

# MOUNTAIN COMMUNITIES' HOUSEHOLDS DEPENDENCY ON PROVISIONING FOREST ECOSYSTEM SERVICES: THE CASE OF UKRAINIAN CARPATHIANS

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**Abstract:** *The concept of ecosystems services used as a model for linking the functioning of forest ecosystems and producing of services to of rural communities well-being in mountain areas. Understanding this link is considered as a critical component for a decision-making in forest management and planning rural territories development. The forests of Ukraine provide important provisioning ecosystem services in terms of wood and non-wood forest products. The collection of non-timber forest products traditionally provides income for rural communities and recreational activities for urban population. In the article attention is given to current status of rural communities' dependence on provisioning forest ecosystem services, which are represented by collecting multiple timber and non-timber forest products. The study field data are collected through quantitative survey of households' representatives which was based on the calculation of their total budget and the share of family income from the forest. Through focus groups survey the information was collected about provisioning services which are most important for local communities (timber products, food products, other forage from the forest, etc.). In terms of non-wood forest products the most prominent are wild berries, mushrooms and birch sap. The challenges which mountain communities are facing because of their dependence on provisioning forest services are also discussed.*

**Keywords:** *ecosystem services, forest related income, forest dependency, rural communities.*

## 1. Introduction

Forest ecosystems play a crucial role in maintaining the ecological sustainability

and the human well-being. There are a lot of people in the world, who has a high level of forest ecosystem services dependency. Forests are the main source

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of livelihood for 350 million inhabitants of forest areas [22]. Forest ecosystem services (FES) are necessary for the sustenance of mankind. Nowadays, they are heavily impacted because of man through economic growth, population growth and climate change [23].

Millennium Ecosystem Assessment [11] ecosystem services classification is used in the study. It classifies ecosystem services by dividing them into such groups: supporting (nutrient cycling, soil formation etc.), provisioning (food, fuel etc.), regulating (climate regulation, water regulation etc.), and cultural (emotional, educational, spiritual, etc.) services. Forests provide us with all kinds of them, at least to a certain limit [8] but the subject of this study is focused on provisioning forest ecosystem services role.

The aims of our article are: to determine the level of dependence of the local population on the provisioning forest ecosystem services in the Ukrainian Carpathians; to compare it with similar studies in different countries; to detail the peculiarities of consumption of forest ecosystem services in Transcarpathia; to describe the specifics of the dependence of local population on the forests

In our view, provisioning forest ecosystem services are very important for rural mountain communities, but not decisive. It is this hypothesis we will try to prove (or refute) in this article.

Provisioning forest ecosystem services considered as important source of income for many local communities. The share of local inhabitants' household income from the forest is very different in different countries.

The synthesis report on the assessment of environmental income of the poor people was prepared by the World Bank

study [14]. The data collected for the study of the Center for International Forestry Research (CIFOR) covering 24 countries from the following regions: Sub-Saharan Africa, South and East Asia, and Latin America. The study was conducted in 333 villages, 7978 households. The researchers calculated the share of revenue from non-forest environment and from forests in total income separately. According to the survey the share of forest income in total income is 27% for the Latin America and Caribbean, 19% for the East Asia and Pacific, 16% for the Sub-Saharan Africa and 12% for the South Asia. Also in this study, has been calculated a share of income from the forest for the poorest people (by division into quintile groups), which is 22% for the Latin America and Caribbean, 21% for South Asia, 18% for poorest people from Sub-Saharan Africa and 17 % respectively to East Asia and Pacific. Forest revenue include resources from natural forests only, excluding plantations and presented products such as timber, firewood, wild fruits and vegetables and fish.

The study of the dependence of local people on the forest in Chitwan, Nepal, [17] found that most of Nepal's forests are a source of fuel wood and fodder for animals (82 respondents out of a hundred are constantly using wood as a fuel, and 81% harvested for livestock feed in the forests).

Among modern studies of ecosystem services relating to forest ecosystems, some of them are focused on non-timber forest products (NTFP) as provisioning services [4, 19], tree saps [20].

