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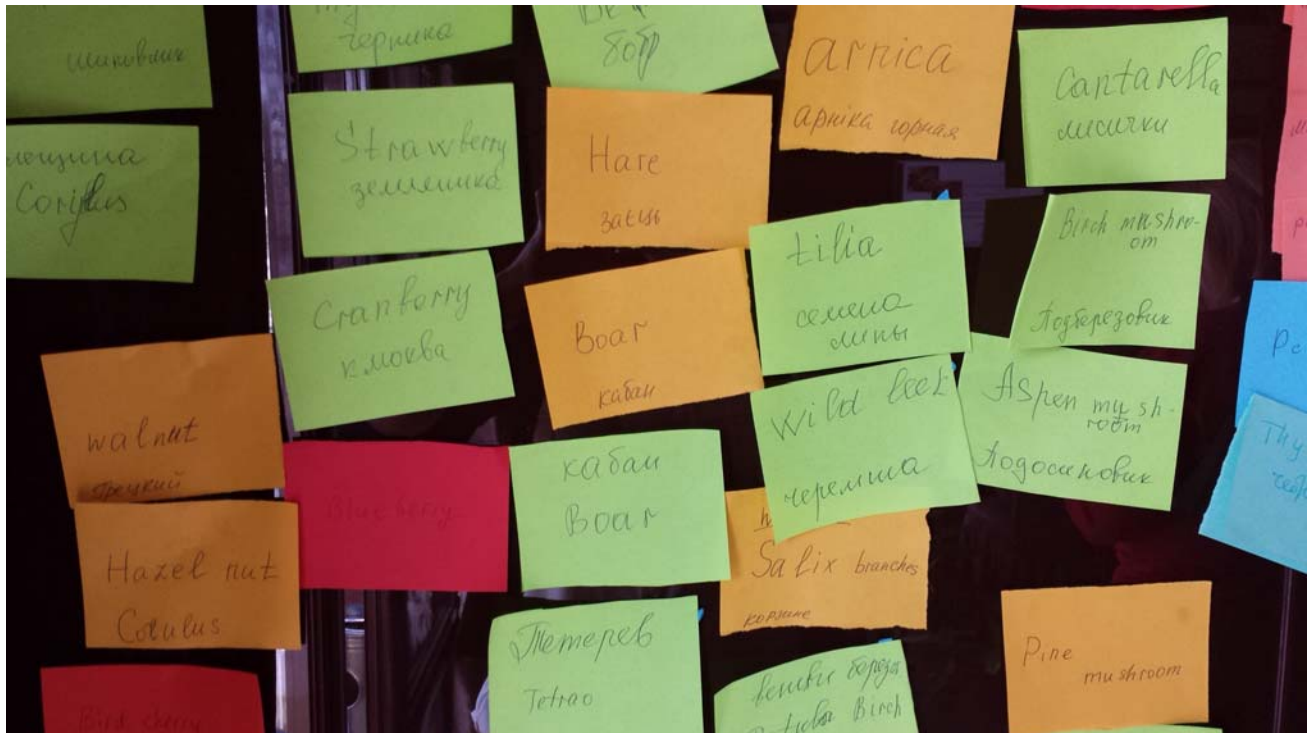


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Regional analysis of forest product use and dependence amongst rural households in South Caucasus, Eastern Europe and Russia

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ABBREVIATIONS AND ACRONYMS

aeu	adult equivalent unit
Altai	Altaisky region, central Siberia
CIFOR	Center for International Forestry Research
ENPI-FLEG	European Neighbourhood Partnership Instrument Forest Law Enforcement and Governance
FLR	Forest Landscape Restoration
IUCN	International Union for the Conservation of Nature
NWR	North-west Russia
RFE	Russian Far East
RFI	Relative Forest Income
USD PPP	United States dollar Purchasing Power Parity

1. Introduction

An estimated 1.6 billion people are dependent to some degree on forests for their livelihoods, of which 350 million to a high degree for their subsistence or income (World Bank 2004). Environmental products – i.e. products from non-cultivated ecosystems such as natural forests, woodlands, wetlands, lakes, rivers, and grasslands – can be a significant income source for rural households providing energy, food, construction and medicines both for subsistence and cash uses. This has come to be known as the ‘hidden harvest’ (Campbell and Luckert 2002). In a pioneer study in Zimbabwe, Cavendish (2000) conducted a panel study developing a full household income account of 197 households finding that environmental income contributes on average over 35% to average total household incomes. Other early case studies in developing countries went on to demonstrate the importance of environmental incomes - in Malawi, Fisher (2004) found forest income to contribute 30% of total household incomes, where Mamo et al (2007) in Ethiopia found this to be 39%. In contrast, Ambrose-Oji (2003) in Cameroon found forest resources to contribute between 6-15%ⁱ. A recent global study by CIFOR compiling data from over 34 study sites in mainly tropical forest regions has estimated forest and environmental income as contributing 28% to total household incomes (Angelsen et al 2014).

So why are forests and the environment so important to rural households? Non-timber forest products (NTFPs) have been characterized as often bulky, low value to weight, and need little skill to harvest. Furthermore, forest products are characteristically quite extensively spread in remote areas, where access is relatively easy (or weakly regulated) (Angelsen and Wunder 2003). By their very characteristics, forest products are attractive to the poorer segments of the population and represent both a dependable source of subsistence food and fiber, as well as a source of quick income (e.g. de Merode et al 2004, Vedeld et al 2004). Byron and Arnold (1999) presented a typology of forest-people dependencies, which Angelsen and Wunder (2003) further conceptualized into three main roles of forests in rural livelihoods:

1. Seasonal gap-fillers and supporting current consumption – in lean seasons, forests could provide a reliable source of food, as well as materials for energy and construction. These functions could be particularly important in predictable periods of food or income shortfall, such as pre-harvest.
2. Safety nets – households could turn to forests products to earn quick cash or for subsistence use in response to covariate and idiosyncratic shocks.
3. Pathways out of poverty – households could use the collection and sale of forest products to

accumulate wealth. Although some cases have been documented where forest products contribute to asset accumulation (e.g. Belcher et al 2005), there is still no consensus on this as the very characteristics of forest products that make them attractive to the poorer households limit their potential for accumulation.

Nevertheless, systematic comparisons of human dependence on forests and environment have been challenging due to methodological differences between what are essentially case studies. As a result, the true value of forests and other environmental products is not captured in GDP measurements and much debate about forests potential to achieve significant poverty alleviation, as the quantitative contribution of forests is not well-documented (Dasgupta 1993, Oksanen et al. 2003, FAO 2006). Thus using a standard methodology can assist in consistently measuring the role of forests and environment in household income and poverty alleviation, and efforts are underway to systematize the capture of environmental resource use in nationwide (e.g. Living Standards Measurement Surveys) and global surveys (e.g. CIFOR Poverty Environment Network).

2. Project background

2.1 ENPI FLEG II Forest Dependency

The regional program “Improving Forest Law Enforcement and Governance in the European Neighborhood Policy East Countries and Russia” is aimed at putting in place improved forest governance arrangements through the effective implementation of the main priorities set out in the St. Petersburg Ministerial Declaration and Indicative Plan of Actions for the Europe and North Asia Forest Law Enforcement and Governance (ENA-FLEG) process.

This Program specifically covers six members of the European Neighborhood Policy Instrument (ENPI) – Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine - and the Russian Federation. Supported by the European Commission and other donors, the program is implemented by World Bank, the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wide Fund for Nature (WWF).

In this regional activity, the aim is to define the real value of forests as there is lack of information to quantify a true value of fully-functioning forest for rural communities. Today, the value of forest products and services other than timber is apparent. The total value that was reported for non-wood goods reaches almost EUR 2 763 million for the entire FOREST EUROPE region, of which EUR 2 116 million are marketed plant products and EUR 648 million are marketed animal

products. The concept of sustainable forest management has needed to encompass the contribution of forests to livelihoods of rural communities in this region (Forest Europe et al 2011). For example, fuelwood is an essential resource on which household survival depends in this region as it is a primary source for heating and energy particularly during the harsh winters. However, there is a critical gap in knowledge on the value of this product along with other forest and environmental products to households and their contribution to household incomes in rural areas in these countries.

Recognizing that commercial forested areas no longer dominate most of the ENPI East Region landscapes, and that land use has dramatically decreased the availability of forest goods and services, forest landscape restoration (FLR) focuses on restoring forest functionality. This means accounting for and either restoring or maintaining (or both) the goods, services and ecological processes that forests can provide at the broader landscape level. FLR is an approach that seeks to put in place forest-based assets that are good for both people and the environment. It incorporates a number of existing rural development, conservation and rational natural resource management principles and works to restore multiple forest functions to degraded landscapes. Analyses of forest functionality seek to describe the interaction of humans and their tenuous relationship with their natural resource base.

2.2 Objective and hypotheses

The objective of this study is to quantify the relationship between rural communities and the natural resource base around them. Through the implementation of a common methodology adjusted to the region, the study aims to measure the true value of fully-functioning forest to rural communities and thereby generate quantitative results that can be used by policy makers to improve forest governance and develop appropriate forest resource policy encompassing the priorities of local communities.

Taking departure in previous literature on environmental resource use amongst rural communities in tropical forest areas, the study sought whether the following trends could be observed in the temperate and boreal forest communities:

- Forest dependence (as measure by Relative Forest incomeⁱⁱ) decreases with total household income - i.e. the richer a household, the less dependent the household is on forest and environmental resourcesⁱⁱⁱ
- Cash from forest products increases with total household income, as households with greater labour and capital resources may better exploit forest resources

Further to this, this report describes the methodology used (Section 3), explains the study area characteristics (Section 4), outlines the main results and implications for sustainability (Section 5). The report concludes with reflections on the methodology and implications for future research (Section 6).

3. Methodology

Quantitative surveys in socio-economic research aim to attribute a value to goods and services used by rural households. They offer the possibility to collect large detailed information in a cost-effective way, and also allow the freedom to be implemented by large teams without significantly affecting the reliability of the answers. Results produced on the other hand offer policymakers numbers against which decisions can be made.

Quantitative methods can therefore provide the vehicle to fully understand the dynamics at play between people and resources use, but at the same time precise description of methods is also needed (Cavendish, 2002).

Using the common 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. The survey components are as follows (Table 1). A community survey was also implemented in each community. Using focus group discussions, community members were asked to qualitatively judge the most important products to their livelihoods and define a seasonal calendar. Other basic community-level information on infrastructure, markets, prices, and units were collected in this survey (Table 2).

Table 1 Sections of Household survey

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 >= 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 environmental 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	Fuelwood 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 ^{iv}
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

Table 2 Sections of Community survey

Section	Title	Content
1	Most Important Product	For each product category, respondents in the village focus group discussion were asked: the most important product for livelihoods of village people, changes and reasons for changes in availability, and suggested actions to increase availability
2	Seasonal calendar	For each month: main harvest, planting and sale periods were recorded for the main forest and environmental products. This calendar also assisted in recalling products in the household survey
3	Infrastructure and markets	For each village: no. of roads, access to electricity, gas and water, and distance of village to markets, other cash/in-kind benefits related to forest services,
4	Salaries and commodity prices	Typical wages for male/female in low/high seasons, main staples and lowest/highest price of 1kg of staple product in lowest/highest season
5	Units and pricing	For each local unit: English term equivalent, metric equivalent, price for local unit, use for what product

The main method of valuing environmental goods was own-reported values, which has the advantage of uncovering the value of the resource to the respondent and household and collecting local prices (Wunder et al 2011, Cavendish, 2002).

However, estimating value can be problematic to rural households who are not used to quantifying amounts of products used let alone give value to them. In cases where products were difficult to value, such as fuelwood for consumption, enumerators were instructed to first ask about the local prices of a unit of fuelwood. If prices were not available or the respondent had difficulty, then barter prices were used- where people were asked how much one unit of fuelwood could be bartered with another traded product. Thirdly, enumerators could choose to ask respondents what they would be willing to pay for a unit of fuelwood (see Annex 3).

Another aspect that affects validity and reliability of the survey data is recall period. Short recall periods (of a week or a month) favour products that are collected frequently (e.g. fuelwood). Long recall favours products that are collected sporadically such as large purchases that may have occurred some time back (Angelsen and Lund 2011). In the IUCN survey, a yearly recall was used, but to avoid omission of important products, a seasonal calendar was filled out during the

community focus group discussion that was designed to help enumerators to ask about the relevant products.

That being said, these types of surveys can be subject to quantification errors or under/over-estimation, which can only be improved through good interview technique, building rapport with respondents and shorter recall periods (i.e. more frequent surveys). Section 6 summarises the issues in the field and post-field that could have influenced validity and reliability of the ENPI -FLEG survey data.

The ENPI-FLEG Forest Dependency team consisted of one regional consultant and seven national consultants - one from each participating country. Survey training took place from 31 March to 2 April 2014 in Chisinau, Moldova (Annex 5 for training presentation). Each national consultant had a team of enumerators who went to the field for implementation of surveys between May and August 2014. September and October was spent mainly for data entry into a specially designed Microsoft Access database and data was cleaned and analysed thereafter.

For purposes of regional analysis, data was converted to USD Purchasing Power Parity (PPP) using the World Bank 2013 conversion factors for private consumption^v.

Country	PPP Conversion factor
1 Armenia	192.53
2 Azerbaijan	0.34
3 Belarus	3333.07
4 Georgia	0.8
5 Moldova	5.76
6 Russia	18.26
7 Ukraine	3.21

For certain analyses data was also converted to adult equivalents, to allow inter-household comparisons (Cavendish, 2002). This was done using the EUROSTAT equivalent scale is 1.0 for the first member of the household; 0.5 for every other adult member; 0.3 for a child under 14 years old.

National consultants were brought together on the 30th September 2014 for a consultant's workshop where preliminary results of the national studies were presented. On 28th October 2014, a regional conference was held to present the main results of the regional study (see Annex 6 for regional presentation).

