Diversity and Utilisation of Floral Non Timber Forest Products by the Communities in Rural Meghalaya, North-East India

Marvellous B. Lynser1,* and Brajesh Kumar Tiwari2

1Department of Environmental Studies, Shillong College, Shillong, Meghalaya 793003, India
2Department of Environmental Studies, North-Eastern Hill University, Shillong, Meghalaya 793022, India

Abstract

The present study analyzes the diversity and usage of NTFPs and evaluates their importance in the day to day life of the people of rural Meghalaya. People use 172 NTFPs belonging to 139 plant species mainly for food, medicine and fuelwood and to a lesser extent for construction, handicrafts and ornamental purpose. These 139 plants belonged to 117 genera and 70 families with Rosaceae, Poaceae and Fagaceae families as the dominant NTFP yielding families. Fruits from shrubs and trees are most commonly harvested by people. Collection and availability of NTFPs for use as food are more during the summer season, which is also the period with least availability of job. NTFPs for subsistence use are greater in number than those having commercial value. The most commonly harvested plant parts are fruits and leaves. Roots, rhizomes and whole plants are extracted in lesser quantity which is a positive approach from sustainability point of view. NTFPs and other forest products also form a vital part of the rural household's income generation activities.

Key Words: NTFP diversity, food security, seasonality, sustainability, rural income

Introduction

Rural communities across the developing world extract a diverse range of non-timber forest products (NTFPs) everyday for used as food, fuel, storage and fodder, medicine, cottage and wrapping materials, raw material for handicrafts and construction, ornaments, etc. De Beer and McDermott (1989) defined NTFP as "all biological materials other than timber, which are extracted from forests for human use". They may be of plant or animal origin. The role of NTFPs in ensuring food security of rural people is immense in that they maintain the nutritional balance in peoples' diets and provides supplementary foods during the food deficit periods (Shackleton and Shackleton 2004; Volker and Waibel 2010). Sale or trade of NTFPs has also been identified as one of key income sources for rural households (Campbell Luckert 2002). Besides contribution in rural development, harvesting of NTFPs is considered to contribute substantially towards conservation of forests (Peters et al. 1989; Evans 1993; Arnold and Ruiz Perez 1999).

In India too, NTFPs are extensively extracted from forests, and their role in rural and forest economies is enormous (Shahabuddin and Prasad 2004). About 400 million people in India are dependent on NTFPs in one way or the other, and of these, about 50 millions living in forests fringes harvest substantial quantities of NTFPs for their subsistence and low-volume trade (Tewari 1992).
The people of Meghalaya have a long tradition of using and relying on forests, not only in terms of arable land for shifting cultivation but also for gathering forest products from the nearby forests. Extraction of valuable timber yielding trees like *Tectona grandis*, *Shorea robusta*, *Terminalia myriocarpa*, *Gmelina arborea*, *Pinus kesiya*, *Michelia champaca*, *Toona ciliata*, etc., was common and has earned huge revenue for the state as well as a source of livelihood for the people. However, with the 1996 order of Supreme Court of India banning extraction of timber in the region, pressure on NTFPs has increased. The present study aims to document the diversity and availability of floral NTFPs in the forests of Meghalaya and their utilization by the people of the state.

**Materials and Methods**

**Study area**

The study was conducted in the Saw Symper area, located in the central Meghalaya (1400 m to 1760 m above MSL) between 91° 30' - 91° 40' N latitude and 25° 25' - 25° 15' E longitude (Fig. 1). The area has a monsoonic climate. Average maximum and minimum temperature during summer months (July-August) was 23°C and 18°C respectively and during the winter (December-January) it often comes down as low as 1°C. More than half the land area is under forest cover (Lynser 2013). Sub tropical wet evergreen forests interspersed with pine are the dominant forest types in the area. Owing to the topography and persistent rains, most of the top soils in the area have been washed away, making a large part of arable lands unsuitable for agriculture. The area is inhabited by people belonging to Khasi tribe who practice shifting cultivation on hill slopes.

**Data collection and Plant Identification**

Data were collected through participatory research tools such as Participatory Rural Appraisal (PRA) and Key Informants Survey (KIS). Eight participants of the age group 18–60 years from four villages viz., Kmawanrum, Mawlynnu, Mawtangor and Wahmawpat of the area were interviewed. Care was taken to include people of both sexes. Information on types and uses of floral NTFPs in the study area were collected following ethno-botanical methods as described by Rao (1989). From these elderly and knowledgeable people, data on habit, availability, plant parts used, purpose of collection, gender involved in collection and price of the listed plant species were collected.

Plant specimens listed by the participants were collected through walks in the forest with knowledgeable local people. These were then tagged on the spot following the
Table 1. Family, genera and species of floral NTFPs of Saw Symper

