	
Caste			
ST	1	95	Range=1-4; Mean=1.09 SD=0.428; CV=39.33
SC	2	2	
OBC	3	2	
General	4	1	
Education			
Illiterate	0	29	Range=0-4; Mean=1.26 SD=1.07; CV=85.63
Primary	1	32	
Middle	2	26	
High	3	10	
Graduate & above	4	3	

Forty nine per cent of the respondents were of young age (*i.e.* 33-52 years) and the range was 33-92 years. Majority of the respondents (95%) were schedule tribe or belong to indigenous community, literate (71%) and farmers (68%) with medium family size (52%) and marginal (low) land holding (78%). Table 2 presents the distribution of respondents according to their primary occupation, land holding house type, material possession, annual income, annual expenses and attitude on medicinal plants.

Table 2. Distribution of respondents according to their personal aspects

Category	Score	%	Statistics
Primary occupation			
Agriculture	3	68	Range= 1-3; Mean= 2.52 SD= 0.76; CV=30.10
Service	2	16	
Other	1	16	
Family size			
Small	1-4	37	Range= 1-10; Mean= 5.33 SD= 2.02; CV= 38.00
Medium	5-8	52	
Large	9-12	11	
Land holding			
Low	0-6	78	Range= 0-18; Mean= 4.94 SD= 3.60; CV= 72.84
Medium	7-13	18	
High	14-20	4	
House type			
Kutcha	1	23	Range= 1-3; Mean= 2.39 SD= 0.83; CV= 35.13
Pucca	2	15	
Mixed	3	62	
Material possession			
High	0-1	82	Range= 0-5; Mean= 1.38 SD= 0.94; CV=68.15
Medium	2-3	14	
Low	4-5	4	
Annual income (in thousand rupees)			
Low	12-168	94	Range= 12-480; Mean= 58.33 SD= 57.40; CV= 98.42
Medium	169-325	5	
High	326-482	1	
Annual expense (in thousand rupees)			
Low	12-88	87	Range= 12-240; Mean= 49.41 SD= 39.90; CV= 80.77
Medium	89-165	8	
High	166-242	5	
Attitude			
Low	54-58	23	Range= 54-66; Mean= 60.72 SD= 2.54; CV= 4.19
Medium	59-63	64	
High	64-68	13	

Amongst them 62% were residing in mixed type of house, 23% in kutcha and 15% in pucca house. Based on material possession, majority of the respondents (82%) possess bicycle with majority of them (94%) had low income and low annual expenses (87%) in maintaining their livelihood. Majority of the respondents (64%) are having medium category of attitude towards ethnobotanical plants while low and high category of attitude with 23 and 13% respondents, respectively. The coefficient of variation of these variables reflects that the distribution of these variables is highly consistent in nature. Table 3 presents the correlation coefficient of ethnobotanical plant user's attitude towards its use with 11 predictor variables. From the results it is discernible that the variables gender, caste, education, annual income and annual expense are significantly and positively associated with the variable ethnobotanical plant user's attitude.

Table 3. Correlation coefficient of attitude of ethnobotanical plant users towards its use with eleven causal variables

Variables	**Coefficient of correlation**
Gender(X_1)	0.227**
Age (X_2)	-0.032
Caste (X_3)	0.199**
Education (X_4)	0.196**
Family occupation (X_5)	-0.118
Family size (X_6)	-0.080
Land holding (X_7)	0.113
House type (X_8)	0.071
Material possession (X_9)	0.189
Annual income*(X_{10})	0.225**
Annual expense*(X_{11})	0.257***