4. Study area

The forests in the ENPI-FLEG region fall within the northern temperate and boreal forest zones (FAO, 1999). Three of the ENPI countries, Armenia, Azerbaijan and Georgia belong to the Southern Caucasus region which is one of the richest regions in the world for species and race diversity of wild-growing fruits boasting over 260 species of fruit plants (FAO, 2006). Over 90% of the forests of Russia are classified as undisturbed by humans (FAO, 2003), and the forests of Belarus, Ukraine and Moldova also provide a rich variety of products upon which local communities depend. In fact, temperate and boreal forests in this region are a traditional source of forest products not only for timber but also for products such as resin, tannin, fodder, litter, medical plants, fruits, nuts, roots, mushrooms, seeds, honey, ornamentals and exudates (Forest Europe et al 2011). Thus the focus on timber production has increasingly been shifted towards people's use of the forests, and particularly the subsistence use of forest products is becoming apparent (Forest Europe et al, 2011).

The region is unique when compared to other forested regions in the world, as it has undergone a socio-political transformation after the collapse of the socialist state in 1991. Countries in the region experienced various degrees of market reforms, decentralised decision-making and privatization of previously state-owned lands. This led to recession, high unemployment and high poverty especially in rural areas (Tikkanen et al 2003). The difficult rural conditions, marked further by a lack of alternative economic opportunities, has meant that rural populations are diminishing as young people are migrating out and leaving behind an increasingly aging population (e.g Heleniak, 1999, Visser 2010).

One of the major patterns of migration is labour migration to urban areas overseas or between newly independent states, and is encouraged by promises of better living conditions, entrepreneurial aspirations and supported by newfound freedoms of exit and entry (Tishkov et al 2005).

In all seven countries, surveys were conducted in the pre-identified pilot regions. Approximately 150-200 households were surveyed in each country in communities located primarily in the forested regions of the countries, providing a total of 1256 households. In each community, one community survey was implemented together with a key informant and/or village focus group discussion. Communities varied according to selected criteria outlined in Table 3.

Table 3 Sample size and site selection criteria

Country	N	Site selection criteria	No. Villages
Armenia	196	Poverty level and economic development, infrastructure (Gas and not), market distance, population density and migration patterns	6
Azerbaijan	150	Infrastructure and distance to market, village location (Mountain or lowland), standard of living	3
Belarus	200	High forest cover, vary by population density, and vary by proximity to road, plus one nuclear-contaminated site	4
Georgia	200	Distance from the forest and access of local residents to forest resources; Socio-economic conditions of the rural population; The existing infrastructure and the distance of the villages from markets; Population density and migration level.	5
Moldova	150	Representation over three regions, proximate to forests of the region	3
Russia	210	High forest cover, vary by population density	9
Ukraine	150	Representative of three major regions that provide markets of western Ukraine with forest products	6
TOTAL	1256		36

The major characteristics of each country are outlined in Table 4. Of our sample, Russia, Georgia and Belarus have the highest percentages of forest cover (from 39-45%), with Russia clearly the highest in terms of area of forest cover.

4.1 South Caucasus: Armenia, Azerbaijan and Georgia

The South Caucasus is ranked among the planet's 34 most diverse and endangered hotspots by Conservation International, and the 2010 IUCN Red List identifies around 50 species of globally threatened animals in the Caucasus. Over 43% of the land area is covered by priority conservation areas and corridors (Slyven undated), yet half the total population of these three countries live in the rural areas. High migration rates are common in the rural areas, where the majority of the rural population live below the poverty level (Balyan 2014; Figure 1).

Armenia is the least endowed when it comes to forest cover with approximately 0.1ha of forest or wooded land per capita (FAO 2004). Broadleaved species predominate, with the main species being oaks, beech and hornbeam, with some coniferous forest species of pine, yew and juniper. Sixty-two percent of forests are located in the northeast, 36 percent in the southeast, 2 percent in central regions. Throughout history and today Armenians in the mountainous areas depend on forests for necessary fuelwood, construction timber, fodder, non-timber forest products such as berries, fruits, mushrooms and medical herbs (FAO, 2004).

Poverty is also higher in the mountain areas as well as along the national borders and zones susceptible to earthquakes. With the collapse of the Soviet, collective farms were handed back to individual households, but usually in unproductive areas with little technological guidance or transfer. This combined with lack of skills for cultivation has led to severe poverty in these areas and agriculture remains constrained to small subsistence oriented agriculture (IFAD, 2011). Poverty is higher in the rural areas and prevalent among female-headed households (IFAD, 2014). The communities selected for the study were located in the forested and mountainous regions of Armenia: North (Lori Marz), North East (Tavush Marz) and South regions (Syunic Marz), also marked by high poverty (Table 5).

Azerbaijan's forests cover 11.3% of the country's territory, and forests are predominantly broadleaved with some coniferous species. Extraction of NTFPs include collection of wild fruits, game meat, nuts, and medicinal plants. In the last 15 years, Azerbaijan has also experienced economic growth resulting from oil and gas production as well as investments in other sectors. This has led to a reduction in absolute poverty rates from 50 % in 2001 to 7.6% in 2011 (IFAD, 2014). Poor households are characterized by young families in rural, upland or mountainous areas. The study communities were located in Zakatalsky district northwest of Azerbaijan (mountainous), where two thirds of the territory is covered by forests (Table 6).

Georgia's forests cover almost 44 percent (3 million hectares) of Georgia's land area, and is mainly broadleaved. The forests house very high biodiversity, containing more than 4 100 of the

estimated 6 350 species in the entire Caucasus region (FAO, 2003). Wood and timber is very important to the Georgian economy, as are NTFPs that are allowed to be harvested for free. Main products include fruit, berries, nuts, mushrooms, medicinal plants, honey and bark which are important to people and wildlife.

High unemployment and low wages put many urban households into poverty following the soviet collapse. Effects were less pronounced in rural areas where households were provided some level of food security in their own agricultural plots. Nevertheless, the poorest demographic are pensioners with children (70%) but do not exclude single, working-age adults (IFAD, 2014). Indeed, the regional distribution of poverty is mainly in the remote highland or mountainous areas where access to services are minimum. Sampled communities were in the Tianeti Municipality of Mtskheta-Mtianeti Region, among the poorest, and this region was selected due to high land-use and forest resource dependence (Table 8).



Figure 1 Map of South Caucasus study sites

4.2 Belarus, Moldova, and Ukraine

Sandwiched between the EU and Russia, Belarus, Moldova and Ukraine are important corridors for military, transportation and energy linking either side (Hamilton and Mangott, 2007; Figure 2). Compared to the other countries, most of the area consists of plains and lowland with forest being concentrated in the Carpathians and Crimea. In Moldova and Belarus nearly all forests are semi-natural, where in Ukraine half of the forest is semi-natural and half is planted. Radioactive contamination from the Chernobyl disaster in 1986 plague millions of hectares of forest and, given no method of cleaning the contamination, forest access is tightly controlled (FAO, 2003).

Forests in Belarus cover 45 percent of the country's land area, and are largely coniferous forests (Norway Spruce and Scots pine), with some broad-leaved species such as oak, hornbeam and alder. With around 75% available for wood supply, the rest is mainly under conservation and protection under nature reserves (FAO, 2003). The collection of non-timber forest products and hunting are also important to the local population, and contribute to the local economy with several products such as berries and mushrooms being processed locally and exported (FAO 2003).

Belarus has also one of the lowest poverty rates out of all the post-Soviet states, with less than 1% living in extreme poverty (<US\$2 day; UNDP 2012). Gomel Region in the southeast of Belarus with borders to Russia and Ukraine in the south has the highest forest cover percentage, and therefore the sampled communities were selected in this region (Table 7).

The Republic of Moldova is sparsely wooded and forest area accounts for 9.9 percent of the land area, bringing area of forest per capita is only 0.1 ha (FAO 2003). Oak broadleaved forests dominate but their low biological resistance and unfavourable climatic conditions leads to outbreaks of pest infestation and disease. The forest is also important to the local population as a source of non-timber forest products such as nuts, fruits and berries, medical herbs, honey, mushrooms, fodder and forage (FAO, 2003). However Moldova is one of the poorest countries in Europe, and 60% of the population live in rural areas engaging mainly in agriculture. The recent global economic crises has decreased remittance income and increased unemployment amongst returning migrants (IFAD, 2014).

In Moldova, the communities selected for the survey are located in each of the three regions in the North, Central and South. Specifically, Alexandru cel Bun village in the North region is near the forested steppe, Ciorasti village in the Central region is near broadleaved forest (oak) and Borceag village in the South region is near the wet forest in the lower meadow (Table 9). Those types of forests represents the main forest types in the Republic of Moldova.

In the Ukraine, forests cover 16.5% of land area made up of broad-leaved and coniferous species in mixed and steppe forests. Agriculture is widespread and therefore constitutes a large percentage of land cover (FAO, 2003). Nevertheless, collection of non-timber forest products is an important activity of the local population, and includes resins, Christmas trees, wild fruits and berries, and birch sap. Poverty in the country is higher in urban areas, but qualitatively more severe in rural areas. Poor households are characterised by more children and more elderly, and more prevalent in eastern Ukraine (World Bank, 2011). For our study, three regions in Western Ukraine were selected representing diverse forest types. Lviv region in the western part of the country is dominated by plains, the Transcarpathian region in the south-western part of Ukraine is located in the Carpathian mountains, and the Polissia, Rivne region north-western part of Ukraine is also dominated by plains (Table 11).



Figure 2 Map of Moldova, Ukraine and Belarus study sites

4.3 The Russian Federation

Russia accounts for more than one-fifth of the world’s total area of forest (851 million hectares; FAO, 2003). In contrast to other European countries, the area of forest undisturbed^{vi} by humans in the Russian Federation is very extensive, amounting to 749 million hectares of natural old-growth forest, with only 50 million hectares is semi-natural (FAO, 2000). Major forest types are northern boreal forests, with mixed and broadleaved forests to the south, and coniferous species. The Russian forests are also exploited for their wild fruits and berries, nuts and mushrooms, medicinal plants and herbs, honey, fodder and forage, resins, oils and game meats.

Since the Soviet collapse however, the migration trends have reversed from settling the North, Far East and Siberia to an outflow to west and south of the country, with concentrations of older rural populations in Central and northwest and youngest populations in North Caucasus and Siberia (Heller et al 2003).

Given the geographical spread and extensive forest cover in Russia, the survey was conducted in three regions with high forest cover, that represent contrasting geographical conditions, including the position within the country, neighboring countries, landscapes, infrastructure and the population structure. They were placed evenly across the country, Pskov Region in North-West European Russia (NWR), Altaiisky Krai in central Siberia (Altai), and Khabarovskiy Krai in the Russian Far East (RFE; Figure 3, Table 10).



Figure 3 Map of Russian study sites



Table 4 Country characteristics

	Armenia	Azerbaijan	Belarus	Georgia	Moldova	Russia	Ukraine
Forest cover	11.5%	11.8%	39.3%	40%	13%	45%	15.9% (16.5% calculated per terrain without water surface)
Area	351000ha	936000ha	9.48 million ha	3 million ha	450000ha	865 million ha	9.6 million ha
Forest type	Broad-leaved (90%) mainly oak, beech and hornbeam. coniferous (10%)	Mainly broadleaved beech with some coniferous	Coniferous (59.6%), with mainly Norway spruce and Scots pine. Broad-leaved (40.4%)	Broad-leaved (80%) coniferous (20%)	Broad-leaved, mainly <i>Robinia pseudoacacia</i> and Oak	Northern boreal mixed and temperate broad leaved. Coniferous (80%)	Broad-leaved (56%) coniferous (44%)
Forest ownership	state	state	state	State	Mostly state (85%) and municipality (15%), private (0,2%)	state	Mainly state (87.5%), communal (12.4%) and private (negligible)
Forest use	Very limited forest available for wood supply, and limited commercial forestry, with rest inaccessible due to economic reasons. collection of fuelwood, fruits, aromatic and med plants and fodder important	Extraction for wood, and also collection of wild fruits, game meat, and fodder, nuts and med plants	75% for wood supply with rest under conservation. Collection of NTFPs, berries and mushrooms	Use of wood for timber and NTFPs - berries, fruits, mushrooms, nuts.	Circa 90% of harvest is fuelwood and circa 10% is timber. A number of NTFPs, such as game, berries, fruits/nuts etc.	66% available for wood supply and rest inaccessible due to economic reasons. Collection of diverse NTFPs incl. berries wild fruits and game meat.	Big environmental importance of forests. 15.8% of forests belong to nature protection areas. In general, about 50% of forests have various limitations of commercial timber extraction. Other use: Christmas trees, NTFP collection (berries, mushrooms, medical plants), resins and and birch sap



Use rights	Paid use with issue of license, warrant or forest ticket for single use. Collection of NTFPs for personal use permitted.	Paid use for leasing from 1-10yrs with provision that 20% remain forested	Forest use rights obtained for a certain period of time. For wood 1–15 years, or short-term use for < one year. Usage rights also given for collection of NTFPs and hunting.	Paid use of timber forest resources for personal consumption within established limits. Free use of NTFPs for personal purposes	Legal harvest done by Agency Moldsilva or partially through forest lease of standing timber. Hunting and other NTFPs are regulated. Access to forests is granted, except to PAs and for commercial harvest.	New forest code has essentially made it illegal for local population to harvest wood products	Tree cutting without felling ticket is prohibited and punishable. NTFPs can be collected for free for subsistence except in protected areas where it is restricted to certain areas. Commercial NTFP collection is allowed by special ticket.
Main regulation	Forest Code 2005; logging ban since 1996	Forest code (1998)	Forest Code (2000)	Forest Code (1999) National Forest Concept (2013)	Forest Code (1996)	Forest Code of the Russian Federation (2006).	Forest Code (2006), Land Code (2001)
Fuelwood provision from state?	8m3 to forest dependent communities	Some provided by state, but mostly illegal cutting	Fuelwood and timber can be bought from state at subsidized price, up to 4.99 m3 per year, after which fuelwood is sold at a higher price	Can buy permit to cut from state, with limit of 7m3 (in the lowland areas) 15 m3 (in high mountainous areas), Mostly illegal cutting due to poverty	Authorized by Ministry of Environment, Illegal logging is mainly subsistence driven	previously provided by the state (under Soviet times) but now generally illegal due to inconsistencies in the Forest Code and lower level legislation	Only branches <3cm diameter are free. Otherwise bought from forestry service, with special ticket

Sources: FAO, World Bank, Metla, National Forest codes, National consultant reports