| Family             | Genera | Species |
|--------------------|--------|---------|
| Amaryllidaceae     | 1      | 1       |
| Anacardiaceae      | 1      | 1       |
| Apiaceae           | 2      | 2       |
| Apocynaceae        | 2      | 2       |
| Araceae            | 1      | 1       |
| Araliaceae         | 2      | 2       |
| Aristolochiaceae   | 1      | 1       |
| Asteraceae         | 5      | 5       |
| Begoniaceae        | 1      | 1       |
| Berberidaceae      | 2      | 2       |
| Betulaceae         | 1      | 1       |
| Cantharellaceae    | 2      | 2       |
| Caprifoliaceae     | 1      | 3       |
| Celastraceae       | 1      | 1       |
| Chloranthaceae     | 1      | 1       |
| Clavariaceae       | 1      | 1       |
| Clavulinaceae      | 1      | 1       |
| Cleistanthaceae    | 1      | 1       |
| Clusiaceae         | 1      | 2       |
| Dioscoraceae       | 1      | 1       |
| Elaeocarpaceae     | 1      | 1       |
| Elegnaceae         | 1      | 1       |
| Ericaceae          | 1      | 1       |
| Erythroxylaceae    | 1      | 1       |
| Euphorbiaceae      | 4      | 4       |
| Fagaceae           | 3      | 7       |
| Flacourtiaceae     | 1      | 1       |
| Gleicheniaceae     | 1      | 1       |
| Hamamelidaceae     | 1      | 1       |
| Juglandaceae       | 1      | 1       |
| Lardizabalaceae    | 1      | 1       |
| Lauraceae          | 3      | 3       |
| Liliaceae          | 2      | 2       |
| Loganiaceae        | 1      | 1       |
| Lycopodiaceae      | 1      | 1       |
| Melastomaceae      | 2      | 2       |
| Menispermaceae     | 2      | 2       |
| Musaceae           | 1      | 2       |
| Myricaceae         | 1      | 2       |
| Myrsinaceae        | 2      | 3       |
| Myrtaceae          | 1      | 1       |
| Oleaceae           | 1      | 1       |
| Oleandriodeae      | 1      | 1       |
| Pinaeae            | 1      | 1       |
| Plantaginaceae     | 1      | 1       |
| Pluteaceae         | 1      | 1       |
| Poaceae            | 11     | 11      |
| Polygonaceae       | 2      | 3       |

Table 1. Continued

| Family             | Genera | Species |
|--------------------|--------|---------|
| Proteaceae         | 1      | 1       |
| Pteridaceae        | 1      | 1       |
| Ranunculaceae      | 1      | 1       |
| Rosaceae           | 7      | 13      |
| Rubiaceae          | 4      | 4       |
| Russulaceae        | 1      | 1       |
| Rutaceae           | 3      | 3       |
| Saxifragaceae      | 1      | 1       |
| Schisandraceae     | 1      | 1       |
| Smilacaceae        | 1      | 1       |
| Symlocaceae        | 1      | 1       |
| Theaceae           | 3      | 5       |
| Tricholomataceae   | 2      | 2       |
| Urticaceae         | 1      | 1       |
| Usneaceae          | 1      | 1       |
| Vacciniaceae       | 2      | 4       |
| Valerianaceae      | 1      | 1       |
| Verbanaecae        | 1      | 1       |
| Violaceae          | 1      | 1       |
| Vitaceae           | 1      | 2       |
| Zingiberaceae      | 2      | 2       |

standard technique (Jain and Rao 1977; Martin 1995) and later identified with the help of standard books viz., Forest Flora of Meghalaya (Haridasan and Rao 1985-1987) and Flora of Assam (Kanjilal et al. 1934-1940). The identifications were confirmed at the Botanical Survey of India, Eastern Regional Centre, Shillong and Department of Botany, North-Eastern Hill University, Shillong. Digital photography was also used for collecting data. To cross verify the data gathered from local people during the field work, important published literature related to these parameters were consulted. Standard references viz., Indian Medicinal Plants: An Illustrated Dictionary (Khare 2007), Ethnobotanical Wisdom of Khasis (Hynniew T rep's) of Meghalaya (Ahmed and Borthakur 2005), Useful Plants of India (Ambasta 1986), Flora of Assam (Kanjilal et al. 1934-1940) and Cross-Cultural Ethnobotany of North-East India (Saklani and Jain 1994) were consulted. The contribution of NTFP and other forest products to total household cash-kind income was calculated following a ‘total household income’ concept given by Cavendish (2002). A total of 120 households were randomly surveyed for a pe-
period of one year for collecting data on the quantity and producer’s price of selected forest products. Data on important income sources in the area were also collected and tabulated.

Results and Discussion

Diversity of Floral Non Timber Forest Products

A total of 172 NTFPs emanating from 139 plant species were utilized by the people in the study area. These 139 plant species belonged to 117 genera and 70 families. The dominant NTFP yielding families are: Rosaceae, Poaceae, Fagaceae, Asteraceae and Theaceae (Table 1). Thirty six plant species were found to have multiple uses while the rest 103 have single use. The fact that some plant species have multiple usage, is the reason for number of plant products being more than the number of plant species.

The NTFPs utilized by people in this study is less than 450 reported by Foppes and Ketphanh (2004) in Lao PDR but higher than 89 reported by Sahoo et al. (2010) used by the hill tribes around Dampa Tiger Reserve in Mizoram, India; 138 reported by Emery (2001) in Michigan’s Upper Peninsula, United States and 160 by Mbuvi and Boon (2009) in Mbooni Division in Makueni District, Kenya. The NTFP diversity shows the cognitive ability of the people, which indirectly reveals high dependency of people on forests.

Distribution across habit/plant category

Trees are the dominant plant category that is used by the people, followed by shrubs, herbs and climbers (Fig. 2). A variety of mushroom and bamboo species are also used by the people of the area. This finding is similar to that of Rijal et al. (2011) who also reported trees as the dominant life form in trade followed by shrubs, climbers and herbs.