*In thousand rupees; **Significant at 5% level; ***Significant at 1% level

Gender is the biological discrimination of our society to assign the societal activities to an individual for complying with the social norms. In the present study, the higher score is assigned to the male member of the society. The male are very aggressive in case of soldering the responsibility in outside activities. The use of ethnobotanical plants may be taken as outside activity in the forest fringe area. The fact that men have better medicinal plant knowledge than women could be due to the reason that boys are usually favoured in the transfer of the knowledge (Begossi et al. 2002; Collins et al. 2006; Teklehaymanot et al. 2007). In contrast, no difference in ethnobotanical plant knowledge between men and women was also reported (Fassil 2003; Geng et al. 2016). Consequently, the treatment of disease is under the custody of male members. That's why the increment of gender score increases the positive attitude of the users. That may be the possible reason for getting the significant and positive association in between the variable gender and attitude of the ethnobotanical plant user's. Caste is also a categorization in our society to stratify the social activities. In the present study the forest fringe area in dominated by the tribal people along with a very limited proportion of other caste people. The ethnobotanical plant use is mostly associated with the people residing adjacent to the forest. The indigenous knowledge of the local people is always in power in case of ethnobotanical plant use. In spite of a very limited presence of the higher caste people they are still using the plants for their traditional uses in a vigorous way and literally they are taking a leadership for distributing the knowledge towards the other caste people. That is why the variable caste is significantly and positively associated with the attitude of the ethnobotanical plant users. Education is the way to make an individual perfect in case of doing a job. Education also helps in gathering analytical mind set. In the present study area the people are not much more educated but still the educated people who are limited in number are using ethnobotanical plants as it is a traditional knowledge and intrinsically associated with their culture from time immemorial. Literate people in the study areas were found to have less knowledge of medicinal plants as compared to illiterate ones as the formers are more likely to be exposed to modernization (Wester and Yongvanit 1995; Gedif and Hahn 2003). The educated people are also testing the benefits of different plant parts. That is why the variable education is significantly and positively associated with the attitude of the ethno botanical plant users. Annual income and annual expenses are the two economic variables for generating new information and also adopting the culturally viable options. It is inevitable that the person with a higher annual income must have the higher annual expenses. So the person with high level of income and expense can take the risk to use the culturally acceptable and socially viable method of using ethnobotanical plants. On the basis of that the variables annual income and expense are significantly and positively associated with the attitude of ethnobotanical plant users. Table 4 presents the multiple regression analysis of ethnobotanical plant user's attitude with eleven predictor variables. Out of 11 predictor variables, the variable gender is positively and significantly contributing in case of characterizing the predicted variable, attitude of ethnobotanical plant users. In presence of other predictor variable, the variable gender contributes 23% in case of delineating the attitude. One unit change in the variable gender can change 1.97 units in attitude towards positive direction.

The R^2 value of 0.163 indicates that the eleven predictor variables put together have explained 16.30% variations embedded with the predicted variables attitude of ethnobotanical plant users. Still 83.7% variations within the predicted variable are left unexplained. Thus it would be suggested that inclusion of some more contextual variable possessing direct bearing on the attitude of the ethnobotanical plant users could have increased the level of explicability. A similar study was conducted at Chilapatta reserve Forest (Shukla and Chakravarty 2012) about a decade ago. This intervening period between these two studies didn't change much the socio-economic conditions of the residents of the fringe villages of the forest. The villages still now are not well connected with decent modern facilities and the residents are highly dependent on the forest for their livelihood. The ten year period had not changed their family size and the reasons for this remain the same what was explained a decade ago. However literacy increased by 22% in 10 years though the level of higher education didn't changed because the higher education facility remains poor still today what was decade earlier. The status of land holding also didn't changed much with still higher proportion of marginal land holders, however occupation changed a lot within the decade. More residents shifted to farming and service sector with a decrease in manual labour. This might be due to adoption and execution of appropriate agricultural policy by the state government during this decade which had encouraged the residents who instead of their possession of land didn't adopted farming now doing so. The age of a person was reported significantly effecting traditional knowledge (Bortolotto et al. 2015; Turreira-Garcia et al. 2015; Geng et al. 2016). Higher numbers of ethnobotanical plants were reported by men than women by informants above 40 years of age than those belonging to an age group of 18-40 years and by illiterate than literate ones (Giday et al. 2009). However, in this study no such effect was observed as about half of the respondents (49%) were of age between 33-52 and others between 53-72 (39%) and 73-92 (12%) years of age. This reveals that there were less population of old and senior citizens beyond septuagenarians. All the respondents responded equally to the questionnaire and seem to have sound traditional knowledge about their ethnobotanical plants. This indicates that in this study area, there is vertical transfer of ethnobotanical plant knowledge which is due to the interest among the younger generation to learn and practice it. This can be attributed to the lesser influence of modernization till now to these residents as they are still devoid of decent modern facilities and have to depend for their livelihood on their surrounding forest. In contrast however many workers have reported no vertical transfer of ethnobotanical plant knowledge due to the lack of interest among the younger generation to learn and practice it and attributed this to the ever increasing influence of modernization (Fassil 2003; Gedif and Hahn 2003; Hunde et al. 2004; Uniyal et al. 2006; Ahmad and Pieroni 2016).Most remedies were reported to be prepared and administrated at a household level (Fassil 2003; Deribe et al. 2006), however in this study area, exchange in this process among the household were also found. This indicates that the transfer of knowledge not only take place along the family line, usually from parents to children (Hong et al. 2015; Turreira-Garcia et al. 2015) but also among the younger generations outside the family also. It seems that there is no secrecy but exchange of traditional practices in contrast to reports of secrecy a common phenomenon (Gedif and Hahn 2002; Giday et al. 2003; Balemie et al. 2004).

