

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

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**Faculty of Tropical
AgriSciences**

**Marketing of forest products collected in ancient
walnut forest in southern Kyrgyzstan**

MASTER'S THESIS

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Declaration

I hereby declare that I have done this thesis entitled Marketing of forest products collected in ancient walnut forest in southern Kyrgyzstan independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague 15.04.2020

.....

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Abstract

Non timber forest products worldwide are important source of livelihoods for the rural population. It is estimated that 350 million people depends on forest as their primary source of income, food, nutrition and medicine. Timber marketing is extensively discussed in forestry literature but there are minor studies on economic botany and value chains of plant based NTFPs from the area of walnut forest in southern Kyrgyzstan. This Master's Thesis aims to analyze use patterns, collection management and commercialization practices of the most commonly collected species by the local households products and to estimate the potential to cash income generation. Transect walks, key informant interviews and semi-structured interviews with households and value chains representatives were carried out. Total number of 62 households were identified via snowball and purposive sampling method, agreement with survey was obtain from each respondent. Based on the market survey, five main products – walnuts, apples, mushrooms, barberry, and rosehip, were identified according to percentage of households being involved in their harvesting. Data was processed via statistical methods to understand the potential relations between household resources/characteristics and NTFPs commercialization. Analysis of data from 25 members of different segments of value chain enabled to map current stage and way of products commercialization. Forest is very important for local people, all the questioned households are involved in the collection of NTFPs. Significant correlation was found between distance to the forest and amount of products collected, which also is due the fact that more remote forest provides higher quantities of the products. Climate change and, comparing to the Soviet times, not sufficient government of the forestry were identified as main problems by key informants. Combined with high usage by local population these problems result in degradation of the forest. Remittances from abroad might affect the collection quantities of identified NTFPs. Households with remittances tented to be less involved in the collection of NTFP. Our findings suggest more research on linkages between household economics and forest product collection as well as more active role of government to support sustainable harvesting of forest products.

Key words: household characteristics, remittances, off-farm income, farming practices, Arslanbob

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List of the abbreviations used in the thesis

NTFP – non timber forest product

HH – household

KGS – Kyrgyz som

1. Introduction and Literature Review

1.1. Forest importance

Forest area is described as land under natural or planted stands of trees of at least 5 meters in situ, whether productive or not, and excludes tree stands in agricultural production systems (for example, in fruit plantations and agroforestry systems) and trees in urban parks and gardens. Forest area cover 31 percent of total land territory worldwide (FRA 2018; The World Bank 2019)).

Forests are extremely important not only for people living in close proximity of them but for society in general. Well known ability of forests to absorb carbon dioxide as they grow through the process of photosynthesis, converting it into the oxygen is essential for the life on the planet. There is no greater carbon-capture technology than photosynthesis which is both highly efficient and free (The Rainforest Alliance 2019).

Besides providing habitats for animals and livelihoods for humans forests also positively influence environment - mitigate of climate change, offer watershed protection, prevent soil erosion and is a great source of genetical recourses and bio diversity (FAO; WWF). Forest-based industries provide employment and revenue for many others industries (Angelsen et al. 2014).

According to FAO only in the formal forestry sector, as wood production and processing, pulp and paper in 2016 were employed 13,709 thousand (almost 14 million) of workers.

Table 1. Employment in the formal forestry sector (wood production, wood processing, pulp and paper) in 2006, by region (FAO 2009).

Region	Forest employment 2006 ('000 workers)	% of total employment	Growth trend
Africa	530	0.1	Unstructured
Asia and Pacific	5811	0.3	Increasing
Latin America and the Caribbean	1510	0.7	Increasing
Europe	3815	1.1	Decreasing
North America	1677	0.8	Decreasing
Western and Central Asia	365	0.2	Increasing
World total	13709	0.4	

According to WWF it is estimated that over 2 billion people worldwide rely on forests. There is though big uncertainty about how many forest-dependent people there are in the world (Chao 2012). Major challenge for estimation of exact numbers of people depending on forests is in difficulties of bringing together demographic, socio-economic, and forest cover data (Calibre Consultants 2012). Table 1. Employment in the formal forestry sector (wood production, wood processing, pulp and paper) in 2006, by region (FAO 2009).

1.2. NTFPs

Forest provides people with important environmental services and products that can be grouped in 3 basic categories (Newton et al. 2016).

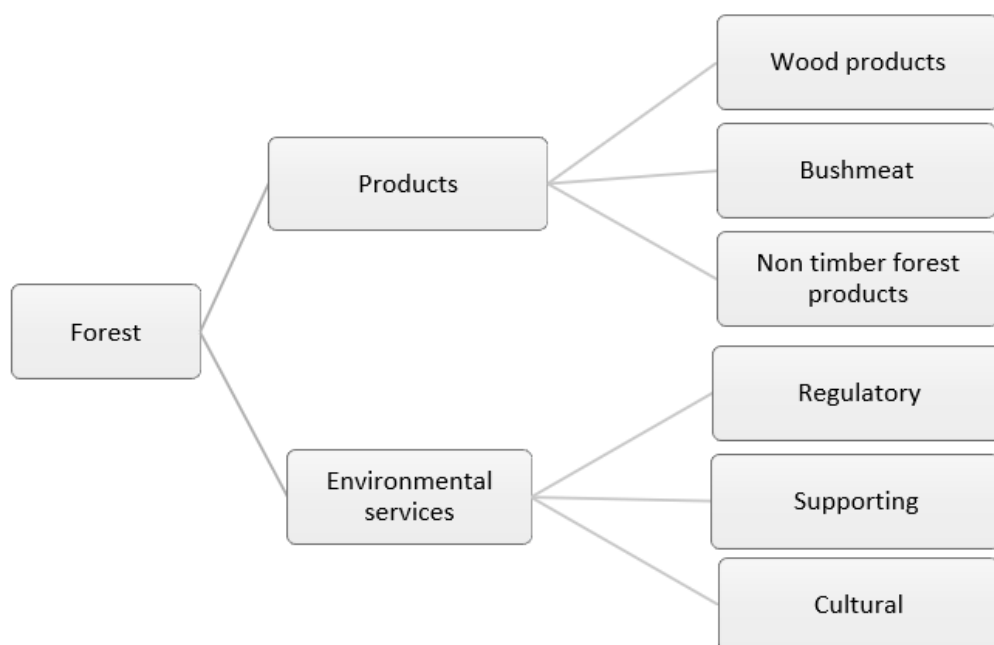


Figure 1. Classification of forest benefits.

Countless plant and animal species are sources of non-timber (or non-wood) forest products (NTFPs or NWFPs) from forests (Timko et al. 2010). Such products include food, e.g. mushrooms and fruits (Arora 1994), animals, birds and fish, fur and feather; as well as their products such as honey, silk and lac (Wickens 1994), medicine (Belcher 2005), fodder (Easterling et al. 2007), fiber and biochemicals (Wickens 1994); construction materials (e.g. palm leaves for roofing), and materials for artisanal production (Calibre Consultants 2012). NTFPs are an important source of livelihoods for the rural population all over the world and also contribute in generating cash-income needs (Luni et al. 2011). It is estimated that 350 million people worldwide depend on forest as their primary source of income, food, nutrition and medicine (UNDP 2004).

Generally, NTFP are also grouped in two categories based on their origin- plant based and animal based products, examples of plant based usage of the NTFPs are shown in the Table below.

Table 2. Examples of plant based NTFPs usage.

Categories	Description
Food	Vegetal food and beverages provided by fruits, nuts, seeds, roots
Fodder	Animal and bee fodder provided by leaves, fruits etc.
Medicines	Medicinal plants or plants parts used in traditional medicine
Perfumes and cosmetics	Aromatic plants providing essential oils and other products used for cosmetic purposes
Dying and tanning	Plants and plants parts providing tannins and used as pigments
Utensils, handicrafts	Heterogenous part of products providing thatch, bamboo, rattan, wrapping leaves, fibers
Construction materials	Thatch, bamboo, fibers
Ornamental	Entire plants and parts of the plants
Exudates	Substances such as gums or latex released from the plants by exudation

Source: Adapted from FAO 1995, Shiva and Verma 2002

NTFPs have historically neglected role, attention to this topic was raised in last two decades by botanists, conservationists, economists and policy makers. Unlike timber marketing which is extensively discussed in forestry literature, the knowledge of NTFPs marketing is limited and spare (Ahekan & Boon 2008; Borchardt et al. 2010; Bourne 2012), particularly in the developing countries where collectors are mainly low income earners who sell these products to supplement their income are not reported (Greene et al. 2006; Shackleton 2006).

