GENERAL DISCUSSION
10.1 NON-TIMBER FOREST PRODUCTS & POTENTIAL

The non-timber forest products (NTFPs) have long been an important but often neglected, component in the livelihood strategies of tribal, rural and forest dwelling communities (Martin, 1995). Despite of the fact that a wide range of NTFPs have been used, the development of forest has largely been focused on timber, and ‘forest management’ became a synonymous to ‘timber management’ (FAO, 2001). The role of NTFPs has been highlighted over past few decades after analyzing the actual and potential values of a wide variety of forest products other than wood or timber, which later on popularly called as ‘non-wood’ or ‘non-timber’ forest products. The NTFPs comprises different plant and animal products used for subsistence or commercialization purposes (FAO, 1999, 2004). The tropical forests are considered major repository of such NTFPs and it is also postulated that more income could be earned by collecting NTFPs than the logging (Peter et al., 1989). This has led to generate a paradigm shift about NTFPs as they meet contrasting needs of development and conservation besides providing local livelihood, trade and state revenue. The recognition of the role of NTFPs in community level livelihoods has been important in stimulating an increased interest in NTFPs management in recent times (Peters, 1994, 1996; Koppell, 1995; Bolton, 1997; Cunningham, 2001). Of late, there is an increased awareness for sustainable use of forest resources, therefore NTFPs have been seen as an important component for sustainable forest management (Peters, 1996). There is growing interest in NTFPs among community people and their leaders, conservationists, foresters, planners, NGOs and developmental workers for sustainable income generation from these resources for rural people, more equitable sharing of benefits from forests, and mainstreaming forest management with local communities (FAO, 2001). There is a need to investigate region specific NTFPs, community dependence and incomes from them, status assessment of potential commercial species in natural habitats, resource governance, and issues affecting their sustainable management.

Globally, there are large number of NTFPs that have potential commercial value (Iqbal, 1993; SCBD, 2001), however, only 150 NTFPs are considered important in terms of international trade (FAO, 1997; Murthy et al., 2005). There are about 15,000 plant species in India, out of which nearly 3000 species (20%) provide NTFPs with 126 species as commercially traded species (Murthy et al., 2005).
In 2006-07, India earned Rs 39.7 million from NTFPs export (Ganguli, 2007). It is estimated that NTFPs harvested per annum contributes Rs 1672 per ha and Rs 42 billion of gross value (Chopra, 2006). The NTFPs sector generates about 1063 million person days of employment. For sustainable development of NTFPs sector, there is a need to assess different types of NTFPs, their diversity, abundance and potential for future supply through resource inventory, use of NTFPs at household level, local markets, and commercial trade, and variations in harvest and revenue generation (FAO, 2001). There is still a paucity of information to assess full potential of NTFPs, limitation in terms of technical, financial, political and social capacity to influence policies, and lack of protected rights of communities to get full benefit from NTFPs (World Forestry Congress, 2003). An ideal development process might begin with species/product selection, resource inventory, growth and yield assessment of species, determination of sustainable harvest rates, market demand-supply, and management planning and monitoring (FAO, 1999, 2001). Also there is a need to identify and analyze the role of NTFPs in local livelihood along with the challenges that these resources, products and users are facing.

10.1.1 North East India and NTFPs

North East India has rich bioresource base. The majority of agriculture is shifting cultivation type and only a small part is sedentary, however, both systems are highly subsistence type and there is hardly any produce to sell in the market. The communities have high dependence on forests. In view of abundance of NTFPs and many other potential species in the community forests, there is an option for farmers to increase their income through harvesting of these species. Given that these NTFPs were used for past many decades and still being harvested, it can be said that community can rely on these species in near future as well. It, however, needs proper strategy to harvest these species as increased demand may pose high pressure on same resources.

Data on NTFPs indeed remain rudimentary and are still not available in a systematic way from north east India, which is global centre of biodiversity with high dependence of communities on natural resources (Tiwari, 2000). Arunachal Pradesh comprised 60% land area of the north east. It forms eastern most state of India that comprised 2.54% of the total land area and 0.11% of the total population of the country (FSI, 2005). Forest is a major land use in Arunachal Pradesh and approximately 82% area of the state is officially classified as forest land (FSI, 1999). The recorded forest area of the state is approximately 51,540 sq km, which is 61.55% of the state’s geographical area (FSI, 2005). The state has significant
percent of Scheduled tribes, which are mainly dependent on forests for their livelihood requirements. Although the major policy decisions are taken by the Ministry of Environment and Forests (MOEF), the forest management in the state is mainly done by the Forest Department. NTFPs are used and managed in complex socio-economic and ecological environments. The tribal communities use a large variety of NTFPs for subsistence purposes, some of them are used on commercial scale that forms a major source of rural income. Selected NTFPs are important medicinal and wild food plants, while some others have socio-cultural values. The sustainable productions of many NTFPs, mainly those traded in high volumes, have declined fast in the region.

