Research Article

Determinants of Non-Timber Forest Products Collection and its Contribution to Rural Household's Income in District Swat

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Abstract | Non-Timber Forest Products (NTFPs) plays a vital role in driving the economy of people who inhabits within or near forests. This study aims to examine how the NTFP's collection affects the rural households' income in district Swat, Pakistan. In addition, the factors of household's participation in the study area were also identified. The relationship among the household's income from of the NTFP's collection and age of the household head, level of education, distance between the forest and home, household size, landholding size, capacity of livestock herd for individual holding (number of livestock held), number of adult males, female and female headed household has been calculated through various econometric techniques. Empirical evidence from several forest based communities across the globe suggests that NTFP's collection contribute significantly to household's income. A total of 410 households were randomly selected for data collection from upper two tehsils of the district Swat. Data were collected from the selected sample households using simple random sampling technique with the help of well-structured and self-administered questionnaires. The study has employed multiple regression model to estimate the relationship amongst the variables. The empirical estimation indicates that all variables except household's size and agriculture land holding have shown positive and significant influence on income from the NTFP's. Household's size and agricultural landholding were found negatively associated with household's income from the NTFP's. The study identified major problems during field visits and data collection, which includes over exploitation of forest resources through severe grazing, deforestation, fuel wood collection, agricultural and residential encroachment, climate change, weak monitoring, etc. The study recommends that public and private sector organizations should provide financial and technical support for the NTFP's promotion in the forest based communities in the country.

Introduction

The Non-Timber Forest Products (NTFPs, hereafter) are the materials that are extracted from managed plantations and natural ecosystems. These organic materials have particular cultural, religious or social importance. These materials are marketed for commercial purposes and can also be utilized in

houses for domestic as well as medicinal purposes. Wickens (1991), Neumann and Hirsch (2000) described such biological material as "NTFPs exclude the industrial round wood and derived wood chips, pulp, wood-based panels sawn timber." Likewise, Adepoju (2007) described NTFPs as plants or plant parts, which have perceived consumption or economic significance appropriate to boost their collection and removal from the forest. NTFPs are defined by FAO (2008) in a more comprehensive way as "those woodland materials that are derived from resources other than round wood (sawn wood) such as water, soil mineral, fauna and flora resources.

According to Centre for Integrated Forest Research (CIFOR), any other merchandise or service produced in forests except timber are known as NTFPs. These NTFPs consist of medicinal plants, fish, fruits and nuts, wild vegetables, essences, a variety of barks, resins and a host of other palms and herbs fibres such as bamboo and rattans.

NTFPs are categorized into non-timber and non-wood products. The non-timber but woody product consists of rattan canes, poles, charcoal, bamboos sponge, chewing sticks and others. NTFPs comprise plant and animal products excluding fuel wood and timber. The non-wood products are those NTFPs which are obtained from the wild animals in the form of horns, meats, bones, teeth and skins. Furthermore, wild plants including their herbs, tubers, bark, roots, resins, gums, corms, saps, flowers, fungi, forage, gravel, latex, honey, ropes, clay and minerals like limestone and natural salt are also included in them (Rai and Uhl, 2004). An alternative classification of NTFPs is based on its nature of consumption, which is edibles and non-edibles. NTFPs can also be grouped according to its source of harvest or collection into domesticated stock (from an agricultural system), managed stock (from managed forest) or wild stocks (from unmanaged forest).

Earlier than the idea of NTFPs, the forest products were defined as 'all those materials produced by a woodland estate'. With the passage of time these materials were categorized into two main categories *i.e.* minor woods goods and major woods goods. The bulky goods like timber and fuel wood were described as major woods goods while the remaining goods were termed as minor timber land goods (Tiwari, 1993). The MFPs as minor wood goods were later distinguished as a separate entity and came to be known as Non timber Forest Products or NTFPs. The best producing specimens among them are the raw form of many herbs, leaves, roots, barks, grasses, bamboo, fruits & nuts, resins & saps, canes & Tasar, silk and honey etc. (Bhattarai and Croucher, 1996). The NTFPs play vital role in the livelihoods of millions of rural and urban people across the globe. (Shackleton *et al.*, 2015). In India, 275 million marginalized peopled rely on NTFPs for at least part of their subsistence and cash livelihoods. Furthermore, NTFPs collection has enormous contribution in the economy by generating employment and income in business activities (Pandey *et al.*, 2016).