Table 5 Armenia sample characteristics

Armenia	Yegeghnut (Lori Marz)	Gargar (Lori Marz)	Hagharcin (Tavush Marz)	Aknaghbyur (Tavush Marz)	Halidzor (Syunik Marz)	Tatev (Syunik Marz)
Database village code	1	2	4	3	5	6
Sample size	65		65		66	
Grouping for analysis	Group 1		Group 2		Group 3	
Region	Lori (NE)	Lori (NE)	Tavush (NE)	Tavush (NE)	Syunik (S)	Syunik (S)
Population	875	1349	3784	445	602	1042
Connection to gas/electricity	Yes, but partly to gas,	Yes, total	Yes, total	Yes, total	Yes to electricity, no gas	Yes to electricity, no gas
Connection to water	Half from water company and half uncontrolled	Yes, partly	Yes, total	Yes, total	Yes, total	Yes, total
Poverty level	43 HH receiving poverty support	108HH receiving	200 HH receiving	20HH receiving	12 HH receiving	40 HH receiving
Major economic activities	Timber and cattle breeding	Crop and cattle breeding	Crop and cattle breeding	Crop and cattle breeding	Crop and cattle breeding	Tourism, Crop and cattle breeding
Major market	23 km	26km	20km		23	32km
Major land uses	Mainly forests and pastures	Mainly forests and industrial/ arable	Mainly pastures	Mainly arable lands	Mainly protected lands and then pastures	Mainly pastures, other agricultural lands and forest lands (over half under conservation)
Tenure	All forests managed by state "Hayantar"					
Conservation areas	None	Gyulagarak State Sanctuary 5km One project on forest protection and poverty alleviation	Dilijan National Park close by	17.1km to Ijevan State Sanctuary	None	
Conservation projects	Government program – provision of 8m3 wood to each household in forest-dependent communities					
Recent calamities	Global economic crises					
Other	Risk adversity after 1988 earthquake		Not strong agricultural tradition	Famous for selling fruits	Close to tourist site "tatev wings"	Is a major tourist town for "tatev wings" and "tatev monastery"

Table 6 Azerbaijan sample characteristics

Azerbaijan	Danachi	Yukhary Chardaglar	Tala
Database village code	16	38	39
Sample size	50	50	50
Grouping for analysis	Group 1		
Region	Zakatalsky district in north west – 2/3 covered by forests.		
Population	7200	2350	7393
Connection to gas/electricity	Yes only electricity Begun work on gas installation	Yes only electricity Dependent on fuelwood and pressed nutshells	Yes total
Connection to water	No, man water from artesian wells	No, water is bought from tank trucks after earthquake in June 2014 which destroyed the natural spring	Yes total
Poverty level	medium	highest	lowest
Major economic activities	Agricultural, livestock breeding, nut growing		
Major market	25km	15km	2km
Major land uses	Mainly forest then arable lands. District is mountainous and lowland		
Tenure	Forest managed by Ministry of Ecology and Natural Resources		
Conservation areas	Zakatalsky Reserve on southern slopes of Greater Caucasus mountains		
Conservation projects	n/a		
Recent calamities	Seismic activity common in the area. Major earthquake in 2012 destroyed many buildings.		

Table 7 Belarus sample characteristics

Belarus	Gubichi	Novaya Buda	Ivanova Sloboda.	Rudnya-Victorinskaya
Database village code	301	302	303	304
Sample size	69	52	67	12
Groupings for analysis	Group 1		Group 2 (high forest use)	Group 3 (no forest use)
Region	Buda-Koshelevo	Gomel	Milashevichi	
Population	585	293	426	25
Connection to gas/electricity	Electricity connection but no gas	Yes, electricity but no gas	Electricity connection but no gas	Electricity connection but no gas
Connection to water	Yes	No	Yes	No
Poverty level	n/d			
Major economic activities	Agriculture, livestock, industrial production		Agriculture and livestock	Agriculture and pension
Major market	22km	15km	45km	10km
Major land uses	n/d			
Tenure	State ownership of all land			
Other				Nuclear contaminated village, all residents are pensioners

Table 8 Georgia sample characteristics

Georgia	Sakdrinoi	Artani	Jebota	Chabano	Zaridzeebi
Database village code	1	2	3	4	5
Sample size	50	15	60	35	40
Groupings for analysis	Group 1				
Region	Tianeti Municipality				
Population	648	90	719	347	462
Connection to gas/electricity	Yes	Electricity, but no gas. Gasification process starting in the municipality			
Connection to water	Yes	No	Yes	No	Yes
Poverty level	Very high unemployment				
Major economic activities	Cattle breeding, Seasonal agriculture of beans and potatoes, and forest product collection				
Major market	30	12	3	7	15
Major land uses	Mainly agricultural land				
Tenure	state ownership of all forest land				

Table 9 Moldova sample characteristics

Moldova	Cioresti	Borceac	Alexandru cel Bun
Database village code	11	12	13
Sample size	50	50	50
Region	Central, Nisporeni rayon	South, Cahul rayon	North, Soroca rayon
Grouping for analysis	Group 1	Group 2	Group 3
Population	3633 (2004)	1602 (2004)	596(2004)
Connection to gas/electricity	Yes electricity, most (87%) to gas	Yes electricity, most (98%) to gas	Yes electricity, most (95%) to gas
Connection to water	Only 25% connected	Only 30% connected	Only 1.1% connected to water
Poverty level	25% poverty in rural areas: 4.1% unemployment in rural areas. There are no data available for every village.		
Major economic activities	Agriculture. Sugar beam, sunflower.	Grape and wine production, cereals, corn	Grape and wine production. Sugar beam, corn
Major market (KM)	20	30	7
Major land uses	Agriculture		
Tenure	Agricultural land is mainly private, forest land is mainly state owned (except some private or community land). Pastures are community owned and collectively (but unorganized) used. Consolidated properties on vineyards. For other agricultural lands an average country size of property of 1.2 ha/owner. Nevertheless, in all the sample villages the land is used in big surfaces through renting or leasing to private companies.		
Conservation areas	None of them in a range that can influence		
Conservation projects	Not pure conservation projects. Some infrastructure and road or renovation projects, also gas connection.	Not pure conservation projects. Some infrastructure and road or renovation projects.	Not pure conservation projects. Some public road and building renovation projects , also a small business related project in agriculture
Recent calamities	Droughts are often, but none of them influenced the areas in selected sites in the last years		

Table 10 Russia sample characteristics

Russia	Bezhanitsy	Krasnyi Luch	Tsevlo	Tyumentsevo	Volchno-Burlinskoe	Yeltsovka	Mukhen	Sita	Sikachi-Alan
Database village code	30	20	10	60	50	40	80	90	70
Sample size	40	20	10	40	20	10	40	20	10
Region	North west region			Altai		Russian Far East			
Grouping for analysis	Group 1			Group 2		Group 3			
Population	3880	1020 (2010)	350 (2012)	5279	1266	646	4076	1845	265-350
Connection to gas/electricity	Electricity to all hh, only some have gas	Electricity to all hh, only some have gas	Electricity to all hh, no gas	Yes for majority	Yes for majority		Electricity to all hh, no gas	Electricity to all hh, no gas	Electricity to all hh, no gas
Connection to water	Majority of hh	Majority of hh	Majority of hh	Majority	Majority	n/d	most	some	some
Poverty level	Unemployment 4.6% in district			Unemployment 6.1%	Unemployment 4.1%	n/d	Unemployment 8.3%	n/d	n/d
Major economic activities	Agriculture	Industry	Tourism, basic services	Timber, dairy, agricultural meat industries	Agriculture. Grain meat and milk and dairy processing	Agriculture. Grain meat and milk and civil service	Logging	logging	Fishing, gardening, some tourism
Major market	In town				40km				
Major land uses	Mainly farmland and forest			Mainly agricultural and arable land	Agricultural land and forest	Mainly agricultural	Mainly forest	Mainly forest	Mainly forest
Tenure	state ownership of all land								
Conservation areas	Polistovsky State Nature Reserve			Kulundinsky PA	Aleusky PA	n/a	n/a	n/a	Bolshekhekhtsirsky state nature reserve
Conservation projects	Pskov regional development and eco-tourism program		Polistovsky Nature Reserve conservation activities	Agricultural subsidies					
Recent calamities	Extremely dry year and bushfires in 2010				Drought in summer 2012	Drought in 2012	Flood in 2013		

Table 11 Ukraine sample characteristics

Ukraine	Seredkevychi	Smolyn	Zahorb	Strychava	Kolodyazne	Bystrychi
Database village code	71	72	73	74	75	76
Sample size	30	30	30	20	10	30
Region	Roztochya		Transcarpathia		Polissya	
Grouping for analysis	Group 1		Group 2		Group 3	
Population	753	762	529	241	1443	2961
Connection to gas/electricity	Electricity, but no gas	Electricity, but no gas	Electricity, but no gas	Electricity, but no gas	Yes to both	Yes to both
Connection to water	n/d	n/d	no	no	n/d	n/d
Poverty level	High poverty and unemployment (though officially unemployment is low as people who own land are not considered unemployed)					
Major economic activities	Mainly agriculture, Seasonal agricultural, construction and service, wild strawberry sale	Mainly agriculture, blueberry sale	Mainly agriculture, wood trade (although illegal) Seasonal work abroad	Agriculture, and mushroom collection	Agriculture, sale of blueberries	Agriculture, sale of blueberries
Major market	19km	17km	27km	8km	15km	18km
Major land uses	Forests and agriculture	Forests and agriculture	Forests and agriculture	Forests	Forests, some agriculture	Forests, some agriculture
Tenure	Private ownership of agricultural land, commercial ownership of forest concession, state ownership of PA.				Private ownership of agricultural land, commercial ownership of forest concession,	
Conservation areas	Ravske Roztochya with tree cutting prohibited		Uzhansky National Park tree cutting prohibited but NTFP gathering permitted in economic zone		n/a	n/a
Recent calamities	2013 – hail storm 2008-9 – global economic crises 1995 – division of village land into small farms		2008-9 – global economic crises 1995 – division of village land into small farms			
Other	Nearby military training ground good for mushrooms but entry now prohibited		25 deserted houses in region, high dependence on berries and fuelwood, nearby military cemetery	High dependence on forest products esp. berries and fuelwood (black berries and mushrooms sold)		

5. Results and Discussion

5.1 National income profiles

Mean household incomes (USD PPP) per adult equivalent vary across the regional sample, with the highest on average recorded in the Belarusian sample (14316.6 USD PPP; Table 12), which is unsurprising given the very low poverty rates in the country. Poorest households per adult equivalent are in the Ukrainian sample with mean household income 844.1 USD PPP. Other national means lie on spectrum in between but need to be remembered as representative for only the selected communities studied.

Table 12 Income values per adult equivalent by country

Values per adult equivalent (USD PPP)	1 ARM	2 AZE	3 BEL	4 GEO	5 MOL	6 RUS	7 UKR
Forest Income	181.8	559.6	1356.1	988.9	796.0	1014.6	42.8
Net agricultural Income	537.8	2283.9	865.0	1207.5	2935.6	594.1	109.6
Net Livestock and Animal Income	773.7	1557.1	1530.5	1136.3	-63.6	1249.6	202.5
Wage Income	2134.1	6821.0	10007.6	4218.1	2517.7	7389.7	373.6
Other Income	1848.2	4100.7	7266.1	1813.4	1531.9	3821.6	236.5
Business Income	471.6	6944.9	1750.3	4801.4	3550.3	31395.3	168.5
TOTAL INCOME	4332.2	10690.1	14316.6	6609.3	6211.4	13934.1	844.1

In the Armenian sample, forest income comprises in total 4% of household incomes (Figure 4). Yet, forest products have been historically and are presently important in the livelihoods of the Armenian communities. Land based incomes make up 32% - net livestock and animal make up 20%, as cattle breeding is a common activity, and net agriculture makes up 12%, which is relatively small considering its role as a safety net to provide food security after the soviet collapse (IFAD, 2011). Nevertheless in Region 1, In Lori Marz, households were closer to urban centres and therefore didn't engage in land-based activities. Furthermore, lack of tools, information and policy incentives have also affected the growth of agriculture in rural Armenia and limiting the development of market-oriented rural economy (IFAD 2014). Wage and other income make up each a third of total income of the sampled population. Wage income is comprised of government and other trades, such as construction (Annex 6.3). Households in the North east regions (i.e. 4 of 6 villages) were

mainly aging or divorced families and therefore state pensions comprise a high percentage. 28% of other income enters as remittances from seasonal workers in and the US (Annex 6.4). Indeed, the single most important source of non-farm income in Armenia is the seasonal migration of male workers to other countries in the Commonwealth of Independent States, leaving one in three households headed by females (IFAD, 2014). 6% of other income is state poverty support. Finally, there are only a few businesses, and some unregistered businesses in Region 2 (Tavush Marz) of Armenia.