10.1.2 Focus of the study

It is assumed that highlighting the issues related to NTFPs would open a road map for planner, politicians, researchers and developmental workers by developing a new sector of livelihood of the rural communities. The present study concentrated on some of these issues by investigating different ethnic communities that intimately use NTFPs in Arunachal Pradesh state. This study focused on NTFPs and emphasizes them in their overall context along with plant/animal parts used and consumption pattern and distribution of the species based on their use categories, rural income from NTFPs, temporal pattern of harvest and revenue generation from this sector in the state, potential nutritive value of selected wild edible, and community preference of species along with its natural status, structure, fruit yield, germination and growth. The study area largely comprised Western part of Arunachal Pradesh, particularly the West Kameng district, however, the temporal pattern of harvest and revenue generation was also presented for entire state. The NTFPs are of considerable value to the traditional societies. A SWOT analysis of NTFPs in the state of Arunachal Pradesh revealed that the sector has more strengths and opportunities than the weakness and threats, which may lead to sustainable development and livelihood upgradation of the local communities (Box 10.1). This chapter addresses some of these issues based on field data collection and discussion with various stakeholders. It also describes the present status of the NTFPs in the state, issues of concern for NTFPs’ management, and possible strategy for sustainable development of this sector.
Box 1. SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of NTFPs sector in Arunachal Pradesh state

<table>
<thead>
<tr>
<th>Strengths</th>
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<tbody>
<tr>
<td>1. High diversity of NTFPs and wide variety of products</td>
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<td>2. High IKS on resource use, management, availability and conservation</td>
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<td>3. Versatile resource base with wide ranging of domestic and industrial uses</td>
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<td>4. High local as well as commercial value.</td>
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<td>5. Substantial community incomes</td>
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<td>6. Edible and nutritionally rich plants</td>
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<td>7. Wide spread traditional uses and availability</td>
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<td>8. Easy availability in close proximity of communities</td>
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<table>
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<th>Weaknesses</th>
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<tr>
<td>1. Open access resources, no ownership, irregular collection procedures</td>
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<td>2. Production potential not known, lack of access to market, credit investment, infrastructure and technology</td>
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<td>3. No storage facilities, middleman, price fluctuation</td>
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<td>4. Lack of capacity for processing and value addition</td>
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<td>5. Cumbersome procedure for licenses and transit rules</td>
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<td>6. Lack of working plan on NTFPs management</td>
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<th>Opportunities</th>
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<td>1. Tremendous employment generation potential and Poverty alleviation</td>
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<td>2. Many species may yield substantial income</td>
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<td>3. High market in domestic as well as overseas</td>
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<tr>
<td>4. Capacity building of communities</td>
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<tr>
<td>5. Value addition and cultivation possibilities, Various alternative uses possible</td>
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<tr>
<td>6. Providing support price for wild collection and insurance if species is cultivated</td>
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<tr>
<td>7. Organising communities for NTFPs management, cooperative and partnership development</td>
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<tr>
<td>8. Generate awareness among technologists, funding and development agencies</td>
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<tr>
<td>9. Development of working plans, and initiation of Certification procedures for NTFPs</td>
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<tr>
<td>10. Biodiversity conservation and economic upliftment</td>
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<th>Threats</th>
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<tr>
<td>1. Risk of over exploitation</td>
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<td>2. Lack of realization of the potential NTFPs</td>
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<tr>
<td>3. Animal hunting</td>
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<td>4. Unsustainable harvesting</td>
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10.2 STATUS OF NTFPS USE AND RURAL INCOME

10.2.1 Diversity of NTFPs and products

Arunachal Pradesh comprised of a large variety of wild-growing plants that are used for food and other subsistence needs by the local communities. West Kameng district of Arunachal Pradesh is one such area that has been considered ecologically significant site for biodiversity. The communities close to forest possess tremendous knowledge about availability, collection period and use of a large variety of species. In this investigation a total of 343 plant and 55 animal species were identified, which are used by five ethnic communities (viz., Aka, Bugun, Miji, Monpa and Sherdrukpen). The plant species were used for food, medicine, beverages, fish-poisoning, dyes, oil, firewood, fodder and various other purposes. Use of NTFPs among different tribes varied from 45-67% of total screened species, which is very high.

A total of 163 plant species were used as medicinal plants, 16 species as construction material, 65 species as wild vegetables, 18 species of mushrooms, 18 woody species for fuel wood, and 22 species were preferred as fodder by the tribal communities. The main use of NTFPs of animal origin was in the form of honey, bush meat, musk pod, bile juice, hide and animal protein. The fresh bush meat was most preferred, and 24 species of mammals, 2 of frogs, and 15 species of birds were hunted for this purpose.

10.4.2 Indigenous knowledge system and conservation

The communities knowledge with relation to availability, collection season, and plant part used were vast. Each tribal group generally woven around forest, their majority of needs are met from diverse non-timber forest products (NTFPs) for which they possess rich traditional knowledge, such as knowledge of edible plants, herbal and animal medicine, skin and body treatment, natural insecticides and repellents, animal behaviour, climate and seasonal variability and soil, and forest management. Though the use of NTFPs was common among all age groups, it was more pronounced amongst upper age classes particularly for wild edible plants. The gender preference of NTFPs use for various purposes varied slightly among male and female groups.