In the study of Stryamets et al., 2012 [19], 100% of respondents in Roztochya highly forested area of the west region of Ukraine gather wild berries. The most popular among them are blueberries

(*Vaccinium myrtillus* L). Also, most respondents collect mushrooms, the most popular of them are porcini (*Boletus edulis* Bull.). Knowledge of how to collect is transferred from the older generation to the younger. Medicinal plants and birch sap are also popular in Ukraine. Like in our study respondents collect main part of NTFPs for their own needs and smaller portion for sale. In Sweden, according to this same study, 80% of respondents collect berries (blueberries and cranberries most often). They collect mushrooms, but not often. Swedish rural population does not collect medicinal plants but forests are very often used for recreation in Sweden.

For the Ukrainian local rural communities the most important product from the forests is NTFPs. Wild berries and mushrooms are not only a source of food and multiple needs of households but also real money. Realization of berries and mushrooms is simple for local communities. In most cases, such products can be sold in the village, though a bit cheaper than at the market. Fuel wood is necessary for survival (most part of forest communities are not gasified, but fuel wood occupy a place in the expenditure of households [24]. In Ukraine, recreational forest ecosystem services are very important for such stakeholders as urban residents and representatives of environmental NGOs. For local people recreational services are at the second place after the forest products (mushrooms, berries, etc.) which called "local values" in the study of Zahvoyska and Bas, 2013 [23].

The non-timber forest plants origin resources are very diverse in species composition and character of the use. 1315 wild medical-technical and food species of

plants grows in the forests of Ukraine. They includes food, medicines, honey, technical and other commercial use groups of plants and edible types of mushrooms, etc. The value of these resources in certain categories of forests exceeds the value of the wood. But the data about stocks and territorial location of most types of plants and mushrooms medical- technical of use types is not systemized because detailed accounting it is not practiced under the forest inventory [16].

## 2. Forestry Sector in Ukraine

The forest area of Ukraine is unevenly distributed between four distinct temperate regions: the Carpathian mountain forests, the northern forests (Polissia), the forest steppe and the steppe zone. The dry mountain forests of the Crimea tend towards Mediterranean climatic conditions and are often classified as a separate forest region. Forests dominate the landscapes of the four oblasts that make up the Ukraine's Carpathian Mountains (Lviv, Ivano-Frankivs'k, Chernivtsi, and Zakarpats'ka oblast (Transcarpathia). The Carpathians, covering only 4 % of the country's territory, produce a third of the forest resources of Ukraine and occupy 53.5 % of this region. The location of the Carpathian mountain forests has global environmental significance for the densely populated and highly urbanized landscapes. The biodiversity of the Carpathians is unique, rich, and threatened. Forest land users in the Ukrainian Carpathians are: state forest enterprises; local communities; nature protected areas, tourism enterprises, agricultural enterprises etc. [18].

The area of Ukrainian forest (lands designated to forestry) is 10.87 million ha. The forest cover is 15.7%. It varies from 3.7% in Zaporizhzhya and Mykolaiv provinces through to 51.4% in Transcarpathia. Total wood growing stock is 1.8 billion m<sup>3</sup> and the average annual wood increment – 4 m<sup>3</sup>/ha.

Ukraine has long historical traditions, rich experiences and capacity in forest management. Due to the heterogeneity of climatic conditions, differences in historic development and characteristics of economic activities in different regions of Ukraine there are different traditions in regard to the forest management.

Nowadays Ukrainian forests are mainly managed by state enterprises which are in public ownership and governed by various ministries and agencies. The majority of forests (66% of the country's forests) are managed by the enterprise of the State Forest Resource Agency.

Collection of all non-timber forest resources is free of charge. People do not need permission to collect mushrooms and berries for their own needs. According to the law, if people need firewood or wood – they should pay for it to the forest enterprises which should receive a permit – a special ticket for fulfilment of every tree harvesting operation. According to [FAO \(2012\)](#), collection of non-wood forest products for own consumption is an important activity of the local population in the Ukraine and include resins, Christmas trees, wild fruits and berries, and birch sap. In 2017 among the main organic products (in volume), which were exported by Organic Standard (leading organic certification body in Ukraine) clients from Ukraine, were non-timber forest resources: blueberries (frozen), elderberry (fruit), birch sap, sea buckthorn

(frozen), blackberry (frozen), wild rose (frozen), elderberry flower (frozen), strawberry (frozen), cranberry (frozen), hawthorn (frozen), cranberries (frozen), raspberries (frozen) [21].

