

Impact of Non Timber Forest Produces (NTFPs) on Food and Livelihood Security: An Economic Study of Tribal Economy in Dang's District of Gujarat, India

Vikas Kumar

Department of Silviculture and Agroforestry, College of Forestry, Kerala Agriculture University, Thrissur, Kerala, India.

Corresponding author: vkskumar49@gmail.com

Paper No. 331

Received: 14 September 2015

Accepted: 24 May 2015

Published: 29 June 2015

Abstract

The present study attempted to assess the contribution of NTFPs to income and employment by ensuring food and livelihood security for the tribal economy in Dang's district of Gujarat. This indicates that most employment (42.51%) was generated by the wage sector followed by NTFPs collection (31.67%) and livestock rearing (15.85%) respectively. About 42 species of NTFPs were found to be collected and utilized for various purposes such as food, medicines, and raw materials for making implements and also as a source of income. It suggested that alternate sources of income to the villagers to improve their socio-economic conditions as well as increasing the income level and employment opportunities by effective collection and selling of Non-Timber Forest Products.

Highlights

- Dominate tribal community in Dang's district of Gujarat are Gamit, Chaudhari, Bhil, Vadvi, Vasava, Konkani, Naik, Kotawalia and Warli.
- NTFPs has played significance role in socio-economic in the context of employment and income generation for very large population especially the weaker section of society including tribal's.

Keywords: NTFPs, tribal economy, livelihood, ethnobotany, dangs, Gujarat.

Gujarat is situated on the western coast of the country having longest coastline. The forest covered in the state is poor but it has fairly rich biodiversity (Vikas kumar *et al.* 2013). Anon (2002) has reported that 915 medicinal plants has distributed in different forest types and agroclimatic zones. The floristic diversity of Gujarat shows 2,198 species of higher plants including 27 species of mangroves (Bonny *et al.* 1998). However, the Western Ghats today is one of the most significant repositories of biodiversity of India. The Dang forest falls on the extreme northern part of Western Ghats (Gadgil 1991; Gadgil 1994; Gadgil 1996). Besides this, various aspects of

floral and faunal diversity, socio-cultural status and ethnobotany in the forests of Dang's district of Gujarat state has also been investigated (Nirmal *et al.* 2001a-b; Nirmal *et al.* 2002; Nirmal *et al.* 2004, Vikas Kumar and Desai, 2014, Vikas Kumar *et al.* 2014a,b; Vikas Kumar, 2014, Vikas Kumar, 2015). Among 26 districts in state, Dang's have very high tribal concentration in the state, which is more than 80% of district's total population. Districts Dohad, Vadodara and Valsad contribute about 40% to the state's tribal population (Joshi *et al.* 1980; Samiran *et al.* 2014). It is located between 20° 39'-21° 50' N and 72° 29'-73° 5' E which is filled with 93% of tribals (Kathiriya *et al.* 2012).

There are 29 scheduled tribes inhabiting the state. Among them, five tribal communities are notified as particularly vulnerable tribal group (PVTG). According to census 2001, Bhils hold first position in terms of their population size (34,41,945) followed by the Dublas (5,96,865) and Dhodias (5,89,108). Tribal populations of Bhil, Dhodia, Dublas, Kolcha, Koli, Konkni, Gond, Gamit, Valvi, Talvi, Padhar, Pateliya, Rathava, Siddi, Waghri, etc. spread in district, predominantly inhabit the forest areas all along its Southeastern boundary. These tribal people mainly depend on forest for their shelter, housing material, food, fuel, fiber and feed. Dependence of tribals on forests is almost total and inseparable. Presently these forests are degrading to a large extent in the country and various parts of the Gujarat state, pose large loom of threats. The forests of Waghai and Saputara are unique and rich biodiversity areas of Gujarat, which serve as gene pool of biodiversity. These forest areas are mainly spread over Dang district, which fall on the extreme northern part of Western Ghats.

Debate over the definition of the term Non Timber Forest Product (NTFPs) has continued since the term was coined by De Beer and Mc Demott (1989). The expression 'Non-Timber Forest Product'; 'Non Wood Forest Product' and 'Minor Forest Product' have also been used interchangeably (Arnold and Ruiz-Perez, 2001), with variously wide limits as to what they include. The appropriateness of including woody plant products and additionally, forest ecosystem services such as carbon sequestration, nutrient cycling or amelioration of water flow, have been two areas of dispute (FAO 1999). The definition used by Arnold and Ruiz- Perez (2001), "any product other than timber dependent on a forest environment: when restricted to material products and their derivatives, characteristic of what is now widely accepted (Belcher 2003). Forests offer to mankind, in addition to timber, many valuable forest products like leaves of commercial importance; bamboos and canes; gums, resin and oleo-resin; oil seeds; essential oils, drugs and spices; fibre and flosses; tans and dyes; animal products and edible products (Vikas Kumar 2014b).

Non-Timber Forest Products constitute a critical component of food security and an important source of income for the poor in many developing countries. In the past, the rationale for forest conservation was simply to sustain the forests' productive role for the timber industry. NTFPs are often common property resources, like fuel wood, fodder, charcoal, fencing, poles, medicinal plants, and a variety of foodstuffs, such as game, fruit and nuts, mushrooms, fibre, and resins (Arnold 1995; Vikas Kumar 2014). Use of medicines from the forest often overlaps with forest food use. Globally, an estimated 350 million people mostly in developing countries depend on NTFP's as their primary source of income, food, nutrition, and medicine (Chandrasekharan 1996; Olsen 1998; UNDP 2004). These products play a vital role in sustaining the lives of local gatherers, who must increasingly adapt to diminishing resources to stay alive. Ravishankar (1994) found that the tribal people have been conserving plant and crop genetic resources as well as the knowledge on their utility without expecting any return. Apart from its contribution to forest revenue, Non-Wood Forest Products (NWFPs) contribute significantly in rural and tribal economy as about 60 percent of the products that are consumed locally. It has been shown that the NWFP based small scale enterprises provide up to 50 per cent of income for 20 to 30 per cent of the rural labour force in India; where as 55 per cent of employment in the forestry sector is attributed to the NWFP sector alone (Joshi, 2003). The study has been carried out to focus the existing floral diversity with special reference to its Non Timber Forest Products for tribal economic and medicinal values, found in different forested pockets of Waghai, Ahwa, Chikhali, Mahal and Saputara of Dang District.