Table 4. Multiple regression analysis of attitude of ethnobotanical plant users towards its use with eleven predictor variables

Variables	**Unstandardized regression coefficient**	**Standard error**	**Standardized regression coefficient**	**t value**
Gender (X_1)	1.970	.940	.234	2.096**
Age (X_2)	-.006	.021	-.033	-.293
Caste (X_3)	.926	.745	.156	1.244
Education (X_4)	.140	.270	.059	.518
Family occupation (X_5)	-.356	.408	-.106	-.873
Family size (X_6)	-.059	.129	-.047	-.457
Landholding (X_7)	.088	.079	.125	1.115
Housetype(X_8)	.083	.314	.027	.264
Materialpossession (X_9)	.123	.329	.046	.374
Annualincome* (X_{10})	-.015	.013	-.342	-1.124
Annualexpense* (X_{11})	.025	.018	.398	1.389

R^2 = 0.163; *in thousand rupees; **Significant at 5 % level;

Further most of the respondents were literate (71) and in any way it was not felt that these respondents have less knowledge of ethnobotanical plants as compared to their illiterate counterparts. Generally literate people were found to have less knowledge of ethnobotanical plants than the illiterate ones as the former are more likely to be exposed to modernization (Wester and Yongvanit 1995; Gedif and Hahn 2003). As discussed earlier that this study area is still devoid of modernization so question of its influence on the literate people doesn't arise. In this study, almost all the respondents were male (91%). It was found that the females were not at all interested to respond to the questionnaire. The fact that men have better medicinal plant knowledge than women could be due to the reason that boys are usually favoured in the transfer of the knowledge (Begossi et al. 2002; Collins et al. 2006; Teklehaymanot et al. 2007). In contrast, no difference in ethnobotanical plant knowledge between men and women was also reported (Fassil 2003; Geng et al. 2016). More knowledge retained in communities more distant from the urban area, indifference in distribution of knowledge between genders and the higher cultural competence of elderly people in respect to knowledge of ethnobotanical plants (Bortolotto et al. 2015).

Conclusion

With the advancement in the modern medical science, the indigenous knowledge about the use of various ethno-medicinal plants has often been neglected and thereby forgotten by the modern people. But, still these ethno-medicinal uses of various indigenous plants are in practice in the forest fringe areas where mostly the tribal people belonging to scheduled tribes are residing. They inherit their knowledge about ethno-medicinal plant usage from generation to generation. If their indigenous knowledge is properly blended with the modern scientific knowledge regarding ethno-medicinal plant use, this could be a great option for fighting against many deadly diseases which could not be cured with modern medical treatment. This will also reduce the cost of treatment and solve the problem of unavailability of major medicines at time of emergency as these can be prepared from various indigenous plants situated within the reach of us. Therefore, it is the need of the hour to identify and preserve this indigenous knowledge for benefit of the human society. The findings of the study revealed that the factors like gender, education, caste, annual income and annual expense have positive and significant association with their attitude towards ethno-medicinal plant use. Furthermore, the variable gender is positively and significantly contributing towards characterizing the attitude of the ethno-medicinal plant users. Therefore, it can be concluded from the present study that any strategic intervention in this issue would first consider the attitude of the custodians of this indigenous knowledge about ethno-medicinal plant use and thereby analyze the above-mentioned socio-economic factors associated with them for successfully blending the modern medicinal science with this indigenous knowledge system about ethno-medicine.