Pakistan is an underdeveloped country where around 4.8 percent of total area is under forest and about 40 percent of total population live in absolute poverty and they depend directly for their livelihoods on forest resources. The major and essential NTFPs in Pakistan are honey, butterflies, wild vegetables, fruits and nuts, spices and condiments, silk coconut, mazri palm and other important medicinal plants.

There is a historic review for conventional use of plants in Pakistan. There are more than 6,000 species of such plants and more have been reported of higher plants among which 12% of them have been used for medicinal purposes (Shinwari, 2011). The base of forest resources in Pakistan is located largely in northern areas like Swat and Khyber Pakhtunkhwa hilly ranges (Ahmad *et al.*, 2011). The collection of non-timber forest products particularly the medicinal plants is an imperative aspect of the local tradition in the northern areas of Pakistan. More than 5000 families are involved in the collection and processing of medicinal plants in the Malam Jabba Valley (Sher *et al.*, 1998).

Due to the diverse climate, multiple ecological regions and soil conditions in Pakistan, the flora is very rich and found in abundance. According to a survey carried out by the Pakistan Forest Institute, more than 75 herbal medicines are widely exported in raw form while over 200 are domestically traded in Pakistan (Humayun *et al.*, 2012). Nasir *et al.* (2014) found around 2000 essential medicinal plant species in Pakistan but unfortunately, overall world export of medicinal plants were recorded at 8.3 million US$ in 2002 for Pakistan as compared to 150.4 for China, 248.7 for Far East and 45.9 for India.

Constraints of NTFPs in Swat

In Pakistan, the medicinal plants are being affected by numerous issues, which are leading to the depletion of plant population. Moreover, many other issues such as soil degradation, overgrazing and deforestation are also regarded as main factors responsible for the shrinking of many kinds of NTFPs at District Swat. Managerial issues are such as unchecked trade, loss of resources during collection and storage, unawareness of sustainable management restrictions and market knowledge as well as information (Sher *et al.*, 2004).

NTFPs resources are depleted due to the major issue of over harvesting. Trade pressure leads to exhaustion of the flora in that region. Shinwari (2010) testified the extinction of numerous important species due to over harvesting in Hindukush Region. Over-exploitation may also lead to decrease in effective population size, which may have great genetic consequences (Cruse-Sanders *et al.*, 2005). In addition, grazing pressure also results in depletion of medicinal plants. Even though livestock contributes significantly towards rural economy, Guenther *et al.* (2005) testified from his work that grazing pressure has a negative influence on the plant population.

Hence, it is very important to provide proper education and training to the local community with the support of NGOs and academia in the area. The participation of agricultural research institutions as well as support agencies can also play an important role for strengthening the NTFPs cultivators in order to improve the NTFPs plants. The socio-economic condition of the local farmers can be improved by large scale cultivation of medical plants and other NTFPs in the district Swat.

Pakistan is an underdeveloped country where natural resources have direct and indirect impact on the rural and home economy like other countries. The variation in natural resources is observed mainly due to factors like human population, behavioural factors and consumption patterns and these factors causes exhaustion of natural resources. It is an established fact that human life is not possible without natural resources. The total area covered by forest in Pakistan is estimated to be 4.8% of the total land where 40% of Pakistan's population live below the poverty line and 34% of the local populations suffer from extreme poverty and depend directly on NTFPs for their live-lihoods. NTFPs are the best source of livelihood and generating income activities for the local population in the Northern Areas of Pakistan. This present study is an effort to investigate the economic role of NTFPs in the improvement of the people's livelihood of the area under study.