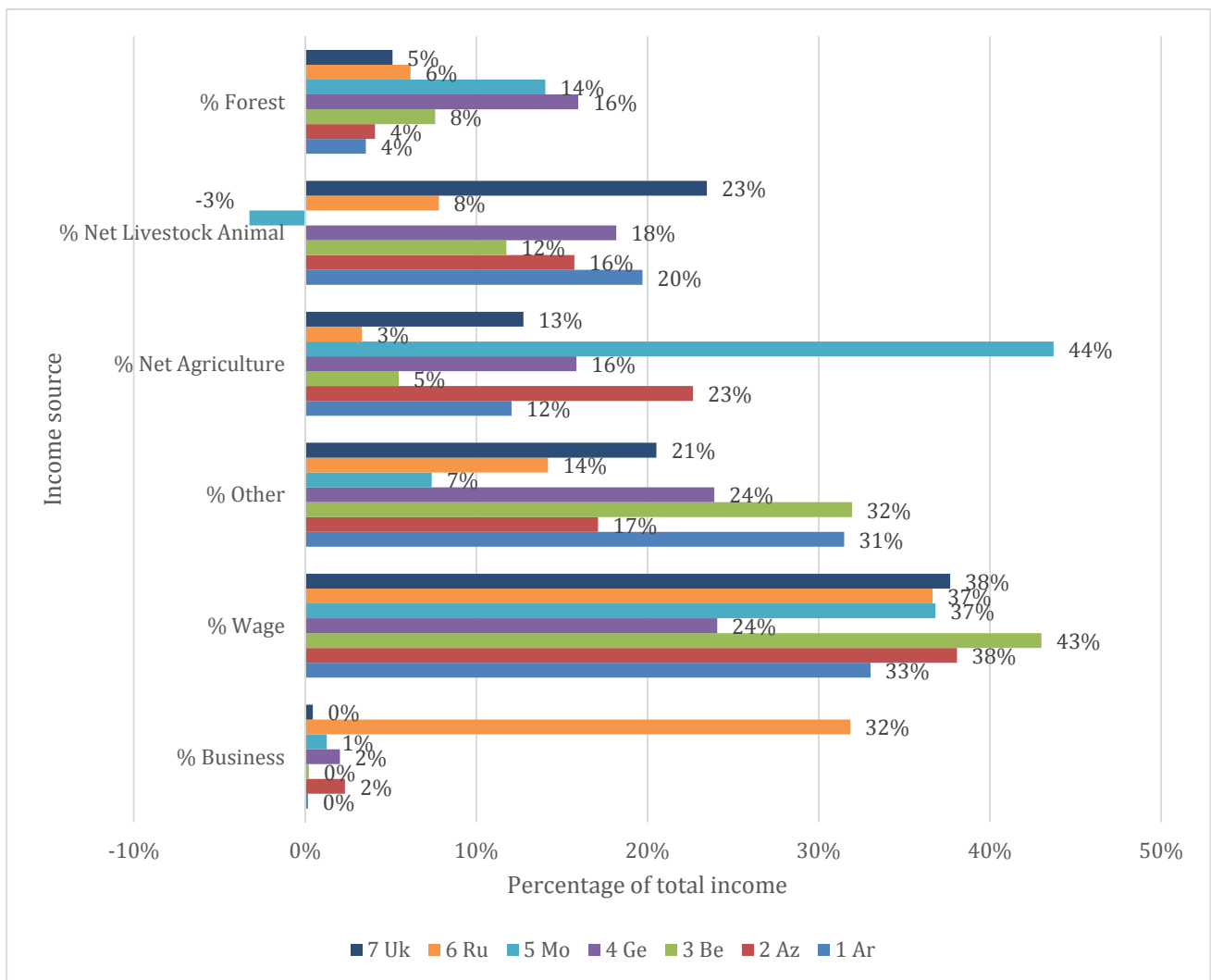


Figure 4 Composition of income by country

Similar to Armenia, over past decade in Azerbaijan there has been a large outflow of young working age men to large cities domestically or to Russia and Ukraine and in our sample, total wage income comprises 38% of the total and is made up of government, trade (mainly construction) and service. Currently the country is experiencing a growth in GDP due mainly to oil production, but also

the creation of jobs through public investment in the construction, hospitality and communication services, which has meant that unemployment has fallen from 5.2 % (2012) to 4.9% (2013; IFAD, 2014).

The second largest share of income in Azerbaijan comes from agriculture (23%; Annex 6.1). The main crops in this region are hazelnuts, corn, vegetables, fruit (apples, pears, peaches, persimmon, grapes, cherries, apricots, sour cherries and plums) and melon. Although hazelnuts grow in forests, the bulk of these nuts are grown on agricultural land. Indeed, farmers have been unable to move beyond subsistence farming as a result of lack of access to services, equipment, and lack of markets for agricultural products (IFAD, 2014).

Following agriculture, other income, comprises 17%. Other income is composed of 98% pensions, which has increased considerably in recent years, and some remittances (in households where the household head leaves to work in Russia). Net livestock and animal income comprises 16% and many households keep chickens and other livestock (cows, sheep and goats) to ensure food security, despite the high costs of rearing. Main products obtained for sale and subsistence are meat, milk products (e.g. cheese, sour milk, sour cream) and eggs. Most important forest products collected are fuelwood, nuts, chestnuts, berries, wild fruit, medicinal plants, and fish and comprise 4% of total Azerbaijan income. Finally, business income is low (2%) due to corruption that has been affecting the business environment.

In Belarus, 43% of income share is from wages, comprised mainly of agriculture-related (22%) occupations in large-scale agriculture and agricultural processing, and community, government and forest-related occupations. In the communities of Buda-Koshalevo and Gomel, nearby towns provide opportunities for wage work. Similarly the children of the pensioners in Rudnya-Victorinskaya periodically come and live with their parents and are employed and help keep livestock, therefore contributing to wage figures in the sample. Net agriculture income in comparison is relatively small (12%) where potato is the primary crop, along with other food staples, such as cabbage, carrots, beets, and garden vegetables (cucumber, tomato, onion and garlic), and pumpkin. 32% of total income is from other sources of which 90% are pensions. Villagers of Community 4 (Rudnya- Victorinskaya) receive pensions as a form of compensation for their clean-up work of the Chernobyl disaster (Lazareva, 2014). 19% of income is from livestock and animal, consisting of meat, milk, eggs and manure. 13% of total income is from forest and is made up of mushrooms, berries, fuelwood and smaller amounts of other NTFPs, particularly in the Milasevichi community. Indeed, as wage work is not widely available in the community, many return over summer to harvest forest products for sale as a source of cash for winter. Further, the predominance of forest product

collection for cash in Milashevichi is attributed to remoteness of the communities, lack of employment and expansive forest resource base surrounding the communities. As a contaminated site, Rudnya-Victorinskaya residents rarely collect forest products.

In Georgia, wage and other income contribute to 24% each to total income. In wage income half of the occupational wages were from the professional group, consisting of business managerial and medical staff, as well as worked in forestry logging (35%). Other income was made up of pensions across the villages (76%) and remittances (10%). Households in the Tianeti region are mainly engaged in cattle-breeding and the income received from the sale of the livestock presents an important source of the income (18%). This is lower than expected considering the large livestock orientation, but reflects investments and inputs made into livestock or animal product processing in the course of the year that have not yet realized their value. For example, cheese of comprises 58% of total animal income and two-thirds (66.4%) of cheese is sold, where cheese production is relatively longer process than meat from livestock (only 19% of meat was sold; Annex 6.2). Similarly the population is engaged in agriculture of beans and potatoes (18%), where more than 80 per cent of the country's rural people depend entirely on their own farms for subsistence with typical households consuming 70% of what they produce. This subsistence orientation is a result of little inputs or technology available to rural households, limited access to markets, and low productivity of agricultural lands (IFAD, 2014). The households also engage in the collection of forest products (16% of total value), and have the highest national share of forest income across the regional sample. According to Gakharia (2014) households intensively use the forest as pasture, as a result of proximity to forest, thus fodder is a dominant forest product in the national sample. Use of forests is especially high amongst households of low and middle income and amongst the unemployed as a gap filler. Despite the abundance and free access to forest products, commercialization of NTFPs has been limited due to barriers to financing and difficulties in collection and processing (IFAD, 2014).

The Moldovan sample is dominated by net agricultural income (44%) which reflects the extensive engagement of households in grape production for the processing of wine, particularly in Ciorasti and Borceag. Other crops include apples and strawberries, cereals and corn. Generally, Moldova has developed into an agricultural economy with more than 60 per cent of Moldovans living in rural areas and depending on agriculture for livelihoods (IFAD, 2014). Wages comprising 37% are mainly from people on the service industry and community employees. Forest income contributes 14% of total income and the second highest in terms of share of total income in the regional sample,

and reflects the high value and frequency of walnut collection. Other income (7%) is comprised mainly of pensions and government support.

The Russian sample covers three expansive and different regions. Of note is the high business income share (32%), which reflects several rich and two extremely rich households in the Altai sample who earned 100-500 times the mean annual income of households in the villages. These rich households were engaged in industrial farming of potatoes and grains. Wage income contributes to 37% and is comprised mostly of government employees (39%) and large scale agricultural employment (16%), followed by service, trade and other professional occupations. Other income is also large (14%) in the total Russian sample, reflecting pensions and unemployment support, particularly in NWR and the Far East. Land-based income (i.e. livestock, animal and net agriculture) contribute to relatively little shares, and could also reflect the subsistence nature of agriculture in the rural areas (e.g. potatoes for own consumption; Gongalsky, 2014). Forest income contributes to 6% of total income also but varies between regions. In NWR the collection and sale of cranberries is common therefore forest incomes are higher (15% of NWR total income) here compared to Altai (3%), where forest income is low due to the poor productivity of forests and general low forest cover in the region. In the RFE, forest income also contributes only 6% of total RFE income, which is surprising given the abundance of forest cover surrounding the villages. However, some of the forest product collection activities here are illegal (e.g. caviar) and these people were not captured in our sample. Overall, elderly who rely on pensions dominate the rural population. There are also a large population of heavy drinkers, relying on collection of small quantities of forest products to sell for vodka (Gongalsky, 2014).

In the Ukrainian sample, wage income clearly dominates (38%), where over 50% of wage income is for seasonal work aboard in the construction (men) and service (women) industries in neighbouring countries e.g. Poland, Russia, Czech Republic. Net livestock and animal income is the second important income share (23%) is comprised mainly of animal income from meat (29%), cottage cheese (21%), sour cream (19%), milk (11%) and eggs (9%). Other income (21%) consists mainly of pensions (56%), support from government (33%) (scholarships for students, maternity allowance and support to families with more than two children) and remittances that are sent by relatives from outside of Ukraine to the household (10%). Agricultural income contributes to 13% and this is mostly the subsistence production of potatoes (64%), but is the most important income source in Region 1 (Roztochya). The very little business income recorded is in carpentry and trade.

Forest income comprises 5% of total income and includes mainly the collection of blueberries and wild strawberries (by women and children) and mushrooms (by men) - surprisingly small considering the study site was chosen due to it being a major supplier of forest product markets to Western Ukraine (Soloviy et al, 2014).

5.2 Forest products and their value

Across the regional sample, 103 different products were collected. Approximately one quarter of the value of forest products comprised wild fruits, and of these wild fruits, 65% of total value were from 17 different types of berries: primarily cranberry, blueberry and wild strawberry (Figure 5). Berries dominate forest product collection for cash, making up over 50% of total value of cash forest products collected (where only 10% is collected for subsistence; Figure 6). Fuelwood surprisingly only makes up 17% of all forest product value, considering it is a major fuel source in rural areas in these countries. However, due to the often complex and sensitive rules surrounding fuelwood harvest, the recorded fuelwood is likely underestimated. Figure 6 highlights that fuelwood collection is mainly for subsistence, accounting for 27% of subsistence forest products, and only 3% of cash products.

Following were mushrooms (17%) and nuts (15%) – both of which have significant cash values across Russia, Belarus, Moldova and Azerbaijan. Across the regional sample, quantities sold and consumed are relatively equal (Figure 6). Livestock related products, in this case fodder collected in the forest, makes up 11% of total value, and like fuelwood is mainly collected for subsistence use (17% of subsistence value). Table 13 below outlines the major forest product categories by total value (USD PPP) and share across the countries.

5.2.1 Fuelwood

Fuelwood is a vital resource for households in the region as it is the main source of heating and energy for cooking for most rural households. Across the countries, fuelwood provision by national governments vary and often is not sufficient to meet the energy needs of rural households (see Table 4). As a result, much fuelwood is illegally cut. For example, in a study done by the World Bank over a decade ago, Sadyayn (2005) found that in Armenia illegal cutting of fuelwood was at least 1000000m³ in the six years preceding.

Forest access has been restricted for the sake of protection, and in 200 forest dependent communities, every household is provided with 8m³ of fuelwood each year following a campaign to raise awareness on the unsustainability of illegal logging and forest degradation (Balyan, 2014). However, illegal cutting still occurs. Despite gas infrastructure being present in over 90% of

communities in the forested regions, including one sample community Tavush Marx, fuelwood cutting and gathering of branches for cooking or heating is still high, spurred by high gas prices. Towns (i.e. in Goris region) that do not have a gas supply are thus found to have the same proportions of forest (and fuelwood) income as communities that did have gas connections. Fuelwood thus contributed to 42% of total forest income recorded for the country (Table 13).

In the average Azerbaijani household, annual fuelwood needs are approximately 8-9 cubic metres, which is currently not being provided by the government. The state forest agency “Azerforest” distributes most fuelwood to the schools, kindergartens, hospitals, and other public institutions, and should distribute the remains to the local populations but this is almost never the case (Mehtiyeva, 2014). The communities of the study area are generally not connected to gas, therefore fuelwood collection and use is very high, despite strict laws prohibiting cutting. However, record of fuelwood collection in the sample is low (5%) due to the illegal nature of collection. Also households use crushed nutshells as alternative source of fuel.

