

# Potential and Opportunities of Non-Timber Forest Products for Rural Livelihood Generation in Nowshera Forest Division, Rajouri District

Rakesh Verma\*  
Range Forest Officer  
Sunderbani

Neelima Shah, IFS  
Divisional Forest Officer  
Nowshera

Corresponding author : Rakesh Verma, Range Forest Officer, Sunderbani,

**Abstract:-** The Non timber forest produce (NTFPs) are the source of livelihood for the forest fringe communities since centuries. It is evident that these NTFPs are associated with these communities in culturally, religiously and socioeconomic manner. Although these forest fringe communities have vast traditional knowledge of its collection, usage and processing but in spite of that NTFPs are marketed in raw unprocessed manner with meagre economic gain to these communities. Further deforestation, change in land use pattern, its depletion and exploitation has arises the concern for the NTFPs based livelihood. The proper Scientific knowledge of its collection time, its uses, processing and storage with some value addition has tremendous scope in increasing the market price of the NTFPs. Hence, this paper focus on the study of all the NTFPs found in the study area, its scientific knowledge of collection, uses and storage as well as the scope of its value addition to enhance its market value. This not only creates the sense and extent of livelihood opportunities to the forest fringe communities of the study area but it will also support the ecological conservation of the NTFPs in that area.

**Keywords:-** Livelihood Generation, Wild Forest Fruits, Wild Fruit Value Addition, NTFPs, Rural Household Economy, Processing, Marketing.

## I. INTRODUCTION

Forest provides variety of products; these products are broadly classified as timber and non timber products. Non – timber forest products (NTFPs) provide a wide range of products which include food, aromatic, medicinal, and fruit plant material. These NTFPs contribute a significant role in the livelihood of rural population especially those residing at fringes of the forest. Worldwide about one billion people worldwide derive food from forests, and around 300 million of these people depend extensively on NTFPs (Paumgarten, et.al. 2009). In many developing countries , as much as 25% of the rural people’s income can be derived from the harvesting processing and asle of natural resources and NTFPs contribute as much as 90% of rural household income ( Amici et. al., 2009, Lovric M et. al, 2020,

Sardeshpande et. al, 2019). Among the NTFP’s wild fruits are undoubtly very important for nutrition security and has high potential of value addition, which will further increase their demand in market. Wild fruits are considered to be organically produced due to which these fruits are in high demand. These fruits are now considered as an important item of commerce as they have gained enormous market potential. As in today’s scenario consumers are becoming conscious of the health and nutritional aspect and their tendency is to avoid chemicals and synthetic foods and increasing preference for nutrition through natural resources. These wild fruits could replace the chemical and synthetic food being organic and with medicinal properties.

The minor fruits like Pomegranate, Amla, Bel, Jamun, Karonda, Phalsa, Batangi, Ber, Shehtut, Timru, etc are the main sources of livelihood for the poor people and the local residing around forest and play an important role in overcoming the problem of malnutrition (Gajanana et al, 2010). Most of these are NTFPs are cheap and readily available with vibrant taste appeal. Their potential in nutritional medicinal, therapeutic and industrial values is well recognized and utilized by the indigenous communities(Rai et.al, 2005). Many of the minor fruit and other edible plant species are threatened and in the verge of extinction due to over extraction, deforestation, and pollution(Rai *et al.*, 2000). The deterioration of environmental factors and extinction of biodiversity thus warrants sustainable conservation and documentation of indigenous knowledge base. Efforts are required to preserve and document the indigenous knowledge base of local and indigenous communities and its subsequent sustainable utilization. Today almost all modern human food is based on a limited number of crops. Since food and phyto-resources are shrinking globally with the hike in population, it is need of the hour to find new alternatives. Thus these minor indigenous or wild edible fruit species can aid in crop improvement, ecological and food security. Although these species continue to be maintained by cultural preferences and traditional practices but they still remain inadequately characterized and neglected by research and conservation. Lack of attention indicates that their potential value is under-estimated and under-exploited. It also places them in danger of continued genetic erosion and disappearance. This