Uses

Majority of the NTFPs collected by the people are used as food (40%), followed by medicine (18%) and fuelwood (18%) which is similar to the findings by Andersen et al. (2001) in Kuyongon, Sabah, Malaysia. Other types of uses are in small percentage only (Fig. 3). Mainly leaves, fruits, flowers, stem and fruiting body (mushrooms) are the plant parts utilized as food by the people in the study area. Important wild fruits in the area include: *Myrica esculenta*, *Castanopsis purpurella*, *Rubus* spp., *Viburnum* spp. and *Docynia*
Table 2. Dominant plant families yielding food, medicine and fuelwood

| Family          | Food No. of Genera | Food No. of Species | Medicine No. of Genera | Medicine No. of Species | Fuelwood No. of Genera | Fuelwood No. of Species |
|-----------------|--------------------|---------------------|------------------------|-------------------------|------------------------|-------------------------|
| Rosaceae        | 5                  | 9                   | 3                      | 3                       | 4                      | 6                       |
| Vaccinaceae     | 2                  | 4                   | 2                      | 2                       | 4                      | 5                       |
| Rutaceae        | 3                  | 3                   | 2                      | 2                       | 3                      | 3                       |
| Polygonaceae    | 2                  | 3                   | 1                      | 2                       | 2                      | 3                       |
| Myrsinaceae     | 2                  | 3                   | 1                      | 2                       | 2                      | 2                       |
| Total           | 14                 | 22                  | 9                      | 11                      | 15                     | 19                      |

The present study showed higher number of plants species utilized as food than those reported by Dutta and Dutta (2005) revealing that the people possessed a good knowledge on the utilization of local plants as food material by the people. Though use of wild plant as medicine in the area is common, plant species for medicinal use recorded in the present study is much lower than other studies in the state due to availability of smaller number of professional herbal practitioners and particularly because only plant species found in the forests were recorded in this study. In the area, other means of energy use (e.g. LPG, electric heaters) are not yet popular; therefore, firewood is the only energy source for cooking and for space heating especially during the severe winter months.

The dominant family yielding food is Rosaceae which is in conformity with study by Pfize et al. (2011) who reported that many edible plants belonged to the Rosaceae family. Fagaceae is the dominant family yielding fuelwood. Trees of Fagaceae family are considered as good fuelwood species (Ul Haq et al. 2010; Jan et al. 2011). Since Fagaceae family is dominant among tree species and easily available in the area, therefore trees belonging to this family are widely used for fuelwood.

Plant parts used

Different plant parts are harvested as NTFPs. Fruits are the most common plant part utilized by the people of Saw Symper followed by stem and branches and leaves. Apart from stem and branches which are used for fuelwood, a detailed analysis of plant parts harvested across life forms revealed that the fruits of shrubs and trees are the most commonly collected NTFPs of the area (Table 3). The plant parts used for food, medicines, and fuelwood are as follows:

- **Fruits**: The most common NTFPs are fruits. A variety of tree, bamboo, and grass species are used as construction material. Straight bole hard wood tree species like *Eubucklandia populnea*, *Glochidion thomsonii*, *Wendlandia wallichii*, and *Castanopsis armata* are used as poles for support, bamboo species like *Drepastachyum khasianum* and *Cephalostachyum capitatum* for walling and grass species like *Imperata cylindrica* and *Panicum sp.* for roofing. Further, tree species with straight bole viz., *Quercus glauca*, *Helicia nelagirica*, *Castanopsis armata*, and *Castanopsis purpurella* are used for making tools and implements like handle for coal digger which is very popular in the study area. The dominant families of plants utilised for food, medicines and fuelwood is given in Table 2.
Table 3. Distribution of NTFPs plant parts across habit/category in Saw Symper

| Plant Parts       | Tree | Shrub | Herb | Climber & Liana | Grass | Fern | Bamboo | Mushroom | Total |
|-------------------|------|-------|------|-----------------|-------|------|--------|----------|-------|
| Bark              | 3    | 5     | 1    |                 |       |      |        |          | 9     |
| Flowers           | 1    | 4     |      |                 |       |      |        |          | 5     |
| Fruits            | 14   | 16    | 10   |                 | 2     |      |        |          | 40    |
| Leaves            | 3    | 6     | 15   | 4               | 2     |      |        |          | 30    |
| Seeds             | 1    | 1     |      |                 |       |      |        |          | 2     |
| Stem              | 9    | 3     | 4    | 8               |       |      |        |          | 24    |
| Stem & Branches   | 31   |       | 8    | 2               | 5     |      |        |          | 44    |
| Underground parts | 1    | 2     | 5    | 2               | 1     |      |        |          | 11    |
| Whole plant       | 1    | 4     |      | 3               | 8     |      |        |          | 16    |
| Young leaves & shoots | 1 | 1 | 1 | 1 | 2 | 5 | 1 | 8 | 8 | 172 |

Fig. 4. Monthly varitions in availability of floral NTFPs.

parts harvested by people in the present study matches with those harvested from tropical forests as reported by Conelly (1985), Peters (1990), Cunningham (1996) and Dovie et al. (2002) except for plant exudates such as latex, resin and floral nectar which is not collected by the people of Saw Symper. Interestingly, the present study recorded fruits as the most harvested plant parts followed by leaves whereas Mbuvi and Boon (2009) in Mbooni Division in Makueni District, Keyna, and Das (2005) in areas around Buxa Tiger Reserve, West Bengal, India found that leaves are the most harvested plant parts followed by fruits.

Availability, time of collection and gender involved in NTFP collection

Availability and collection of different NTFPs varies with time of the year (Fig. 4) The highest number of NTFPs available was recorded during the month of May (133) and least during the month of March (106). Altogether 94 NTFPs are available all the year round. It was observed that majority of the fruits and leafy vegetables are available and collected during the wet months (April to November). Firewood and poles for construction, though available throughout the year, are mainly collected during the dry season (November to March). More NTFPs are available during the rainy-summer months than during the dry-winter season.