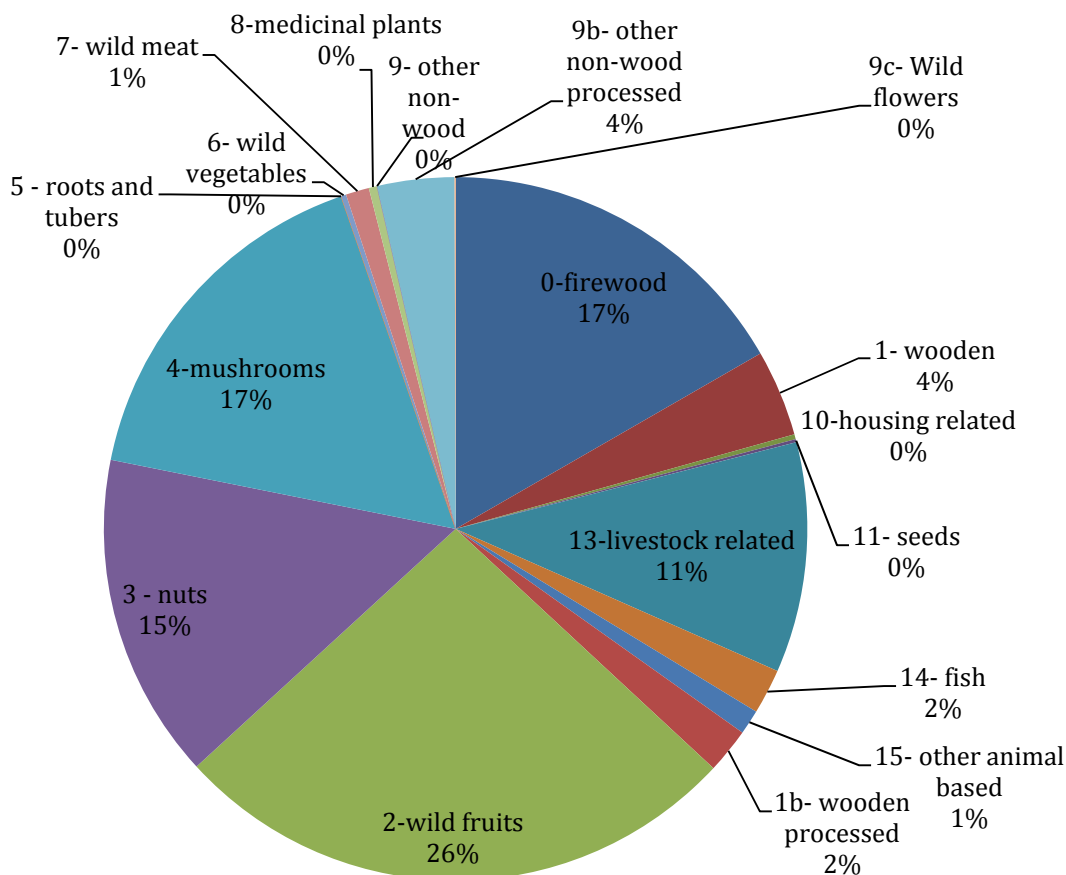
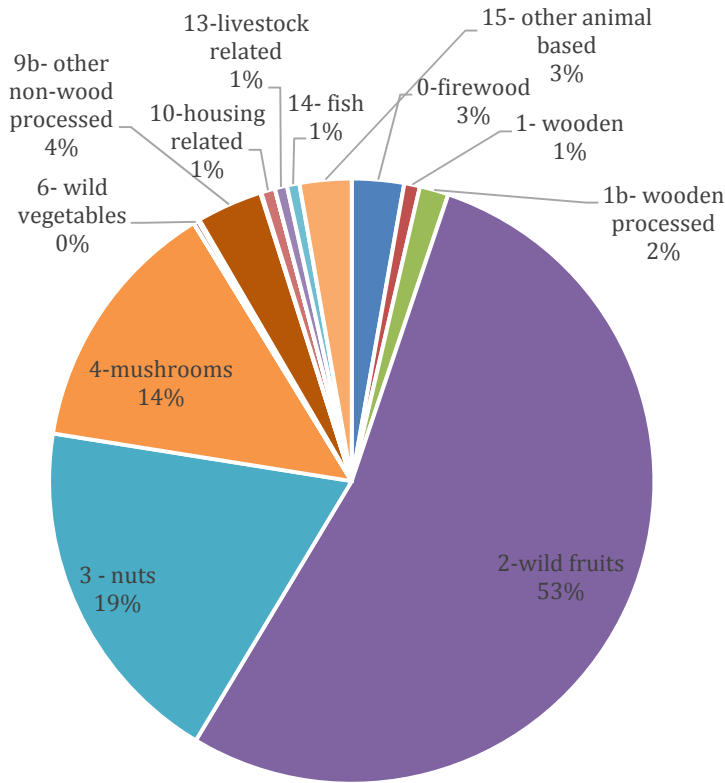


Figure 5 Shares of total value (USD PPP) of forest products



Forest subsistence

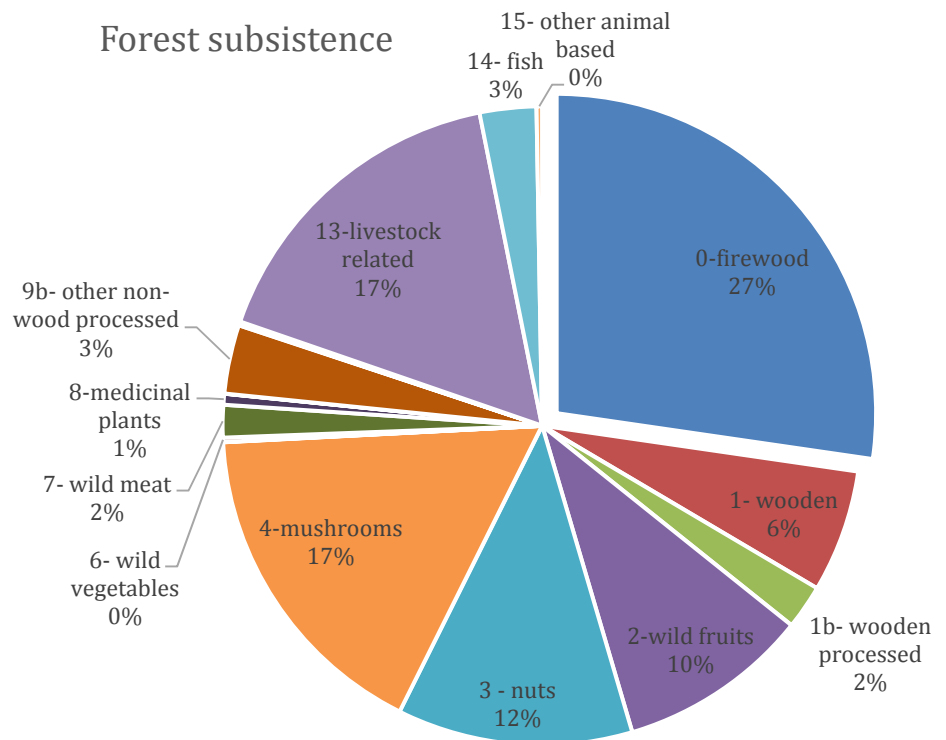


Figure 6 Shares of total cash and subsistence value of forest products

In Belarus, residents of most communities need to purchase fuelwood from the forest department. However in Milashevichi, a third of residents have permits to harvest dead standing trees independent of the forest department due to additional needs for fuelwood to fuel their bathhouses. Up to 4.99m³ of fuelwood can be purchased at a subsidized price after which the price is higher. At the same time some forest enterprises allow villagers to harvest certain trees from allotted sites (Lazareva, 2014). This has resulted in the low share of fuelwood in total forest income (1%). Villagers experienced a reduction in fuelwood availability as a result of forest use restriction and decrease in mature forest areas.

In Georgia, 60 percent of the annual forest harvest is estimated as unrecorded fuelwood (FAO, 2003). Construction to connect gas to the communities in the sample had begun at the time of the survey, but high gas rates and high expense of extending gas pipelines to households has meant that fuelwood is still heavily harvested, contributing to some 30% of total forest income for Georgia. Most likely, not all fuelwood harvesting is legal: Metrevili (2005) found that 82-85% of the annual illegal forest harvest in the period 2002–2003 was unauthorized logging for fuelwood with the majority used for subsistence heating and cooking.

In Moldova, fuelwood also makes up a significant share by value (31%) and is the only source of heating in many rural areas. Demand for fuelwood lies at 1.5m³ per household per season totalling nearly 1.000.00m³ and from 2000-2004 the estimated illegal cutting in Moldova was 33.000m³ (Savcor, 2005). National resources have been estimated to only be able to supply 75% of the demand of the local population for fuelwood (Tikkanen et al 2003). Officially the quantity of fuelwood sold by forest administrators is almost half of total wood consumption for heating, suggesting a high dependence on illegal sources (Zubarev et al 2014).

In Russia, collection of fuelwood is still widespread but since the new Forest code (2005) has taken force, collection by local inhabitants has become illegal. This is because management shifted from the state to the regions in an effort to stimulate domestic investment in forestry and improve forest management but instead has led to hefty fines and heavy restrictions to local communities (Gongalsky, 2014). In NWR, fuelwood is collected by mainly sole collectors, while in RFE there are sometimes groups collecting both for sale and for own use, with some being exported (illegally) to China. Generally fuelwood constituted 12% of total forest income recorded, but is likely underestimated due to illegality of harvest.

In Ukraine, despite the provision of gas in Polyssa region, fuelwood is still collected and used

in large quantities due to the high price of gas. Recent tensions with Russia have also meant that gas prices are steadily increasing. Recorded fuelwood across the Ukrainian sample is however quite low (2%) and the main reason is that only fuelwood that was grown naturally (not cultivated) on their own agricultural land was recorded. Also provisions of fuelwood often were illegal and therefore villagers were reluctant to talk about this.

Table 13 Forest product value by product category and country

USD PPP	1 Arm	2 Aze	3 Bel	4 Geo	5 Mol	6 Rus	7 Ukr
fuelwood	31837	7353	5503	102354	68324	45444	285
%	42%	5%	1%	30%	31%	12%	2%
Timber, sawnwood, poles, branches and other wooden	2735	4353	588	5425	25883	22383	929
%	4%	3%	<1%	2%	12%	6%	5%
wooden processed e.g charcoal, furniture, woven products	46	779	3260	2731	0	25502	166
%	<1%	1%	1%	1%		7%	1%
wild fruits incl. berries	10088	17801	192307	10427	3683	166419	10222
%	13%	12%	52%	3%	2%	43%	60%
Nuts	8607	105343	1074	846	116206	1881	128
%	11%	68%	<1%	<1%	53%	<1%	1%
mushrooms	1103	338	157861	19474	5601	70203	4696
%	1%	<1%	43%	6%	3%	18%	28%
roots and tubers	31	9	0	13	0	5	0
%	<1%	<1%		<1%		<1%	
wild vegetables	2745	112	0	686	0	126	34
%	4%	<1%		<1%		<1%	<1%
wild meat	0	3428	15	0	764	12373	132
%		2%	<1%		<1%	3%	1%
medicinal plants	1651	993	1884	224	555	547	209
%	2%	1%	1%	<1%	<1%	<1%	1%
other non-wood e.g. reeds and stalks	1	0	15	0	0	0	0
%	<1%		<1%				

other non-wood processed e.g. alcoholic beverages, juices, oils	361	0	1346	43694	0	9795	153
%	<1%		<1%	13%		3%	1%
wild flowers	623	0	0	29	0	49	0
%	1%			<1%		<1%	
housing related e.g. thatching grass, wood for construction	0	0	0	3500	0	0	0
%				1%			
seeds	2127	0	0	0	0	110	16
%	3%					<1%	<1%
livestock related e.g. fodder grass, browse	8917	853	0	144744	0	11051	0
%	12%	1%		43%		3%	
fish	184	12635	4685	571	0	14482	0
%	0%	8%	1%	<1%		4%	
other animal based e.g. honey, animal skins	4675	0	1890	2438	0	8702	1
%	6%		1%	1%		2%	<1%
Total	75731	153997	370426	337155	221016	389074	16969



Figure 7 branches for Christmas decorations, Ukraine

5.2.2 Sawnwood and other wooden products

In the Russian Far East, collection of sawnwood and other types of timber make up 25% of value of forest products in this region. Sawnwood is also collected for mainly subsistence use in Moldova (12%) and is used in construction. Like fuelwood it can be purchased from forest administrators but the collection can often be done illegally (Zubarev et al 2014).

In Ukraine, collection of tree branches is common in the Carpathians region to make Christmas trees (whole or weaved from several branches, see Figure 7) and to make bean trellises.

5.2.3 Fodder grass

In the Armenian sample, fodder grass (12% of total forest income) is collected from the forest to stock up over the year as many of the households are engaged in cattle breeding. Households closer to the forest and who have access also engage in selling the fodder grass. In the Georgian sample, livestock browse and fodder grass is 43% of total value of forest products collected, and constitutes a major resource to support livestock breeding.

5.2.4 Berries and other wild fruits

Cornelian cherry is a high value product sold fresh in the Armenian and Azerbaijani sampled communities. The cherry is usually bought by local households and commonly used for processing into jams, syrups, as medicinal treatments for colds, and distilled into vodka. Other berries are also collected in high quantities (e.g. wild rose berries, wild strawberries and black berries in Armenia, and blackberries and raspberries in Azerbaijan), and together these are processed and sent as gifts to relatives and children in the cities, contributing to 13% and 12% respectively to total forest value in these countries.

In NWR, mainly blackberries and cranberries are collected, but latter is sought after as they are easier to collect and fetch a high value (49% of total value of forest product collected in NWR, and 99% of collected berries are sold). Wild fruits are also commonly sold in this region, and include bog bilberry, raspberry. In Altai, wild strawberry collection is common, and in the RFE smaller quantities of a more diverse range of berries (including blackberry, raspberry, bog bilberry etc.) are collected.

The greatest share of forest products by value collected in Ukraine sample are also berries, especially blueberries, which make up 43% of the value of all forest products collected and are collected all throughout the sample villages. Berries are traditionally consumed and an important seasonal income. In Region 1 (Roztochya) blueberries are more valuable as they are hand-picked and organic, making them highly demanded. However, destructive collection methods threaten the availability of blueberries, particularly in Polissya (Region 3). Wild strawberry is the most expensive forest berry across Ukraine and is twice the market value of blueberry. Wild strawberries are collected in most villages in the sample making up 10% of the value of forest products, and are harvested in disturbed forest areas (i.e. abandoned agricultural land or deforested areas). Blackberries are also collected across the sample, and are used in the production of wine. Other berry types that are collected are the red bilberry, cranberry and raspberry. All berries are sold for

cash, e.g. wild strawberries commonly sold on the roadside, and they are also processed into jams for own use and as gifts.

In Belarus, cranberries and blueberries are widely collected (52% of total value of forest products for the country) and predominantly sold. The presence of marshes in the Milasevhici region results in the high collection of cranberries for sale. In the other communities of Buda-Koshelevo and Gomel, approximately half the blueberries collected are given as gifts or consumed and the other half are sold.

5.2.5 Nuts

In Azerbaijan, nuts contribute to 68% of total value of forest products collected with most being sold (70%). Chestnuts and walnuts are mainly collected in forests, where hazelnuts are now being cultivated as a result of better access to capital, equipment and technology (Mehtiyeva 2014).

Nuts, especially the walnut, are a major forest product harvested in Moldova, contributing to 53% of total value of forest products collected. The walnut is collected by all family members and is used both for own consumption and sale to enterprises who specialize in export of nuts abroad.

5.2.6 Mushroom

Mushrooms make up 43% of total forest product value in Belarus and are mainly for subsistence. However, approximately half of the collected amounts are sold in Milashevichi community. Mushroom collection constitutes 18% of total value of forest products collected in Russia, and are an important subsistence component to forest income but in Altai around half of the mushrooms collected are sold for cash. Indeed, mushroom collection is a recreational pastime amongst Russian families and are commonly used in Russian cuisine.