Northern areas especially Swat is widely known for its greenery, thick forests and scenic beauty. The people living in and around forests mainly rely on forests/NTFPs for their livelihood activities. Due to population growth, commercialization and changes in preferences of the people, these forests/NTFPs are extensively exhausted. With little interventions/efforts, the livelihoods opportunities of the poor rural people of Swat can be enhanced. The researcher belongs to Swat and knows the customs and tradition of the area. This in-depth study will highlight the importance, role and determinants of NTFPs.

Review of relevant studies from local researchers' reveals that most of the researchers have investigated the collection and marketing of medicinal plants from forests on communal land and the welfare impact of value addition in its business. None of them have collectively investigated the NTFPs collection, their impact on households' (collectors) wellbeing and sustainability in the existence of forest resources and flow of benefits in the form of NTFPs to local human communities. This research study is designed to fill out this research gap.

Objectives of the study

To study socioeconomic characteristics of the targeted rural households in study area.

To identify determinants of NTFPs collectors' household income in the study area and to give some suggestions and recommendations on the basis of research findings.

Materials and Methods

Universe of the study

District Swat constitutes the universe of this study. Although participating in NTFPs was considered as population of the study. Most of the local people living near the forest in district Swat rely upon Non timber forest products to achieve their means for living, therefore, the collection of this non-timber forest

products act as key source for revenue among most of the deprived individuals dwelling among those woodlands. The popular NTFPs products are several valuable medicinal plants, wild vegetables, fruits, fuel wood, mushrooms, morels, etc; the resident societies consume and market these wild goods in order to enhance the households' revenue.

Figure 1: *Map presenting the study areas.*

Sample selection
District Swat is comprised of seven tehsils namely Babuzai, Matta, KhwazaKhela, Barikot, Kabal, Charbagh and Bahrain. For gathering the required information two tehsils *i.e.* Matta and Bahrain were purposively selected. Reasons for the selection of these tehsils are the availability of more NTFPs and the reliance of poor people on these products for their livelihoods.

Selection of villages was made on the basis where collections of the NTFPs were concentrated. Purposive sampling technique was used for selection of villages from the above mentioned tehsils. On this criterion, two villages naming Landi Garhi and Sakhra from Matta and Chail and Mankial villages were selected from Tehsil Bahrain.

For this study, all the households who were involved in the collection of NTFPs were taken as a unit of analysis and information was gathered from the head

of household. Data was collected from the selected sample households using simple random sampling technique. This method was helpful in overcoming the selection bias.

Because of monetary (financial) and human requirements, Sekaran (2003) sampling table was used. So, a total of 410 sample size was fixed. In the above mentioned villages, sample was properly divided through proportional allocation method. The below Table 1 is representing the distribution of the sample size in all villages.

Table 1: *Selection of the sampled respondents in the study area.*

S. No.	Tehsils	Villages	No. of Households	Sample Size
1	Matta	Landi Ghari	1876	93
		Sakhra	2742	137
2	Bahrain	Chail	851	44
		Mankial	2734	136
	Total	All	7311	410

*Data source: *Census of 2017.*

Data s sources and data collection
For gathering the important and relevant data for the study both primary and secondary sources were used. Published reports from government as well private sources were also included in the secondary data. Vital enhancements were made in the light of objectives of the research study in the questionnaire through pretesting of questionnaire and ground realities prevailing at village level. Regression analyses was conducted to achieve the study objective with analysis tool; STATA as well as SPSS (v21.0).