References

Ahmad K, Pieroni A (2016). Folk knowledge of wild food plants among the tribal communities of Thakht-e-Sulaiman Hills, North-West Pakistan. J Ethnobiol Ethnomed 12: 17-31

Anita R, Samuel R, Rajendra Y (2013). Ethnomedicinal plants used by the people of Darjeeling Hills in the eastern Himalaya of India. Universal J Pharmacy 2**:** 122-134

Anonymous (2001). 4th Working Plan for the Forests of Cooch Behar district and Jalpaiguri district (Part) Comprising Cooch Behar Forest Division and Cooch Behar SF Division Volume – I, 2000-01 to 2009-10. Divisional Forest Officer, Working Plans (North) Division, Darjeeling.

Anonymous (2000). What do we know about the contribution of forest resources to livelihoods and poverty reduction? Some facts and figures. http://www.fao.org/DOCREP/005/AC914E02.ht

Balemie K, Kelbessa E, Asfaw Z (2004). Indigenous medicinal plant utilization, management and threats in Fentalle area, Eastern Shewa, Ethiopia. Ethiop J Biol Sciences 3**:** 37-58

Begossi A, Hanazaki N, Tamashiro JY (2002). Medicinal plants in the Atlantic Forest (Brazil): knowledge, use and conservation. Human Ecology 30: 281-299

Bortolotto IM, de Mello Amorozo MC, Neto GG, Oldeland J, Damasceno-Junior GA (2015). Knowledge and use of wild edible plants in rural communities along Paraguay River, Pantanal, Brazil. Journal of Ethnobiology and Ethnomedicine 11**:** 46-59

Byron N, Arnold JEM (1999). What futures for the people of the tropical forests? World Development 27: 789-805

Collins S, Martins X, Mitchell A, Teshome A, Arnason JT (2006). Quantitative ethnobotany of two East Timorese cultures. Economic Botany 60: 347-361

Cotton CM (1996). Ethnobotany- Principles and Applications. John Wiley and Sons Inc.

Cunninqham AB (2001). Applied Ethnobotany- people, wild plant use and conservation manual. Earth scan, London.

Deribe K, Amberbir A, Getachew B, Mussema Y (2006). A historical overview of traditional medicine practices and policy in Ethiopia. Ethiop J Health Dev 20: 127-134

Fassil H (2003). Ethiopia: a qualitative understanding of local traditional knowledge and medicinal plant use. IK Notes 52**:** 1-4

Frechtling J, Sharp L Westat (1997). User-friendly handbook for mixed method valuations. National Science Foundation.

Gedif T, Hahn H (2002). Herbalists in Addis Ababa and Butajira, Central Ethiopia: mode of service delivery and traditional pharmaceutical practice. Ethiop J Health Dev 16**:** 191-197

Gedif T, Hahn H (2003).The use of medicinal plants in self-care in rural central Ethiopia. J Ethno Pharmacol 87**:** 155-161

Geng Y, Zhang Y, Ranjitkar S, Huai H, Wang Y (2016). Traditional knowledge and its transmission of wild edibles used by the Naxi in Baidi Village, northwest Yunnan province. J Ethnobiol Ethnomed 12**:** 10-30

Giday M, Asfaw Z, Elmqvist T, Woldu Z (2003). An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. Journal of Ethno pharmacology 85: 43-52

Giday M, Asfaw Z, Woldu Z, Teklehaymanot T (2009). Medicinal plant knowledge of the Bench ethnic group of Ethiopia: an ethnobotanical investigation J Ethnobiol Ethnomed 5**:** 34-43

Hebbar SS, Hursha VH, Shripathi V, Hegde GR (2004). Ethnomedicine of Dharwad district in Karnataka, India- plants in oral healthcare. J Ethno Pharmacol 94**:** 261-266

Hong H, Zhuo J, Lei Q, Zhou J, Ahmed S, Wang C, Long Y, Li F, Long C (2015). Ethnobotany of wild plants used for starting fermented beverages in Shui communities of southwest China. J Ethnobiol Ethno Medicine 11**:** 42-62

Hunde D, Asfaw Z, Kelbessa K (2004). Use and management of ethno veterinary medicinal plants by indigenous people in 'Boosat', Welenchiti area. Ethiop J Biol Sci 3: 113-132

Jablonski D (2004). Extinction: past and present. Nature, p 427

Jain SK (1981). Glimpses of Indian Ethnobotany. Oxford and IBH Publishing Co., New Delhi.