In Ukraine, mushroom collection contributes to 28% of total forest income and mushrooms are collected almost equally for sale and subsistence (mainly as gifts). Their cultural importance during Lent and popularity in cuisine makes mushroom collection an important recreational activity, similar to Russia, and particularly for city-dwellers. In the Carpathians, mushrooms provide an important source of income for some households and in all cases, men are the main collectors.

In the Georgian sample, mushrooms make up 6% of total value of forest products collected but remain a solid source of income for households with around 63.6% being sold (Gakharia, 2014)

5.2.7 Non-wood processed - alcoholic beverages

In the Georgian sample, alcoholic beverages from forest fruits such as the crab apple contributed to 13% of total value of forest products collected. In Altai, Russia, alcoholic beverages are also made from berries (3% of total value) and largely sold.

5.2.8 Other products

Wild honey makes up 6% of total value of forest income in Armenia, but the largest total value was collected in Altai region of Russia and it is sold for cash. Bracken fern is a commonly consumed forest product in Russia, but was not recorded at the household level. This was because the fern was collected by mobile external groups of people who specialized in fern harvesting.

In Moldova rosehip was frequently collected but of low market value. These were collected by women and children for subsistence use together with other forest fruits.

Hunting is also a common recreational pastime in Russia, reflected by the game meat (mammals like foxes and rabbits, and birds) collected in the Russian sample (3% of total value). In Ukraine, generally hunting was not common (1%), but a few households had income from hunting of wild boar and these were typically forest workers. Azerbaijani households were also recorded as hunting wild boar, rabbits, foxes and wolves (2% of total forest product value). Furthermore, the illegality of fishing and logging particularly in RFE, meant that the data collected on these products is underestimated, but fish make up 4% of total value of forest income in Russia. Also Azerbaijani villagers catch fish in forests (8% of total forest product value), and fish makes up a component of the national dish, Levengi (Mehtiyeva, 2014). Fish and birch juice were commonly collected for subsistence in the Buda-Koshelevo and Gomel communities of Belarus.

The use of medicinal plants is also common throughout the sample, and is likely an important supplement particularly amongst those who cannot afford expensive medicine (Ter-Gazarian et al 1995). Types of medicinal plants collected include nettle, Saint Johns wort, and reindeer lichen and this is also reflected in our sample.

5.3 Forest dependence across countries

To measure the forest dependence, a numeric is used here called Relative Forest Income, which is total forest income divided by total income (after Vedeld et al 2004). The samples in each country were divided into five equal income quintiles based on their total per capita (or adult equivalent- aeu) income. Quintile 1 reflects the poorest where quintile 5 is the richest.

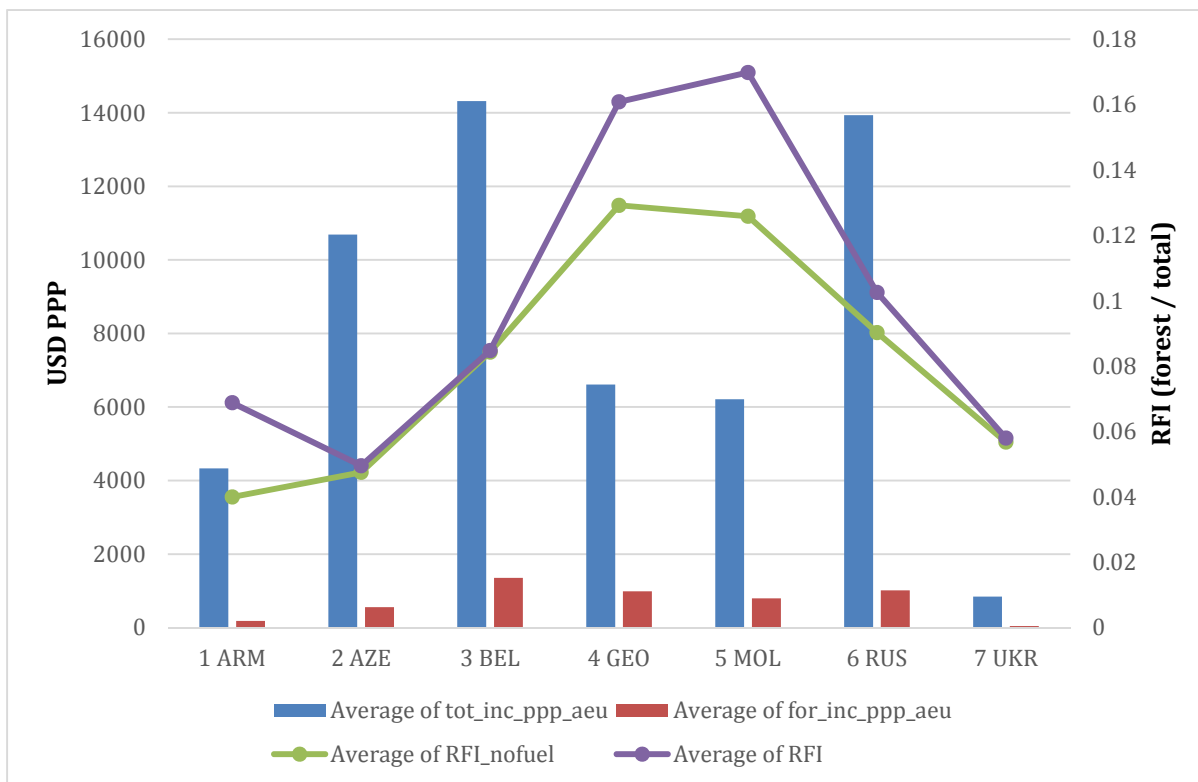


Figure 8 Mean forest dependence (RFI) and total and forest incomes (USD PPP) across countries

Figure 8 gives an overview of average RFI (purple line) compared to total income per aeu and forest income per aeu. Some distinct patterns emerge - on average Georgia and Moldova had the highest RFI, and the largest difference between RFI and RFI without fuelwood, indicating that fuelwood makes up a significant component of forest product collection. The national reports also support this- despite gasification in Georgia, fuelwood dependence remains high due to high costs of gas. In Moldova, dependence on fuelwood for heating is high, though illegal logging is prevalent. Armenia also shows this trend, and again high gas prices drive the high reliance on fuelwood.

On the other hand, Azerbaijan, Belarus and Ukraine have almost no difference in forest dependence when fuelwood is removed from forest income, reflecting the strict policies around

fuelwood extraction and the reluctance of respondents to report this, or the provision of fuelwood at subsidized prices as in the case of Belarus.

5.3.1 Forest use over income quintiles

In Figure 9 a regional average for forest cash and subsistence per adult equivalent is given across the five different quintiles. The lines represent the average RFI for each of the quintiles in each country, as well as the regional average RFI (red). Of importance, the graph shows the typical relationship between poor and forest dependence. That is, in previous studies of forest dependence amongst rural populations in tropical forest regions (e.g. Cavendish, 2000, Fisher 2004, Mamo et al 2007, Bakkegaard, 2008), poor are often more forest dependent than their richer income counterparts. This is due to a variety of factors, including the fact that these resources require minimal capital and skills to harvest, and are usually accessible for extraction (Angelsen and Wunder, 2003; Belcher 2005).

Similarly average regional cash forest income per aeu is also highest in the richest quintiles, further confirming trends in other studies (e.g. Vedeld et al, 2004), and this was found in every country sample. Richer quintiles often have better resources (e.g. money, labour) to invest in extracting forest resources and also in realizing their cash potential and this can be often tied to their higher social status and thus network in communities (Ambrose-Oji 2003).

Moldova has by far the highest forest reliance amongst the poorest quintiles, reaching over 27% in Quintile 1 and dropping to under 10% in the Quintile 5. This high reliance on forest among the poor is attributed to less diversified income sources (Zubarev et al, 2014). Belarus has the highest average RFI in quintile 3 and another peak at quintile 5, as does Azerbaijan, and Russia. This may likely be due to the involvement of the richer quintiles in forest extraction for cash, and also of higher value forest products such as cranberry in Russia, cranberries and blueberries in Belarus, and nuts (chestnut and walnuts) in Azerbaijan. Indeed, it was found that quintile 4 households in Azerbaijan were located further from the forests and on average older (and therefore pensioners), whereas the richest quintile were located near the forest and actively used the forest for subsistence (fuelwood, nuts, chestnuts) and cash (sale of chestnuts and nuts, raw or processed into a walnut jam; Mehtiyeva; 2014). In Belarus, quintile 3 represent households with working-age members who have jobs, work in their households and actively collect non-timber forest products (Lazareva, 2014).

In Armenia, the richer quintile were so-called “force-keepers” of each community, with good

networks and ties to forest inspectors and police (Mkrtchyan and Grigoryan, 2014). Not surprisingly, subsistence and cash were significantly higher for quintile 5 compared to other quintiles.

Across the Russian sample, RFI decreases with income, but increases slightly at quintile 5. At the sub-national scale in NWR, cash earned from forest products is almost 10 times subsistence income in the highest income quintile, and this is from the sale of cranberries. Similarly in RFE cash income is prominent in quintile 5 and almost zero amongst the poorer quintiles (1 and 2). In Altai, subsistence income also drops amongst the richer quintiles.

In the Ukrainian sample, RFI is relatively flat largely due to that most people are engaged to some extent in forest product collection. This reflects the study site characteristics, as the sites were chosen on the basis of their significant contributions to forest product markets in Western Ukraine. In the Ukrainian analysis, forest cash income was also markedly higher amongst the richer quintiles particularly as main incomes of these groups was from temporary work abroad. These groups collected mushrooms and berries for sale mainly to supplement their seasonal incomes (Soloviy et al, 2014).

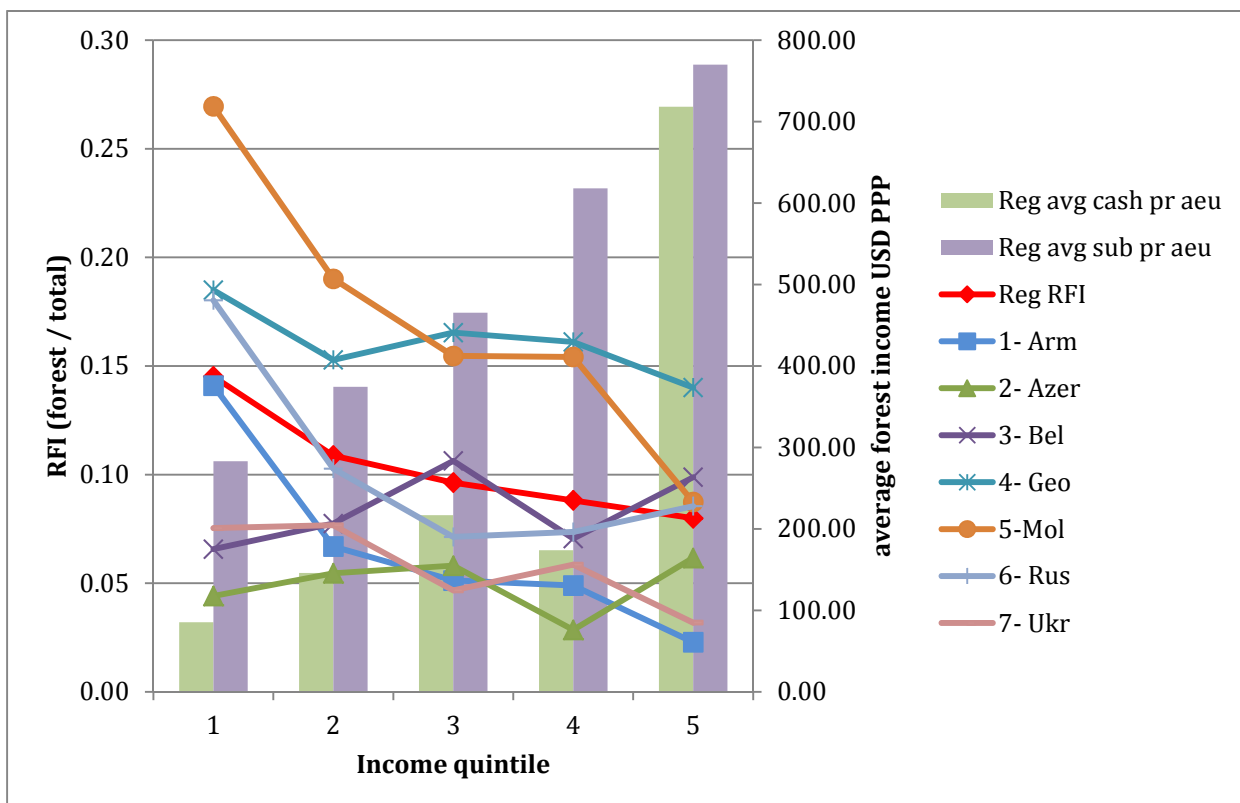


Figure 9 Mean forest dependence RFI over regional mean for cash and subsistence forest incomes (USD PPP) per aeu

5.3.2 Forest use over asset groups

To distinguish between income and asset wealth, the samples were divided into asset groups reflecting poor, middle and rich assets. Since the reliability of the asset data was in some cases low (see Section 6), national consultants were asked to divide their sample based on their expert field knowledge of the communities and the data collected into these three groups (see Annex 6.7)

In all regions of Russia, the rich asset groups derive the highest cash income per aeu than the other asset groups (Figure 10). This is also in Georgia, Azerbaijan and Armenia, lending support the trends found in previous studies in developing countries (e.g. Vedeld et al 2007) that greater assets mean greater opportunities to realize the cash values of forest products. In a decomposition of the asset data (Annex 6.6), the most significant asset by value in the majority in most countries is transport assets. Indeed, the accessibility to markets provided by private transport could itself allow a household to choose to engage in forest product extraction for cash, as households would be better able to access remote areas and/or markets where they are sold. Taking the Ukrainian sample as an example, where markets were located far from collection areas, ownership of transport would therefore be essential.

Across all country samples, cash income drops for the middle asset income group, where subsistence is actually highest. This is interesting as it shows that the middle asset group may still be engaged in forest use but only for subsistence purposes (e.g. fuelwood, or NTFPs for consumption). Their exploitation of NTFPs for sale is low suggesting that this group are involved in alternative livelihoods. Pairwise correlations on RFI and Forest cash and subsistence per adult equivalent against income and socio-economic characteristics (Table 15) seem to support this. That is, that higher forest subsistence per adult equivalent is significantly correlated (at 5% level) to higher wage income, higher net agricultural income and higher net livestock and animal income. Interestingly, higher forest cash income per adult equivalent is significantly correlated with higher wage per adult equivalent. This is a trend seen in e.g. Ukraine where seasonal workers supplement their incomes with forest collection for cash, and in Belarus where the wage receivers are actively engaged in NTFP collection.