Environmental, economic and cultural importance of NTFPs

Environmental importance: In agro forestry ecosystem, cultivating NTFPs species helps in achieving environmental objectives such as conservation of watersheds, biological diversity and genetic resource. Clark (2001) explained that NTFPs is a possible "magic bullet" to solve deforestation issues and are



important, ubiquitous, and culturally integral part of rural and urban lives and must continue to be considered in forest management decisions.

Economic importance: In some areas, the financial impact of NTFPs may be greater than that of timber. For example, a study in Zimbabwe revealed that small-scale NTFP- based enterprises employed the 237300 people as compared to only 16000 employed in conventional forestry and forest industries (Anonymous 1995). According to FAO (1997), it was estimated that the total value of world trade in NTFPs is approximately US \$ 1100 million. NTFPs market has grown by nearly 20% annually over the last several years (Hammet 1999). For instance, herbal medicine market at a rate of 13.15 percent annually (Anonymous 1984).

Cultural importance: NTFPs are also of great cultural importance. Preservation of NTFPs is fundamental to maintenance and continuation of traditional ways of life. The field of herbal medicine and biomedical research are growing rapidly. Often people who used them traditionally studied the plants, their uses and techniques of harvesting and processing over generations. As these discoveries blossom into lucrative industries an equitable share of benefits is due to the people, communities and countries from which they originate (Prakash 2003).

Materials and Methods

The selected villages for study on the basis of their backwardness (Figure 1). The study areas were dominant of tribal Bhil, Dhodiya, Kolcha, Koli, Konkni, Gond, Gamit, Valvi, Talvi, Padhar, Pateliya, Rathava, Siddi, Waghri, etc. An extensive preliminary survey was helpful in identifying the ranges rich in a variety of NWFPs and also the communities who extensively depend on NWFPs not only for their subsistence but also for earning cash income. Villages surrounded by the forest were selected based on purposive sampling method using the criteria of rural families engaged in forestry activities. The study includes both primary and secondary sources of data. The primary data were collected with the aid of structured and comprehensive questionnaire

exclusively prepared for the study. The questionnaire was prepared after extensive preliminary survey (August, 2012 to July, 2013) in the study region that helped to choose the relevant villages for sampling. The questionnaire was subjected to pre-testing during preliminary survey to improve it.

The primary data were collected from sample tribal respondents by personal interviews (Appendix-I). The secondary data were collected from locations of respondent's residence were identified with the help of local guide working for tribal co-operative societies and Participatory Forest Management (PFM) Institutions like Vana Samrkhshana Samities (VSS), Eco-development Committees, Large Scale Adivasi Multi-purpose Societies (LAMPs), District statistical office (DSO), Integrated Tribal development programme (ITDP) office and FLCs act as its collection agents.



Figure 1. Map showing the study site of Dang's district

Questionnaire was administered orally in Gujarati, a native language. Each interview took 10 to 15 minutes. The data collected included information on NTFPs collected and their quantities, together with demographic information of the collectors (age, gender, origin, literacy level, land holding, community background, total annual earnings, collection timings and availability). Basic statistics about were taken from the official sources of the districts. As majority of the tribal's were illiterates, they could not give absolute distance they travel (Kms) and actual time taken (hrs) for extraction of NTFPs. Hence, distance travelled and times taken were carefully approximated.

Results and Discussion

Tribal communities in the study area

The major tribal communities surveyed are Patelia (39.71%), Chaudhri (21.84%), Rathava (17.95%), Bhil (12.24%), Gamit (4.75%), Kolecha (2.07%) and Jhavada (1.44%) (Table 1). These communities are considered as descendants of nomadic primitive tribal groups dwelling in the interior parts of the forests, depending on NTFPs for their subsistence. The Chaudhri and Pateliya tribes were sampled more since this tribe is dominant in the district. The tribal communities own small pieces of land on which they mainly collected Non-timber forest products. The Chaudhri tribes mainly cultivate paddy, pepper, ginger etc. Pateliya are skilled in fishing and agriculture. Comparing these tribal communities, Gamit has a relatively better socio-economic status. In this study, communities are not analyzed separately since the differences in terms of their livelihood opportunities and outcomes are not that big.

Table 1: Major tribal communities surveyed in the study area

Sr. No.	Community	No. of respondents
1.	Patelia	28 (39.71)
2.	Chaudhri	21 (21.84)
3.	Rathava	17 (17.95)
4.	Bhil	14 (12.24)
5.	Gamit	07 (4.75)
6.	Kolecha	06 (2.07)
7.	Jhavada	03 (1.44)
	Total	96 (100)

Note: Figures in parenthesis indicate percentage to total

Socio-economic characteristics of the NTFPs collectors

Family size: The basic information about the households has presented (Table 2). Average household size was 4.50 with on average 1.9 adult males and 1.4 female respectively and 1.2 children.

Table 2. Socio-economic profile of the NTFPs collectors

Sl. No.	Socio-economic characteristics	Number	Per cent
1.	Size of the family (average)	4.50	-
	Adult males	1.90	-
	Adult females	1.40	-
	Children	1.20	-
2.	Age of the respondents (years)		
	18-40	61	62.37
	41-60	32	29.43
	61-80	3	8.20
3.	Literacy level of the households		
	Adult males	58	55.70
	Adult females	43	42.60
	Children	82	76.20
4.	Size of the land holding (ha)		
	Forest land/encroached	0.86	23.91
	Pisary (Revenue land)	0.44	02.55
5.	Livestock (average)	3.20	14.12
	Cow	2.90	10.86
	Poultry	6.20	20.06
	Goat	4.30	05.16
	piggery	1.0	1.1

One characteristic feature of the tribal community is that, they go for early marriage. They live independently forming a nuclear family. This might be the reason why the average family size is quite small. Similar results were observed by Tewari and Cambell (1995); Tewari (1998a); Tewari (1998a); Ahenkan *et al.* (2008); Mahesh *et al.* (2011); vikas Kumar (2014). This nucleus nature was the major determining factor in the composition of the tribal families. However, formation of nuclear families depends on level of education and employment (Parvathamma 2004)

Age of respondents: Most respondents were in the age group of 18 to 40 years (62.37%), followed by 41 to 60 years age group (29.43%). While the age group of 61 to 80 years contained the least respondents (8.20%) (Figure 2). The tribes in the age of 18 to 60 years (91.8%) constitute main workforce who employ in collection of NTFPs, agriculture, wage earning and



allied activities. On the other hand the tribes above 60 years are rarely involved in such activities.