There is a need in Ukraine to conduct forest research, train foresters, and raise public awareness about the values of traditional natural resource uses [1].

### **3. Materials and Methods**

#### **3.1. Methodology**

The method of research - a quantitative survey of households' representatives, which was based on the calculation of the total budget and the share of family income from the forest. The similar study was conducted in seven countries in Eastern Europe. The common methodology for all seven countries in this survey was used. This methodology based on elements of the World Bank Living Standards Measurement Survey, and the CIFOR Poverty Environment Network, a regionally adapted quantitative survey was developed to systematically account household income for the preceding 12 months [5].

In Ukraine 150 interviews were conducted in six villages (two villages per each region). Also focus group surveys were conducted in each community. Using the format of discussion, local populations identified most important product from the forest for them, also were determined seasonal calendar for each communities and important information about each village (markets, infrastructure etc.) [5, 24]. In this article we analyze the results of research in the Carpathian Mountains' region. The information which was collected for in each household is presented in Table 1.

*Sections of Household survey [5]*

Table 1

Section	Title	Content
	Control information	Identification of who and when interview took place, data entered, checked, as well as village/household coding
1A	Basic information on household members	Relation to HH head, gender, age in years, years of education, principal and secondary occupation of members $\geq 16$ yrs
1B	Identification of principal respondent	Who was interviewed
2A	Land assets	Land controlled, not controlled by household, plus open access land
2B	Other assets	Ownership of households in and outside community, ownership, quantity and age of various household assets
3	Forest resource base and Ecosystem Services	Distance to forest, planting of woodlots and purpose, perception of ecosystem services
4A	Forest and Environmental Income	For each product collected: who, quantity, unit, quantity for own use, quantity for sale, average unit price, cost of marketing and other inputs, and total forest/environmental income
4B	Fuel wood consumption	Quantity consumed and price per unit
5A	Agricultural income	For each product: total production, unit, quantity for own use, quantity for sale, unit, unit price, total agricultural income
5B	Agricultural inputs	For each input: quantity, unit, unit price and total agricultural cost
6A	Livestock assets and income	For each animal: initial quantity 1 year ago, quantity sold and own use (both which are used to calculate household's livestock income), quantity lost, quantity bought, and quantity new from own stock, final number, price per animal, and total value of livestock assets.
6B	Animal product income	For each product/service: quantity produced, quantity for own use, quantity sold, unit price, and total animal income.
6C	Livestock and animal inputs	For each input: quantity, unit, price per unit and total cost
7	Wage income	For each household member: type of work, days worked in past month, daily wage rate, total income
8	Business income	For each business: business type, gross income, purchased and own inputs, hired labour, transport, marketing and other costs, and net income
9	Other income	For each income source: total amount received over past year

Through focus groups survey the information was collected about most important for villager's forest products for each product category (timber product, food from the forest, other forage from

the forest etc.). The information about how has availability of the most important products changed (declined or increased) over the past 5 years and the reasons of changes if it happened were found from

the local population. Also, information was gathered about seasonal calendar (main agricultural harvest and planting seasons), infrastructure and markets (access to electricity, gas, running water, distance to the market); Salaries and commodity prices; and units and pricing for each local unit. Also, information received on whether has the village (as a community or individuals in the village) received any direct benefits (in kind or in cash) related to forest services over the past 12 months.

Interviewers used local market prices in calculating products values. If the goods, neither bought nor sold, such as fuel wood, the price was determined by willingness to pay. All the data was collected over the past 12 months. The collected data was converted into USD using Purchasing Power Parity (PPP). PPP for Ukraine is 3.21, according to World Bank 2013 [13] conversion factors. Training for all working group was organized before the survey. The working team included national consultants from each country and one regional consultant. Each national consultant works with team of enumerators in the own country. During the period May - August 2014 field studies were fulfilled. The results of the investigations were presented on the consultants' workshop in September 2014.