1.3. Commercialization of NTFPs and value chain

NTFPs could be commercial products that can make a significant contribution to the cash income generation of households. Individual forest products may be processed into one or more marketed products and traded through a variety of different value chains (Marshall et al. 2006).

NTFP commercialization is defined as a process of increasing the value of NTFP in trade so as to increase income and employment opportunities, especially for poor and otherwise disadvantaged people (Belcher & Schreckenber 2007).

Many studies emphasize that in commercialization of NTFPS are more involved recourse-poor households than resource-rich (Taylor et al. 1996; Cavendish 1997; Margoluis 1994; Quang & Anh 2006).

Results of the study of Quang and Anh (2006) emphasize that resource poor households are more dependent on forest as their income share of NTFPs are higher than for resource rich. Insufficient income from other sources is the reason for collection NTFPs, which have low capital requirement, aiming to increase or supplement HH income. Another reason for rural people of being engaged in NTFP-gathering economic efficiency and social effectiveness (Mikolo Yobo & Ito 2015).

NTFPs value chains are the linkages between the product and the final consumer with all the actions required for that. All the actors are specializing in different functions and are linked between each other (Marshall et al. 2006). Value chains of NTFPs are often diverse, complex opportunistic and marginal (Tomich 1998). Regardless of the governance of a value chain, the ability to negotiate prices and define the rules of trade is vital in determining the satisfaction levels of poor producers, processors and traders in NTFP value chains (Marshall et al. 2006).

Ancient walnut fruit forest of the southern Kyrgyzstan have global importance: it is largest natural grown walnut forest in the world, it provides biodiversity conservation due to great diversity of fruit and nut trees that are wild relatives of domesticated species, is a storehouse of genetic diversity, is valuable for disease control and climate change adaptability and plays a key role in survival of thousands of

people across the whole region especially for resources-poor households (Borchardt et al. 2010; Harris et al. 2002; Hemery & Popov 1998; Orozumbekov 2011)

A few studies focusing on value chains and commercialization of walnut in Kyrgyzstan are conducted (Bourne 2012). However, no studies on economic botany and value chains of NTFPs in the area were carried out so far.

1.4. Remittances and NTFPs

Big part of the population of Kyrgyzstan are labour migrants; exact number is between half a million to one million (World bank 2015). Official number thought for 2013 was 199500 people provided by Kyrgyz Integrated Household Survey. The number of labour migrants according to KIHS is lower than estimated by other sources. The National Statistical Committee of the Kyrgyz Republic estimates the number of labour migrants abroad to be 457,000 in 2011 and the Eurasian Development Bank estimates over a million.

Data from other countries shows that labour migration and transfers from abroad are increasing the welfare of the population (The world bank 2010).

It is important to take cash flows from abroad as an income source into the consideration, in Kyrgyz republic remittances received from abroad in 2016 were 2486.3 millions USD (Country Economy 2019). Remittances refers to inflows of migrants' and short-term employee income transfers (personal remittances) (TRADING ECONOMICS). Personal remittances are combination of personal transfers and compensations from employers. Compensations refers to the income of border, seasonal, and other short-term workers. (The World Bank)

According to Kyrgyz statistical committee income poverty rate for Jalal Abad region is 58 percent for HH without remittances and 49 percent for HH with.

A number of researches are analyzing impact of remittances on the Kyrgyz Republic economy. According to them, remittances affect consumption behavior of households (Ukueva & Becker 2010) and depend on socio-economic characteristics of migrant sending households (Atamanov & Berg 2010).

Labor migration is an important topic for Kyrgyzstan not only because of its impact on country's labor market, its demographic and social situation, but also as a source of income for many households. Volumes of received personal remittances to the Kyrgyz Republic are larger than volumes of incoming foreign direct investments and foreign aid. According to (Muktarbek et al. 2015) average remittance per HH in Jalal- Abad region is 7,617.7 KGS per month, when average for the whole country 7,238.3 KGS per month.

Between factors that influence the migration the most important are level of income, economic situation and level of employment. According to the Eurasian Development Bank major labour migrants work in Russia (92 percent). Income level is 10 times higher then in Kyrgyzstan and most of workers provide low qualified jobs (World bank 2015).

Aims of the Thesis

Main aim of the master's thesis was to document and analyze use patterns, collection management and commercialization practices of selected NTFPs gathered by local households in Walnut Fruit Forest in southern Kyrgyzstan.

Specific objectives were to:

identify the most important plant-based NTFPs collected by local households

estimate potential contribution of NTFPs harvesting to household income;

documenting sociodemographic and economic characteristics of involved households in the area; and

mapping existing market/value chains and document existing selling practices.

2. Methods

2.1. Study area

Kyrgyzstan is a landlocked country in Central Asia, it has borders with Kazakhstan, Uzbekistan, Tajikistan and China. Economic indicators will show that Kyrgyzstan is lower middle income country with an economy dominated by minerals extraction, agriculture, and reliance on remittances from citizens working abroad. Remittances from Kyrgyz migrant workers, predominantly in Russia and Kazakhstan, are equivalent to more than one-quarter of Kyrgyzstan's GDP (CIA 2015). Territory of Kyrgyzstan, officially Kyrgyz Republic, also called Kirgizia, is 19,995,000 ha (NSCKR 2012) around 80 percent of the country is covered with mountainous region Tian Shan.

Forest according to FAO takes territory of 637,000 ha – 3.2 percent of total land area, land for agriculture 10,541,100 ha – 55 percent. FAO estimate in 2016 48 percent of labor force is working in agriculture. Country population is 6,389,500 people, capital city Bishkek has population around 1 million (NSCKR 2020). Second biggest city Osh is situated next to the borders with Uzbekistan has 300,000 inhabitants. (CIA 2015)

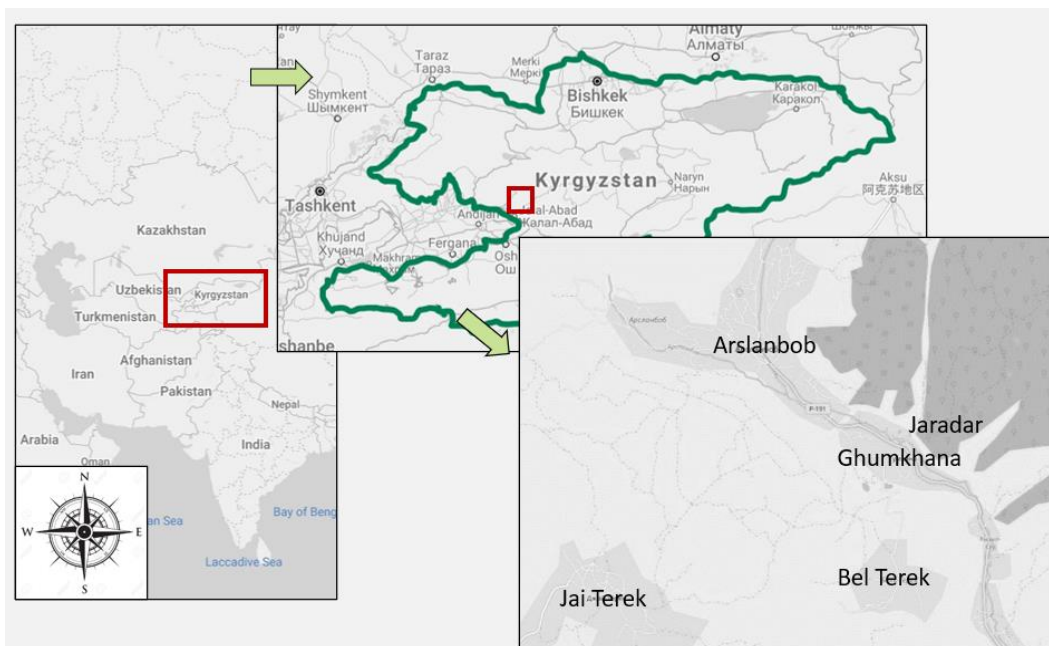


Figure 2. Map of the study side.