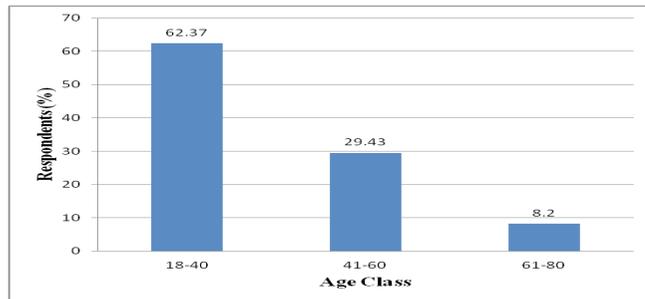


Figure 2. Age classes of surveyed respondents

Literacy level: The literacy rate of adult males (55.70%) was higher than adult females (42.60%). Literacy was highest for children (76.20%) because of encouragement from government through free educational programs and support from parents (Figure 3). This confirmed the results of the government survey in 2011.

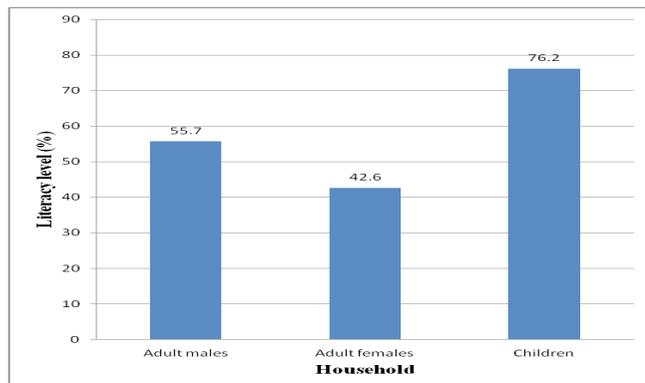


Figure 3. Literacy levels of the households

Land holding: Out of the total 96 tribal households, the landless (73.54%) are dominant in the study area followed by marginal farmers (26.46%) with holdings of an average 0.86 and 0.44 hectares of forest and revenue lands respectively. Thus, indicating the dependence on encroached forest lands for agriculture and revenue land for carrying out other activities. Infact they own livestock because the rights to these lands are only usufruct.

Livestock: About 14.12% of the tribal population owns livestock with on average 3.20 animals per

household. The reason for high number of livestock is due to the practice of agriculture and availability of free fodder in the forest lands. The poultry reared per household was quite high (6.2), since this is considered as common feature among the tribals. Most of the households own poultry because of easy maintenance and ready cash if they sell to local market. In addition, 10.86% of the tribals own an average of 3 cows. In general having animals is a kind of an economic security for forest dwellers.

Respondents involment in different sectors: The tribals meet food and income needs from collection of NTFPs, wage earning, agriculture, livestock rearing and services and allied activities. Table 3 indicates that, all tribal households are traditionally involved in NTFPs collection. An average number of 1.15 tribals in each household depend on this activity. In addition, tribals also depend on wage earning (73%) followed by livestock rearing (41%), agriculture (28%) and services and allied activities (4%). In Conclusion, NTFPs is the important activity in terms of labour contribution.

Table 3 Percentage of sample respondents in different sectors

Activities	Number of respondents	Percentage	Average numbers of family members involved
NTFPs	96	100	1.15
Agriculture	28	29.16	1.5
Livestock rearing	41	42.7	1
Wage earning	73	76.04	1.5
Services and Allied activities	4	4.16	1

Composition of tribal employment: Comparing employment generation in various sectors, the wage earning sector generated the highest employment (42.51%) followed by NTFP (31.67%), and other sectors (Table 4). This was similar to the results of Prakash (2003) had obtained in Kodagu district, Karnataka. He reported average employment of

64.42 mandays from NTFPs collection. The livestock rearing (15.85%), agricultural sector (8.65%), and services and allied activities (1.32%) were other sources of employment available for the collectors in the area.

Table 4. Composition of employment in different sectors

Sl. No.	Activities	Employment generated (days/HH/year)
1.	NTFPs	77.81 (31.67)
2.	Agriculture	19.04 (8.65)
3.	Livestock rearing	69.47 (15.85)
4.	Wage earning	115.56 (42.51)
5.	Services and Allied activities	5.93 (1.32)
	Total	287.81 (100)

Note: Figures in parenthesis indicate percentage to total.

The larger employment in wage sector and NTFP is because of two reasons: (i) most of the tribes were landless (73.54%) and those who possessed land, hold only small pieces (ii) demand for labour in local industries, city, orchard and agroforestry intercropping mango/ sapota with agriculture crop like wheat, paddy or other horticultural practice. Furthermore, forest departments also engage for planting, digging and other maintenance activities. There are a number of successful agriculture-based projects, although small in number, implemented in India, by both government and civil society, in which local communities have benefited (Gubbi 2006, Karanth *et al.* 2006, Karanth and Karanth 2007) whilst also reducing their dependence on NTFPs (Shanker *et al.* 2005). Formal and non-formal education among collectors could also improve chances of alternative employment and lead to reduced dependency on forests (Gunatilake 1998, Hegde and Enters, 2000, Tessema, 2003, Xu *et al.* 2006). NTFPs are important to rural households in terms of their contribution to health, food, energy, and other aspects of rural welfare (Falconer and Arnold 1989, De Beer and McDermott 1989, Poulsen 1982, May 1991, Cavendish 2000). In India, an estimated 50 million people living

in and around forests rely upon NTFPs for their subsistence and cash income (Tewari 1992). Studies such as Malhotra *et al.* (1991) and Bahuguna (2000) have looked at the contribution of NTFPs to cash income, but such studies are scarce.

Scenario of NTFPs in the study area

There is no doubt that NTFP's play a critical role in providing subsistence and cash income to a large proportion of the world's population. Studies from all tropical regions indicate that it is often the poorest households in rural communities that are most directly dependent on NTFP's. But in present study the local people were found less aware about the market value of many produce and therefore not able to generate significant income from NTFP's though they offer huge opportunities. Therefore, NTFP's is the next major alternative business to improve tribal's economy in study area.

