

Non-Timber Forest Products (NTFPs) and Livelihood Security: An Economic Study of High Hill Temperate Zone Households of Himachal Pradesh

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ABSTRACT

Non Timber Forest Products (NTFP) can fulfill important community needs and improve rural livelihood in Parvati Forest Division of Kullu circle. There is a growing understanding about NTFPs but its importance has not been fully introduced within government frameworks and rural development policies and programs. The average family size of examined area comprised of 6 persons, out of whom 53 percent were males and rest were females. Literacy situation revealed that nearly 83.48 percent family members were literate at overall level with a literacy index of 1.84, indicating poor quality of education in the study area. About 48.48 percent of the total land holding was cultivated area with cropping intensity 172 percent. NTFPs' contributed about 24.99 percent to the total farm income. Moreover, inclusion of NTFPs' income in the farm income resulted in reducing the income inequalities as Gini coefficient with NTFPs income from 0.20 to 0.18. NTFPs collection generated on an average 72 days of employment to sampled households. Literacy index and land holding were found affecting NTFPs dependency negatively i.e., with the increase in the land holding size and literacy index, NTFPs dependency is going to decrease whereas, age of the household head was found positively related to the NTFPs dependency, since they had more knowledge about NTFPs uses and their method of extraction.

Highlights

- Non Timber Forest Products (NTFPs) helps to contribute around 25% in the income of rural farmers and NTFPs collection generated on an average 72 days of employment.

Keywords: NTFP, literacy, livelihood, land holdings, income, dependency

Non-timber forest products (NTFPs) are any product or service other than timber that is produced in forests. Non-timber forest products (NTFPs) are non-wood, minor, alternative and secondary forest products, useful substances /materials and/ or commodities obtained from forests which do not require harvesting (logging) trees. The United Nations Food and Agriculture Organization (FAO) define non-timber forest products as: "products of biological origin other than wood derived from forests, other wooded land and trees outside forests. They may be gathered from the wild, or produced in forest plantation and from trees outside forests." NTFPs embody all biological matter of wild plants and animals other than timber extracted from

forests and woodlands, e.g. fruits, nuts, vegetable, medicinal plants, resins, bark, fibres, palms, grasses as well as small wood products and firewood, amongst others.

There is growing evidence that non-timber-forest-products (NTFPs) contribute significantly to maintain livelihoods in rural area (Sarmah and Arunachalam). Livelihood refers to the "means of securing the basic necessities -food, water, shelter and clothing for life". Thus, livelihood is a set of activities, involving securing water, food, fodder, medicine, shelter, clothing and the capacity to acquire above necessities working either individually or as a group by using endowments (both human

and material) for meeting the requirements of the self and his/her household on a sustainable basis with dignity. NTFPs help to fulfill households' subsistence and consumption needs in terms of energy and nutrition as well as medical and construction purposes (Ajaz-ul-Islam *et al.*).

In India over 50 million people are dependent on NTFPs for their subsistence and cash income (Hegde *et al.* 1996). This provides 50 per cent of household income for 20 to 30 per cent of rural population particularly for tribals. Potentially around 3000 species of forest products are found to be useful, but only 126 have developed marketability (Maithani 1994). Around 50 per cent of forest revenues and 70 per cent of forest based export income of the country comes from NTFPs. Thus, it can be depicted that NTFPs form one of the mainstays of income and sustenance for many tribal communities (Gauraha, 1992; Chopra, 1993; Mallik, 2000). An estimated 80 per cent of the population of the developing world uses Non-Wood Forest Products (NWFP) to meet some of their health and nutritional needs (FAO, 2008). It is an important source of income for the poor in many developing countries. In addition, several opportunities for improved rural development are linked to NTFPs (Adepoju, 2007).

Throughout the tropics hundreds of millions of people derive a significant part of their livelihood from a vast range of non-timber forest products that they harvest from forest (Bhavannarayana *et al.*). Although NTFP use by rural households is widespread, the extent of use, the quantities used and the value derived vary spatially and temporally. Understanding the significance of NTFPs in rural livelihoods is key for any development policy to respond to the needs of local people. The potential economic value of NTFPs either in terms of utilization or their market value is often underestimated or unknown. The challenge is therefore, to assess and quantify the value of these products and to transform the use of many of them as are socially and ecologically viable for subsistence and development (Sharif *et al.*). Hence, there is need to establish site-specific NTFP- livelihood linkages and to investigate the problems and potential of using NTFPs to sustain and improve livelihoods, and on this basis to conceptualize initiatives for supporting sustainability and higher incomes for local people in the long term. Therefore, the

study was undertaken with the following specific objectives:

1. To estimate the contribution of NTFPs to household income and employment.
2. To study the socio economic factors affecting the dependency of rural household on NTFPs.