would further restrict development options for poor. Therefore, exploration of these plants with their ethno-biological values is important for knowing and evaluating their economic potential. (S.K. Mahato and Binoy Chhetri, 2015). Variety of wild edible fruits processes medicinal properties that are effective in treating many common ailments. The NTFPs can also be used for a wide variety of other end products like cosmetics, handicrafts, extraction of fiber, preparation of pickles, jams, jellies, candies, few can also be used as fresh vegetable, chutney and fuel wood. Post-harvest losses of fruits are more serious in developing countries than those in well developed countries. The total losses from harvest to the consumer point are as high as 30-40%, which is worth thousands of crore rupees. Fruit processing and value addition is necessary where it ensures fair returns to the growers to improve their economic condition. Food processing has an important role in the conservation and better utilization of fruits in order to avoid the glut and utilize the surplus during the off-season. It is necessary to employ modern methods to extend storage life for better distribution and also processing techniques to preserve them for utilization in the offseason in both large and small scale (Jena *et al.*, 2013). A value chain perspective is used to identify various routes by which the value of food exports can be increased.(M.Viswanath, et. al, 2018).

**II. METHODS AND MATERIAL**

The papers focus mainly on the availability of NTFP’s in the study area, its collection consumption, storage, trade etc. Further their scope of processing and value addition. The knowledge of collection, storage, processing and value addition of NTFP’s can unfurls the area of livelihood generation of local people and developing a sense of entrepreneurship in them.

➤ *Study area*

The present study was conducted in Nowshera Forest Division of Rajouri District of Jammu and Kashmir Union Territory during September 2022 to January 2023. The study area lies between 33.366784 and 32.936094 to 73.998561 and 74.676321. The territorial jurisdiction of Nowshera Forest Division is managed by three Territorial Ranges viz: Nowshera Forest Range, Lamberi Forest Range and Sunderbani Forest Range. Nowshera is a mountainous region comprising of Lower or Shivalik Chir Pine Forest, Northern Dry mix deciduous forest, Himalayan Sub tropical Scrub, Dry Deciduous Scrub, Upper or Himalayan Chir Pine Forest and Khair Sissu Forest. Chir Pine , Sissoo, and Banj Oak are the characteristic vegetation of the study area. The mean sea level elevation of the study area ranges from 291 to 2120 mtr . The study area encompasses mountains, pasture lands, rivers, springs and number of bowlies. The mean annual temperature of the study area ranges between 15 degree Celsius to 44 degree Celsius with mean annual rainfall of 951 mm. Pool frost is one of the characteristic feature of Sunderbani Forest during the winter months, where valley areas of Nowshera, Lamberi, Seot receives frost from mid December to mid January.