Many of Non Timber Forest Produces (NTFP's) are being used by locals for the improvement of their livelihood status; these include leaves, flowers, fruits, branches, gums/resins, roots (Lynch and Alcorn 1994; Kumar *et al.* 2009). Factors like total forested area, access, historic use of both target and non-target species and observation of land use patterns in adjacent areas have a dramatic impact on the forest development as well as extra income during the off agriculture season, which contributes to supply and the sustainable use (Howard 1993). Present study showed that the forest offers a wide range of goods contributing to people's basic needs. Dependence of the people on various minor forest products in these villages was found to be very high. Several minor forest produces are being used by aboriginals for their day to- day needs and many of them are their income generative sources. Total 42 plant species had recognised, which used in medicinal purpose as well as NTFP's in this region. The plants of scientific name, local name, family, habit, parts used, and medicinal dosages have been given (Table 5). Similar studies reported by Nirmal *et al.* 2001; Nirmal *et al.* 2004, Vikas Kumar and Desai 2014, Vikas Kumar *et al.* 2014a,b; Vikas Kumar 2014; Vikas Kumar 2015;



Chakraborty and Paul, 2014 in West Bengal; Ghosh *et al.* 2014 in Arunachal Pradesh. Since most of the tribal or ethnic communities do not have their own script and written language, the information about prescription, pharmacology, attitude towards diseases, diagnosis, etc. of the age old tribal medicine system are lying unclaimed. The people belonging to modern societies are not fully aware of this traditional knowledge system. In our national agenda, documentation, conservation, preparation of databases of medicinal plants and their cultivation are now priority issue. The major NTFPs are timru leaves, mahuda flowers, Mahuda seeds, kachka seeds, teak seeds, satavari, kadaya gum, gugal gum, salai gum, shikakai and soap nuts. While other

available in minor quantities such as honey, beeswax, khair gum, baheda fruits, amla seeds, amla pulp and kaju seeds. NTFPs are collected all year round. However, most of them are seasonal in nature. The late winter and summer season (February to May) is considered as the peak season for NTFPs collection. Thus maximum NTFPs collection was done during summer and monsoon seasons. However, this frequency may vary according to season and type of NTFP collected in the respective season. Collection of NTFPs in the study area is only by men. Though women are interested in that job, they were not involved in collecting because of fear of leopard in collection process.

Table 5. Details of NTFPs and medicinal plants used by local community in Dang's region of South Gujarat

Sl. No.	Botanical name	Local name	Family	Habit	Parts use	Medical value
1	2	3	4	5	6	7
1.	<i>Acacia nilotica</i> (L.) Willd. Ex Delile	Babool	Mimosaceae	T	Bk	Decoction of bark is used in cough treatment and infusion of leaves is used in dysentery.
2.	<i>Aegle marmelos</i> (L.) Corr.	Biliptra	Rutaceae	T	Fts and Bk	Used in dysentery. Bark is taken thrice a day for one week in intermitted fever.
3.	<i>Aloe vera</i> (L.) Burm.f.	Gwarpatha	lilaceae	S	Lvs	Pulp of leaves is used in headache and inflammation.
4.	<i>Azadirachta indica</i> A. Juss.	Limdo	Meliaceae	T	Lvs and Flw	Fresh juice of leaves with salt is used in intestinal worms and applied externally skin disease. Fresh flowers are consumed raw or crushed against sun stroke and fever.
5.	<i>Bambusa arundinacea</i> (Retz.) Willd.	Kanti vans	Poaceae	T	Sht	The tender shoots are used to prevent nausea and vomiting.
6.	<i>Bauhinia purpurea</i> L.	Kanchnar	Caesalpiniaceae	T	Lvs	Mature leaves used to wrap "Bidi" locally.
7.	<i>Bauhinia racemosa</i> Lam.	Asitro	Caesalpiniaceae	T	Lvs	Mature leaves used to wrap "Bidi" locally.
8.	<i>Bombax ceiba</i> L.	Shimal	Bombacaceae	T	Floss and Rt	Floss is commonly collected and used to stuff pillows and cushions. Roots of young plants are considered to be tonic.

9.	<i>Boswellia serrata</i> Triana and Planch.	Salah	Burseraceae	T	Bk	Decoction of bark is used against stomach ache and dysentery.
10.	<i>Butea monosperma</i> (Lam.) Taub.	Kesudo, Palas	Fabaceae	T	WP	Mixed of flowers and seeds are used two times a day as vermicide. The bark decoction is used once a day for month in piles. The extract of root of one or two years old plants are orally given to improve eye sight.
11.	<i>Cassia fistula</i> L.	Garmalo	Caesalpiniaceae	T	Fts and Bk	The sweet pulp of the fruit is used in skin diseases. The pulp is used two times a day for three days as a laxative in fever. Bark is used on sore throat.
12.	<i>Cassia tora</i> L.	Kunvadio	Caesalpiniaceae	H	Lvs	Tender leaves and young seedling eaten as spinach. Decoction of leaves is used to wash painful eye and to cure cutaneous inflammation.
13.	<i>Centella asiatica</i> (L.) Urban	Bramhi	Apiaceae	S	Lvs	The extract of leaves is used in hypertension.
14.	<i>Chlorophytum tuberosum</i> (Roxb.) Baker	Safed musli	Liliaceae	H	Tuber	Root tuber are boiled and given for mentally deranged person. The tuber is boiled with milk in case of impotency and weakness.
15.	<i>Curcuma longa</i> L.	Haldi	Scitamineae	S	Rhz	Paste of rhizome is used in hurt and sprain and juice of un-boiled rhizome is very useful in anaemia.
16.	<i>Dendrocalamus strictus</i> Nees.	Malvel vans	Poaceae	S	Sht	Young shoot apex are delicious and use as vegetable and also pickled. From the hollow internodes a white substance is obtained (vans kapur) used in T.B. The siliceous material from the culms is used two times a day for one month as tonic and astringent.
17.	<i>Derris indica</i> (Lam.) Bennet.	Karanj	Fabaceae	T	Rt and Sd	The roots are used as fish poison. The seed oil is used in rheumatism.
18.	<i>Diopyros melanoxylon</i> Roxb.	Timbru, Bidipatta	Ebenaceae	T	Lvs and Fts	Used foe "Bidi". The fruits are powdered and taken three times a day for five days in stomach disorders.
19.	<i>Emblica officinalis</i> Gaertn.	Aonla	Euphorbiaceae	T	Fts	Fruits are rich source of vitamin "C" and a main ingredient of Chyavanprash, Trifala etc. Whole fruits are used in preparing sugar syrup. Fruits are used in preparation of hair oil, which has hair darkening properties. Dry fruits used in dysentery, asthma and bronchitis.
20.	<i>Ficus benghalensis</i> L.	Bargad	Moraceae	T	Bud and latex	The bud and latex are used in diarrhoea and dysentery.