10.4.3 Traditional uses of NTFPs and availability

The ethnic communities use diverse NTFPs, which varied with tribes. Monpa community consumes Prasiola crispa, an algae, as vegetable, which has high protein content. They also...
use *Gymnocladus assamicus* as detergent and *Aconitum* species as medicine against cattle diarrhea. Sherdukpens use *Ramalina himalayensis*, a lichen, as vegetable. In both the case people process at the local level and preserve for use throughout the year. Similarly, people of Aka, Miji and Bugun community consume pith starch of *Wallichia densiflora* as food, especially during scarcity. There are many medicinal plants, viz., *Abroma augusta*, *Acorus calamus*, *Aerides odorata*, and *Artemisia nilagirica* that were traditionally used by the communities.

Many of the species were easily available at the proximity of villages and frequently harvested, e.g., leafy vegetables from *Oenanthe javanica*, *Diplazium esculentum*, *Houttuynia cordata*, mushrooms such as *Laetiporus sulphureus*, *Auricularia auricular judae*, *Agaricus* species, wild fruits such as *Actinidia callosa*, *Ficus hirta*, *Fragaria* species and bamboo young shoot as vegetable.

### 10.4.4 Versatile resource base and commercial value

Other than the species used at household level, many of the recorded NTFPs were commercial NTFPs, viz., *Illicium griffithii*, *Picrorhiza kurrooa*, *Swertia chirayita*, *Rubia cordifolia* which had good resource base in the area. They were sold to earn cash income. *Usnea baileyi* (a lichen) is used for medicinal purpose, *Everniastrum nepalense* for pigmentation, and resin of *Pinus* species in diverse uses. Some of the these species are having high future potential, viz., *Gymnocladus assamicus*, *Prasiola crispa*, *Cordyceps sinensis* and *Ramalina himalayensis*. Of the total screened plants, 76 species (22% of all screened species) were also sold in local markets, which is a significant number. The NTFPs that yielded good income to rural people comprised barks of *Litsea sebifera* and *Cinnamomum* species, twine of *Calamus* species, and medicinal plants such as *Swertia chirayita*, *Valeriana jatamansi*, *Cordyceps sinensis*, *Picrorhiza kurrooa* and *Rubia cordifolia*. Other potential species were *Myrica esculenta*, *Persea* sp., *Illicium griffithii*, *Juniperus recurva*, *Juglans regia*, *Calamus tenues*, *Calamus leptospadix*, *Quercus lamellosa*, *Schizostachyum pergracile* and *Thysanolaena maxima*. *Auricularia auricula-judae*, *Pleurotus ostreatus*, *Laetiporus sulphureus*, fruits of *Cornus capitata*, *Juglans regia*, *Diospyros peregrine*, *Persea* spp., vegetables of *Spilanthes paniculata*, *Oenanthe javanica* and an algae *Prasiola crispa* were commonly collected to sell in the local markets. Weekly market surveys revealed that the volume of the product was minimum at Bomdila, and it increased to Bhalukpong and maximum at Itanagar which is state capital. This market also
fetched higher prices in comparison to other two markets which can be attributed to higher demand.

A total of 22 plant species were collected on commercial scale and mainly traded outside the state. Most of the local dwellers collect these wild resources from the forest areas and either directly sold them in the market or sell them to some other retailers.

**10.4.4.1 Household incomes from NTFPs**

Contribution of NTFPs to household income varies from 19-32%. Most of the collectors bring a limited quantity of NTFPs in local markets so that it could be sold in a day. All possible locations are visited in search of these species. The local state government charges a nominal royalty for collection of these plants, which mainly comprised the medicinal plants. *Taxus wallichiana* was an important species giving handsome amount to the villagers of Chongdor, Upper Dzong and Lower Dzong, in recent times however, it is banned for extraction. It was interesting to note that the communities practice shifting cultivation (i.e. Aka, Bugun and Miji) generate 25-32%, while those practice settled agriculture, generate only 19-20% of their household income from NTFPs. Generally, most of the species available for short period in view of their low-keeping quality, therefore, often sold in cheap prices.

**10.4.4.2 Market demands and processing**

Fortunately, due to market demands, farmers have started maintaining a few species in the community forests. Some of these species are *Illicium griffithii*, *Juglans regia*, *Litsea citrata*, *Cornus capitata*, *Euphorbia hirta*, *Persea robusta*, *Persea duthiei*, *Spondias axillaris* and *Zanthoxylum armatum*. The value addition to different NTFPs through semi-processing, and grading can improve the income to locals. It was recorded that even the nominal processing at local level gives fair profit to the stakeholders, e.g., the freshly sold bamboo shoots give very nominal profit in comparison to the fermented as well as dried bamboo shoots. Such value addition was based on local demands.