2.1.1. Study site characteristics

Present field research was conducted in Jalal Abad region 130 km North from Osh. Jalal Abad region is administratively divided into 8 smaller regions and 4 cities, one of eight is Bazar Korgon region territory of which is grouped into 10 rural areas. Arslanbob rural area has a population 22,404 people and is formed by 8 villages, 3 of them are not populated, others can be seen in a table below. According to National Statistical Committee of the Kyrgyz Republic ethnicity of the population of the Bazar Kogron region - 55.6 percent Kyrgyz, 43.2 percent Uzbeks and other.

Table 3. Population of the study area.

Administrative unit, name	Permanent population, people
Jalal Abad region	1,238,750
Bazar Korgon region	180,200
Arslanbob rural area	22,404
Arslanbob	15,193
Ak Terek, Gava, Dashman	No permanent population
Bel Terek	1,351
Gumkhana	2,220
Jaj Terek	2,988
Jaradar	652

Arslanbob rural area is situated in mountainous area of Ferghana and Chatkal ranges and is mostly known for its walnut-fruit forests. Forest is lying between altitude 1,200 to 1,700 meters (Colfer & Pierce 2005), and its territory is approximately 60,000 to 70,000 ha. Nowadays Kyrgyzstan is still using patterns from the Soviet Union, the part of which it used to be for 73 years. Mostly rights of land property belongs to the

state and government. Situation is not different in the Arslanbob forests. Arslanbobob -Atinsky forestry has the territory of 18,000 ha of forest (NSCKG 2018) which is mostly divided between households for collection of the walnuts.



Figure 3. Fergana mountains picks above the walnut fruit forest.

Forest became extremely monocultural and one-leveled. Governmental financing is not sufficient for forestry administration to take care of it. Due to extremely high usage of the forest combined with letting the livestock graze in the forest and climate change the quality of harvest as well as the amounts is significantly decreasing between seasons.

2.2. Data collection and data analysis

2.2.1. Data collection

Data collection in order to formulate an answer to the objective of the thesis was conducted in Arslanbob rural area in Kyrgyzstan in a proximity of walnut forest. Research was done in period of mid-August – mid-September and had two parts. In first part were provided market survey, participants' observations and transect walks, direct interviews with households' heads or members and interviews with key informants (Cook 1997; Martin 1995). Second part was mainly focused on observations of the preparation of NTFPs for selling, markets operation and interviews with representatives of value chain nodes.

Convenient, snowball and voluntary sampling of 62 households in 5 villages (Arslanbob, Ghumkhana, Jaj Terek, Bel Terek and Jaradar) of the area was used for gathering data on:

- household resources capacity and use (human resources, land ownership and usage, income sources etc.);
- the most important NTFPs with market potential;
- further information on identified NTFPs (collection technics, parts of use, processing, involvement of the HH members in collection and processing, ways of selling, volumes etc.).

Convenient sampling of five respondents of each value chain segment was used to get information on marketing of each product – walnut, apple, mushroom, barberry, rosehip - prices, volumes, frequencies of sales, consumers/markets.

During the research was possible to identify only 3 segments of each product value chain: collectors, resellers and processors.

Collectors of NTFPs are HH and HH members whose activity in a market chain is to collect products from forest and sell it further. HH is defined as a group of persons living together and making common provisions for food and other essentials for living (United Nations 2007).

Processors are small household enterprises rarely governmental organizations aiming to process the primary product. In case of selected NTFPs processing is drying and sorting of the production aiming to sell it for higher price.

Resellers are the most interesting segment as they are present at any stage of the product transformation. They buy and resell products in different stages of processing which leads to increasing of the price and bring difficulties in understanding the market operations and connections between value chain segments.

Table 4. Topics covered in questionnaires for different market chains segments.

Topic	Collectors	Processors	Resellers
Socio-demographic data	yes	No	no
Economic data	yes	No	no
Quantities and prices	yes	Yes	yes
Period of selling and buying	yes	Yes	yes
Transport	yes	Yes	yes
Technics used and processing practices	yes	Yes	no
Problems	yes	Yes	no
Information sources	yes	Yes	yes

2.2.2. Data analysis

A few definitions were identified in the literature on the aims of descriptive research; description and accurately provided facts on an area of interest; to describe characteristics of people or situations and the frequencies with which something occurs (Dulock HL 1993).

A descriptive statistic is a summary statistic that quantitatively describes or summarizes features from collected information (Mann & Prem 1995), while descriptive statistics is the process of using and analysing those statistics. Descriptive statistics is not developed on the basis of probability theory, and are frequently non-parametric statistics (Dodge 2003).

Some measures that are commonly used to describe a data set are measures of central tendency and measures of variability or dispersion. Measures of central tendency include the mean (the sum of a collection of numbers divided by the count of numbers in the collection (Jacobs 1994), median (the middle number in a sorted, ascending or descending, list of numbers and can be more descriptive of that data set than the average (Ganti 2019) and mode (the mode of a set of data values is the value that appears most often (Damodar & Gujarati 2006) while measures of variability include the standard deviation (the standard deviation is a measure of the amount of variation or dispersion of a set of values. A low standard deviation indicates that the values tend to be close to the mean (also called the expected value) of the set, while a high standard deviation indicates that the values are spread out over a wider range. (Bland & Altman 1996), the minimum and maximum values of the variables. (Ganti 2019).

3. Results

3.1. Household members and resources management

Local people nowadays as well as the whole Kyrgyzstan are still under the influence of the former Soviet Union. Patterns of living are not changed as there was no replacement of a broken structure of the Union. Almost everything in the area is reminding of the old times, architecture, transport, hospitals system and education. In the main city of the district – Osh - everything looks like in a movie from Soviet time except of a few new buildings, modern cars and clothes. In smaller Jalal Abad even the best restaurants look and also serve as during best time of Soviets. If in bigger cities as Osh or even in Jalal Abad there is a possibility to find work, in Bazar Korgon and villages possibilities are very limited. For example in Ghumkana village there is one small shop where the owner is working, village directory with 7 employees, elementary school with around 10 people working and partly destroyed sanatorium. During the Soviet time sanatorium was welcoming recreants from whole Union, mostly people with lungs and respiratory problems as the air in the forest area is very clean, there was summer camp for children in 20 km away situated village, was kindergarten and not only elementary school. Processing factories and state institution were working in the area giving people working places and confidence in the future. Local people were much less dependent on the forest then now. Forestry was taking good care on the territory they were responsible for. Local people are remembering Soviet times as times of prosperity and good life comparing to the situation after the Union. Of course situation is very similar to other post-Soviet countries – some are doing better some worse but is definitely difficult to take care of something that was centrally managed for more then 70 years.

For now local people are not very interested in improving the situation in the country, they are covering needs of their families in resources for living. None of the questioned household experience shortage of food but shortage of cash is occurring very often. 47 of 61 households or 76 percent experience cash shortage especially

mostly during April, May and March. Level of pension and salaries are very low. According to National Statistical Committee of Kyrgyz Republic average salary in Jalal Abad region for 2018 year is 14,600 KGS per month. Latest available information on average wage for people working in agriculture, hunting and forestry in whole country for 2013 was 5,939 KGS per month (NSCKR 2012). For 2019 it is 10,542 KGS (Economist 2019). Notwithstanding this amount none of the households reported salary higher than 9,000 KGS per month. Governmental support for children is also insufficient, it equals 810 KGS per child younger than 16 years old and is available only for families where nobody is earning more than a minimum wage which is 1,200 KGS. If family lives in a remote or mountainous area there are territorial coefficient that can increase the support amount. When public authorities are considering if family can apply for a child support even ownership of a car and livestock is taken into consideration. If family own a car which is not older than 20 years there is no right for a governmental support (Ministry of Labor and Social Development of the Kyrgyz Republic)

Local people are traditionally living in big families, situation where there is less than 3 children in household is very rare - the more members household have the more potential labor force is available. As CIA states fertility rate in a country is 2.54 children born/woman for 2020. Traditionally the youngest son is staying in the house of parents and is together with his own family taking care of growing old household members.

If to imagine average family in the area it will have 4.9 members, from whom 2.1 will be dependent members. However, all the members are participating in a household activities accordingly their abilities. Children below 15 years old and people older 65 years are categorized as a dependent household members. Male labor force in average family will equals 1.5 members, female – 1.3.