21.	<i>Garuga pinnata</i> Roxb.	Kakad	Burseraceae	T	Lvs and Bk	Decoction of leaves with honey is used in asthma. Bark is considered to be aphrodisiac. Probably contain high percentage of vitamin "C". Length and thumb thickness is cut from the tree and blown from one end and the extract oozing out is used for injuries in the eyes.
22.	<i>Gloriosa superba</i> Linn.	Dudhio Vachnag	Liliaceae	H	Rt and Sd	The paste of seeds and roots is applied on skin diseases. Roots are highly poisonous. If natural water flowing through root is ingested then it causes abdominal oedema.
23.	<i>Grewia tiliaefolia</i> Vahl.	Dhaman	Tiliaceae	T	Lvs, Bk and Fts	Decoction of leaves used for washing hairs. Bark decoction used in dysentery. The paste of inner bark and leaves is applied on bone fractures stem fibres are used to prepare rough cords. Fruits are edible.
24.	<i>Jatropha curcas</i> L.	Ratanjot	Euphorbiaceae	H	Lvs	Juice of leaves is used externally for piles.
25.	<i>Lawsonia inermis</i> L.	Mehandi	Lythraceae	H	Lvs	Paste of leaves is used in headache and stop hair loss.
26.	<i>Madhuca indica</i> Gmel.	Mahudo	Sapotaceae	T	Fts, Sd and Bk	Fruits are edible and use in making bread and also country liquor is made from it. The seed oil known as "Dodi" is used in cooking and for making soaps.
27.	<i>Mangifera indica</i> L.	Aam	Anacardaceae	T	Bk and Lvs	The decoction of bark is used in dysentery. Infusion of leaves is used in vomiting.
28.	<i>Ocimum basilicum</i> L.	Damaro	Lamiaceae	H	Lvs	The extract of leaves is used in ringworm.
29.	<i>Ougeinia oojeinensis</i> (Roxb.)	Tanachh	Fabaceae	T	Lvs and Bk	Leaves used as fodder. Bark decoction is used for fish hunting. Red sap from bark is applied to heal wounds. Bark powder is used to cure diarrhoea.
30.	<i>Pongamia pinnata</i> (L.)	Karanj	Papilionaceae	H	Bk and Lvs	Extract of leaves and bark is used in skin diseases.
31.	<i>Schleichera oleosa</i> (Lour.) Oken	Kusum	Sapindaceae	T	Sd	The oil extracted from seeds is used in animal leg swelling, also used for the cure of itch (Macassar oil) and rheumatism. It produces superior quality of lac.
32.	<i>Sida alba</i> Linn.	Safed Bala	Malvaceae	S	Lvs and Rt	Decoction of leaves is used in high fever as coolant. Decoction of root bark is used in irritability of the bladder in gonorrhoea.
33.	<i>Solanum nigrum</i> L.	Makoi	Solanaceae		Lvs	Decoction of leaves is used in jaundice.

34.	<i>Sterculia urens</i> L.	Kadayo	Sterculiaceae	T	Sd and Gum	Seeds are considered to be a brain tonic. The Gum "Kateera" is obtained from trunk and used to cure gonorrhoea and syphilis.
35.	<i>Syzygium cumini</i> (L.) Skeels.	Jambu	Myrtaceae	T	WP	Leaves used as fodder. Fruits are edible. The seed powder is administered orally thrice a day for 3-4 months in diabetes. The fresh bark juice mixed with milk is taken thrice a day for four days in diarrhoea of children.
36.	<i>Tamarindus indica</i> L.	Goras Amla	Caesalpiniaceae	T	Lvs, Sd and Bk	Leaves are applied on inflammation. Seeds are taken after food for the cure of acidity. The bark is used for loss of sensation in paralysis.
37.	<i>Tectona grandis</i> L.f.	Sag	Verbenaceae	T	Lvs	The leaves are used for making "Ghonghada" used as umbrella in rainy season.
38.	<i>Terminalia arjuna</i> (Roxb.) Wight and Arn.	Arjun sadad	Combretaceae	T	Bk	Decoction of bark mixed with flour is used for rat killing. Bark ash with coconut oil applied on burning wounds.
39.	<i>Terminalia bellerica</i> (Gaertn.) Roxb.	Baheda	Combretaceae	T	Fts and Sd	The fruit powder is used as tonic and laxative. It is used in piles and dyspepsia. Fruits are used in cough and asthma. Kernel of seed is edible.
40.	<i>Vitex negundo</i> L.	Nagod	Verbenaceae	T	Lvs	The leaves are mixed with cow gung and massaged in backache. Bullocks shoulder wounds are also cured by the paste made with <i>Loranthus</i> and <i>Cuscuta</i> .
41.	<i>Withania somnifera</i> (L.) Dunal.	Asgandha	Solanaceae	H	Fts	Ashwagandha is used in tuberculosis and rheumatism.
42.	<i>Zizyphus jujuba</i> Mill.	Ber	Rhamnaceae	T	Bk	The extract of bark is used in dysentery.

Abbreviations: S-Shrub, H-Herb, T-Tree, Lvs-Leaves, Bk-Bark, Rt-Roots, Sd-Seeds, Rhz-Rhizomes, Wd-Wood, Sht-Shoot, Flw-Flowers, Fts-Fruits, WP-Whole Plants

Recommendations/Suggestions

1. In the study area NTFPs collection provides substantial employment and income opportunities to the poor forest dwellers. However resource decline is also reported due to commercial extraction, logging and fire hazards. There is a strong need for scientific management and strict monitoring of forest resources. Besides, local people should also be educated about the poor effects of man-made fire in the forest and fire protection should be proactively followed by the forest department involving local people.
2. LAMPs have the monopoly over the NTFPs trade. The LAMPs agents reportedly followed inappropriate weighting of the products and LAMPs retained higher margins through sales as indicated through price spread analysis. Therefore concerned



authorities of LAMPs should ensure fair practices in the trade of NTFPs and explore the possibilities of increasing price benefit to the collectors.