Collection of NTFPs like fruits and leafy vegetables is common during the rainy season due to the fact that these are available during the period and convenient to collect because of low volume and the distance to be travelled to collect them is less. Another reason is because during the rainy season, people have less work in their farms and other types of employment are not available, and in a way is good opportunity for people to sustain themselves during the financially lean months. This was also observed by Sunderland and Obama (1999) and Ngane et al. (2012). Firewood and construction materials although available throughout the year, are particularly collected during winter months because they are available in distant forests and since the volume is large and the terrain is difficult, transportation during rainy seasons is not convenient. Moreover, NTFP like firewood is needed year round so huge quantity is required to be collected and thus required involvement of almost all members of household. Winter months (November-February) are the best time for collection as young family members (children) are free from their school schedule during this period of the year.
Gender and age of NTFP collector varies with the type and uses of the NTFPs. NTFPs such as Bamboo and *Thysanoleana maxima* are often collected by men, whereas NTFPs that are used as food such as wild fruits, leafy vegetables, wild mushrooms, etc. are mostly collected by women folk and children. Overall, women are mostly involved in NTFP collection in the study area.

**Purpose of utilization**

Majority of the products collected by people are meant for subsistence use (Table 4). Studies by Mbuvi and Boon (2009) and Pandit et al. (2004) support this finding. Thirty five NTFPs are collected for commercial purpose while one hundred and thirty seven are used for subsistence. Majority of commercial NTFPs harvested (88%) are sold in the local market. Only 12% are traded at the regional and national levels. On the basis of the percentage of households involved in collection of NTFP for sale, the quantity of NTFP collected and financial value obtained from selling of the NTFP, *Thysanoleana maxima*, *Myrica* spp., *Houttuynia cordata*, *Castanopsis purpurella*, *Panax pseudoginseng* and *Mahonia pycnophylla* emerged as the most important commercial NTFPs in the study area.

**Table 4.** Purpose of collection of NTFPs and level of trade of various commercial NTFPs

| Purpose          | No. of NTFP | %   | Level of Trade | No. of products | %   |
|------------------|------------|-----|----------------|----------------|-----|
| Commercial       | 35         | 20  | Local          | 31             | 88  |
|                  |            |     | Regional       | 2              | 6   |
|                  |            |     | National       | 2              | 6   |
| Subsistence      | 137        | 80  | -              | -              | -   |

**Table 5.** Plant parts harvested

| Type of plant parts harvested | No. of NTFPs | No. of plant species |
|-------------------------------|--------------|----------------------|
| Fruit, Leaf, Seed, Flower,    | 89           | 84                   |
| Young leaf and shoot          |              |                      |
| Stem, Bark, Exudates          | 58           | 55                   |
| Whole plant, Root, Rhizome    | 19           | 19                   |

**Sustainability of harvest**

Sustainability of the NTFPs to a large extent depends on the plant parts harvested. Fruit, leaf, seed, flower and young leaf and shoot are collected in case of most NTFPs while whole plant, root and rhizome are collected in less number of cases (Table 5). Harvest of different plant parts may produce impacts that can be either beneficial or detrimental to the growth and regeneration of the species. In the present study, the plant parts with highest utilization are fruits, followed by leaves, seeds and flowers and to a lesser extent young leaves and shoots. Harvesting of these products, especially fruits and seeds have less impact on the species at individual and population level, provided correct harvesting method is employed and other parts of the plant are not damaged during fruit harvest (Vasquez and Gentry 1989; Ticktin 2004). Kahn (1988) noted that harvesting of leaves may have a negligible effect on the plant population being exploited provided individual plants are not killed in the process, the reproductive structures and apical buds are not damaged, a sufficient number of healthy leaves are left on each plant for photosynthesis and sufficient time is allowed between successive harvests for the plant to produce new leaves. The harvesting of roots, bulbs and bark usually kills or fatally weakens the exploited plant and adversely affects

**Table 6.** Contribution of forest products and different income categories to the annual total household income (in INR) in Saw Symper, Meghalaya (N=120)

| Income source         | Household engaged | Sum       | Mean per household | Contribution to total income (%) |
|-----------------------|-------------------|-----------|--------------------|----------------------------------|
| Forest Products       | 120 (100%)        | 1405080   | 11709±8730         | 13.8                             |
| Livestock             | 112 (93%)         | 901735    | 7515±7717          | 8.8                              |
| Agriculture           | 115 (96%)         | 889738    | 7415±8990          | 8.7                              |
| Daily wage            | 115 (96%)         | 2145710   | 17881±14259        | 21.0                             |
| Salaried job & businesses | 76 (63%)     | 4851640   | 40430±57626        | 47.6                             |
| Total                 |                   | 10193943  | 84949±58409        |                                  |
its regeneration (2002). Harvest of underground plant parts like roots and rhizome in the study area is not so common which is good from the sustainability point of view. But again, tolerance to harvest also varies with life forms/life history (Ticktin 2004). For example, slower growing and long lived life forms like trees can withstand lower rate of harvest than populations of perennial herbs having tubers/rhizomes.

**Contribution of NTFP and other forest products to total household income**

Five categories of income sources viz., income from forest products, agriculture, livestock, daily wage and salaried jobs & businesses are available in the area, through which most of the households’ needs such as food and cash income are met. It was found that NTFP and other forest products contributed nearly 14% (13.8%) of the total household cash kind income (Table 6). This finding is in close conformity with studies by Ambrose-Oji (2003), McSweeney (2002), McElwee (2008), Kamanga et al. (2009) in Africa and Illukpitiya and Yanagida (2008) and Khanal (2001) in Indian sub-continent. Though the dominant source of income was from salaried jobs & businesses and daily wages, nonetheless, contribution from forest products income forms a vital part of the households’ income generation activities in Saw Symper. Also, all the surveyed households are engaged in collection of forest products showing that collection of forest products is an important activity in the area.