**10.4.5 Species prioritization for adoption**

A discussion with plant dwellers revealed that the regeneration of many species is hampered in view of large scale collection, which may threaten their population in near future. Sustainable marketing and conservation of non-timber forest products and their habitats requires identification of potential species, and analyze their stand density, regeneration,
phenology, productivity and harvest levels (i.e. fruit yield and collection) and harvest adjustment, if any, in the forest stand. There has been an increasing demand for the planting materials of various useful NTFPs species during recent years, viz., *Taxus wallichiana*, *Swertia chirayita* and *Illicium griffithii* etc. Such change in the attitudes of farmers may be properly harnessed for conservation of various NTFPs.

A two-tier strategy was used to prioritize the species, first at villages/single community level and thereafter between communities. Each village community identified a set of 5-6 species, thus a total twenty three species were identified by 10 surveyed villages. A supplementary survey of farmers’ preference for NTFPs by matching all prioritized species in the one another clearly prioritized the best preferred species, viz. *Illicium griffithii*. This species is preferred by the communities as it has high demand for its fruits. Moreover, it supplies regular income year after year. There was regular demand to adopt this species by the communities.

**10.4.6.1 Tree structure and fruit yield of *I. griffithii***

It is an evergreen tree of medium size that grows in temperate forest as mid canopy species. Three forest stands were sampled to assess its status, stand structure, fruit yield and phenology. All three forest stands fall in USF category that are under community control. It was interesting to note that besides *I. griffithii* the three forest stands comprised 62-67% tree species as NTFPs, thus highly beneficial to the community. *Illicium griffithii* contributed 17-61% of total stand density, 11-27% of total basal cover and 11-33% of total IVI in the three studied forest stands, which clearly showed the dominance of this species in the community forests. The fruit yield varied from 0.015-23.27 kg/tree for different tree girth sizes. The fruit yield for NTFPs varied significantly from year to year. The regeneration of most of the NTFPs species was poor due to intense biotic pressure on them. *Illicium griffithii*, however, showed good regeneration. To adopt this species in traditional agroforestry system, it was prerequisite to study its germination and growth behaviour so that the species could be cultivated at farmer’s fields.

**10.4.6.2 Seed germination and growth of *I. griffithii***

The seeds of *Illicium griffithii* germinated after 54 days of sowing and registered 27-72% at clos-canopy and open canopy conditions. Amendment in soil condition with leaf ash, forest soil and sand, improved the seed germination. The seedling growth was studied up to 24
months of age after germination as this is considered as the most vital developmental stage for establishment of juveniles.

10.4.7 Collection of NTFPs and customary rules

It was interesting to note that the communities have organized to collect the fruits of *I. griffithii* and a few other NTFPs, and it was governed as per a few customary laws, which may be considered as a highly equitable benefit sharing mechanism. Such attitude needs to be promoted and disseminated to other areas for wiser use and management of common pool resources. Besides *Illicium*, the fruits of *Persea* and *Litsea*, and the leaf litters of *Quercus* species were also collected under similar regulations. The forest around the villages was divided among different clans of a community. Local collectors were allowed to collect the fruits on the basis of a nominal royalty given to the clan head, which later on shared among all the households of that clan. Such income from NTFPs encouraged people to conserve the trees in their natural habitat. This practice, however, was limited to a few villages only.

10.4.8 Nutritive value of edible species

To meet the food requirement of growing population, selected edible NTFPs may provide alternate food source. Based on the nutrient analysis of 16 most preferred wild edible plants, it was found that these species contained good source of protein, carbohydrate, fat, vitamin and other minerals.

10.4.9 Temporal pattern of NTFPs harvest and revenue generation

The Forest Department earn significant amount of revenue by issuing permit for collection of these species from wild habitats. In Arunachal Pradesh, nearly 12-20 plants species have been traded annually for past 14 years (1993-94 to 2006-07). West Kameng district alone contributed >60% of these species thus showed that the district is an important habitat for NTFPs. Harvesting of cane (twine), *Pinus roxburghii* (resin), *Illicium griffithii* (fruits), and tree species used for firewood was most prevalent. Other than the species harvested for firewood, leaves of *Calamus* sp., *Imperata cylindrica* and *Livistona jenkinsiana* used within the state. Rest all species traded outside the state. The state has witnessed an increasing pressure on few selected NTFPs species, e.g., *Taxus wallichiana*, *Illicium griffithii*, *Cinnamomum* sp., *Litsea* sp., *Persea* sp., *Calamus* sp., and *Pinus roxburghii*. It was alarming to note that the temporal pattern of NTFPs harvested for commercial use has gone down in past 14 years, which could be attributed to high pressure on these resources. The revenue
generated through issuing licenses/ permits has also drastically reduced to one-fourth in 2006-07 than in 1994-95.