3. Scientific studies have to be carried out to assess the short and long run impact of NTFPs extractions on forest and ecosystem. Based on this, tribals have to be educated on sustainable ways of harvesting NTFPs.
4. The forest laws prevent extraction of NTFPs in the National Parks and Wildlife sanctuaries. In such cases, tribal people should be given suitable alternative sources of livelihood outside the protected forests and also government should explore the possibility for voluntary relocations outside the forest.
5. The concerned government authorities should ensure that the benefits of the development policies and programs targeted exclusively at the forest dwellers should effectively reach the needy people including the health, education and infrastructures facilities should be ensured to people with in the available provisions.

Conclusion

NWFP are a significance source of subsistence production, income and employment to tribal people in and around forests. A large population of tribals and other forest dwellers depend on various NWFP which have great socio-economic significance in the context of employment and income generation for very large population especially the weaker section of society including tribals. This region is dominated by tribal- Gamit, Chaudhari, Bhil, Vadvi, Vasava, Konkani, Naik, Kunbi, Kotawalia and Warli. In Gujarat the Non Wood Forest Products namely Timru leaves, Mahuda flowers, Kadaya Gum, Honey, teak seed and Ratanjyot are most common items which are collected by the tribals in different season for their livelihood regularly. Some of these items namely Timru leaves and Mahuda flowers are nationalised and these are collected and supplied to Forest Development Corporation organises

collection and marketing of all NWFP. LAMPs and FLCs act as its collection agents.

Acknowledgements

The present investigation was part of MSc. course programme, funded by the Gujarat Ecology Commission and assigned by Navsari Agricultural University, Navsari, Gujarat (India). Author is very much thank full to all the informators for kindly sharing their knowledge with me. I also thankful to all teaching and non teaching staffs of College of Forestry, NAU, Navsari.

References

- Ahenkan A and Boon EK 2008. Enhancing Food Security and Poverty Reduction in Ghana through Non-timber Forest Products Farming: Case Study of Sefwi Wiawso District, Munich: GRIN Publishers.
- Anonymous 2002. Medicinal Plants of Gujarat (Draft final report), GEER Foundation Gandhinagar, Gujarat State Forest Department, India.
- Anonymous 1984. Food and fruits bearing forest species 2: Examples from South-Eastern Asia. Forestry paper 44/2, Food and Agriculture Organisation, Rome, Italy.
- Arnold JE, Ruiz-Perez M 2001. Can non-timber forest products match tropical forest conservation and development objectives? *Ecological Economics* 39(3): 437-447. Doi:10.1016/S0921-8009(01)00236-1
- Arnold JEM 1995. Socio-economic Benefits and Issues in Non-wood Forest Products Use. In Report of the expert consultation on non- wood forest products, Yogyakarta, Indonesia, 17-27 January 1995, Non-Wood Forest Products 3, FAO, Rome.
- Bahuguna VK 2000. Forests in the economy of the rural poor: an estimation of the dependency level. *Ambio* 29(3): 126-129. Doi:10.1579/0044-7447-29.3.126
- Belcher BM 2003. What is not on NTFP? *International Forest Review* 5(2): 161-168. Doi:10.1505/IFOR.5.2.161.17408
- Bonny P, Pathak BJ, Anoopkumar M, Sunita K, Vinod KR 1998. Biological diversity of Gujarat, Biodiversity Conservation, by Kotwal PC, Banerjee S, Scientific Publishers, Jodhpur, pp. 43-52.
- Cavendish W 2000. Empirical regularities in the poverty-environment relationship of rural households: evidence from Zimbabwe, *World Development* 28(11): 1979-2003. Doi:10.1016/S0305-750X(00)00066-8
- Chakraborty NR, Paul A 2014. Traditional Knowledge on Medicinal Plants used by the Tribal People of Birbhum District of West Bengal in India. *International Journal of*