Econometric model for household income estimation
The popular econometric techniques used in these kinds of research are logistic models *e.g.* Logit and Probit (Suleiman *et al.*, 2017; Raufu *et al.*, 2012). By its very nature these models give probability of the existence or absence of a feature. However, according to (Gujrati, 2004) in these models dependent variable is least affected by the magnitude of the independent variables. Another problem associated with these models is that the signs of parameters can't be confidently interpreted. On the other side in the OLS analysis the dependent variable is affected by the magnitude of the independent variable and thus can provide more precise and consistent results. Besides that this technique, by the virtue of its Blue proper-
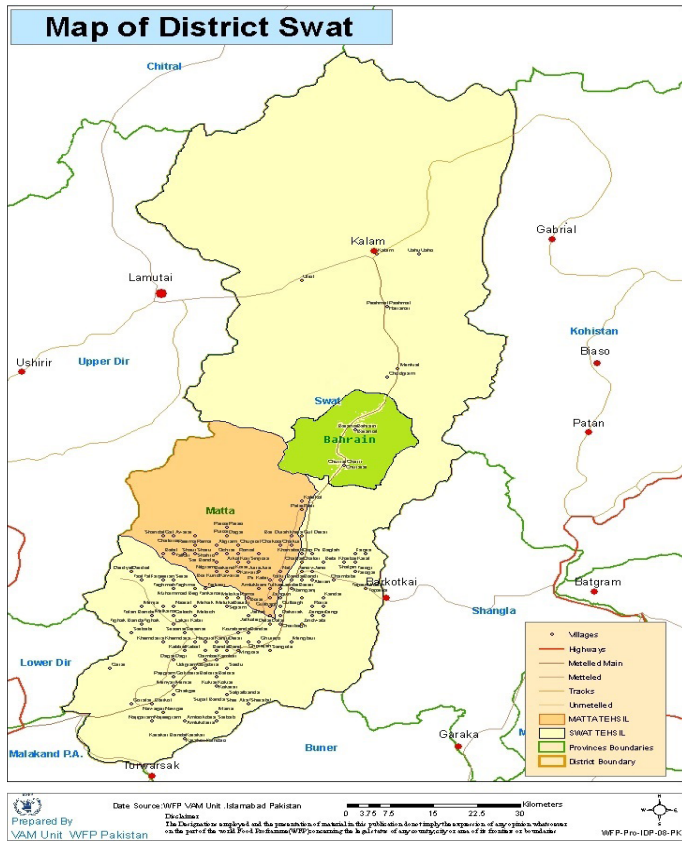
ties, is free of both drawbacks of the logistic models. So, multiple regression models were used in order to achieve the objectives set for the study.

After preliminary discussion with sampled respondents and in the light of literature review main determinants that enhanced the NTFPs rural household income in the present study were; Age of the household head, level of education of household head, distance between the forest and home, Household size, Landholding size, Size of livestock herd for individual holding (number of livestock held), Number of adult males, Number of adult female and female headed household. Following Nygren *et al* (2006), the below mentioned multiple regression model was used.

Econometrically it can be expressed in the following way.

$$Y_i = \beta_0 + \sum_{i=1}^{1} \beta_i X_i + \beta_2 D_1 + \beta_3 D_2 + \varepsilon_i \ \dots(1)$$

Where;

β_0: constant term; β_i :(i = 1, 2, ..., 11) = regression co-efficient of ith predictor; Y_i: Income from the NTFPs (PKR); X_{1i}: Age of the household head (number of years); X_{2i}: Level of education of household head i (0 for illiterate, 1 for Primary, 2 for middle, 3 for matric, 4 for F.Sc and 5 for graduates); X_{3i}: Income from other sources i (PKR); X_{4i}: Distance from forest to market i (km); X_{5i}: Household size i (number of people living in the household, including adults and children); X_{6i}: Land size i (kanals); X_{7i}: Size of livestock herd of individual holding (number of livestock held); X_{8i}: Number of adult males; X_{9i}: Number of adult females; X_{10i}: Female-headed household; X_{11i}: Total income of household; D_{1i}: Market access (if the household has access to market the dummy takes 1, 0 otherwise).

Results and Discussion

Socioeconomic characteristics of the sampled respondents
Age of the sampled respondents: The characteristic of age is considered the main factor that reveals the consciousness and responsiveness of an individual to the certain livelihood approaches. Experience is also directly related to age as the increase in age brings new experiences upon relevant stage. Age is an important factor to determine the collection of NTFPs for livelihood.