10.5 FOREST MANAGEMENT AND NTFPS IN STATE

Forests in India were nationalized in 1865 exempting the forests of North East Frontier area (Pant 1994). After independence, the Indian Government initiated the process of bringing the forest of Arunachal Pradesh under Government control by declaring Reserve Forests. However, till date most of the forests in the state falls under the category of Unclassed State Forests (USFs). Such forests do not have a clearly defined legal status and understood by the State and the local people to be under the control of community. Arunachal Pradesh is a semi-autonomous social field implying that it can generate rules and customs having a social sanction internally and at the same time is subjected to the rules, decisions, and forces emanating from an outside source (the central as well as the state statutory laws in this case) (Pant 1994). These forests harbor a large variety of timber and non-timber forest products. The tribal communities are intimately dependent on various NTFPs for their diverse needs. Though it is the communal mechanism that regulates the extraction and utilization of NTFPs in the USFs, it is the State Forest Department which has been issuing permits for felling and transporting timber from the USFs. This arrangement has led to several instances of dissatisfaction, tension and conflicts in the society. Disputes in USFs, in the past, were limited in number as strong conflict prevention mechanisms prevailed in the society. The traditional institutions played an important role within their jurisdiction in the prevention and resolution of all kinds of disputes especially relating to forestry. Due to increase of human population, depletion of forest cover, change in marketing systems, the collective management of natural resources is eroding fast along with disintegration of the traditional village institutions. Since the NTFPs on one hand form an important source of livelihood and income to all tribal families, they also generate significant revenue for the state government on the other, there is great potential for NTFPs to improve socio-economic potential of rural communities as well as generate substantial employment for the state.

10.6 ISSUES OF CONCERN FOR NTFPS’ MANAGEMENT

10.6.1 NTFPs gatherers

NTFPs are considered open excess resources in the state. The primary collectors, who were socio-economically poor and members of marginalized families of the society, had a clear understanding of the availability of NTFPs in natural stands. The collection procedure was
labour intensive and done with much hardship. Most of the primary collectors were subsistence farmers and they do not get much benefit from high prices of the NTFPs commodity/products. They sell their products to the middleman/traders, who own licenses for NTFPs. Often the farmers with upper socio-economic status of the society act as middleman/traders (primary traders), who further sell it to the traders based at towns. Often the primary collectors borrow cash from the middleman/traders during lean period and thus come under the obligation to sell the product to the later.

10.6.2 Collection procedures

When species were collected from wild habitats, yield per unit area is not given enough consideration rather collection quantum per unit labour was most important consideration as it is directly related to the income. Because of this, level of extraction is not given due importance by the plant dwellers, which often leads to overexploitation of many species. Fluctuation of price is also an important issue, e.g. fruits of *Illicium griffithii* sold between Rs. 20 to 150 per kg, at low prices communities have least interest to collect the fruits. Generally most demanding plants are seasonal in distribution, which make good option for a few months only. It also requires significant time as well as labour to collect such species, therefore maintaining such species at farm or private forest areas is supposed to be cost-effective.

10.6.3 Seasonal availability and production potential

Except for a few NTFPs that are available throughout the year (e.g. bamboo, cane, thatch plants, fuel wood), most of the other species are available for short periods, therefore harvested for limited periods only. Such NTFPs are produced in small volumes, dispersed over wide areas. Wild products can be very unreliable in the quantities, qualities and even locations of production due to the biology of the organism and micro-habitat conditions in forest stands. Such seasonality in availability is a major factor for commercialization of the NTFPs. The limited production time linked to unsustainable harvesting results in scarcity and limited access to NTFPs year after year explain why these resources, although commercialized, contribute minimal to the total household income.

10.6.4 Market access and middleman

There was a complete lack of information on the market prices of various NTFPs products, and their demands and supply status. Also, the quality/grading was not done for any
produce. The primary collectors have a contact with the village buyers (middleman) alone and they seldom bring their products to the town. Lack of knowledge about the market prices, low volume of the produce, and high transportation cost with market uncertainty restrict the primary collectors’ movement to the town. Although, most of the commercial NTFPs reach to a large and wide ranging markets, the primary collectors have very limited geographical access to sell their products. In most cases NTFP producers have no knowledge about the chain-of-custody (COC) of their produce. Also, they were unaware about the commercial use of high value species, the type of quality assurance required for the produce, the prices offered by buyer/ companies, and any value addition measure to their produce.

The income of the local people can be augmented by installation of semi-processing units for fruits, oil yielding NTFPs and others. Establishment of proper market channels and permitting villagers to collect NTFPs from forest areas can further help to improve rural incomes. A plan is to be drawn on level of current use and future potential of NTFPs for generating employment through product diversification and value addition. Such development of NTFPs sector desires immediate and long-term attention, which should be undertaken with caution and clarity.

10.6.5 License for trade of commercial species

The nationalized NTFPs require permits/ transit pass for supplying the species outside the state which they procure from Forest Department by paying a fix royalty for certain quantity of the produce. Often the procurement of such licenses is a cumbersome process. Therefore, only few resourceful persons get such licenses. The nationalization of the commercial NTFPs has tremendously reduced the number of legal buyers, it also limited free flow of the products, thus hamper the interest of the poor. Moreover, the status of the species in wild habitat have declined. This reveals that the NTFPs trade is operated on monopolistic conditions which lead to exploit primary collectors through cutting of the prices to be paid to them.