MATERIALS AND METHODS

Present study was conducted in the High Hill Temperate Wet Zone of Himachal Pradesh. Parvati forest division of Kullu circle was selected purposively. This forest division has four ranges out of which Hurla and Kasol ranges were selected. Two blocks each i.e., Garsa and Thela from Hurla range and Pulga and Tosh from Kasol range were selected. Further from the selected blocks one village each i.e., Garsa, Thela, Pulga and Barsheni were selected respectively. Fifteen households were selected from the each village.

A Simple random sampling design was used for the selection of the respondents. A sample of 60 household was taken from Parvati Forest Division of Kullu Circle of Himachal Pradesh.

Sources of data

Primary as well as Secondary data were collected for the study. The primary data were collected with the aid of structured and comprehensive schedule exclusively prepared for the study. The data collected included information on NTFPs collected and their quantities, together with demographic information of the collectors. The data were collected through a personal interview method from the selected households and traders in the study area during the year 2014-15.

Secondary data were collected from the records of the Forest Department from Kullu Circle for a period of ten years (2004-05 to 2013-14). The secondary data on quantity supplied, prices and export permit fee levied by the forest department on medicinal plants were selected.

Selection of NTFP collectors

The households of study area are geographically scattered thus, data collection was done from households who were conveniently available to participate in study.

Analytical framework

To fulfill the specific objectives of the study and based on the nature and extent of availability of data, analytical tools and techniques have been employed for the analysis of the data. Simple tabular analysis was used to examine socio-economic status, their resource structure, income pattern and opinions about the collection and marketing problems of NTFPs. Tabular presentation was adopted to compile the general characteristics of the sampled farmers. Simple statistical tools like averages and percentages were used to compare, contrast and interpret the results. The sex ratio, literacy rate and index were calculated.

To estimate the contribution of NTFPs to household income and employment

The objective is aimed to study scenario of NTFPs in the area. Share of NTFPs income in the total income and employment pattern was analyzed. Contribution of NTFPs collection in employment generation and pattern was studied. Gini concentration ratio helped to study the role of NTFPs in household income inequality. Gini concentration ratio is calculated by the formula:

$$G = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu} \times \sum_{i=1}^n P_{ixi}$$

Where;

G = Gini coefficient

μ = Population's mean income

P_i = Income rank P of person i with income X

N = Rank of person with lowest income

To study the socio economic factors affecting the dependency of rural household on NTFPs

The objective is aimed to which socio-economic variable influences NTFPs dependency. Linear regression model was used to measure as the share of income from NTFPs in the total household income. In order to test which socio-economic variables influence NTFPs dependency, linear regression analysis was carried by the formula

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + \mu$$

Where;

Y = Share of NTFPs in total household income

x_1 = Farm size

x_2 = Family size

x_3 = Literacy index of the household

x_4 = Farm income

x_5 = Age of household

RESULTS AND DISCUSSION

Socio-economic characteristics of sampled households

To have a comprehensive profile of the farm households, a demographic base becomes more relevant. The social characteristics such as family size, age, work force and sex composition of farm households, dependency ratio and literacy affect the economic conditions and in turn affect social conditions. The significance of the social and demographic variables is discussed below. First, the farmers are classified in to two categories (marginal and small) on the basis of land holding.

Size and structure of family

The size and structure, work force and literacy status among the sampled households are the important factors influencing the collection of NTFPs in this area (Parvati forest division, Kullu), which happens to be family labour based occupation at the village level.

Table 1: Educational status of sampled households in the study area

Particulars	Farm Size		
	Marginal	Small	Overall
Illiterate	0.71 (13.10)	0.63 (10.84)	0.68 (12.23)
Primary	1.34 (24.72)	1.5 (25.82)	1.4 (25.17)
Middle	1.5 (27.70)	1.54 (26.51)	1.57 (27.15)
Secondary	1.15 (21.22)	1.4 (24.10)	1.25 (22.48)
High secondary	0.21 (3.88)	0.22 (3.80)	0.21 (3.77)
Non-school going	0.5 (9.23)	0.5 (8.60)	0.5 (8.99)
Total	5.42 (100.00)	5.81 (100.00)	5.56 (100.00)

Figures in parentheses indicate percentage to total.