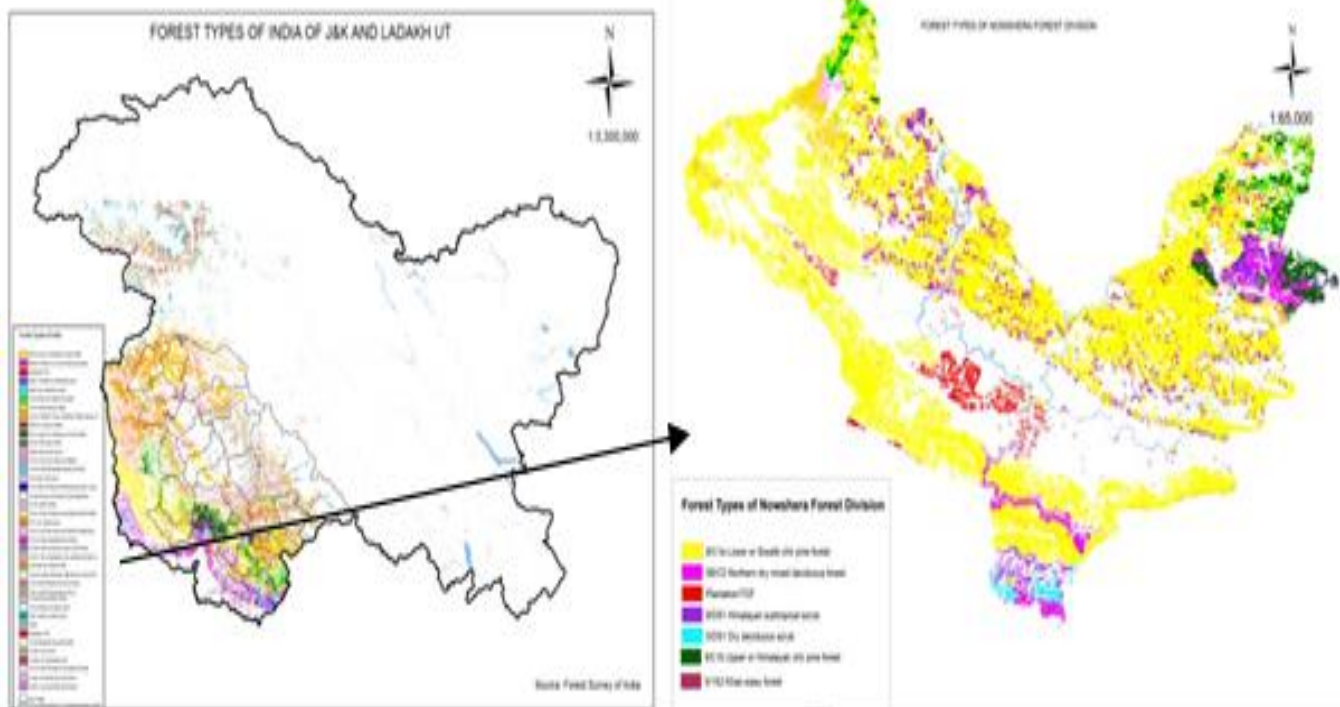


Fig 1 Map of Jammu and Kashmir Showing the Territorial Jurisdiction of Nowshera Forest Division (Study Area)

### ➤ Data Collection

Primary and secondary data were used for this study. Primary data were collected through interviews and informal discussions, household surveys, and focus groups, while secondary data were collected from the published literature. In total, we reviewed more than 300 articles published in international and national journals, books, and reports focused on Indian Forests. Articles were retrieved mainly from scientific databases, including Scopus, CAB Abstracts, the UN Food and Agriculture Organization (FAO), and Web of Science (WoS). We also used Internet search engines such as Google Scholar. Keywords included “non-wood forest products (NWFPs)”, “non-timber forest products (NTFPs)”, and “NWFPs collection”. Findings from secondary sources support the descriptions of the situation with NTFPs in J&K specifically focused on Nowshera Forest Division. Based on the results of the secondary sources, we collected socioeconomic data during the field study on two aspects: number of NTFPs present in the study area and NTFPs used by the people living in the fringes of the forests.

There are 93 villages with a total of 30165 households living in the territory of the study area, with a total population of 136293 inhabitants living in this area. The main economic activities consist of farming, honeybee production, and livestock production. Among these villages, we did rapid rural appraisals (RRA) to identify the villages and households involved in collecting NTFPs. To examine the importance of all NTFPs within the study region, we administered a survey to 694 households that identified as collecting NTFPs. The number of households surveyed was estimated following the Cochran's formula (Soltani et. al, 2012), as reported in numerous studies (e.g., Cochran (2007) and Singh and Masuku (2013)). This technique allows one to draw inferences or generalize about the population from the sample data. The sample size by the Cochran's formula was estimated using a margin of error of 10 percent. Cochran's sample size formula for categorical data for an alpha level a priori at 0.1 (error of 10%) with a community size of 30165 households was 694 households as the sample size, where  $n$  is the sample size,  $t$  is the value for the selected alpha level, e.g., 1.96 for (0.25 in each tail) a 95 percent confidence level.  $p$  is the estimated proportion of an attribute that is present in the population.  $q$  is  $1-p$ .  $(p)(q)$  is the estimate of variance.  $d$  is the acceptable margin of error for the proportion being estimated or the confidence interval in decimals. Respondents were asked about the role of NTFPs in the household economy, amounts collected, consumed, processed, and sold in order to allow for an estimate of the contribution of NTFPs to total household incomes. The contribution of NTFPs to total household income including sales and consumption (i.e., relative NTFP income) was assessed as the household dependency on