Turning to RFI, the trend among asset groups in the Belarusian sample where RFI increases for the middle asset group, is attributed to the poor group being unable to engage in forest income (poor health and advanced age) and the rich group who collect only for own consumption, leaving the middle asset group to collect forest products to cash in on products (Lazareva, 2014).

RFI in Ukraine again remains relatively flat mirroring the high forest use in the study areas. Interestingly in all areas of Ukraine, average cash income per aeu was always greater than average

subsistence income per aeu (unlike all other country samples which show the reverse), reflecting the commercial orientation of the forest product collectors from this region.

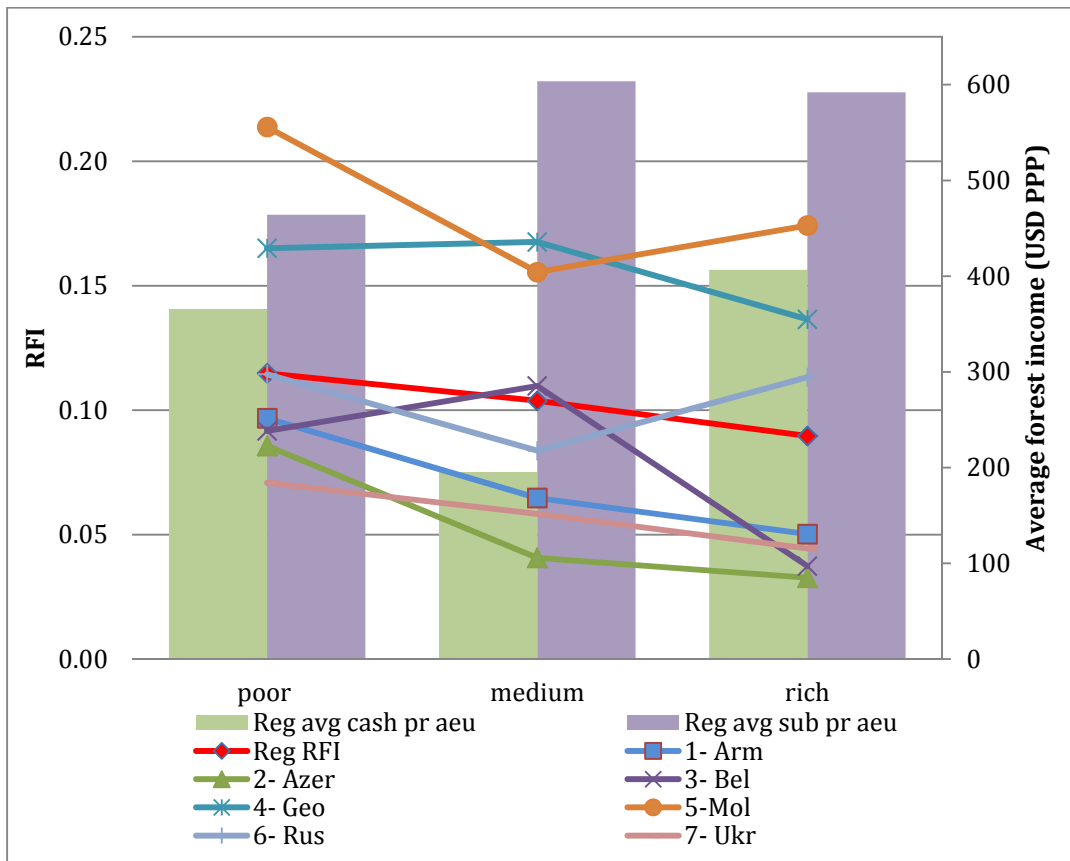


Figure 10 Mean forest dependence (RFI) over asset groups

5.3.3 Forest use and socio-economic characteristics

Socio-economic characteristics have also been shown to explain forest resource use behaviour, particularly in the developing country cases (e.g. Appiah et al, 2007, Cavendish 2000, Vedeld et al 2004). The basic statistics for each national sample are shown in Table 14. In the pairwise correlations certain household characteristics were correlated to RFI and forest cash and subsistence per adult equivalent (Table 15). Larger household for instance could mean greater income needs and the need to feed more household members (e.g. Appiah et al, 2007) but also more labour to diversify into more rewarding income streams (Mamo *et al*, 2007). Cavendish (2000) found that larger households in Zimbabwe have often meant greater incidence of poverty. In this case, higher RFI is significantly correlated with smaller household sizes showing that forest income make up larger shares of total household incomes in the smaller households. In fact, the higher

forest subsistence per aeu drives the correlation here, indicating that small households harvest products for subsistence. Further national level analyses are needed to understand whether this relationship holds true in the local case studies.

Table 14 Socio-economic characteristics of households in sample

Values	1	2	3	4	5	6	7
% female headed households	27%	15%	42%	28%	12%	28%	17%
Mean household size	4.4	3.8	2.6	2.4	3.1	3.1	4.6
(s.d.)	1.9	1.8	1.5	1.2	1.2	1.3	2.2
Mean age of HH head (yrs)	62.6	58.2	59.1	62.3	50.5	47.2	48.9
(s.d.)	13.8	12.0	15.9	13.4	11.3	12.6	13.2
Mean years of education of HH head	10.2	9.6	9.9	11.1	11.9	11.6	12.0
(s.d.)	3.1	2.3	3.7	2.7	3.2	2.5	2.6
Mean annual fuelwood consumption per aeu (m3)	3.4	1.8	8.0	9.5	3.4	5.5	6.4
(s.d.)	1.9	1.5	4.4	4.2	2.0	2.8	3.3
Mean RFI	7%	5%	8%	16%	17%	10%	6%
(s.d.)	0.10	0.08	0.11	0.13	0.13	0.14	0.06
Mean forest cash income per aeu (USD PPP)	37.2	294.1	733.9	142.1	100.1	507.0	25.5
(s.d.)	141.8	894.7	2559.4	606.2	259.4	1927.2	40.1
Mean forest subsistence income per aeu (USD PPP)	163.7	286.9	622.8	957.4	754.8	542.1	18.2
(s.d.)	226.7	271.6	658.7	871.9	634.1	561.2	13.4

Table 15 Pairwise correlations

	RFI	Forest cash per aeu	Forest subsistence per aeu
Household size	-0.1279 *	-0.0554	-0.2908*
Distance to market (km)	0.1022 *	0.0800	0.0480
Age	-0.0891	-0.0924	0.0540
Education of HH head (yrs)	-0.0325	-0.0352	-0.0032
Wage per aeu (USD PPP)	-0.1570 *	0.1237 *	0.2415 *
Other per aeu (USD PPP)	-0.1672 *	0.1055	0.0640
Net livestock animal per aeu (USD PPP)	-0.0753	0.0243	0.1358 *
Net agriculture per aeu (USD PPP)	0.0057	0.0548	0.2079 *

* denotes significance at 5%

Distance to market was also found to be significantly positively correlated with RFI, meaning that greater distance to market meant a greater share of forest income in total household income. This could go two ways: firstly, a greater distance may mean that it could be harder for households to realise the values of collected products. Secondly, a greater distance to market may mean access to more expansive high quality resource base to exploit. Considering transport assets comprise over 50% of total asset value recorded in the surveys (Annex 6.6), it is likely that households could own the transport necessary to realize the market values of harvest forest products.

The final significant correlate with RFI is other income per aeu, where lower income per aeu from other sources is significantly correlated to higher RFI. This could mean that other incomes suffice to support households and therefore there is no need to tap into forest resources. Also it could be related in some degree to the demographics of those who receive other income. 83% of other income is made up of pensions for the aged, and although age did not significantly correlate with RFI, it may suggest that the aged population receiving pensions have lower shares of forest income in their total household incomes. Studies from tropical and developing regions suggest that the intensity of forest resource collection could be beyond the capabilities of an aged household (Vedeld, *et al*, 2004; Mamo *et al*, 2007), suggesting that the younger households are more likely to engage in resource collection. Also, elderly households may be more dependent on other households for food (De Merode *et al*, 2004) or on transfers from off-spring (Cavendish, 2000).

As well as age, other socio-economic characteristics that deserve further analysis at the national level is the role of education. Education of household heads has been found in other studies to lead to less forest dependence (e.g. Godoy and Conteras 2001, Adhikari *et al* 2004) as education can lead to better opportunities for outmigration and off-farm employment (Mamo *et al* 2007). Education can also lead to changes in taste, where higher education and rising incomes leads to less demand for cheap extractive goods and more demand for luxury purchased good (Byron and Arnold, 1999; Vedeld *et al*, 2004). This however, could be less relevant where forest product collection activities serve a recreational purpose as in Russia and Ukraine.

Finally, the role of gender in forest product extraction has been studied in several case studies with the conclusion that female-headed households are generally poorer and more likely to have a greater share of forest income from forests (Paumgarten, 2005; Osemeobo, 2005). However, in developing region case studies, cultural social and traditional roles also affect women's use of forest resources. For instance, case studies in Africa find that traditionally certain products are the domain of men (e.g. charcoal making in Malawi and Zimbabwe), but subsistence products are often collected by women. In a simple analysis, the regional sample showed that subsistence

products were collected by both, but largely by men (Figure 11). In particular firewood, wild meat, fishing and livestock related (fodder) were largely collected by men, but *proportionally*, women were relatively more involved in nuts and medicinal plant collection (Figure 12).

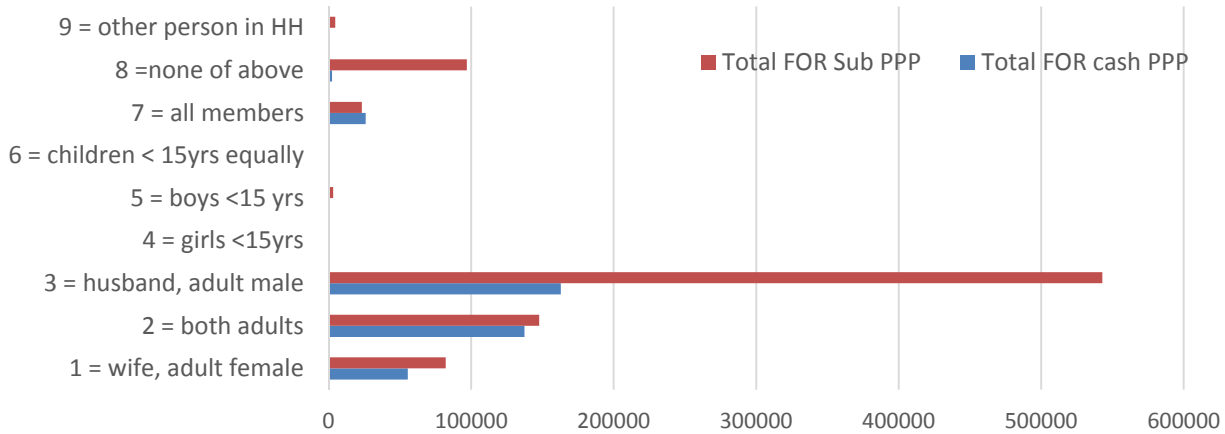


Figure 11 Main collector of subsistence and cash forest products

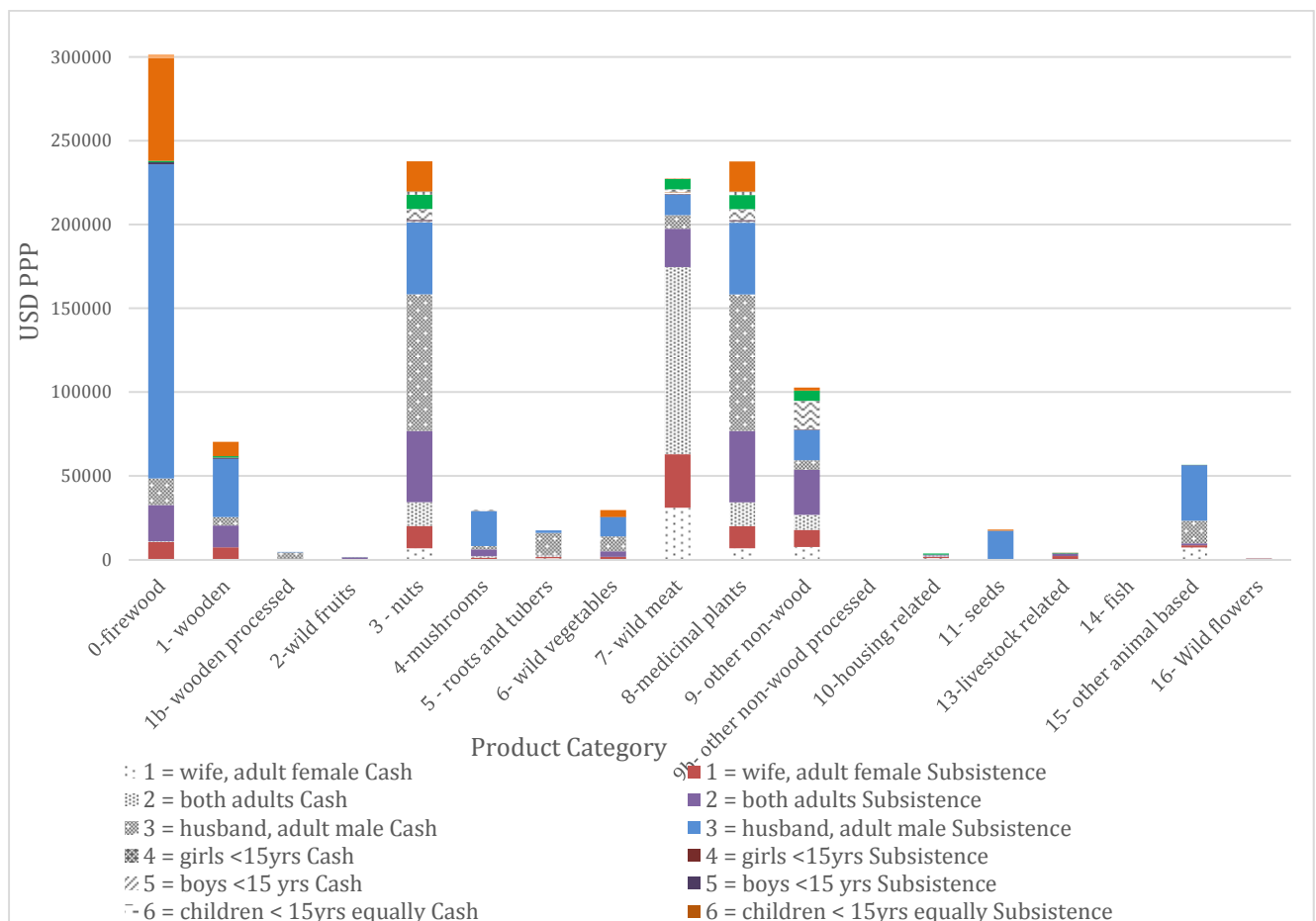


Figure 12 Main Collector of specific products

5.4 Forest dependence and sustainability

This analysis has shown that a wide diversity of products are economically and traditionally important to households. In community focus group discussions, communities were asked to qualitatively judge the most important products for their livelihoods. Almost all country samples identified fuelwood as a central product with the other main products being berries (cranberries or blueberries), nuts, and mushrooms. Most communities also revealed a decline in availability in a forest product,.