- Agriculture, Environment and Biotechnology* 7(3): 547-554. Doi:10.5958/2230-732X.2014.01359.X
- Chandrasekharan D 1996. NTFPs, Institutions, and Income Generation in Nepal: Lessons for Community Forestry. Kathmandu: International Centre for Integrated Mountain Development.
- Clark L 2001. Non-timber forest products economics and conservation potential, Central African Regional Program for the Environment, CARPE March 2001.
- De Beer J, McDermott M 1989. The economic value of non-timber forest products in south east Asia, Tech. rep., The Netherlands committee for IUCN, Amsterdam.
- Falconer J, Arnold JEM 1989. Household food security and forestry: an analysis of socio-economic issues. Community forestry note, no. 1, FAO, Rome.
- FAO 1997. State of the world's forest. Rome, Italy.
- FAO 1999. FAO forestry towards a harmonised definition of Non-Wood Forest Products. *Unasylva* 50(198): 63-64.
- Gadgil M 1991. Conserving India's Biodiversity- The Social Context, *Evol Trends Plants*.
- Gadgil M 1994. Inventorying, monitoring and Conserving India's Biological Diversity, (Center for Ecological Sciences, Indian Institute of Science, Bangalore), pp. 1-17.
- Gadgil M 1996. Documenting Diversity- An Experiment, *Current Science* 70(1): 36-44.
- Ghosh G, Ghosh DC, Melkania U, Majumdar U 2014. Traditional medicinal plants used by the Adi, Idu and Khamba tribes of Dehang-Debang Biosphere Reserve in Arunachal Pradesh. *International Journal of Agriculture, Environment and Biotechnology* 7(1): 165-171. Doi:10.5958/j.2230-732X.7.1.022
- Gubbi S 2006. Tiger habitats and Integrated Conservation and Development Projects: a case study from Periyar Tiger Reserve, India. MSc thesis, University of Kent, Canterbury, UK.
- Gunatilake HM 1998. The role of rural development in protecting tropical rainforests: evidence from Sri Lanka. *Journal of Environmental Management* 5: 273-292. Doi:10.1006/jema.1998.0201
- Hammet T 1999. Special Forest Products: Identifying opportunities for sustainable forest-based development. Virginia landowner update, Virginia Tech: In agroforestry ejournal.
- Hegde R, Enters T 2000. Forest products and household economy: a case study from Mudumalai Wildlife Sanctuary, Southern India. *Environmental Conservation* 27: 250-259. Doi:10.1017/S037689290000028X
- Howard AF 1993. A linear programming model for predicting the sustainable yield of timber from a community forest on the Osa Peninsula of Costa Rica. *Forest Ecology Management* 61(1-2): 29- 43. Doi:10.1016/0378-1127(93)90188-5
- Joshi MC, Patel MB and Mehta PJ 1980. Some folk medicines of Dangs, Gujarat State. *Bull Med Ethnobot Res.* 1: 8-24.
- Joshi S 2003. Super Market, Secretive, Exploitative, Is the market in Minor Forest produce unmanageable? *Down to earth* 28: 27-34.
- Karanath KU, Karanath KK 2007. Free to move: conservation and voluntary resettlements in the Western Ghats of Karnataka, India. In *Protected Areas and Human Displacement: A Conservation Perspective* (eds K.H. Redford and E Fearn), pp. 48-59. Wildlife Conservation Society, New York, USA.
- Karanth KK, Curran LM, Reuning-Scherer JD 2006. Village size and forest disturbance in Bhadra Wildlife Sanctuary, Western Ghats, India. *Biological Conservation* 128: 147-157. Doi:10.1016/j.biocon.2005.09.024
- Kathiriyi SV, Durga Rani V, Vyas HU 2012. Ethnoveterinary practices Associated with animal healthcare in dang district of south Gujarat, India. *International Journal of Applied Biology and Pharmaceutical Technology* 3(1): 92-95.
- Kumar PG, Hate S and Chaturvedi A 2009. Community based forest management and its impact on vegetation: a case study. *iForest-Biogeosciences and Forestry* 2: 93-98. doi: 10.3832/ifer0490-002
- Kumar Vikas and Desai BS 2014. Indigenous knowledge of wild plants species of South Gujarat, In: *Ethnobotanical studies in India*, Sanjeev Kumar, Deep Publication, Delhi, pp- 303-310. DOI: 10.13140/2.1.3889.9523
- Kumar Vikas, Babu S, Revale AK, Meena RK, Ranjan MK, Desai BS (2014a) Cultivation of medicinal plants in natural ecosystem in Gujarat (India): Constraints and conservation need. *Journal of Plant Development Sciences* 6(3): 425-435.
- Kumar Vikas, Desai BS, Ajeesh R 2013. Ecology of Rare and Endangered plant species of Dang's Forest, South Gujarat. LAP LAMBERT Academic Publishing, Germany. DOI: 10.13140/2.1.2960.1603
- Kumar Vikas, Mehta AA, Tripathi S (2014b) Non-Timber Forest Products: Availability, Production, Consumption, Management, Marketing and Policy in Gujarat, India. LAP LAMBERT Academic Publishing, Germany.
- Kumar Vikas 2014. Impact of Non Timber Forest Produces (NTFPs) on rural tribes economy in Peechi Vazhani Wildlife Sanctuary, Western Ghats, Kerala. *International Journal of Forest Usufructs Management* 15(2): 80-100.
- Kumar Vikas 2015. Role of Non Wood Forest Products (NWFP) on Tribal Economy of Gujarat, India. *International Journal of Forest Usufructs Management* 16(1): 67-75.
- Lynch OJ and Alcorn JB 1994. Tenurial rights and community-based conservation. In: "Natural connections: perspectives in community-based conservation" (Western D, Wright M eds). Island Press, Washington, DC, 347-372.
- Mahesh M, Mungole A, Kambel R, Chaturvedi A and



- Chaturvedi A 2011. Impact of non timber forest produces (NTFP's) on rural tribes economy in Gondia District of Maharashtra, India. *Archives of Applied Science Research* 3(3): 109-114.
- Malhotra KC, Dutta M, Vasulu TS, Yadav G, Adhikari M 1991. Role of NTFP in village economy: a household survey in Jamboni range, Midnapore district, West Bengal. Mimeo. IIBRAD. Calcutta, India.
- May PH 1991. Building institutions and markets for non-wood forest products from the Brazilian Amazon. Proceedings of the Tenth World Forestry Congress 15: 119-124.
- Nirmal Kumar JI, Hiren Soni, Rita, NK 2004. Ethnobotanical values of certain plant species of Dang forest, extreme northern parts of Western Ghats, South Gujarat, India. *Journal of Current Bioscience* 2(1): 63-74.
- Nirmal Kumar JI, Kumar RN, Hiren Kumar BS 2000. Preliminary investigations of plant diversity of Khatana and Waghai forests of North Western Ghats, South Gujarat, India. *International Journal of Ecology, Environment and Conservation* 6(1): 87-92.
- Nirmal Kumar JI, Kumar RN, Hiren Kumar BS 2001a. Environmental studies of biodiversity and ethnobotany of certain forests of Gujarat (Gujarat State Forest Department, Gandhinagar, Gujarat).
- Nirmal Kumar JI, Kumar RN, Hiren Kumar BS 2001b. Tree species diversity of Khatana forest of South Gujarat. *Journal of Natural Conservation* 13(2): 149-166.
- Nirmal Kumar JI, Kumar RN, Hiren Kumar BS 2002. Tree species diversity of Waghai forest of the northern part of Western Ghats. *International Journal of Ecology, Environment and Conservation* 8(3): 235-248.
- Olsen CS 1998. The trade in medicinal and aromatic plants from central Nepal to northern India. *Economic Botany* 52(3): 279-292. Doi:10.1007/BF02862147
- Parvathamma C 2004. Reservation: A pie in the sky, Development through education. Hunsur, Karnataka, India.
- Poulsen G 1982. The non-wood forest products of African forests. *Unasylva* 34(137): 15-21.
- Prakash S 2003. Collection and marketing of Non-Timber Forest Products – An economic analysis in Tumkur district, Karnataka. MSc (agri) thesis, University of Agricultural sciences, Bangalore, India.
- Ravishankar T 1994. Tribal women and their contributions for biodiversity conservation, Proceedings of the workshop on Women, Biodiversity and Seed industries, M.S. Swaminathan Research Foundation, Chennai, India, pp. 10-18.
- Samiran B, Saha KB, Sharma RK, Muniyandi M, Singh N 2014. *Tribal Health Bulletin* 20(Special Issue): 1-126.
- Shanker K, Hiremath A, Bawa K 2005 Linking biodiversity conservation and livelihoods in India, *PLoS Biology* 3(11): e394. Doi:10.1371/journal.pbio.0030394.
- Tessema ME 2003 Perceptions of local communities towards wildlife and protected areas of Ethiopia, MSc thesis, University of Kent, Canterbury, UK.
- Tewari DD 1998a Economics and management of non timber forest products: a case study of Gujarat, India. Oxford and IBH, New Delhi.
- Tewari DD 1998b Income and employment generation opportunities and potential of non-timber forest products (NTFPs): A case study of Gujarat, India. *Journal of sustainable forestry* 8: 55-76. doi:10.1300/J091v08n02_05
- Tewari DD, Campbell JY 1995. Developing and sustaining non-timber forest products: some policy issues and concerns with special reference to India. *Journal of Sustainable Forestry* 3(1): 53-79. doi:10.1300/J091v03n01_04
- Tewari DN 1992. Tropical forestry in India. International Book Distributors, India, 387 p.
- UNDP 2004. The Equator Initiative: Money Grows on Trees. Cameroon Series 5, New York.
- Xu J, Chen L, Lu Y, Fu B 2006. Local people's perceptions as decision support for protected area management in Wolong Biosphere Reserve, China. *Journal of Environmental Management* 78(4): 362-372.