NTFPs (Vacik, et.al, 2020). Other sources of household income included in the survey were animal husbandry, farming, beekeeping, and off-farm employment. Questions related to household income and cost of activities were included to allow us to estimate the contributions of other income sources for each activity during past production periods. To estimate income and cost, we asked questions about inputs (labour, fodder, fertilizer, and seed,) and outputs (harvest, raw and processed selling, and self-consumption amount of diverse products). Finally, we estimated the annual household incomes from different sources of livelihood. Based on total annual NTFPs collection by the household and the market price of each product, the income of each product was calculated and then summed to provide an estimated total income from NTFPs. The market prices of different species were collected through interviews with 236 local collectors of NWFPs, which was a sub-sample of the household interviews, and through direct observation at local markets (Cia, M, et.al, 2011). When market prices were not available, a cost-based methodology was used. The fruit price was calculated by dividing daily wages given to the collectors with per capita quantum harvested per day.

### III. RESULTS

The study results are described in two sections. First section focus on NTFPs including forest fruits, collections, storage, consumption, trade etc. the other section focus on processing and value addition of NTFPs of the study area. Based on RRA exercise conducted in the study area, local people has a high dependency on three species collected in some parts of study area due to economic and medicinal values. These species are Amla, Tarar and Anardana.

#### A. Forest Fruits

Forest fruits were the main products collected, consumed and traded in the study area. Our findings identified the fruits from 41 species including trees and shrubs that were harvested (Table 1). Out of 40 species observed, 18 are trees, 5 herbs, 10 shrubs, 3 grasses, 2 climbers, 1 fungus and 2 bee species. Of these species, Tarar, Daruni, Amla, Phalsa, Broom Grass, Aakhra were the main harvested species in terms of their economic benefits for local households. According to our surveys, local households typically collected fruits between July and November to January. *Punica granatum* as collected by 48% of households, while 36% of households collected *Dioscoria beleyphylla* and 16% collected broom grass. According to our surveys, the average share of forest-harvested fruit to household income in the region was 21%. Animal husbandry (39%), farming (20%), and other sources (20%) were the other main sources of household income.

Table 1 Showing NTFPS Collected and Processed in the Jurisdiction of Nowshera Forest Division