The perusal shows that at overall level the average family size was 6 members per household, 5 members per household in case of marginal farmers and 6 members per household in small farmers.

Family size did not vary significantly across farm size and between regions. Likewise, the average age of household heads was above 40 years and did not vary significantly across regions. Almost all the households in the sample were male-headed. In the study area the percentage of males was 53 percent and females were 47 percent. The number of females per thousand of males ranged between 839 in case of marginal farm category to 939 in small farms with an average of 889 at the overall level. Number of nuclear families was higher 40 than the joint families 20.

Literacy status

The overall literacy rate varied from 82.35 percent to 84.61 percent in marginal and small farm categories respectively. Male literacy rate was higher (85.91 percent) as compare to the female literacy rate (80.77 percent). The table 2 showed a marked improvement in the literacy rate. However, literacy index varied from 1.80 to 1.88 among the different categories of the farms with an overall index of 1.84. This highlighted the fact that literacy rate was higher however; the quality of education was poor as indicated by low literacy index.

Table 2: Literacy index of Sample household in the study area

Literacy rate (%)	Marginal	Small	Overall
Male literacy rate (%)	85.15	86.67	85.91
Female literacy rate (%)	79.07	82.46	80.77
Literacy index	1.8	1.88	1.84

Source: Researcher primary data observation.

Occupational distribution

Per household occupational structure of the selected households is given in Table 3. Occupational distribution showed that in selected villages of Parvati forest division around 88.58 percent of the population was engaged in agriculture which was major constituents of livelihood occupation whereas, 7.41 percent households were engaged in business as secondary occupation at overall level followed by services (4.01 percent) in private/public sectors. Similar trends in occupational distribution were observed on small and marginal farm categories. In case of marginal farms workers engaged in service were 3.54 percent and in business were as 8.85 percent. More members of the small farm category

were engaged in business (5.97 percent) than in services (4.48 percent).

Table 3: Occupational distribution of the sampled households in the study area (in percent)

Particulars	Farm Size		
	Marginal	Small	Overall
Service	3.54	4.48	4.01
Business	8.85	5.97	7.41
Agriculture	87.61	89.55	88.58

Source: Researcher primary data observation.

Table 4: Farm category wise distribution of workers and dependents of the sampled Households

Particulars	Farm size		
	Marginal	Small	Overall
Average no. of workers	3.23 (59.70)	3.27 (56.25)	3.24 (58.27)
Average no. of dependents (<14 yrs & >65 yrs)	2.18 (40.29)	2.54 (43.64)	2.31 (41.54)
Average family size (No.)	5.42 (100.00)	5.82 (100.00)	5.56 (100.00)
Dependency ratio w.r.t. total workers	1:1.47	1:1.29	1:1.40
Dependency ratio w.r.t. Family size	1:2.5	1:2.3	1:2.40

Source: Researcher primary data observation.

Workforce

The proportion of active workers was worked out to be 59.70 percent in marginal farmers and 56.25 percent in small farm categories. It was assumed that persons in the age group of 15-60 year are actively engaged in useful economic activities and were termed as working force. The dependents were found 43.64 percent in case of small farmers and 40.29 percent in the marginal farmers. The overall dependency ratio with respect to total workers was found to be 1:1.40 and among the different categories, it was observed 1:1.29 in small farms and 1:1.47 in marginal farms. Dependency ratio indicates that on an average one worker has to support more than one member in the family in the sampled area. Dependency ratio estimated with respect to family size was found 1:2.40 on an average.

Distribution of sampled households according to farm size

According to size of land holding the farmers were

categorized in the two categories; marginal and small farmers. Most of the farmers in the studied area were having marginal and small land holdings. In case of marginal farmers the minimum size of land holding was 0.16 ha, whereas maximum was 0.8 ha. In case of small farmers minimum land holding was 1.04 ha and maximum was 1.6 ha. The data presented in Table 5, showed higher variations in land holding in marginal farmers (46.79 percent) compared to small farmers (16.70 percent) with overall variation of 63 percent.

Table 5: Distribution of sampled households according to the size of land holding

Particulars	Farm size (ha)			CV(%)
	Minimum	Maximum	Average	
Marginal	0.16	0.8	0.38	46.79
Small	1.04	1.6	1.13	16.7
Overall	0.16	1.6	0.65	63

Source: Researcher primary data observation.