10.6.6 Lack of processing, value addition, storage, transport, and credit

Small-scale NTFP collectors were often at a disadvantage in marketing because they gather only small volumes and inconsistent quantity of NTFPs from remote forest areas. If their product is perishable they have the additional pressure of having to sell the product before it spoils. At present, no processing, value addition, and storage facilities were available for the NTFPs, except for bamboo and cane, for which some furniture and article making shops
were available. So far the primary collectors are not given and credit facilities to handle the bulk of NTFPs.

10.6.7 Cooperatives or community-private partnership

There was no cooperative of community-private partnership for the primary collectors in the state, which is otherwise crucial for the development of both, the resources as well as the people dependent on them. A long-lasting partnership between local stakeholder-private agencies-NGOs-government is highly desirable in the area. There is also a complete lack of research pertaining to corporate-community agreement, particularly in forestry sector, not only in state but in entire country.

10.6.8 Lack of working plans for NTFPs management

Despite of availability of diverse NTFPs product there was no definite working strategy or system in place within the state. The Forest Department does not mention these NTFPs in their forest working plan except for harvesting of a few species (e.g. pine-resin, bamboo and cane collection). The state generated some revenue through issuing permits, which was much less than the revenue from timber, making NTFPs an inferior choice than timber for the Forest Department. Also, any part of revenue was not spent to conserve and manage NTFP resource in their natural habitats. Selling of all NTFPs was done without any value addition. Also, no policy/ program was visible that promotes value addition of the NTFPs.

10.6.9 Acts and regulations

There have a large number of regulations that govern the trade of non-timber forest products, particularly those of medicinal plants if they are sole out of the state. The CITES, Indian Forest Act, Wildlife Act, Foreign Trade Act, Biological Diversity Act, etc., are implemented independently that creates confusion in the trade. Often the forest permits issued in one state do not work in other states, for which new permits are to be taken. Such irregularities be tackled for smooth trade of NTFPs. Many times the species that do not have any extinction threat are also cited in the list of banned plants because their group/family is named in such list.

10.7 SUSTAINABLE MANAGEMENT OF NTFPS

There is a high scope to develop NTFP sector in the state of Arunachal Pradesh considering its rich biological wealth, diverse forest types and cover, and huge community knowledge on these resources. All commercially viable NTFPs are partially nationalized in the state as they
can only be extracted by Arunachal Pradesh Forest Corporation Limited (APFCL) or sold to permit holders within the state. The APFCL auctioned such items, while the permit holders sold it to the NTFPs traders outside the state. Other than the scheduled species, the entire NTFPs trade was a state monopoly irrespective of the land where they come from. In Arunachal Pradesh 41 such items have been notified by the office of Principal Chief Conservator of Forest (PCCF). The present study estimated that the share of primary collection was much lower than the share of middlemen and permit holders. Unfortunately, there was no check on the quantity harvested, its impact on natural regeneration of species, and the prices paid to the primary collectors after the issuance of the permit. Such a system created the monopoly of the wealthy traders. The payment system to the primary collectors are not uniform because of lack of the transparency in collection system.

The primary collectors sell the products within villages and in local/ weekly markets, which ultimately limited the bargaining capacity of the primary collectors. In view of lack of any grading system all the NTFPs were categorized in medium to inferior quality. Such a system clearly shows a favour for traders rather than the primary collectors/ villagers. It was interesting to note that the selflife of the locally sold NTFPs was minimum. Therefore, they were sold in low prices. Contrarily, the self-life of commercially traded NTFPs was relatively longer which can withstand market fluctuations. However, need of immediate cash compel the villagers to sell them immediately after collection. Such NTFPs require simple and easily handled processing and packaging, which can increase return substantially.

10.7.1 Poverty alleviation

Proper management and harvesting of NTFPs may allow communities to benefit them from growing markets in domestic as well as international circuits. It may help to diversify rural incomes, raise income and allow high return and may create self-employment, thus can provide a continuous and income to rural communities. Through adoption of a few crops the farmers may also diversify their farming system and may also select better landuse options. An increased access to market may bring high advantage in comparison to other forms of trade. The wild edible species may also help communities to opt for new food crops during critical and lean period, thus help to alleviate the poverty.

10.7.2 Resource ownership and community empowerment

At present most of the NTFPs are either collected from community of government owned forests. The community owned forests are categorized as Unclassed State Forests (USF).
There are often conflicts on the resource ownership of the forested areas. The State government issues permit to collect selected NTFPs, which is partly a process to nationalize the NTFPs harvesting for commercially traded species. The NTFPs sector may not be promoted to desired level until the local communities are given resource ownership. If the communities are authorized to harvest and manage locally available NTFPs, such a process will foster local empowerment and institutional strengthening at local level. The community empowerment and institution building would act as an important tool to improve community capacity and confidence, long-term management of the resource at large. Also, improvement in services for value addition, negotiation and bargaining power of the community is strongly desirable.