Kala CP (1998). Ethnobotanical survey and propagation of rare medicinal herbs for small farmers in the buffer zone of the Valley of Flowers National Park, Garhwal Himalaya. A Report. International Centre for Integrated Mountain Development, Kathmandu, Nepal.

Kala CP (2000). Status and conservation of rare and endangered medicinal plants in the Indian trans-Himalaya. Biological Conservation 93**:** 371-379

Kala CP (2005). Current status of medicinal plants used by traditional vaidyas in Uttaranchal State of India. Ethnobotany Res Applic 3**:** 267-278

Katewa SS, Chaudhary BL, Anita J (2004). Some unreported medicinal uses of plant in tribal area of southern Rajasthan. Ind J Ethno pharmacology 92**:** 41-46

Kendler BS, Koritz HG, Gibaldi A (1992). Introducing students to ethnobotany. The American Biology Teacher 54**:** 46-50

Kerlinger FN (1973). Foundations of behavioural research. Holt, Rinehart and Winston Inc, New York.

Kirtikar KR, Basu BD (1993). Indian Medicinal Plants, Vol. 2. Sri Satguru Publication, New Delhi.

Kujawska M, Pardo-de-Santayana M (2015). Management of medicinally useful plants by European migrants in South America. J Ethno Pharmacology 172**:** 347-355

Kumar A, Avasthe RK, Shukla G, Pradhan Y (2012), Ethnobotanical edible plant biodiversity of Lepcha Tribes. Indian Forester 138**:** 798-803

Lynch OJ (1992). Securing community-based tenurial rights in the Tropical Forests of Asia. Issues in development, Report WRI, Washington.

Maikhuri RK, Gangwar AK (1993). Ethnobiological notes of the Khasi and Garo tribes of Meghalaya, north east India. Economic Botany 47: 345-357

Maikhuri RK, Nautiyal KS, Rao KS, Semwal RL (2000). Indigenous knowledge of medicinal plant and wild edibles among the three tribal sub-communities of the Central Himalaya, India. Indigenous Knowledge Development Monitor 8: 7-13

Narzary H, Brahma S, Basumatary S (2013). Wild Edible Vegetables Consumed by Bodo Tribe of Kokrajhar District of Assam, North-East India. Archives of Applied Science Research 5: 182-190

Nautiyal S, Rao KS, Maikhuri RK, Negi KS, Kala CP (2002) Status of medicinal plants on way to Vashuki Tal in Mandakini Valley, Garhwal, Uttaranchal. J Non-Timber Forest Product 9**:** 124-131

Palit D, Gurung S (2008). Some phytoremedies used traditionally by Gurungs in Darjeeling, West Bengal, India. Pleione 2**:** 175-181

Panse VG, Sukhatme PV (1967). Statistical methods for agricultural workers. ICAR, New Delhi.

Reyes-García V, Aceituno-Mata L, Calvet-Mir L, Garnatje T, Gómez-Baggethun E, Lastra JJ, Ontillera R, Parada M, Rigat M, Vallès J, Vila SM, Pardo-de-Santayana (2014). Resilience of traditional knowledge systems: the case of agricultural knowledge in home gardens of the Iberian Peninsula. Global Environment Change 24**:** 223-231

Sharma M, Kumar A (2013). Ethnobotanical uses of medicinal plants: a review. Int J Life Sci Pharma Res 3**:** 52-57

Shukla G, Chakravarty S (2012). Ethnobotanical plant use of Chilapatta Reserved Forest in West Bengal. Indian Forester 138**:** 1116-1124

Teklehaymanot T, Giday M, Medhin G, Mekonnen Y (2007). Knowledge and use of medicinal plants by people around Debre Libanos monastery of Ethiop J Ethno pharmacol 111: 271-283

Tewari DN (1989). Dependence of tribals on forests. Gujarat Vidyapith, Ahmedabad.

Turreira-García N, Theilade I, Meilby H, Sørensen M (2015). Wild edible plant knowledge, distribution and transmission: A case study of the Achí Mayans of Guatemala. J Ethnobiol Ethno Med 11**:** 52-68

Uniyal SK, Singh KN, Jamwal P, Lal B (2006). Traditional use of medicinal plants among the tribal communities Chhota, Western Himalaya. J Ethnobiol Ethno Med 2**:** 14

Wester L, Yongvanit S (1995). Biological diversity and community lore in northeastern Thailand. J Ethnobiol 15**:** 71-87