Income and employment structure of sampled households

Income structure

In order to calculate income structure, share of NTFPs income in the total income and employment pattern, only those households was selected who were actively engaged in NTFPs collection. Total number of those households was 39 out of which 24 were marginal and 15 were small farmers. The present study revealed that a good number of villagers have knowledge of exploring NTFPs as about 24.99 percent of the gross income was generated from the collection of NTFPs on the overall while fruit, cereal and vegetable contributed

27.49 percent, 14.76 percent and 14.25 percent respectively (Table 6). In case of marginal farms NTFPs contributed maximum share (28.86 percent) followed by fruit (25.26 percent), whereas on small farms maximum share was from fruit (29.87 percent) followed by NTFPs (20.87 percent). Vegetables contribution varied from 11.72 percent to 16.94 percent on marginal and small farms. Thus the study revealed that the majority of households from marginal farms preferred to collect the NTFPs from the forest area as NTFPs contributed maximum proportion in their household income.

Scenario of NTFPs in the study area

NTFPs were collected all year round. However, all of them were seasonal in nature. *Kutki*, *Dhoop*, *Patish* and *Sugandhbala* were collected in the same season i.e., during July–September. The collection of *Guchhi* was done from January to March while *Akhnor* was collected during November–December. Each collector either used to make on an average of 2 to 3 visits to the forest in a month or stayed for 15–20 or 30 days in a group of 5–10 persons. However, this frequency varied according to season and type of NTFPs collected. In the study area collection of NTFPs was carried out only by men, though women were engaged in household and farm activities only.

Composition of NTFP employment pattern

The collection of NTFPs generated employment to rural households. On an average 72 man days were generated in the study area. The employment generated per households per year varied between about 70 to 73 man days on small and marginal farms (Table 7). *Dhoop* was the major employment source contributing 28.10 percent (21mandays/

Table 6: Source of income of sample households (days/HH/year)

Particulars	Marginal				Small				Overall	
	Mini.	Max.	Average	CV (%)	Mini.	Maxi.	Average	CV (%)	Average	CV (%)
Vegetables	5000	31150	15454 (11.72)	41.95	18125	73875	33602 (16.94)	44.93	22434 (14.25)	61.35
Cereal crops	7950	42100	16864 (12.79)	55.95	15900	49900	33437 (16.86)	32.28	23238 (14.76)	55.02
Fruits	0	70500	33292 (25.26)	48.33	27500	101000	59233 (29.87)	42.34	43269 (27.49)	54.29
Livestock	0	44800	28125 (21.34)	26.09	28000	44800	30613 (15.44)	15.25	29082 (18.48)	22.31
Farm	55450	146219	93735 (71.13)	25.23	94800	222863	156885 (79.12)	21.8	118023 (75.00)	35.32
NTFP	12400	93450	38038 (28.86)	52.87	13150	79800	41383 (20.870)	57.72	39324 (24.99)	54.4
Farm+NTFP	85794	227088	131773 (100.00)	25.52	107950	251500	198268 (100.00)	20.68	157348 (100.00)	30.99

Figures in Parentheses indicate percentage to total.

HH/annum) to the total NTFPs employment. The collection of *Dhoop* was time consuming process due to the deep root system of the plant. *Kutki* collection was the next important employment generating activity providing employment of 14 mandays/HH/annum followed by *Guchhi* (13 mandays/HH/annum). The collection of *Sugandhbala*, *Patish* and *Akhnor* were contributing 14.64 percent (11 mandays/HH/annum), 14.07 percent (10 mandays/HH/annum) and 6.67 percent (5 mandays/HH/annum) respectively to the total NTFPs employment. The collection of *Akhnor* was generating less than 5 mandays of employment because of its easy availability and ease in its collection.