Table 2 depicts that most of the sampled respondents

in the study area belonged to the age group between 40-48 years which is about 29 percent of the total sampled respondents while the age of 14 percent of the sampled respondent belonged to the age group of 67-75 years. Ages less than 39 years were found only 19 percent and 21 percent ages of the sampled respondents belonged to the age group of 49-57 years while 17% between 58-66 years age group. At Landi Ghari, Sakhra and Mankial, most of the sampled respondents' ages (29%) were found between 40-48 years while in Chail only 3% of sampled respondents' ages belonged to age group of 49-57 years.

Table 2: *Age of the sampled respondents in the study area.*

Study Area	Age (years)					Total
	<= 39	40 – 48	49 – 57	58 – 66	67 – 75	
Landi Ghari	18	28	17	15	15	93
	(4)	(7)	(4)	(4)	(4)	(23)
Sakhra	27	38	31	24	17	137
	(7)	(9)	(8)	(6)	(4)	(34)
Chail	8	10	12	7	7	44
	(2)	(2)	(3)	(2)	(2)	(11)
Mankial	26	42	28	23	17	136
	(6)	(10)	(7)	(6)	(4)	(33)
Total	79	118	88	69	56	410
	(19)	(29)	(21)	(17)	(14)	(100)

Values in parenthesis are percentages Source: Field survey, 2019.

Table 3: *Educational level of the sampled respondents in the study area.*

Study Area	Education level of household head					Total
	Illiterate	Primary	Matric	F.Sc.	Graduate	
Landi Ghari	78	9	5	1	-	93
	(19)	(2)	(1)	(0.2)		(22)
Sakhra	113	7	10	5	2	137
	(28)	(2)	(2)	(1)	(0.5)	33)
Chail	39	2	1	2	-	44
	(9)	(0.5)	(0.2)	(0.5)		(11)
Mankial	108	14	4	8	2	136
	(26)	(3)	(1)	(2)	(0.5)	(33)
Total	338	32	20	16	4	410
	(82)	(8)	(5)	(4)	(1)	(100)

Values in parenthesis are percentages Source: Field survey, 2019.

Educational level of the sampled respondents: For healthier understanding and competencies, a person should be equipped with the aptitude of education. It is important in building choices to implement a new knowledge, invention or any certain approach to raise revenue is very essential. It creates new skills, measures for collection of knowledge, considerations and

ethics. Literate individuals are in a better position to generate more revenue and maximize NTFPs utilization as per market demands.

The results from Table 3 showed that majority (82%) of the sampled respondents in the study area were illiterate. Among the rest, 8 percent of the sampled respondents were primary educated, 5 percent were matriculated and 4 percent had F.Sc. level education. Only 1 percent of the sampled respondents were found to be graduates. In Landi Ghari, 19 percent of the sampled respondents were found illiterate while no graduates existed. The findings from the table 4.2 revealed that at Sakhra 28 percent of the sampled respondents were illiterate and 26 percent at Mankial and 9 percent at Chail. Only 0.5 percent respondents each were found as graduates from Sakhra and Mankial while no respondent from Chail had such high education level.

Raufu et al. (2015) reported the same results that there exist a positive and significant association between year of education and income earned from NTFPs.

Household size
Household size shows the number of members in a family. A direct relationship with NTFPs collection can be expected as the household size is increased. More individuals are supposed to be participating in collection of NTFPs achieving more benefits from (Dash et al., 2016).

Table 4: *Household size of the sampled respondents in the study area.*

Study Area	Household Size			Total
	<= 8	9 - 12	13 – 15	
Landi Ghari	64 (16)	22 (5)	7 (2)	93 (23)
Sakhra	83 (20)	34 (8)	20 (5)	137 (33)
Chail	27 (7)	12 (3)	5 (1)	44 (11)
Mankial	87 (21)	34 (8)	15 (4)	136 (33)
Total	261 (64)	102 (25)	47 (11)	410 (100)

Values in parenthesis are percentages Source: Field survey, 2019.