Often the harvesting of NTFPs is done at individual level, except for *I. griffithii* and a few other plants in some villages, where communities have organized themselves to collectively harvest a few select species from community forests. The purpose of such community regulations is to stimulate collective practices to get equitable sharing of the benefit, which is a sensitive arrangement for management of common property resources. Such village-based organizations may be strengthened to negotiate fair prices and value addition of the products through building their capacities. Thus through community empowerment, there is every chance that the communities may improvise common property resources and land ownership.

**10.7.3 Development of village institutions**

As per recent Government legislation for tribal since December 1996 (in Scheduled V areas), the NTFPs will be owned by Gram sabhas/ Panchayats in place of the state Government. This law has been implemented. In most of the tribal states, however, the state Government or Forest Corporation or private parties are still involved in trade of NTPFs. A substantial part of selected NTFPs (viz., bamboo, cane) is directed to industry at low prices to maximize government-revenue. Arunachal Pradesh is not included in the group of Scheduled V States, however there is full scope to involve village councils/ Gram sabhas/ Village Panchayats for managing NTFPs since the USF areas are under community control. This reveals the need to transfer rights of ownership of NTFPs to village institutions. The State Government (Forest Department / Forest Corporation) should fix some optimum support prices to each NTFP produce. There should be a continuous technical, credit/ monetary and marketing support be extended to the communities. This process will help to
realize a strong sense of ownership and responsibility for forest among tribal communities (Saxena, 1999a).

10.7.4 Non-nationalized NTFPs

There are large number of factors that affect NTFPs trade and community benefit in the state of Arunachal Pradesh. A large variety of NTFPs are either used at household level or sold in local markets. Those of the later category were of local demands, however have low keeping qualities, therefore sold on cheap prices often at a disadvantage cost to primary collectors. The retailers in local markets get relatively higher benefit share than the primary collectors of the NTFPs. Most of these products are low volume-low profit products. A large variety of species were season in availability. However, for the species which have a continuity of production throughout the year in terms of availability as well as volume, the traders and processors can be confident that there will be an annual (or more frequent) supply and a demand for the commodity, so they can invest in storage and processing equipment and establish long-term market relationships. Thus the marketing aspects and so the commercialization of those NTFPs can be promoted.

10.7.5 Movement of NTFPs

As such there was no restriction on the movement of non-nationalized NTFPs. For commercial NTFPs there is uncertainty with relation to selling the products to the permit holders/ APFCL. Few other NTFPs that were not covered yet under Transit Pass system but had high market demands (e.g. Cordyceps sinensis, Lichens), they were exported out of the state with other Transit Pass regulated NTFPs. The outside movement of NTFPs is controlled through forest check posts at interstate borders. For free movement from one state to another, appropriate amendments need to be done in the acts so that the person procuring the plant material legally, should be allowed to export the material with due permission of authorities. The cultivated species should be delinked from such list, which should be done through proper certification.

10.7.6 Access to market, infrastructure and technology

There is a need to provide easy access to market and support some credits to the local communities that are dependent on NTFPs trade. Providing a network of working capital (i.e. rolling fund) to communities, so that they get immediate return of their produce, is desirable. The government generally provide such capital for various program at the
implementation phase only, it however, need to be continued till a proper system becomes operational. Further, there is a necessity to provide infrastructure and equipments to the local people so as to add value and increase self-life of the NTFPs. There is also need to continuously influence government to implement improvement measure in the NTFPs sector in the state. To improvise marketing system in the area, it may be more effective to focus on how to improve the bargaining power of producers without necessarily replacing the trader. This can be done through collective action in post-harvest storage and processing, and collective bargaining. It can also be helpful to organize improved market information and to help develop and disseminate information about quality (grading) standards.

The concept of NTFPs based enterprise desire high technical capacity building for govt. official, NGOs and community people so as to access suitable technologies, competencies, and creativity. Finally these activities should also increase access to social programs, commonly implemented by govt. or other partners. Till recently there is no such partnership between community and any private or government players. Developing traditional herbal cure system for outside world, value addition of bamboo & cane for making market oriented articles, and to wild edible plants for new products, would help local people to earn better livelihoods from the NTFPs. A better strategy may increase community access to market, financial gains and resource control. This would also improve the supply chain by more sustainably exploiting natural resources.

10.7.7 Capacity building

The inadequate or rather poor capacity of the communities is unable to empower them to take maximum benefit from NTFPs and control the enterprise based on these species. Therefore building community capacity for proper harvesting, processing the products, value addition, and quality control is very essential for long-term and sustainable management of the NTFPs in the state. At present no such program is in practice. To begin with, there is a need to thoroughly assess the potential of NTFPs sector for generating employment in the state. There is also need to create mass community awareness about the scope of NTFPs and the income it could generate to the local people. Capacity building also required to cultivate a few potential species in the farmers’ fields. The capacity building may also bring social harmony amongst the communities as it would provide better opportunities to all individuals within a community and it would also streamline the wide and diverse skills within a society.
10.7.8 Rationalizing natural resources use

A proper planning of NTFP trade may bring enough benefit to indigenous and forest dependent communities in harmony with their socio-cultural and traditional practices of natural resource use. It would provide better livelihood alternatives through income diversification; it may lead to increase the community rights on forests and thus promotes the practice of forest conservation. It may also help to strengthen the cultural identity of local communities by fostering collective work ad maintenance of traditional customs.