Table 7: Contribution of NTFPs collection in employment generation (Mandays)

Name of Species	Marginal	Small	Overall
	Employment generated (days/HH/year)	Employment generated (days/HH/year)	Employment generated (days/HH/year)
<i>Picrorhiza kurroa</i>	13.28 (17.97)	14.31 (20.16)	13.66 (18.76)
<i>Jurinea macrocephala</i>	21 (28.42)	19.54 (27.53)	20.46 (28.10)
<i>Morchella esculenta</i>	12.63 (17.09)	13.4 (18.88)	12.91 (17.73)
<i>Aconitum heterophyllum</i>	10.92 (14.78)	9.09 (12.80)	10.25 (14.07)
<i>Valeriana jatamansi</i>	11.31 (15.31)	9.54 (13.44)	10.66 (14.64)
<i>Aesculus indica</i>	4.73 (6.40)	5.09 (7.17)	4.86 (6.67)
Total	73.87 (100.00)	70.97 (100.00)	72.81 (100.00)

Figures in Parentheses indicate percentage to total.

Variability in income from selected medicinal plants

Non-timber forest products were the next major alternative source of income after agriculture in the study area because of the availability of large scale forest area. It is clear from Table 8 that on an average income generated from NTFPs was ₹ 38038, ₹ 41383 and ₹ 39234 contributing 28.89 percent, 20.87 percent and 24.99 percent on marginal, small and on overall farmers, respectively. NTFPs played a critical role in providing subsistence and cash income to the

households of the study area. The share of *Kutki* was maximum (65.85 percent) followed by *Patish* (12.93 percent) on the overall category. Similar results were found in case of marginal and small farms. The minimum share (1.14 percent) was contributed by *Sugandhbala*. The income from NTFPs varied between ₹ 38038/- on marginal farms to ₹ 41383/- on small farms in the study area. It was concluded that from the fore going analysis that *Kutki* and *Patish* were major contributors of NTFPs income in the study area.

Table 8: Variability in income from selected medicinal plants (₹/HH/annum)

Name of species	Marginal	Small	Overall
<i>Picrorhiza kurroa</i>	24167 (63.53)	28667 (69.27)	25898 (65.85)
<i>Jurinea macrocephala</i>	4125 (10.84)	4400 (10.63)	4231 (10.75)
<i>Morchella esculenta</i>	2375 (6.24)	2250 (5.43)	2327 (5.91)
<i>Aconitum heterophyllum</i>	5600 (14.72)	4267 (10.31)	5087 (12.93)
<i>Valeriana jatamansi</i>	437 (1.14)	473 (1.14)	450 (1.14)
<i>Aesculus indica</i>	1334 (3.50)	1326 (3.20)	1330 (3.38)
Total	38038 (100.00)	41383 (100.00)	39324 (100.00)

Figures in parentheses indicate percentage to total.

Gini concentration ratio

To study the role of NTFPs in household income inequality Gini coefficients were estimated and results have been presented in Table 9.

Table 9: Comparison of Gini coefficient of total household income without and without NTFPs income

Particulars	Marginal	Small	Overall
Farm	0.14	0.13	0.20
NTFP	0.28	0.33	0.17
Farm + NTFP	0.13	0.12	0.18

The inclusion of NTFPs income in total household income considerably reduced inequality between households from 0.20 to 0.18. In case of marginal farms Gini coefficient for farm income without

NTFPs (0.14) reduced to 0.13 with the inclusion of NTFPs. In small farm category it has decreased to 0.12 from 0.13. Thus, from this study it was proved that the NTFPs helped in diminishing income disparities between rural people.

Cost of collection and net return from NTFP's collection

These species were collected from the forest area and their cost of collection (qtl basis) and net return estimated were shown in Table 10. On this basis gross return and net return were calculated for all the selected species except *Guchhi*. In case of *Guchhi* because of its less availability, its cost and returns were estimated on per kg basis.

Table 10: Cost and Returns from NTFPs of Collection

Name of species	Units	Gross return	Cost of collection	Net return
Kutki	₹/qtls	200000	7260.50	192739.50
Dhoop	₹/qtls	20000	8693.83	11306.17
Guchhi	₹/ Kg	15000	6475.92	8524.08
Patish	₹/qtls	320000	7493.83	312506.17
Sugandhwala	₹/qtls	5000	4493.83	506.17
Akhnor	₹/qtls	1000	657.50	342.50

Net return from collection of NTFPs

The gross return cost of collection and net return from different species. Gross returns from *Kutki* were ₹ 200000/qtl and cost of collection was ₹ 7260.50/qtl. Therefore net returns obtained from *Kutki* were ₹ 192739.50/qtl. Net returns from *Dhoop*, *Patish*, *Sugandhbala* and *Akhnor* were ₹ 11306.17/qtl, ₹ 312506.17/qtl, ₹ 506.17/qtl, ₹ 342.50/qtl, respectively.