**Conclusions**

In conclusion, this study revealed the diversified use of floral NTFPs by the rural people of Meghalaya as a source of food, fuel, medicines, construction materials and cash income generation. Collection and availability of these products varies with seasons. Women folks are mostly involved in collection of NTFPs that are used as food. NTFPs used as food are collected more frequently during the summer season and this help meet the food need of the people when income from other sources are least available and thus purchasing power are low. At present, commercial exploitation of NTFPs is done on a small scale and for a few products only. This should be encouraged so as to enhance the benefit accrued from these resources to the people of the state.

As regards to sustainability of plants yielding NTFPs, plant parts most commonly harvested are fruits and leaves rather than roots, rhizomes and whole plants, which is a positive approach from sustainability point of view. NTFP and other forest products contributed nearly 14% (13.8%) of the total household cash kind income and forms a vital part of the households’ income generation activities. Overall it can be said that NTFPs are playing a vital role in the subsistence economy and food security of the state.

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## Annexure 1. NTFP species collected and used by the people in the study area

| Sl. No. | Scientific name | Family | Habit/ Category | Part used | Uses | Months available | Purpose of Trade | Level of Trade |
|---------|----------------|--------|----------------|-----------|------|-----------------|-----------------|----------------|
| 1       | Agapetes obovata (Wt.) Hk. f. | Vacciniaceae | S | Fruits | Food | Mar-Jul | S | - |
| 2       | Agapetes variegata (Roxb.) G. Don | Vacciniaceae | S | Fruits | Food | Nov-Apr | S | - |
| 3       | Annona squamosa | Annonaceae | H | Rhizome | Medicinal | Jan-Dec | S | - |
| 4       | Annona squamosa | Annonaceae | H | Leaves | Medicinal | Jan-Dec | S | - |
| 5       | Aristolochia tagala Cham. | Aristolochiaceae | T | Fruits | Food | Oct-Dec | S | - |
| 6       | Aristolochia tagala Cham. | Aristolochiaceae | T | Fruits | Food | Oct-Dec | S | - |
| 7       | Arundinaria griffithiana Munro | Poaceae | B | Stem | Fencing, Construction (Walling) | Jan-Dec | C L | - |
| 8       | Bambusa pallida Munro | Poaceae | B | Stem | Handicraft, Construction (Walling) | Jan-Dec | S | - |
| 9       | Begonia rubra | Begoniaceae | H | Leaves | Food | Jan-Dec | S | - |
| 10      | Berberis aristata DC. | Berberidaceae | S | Fruits | Food | Sep-Oct | S | - |
| 11      | Bergenia ciliata (Haw) Sternb. | Saxifragaceae | H | Leaves | Medicinal | Apr-Oct | S | - |
| 12      | Betula alnoides Ham. | Betulaceae | T | Stem & branches | Firewood | Jan-Dec | S | - |
| 13      | Camellia caduca Cl. Ex Brandis | Theaceae | T | Stem & branches | Firewood | Jan-Dec | S | - |
| 14      | Cantharellus cibarius Fr. | Cantharellaceae | M | Fruiting body | Food | May-Jul | S | - |
| 15      | Cattleya schaueri | Orchidaceae | T | Stem & branches | Charcoal | Jan-Dec | S | - |
| 16      | Cattleya purpurella (Miq.) Balak. | Orchidaceae | T | Nuts | Food | Nov-Jan | C L | - |
| 17      | Centella asiatica (L.) Urban | Apiaceae | H | Leaves | Food | Apr-Oct | C L | - |
| 18      | Cephalotaxus cephalotaxus Munro | Cephalotaxaceae | S | Leaves | Medicinal | Apr-Oct | S | - |
| 19      | Cleistostachys albochiloptera Cl. | Cleistostachyaceae | F | Whole plant | Medicinal | Jan-Dec | S | - |
| 20      | Chlorophyllum sp. | Liliaceae | H | Leaves | Food | Apr-Aug | C L | - |
| 21      | Cocculus sp. | Menispermaceae | T | Fruits | Food | Nov-Jan | S | - |
| 22      | Clerodendrum quadrangulare (Fr.) Schrott | Clusiaceae | M | Fruiting body | Food | May-Jul | S | - |
| 23      | Citrus x aurantium | Rutaceae | T | Stem & branches | Firewood, Charcoal | Jan-Dec | S | - |
| 24      | Dendrocalamus sinicus | Poaceae | B | Stem | Handicraft, use as ropes | Jan-Dec | S | - |
| 25      | Dioscorea alata Linn. | Dioscoreaceae | Cl | Fruits | Food | Jan-Feb | S | - |
| 26      | Dioscorea komo var. komo | Dioscoreaceae | Cl | Tuber | Food | Jan-Dec | S | - |
### Annexure 1. Continued