Only 0.84 will be employed or involved in off farm activities but 4.27 will be working on farm for 6.45 hours a day during planting and harvesting season and 4.37 collecting in the forest. These numbers show how local people are involved in different activities and what is their priority. Most families are growing more than half of food for their needs and having livestock to cover their needs.



Figure 4. Family collection potatoes on the field.



Figure 5. Traditional round bread baking in the outdoor oven.

Family houses are usually not big, there are 2 to 3 rooms with a terrace that is mostly used during the summer. Outside very close to the houses under the roof there are made from bricks or rocks and clay stoves which are used a few times a week to bake traditional round bread. There are plenty ways of bread consumption – with jam and honey as a dessert for tea, fried in oil after the baking as a snack in the forest, with soups, with pilaf, with homemade preserved or pickled vegetables.

Most household have gas stoves inside the house for everyday cooking with refillable gas bottle, those who do not cook all meals outside on the heat from timber. Interesting is the fact that there are almost no chairs in the houses, tables are low and people are sitting next to it on very low benches or its also common to sit on the leveled flour. Each house has a pile of red

pillows, carpets and thin mattresses as well as tablecloth to make each mealtime comfortable.



Figure 4. Barn for livestock with a space for hay.

Livestock is kept next to the houses in barns. This building usually has a space for hay. Cows and chicken are the most popular animals, some families have also a donkey or a horse to work on farm and in the forest and to prepare fermented drink kumyz from their milk. Eggs and chicken meat are consumed often, cows are mostly for milk production. Another very popular product is kurut – small balls with diameter 1 – 1.5 cm made from fermented milk and dried – it is consumed as a snack in all appropriate and not appropriate situations. Pork meat is consumed only in restaurant for tourists by tourists in Arslanbob due to religious reasons. The whole area is Muslim nowadays but a lot of Kyrgyz people do not really relate themselves to Muslims, they used to have different religion based on the worship to the nature before the influence of Islamic neighbors become strong. Kyrgyz women do not cover faces and are just wearing scarfs tied in a knot on the back of the head during work or cooking. This habit comes from need to have something on the head while working outdoors to prevent pieces of leaves and twigs and dust get into the hair and also from old custom that married woman should cover her hair when in public.

Arslanbob area is a mix of Kyrgyz and Uzbek households. It is almost always possible to distinguish who is who by the clothes people wear. Uzbek women often wear hijab and longer dresses with long sleeves. Most of the questioned households are Kyrgyz – 76 percent, Uzbek – 19 percent and 3 mixed household. Different ethnicities do not play any difference when it comes to covering household needs. Rice, flour, salt, sugar, tea, coffee, oil and some other products are always bought on the markets, but significant amount of the food needed is grown by families themselves.

An average household has a territory of 2,245 m² where there is a family house, barn, relatively small space for growing vegetables or just a yard. Orchards are often combined with a yard, rarely orchard is situated in horticulture colonies not far away from the villages. Orchards most common trees are apples, plums and pears, fruits from which are mostly used for family consumption in dried or conserved way. Average household orchard size is 586 m². Foods that are mostly harvested to be available during winter season as potatoes, corn, beetroots, pumpkin and other is grown on fields, average field size is 3,582 m². Rent for field with access to water makes 4,000 KGS per ha per year, 2,000 KGS per ha per year with no water. All members of the household are involved in the planting and harvesting according to their abilities, small children for example are not digging potatoes but can sort it to different sizes or put in the bags. Older women are not working on the field but can clear beetroots from the dried leaves and soil before storing. 25 households have also a hayfield for producing hay for livestock for winter. Hayfields are usually situated on the forest boundaries or along the riverbed. Hayfield sizes is unified – its 10,000 m². Most families are also mowing hay on the rented forest where they collect walnuts. Hayfield rent costs families 400 KGS per ha per year. There is a possibility to buy hay for price of 10,000 KGS for a truck which will be enough for 2 cows for non-grazing season. During grazing season cows are on pastures up to 100 km away with a herd herdsman are forming from the local cows every year. There is a payment for every cow for the season amount of which is always a subject of agreement between cow owner and the herdsman. If orchard and farm territories are private, fields and hayfields are governmental. Rent for field with access to water makes 4,000 KGS per

ha per year, 2,000 KGS per ha per year with no water, hayfield rent costs families 400 KGS per ha per year.

If to summaries there are a lot of activities local people are doing to feed families and economically survive. Lack of opportunities to earn sufficient for good living amount of money in Kyrgyzstan makes men from the area to look for a job abroad. Most of the working abroad people from the region are seasonally working in Russia in construction industry. 34 from 61 questioned households have cash flows from abroad, more then 54 percent are living at least half of the year without members of their families – household heads and adult sons. Those who are staying in the country are taking all opportunities to have an additional income, men become occasional taxi drivers and builders, women are selling homemade products. During harvesting season some people are working at other's people fields to earn money during the day and during evenings and early nights on their own.

For approximately a decade tourist business has been establishing and growing in the area, tourists are attracted to by mountains hiking tours and alpinism, rafting in the spring and beautiful nature. Local people are providing tourists with simple accommodations, food, guided tours, horse rides etc. In tourist business are mostly involved household directly from Arslanbob village, from there most of the touristic routs are beginning.

Only 20 from 173 adult people under retirement age from questioned households are employed and are getting salaries on a monthly basis. When there is very limited sources of income in the area forest becomes essential for local households and people are trying to get from it as much as possible.

3.2. NTFPs with potential to commercialization

Local people are involved in collection of a various products from the forest. Forest is a source of medical plants, spices and herbs for tea, young twigs are used for preparing baskets and other domestic appliances, pistachios are collected in lower

altitudes by collectors from neighbor villages, berries as blackberries are collected for preparing jam and drying for winter season.

Table 5. Most commonly collected NTFPs

English name	Latin name	Vernacular (Local) name	Main selling part	Selling price (KGS/kg)	Selling place (spot)
Yarrow	<i>Achillea millefolium</i> L.	Минжалбырак	Leaves	100	Market
Wild almond	<i>Amygdalus bucharica</i> Korsh.	Бадам	Fruits	14-20	Market
Barberry	<i>Berberis oblonga</i> (Regel) Schneid.	Изирик	Fruits	20-100	Market
Caper tree	<i>Capparis herbacea</i> Willd.	Гавар	Fruits	50	Market
Walnuts	<i>Juglans regia</i> L.	Жангак	Nuts	30-200	Market/Home
Apple	<i>Malus</i> spp.	Алма	Fruits	30-70	Market/Home
Mushroom	<i>Morchella esculenta</i> L.	Козукарын	Whole	80-200	Market/Home
Kyrgyz oregano	<i>Origanum tyttanthum</i> Gontsch.	Кийик-От/Ак-коку/Аш коку	Whole	4	Home
Pistachio	<i>Pistacia vera</i> L.	Мисте	Nuts	70-150	Market/Home
Yard knotweed	<i>Polygonum aviculare</i> L.	Кымыздык	All parts	5	Market
Cherry plum	<i>Prunus divaricata</i> Ledeb.	Алча	Fruits	5-90	Market
Feverfew	<i>Pyrethrum partheniifolium</i> Willd.	Ромашка	Leaves	80	Home
Rosehip	<i>Rosa corymbifera</i> Borkh./ <i>Rosa canina</i> L.	Ит-Мурун	Fruits	15-100	Market/Home
Berries	<i>Rubus</i> spp.	Бүлдүркөн/Малина	Fruits	70-200	Market

Forest is also a source of hay for livestock, horticulture colonies and field for growing vegetable and corn are on a territory where there used to be a forest using

accumulated organic matter. And there much more examples of forest importance in local people life.

We will concentrate on the identified most popular for commercialization in the area – walnuts, apples, mushrooms, barberry and rosehip.

Table 6. Information on collected for selling NTFPs.