Table 4 presents that the household size of 64 percent of the total sampled respondents were less or equal to

8 members in the study area and 25 percent of sampled respondents belonged to such households having between 9 - 12 members. Only 11 percent of the total sampled respondent's households were having 13- 15 members. The findings from the table also discuss that most of the sampled respondents' household sizes at each village of the study area were less or equal to 8 members. Respondents with large household size were not much present in the study area.

Total incomes of the households in the study area
Total income is one of the most important determinants for collection of NTFPs. The total annual income of the sample respondents shows ratio of NTFPs share in total income as well as the participation of lower and upper classes to collect NTFPs. Collection of NTFPs is one of the effortless livelihood strategy with less investment as compared to Agriculture, business and services, therefore, most of poor households rely more on NTFPs as a livelihood and make most of their total income out of it.

Table 5 shows the different total incomes groups of the sampled respondents with response to each study area. The table describes that the total incomes of most sampled respondents of about 34percent in the study area was between 180001 – 322500 rupees. The total incomes of 23percent of the sampled respondents were found less than or equal to 180000 rupees. High total incomes of the sampled respondents such as incomes between 465001- 607500 and 607501 – 750000 rupees were found only between 9percent and 10percent of the sampled respondents, respectively. 23percent total incomes of the sampled respondents belonged between 322501 – 465000 rupees. At Sakhra Chail, and Mankial, most of total incomes of the sampled respondents were found between 180001 – 322500 rupees while in Landi Ghari about 7percent of sampled respondents' total incomes were found to be less than or equal to 180000 rupees.

Results for multiple regression model
The Table 6 shows results of regression model for households' income from NTFPs. The F-statistic value of 169.76 and the associated probability of 0.000 suggest that the combined effect of all the explanatory variables on household's income from NTFPs is significant. In simple words, the whole model significantly predicts and explain variant in household's income from NTFPs. The estimated R-squared is 0.8866 means that the model explains

Table 5: *Total incomes of the households of sampled respondents in the study area.*

Study Area	Total Income of the Households (Rupees per Annum)					Total
	<= 180000	180001 – 322500	322501 – 465000	465001 - 607500	607501 – 750000	
Landi Ghari	29 (7)	24 (6)	21 (5)	7 (2)	12 (3)	93 (23)
Sakhra	23 (6)	62 (15)	31 (8)	11 (3)	10 (2)	137 (33)
Chail	7 (2)	16 (4)	13 (3)	5 (1)	3 (1)	44 (11)
Mankial	37 (9)	37 (9)	30 (7)	15 (4)	17 (4)	136 (33)
Total	96 (23)	139 (34)	95 (23)	38 (10)	42 (10)	410 (100)

Values in parenthesis are percentages Source: Field survey, 2019.

Table 6: *Estimates of multiple regression model for income by NTFPs.*

Source	SS	Df	MS	F ratio	P
Model	119.81429	18	6.65634942	169.76	0.0000
Residual	15.3312552	391	0.039210371		
Total	135.145545	409	0.330429205		

Source: *Field survey, 2019;* **Number of obs:** *410;* **R-squared:** *0.8866;* **Adj R-squared:** *0.8813.*