S.no	Common name	Botanical name	Species type	Collection period	Uses
1	Aakhre	Rubus ellipticus	Shrub	May-June	Ripe fruit eaten raw, sold on roadside
2	Amla	Phyllanthus emblica	Tree	Dec-Jan	Fruit used as pickle, jam, jelly
3	Anjeer	Ficus carica	Tree	Nov-Dec	Ripe fruit eaten by locals
4	Arjun	Terminalia arjuna	Tree	Nov-Dec	Bark used for heart ailments
5	Bach	Acorus calamus	Herb	Dec-Jan	Abundantly available, not used by locals due to lack of knowhow.
6	Balungar/Malwaar	Bauhinia vahlii	Climber	Sep-Oct	Leaf used for the preparation of Doona –Pattal
7	Ringaal	Arundinaria falcate	Grass	Sep-Oct	Not used , due to lack of knowledge
8	Bana	Vitex negundo	Shrub	Jan-Oct	Decoction of leaf used to cure fever
9	Banafsha	Viola Odorata	Herb	March-May	Not collected to due scarce availability
10	Barenkad	Justicia adhatoda	Shrub	Jan-Oct	Flower used to cure cough
11	Batangi	Pyrus pashia	Tree	June-July	Fruit eaten raw
12	Bel	Aegle marmelos	Tree	Jan-Feb	Not used , due to lack of knowledge
13	Bheda	Terminalia bellirica	Tree	Jan-Feb	Seed sold in local market @Rs.5.00 to 7.00 per kg
14	Broom grass	Themeda anathera	Grass	Oct-Jan	Brooms prepared and traded in local market
15	Chirangali	Caralluma tuberosa	Herb	Nov-Jan	Pickle prepared
16	Daruni	Punica granatum	Shrub	March-April	Very few farmers collect the ripe seed and trade as anardana
17	Garna	Carissa carandas	Shrub	Dec-Jan	Eaten locally
18	Guchi	Morchella esculenta	Fungus	Nov-Dec	Traded in local market
19	Harar	Terminalia chebula	Tree	Dec-Jan	Traded in local market
20	Honey	Apis dorsata	Bee	June-August	Traded in local market
21	Honey	Apis cerana indica	Bee	June-Aug	Traded in local market
22	Insulin plant	Chamaecostus cuspidatus	Shrub	Nov-Jan	Not known to locals
23	Jamun	Syzygium cumini	Tree	July-Aug	Eaten by locals
24	Kachnar	Bauhinia variegata	Tree	June-July	Flowers eaten as vegetable
25	Kakar singhi	Pistacia Integerrima	Tree	Dec-Jan	Fruit traded in local market
26	Kamila	Mallotus philippensis	Tree	Dec-Jan	Decoction of fruit is used to cure stomach ailments
27	Kasrod	Diplazium esculentum	Herb	Oct-Jan	Fresh herb is sold in local market which used as vegetable.
28	Khajoor	Phoenix dactylifera	Tree	June-July	Eaten raw by locals, leaf are used to prepare brooms which are used in local market @ Rs. 30.00 to 35.00 per broom
29	Kie	Saccharum spontaneum	Grass	Oct-Dec	Collected as fodder, also used for the preparation of whitewash brush traded in local market @Rs. 20.00 per brush locally known as Kuchii
30	Koar gandal	Aloe vera	Herb	Dec-Jan	Not traded due to non availability of market
31	Lasoor	Cordia mexa	Tree	July-Aug	Very few trees are observed, fruit used in pickle
32	Maida Sak	Litsea chinensis	Tree	Dec-Feb	Bark used in joint treatment
33	Phalsa	Grewia asiatica	Tree	July-Aug	Eaten raw, could be used as fresh juice during summer
34	Rambans	Agave Americana	Shrub	Dec-Jan	Not used due to cheap availability of other products in market
35	Rasount	Berberis lyceum	Shrub	Dec-Jan	Roots are used to cure diabetes
36	Retha	Sapindus mukorossi	Tree	May-June	Traded in local market , but market is not on high demand
37	Sains poud	Asparagus officinalis	Shrub	Dec-Jan	Nomads use its roots as fodder to mulching animals to increase the

					quality and quantity of milk
38	Sentha	Dodonaea viscosa	Shrub	July-Aug	Used as brush wood fencing, brooms.
39	Shehtut	Morus alba	Tree	June-July	Eaten raw
40	Tarar	Dioscorea belophylla	Climber	Nov-Jan	Tubers eaten as vegetable, pickle, prantha
41	Timru	Zanthoxylum armatum	Tree	Dec-Jan	Fruit used in chutney

#### ➤ Species Utilised for Economic Benefits

##### • Broom Grass

*Themeda anathera*, a species of hardy grass which grows naturally in the Chir Pine forests, this species is one of the causes of forest fires. It becomes dry during the winter months. Locals use to cut it during the winter months and sell it in the nearby markets in the form of brooms. Its broom is considered as pure broom. Our study observed that on an average 250 to 300 brooms per day are sold on highway markets @ Rs. 25.00 per broom. It catches business from October to January every year. Few vendors store it for delayed marketing and sell it @ Rs. 30.00 to 35.00 per broom during rest of the year. The total revenue generated by this single activity is around **Rs. 750000.00 to 900000.00** per year.