Product	Walnut	Apple	Mush Room	Bar berry	Rosehip
Questioned HH involved in collection, number	61	29	26	21	19
Questioned HH involved in collection, % from total participated HH	100.00	46.8	41.9	33.9	30.6
Average amount collected for selling, kg per season/Standart deviation	1043/451	4528/165 1	125/66	135/64	101/35
Collection place, forest ownership	Rented forest	Common forest	Commo n forest	Common forest	Common forest
Collector(s), HH members	All members	HH head, childs	Females, childs	Females, childs	Females, childs
Average rating by HH, scale from 1 - not important 5 - essential	4.8	3.2	3.5	2.5	2.2
Average product contribution to HH,KGS per year	98613	25803	10127	6724	3041

Farm calendar is a graphic visualization of HH activities and conditions connected with NTFPs. Lack of cash is experiences by households in months highlighted red. It was defined as a need to make a decision on a purchasing essentials like foods more then in other times of year. Main months of cash inflows from NTFPs

are highlighted in green color. Yellow are months when HH are involved in collection of a particular product. In the questionnaires' was also included question about food shortage, however none of the questioned HH experience food shortage.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lack of cash			Red	Red	Red	Orange						
Main cash inflows	Green				Light Green	Green			Light Green	Green	Green	Light Green
Walnut collection									Yellow	Yellow		
Apple collection								Yellow	Yellow			
Mushroom collection					Yellow							
Barberries collection						Yellow	Yellow	Yellow				
Rosehips								Yellow				

Figure 5. Farm calendar.

3.3. Collection

3.3.1. Walnuts collection

Walnuts collection and commercialization is essential for the local population. From the 62 households participated in research only 1 was not involved in collection and selling of the main product of Arslanbob forests. Walnuts are collected by families only from rented territories. There is legislation that allows one family only rent two ha of forest from the governmental forestry, collectors have to share some of the harvest with the forestry authorities for the new trees planting, amount of nuts is around 100 kg per ha. Situation in reality is slightly different. A lot of families are collecting nuts

from bigger territory. This does not necessarily mean then that the law is not taking into the consideration but for example two generations living together in one household can still rent two ha forest for each “family”. Other example could be that the territory of older people not willing to collect any more is sub rented by them to somebody else. Bigger territory for collection of nuts does not always mean bigger amount collected as the quality of forest varies.

Season for walnut collection starts in late September and lasts till the end of October. In this time local families are taking tents, kitchenware and things needed for the life outside the village and move to their rented forest. Some even have a small wooden house to live this month in comfort. Happens that male members of the household are in the forest before the season starts to make sure nobody is taking what belongs to their family. Older household members are staying at home and are taking care of the livestock.

Harvesting of walnut can be only done by picking the nuts from the ground or collecting straight from the trees. Walnuts plants thought are mostly grown up trees and not to wait until the nuts fall by themselves the strongest man of the family is climbing the trees and shaking them to make the nuts fall. The rest of the family is picking them from the ground and packing into big bags where the walnuts will be stored until sold or consumed.

In past all the needed things to the forest as well as collected nuts from the forest were transported by horses or mules, nowadays its mostly mechanized. Local people are assisting each other in renting the cars or sending sons to help the neighbor who only has daughters in the family.

During the walnut collection life in the region is changing. Villages are quiet, most of the small shops are closed, children are not really attending the schools where the studying starts 1st of September.

After the walnuts are collected in the forest and packed into the backs long journey starts. There are a few ways how locals are selling walnuts. The easiest one for the families is when the resellers are coming to the farm gate or even picking the walnuts directly in the forest. This way of selling though is not popular because

resellers are usually paying low price. The second option to sell is to go to the market. The closest one is in Arslanbob village but the situation with pricing will not change because walnuts will be bought on small market by the same resellers who are coming to the farm gate. When selling on a bit more remote market the price is increasing. The highest price collectors will get when selling walnuts in Osh market which is around 130 kilometers away, but none of the research participants do so.

Price for the collected walnuts also vary by the time of selling. Nuts sold right after the collection will be much cheaper than the one properly stored, dried and then sold in January or February. The most common pattern for selling the walnuts for the local households is selling on the second closest market in Jalal- Abad. It takes around one hour to get there and a few times a month until all the collected walnuts are sold locals are doing so. People combine those trips with buying needed things for their households such as food, clothing, medicine and other. Price for the kilogram of the walnut varies from 70 to 150 KGS. At the farm gate collectors will get 70 KGS and for selling on the market in January 150 KGS .

Getting to the 50 km away from the villages situated market in Jalal- Abad with big bags of walnuts is not easy when there is no car in the household. There are two ways off transportation, one is taking small bus called “marshrootka”, another one is so called shared taxi where there is a need to pay not only for the person traveling but for each bag of walnuts as well.

Market in Jalal-Abad is even called Walnut market among the locals. Significant part of the market is for selling and buying walnuts only. Sellers can rent places inside the market building or they can pay for entering with the car and sell directly from the car outside of the building.

Under the open air unpeeled nuts are sold. Inside the building on the metal tables are lying different size fractures of peeled nuts in the shape of small heels. The scales used by the sellers should be rented from the market administration or if seller is bringing their own – must pay for it.

Market is very busy from early morning till noon. Around noon minivans and even big trucks are forming a que next to the door of the building. One by one they are

coming inside, and the door does not seem unnecessarily big anymore, people are quickly loading bags on the cars and in half an hour market is empty.

But where does all those walnuts go after the market? When asking buyers this question the most common answer was that they will sell it. Some will store nuts at home until the price will grow, some will sell immediately to people who are buying in big amounts. One questioned lady told me about her business model. At 6 am she is coming to the market, buying nuts from people who are not willing to spend much time on the market for 60-70 KGS per kg and a few hours later is selling bought nuts for 80-90 KGS per kg. As a final destination of Arslanbob nuts people were mentioning Bishkek, the capital city of Kyrgyzstan, Turkey and China.



Figure 6. Jalal-Abad walnut market. Inside peeled nuts fractures are sold, outside unpeeled nuts are sold from the cars.

Peeled and dried nuts are more expensive. To earn more people are either peeling walnuts at home with a help of family or are establishing small processing factories.

One of those was visited to have a better overview on a process. From the street the territory looks like a house in the urban area, with high fence and metal doors. Behind the fence there is almost finished 2 floors house and a small building in the most remote area of the plot. Building has 2 windows and a door. Inside along the wall there is made of bricks nut dryer which takes 1/3 of the room. Along the opposite wall under the windows – long low table and 8 small chairs. Son of the owner is telling about their family business proudly. He says that during the season 8 ladies from the neighborhood are peeling nuts here 10 hours a day for 5 KGS per 1 kg and sorting for 4-5 KGS per kg. Per day they earn around 400 KGS.



Figure 8. Drying system for peeled walnuts.



Figure 7. Second most expensive fracture of the walnut (on the left) and one of the cheapest (on the right).

Owner and his father are bringing nuts to peel, dry and negotiate further selling. His mother is doing packaging for the confectionary in the capital city they managed to agree a few years ago, she is also packing smaller amounts of nuts for relatives, friends and retail customers. 90 percent of all nuts are thought sold to Turkey. Owner is showing different fractures and

qualities of nuts, 10 kg green boxes for confectionary and tools that are used during work. They are also preparing walnut oil but it is not for selling.

On the picture below there are all types of walnuts fractures that this processing factory is selling. Upper line from left to right: “Navat” – darker nuts, sold for 300 KGS per kg, Mixed – all peeled nuts before sorting – 420 KGS per kg, Butterfly and sticks – damaged halves and quarters of the nut – 450 KGS per kg , Butterfly selective – fine half or even whole nuts, the most expensive - sold for 500 KGS per kg. Bottom line on the picture from left to right: Red – 200 KGS per kg, Chaff – 250 KGS per kg, “Kukum” – small fractured chaff – 20-30 KGS per kg, Partitions – parts dividing nuts seed halves inside the shell –sold for 150 KGS per kg and is usually used for starting the fire in the ovens. The whole amount of sold nuts is around 5 – tones per season. Average profit from processing of walnuts in this factory makes approximately 700,000 KGS per season after the calculation of revenues from selling, and costs for purchasing productions, paying workers and transportation costs.



Figure 9. Different nuts fractures after drying, peeling and sorting.

Assumption that market chains of NTFPs in the area are not linear and clear was set after the literature review. In field research showed that there is enormous amount of trade transactions between one segment of market chain which increase price.