| Sl. No. | Scientific name       | Family     | Habit/Category | Part used | Uses                        | Months available | Purpose | Level of Trade |
|---------|-----------------------|------------|----------------|-----------|----------------------------|------------------|---------|----------------|
| 29      | Docynia indica (Wall.) Decne. | Rosaceae   | T              | Fruits    | Food                       | Oct-Dec          | C       | L              |
| 30      | Drepanostachyum rhizanum (Munro) Majumdar | Poaceae   | B              | Stem      | Construction (Walling), use as rope | Jan-Dec          | S       | -              |
| 31      | Elaeocarpus lanceolatus Roxb. | Elaeocarpaceae | T              | Fruits    | Food                       | Nov-Dec          | S       | -              |
| 32      | Elegia pyrifera Hk. f. | Elaeagnaceae | S              | Fruits    | Food                       | Apr-May          | S       | -              |
| 33      | Embelia sp. | Myrsinaceae | Li             | Seeds     | Food                       | Jan-Feb          | S       | -              |
| 34      | Embelia ribes Burm. | Myrsinaceae | S              | Fruits    | Food                       | Jan-Apr          | S       | -              |
| 35      | Emilia sonchifolia (Linn.) DC. | Asteraceae | H              | Leaves    | Food                       | Apr-Aug          | C       | L              |
| 36      | Engelhardia spreta Leschen.ex Bl. | Juglandaceae | T              | Flowers   | Ornamental                 | Jan-Mar          | S       | -              |
| 37      | Eriobotrya sp. | Rosaceae | T              | Stem & branches | Firewood             | Jan-Dec          | S       | -              |
| 38      | Erythroxylum kunthamum Wall. ex Kurz. | Erythroxylaceae | S              | Bark      | use as betel nut           | Jan-Dec          | S       | -              |
| 39      | Euonymus theacifliau Wall. | Celastraceae | S              | Stem      | Rope                       | Jan-Dec          | S       | -              |
| 40      | Exuropium adenophorum Spreng. | Asteraceae | H              | Leaves    | Medicinal                  | May-Nov          | S       | -              |
| 41      | Exuropium acuminata DC. | Theaceae   | T              | Bark      | Dye                        | Jan-Dec          | C       | R              |
| 42      | Eurya japonica Thumb. | Theaceae   | S              | Whole plant | Fencing                  | Jan-Dec          | S       | -              |
| 43      | Eschscholzia populosa Griff | Hamamelidaceae | T              | Stem & branches | Firewood, Charcoal      | Jan-Dec          | S       | -              |
| 44      | Fallopium cymosum (Trev) Meissn. | Polygonaceae | H              | Leaves    | Food                       | Apr-Aug          | S       | -              |
| 45      | Garinia sp. | Clusiaceae | T              | Fruits    | Food                       | May-Jun          | S       | -              |
| 46      | Garinia polyantha G. Don. | Clusiaceae | T              | Stem & branches | Firewood, Charcoal   | Jan-Dec          | C       | L              |
| 47      | Gaultheria fragrantissima Wall. | Ericaceae | S              | Leaves    | Medicinal                  | Jan-Dec          | S       | -              |
| 48      | Gleichenia sp. | Gleicheniaceae | F              | Whole plant | Fencing                  | Jan-Dec          | S       | -              |
| 49      | Globba clarkii Baker | Zingiberaceae | H              | Rhizome   | Medicinal                  | Jan-Dec          | S       | -              |
| 50      | Glochidion zhusoni Hk. f. | Euphobiaceae | T              | Stem & branches | Firewood, Charcoal  | Jan-Dec          | S       | -              |
| 51      | Gomphus floccosus (Schw.) Singer | Cantharellaceae | M              | Fruiting body | Food, Medicines     | May-Jul          | S       | -              |
| 52      | Gymnacanthus odorata R. Br. | Flicourtiaceae | T              | Seeds     | Food                       | Jan-Feb          | C       | L              |
| 53      | Hedyotis scandens D. Don | Rubiaceae | Cl            | stem      | Fish poison                | Aug-Apr          | S       | -              |
| 54      | Helicia minitigera Bedd. | Proteaceae | T              | Stem      | Tools & Implements         | Jan-Dec          | C       | L              |
| 55      | Holbellia latifolia Wall. | Proteaceae | Li            | Fruits    | Food                       | Sep              | S       | -              |
| 56      | Houptia cordata Thumb. | Saurreaceae | H              | whole plant | Food                        | Feb-Dec          | C       | L              |
| 57      | Imperata cylindrica Linn. | Poaceae   | G              | Leaves    | Construction (roofing)    | Jan-Dec          | S       | -              |
| Sl. No. | Scientific name          | Family      | Habit/Category | Part used     | Uses           | Months available | Purpose | Level of Trade |
|--------|--------------------------|-------------|----------------|---------------|----------------|------------------|---------|----------------|
| 58     | Inula cappa DC.          | Asteraceae  | H              | Young leaves  | Medicinal      | Mar-Dec          | S       |                |
| 59     | Itea chinensis Hk. f.    | Rutaceae    | T              | Fruits        | Food           | Oct-Nov          | S       |                |
| 60     | Jasminum dispermum Wall. | Oleaceae    | C1             | Stem          | Rope           | Jan-Dec          | S       |                |
| 61     | Lactarius deliciosus (L.) Gray | Russulaceae | M              | Fruiting body | Food           | May-Jul          | S       |                |
| 62     | Lactuca laxisepa (BL.) DC | Asteraceae  | H              | Leaves        | Firewood, Charcoal | Jan-Dec | S       |                |
| 63     | Ramaria sp.              | Clavariaceae| M              | Fruiting body | Food           | Jun-Sept         | S       |                |