The analysis takes into account adult equivalents. All data corrected for this indicator: 1.0 for the first adult member in the household, 0.5 for every other adult and 0.3 for children younger than, 14 years old [5].

All data was checked and specified during the survey process. After collecting data, the information has been converted into special codes. Then national consultants compiled the Microsoft Access database which was the source for national reports. Then the data from the database was imported into the Microsoft Excel. Then all the data was processed in Microsoft Excel.

### **3.2. Case Study Area**

The study in Ukraine was carried out in three highly forested regions including the Transcarpathian administrative region which belongs to the mountain zone of the Ukrainian Carpathians. It is one of the most forested regions of Ukraine. Forest cover on this territory makes 51.4%. The study region is the one of the main suppliers of forest non-timber products (especially, mushrooms and berries) to the markets in the Western Ukraine. Survey area we can see on the map of Ukraine on the Figure 1. The level of the local communities' well-being is low in this region. 50 interviews (one interview per one household) were conducted in the case study area (CSA, Velykobereznianskyi district, villages Zahorb and Strychava). There are 186 households in Zahorb (but 25 of them are abandoned) and 68 households in Strychava (16 of them abandoned). Respectively, 30 and 20 households were interviewed in the villages. The survey in focus-groups was held in each village as well.



**Fig. 1.** Survey area location on the western border of Ukraine

There is electricity in two villages. The gas supply and central water supply system is not available in this region. The official unemployment level after the methodology of the International Labor Organization (ILO) in Transcarpathian region is 8,2% [25]. The process of migration abroad is observed in two villages of CSA. The typical seasonal migration aimed to work abroad is mostly directed to Poland, to Slovakia and the Czech Republic and also to other regions of Ukraine. The predominant work type abroad is: seasonal agricultural (men and women), construction (men), service sector (women).

According to the data of the Ministry of Social Policy of Ukraine [26] the poverty datum line in Ukraine in 2013 made 24,7%. In Transcarpathian region – 20,6%.

The core economic activity in the CSA is the work at own private household. Now most of people in rural area are working on their own plots of land. These plots are used mostly for making hay for cows and horses, growing potatoes and many other vegetables, production of wheat and oat. Agriculture in mountainous regions like “Transcarpathia” is underdeveloped, because of terrain conditions and low fertility. The Transcarpathian region is the regions with the high forest cover, that’s why people go to the forest to pick mushrooms, berries and other resources. They collect it both for further sale and for their own needs also. For some people non-wood forest resources are very significant source of income.

Land use in Ukraine is subject to the law and regulations depend on the category of

land. The peculiarities of forest land use are defined in the Forest Code of Ukraine (2006) [10], of lands of agricultural designation usage defined in the Land Code (2006).

#### 4. Results and Discussions

Provisioning forest ecosystem services are important for local rural Transcarpathia's populations, as we predicted. However, this dependence is not decisive. Forest income makes up 5.2% of total family income.

The income structure of local inhabitants in case study area, including forest related income is following (Figure 2):

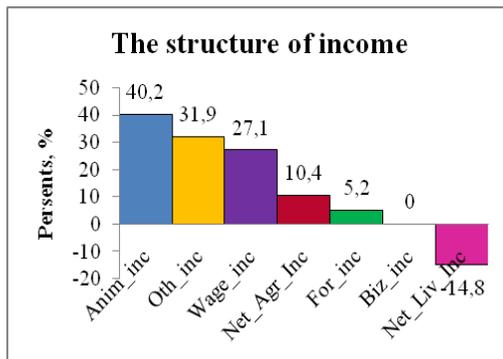


Fig. 2. Income shares by source in Transcarpathia region, %

Stockbreeding related income is the most important source of income (40.2%), which includes such products as meat, cottage cheese, sour cream, milk and eggs. So called "other income" is on the second place, which consists mainly from pensions and other forms of governmental support (scholarships for students, maternity allowance and support to families with more than two children) and remittances that are sent by relatives working outside of Ukraine to the households. The third by importance