Gross returns from *Guchhi* were ₹ 15000/kg whereas cost of collection was ₹ 4493.83/kg and net returns received by collection of *Guchhi* were ₹ 8524.08/kg. The study revealed that the farmers were getting a good amount of net returns from the NTFPs collection.

Supply analysis of selected Medicinal plants

Growth and variability in the prices

The price analysis for the selected medicinal plants was carried out by considering their nominal and real prices. The results showed that average current prices for the selected medicinal plants were found higher as compare to average real prices. It can be seen from the table that the real prices showed a decrease of 39.77 per cent to 31.12 per cent.

Linear growth rate of nominal and real prices of selected medicinal plants showed that nominal prices of all the medicinal plants showed positive and significant growth where as in case of real prices only *Dhoop* showed significant growth indicating that in real term prices of *Dhoop* were increasing. Whereas, *Guchhi* and *Patish* were recorded with negative and significant growth rate. In nominal prices highest growth rate (17.15%) was observed in *Dhoop* followed by *Kutki* (9.05%), *Sugandhbala* (8.85%) and *Akhnor* (7.79%). The lowest growth rate was observed in *Patish* (3.84%) followed by *Guchhi* (5.09%). In real sense only *Dhoop* price (6.57%) showed significant growth whereas, real prices of other M&APs did not show significant growth.

The analysis of coefficient of variation of nominal prices showed highest variation in prices of *Dhoop*

Table 11: Growth and variability in nominal as well as real prices of selected medicinal plants (2004-05 to 2013-14)

Medicinal Plants	Nominal Prices			Real Prices			
	Mean (₹)	Nominal price growth rate (%)	CV (%)	Mean (₹)	Percentage decrease over nominal prices	Real price growth rate (%)	CV (%)
Kutki	361.00	9.05* (1.46)	30.10	238.55	33.92	-1.35 (0.95)	9.10
Dhoop	64.50	17.15* (3.56)	60.21	39.80	38.30	6.57* (2.39)	28.56
Guchhi	10000.00	5.09* (0.63)	16.33	6820.50	31.80	-4.67* (0.83)	15.84
Patish	1690.00	3.84* (0.57)	12.61	1164.10	31.12	-6.15* (0.49)	19.00
Sugandhbala	50.00	8.85* (1.43)	29.44	33.12	33.76	-1.33 (1.29)	11.74
Akhanor	7.70	7.79* (0.78)	24.42	4.64	39.77	-2.03 (1.27)	10.69

Figures in the parenthesis are the standard errors of the linear growth rates.

*Significant at 5 per cent level of significance respectively.

(60.21%) followed by *Kutki* prices (30.10%) and lowest in *Patish* prices (12.61%). In real prices also highest variation was shown by *Dhoop* prices (28.56%) followed by *Patish* prices (19.00%) and lowest variation by *Kutki* prices (9.10%). The results have also been presented in Fig. 1.

The results have been shown in the Table 11. The own price elasticity for *Guchhi*, *Patish* and *Sugandhbala* were found less than one i.e. these medicinal plants were inelastic. Whereas, own price elasticity for *Kutki*, *Dhoop* and *Akhnor* were elastic.

Highest price elasticity was recorded in *Kutki* (2.10) followed by *Akhanor* (1.09) and *Dhoop* (1.07). The lowest price elasticity was recorded for *Sugandhbala* (0.16) followed by *Patish* (0.74) and *Guchhi* (0.92) highlighting their responsiveness to price change. As there is positive relationship between price and quantity supplied it means more quantity will be supplied higher price and *vice-versa*.

Nominal Price elasticity

The arc elasticity was used to estimate the elasticity



Fig. 1: Trends in nominal and real prices of selected medicinal plants during 2004-05 to 2013-14

Table 12: Nominal price elasticity of supply of selected medicinal plants during 2004-05 to 2013-14

Name of the species	Average quantity in the terminal years in qtls(Q ₂)	Average quantity in the base years in qtls(Q ₁)	Average price in the terminal years (P ₂)	Average price in the base years (P ₁)	Elasticity of Supply
Kutki	270.90	64.66	500	273.33	2.10
Dhoop	125.66	35.66	116.66	36.66	1.07
Guchhi	10.51	7.24	12000	8000	0.92
Patish	1.93	1.6	1933.33	1500	0.74
Sugandhbala	7.31	6.66	66.66	36.66	0.16
Akhanor	4.36	2.33	10	5.66	1.09