| 64     | Lentiskula odoloid (Berk.) Pegler | Trichotoma | M              | Fruiting body | Food           | Apr-May          | C       | L              |
| 65     | Lindera causata Benth.   | Lauraceae   | T              | Stem & branches | Firewood, Charcoal | Jan-Dec | S       |                |
| 66     | Lithocarpus dal右手 (Hk. et. Th. ex Miq.) Rehder | Fagaceae | T              | Stem & branches | Firewood, Charcoal | Jan-Dec | C       | L              |
| 67     | Lithocarpus elegans (Bl.) | Fagaceae    | T              | Stem & branches | Firewood, Charcoal | Jan-Dec | S       |                |
| 68     | Lithocarpus femonstratus (Roxb.) Rehder | Fagaceae | T              | Stem & branches | Firewood, Charcoal | Jan-Dec | C       | L              |
| 69     | Lycocysus piceum Hk.     | Rubiaceae   | T              | Stem & branches | Firewood       | Jan-Dec          | S       |                |
| 70     | Lycocysus eurmum Linn.   | Lycopodiaceae| C1            | Leaves        | Ornamental     | Jan-Dec          | S       |                |
| 71     | Macaranga dentiflata Muell. Arg. | Eurybehaceae | T            | Leaves        | Packing        | Jan-Dec          | S       |                |
| 72     | Mahonia pynphylla (Fedde) Takeda | Berberidaceae | S            | Fruits        | Food           | Nov-Feb          | S       |                |
| 73     | Mallotus sp.             | Euphorbiaceae| T            | Stem & branches | Firewood, Charcoal | Jan-Dec | S       |                |
| 74     | Melastoma nepalensis Lodd. | Melastomaceae | S            | Leaves        | Medicinal      | Apr-Nov          | S       |                |
| 75     | Melochiun bacefera (Roxb.) Kurz | Poaceae | B            | Stem          | Handicraft     | Jan-Dec          | S       |                |
| 76     | Melodinus monognus Roxb. | Aporcianaceae| Li         | Fruits        | Food           | Jan-Feb          | S       |                |
| 77     | Microcalamus prainii Gamble | Poaceae | B            | Stem          | Rope           | Jan-Dec          | S       |                |
| 78     | Lantana camara Linn.     | Verbenaceae | S            | Fruits        | Food           | Jan-Dec          | S       |                |
| 79     | Mikania micrantha Kunth  | Asteraceae  | H              | Leaves        | Medicinal      | Jan-Dec          | S       |                |
| 80     | Molineria capitulata (Lour.) Herb | Myricaceae | H            | Roots         | Medicinal      | Jan-Dec          | S       |                |
| 81     | Musa acuminata Colla     | Musaceae    | S              | Flowers       | Food           | Jan-Dec          | C       | L              |
| 82     | Musa paradisiaca Linn.   | Musaceae    | S              | Leaves        | Packing        | Jan-Dec          | S       |                |
| 83     | Myrica esculenta Buch.-Ham. ex D. Don | Myricaceae | T            | Fruits        | Food, Medicinal | May-Jul          | C       | L              |
| Sl. No. | Scientific name            | Family         | Habit/ Category | Part used     | Uses             | Months available | Purpose of Trade |
|--------|----------------------------|----------------|-----------------|---------------|------------------|------------------|------------------|
| 84     | Myrica nagi Thunb.         | Myricaceae     | F               | Fruits        | Food             | May-Jul          | C L              |
| 85     | Nephrolepis cordifolia (Linn.) Presl. | Osmundaceae   | T               | Tuber          | Medicinal        | Jan-Dec          | S -              |
| 86     | Oenanthe javanica (Bl.)DC | Apiaceae       | H               | Leaves         | Food             | Apr-Aug          | C L              |
| 87     | Osbekia stellata Buch. -Ham. ex D. Don | Melastomaceae | S               | Leaves         | Medicinal        | Apr-Nov          | S -              |
| 88     | Panax pseudoginseng Wall.  | Araliaceae     | H               | Tuber          | Medicinal        | Jan-Dec          | C N              |
| 89     | Panicum sp Poaceae         | Poaceae        | G               | Leaves         | Fodder, roofing  | Feb-Dec          | S -              |
| 90     | Pericampylus glaucus (Lamk.) Merr | Menispermaceae | Cl              | Leaves         | Medicinal        | Jan-Dec          | S -              |
| 91     | Persea parviflora (Meissn.) Haridasan et R.R. Rao | Lauraceae     | T               | Stem & branches | Firewood, Charcoal | Jan-Dec          | C L              |
| 92     | Photinia cuspidata (Bertol) Balak | Rosaceae      | T               | Stem & branches | Firewood         | Jan-Dec          | S -              |
| 93     | Phyllostachys mannii Gamble | Poaceae        | B               | Stem           | Fencing          | Jan-Dec          | S -              |
| 94     | Pinus kesiya Roxb.         | Pinaceae       | T               | Leaves         | Manure, Mattresses | Nov-Mar          | S -              |
| 95     | Plantago major Linn.       | Plantaginaceae | H               | Leaves         | Tool & Implements | Jan-Dec          | C L              |
| 96     | Plateaum major (B.K. & Br.) Sacc. | Plantaginaceae | M               | Fruiting body  | Food             | Jan-Dec          | S -              |
| 97     | Polygonum chinense Linn.   | Polygonaceae   | S               | Young shoots   | Food             | Jan-Dec          | S -              |
| 98     | Polygonum molle D. Don     | Polygonaceae   | H               | Tuber          | Food             | Jan-Dec          | S -              |
| 99     | Prunus sp.1 Rosaceae       | Rosaceae       | T               | Stem           | Food             | Jan-Dec          | S -              |
| 100    | Prunus cerasoides D. Don   | Rosaceae       | H               | Tuber          | Food             | Jan-Dec          | S -              |
| 101    | Quercus glauca Thunb.      | Fagaceae       | T               | Stem & branches | Food             | Jan-Dec          | S -              |