source of income is wage income. This is because many people who live in these regions and cannot find employment in their locations, work abroad on seasonal jobs or in the construction and service industries, bringing home over 50% of wage income. High level of labour migration is typical for mountain villages in Transcarpathia. The most common local professions in these communities are teacher and salesperson, but it is clear that number of such jobs is limited. The next is agricultural income from farming (10.4%), coming mostly from such activities as growing vegetables and fruits (potatoes, beans, apples). The share of forest income is not high (5.2%). It is on the fifth place only. But this 5.2% of revenue is a common average unit, the share of forest income for some families is over 59%. Net livestock income is very negative because households that own livestock derive very little cash income from it.

We met the following indicators among such studies in the world, where the share of forest incomes in the family budget is determined. The highest level of dependency on the services that local people receive from the forests or wildlife is in African countries. For example, scientists say that the shares of income from forest ecosystems in total household income is 38% respectively in Ghana [3]. The income structure of the local population in Ghana is the following: 60% of family income residents receive from agriculture, 38% from the forest and 2% is off-farm income. Such resources as wild animals like snail, bush meat, wild honey and wild and cultivated vegetables are most important for local people of Forest Districts in Ghana.

According to study which was conducted in Gonarezhou National Park, Zimbabwe,

the share of environmental revenue in total income for local rural households is 28.7% and is the second after the farm income. In this case, the components of environmental income consist of environmental based labor income, wildlife income, environmental income (without wildlife) [15].

The scientists who conducted a study in Brazil, the State of Amazonas gave the following results: the share of forest income including fishing is 30% of the total average households' income within the natural reserve and 17% for residents of the buffer zone [6].

The most common forest product by value is blueberries (43%). The structure of forest revenue for the various types of products is shown in Figure 3.

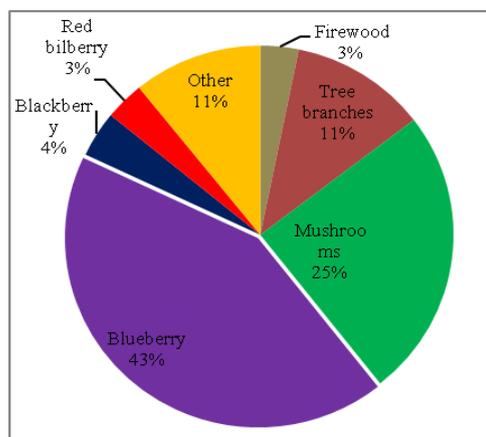


Fig. 3. *Most common forest product by value in Transcarpathia, %*

Blueberries are the most popular plant collected by the local population in the forests. Let's dwell on the peculiarities of harvesting, consumption and sale of these plants. Blueberries are collected for sale and for eating (making jam, freezing for future use, drying in small quantities, in baking, and consuming fresh berries in summer) and also as gifts. The price for

blueberries was from 18-20 UAH to 30 UAH per litter in 2014. Women and older children are the main categories of collectors. There are many areas which are popular places for blueberries harvesting in the region but in some parts of the Ukrainian Carpathians big amounts of blueberries are harvested.

In Transcarpathia, blueberries are harvested on the tops of the Mounts Cheremkha and Stinka. The villages, investigated by us, are located near the border with Slovakia, therefore peasants often organize groups of collectors, and after receiving the permission from border guards go to gather berries on the zone between two neighboring borders. Figures 4 and 5 show the Mount Cheremkha with indicated blue fields on it, where the berries are gathered by the inhabitants of the nearby villages. The distance from villages to gathering points is 7-9 km. The most experienced collectors bring about 40 litters of berries one time. This kind of earnings is difficult for the local population. According to the local residents, it is the most difficult to go down with the load from the top of the mount and get home, so every person collects as much as he can bring home.

There is another peculiarity of the use of blueberries in the Ukrainian Carpathians (like in Polissia): in villages there are often reception (procurement) points and buy these berries from the population for further processing, or, more frequently, for sale abroad. For example, Transcarpathian blueberries are bought by the company "HIPPI", the manufacturer of baby food, which testifies to the high quality of berries. Bilberries are sold also on the border with Slovakia (Figure 6).