Table 7: *Parameters of multiple regression analysis for income from NTFPs.*

Log NTFP Income (Rs.)		Coef. (β)	Std. Err.	t	P>|t|
Age		0.0004662	0.0008952	0.52	0.603
Area	Sakhra	-0.0563252	0.031347	-1.80	0.072
	Chail	-0.1111838	0.0620753	-1.79	0.074
	Landi Ghari	-0.0992944	0.052004	-1.91	0.057
Education	Primary	-0.0252355	0.036819	-0.69	0.491
	Middle	-0.3563874	0.06286	-5.67	0.000
	Matric	-0.3138959	0.0476582	-6.59	0.000
	F.Sc.	-0.4317322	0.0523258	-8.25	0.000
	Graduate	-0.5746078	0.066727	-8.61	0.000
Total income		2.61e-06	7.38e-08	35.22	0.000
Distance from forest to home (kilometres)		0.008874	0.0059312	1.50	0.135
Land Size (0.125 acres)		-0.0032403	0.001463	-2.21	0.027
Livestock (numbers)		-0.002713	0.003104	-0.77	0.440
Household Size (individuals)		-0.0139121	0.0068017	-2.05	0.041
No. of Adult Males		0.0272402	0.0108194	2.52	0.012
Female headed households		0.074831	0.0481764	1.77	0.121
Market access (yes if located within 10 Km to forest)		0.1251471	0.0703051	1.78	0.076
Constant		10.54248	.1117573	94.33	0.000

Obs.: *410;* **F(18, 391):** *169.76;* **Prob>F:** *0.000;* **R-Squared:** *0.8866;* **Adj R-Squared:** *0.8813;* **Root MSE:** *0.19802;* **Source:** *Field survey, 2019.*

88.66 percent variance in household's income from NTFPs. Among other studies, the R-square values were considerably deviated such as Rodríguez (2007) revealed the R-square were 0.58, Heubach et al. (2011) reveal R-square of 0.506 and the R-square by Adongo *et al.* (2019) was 0.28 which showed that the study was more legitimate and justified by its explanatory variables.

The results from Table 7 shows the impact of different independent variables such as age, education level, total income, distance from forest to home, land size, livestock, household size, no. of adult males and females, female headed households and market access on the income by NTFPs. The findings OLS estimated model; given in Table 3; reveals that head's education, head's gender, home location, (Sakhra, Chail or Mankial), household total income, household size, number of working individuals and market access have statistically significant effects on household's income from NTFPs collections. These findings are consistent with results of Rodríguez (2007), Timko *et al.* (2010), Heubach *et al.* (2011), Mulenga *et al.* (2011), Suleiman *et al.* (2017), and Adongo *et al.* (2019).

Head's education and gender
Education was used as a categorical variable as illiterate, primary, l middle, matric, secondary and graduate. For the estimation of coefficients, stata used the first category, illiterate as reference category and coefficients for all other were estimated. The estimated coefficients for education categories are negative and statistically significant which reveals that household's income from NTFPs is negatively associated with head's education and this is consistent with prior expectations of the researcher.

The Graduate level of education is highly statistically significant as the P-value is equal to 0.000 and a neg-

ative sign, which indicate that the household's income from NTFPs if headed by a Graduated individual is 58 percent less than household's income from NTFPs headed by illiterate individual. Estimated coefficient for female head is positive and significant at 10 percent level of significance. It indicates that the monthly income from NTFPs collection of a female headed household is greater than others by 7 percent, shown by the coefficient value of 0.07.

Income

The estimated coefficient for household's total monthly income is positive and statistically significant. The estimated coefficient shows that relative share of NTFPs in household's total monthly income which is around 2 percent and is equal to the coefficient value of the income variable. The findings of the study are favoured by Rodríguez (2007) as it showed a positive and significant relationship for income from other sources with income from NTFPs. The finding of Heubach *et al.* (2011) were also conquered inversely by this study. The income from other sources rather than income from NTFPs was considered as a secondary source of income among the sampled respondents. Therefore, the share of income by NTFPs showed prevailing effect on the livelihood of the sampled respondents and the income from other sources contributed as a secondary portion to the income from NTFPs.

Home location

The estimated coefficients for all area variables are negative and statistically significant at 10 percent level of significance. It indicates that the household's income from NTFPs collection in Mankial, which is the base category, is comparatively high.