Table 13: Real price elasticity of supply of selected medicinal plants during 2004-05 to 2013-14

Name of the species	Average quantity in the terminal years in qtls (Q ₂)	Average quantity in the base years in qtls (Q ₁)	Average price in the terminal years (P ₂)	Average price in the base years (P ₁)	Elasticity of Supply
Karoo	270.903	64.66	236.55	260.00	13.02
Dhoop	125.667	35.66	54.95	34.90	-2.50
Guchhi	10.51	7.24	5735.87	7636.62	1.30
Patish	1.93	1.6	920.89	1431.87	0.43
Sugandhbala	7.31	6.66	31.38	34.84	0.89
Akhanor	4.36	2.33	4.78	5.07	10.31

Table 14: Scarcity ratios of selected medicinal plants supplied during 2004-05 to 2013-14

Years	Selected medicinal plants					
	Karoo	Dhoop	Guchhi	Patish	Sugandhbala	Akhnor
	Quantity (qtls)					
2004-05	37	38	2.61	0.3	7	0.5
2005-06	74	46	15.21	1.6	9	3
2006-07	83	23	3.9	2.9	4	3.5
2007-08	46.5	18	1.44	4	9	5
2008-09	125.9	29	2.55	1.9	5	10
2009-10	103	23	2.9	3	4	7
2010-11	92.7	55	3.5	0.11	1	6.5
2011-12	231.71	48	5.2	0.41	4.2	4.3
2012-13	259	119	15.66	2.5	7.25	5
2013-14	322	210	10.69	2.9	10.5	3.8
Scarcity ratio	1.37	-0.45	56.36	8.20	-0.67	-0.95

of supply of selected medicinal plants. The values were positive for all the medicinal plants showing the positive price supply elasticity relationship.

Real price elasticity

The own price elasticity was also estimated for real prices and results have been shown in the Table 14. The price elasticity for all the medicinal plants was positive except *Dhoop* (-2.50) which indicated that *Dhoop* was very inelastic in nature, i.e., change in

price does not affect the quantity supplied of the species.

Scarcity ratio of selected medicinal plants

The real increase in the price of the resources over a period of time indicates the economic scarcity of the resources (Suneeta, 1998). *Kutki*, *Guchhi* and *Patish* had positive ratio implying thereby that these species are highly scarce in nature. The scarcity ratio was found highest in *Guchhi* (56.36) followed

Table 15: Regression of NTFPs incomes against socio-economic variables (estimation of NTFP income share)

Terms	Coefficient	SE	t-value
Intercept	-17493.641	14891.213	-1.175
Land holding	-33481.166	7613.612	-4.398*
Size of family	1189.579	1480.649	0.803
Literacy index	-13358.672	3931.005	-3.398*
Farm income	0.15	0.076	1.979
Age of household head	1292.199	255.12	5.065*

■N= 39; $R^2 = 0.722$; Adjusted $R^2 = 0.680$; * Significant at 5 per cent level of significance respectively.

by *Patish* (8.20) and *Kutki* (1.37) shown in Table 15. Hence, availability of these species is becoming scarce over the period of time. Other selected medicinal plants showed negative ratios indicating their abundant availability in nature.

Socio-economic factors affecting NTFPs income share

Land holding of sampled households, size of family, literacy index, farm income and age of household were found affecting the NTFPs income share. Out of these five variables only three variables, viz., land holding, literacy index and age of household head significantly affected the NTFPs collection. Land holding and literacy index were found affecting the NTFPs income share negatively i.e., with the increase in the land holding size and literacy index, NTFPs income share is going to decrease. The literacy index was very low in the study area (1.84) indicating that quality of education was low. Thus lower the formal education, more the income share on NTFPs.

Age of household head was found positively related to the NTFPs income share, since old households were assumed to have more knowledge about the NTFPs uses and their extraction. Moreover they were having lower formal education. Both knowledge and skills were spread within the family. Additionally, as elder people often were limited in their physical performance, they were more likely to be engaged in NTFPs extraction. Thus, higher age of household head positively affected NTFPs income share.

Other variables like size of family and farm income were also considered which were found not significantly affecting the NTFPs income. It showed that people from nuclear family and from joint

family collect the species in the same proportion. Similarly, farmers with high farm income were also collecting the NTFPs for their additional income. The factors considered together were able to explain the NTFPs income share up to 68 percent. This Adjusted R-Squared value adjusts the statistics based on the number of independent variables in the model and it is a desired property of a goodness of fit statistics. There may be some other factors affecting the income share of NTFPs.