Fig. 4. *Top of the Mount Cheremkha, place of collection*



Fig. 5. *The Mount Cheremkha, place of collection*



Fig. 6. *Place of berries sale*

Some collectors prefer selling blueberries and even not conserve or freeze blueberries for their own needs any more. After all, the incomes from the sale of blueberries are real money, which are often the only cash inflows for unemployed families.

Mushrooms are the second (25%) common forest product by value in Transcarpathia. In most cases this is porcini (*Boletus Edulis* L). Mushrooms are collected for sale, family consumption (to cook mushroom dishes, to dry and freeze for winter season) and also as gifts (dried mushrooms at Christmas time). This is a very popular forest product throughout all of the Carpathians. For some families, mushrooms are the most important source of income. In contrast to berries mostly men collect mushrooms.

That is, the income from the collection and sale of mushrooms is on second place after blueberries. Although mushrooms are harvested often. The share of

respondents who gather mushrooms in the last year (at the time of the study) is 72%. Other studies confirm this. For example, in one study, 98% of respondents collect mushrooms in Ukraine, Roztochia [19].

Dependence on mushrooms and berries is stable. Even if the level of villagers' income increases, they will not refuse this part of their total income. Mushrooms and berries are a traditional food staple and also a commodity that is always in demand at the market. Forest income in the annual income is lower than agricultural income, but by the time spent, the former is a kind of quick income. People receive more income from other sources, but they invest much more time and effort into, for example, agriculture or wage. Non-timber forest income is a seasonal income, in our case.

The key factor that influences community forest dependence is the availability of resources. If there are berries and

mushrooms, the villagers will collect them, regardless of their level of income.

Other forest products include: blackberries (4%), red bilberries (3%), firewood (3%), wild strawberries (2%), reindeer lichen (2%), Christmas tree (1.8%), birch sap (1.4%), birch tree branches for wicker broom (1.1%), filbert nuts (*Corylus avellana* L.) (1.4%), raspberry (0.9%) and medicinal plants (0.3%).

Collecting of wild mushrooms, berries and other fruits is popular in many countries around the world. For example, collecting indigenous fruits for sale are an important part of the income of local population in Kenya. Proceeds from the sale of fruits such as baobab, tamarind and chocolate berries are an important addition to the financial needs of households. Some households depend on collection of these fruits almost exclusively, especially in areas with long droughts [12].

The forest products are used primarily for filling gaps in family budgets. Forest income is very important for big families. During the collection season a family earns enough on berries and mushrooms to buy what is basically needed for children to go to school (clothes, shoes, books, and stationary).

Fuel wood is an essential product for survival. In the communities where there is no gas heating opportunity, people use fuel wood for heating and cooking, because they do not have an alternative - coal and liquefied natural gas are very expensive. They sometimes use liquefied natural gas in summer for coking, but this accounts for a very small percent. As it was mentioned above, Transcarpathians lack gas supply for heating in rural remote areas. Generally, in the Ukrainian Carpathians a lot of villages lack natural

gas supply. The share of the total income each villager spends on fuel wood ranging from 4% in Zahorbto 5% in Strychava – in two studied villages.

In most cases firewood is not included in forest income because people cannot take wood from the forest as mushrooms and berries, they have to pay for it. This is a cost for them and not a source of income. Only branches not more than 3 cm in diameter are free. The villagers, harvest illegally firewood, but they were afraid to talk about that. According to experts, 10-15% of villagers harvest firewood from the forest. However, even when they harvest firewood they can do this in some cases by agreement with foresters whom they pay unofficially (less than the official price) or compensate it with some works in forest.

Ukraine is similar in forest dependence with Azerbaijan and Belarus when fuel wood is removed from forest income, reflecting the strict policies around fuel wood extraction and the unwillingness of respondents to provide information on this [5].