Land size

The estimated coefficient for land size is negative and statistically significant which reveals that land size has a strong negative effect on household's income from NTFPs. A dispute was found among this study and the finding by Suleiman *et al.* (2017) as their result was statistically non-significant. Adongo *et al.* (2019) agreed as their findings revealed a significant but positive relationship between land size and NTFPs' income but this study favored the findings of Heubach *et al.* (2011) and (2014) as it showed a negative and significant relationship with income from NTFPs. which means that firstly local communities would been less dependent on NTFPs if they had better ac-

cess to other livelihood activities such as farming and related activities.

Household size and number of adult male

The estimated coefficient for household size is negative and statistically significant, which reveals that household size has a strong negative effect on household's income from NTFPs. This study conquers the findings of Suleiman *et al.* (2017), where household size has significant correlation with the income from NTFPs.

However, the finding were opposed by Mulenga *et al.* (2011) as his study showed no significant impact of household size upon income from NTFPs. Large families are also more likely to face lower per capita land availability and high dependency ratios for requirements of basic amenities of life It was hypothesized that household size is positively related to income from NTFPs collection.

Number of adult males

Coefficient values for number of adult males is 0.027 with a positive sign and statistically significant. It indicates that at the constant level of all other variables, a 1 unit raise in number of adult males would increase income from NTFPs increases by 2.7 percent. This is because adult men are more directly engaged in the collection and marketing of NTFPs than adult women. This assertion contradicts the findings of Adongo *et al.* (2019), Timko *et al.* (2010), and Heubach *et al.* (2011) where collection of NTFPs was the primary responsibility of adult women (though men and boys also participated). However, Suleiman *et al.* (2017) agreed with these findings with the claim that cultural barriers limit women's participation in NTFP collection from the forest. Their studies therefore hypothesized that men are more likely to gather NTFPs from the forest compared to women. The reason behind this lag in the studies is that it is considered bad for women to leave their homes.

Market access

Market access was used as a dummy variable taking the values of 1 and 0 only (1 if forest to market distance was <=10 kilometres, 0 otherwise). The estimated coefficient value is 0.125 which reveals that household's income from NTFPs collection is 12.5 percent high if forest to market distance is equal to or less than 10 kilometres or if they have access to market.

Conclusions and Recommendations

Diverse livelihood activities are carried out by the people living in the study area. These activities include farming, livestock, and forest product collection. In addition, people also rely upon the limited own farm tree. Based on the results of the study, it is evident that various NTFP's determinants contributed significantly to household's income. However, the contribution of various NTFP's determinants regarding households' income is found different in the study area. NTFP's has shown negative impact on household income in **a**reas such as Sakhra, Chail and Landi Ghari. Whereas, it has a positive and significant impact upon households' income in Mankial. Moreover, different education levels except primary as compared to illiteracy level have shown significant impact on households' income. Similarly, determinants like total income and number of adult males in a house has significant effect on income from NTFPs. Farming land size as well as household size showed inverse relation. Remaining various socio economic factors were found non-significant and showed no role in income generation by NTFPs. The study recommends that opportunities must be provided to the rural population in order to gather controlled access to resources (NTFPs) and convert them into marketable products for continuing their source of income as a safety net for rural households. The rural residents should be educated about the continued availability of NTFPs depends largely on the integrity of the forests. Due to lack of alternative employment opportunities, small amount of cash earning by NTFPs is of great importance. Therefore, capacity building of the community in terms of technical trainings, preliminary processing, financial support, storage facilities and knowledge of legal requirements can help to improve the bargaining power of the local NTFPs collectors.

Novelty Statement

The research study in hands is a unique itself; so far there is no research conducted regarding NTFPs in Swat valley except on medicinal plants. Therefore, this research is pleasant contribution that will help promoting NTFPs and its economic benefits to the local community.

Author's Contribution

Ibrarul-Haq: PhD. Scholar who did research, data collection and wrote first draft of the manuscript.
Malik Muhammad Shafi: Major supervisor who provided technical guidelines and proofreading of the manuscript.

Conflict of interest
The authors have declared no conflict of interest.

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