CONCLUSION

Literacy situation revealed that nearly 83.48 percent family members were literates at overall level with a literacy index of 1.84, indicating poor quality of education in the study area. Occupational distribution revealed that 88.58 percent of work force in the sampled households practice farming, followed by business sector (7.41 percent) and service sector (4.01 percent) at overall level. On an average, 58.27 percent were the workers in family in overall farms. The proportion of workers found on marginal farms (59.70 percent) higher compared to small farms (56.25 percent). The overall dependency ratio w.r.t. total worker was worked out to be 1:1.40 and dependency ratio w.r.t. family size was 1:2.40 indicating that on an average one worker has to support more than two family members. The average size of land holding of the sampled households was found 0.66 hectares of which 48.48 percent was cultivated area. The other uses of land were pastures/*ghasnis* (16.18 percent), orchards (22.72 percent) and barren land (10.89 percent). The cultivated land varied from 55.26 percent to 46.01 percent in marginal to small categories of the farm. NTFPs contributed maximum in the total income in case of marginal farms (28.86 percent) whereas, in small farms NTFPs contribution was 20.87 percent.

On an average, NTFPs contributed 24.99 percent to the total farm income in the study area. Gini coefficient value without NTFPs income was 0.20, which reduced to 0.18 with the inclusion of NTFPs income. Literacy index and land holding were found affecting NTFPs income share negatively i.e., with the increase in the land holding size and literacy index, NTFPs income share is going to decrease whereas, age of the household head was found positively related to the NTFPs income share, since they had more knowledge about NTFPs uses and their method of extraction.

REFERENCES

- Adepoju, A.A. and Salau, A.S. 2007. Economic valuation of non-timber forest products (NTFPs), Munich Personal RePEc Archive (MPRA) Paper no. 2686. <http://mpr.ub.uni-muenchen.de>
- Ajaz-ul-Islam, M., Sulaiman Quli, S.M., Rai, R. and Sofi, P.A. 2013. Livelihood contribution of forest resources to tribal communities of Jharkhand. *Indian Journal of Fundamental and Applied Life Sciences*, 3(2): 131-44
- Bhavannarayana, C., Saritha, V., Usha, P., and Brahmaji, Rao, P. 2012. Dependency and usage pattern of forest-dwellers on non-timber forest product. *Erudite Journal of Ecology and Environmental Research*, 1(1): 1-5.
- Chopra, K. 1993. The Value of Non-Timber Forest Products: An estimation for tropical deciduous forests in India, *Economic Botany*, pp 251-257. In: International association of agricultural economists' conference. 12-18 August, 2003, Ravi *et al* (eds.). Gold Coast, Australia. <https://www.jstor.org/stable/4255519>
- Hegde, R., Suryaprakash, S., Achoth, L. and Bawa, K.S. 1996. Extraction of NTFPs in the Forests of B.R. Hills. Contribution to Rural Income. *Economic Botany*, 50: 243-244.
- Food and Agriculture Organization 2008. An information bulletin on Non Wood Forest Products. Non- Wood News. Rome, Italy.
- Gauraha, A.K. 1992. Micro-economic analysis of a tribal village. *Indian Journal of Agricultural Economics*, 47(3): 446-447.
- Maithani, G.P. 1994. Management perspectives of Minor Forest Produce. MFP News, October-December, 1994. Dehradun.
- Mallik, R.H. 2000. Sustainable management of Non-Timber Forest Products in Orissa: Some issues and options. *Indian Journal of Agricultural Economics*, 55(3): 384-397.
- Sarmah, R. and Arunachalam, A. 2011. Contribution of non-timber forest products to livelihood economy of the people living in the forest in Changlang district of Arunachal Pradesh, India. *Indian Journal of Fundamental and Applied Life Science*, 1(2): 157-169.
- Sharif, A.M., Rashid, A., Uddin, M.B. and Khan, N.A. 2015. Role of non-timber forest products in sustaining forest-based livelihoods and rural households' resilience capacity in and around protected area: a Bangladesh study. *Journal of Environmental Planning and Management*, 58: 1-15.
- Suneetha, M.S. 1998. Demand and valuation of medicinal produces and produces in Western Ghats of Kerala: a resource economics study. M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Bangalore.