##### • Anardana

*Punica granatum* wild species which yields Anardana, it is a high demanding forest produce. Its average market rate varies from Rs.80.00 to Rs. 100.00 per kg in local market. Our study reveals that its production is significantly reduced due to borer attack. Due to these seed borer, fruit gets infected by fungus which deteriorates its quality. Now very few are engaged in its collection and marketing. On an average about 15 Qtl Anardana is collected and traded in the study area. It generates revenue of **Rs. 150000.00** which is very low as compared with the previous data of revenue generation.

##### • Tarar

*Dioscoria belophylla*, a species of Dioscoraceae which is known for its tubers. The tubers are dug out during winters. Fresh tubers and its pickle are also sold in market. Its average rate varies from Rs. 150.00 to Rs.180.00 per kg. It is observed during the study that about 500 kgs to 700 kgs tubers are sold per day from the study area, which generates revenue to the tune of **Rs. 6,75,000.00** per year. Its pickle fetches an average rate of Rs. 300.00 per kg.

##### • Fodder collection

*Themeda arathera*, *Cenchrus ciliaris*, *Eulaliopsis binata*, *Saccharum spontaneum*, *Setaria shacelata*, *Heteropogan contortus* are the grass species usually collected by the villagers during winter months. Every household collects 50 to 60 headload of grass from the nearby forest. The grass is stored as fodder for cattle. Its value is not assessed, our study reveals that at an average one household collects the grass to the tune of Rs. 12500.00. Total grass collected in the study area comes to the tune of 301350 head loads which is worth **Rs. 7,53,37500.00** by 6027 families who depend entirely on agriculture farming.

#### B. Processing and Trade of NTFPS

Value addition to NTFPs through semi-processing, drying, and grading can increase local people's income substantially. The fruits/tubers of Amla, Pomegranate and Tarar were sold fresh in the local markets at lower prices. Several other researchers have stated the importance of processing in value addition (Alinjanpour et.al, 2020). However, as noted by other scholars, processing activities are not always profitable. NTFP processing profitability is highly dependent on the relative levels of the different costs involved, labour, and use of specialized technology (Coulibaly-Lingani et.al, 2009). Most of the fruits and other plant parts studied in this project received limited processing. With regard to NTFP diversity, the motivation of local people can be increased by the installation of local processing facilities as small scale factories for NTFPs, especially for fruits and involving self help groups. Processing activities are reported to be profitable and recommended for species such as Amla, Chirangali, Anardana and Tarar. Generating income from the NTFPs trade alone does not necessarily lead to rural development, but the creation of small-scale processing industries and cooperatives, focusing on species of high abundance, and increasing market information and connections to markets would make a positive impact on poverty alleviation at the rural household level. These SHGs can create a value chain right from production, processing to the market link.

## IV. DISCUSSION

#### ➤ Potential of NTFPS in Rural Livelihood Generation

More than 100 trees and shrubs species with the potential of providing NTFPs have been documented in the J&K, but according to our findings, just a few species were harvested and traded by local people. Although policymakers and researchers mention these products as a main source of income to empower local people. Our research provides an estimate of the amount that NTFPs contribute to rural household incomes within the study area. The average share of NTFPs to total household incomes was about 27% in this region with 73% of household income being derived from other sources. This result is consistent with research that has been conducted in other regions of the world (Soltani, A et.al., 2011) Keyvan Behjou and Ghanbari (2017) estimated that the share of hazelnut income to total household income was 20 percent (total household income was about 950 million IRR in 2014). Khosravi et al. (2017) estimated the dependency of local people on NTFPs between 10% and 21% among different income groups in the Zagros forests of Iran, suggesting that the household annual net income was approximately 189 million IRR in 2013. In some villages, the time frame for NTFP collection did not coincide with the period of farming activities, and