Walnut market chain

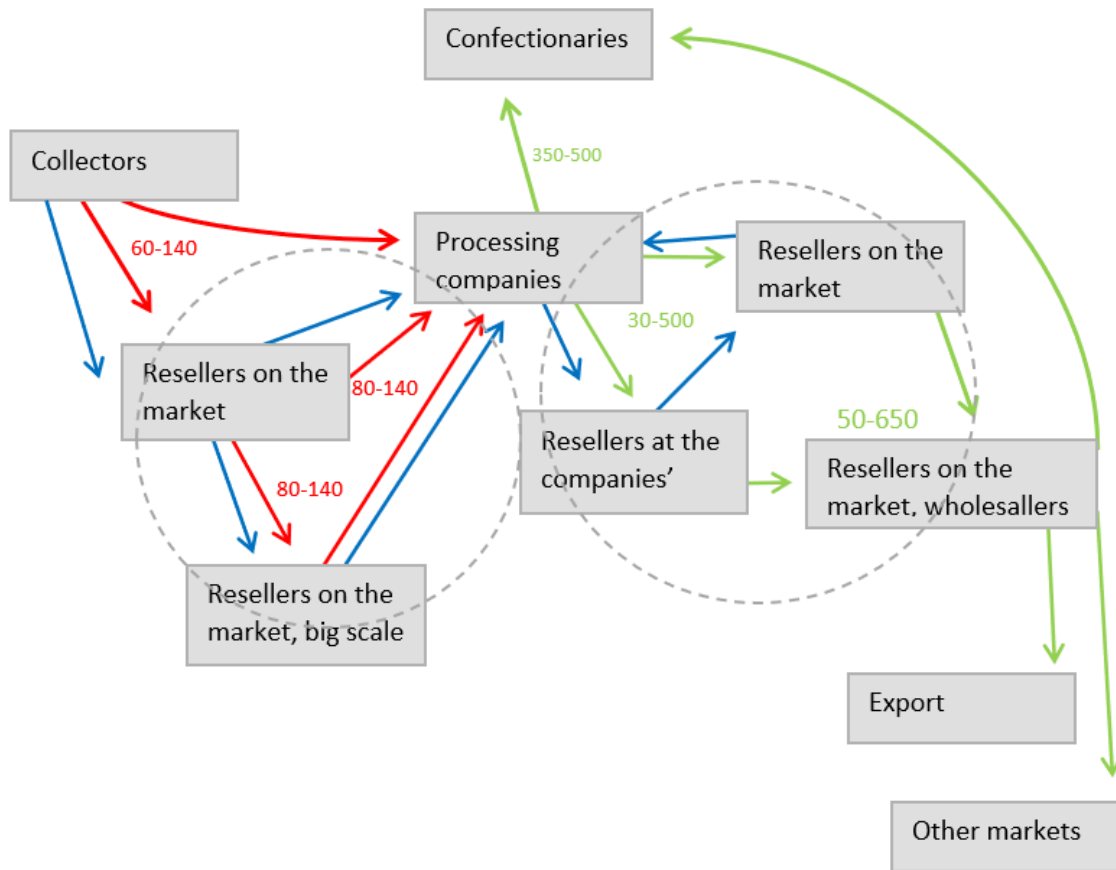


Figure 10. Walnut market chain.

Red arrows are standing for unpeeled nuts, green for peeled, dried and sorted, blue for nuts when at least one of the processing steps are done (peeling, sorting or drying).

Red numbers are prices when selling unpeeled nuts in KGS per kg, prices varies in the range 60-140 KGS depending of time of the year (nuts are the cheapest right after the collection and price is growing till February), nuts quality and negotiation skills of seller and buyer. Green numbers are prices for different fractures of peeled,

dried and sorted product, smallest pieces are sold for 30 KGS and fine halves for 500 KGS by processing factories.

Dashed circles are highlighting transactions withing one segment of a chain.

3.3.2. Apples



Figure 11. Weighting apples after the collection on a neighbor's plot.

Second by importance product for collection for local people are apples. 18 percent of questioned households are involved in apple collection. It is much less than the numbers we see in case of walnuts, the reason is that it is not profitable enough and not everybody see the worthiness of effort. Price per 1 kilogram of fresh apple varies from 4 to 7 KGS. There is no price changing based on the apple quality or other factors, it fully depends on agreement with the buyers.

Apples are ready to be collected in September and October which means certain overlap with the season for collection walnuts which has priority. In collection of apples not the whole family is involved. The transportation is needed to bring apples so the man who can drive, usually it is the head of household or one of the adult sons are going with children. Wives and older people are only involved when there are no younger helpers in the family. Households usually manage to collect apples from 8 to 15 times before the walnut season starts, it takes between 5 to 8 hours per one collection and depending on a lot of factors 300 to 600 kg are harvested per one day. Apple trees are almost not growing in the close perimeter of the people living, as

forest there became monocultural and can be found starting from 6 km away from the villages. Some households are lucky and have apple trees on the territory of the rented forest they have but this situation is very rare. Procedure of collection is basically same as for walnut, the trees are shacked and fallen apples collected into big bags. The forest territory is not divided between people in any specific way.

Apple skin is often damaged after falling and fresh apples could not be stored for a long time. Apples are usually sold short after collecting to resellers coming to the farm gate. For the purpose of usage households are processing apples by themselves. Process consist of washing, cutting on a thin slices and then drying on the metal surface, usually on the roofs of the houses or barns. Dried sliced apples are used during the winter as a snack, drink called “kompot” is made by boiling dried fruits and berries. Other option is preparing hard jelly made from the apple juice and sugar called “pastila”. Fresh apples for selling are weighted by resellers, put to the tracks and taken to the processing factories to be sold there. Collected fruits sometimes become a juice or most commonly- a dried product. A lot of people are selling and buying apples, significant part of traded amount will end up in few drying combinates in the area.



Figure 12. Drying apple factory.

Processing factory on halfway between Arslanbob and Jalal-Abad looks like an abandoned livestock farm: big territory, old machinery and tractors and a few barns in the middle. Wide gates are open and person walking though them is stepping on a huge rusty cargo scale. Looks like no one is on the territory, only 5 ladies in the

distance are swiping yellow grass. From the closer look yellow grass becomes sliced apples drying under the sun and being turned by the workers with help of shovels and rakes. Behind the barn there is low table under the roof used for slicing the apples, 15

more people are having dinner there and nobody is willing to talk. Apples are lying on textile on the ground everywhere, fresh green, half dried yellow, and brown - ready for further selling. After finding that I didn't come to ask about paying taxes or working contracts people became more friendly and even showed me remote area where red apples are drying – Niedzweysky's apple is known for its pink, sweet, red-skinned apples, is included in the Red Book and are forbidden to sell. The procedure of processing is further: apples are sliced by the machine in one of the building and then transported by workers on the textile outside to dry. When the temperature during the day is higher than 30C it takes 2 to 3 days for apples to dry, when around 25C – around a week. 1 kg of dried apples is 6 – 7 kg of fresh. Apples have to be turned once a day. 40 workers of the factory are working 12 hours shifts and are paid 15,000 KGS per month.

After the short talk with a director was found out that apples are only brought here by the resellers who are buying freshly collected apples from the people, price



per kg varies from 4 to 7 KGS depending on the apples quality how fresh and ripe they are and, director told me laughing, on the bargaining skills of both buyer and seller. Resellers are usually coming early evening bringing from 600 kg to 2 tons of fresh apples. All the payments are done in cash, and there is no evidence of the exact amounts that were bought for processing to be seen.



Amount of apples this factory process is not known. Dried apples are mostly bought by Turkish people that are operating

Figure 13. Drying on textile apples, on the picture below workers are turning the apples.

in Jalal-Abad and sending production to Turkey, 10 – 15 percent of the apples are sold to USA and Europe because of pectin and used in confectionary and cosmetics production.

Apple market chain

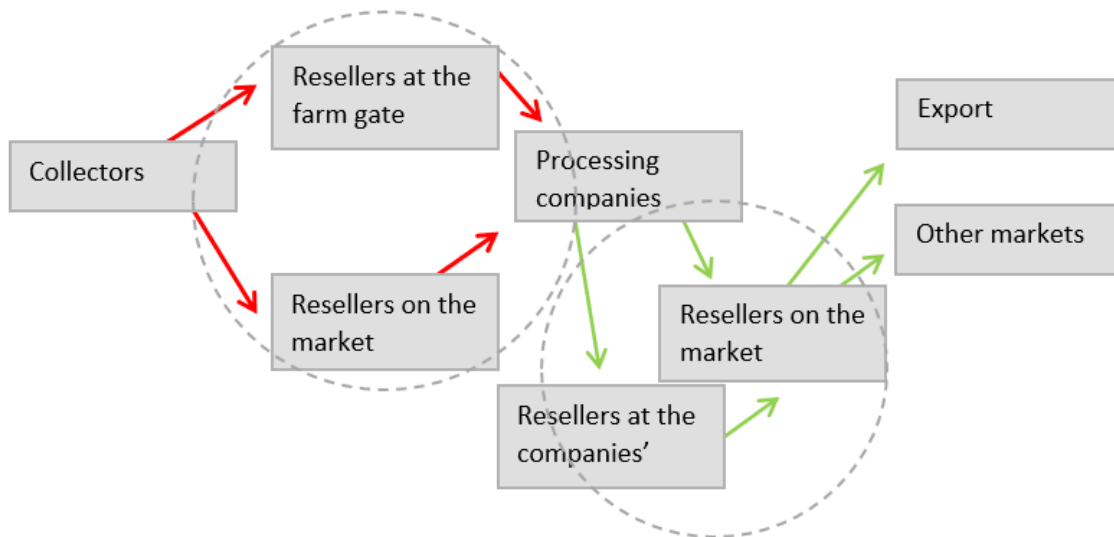


Figure 14. Apples market chain.