Main reasons for declines in cranberries were over harvesting (by non-locals), poor harvesting techniques (using scrapers which are much faster to collect berries, but damage the plants and decrease potential of these shrubs to have a high yield a year later) and changes in climate that affect distributions of the forest product. These are all very real threats to the sustainability of forest products and their continued support to the livelihoods of rural people. For instance, cranberry collection in NWR and Belarus are particularly susceptible to a drying climate. These berries generate large cash income and can result in the loss of significant incomes.

In the Ukraine, blueberries are a significant income source, and similarly susceptible to changes in climate, particularly in Transcarpathia and Polyssia. However, exploitation is likely to turn to other areas once the resource base dries up (Soloviy et al 2014), but will ultimately be determined by the available resources within a household to tap into other resource bases.

Nuts were also identified as an important product that was declining in availability in Azerbaijan. Chestnut trees have been subject to disease, but also tectonic changes have affected water flows and a drying climate has affected distribution. Nuts of the Siberian pine in Altai, Russia, were in decline due to over harvesting and destructive harvesting techniques. Mushrooms in Russia were also declining due to the drying out of the climate.

Finally across countries, fuelwood was recognised as an important product and generally in decline. Main reasons attributed were reduced forest area due to unregulated logging or forest use restrictions, climate change (less rainfall and drought causing shrinking forest area), and increased collection and overharvesting (illegal).

All of these reasons point to the need for better forest management to secure the availability of economically and socially important forest products. Indeed this is a resource base that is essential for rural households to survive during winter months. Fuelwood harvesting and provision in particular needs to be better managed as gas prices are beyond the affordability of some rural households to make the total switch to gas.

Climate variability is also affecting both forests and forest product availability, and this is

already being felt by communities. Diminishing forest incomes in rural livelihood strategies means that rural households need to be able to make a viable living from other activities such as agriculture, which will require investments into technology transfer and market development and the labour market.

Some communities noted an increase in availability of forest products such as blueberries in one village in Belarus as a result of a ban on collection. Hazelnuts in Azerbaijan were also on the increase resulting from better access to equipment and processing technology, and finance. One community in Russia stated that fuelwood was increasing, which was thought to be a response to better forest management in the local area (Gongalsky, 2014).

Surveyed households were also asked their reason for planting trees if they did at all (Table 16). Except for Belarus (where respondents did not answer this section) and Ukraine, where fuelwood for domestic use was the sole reason for planting trees, large shares in each country responded that planted trees were for the benefit of future generations. Seemingly, household preferences are to some degree to ensure the survival of the forests. Other common reasons were fuelwood or fodder for own use, other domestic uses, land demarcation and other environmental services.

Table 16 Reason for planting trees

Reason	1	2	4	5	6	7
1. Fuelwood for domestic use	17%	24%	1%	26%	5%	100%
2. Fuelwood for sale					2%	
3. Fodder for own use	6%	4%	2%	4%	5%	
4. Fodder for sale				2%	2%	
5. Timber/poles for own use		3%				
6. Timber/poles for sale		1%		2%		
7. Other domestic uses	3%	8%	3%	28%	2%	
8. Other products for sale	17%	1%	3%	2%		
9. Carbon sequestration	3%		2%			
10. Other environmental services	11%	4%	4%	4%	5%	
11. Land demarcation	8%	4%	4%	2%	22%	
12. To increase the value of my land		13%	1%	2%	5%	
13. To allow my children and/ or grandchildren to see these trees	36%	31%	19%	26%	41%	
19. Other		8%	63%	4%	10%	

6. Conclusions and reflections

6.1 In the field

The structure of field survey implementation varied between countries. In all cases, national consultants had one or several enumerators who assisted in survey implementation, and were trained by each consultant themselves in their own language. Quality of the training could therefore have varied, and concepts could have been lost in translation.

Furthermore, the distance to some study areas (e.g. in Russia) or team structure (e.g. Moldova) prohibited the field presence of national consultants, which could also affect the data collected. In Armenia, village focus group discussions were also rarely attended by men, which could affect the answers given to the community survey. In Russia, data collection in one region was comprised as a result of slack enumeration, but this was remediated through imputation of prices based on other household data.

Generally, there was also reluctance on the part of households to uncover the cash income and/or asset data, either out of suspicion or out of fear for being held accountable by the tax department for example, and this was particularly a problem in Armenia, Moldova, and Azerbaijan. In Russia, high criminality that surrounds the collection of certain forest products (e.g. caviar) made it dangerous to ask about these forest products and these households or businesses were avoided. Indeed, the quantification of household income and assets is sensitive and this suspicion and reluctance can be reduced through good rapport, confidentiality, reporting back to communities as well as demonstrating that their contributions have contributed to change.

6.2 Validity and reliability

Enumerators were asked to evaluate the reliability of the household responses throughout the survey and then specifically to the forest income section. Figure 13 highlights that in almost all countries, poor reliability of all answers, and answers to forest income remained below 10%. Two exceptions were Azerbaijan where general reliability was poor in almost a quarter of respondent households due largely to the suspicion of respondents towards income questions particularly among richer households. In Ukraine, forest reliability was poor in just under one in five households and was a result of respondents finding it difficult to quantify their sale and inputs.

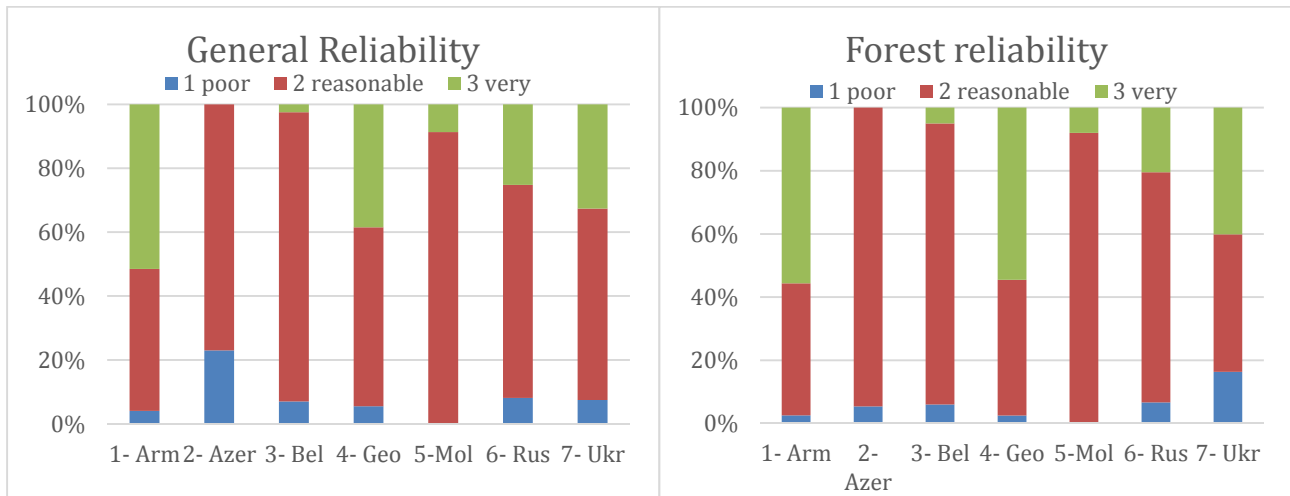


Figure 13 Reliability of information given by respondents

For households that were estimated to have given unreliable responses, enumerators were there asked to judge whether responses were over- or underestimated. Figure 14 shows clearly that underestimation was the dominant direction, and this is not surprising given that recall periods are for the past year. Doing so implies that respondents can find it difficult to remember quantities collected and sold, as well as the prices for them.

Also, most fieldwork was done over the summer months. Since the collection of forest products such as berries was quite common during these months, such products could very well be ‘overrepresented’ in our sample, with other important forest products that are collected during colder periods underestimated. The use of the seasonal calendar to help jog enumerators’ and respondents’ memories can only assist up a certain point, after which accuracy of data relies on respondent’s recall.

Finally, the wage section in the survey collected monthly information and was multiplied to get the annual figure based on best estimations of the number of months worked over the past year. This method of upscaling monthly figures could potentially overinflate figures relative to the other income sources, and this can also occur when upscaling frequently collected products (e.g. fuelwood) to an annual amounts (Bakkegaard, 2008).

Although implementation of quarterly surveys over the year could improve the accuracy of the data collect, the data collected and presented here represents the *minimum* of resource use and income earned by the communities. Importantly, the above results emphasise that environmental and forest resource use is not insignificant to the average rural household, and further analyses of the dynamics at play between humans and nature is needed.

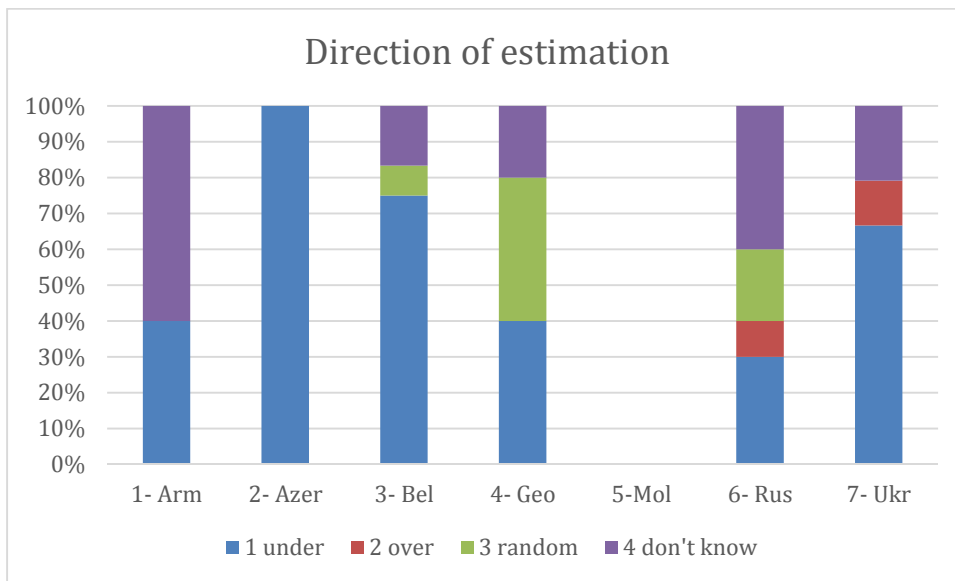


Figure 14 Direction of estimation of unreliable responses

6.3 Future perspectives

Development of forestry is an important sector for national growth of countries in the regions, e.g. Georgia (Tikkanen et al 2003), and Russia (Nilsson and Shvidenko 1998) and the role of forest and environmental resources in rural household incomes is evident. Forest products are important for subsistence and cash income, and therefore vital to livelihoods of the rural people. This is particularly pertinent in countries where rural economies are still lagging behind their urban areas, and migration, poverty, and lack of jobs are encouraging the depopulation of rural communities.

Results from this regional analysis have confirmed the trends found in forest poverty studies in the tropical forest regions. The analysis is one of the first characterising forest resource use in the northern temperate and boreal forests, in countries that are transitioning from decades of Soviet rule to new economies. Outmigration is a recurring trend in the studied communities and populations are aging.

Regional forest dependence is 10.3% with national variation from 5% to 17%, and even more variation within study sites. Fuelwood remains important despite the beginnings of gasification in communities, which remain out of the reach of rural households due to high gas prices and costs of installation. Berries and mushrooms contribute greatly to cash income, with some households using income from these products to supplement other income.

The analysis has shown that forest income makes up a larger share of total household income if the household is poorer – that is, poorer households are more dependent on forest income.

Also, the richer segments of the community generate more forest cash income.

Importantly, most communities see forest products as declining in availability citing reasons such as overharvesting, illegal logging, and climate change as main reasons that are shrinking the resource bases. Thus, in the face of macro-economic development and climate change, there is an imperative need to understand how people depend on nature so that appropriate measures can be taken to insure households who may be dependent on forests for their livelihoods.

Although these studies are only snapshots in time of localised cases, they serve to demonstrate that forests and the environment provide important resources to the rural households. This not only points to the need for continued research and analyses, but for the development of appropriate policies that can integrate the resource needs of rural communities in order to ensure that the people who are most dependent on forests and the environment are not excluded from an important base for their survival.

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ⁱ Other case studies include: Rayamajhi et al 2012, Kamanga et al 2009, Uberhuaga et al 2012, Yemiru et al 2010, Jagger, 2012

ⁱⁱ RFI = Relative Forest Income = share of forest income in total household income (from Vedeld et al 2004).

AFI = Absolute Forest Income = absolute value of forest income

Total household income = forest + net agriculture + net livestock + animal + business + wage + other

ⁱⁱⁱ For definitions, see Annex 3 - Guidelines

^{iv} Months worked in past year was then estimated (post-field) by national consultants to derive an annual figure.

^v PPP conversion factors for private consumption (LCU per international \$)

<http://data.worldbank.org/indicator/PA.NUS.PRVT.PP>

^{vi} [according to the definition of the Temperate and Boreal Forest Resources Assessment 2000 (TBFRA) (UNECE/FAO 2000)]