The Figures 7 and 8 below show popularly sold and eaten forest products for this region and the comparison of amount of different forest products for own consumption and for sale. The figure 3 shows the comparison of sold and eaten all types of forest products by the population in Transcarpathian region. The figure 4 shows us the comparison of total amount of forest products for own consumption and for sale in Transcarpathians. This is interesting, that mountain communities using forest products for their own use and sold in almost equal amounts.



Fig. 7. Comparison of sold and consumed forest products in Transcarpathia, (total value), USD (PPP)

The share of forest products used for sale and for own consumption is roughly equal: 53% and 47% respectively. This is because more mushrooms are widely consumed in this region (traditionally almost every household collects them). Only blueberries people sell in amount which is two times higher than consumed amount. Many other forest products are used here solely for subsistence (firewood, medicinal plants, wicker brooms, nuts, birch sap and raspberries). This is an indication of a higher forest dependence in this region for some families where a large share of forest

income is used for subsistence (the people need these products; otherwise they would have to buy substitutes).

There is a need to diversify the sources of income. For example, there is a possibility to develop hang-gliding in this village, which would improve the welfare situation of the community. Moreover, this sport does not have a serious impact on the environment.

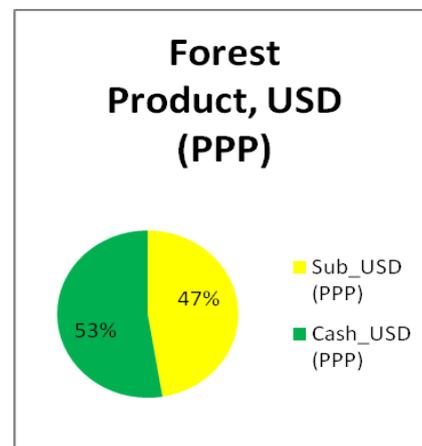


Fig. 8. Cash and subsistence of forest value in Transcarpathia, (total value), USD (PPP)

Arnold and Perez (2001) [4], concluded that non-timber forest resources in tropical forests often are used as additional income and like “economic buffer in hard times”. Often food from the forest and therefore income from it is more important part of income especially for poorer groups of the population. However, this situation occurs not always: the poorer part of the population does not always have the opportunity to obtain the necessary funds, capital or technology to gather these resources. In our study, higher levels of forest dependence are not always typical for poorer populations. This can be explained by the fact that gathering wild berries (blueberries, cranberries) requires

sufficient physical effort. For example, single pensioners who are poorer part of the population do not have enough physical strength to collect berries.

Related forest income per adult equivalent across five quintile groups is shown on Figure 9.

Quintile groups are groups of people in terms of income, where 1 quintile is the poorest and the 5 - richest, respectively.

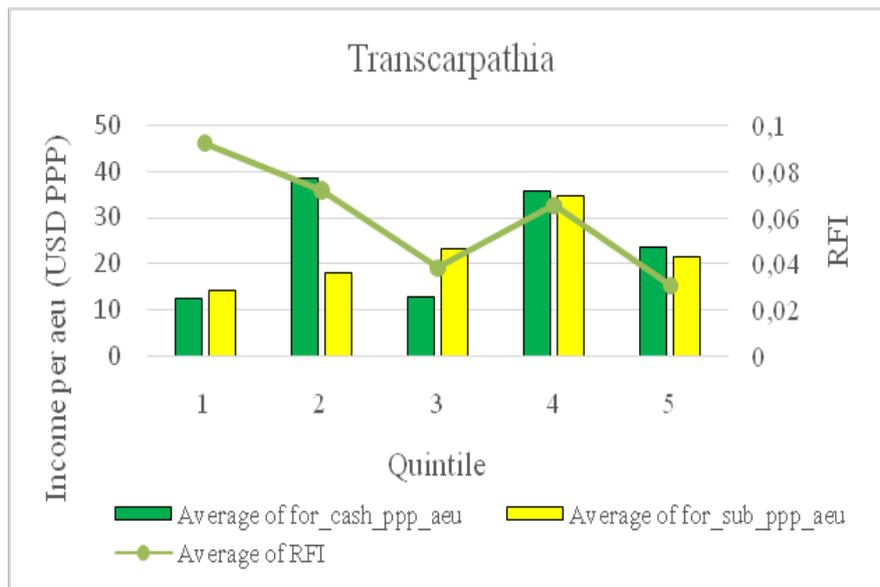


Fig. 9. Forest income over income quintiles in the Transcarpathian region, USD (PPP)