Appendix I. Interview questionnaire

I. General Information

Name of the respondent:

Age:

Village:

II. Family information

Sr. No.	Relationships	sex	Age	Education	Employment from various sources in man days per annum			
					NTFPs	Farm	Services	Allied activities
1.								
2.								
3.								

Note (Relationships):

1= House hold head, 2=spouse, 3= children, 4=sisters, 5= brothers, 6= others

Note (Education): 1=Masters, 2= Degree, 3= Pre-university, 4= Secondary school, 5= Middle school, 6= Primary school, 7=Illiterate/others

III. Details of landholdings (Area)

Type of ownership	Wet (area in ha)	Dry(area in ha)	Subsidiary(area in ha)

Total operation holding: owned land + leased land – leased out land (area in ha):.....

Lease value:.....

Types of soil: 1,..... 2,..... 3,..... (4).....

IV. Time spent for crop production

Operations	Family owned (time spent hrs/day)				Hired (time spent- hrs/day)			
	Male	Female	children	bullock	Male	Female	children	bullock
Total time spent (hrs)								
June-sep (avg)								
Oct-jan (avg)								
Feb-May (avg)								
Total (average)								



V. Returns

Name of the products	Main products				By products			
	Qty produced (Qtl)	Home consumption	Qty sold (Qtl)	Price /unit (INR)	Qty produced (Qtl)	Home consumption	Qty sold (Qtl)	Price/ unit (INR)

Total income (main products):.....

Total income (by products):.....

VI. Live stock production

Particulars	Number	production Quantity (Its/kg)	Home consumption	Sale	Price/ unit (INR)	Total income (INR)
Cow						
Buffalo						
Bullock						
Goat						
Sheep						
Goat						
Piggery						
Poultry						

VII. Information on product gathered (NTFP'S-plants/animal products)

Particulars	1	2	3	4	5	6
Name of the NTFPs						
Plant parts (edible /non edible)						
Animal products (edible/non edible)						
Period of availability						
Peak season						
Lean season						
No. of hours of collection/day						
a. Male						
b. Female						



Qty. collected /season (kg or qtl)						
Male						
June-Sept.-						
Oct- Jan.						
Feb-May-						
Female						
June-Sept.-						
Oct- Jan.-						
Feb-May-						
Distance traveled/trip						
a. Male						
b. Female						
Method of collection						
a. Male						
b. Female						
Cost of collection						
a. Male						
b. Female						
Qty processed						
a. Male						
b. Female						
Cost of processing						
a. Male						
b. Female						
Home consumption						
a. Qty						
b. Uses						
NTFPs sales(Qty in kgs)						
a. Male						
b. Female						
To whom they will sell						
Cost of transportation (INR/trip)						
Marketing channel						
Price received (INR/ctl)						
Total income from sales						
Consumer price of NTFPs						
End use of this product						
Remarks						



Note (Marketing channels):

1= producers- consumers

2= producers- cooperative society (retailers) - consumers

3=producers- cooperative society (wholesaler)-retailers (private traders) - consumers

4=producers – commission agent-local wholesaler- wholesaler of the city-retailer-consumers

VIII. Respondents opinion

Problems according to priority by respondents	Priority basis (ranking)					Coping mechanisms by respondents
	1	2	3	4	5	
Implementation of act						
Commuting						
Accessibility to food						
Threatens by forest officers						
Employment scheme						
Jurisdiction						
Restriction						
Unfavorable policy by govt.						
Other basic facilities (food, shelter, water, credit, education)						

Note: 1= strongly disagree, 2= somewhat disagree, 3= undecided, 4= somewhat agree

5= strongly agree (higher the scale higher will be the importance)

IX. Institutional factors

Particulars	Remark		Details
	Yes	No	
Name of the institution and service: (FD,CFP,PPU,NGOs)			
Arrangements for collecting NTFPs?(Formal/informal)			
Collection of NTFPs by respondents type (S,Co,I,Ce,R)			
Problems that you encounter while collecting NTFPs?			
Do you follow any typical custom during (C,P,M)			
Restriction on NTFPs (C,P,M)			
Any jurisdiction for collection, processing and marketing of NTFPs			
Restriction on hunting, fishing and felling of trees			
Reliant more on industrially produced goods rather than locally produced goods (NTFPs)			
Do you feel that processing can be done at your home			
What products need drudgery and who bears this?			



Is there any extinction of NTFPs used in the past or present time?			
Is there any attack of wild animals on crops and/or human? If yes, give details			
Is there any policy or rules on NTFPs at this moment in the area by government?			

Note: 1. FD-Forest dept., CFP- Community Forest programme, PPU-private processing unit, NGOs

2. S- Subsistence, Co-Commercial, I- Incidental, Ce- Ceremonial, R-Recreational

3. C- collection, P- processing, M- marketing

1. Do you really want your future generation to continue collecting NTFPs ?

2. Do you wish to continue collecting NTFPs if an alternative livelihood option is provided in agriculture?