this may have increased the share of NTFP income to total household income. In other areas, NTFP collection coincided with the period of farming activities and fodder harvesting. In these cases we found that employment in other activities substantially reduced the importance of NTFPs in total household income. There is a marked growing demand across world for foods which are in some sense 'authentic'—meaning they are 'natural', 'healthy', or 'pure'. This is most often expressed as a demand for organic or local produce. Wild fruits are an important sector within these markets and have experienced sustained growth over the past decades (Wolfslehner, B et.al. 2019). Other researchers have also noted that the international trade of wild and cultivated forest products is increasing, both as a consequence of trade within Europe and as a consequence of increased imports from non-European countries, reflecting a general increase in global interest (Greene, S.M. et.al. 2000). This growing international interest can provide a new marketing opportunity for the export of NTFPs to these countries. Other scholars have also found that access to market and new marketing opportunities influence the trading of NTFPs. As a result, fruit-providing species may be prone to overexploitation in the future (Vicik ,H, et.al, 2020).

#### ➤ Value Addition Activities in Nowshera Forest Division.

Variety of wild fruits are already present in the forest. By their sustainable collection and some value addition, can be source of livelihood income for the forest fringe communities. Nowshera Forest Division has worked on the similar path and conducted 03 trainings on "Value addition of wild fruits and its processing" specifically for the local people residing around the forest areas. The training includes the making of achar/pickle, jam, jelly, candy, chutney from the Amla, Wild Yam, Timru, Chirangali, Harar, Garna, Anardana etc. In the training about 60 participants took part in the 05 days training programme. In the training, the participants were given the insights of processing and enhancing the shelf life of the product, Labelling and packaging of the product and also about the various market opportunities of the product. Trainers from Food Craft wing of Horticulture department were called to impart the above training to the villagers. Various Government schemes were also discussed among the villagers in which they can get subsidy for starting up these types of value addition activities. To motivate the villagers 05 glass jars (02 lit capacity) were distributed to each participants for this activity.

#### • In-Situ Conservation

*Viola odorata* is a species of flowering plant in the genus *Viola* commonly found in Nowshera Forest Division. This small hardy herbaceous perennial is commonly known as wood violet or sweet violet. In herbal medicine, *V. odorata* has been used for a variety of respiratory ailments, insomnia and skin disorders. In the last few years due to grazing pressure and population pressure, there is sharp decline in the population of the *Voila odorata* in Nowshera Forest Division. In order to conserve the plant species, a experimental trail for in-situ conservation of *Voila odorata* has been set up in the Nowshera Forest Division.

These units will help in the conservation of this plant species of medicinal importance and also it is in high demand. An area of 1.5 hact. has been fenced for then in-situ conservation.

#### • Ex-Situ Conservation

The species *Elaeocarpus sphaericus* (Rudraksha) is a religious and medicinally important threatened tree of India and very much adoptable in the ecosystem of study area. Other species namely *Terminalia chebula* locally known as Raj Harar having high medicinal importance also been found in the study area. Both the plant species are in the declining stage in the study area. In order to conserve the species of religious and ritual importance two Nakshtra vatika and two Navgraha vatika has been established in the Nowshera Forest Division.

## V. CONCLUSION

The study found the varieties of NTFPs available in the study area, but their way of extraction is unsustainable most of the species are having very short shelf life. These species, if timely harvested/collected could lead to the generation of livelihood of the villagers living near the forest area. Preference on few species may be beneficial for short-term but NTFPs are important for biodiversity conservation and long term benefit. Economic valuation and importance of the species can be useful to take special attention for conservation and sustainable harvesting. Sustainable way of harvesting NTFPs and development should be taken care which can alleviate poverty of the rural people. Value addition efforts should be done so that NTFPs could fetch a reasonable market.

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