Apple market chain is characterized by fast transportation of fresh product from the collectors to the processing companies as apples are spoiled fast. Apple collected by households will be sold same or the other day. Collectors have no time and transportation capacity to sell apples on the market often, so the most convenient way is to call resellers who will come daily to more households to buy apples and then will sell to the drying companies.

3.3.3. Mushrooms

Mushrooms are third most popular product to collect in the forest. 26 percent of questioned households are involved in mushroom collection. Season for collection is one week in May. In collection of mushrooms usually are involved women and children. One adult collector per one time can collect around 10 kg of mushrooms, children a little less – 6 – 7 kg. In the region there are a few mushroom types growing but when speaking about mushroom people will think about True Morels, the only one

collected for selling. Pattern of mushroom collection for people who are willing to sell the product - is everyday collection for a week for 5 – 7 hours in perimeter of 5 – 10 km from the farm in freely accessible forest. It is not possible to collect when the weather is rainy as product is spoiled very fast. Very few families are drying morels by themselves but those who do can sell dried product for much higher price. 1kg of fresh mushrooms costs from 120 to 300 KGS depending on a quality, dried – up to 8,000 KGS.

Usually morels are collected into baskets made from young trees benches, it allows mushrooms to breeze and not get moldy and are sold to the drying factory same day.



Figure 15. Fine dried morels, the most expensive type.



Figure 16. Damaged morels parts.

Drying factory that was visited is situated between the busy road from Jalal-Abad to Arslanbob and deep canyon made by mountain river. Metal gate and fence from bricks is the same as all houses in the area have. Inside there is small building with a big terrace, a lot of buckets and huge plates, laundry is drying on the ropes and chicken are running around – family is living there. Middle age smiling lady in colorful

clothes offers me some tea with jam and honey and telling the story of her business. I came long after the season of morels so she can only show me some leftovers that will be sold to local people on holidays. During May and beginning of June every day for approximately a month she is buying 150 – 200 kg of mushrooms, it makes around 5 stones of fresh morels per season. Interesting fact is that households report only 7 – 10 days season when they collect mushrooms, explanation could be that in different altitudes and parts of the forest mushrooms are ready to collect in different time.

Mushrooms are bought unpeeled and sometimes dirty so the process starts with cleaning by cutting unneeded parts as washing will spoil the structure of the product. Then there is time for drying, under the sun on a special 18m long drier which looks like a long table with airflows working on the sun energy morels are dried within a day, airflow also keeps the flies away from the mushrooms. Price for this machine is around 1 million KGS but the lady got it as a part of project of supporting local entrepreneurs by German organization. A few times a day mushrooms have to be turned. When there are more mushrooms then the drier can carry old way drying in metal netting is used, here it takes around 3 days. From 12 kg of fresh only 1 kg of dried mushrooms is produced. There are 2 types of morels – open and closed. Closed are more rare and are sold for up to 8,000 KGS per kg, open – for 4,000-5,000 KGS, smaller pieces and damaged morels– for 3,000 KGS.

Around 400 – 500 kg of dried mushrooms are sold per year. A few years ago Turkish people were buying almost all production, as they have no more interest in morels its sold on market in Jalal-Abad to buyers from Russia, China and Japan.

3.3.4. Berberis

Berberis also known as barberry is also popular between local people to collect. Berries are ready to collect in August – beginning of September. Around 21 percent of households are involved in the collection. Usually women, sometimes with children, are spending 6 hours a day in the forest to bring home 10 kg of berries. Then barberry is sold to be dried and cleaned to people who are dealing with it.

Lady who is drying morels in May in the time of the visit was drying barberry. The same drying machine is used for the whole summer and makes work a lot easier. Barberry is changing color to dark purple when is dried. 1kg is bought from local people for 50 KGS, after 5 day long drying and cleaning there is 1 kg of ready to be sold product from 3 kg of fresh barberry. Cleaning of dried berries is done in 2 steps. First is using strainer to separate berries from leaves and twigs, second – when one bucket is emptied in a level of eyes of standing person, berries are falling into a big plate on the ground and wind is blowing away all leftover small parts of leaves and dust. Lady is selling dried barberry to the resellers for 300-400 KGS per kg who are selling it further. Resellers are payed 5 KGS per kg for transportation. Last year buyers were from Tadzhikistan, Uzbekistan and Russia. Barberry is very popular as a seasoning for middle East dish with rice and meat – “plov”, also known as



Figure 17. Barberry in different stages of drying.



pilaf.

Figure 18. Supplies for cleaning barberry.

Around 5 tons of dried barberry are sold each year. After showing the way how dried berries are separated from the leaves and twigs the lady calls his husband to show how profitable their business is.

On the adjacent territory behind the fence there is ongoing constructing of 2 floors house. Now it is just a concrete and bricks made building where on every surface barberry is drying. Then lady's husband is taking me to show the territory he is planning to make a processing factory as he is tired of mushrooms and barberry everywhere in his house. We have to cross the river that is really shallow now with no bridge, so the car wheels are fully in the water. In the spring they use a bridge 20 km away as snow is melting in the mountains and there is no possibility to cross the river here.



Figure 20. Dryer system for NTFPs.

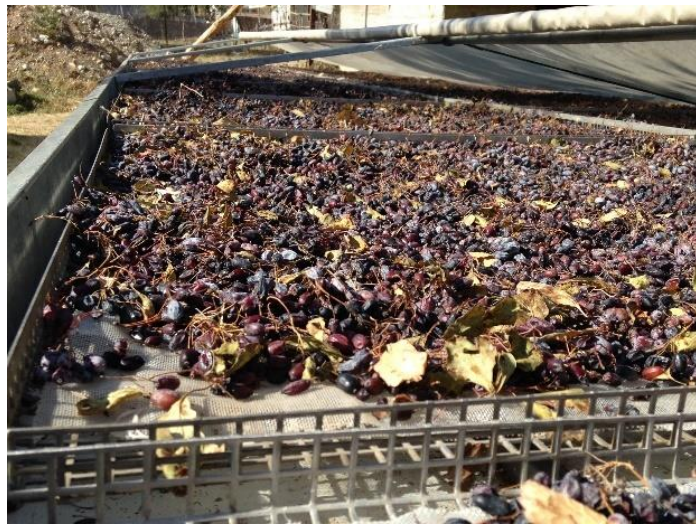


Figure 19. Drying system.

In 10 minutes we are at future processing factory, there is one almost finished house and a drying machine surrounded with fence with a locker. It was first time I saw somebody locking something in the area. The thing because the territory is locked is a dryer. Currently there is barberry drying. The machine is made from iron with netting for drying production, under it there is space for airflow working from solar panels, all the surface is covered with removable textile to protect the product from flies and extreme sun light.

3.3.5. Rosehip.



Figure 21. Rosehip drying on the market.

In collection of rosehips women and children are involved, rosehip as well as barberry is a bush with thorns so collection is not easy. 12 percent of questioned households are involved in collection which starts in the end of August and end when the walnut collection starts. Per one time of collection up to 8 kg of berries are brought. Pattern is very similar to barberry, rosehip is sold at a market to resellers. They can dry berries at home or even on the market why selling already dried rosehip.

An old lady who is drying big amounts at home and then selling on the market was visited. Her son is buying fresh berries on the market and she is buying directly from the collectors paying around 20-30 KGS per kg. After drying on textile all the berries must be sorted. There are 3 types – red – of the highest quality, and all the rest is divided by the size of berries. Women from the neighborhood work here to turn and sort the berries and earn 400 to 500 KGS per day.