10.7.9 Value addition

Product quality is a key factor in accessing and maintaining position in high value markets (Alexiades and Shanley, 2004). A better access to market is the best possible tool to increase community benefits. Value addition is the best way to increase the share of community profit. It may bring high returns to the indigenous communities. In locations that are far from towns, where the production/ collection costs are high, it may not be possible to all the value addition at that place, however, simple grading and semi-processing may increase returns to local people. Such semi-processing can easily be done in case of medicinal plants.

Investment in value-added processing in the producing area could be highly remunerative. Facilities on post-harvest storage and processing can extend the economic life of the produce and allow for the collection of larger volumes at one time. In this way producers can gain considerable negotiation power with traders, and create efficiencies in the overall market. A value product may greatly reduce transport costs and lead to higher profits for producers. Simple grading of the produce as per the consumers choice may increase the profit share considerably. For example, the mushroom collectors in Mexico have been able to improve their incomes by grading their mushrooms into different qualities (Edouard et al., 2006). Similarly, the incense collectors in Bolivia sell their ungraded product to traders who reap the benefits of selling the product on in three different quality categories (Enriquez et al., 2006).
10.7.10 Cooperatives and partnership

Formation of cooperatives of NTFPs collectors has been very effective in many areas for getting better prices of the produce and resource management at forest stands. Till date there is no initiative to develop community-private-government partnership to develop this sector. Such partnerships may vary as public-private, corporate-civil society, and corporate-community agreements. A partnership is needed among the communities, NGOs and state government to effectively develop and sustainably manage NTFPs based planning and development. This partnership requires mutual trust with clearly defined roles and benefit sharing mechanisms. The community may help in identifying resources, assessing their status, collection and site management. The NGOs may help to diversify products through value addition and processing, develop local capacity for such value addition and forest management, quality control, production and management techniques. The government should help to devise and implement a regulatory framework along with setting up an institutional mechanism. It should modify cumbersome rules and regulations in NTFPs sector, make financial and credit to such enterprise, and extend market services. Such a lead from government side would help to develop NTFPs sector as a ‘green trade’ or ‘fair trade’.

10.7.11 Certification

Certification of NTFPs is a very recent concept which takes care of the product quality and its origin. Therefore, processing and grading considered as key factors of value addition and commercialization of NTFPs. Storage, processing and transport may be more or less complex depending on where the product is produced, the nature of the product, the degree of processing, and the consumer requirements. NTFPs include many fresh fruit for which perishability is a serious concern. These require careful storage and handling and rapid transport to market or some level of primary processing close to the point of origin.

10.8 NTFPS AND FOREST CONSERVATION

The harvesting of NTFPs has much better prospects as it may lower ecological impacts on forests than the commercial logging and land use change (Arnold and Perez 1998). The trade of NTFPs may bring direct and indirect benefits by providing income diversification and livelihood alternatives based on forest products that may encourage forest conservation by indigenous communities, it would also greatly increase the value of standing forests by realizing their economic value. Through use of NTFPs, the harmful uses of forests may be avoided, which also include short term gains. This would increase public awareness and
forest conservation. The harvesting of NTFPs, however, is to be realized by maintaining resource base and avoiding adverse ecological impacts. There is also a need to strengthen research on assessing impact of such harvesting on overall impact on forest composition and ecological services of any given stand.

10.9 FRAMEWORK FOR NTFPS SECTOR DEVELOPMENT

Based on the data collected in the western Arunachal Pradesh, the present study focused on the diversity of NTFPs, their distribution and utilization pattern, harvests and incomes at local and regional levels, quantum of export from the state and revenue generation, and SWOT analysis of NTFP sector in the state. The evaluation suggests that dependence on NTFPs can both provide substantial benefits to the communities and conserve the huge biodiversity of the state if planned properly and developed strategically. To streamline the development of NTFPs sector in the state, a broad framework is being provided that suggest for resource conservation as well as livelihood development (Fig. 10.1). The conservation of resource could be done in-situ condition in Reserve Forest (RF), Unclassed State Forests (USFs), and Anchal Reserve Forest (ARF) sites, and/or ex-situ condition by maintain them in nurseries, arboreta and gardens. Such conservation of resource will ensure ecological security of the resource. The livelihood and income generation from NTFPs may be done for all categories of species, those used at household level or traded within and outside the state. Cultivation, processing, formation of cooperative and partnership, and certification process would do much value addition to the existing resources, which will fetch high income and employment in the state. The planners and policy makers in the state should think to exploit NTFPs sector in a scientific and long-terms perspective. Value addition to produces and proper cultivation of selected species can bring high income to the people and the state. If properly planned and implemented, the NTFPs sector could be a high money spinner to the state than the timber sector. It is, therefore, high time to focus towards sustainable use and management of non-timber forest produces in the state of Arunachal Pradesh.