Green line on the graph represent us related forest income (RFI) for each quintile group. As it may be seen in the above graph, all quintiles use forest products for own consumption (subsistence) approximately in equal measure. People traditionally consume large amounts of mushrooms and berries regardless of their level of income. However, quintiles 3, 4 and 5, the wealthier quintiles, consume more. For them forest income is not as important as for the poorer segment which is why they do not spare these products. The poorer are more dependent on forest income – quintile 2 collects a lot of berries and mushrooms for sale. These are large families, in which the children have grown up, which means that the state is no

longer providing assistance. These children do not yet have an income of their own, but do have time to collect berries and mushrooms.

Forest products are sold by each quintile, because in each of them are several households that sell large quantities. Practically all those, who have the time and desire to work, collect berries and mushrooms for sale. The poorer quintile (1) and the average one (3) sells less. The smaller share of income from forest products falls to quintile 3, because most of the people in this group have permanent jobs in their regions, qualifying them in the middle-income class. However, they do not have time to go to the forest.

## 5. Conclusions

Provisioning forest ecosystem services are very important for rural mountain communities.

The key factor that influences community forest dependence is the availability of NTFPs. If there are berries and mushrooms, the villagers will collect them, regardless of their level of income. Forest-related products contribute 5.2% to an average household income. Forest income is an important additional income. This is the only chance to get real money if families do not have alternative cash revenues.

Blueberries (43%) and mushrooms (25%) are the source for the main part of the households' revenue from forest. Villagers collect them both for sale and for own consumption. Mushrooms and berries are the traditional way of earning for the local population.

NTFPs are in demand and they may be sold at the market or acquired by procurement centers in villages. In Ukraine, a lot of mushrooms and berries are traditionally consumed and they are an important source of seasonal income.

Forest products (firewood, berries, mushrooms), agricultural products and animal products are vital products for local populations. Firewood is used for heating and cooking. It is a vital resource for many communities.

In the Transcarpathia region where there is no gas supply for heating, the use of firewood will remain stable. Dependence on mushrooms and berries is also stable; even if the villagers' income will increase, they will not refuse this share of income in their total income. Mushrooms and berries are a traditional food staple and also a commodity that is always in demand at the market. Forest

income in the annual income is smaller than agricultural income, but by the time spent, the former is a quick income. People receive more income from other sources, but they invest much more time and effort into, for example, agriculture. The study also identified many problems with harvests involving both timber and non-timber crops. Also, the respondents noted reduced forest cover from both legal and illegal logging, overharvesting (especially from outsiders coming to the forest to cash-in on lucrative berries and mushrooms), and some destructive harvesting techniques that increase the volumes of short-term harvests but hinder regrowth. They also blamed climate change for reducing forest cover, drying wetlands, increasing disease, and for changing the distributions of forest products like mushrooms and cranberries. The amount of blueberries may change in Transcarpathians because of climate change, which will, in turn, lead to a loss of this part of income. There is a high probability that in this case the villagers will collect blueberries in other regions.

The facts that NTFPs as provisioning ecosystem services continue to be an important component of communities' lifestyle is explained not only by their economic dependency from these products but also by cultural and religious traditions. To achieve a sustainable harvesting, pertinent scientific information and governmental regulation are necessary [9]. There is a need to develop policies on mountain rural communities capacity building towards diversification the sources of forest dependent communities' income to avoid their possible social problems and as consequence threatening of fragile mountain forest ecosystems.

### Acknowledgments

The authors gratefully acknowledge the study done by the IUCN experts as part of activities conducted in countries of South Caucasus (Armenia, Azerbaijan and Georgia) and Eastern Europe (Belarus, Moldova, Ukraine) and Russia in the framework of the ENPI-East FLEG II Program funded by the European Commission.

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