| 102    | Quercus sp.                | Fagaceae       | T               | Stem & branches | Food             | Jan-Dec          | S -              |
| 103    | Repandulaeum multiflorum Koch. | Fagaceae      | T               | Fruits         | Food             | Jan-Dec          | S -              |
| 104    | Rhus javanica Linn.        | Anacardiaceae  | T               | Fruits         | Food             | Nov-Mar          | S -              |
| 105    | Rubus fruticosus Schott.   | Rosaceae       | T               | Fruits         | Food             | Jan-Dec          | S -              |
| 106    | Rubus fruticosus Schott.   | Rosaceae       | T               | Fruits         | Food             | Jan-Dec          | S -              |
| Sl. No. | Scientific name          | Family          | Habit/Category | Part used | Uses          | Months available | Purpose | Level of Trade |
|---------|--------------------------|-----------------|----------------|-----------|---------------|-----------------|---------|----------------|
| 109     | *Rosa longicuspis* Bertol. | Rosaceae        | S              | Fruits    | Food          | Nov             | S       |                |
| 110     | *Rubia cordifolia* Linn.  | Rubiaceae       | Cl             | Roots     | Medicinal     | Jan-Dec         | S       |                |
| 111     | *Rubus ellipticus* Smith  | Rosaceae        | S              | Fruits    | Food          | May-Jun         | S       |                |
| 112     | *Rubus laioscapus* Smith  | Rosaceae        | S              | Fruits    | Food          | May-Jul         | S       |                |
| 113     | *Rubus niveus* Thunb.     | Rosaceae        | S              | Fruits    | Food          | May             | S       |                |
| 114     | *Rubus rugosus* Smith     | Rosaceae        | Cl             | Fruits    | Food          | May-Oct         | S       |                |
| 115     | *Sarcandra glabra* Nakai  | Chloranthaceae  | H              | Whole plant | Ornamental | Nov-Dec         | S       |                |
| 116     | *Schefflera hypoleuca* (Kurz.) Harms | Araliaceae | T               | Leaves | Fodder | Mar-Nov     | S       |                |
| 117     | *Schima khasiana* Dyer    | Theaceae        | T              | Stem & branches | Firewood | Jan-Dec     | S       |                |
| 118     | *Schima wallichii* DC.    | Theaceae        | T              | Stem & branches | Firewood, Charcoal | Jan-Dec     | S       |                |
| 119     | *Schisandra sp.*          | Schisandraceae  | Li             | Bark      | Medicinal     | Jan-Dec         | S       |                |
| 120     | *Smilax glauca* Klotz.    | Smilacaceae     | Cl             | Fruits    | Food          | Jan             | S       |                |
| 121     | *Strophantus wallichii* A.DC. | Apocynaceae  | Cl             | Fruits    | Food          | Jan-Dec         | S       |                |
| 122     | *Styrchys spinosa*        | Loganiaceae     | Li             | Fruits    | Food          | Nov             | S       |                |
| 123     | *Symplaca laurina* (Retz.) Wall | Symplocaceae  | T              | Stem & branches | Firewood, Charcoal | Jan-Dec     | S       |                |
| 124     | *Syzygium tetragonum* (Wt.) Kurz | Myrtaceae      | T              | Fruits    | Food          | Apr-May         | C       | L               |
| 125     | *Termitomyces sp* Heim.   | Tricholomataceae| M              | Fruiting body | Food     | Jan-Mar         | C       | L               |
| 126     | *Tetragastrina leucophlaema* (Demstn.) Balak. | Vitaceae | Li              | Stem      | Rope          | Jan-May         | S       |                |
| 127     | *Thysanolaena maxima* (Roxb.) O. Ktze. | Poaceae | S | Inflorescence | Sweeping | Jan-Mar         | C       | L               |
| 128     | *Tetragastrina serrulatum* (Roxb.) Planch | Vitaceae | Cl | Fruits | Food | Sep-Oct | S |                |
| 129     | *Tuddalisa asiatica* (Linn.) Lamk | Rutaceae | S | Inflorescence | Sweeping | Oct-Nov | S |                |
| 130     | *Triericytis sp.*         | Liliaceae       | H              | Leaves    | Food          | May-Oct         | S       |                |
| 131     | *Usnea sp.*               | Usnaceae        | F              | Whole plant | Medicinal | Jan-Dec         | S       |                |
| 132     | *Vaccinium griffithianum* Wt. | Vaccinaceae| S | Fruits    | Food          | Jul-Oct         | S       |                |
| 133     | *Vaccinium vacciniaceum* (Roxb.) Skurn | Vaccinaceae | S | Fruits    | Food          | Jul-Aug         | S       |                |
| 134     | *Valeria jatamansi* Jones | Valerianaceae   | H              | Leaves    | Medicinal     | Apr-Aug         | S       |                |
| 135     | *Viburnum corylifolium* Hk. f. & Th. | Caprifoliaceae | S | Fruits | Fishing Baits, Food | Sep-Oct | C | L               |
| 136     | *Viburnum coxifolium* D. Don | Caprifoliaceae | S | Fruits | Food          | Sep-Oct         | S       |                |
### Annexure 1. Continued

| Sl. No. | Scientific name          | Family     | Habit/Category | Part used | Uses       | Months available | Purpose | Level of Trade |
|---------|--------------------------|------------|----------------|-----------|------------|------------------|---------|----------------|
| 137     | *Viburnum foetidum* Wall. | Caprifoliaceae | S              | Bark      | Medicinal  | Jan-Dec          | S       | -              |
|         |                          |            |                | Roots     | Medicinal  | Jan-Dec          | S       | -              |
| 138     | *Viola sikkimensis* W. Becker | Violaceae   | H              | Whole plant | Medicinal  | Apr-Nov          | S       | -              |
| 139     | *Wendlandia wallichii* W. & A. | Rubiaceae  | T              | Stem      | Construction (Poles) | Jan-Dec | S       | -              |

Habit/Category: T=Tree, S=Shrub, H=Herb, Cl=Climber, Li=Liana, B=Bamboo, G=Grass, Fe=Fem, M=Mushroom.

Purpose: C=Commercial; S=Subsistence.

Level of trade: L=Local, R=Regional, N=National.