To get 1 kg of dried product 2 kg of fresh berries collected in September October is needed, or 2.5 to 3 kg of unripe rosehip collected earlier. Per season she is selling around 20 tons of dried rosehip to Russia, price for kg varies from 80-120 KGS which makes her and her family profit around 500,000 KGS per year. Rosehip is used in

tea production and for medical purposes. Local people are drinking tea made of dried berries which is believed to help against coughing and boosting immunity or preparing jam from freshly collected rosehip.

Mushroom, barberry and rosehip market chains

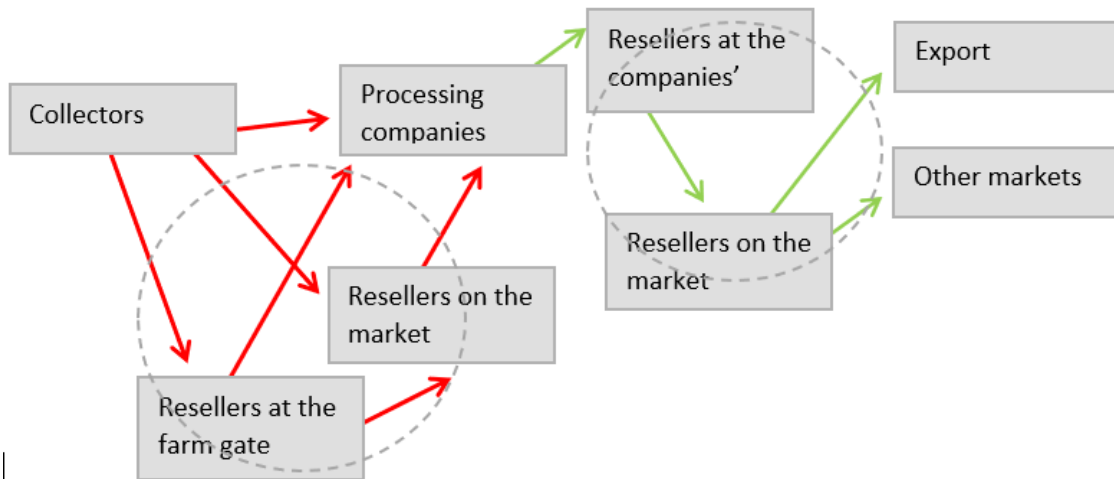


Figure 22. Mushroom, barberry and rosehip market chain.

Market chains of mushrooms, barberry and rosehip are very similar. Collected by local HH fresh (red arrows) products are getting to processing companies directly or via various resellers. After drying and sorting (green arrows) production is sold to resellers at a farm gate who then sell production on the market to be exported or sold in different cities. Dashed circles highlight the stages of the market chains that consist of transactions withing one stage of a product.

A major problem of decreasing amounts of available NTFPs was identified by the questionnaires. 94 percent of the questioned households are worried about the decreasing of amounts of forest products. Local people are perturbed how the situations will develop as forest governance is not sufficient and usage is not sustainable. On the market decrease of collected amounts is also present, but the main issue remains decrease in interest to the products of exporting companies, losing established trade connections and difficulties in entering new markets.

3.4. Effects of household recourses on forest products harvesting and marketing

Collection and commercialization of NTFP are taken by local people as a way to increase income of the households. I had an assumption that household's collection amounts and commercialization will be affected by the characteristics as size of the family, level of employment or participation in off-farm activities and distances to places of collection and selling.

All the questioned HHs have very similar situation with employment and participation in off activities aiming to generate cash income. In HHs its usually 1 member who is receiving salary or pension and 1 – 2 who are occasionally earning: man as a taxi drivers and on constructions, women at processing factories.

Amount of collected NTFPs was found to be connected with the size of the households, for the purpose of calculations all the household were grouped into small, medium and big ones.

Small households (2-3 members) are mostly families where there are 2 adults of retirement or approaching retirement age and a child who did not reach 18 years old age living with grandparents. 1 HH is a young family with a newborn. 13 percent of questioned households are in this category. 1 HH have a member who receive salary and 4 HH have 1 member receiving pension. Average income for this category is 3,250 per month, contribution from NTFPs selling 99,500 KGS per season. This HHs tend to collect less apples and mushrooms due to limited labor force which average is 1.9, only 1 HH from the category is collecting apples as it usually involves HH heads and children, and mushrooms which are collected with children as well. Amount of collected mushrooms is also smaller then in 2 other categories. But amounts of harvested rosehip and barberry, which are mostly collected by women as both plants have thorns, are the highest from all categories.

Medium size HH have 4.5 members. To this group 30 HH belong and it makes 48 percent of all questioned households. This families have 3 to 4 generations and 1.8 dependent members on average. 0.6 people are employed or are involved in a off farm activities. Average off farm income excluding remittances is 3,600 KGS per month and NTFPs contribution to income is 110,500 KGS per season.

Big household which have more then 6 members are families with 2.9 dependent members make 39 percent of questioned HH. 11 people from the group are employed, average 2 member have off farm income. 6,960 KGS per month is average monthly income, NTFPs contribution is 148,173 KGS per season. Amounts of collected apples and walnuts is higher then in other categories, but amounts of mushroom, barberry and rosehip collection of which is mostly done by women are lower. The possible reason could be that there is much more load of on-farm work and women are having less time while taking care of big families then of smaller ones.

Table 7. Comparison of different sizes households.

HH size	ppl	2-3members, 8 HH, 13%		4-5members, 30 HH, 48%		6+ members, 24 HH, 39%	
		Average	Median	Average	Median	Average	Median
HH members							
involved in collection in the forest	pp%	95.02%		85.81%		88.80%	
HH members employed or involved in off-farm activities	ppl	0.50	0.50	0.58	0.00	1.23	1.00
Off farm income, excluding remittances	KGS	3250.00	4500.00	3622.00	2400.00	6950.00	6550.00
Income from NTFPs	KGS	99556.0	100050.	110562.	110000.	148173	143125.

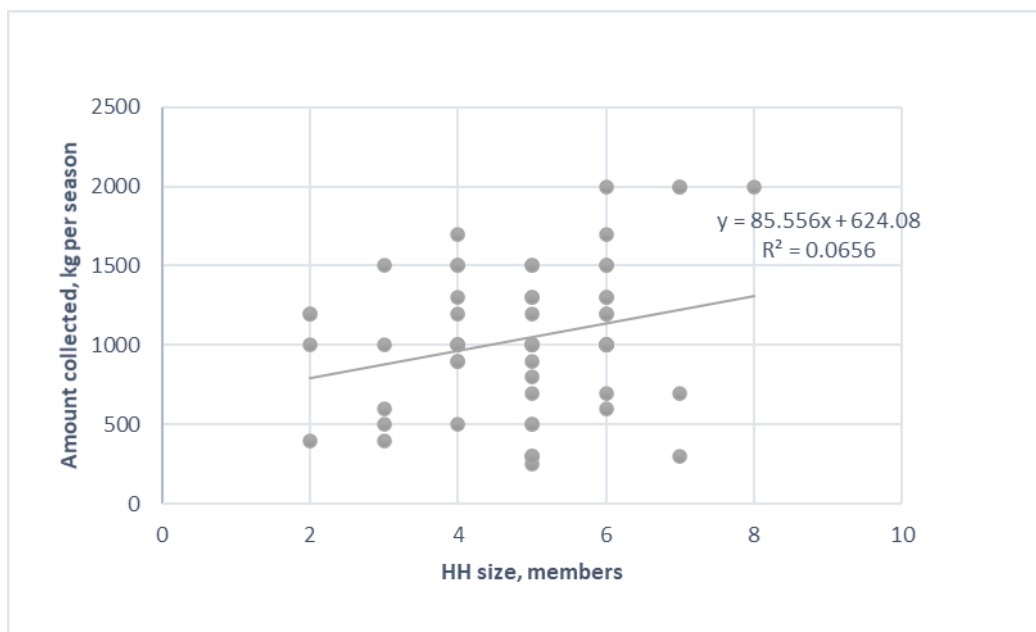


Figure 23. Household sizes and amount walnuts collected regression.

As is showed by linear regression model 65 percent of dependent variable (amount of collected walnuts, kg per season) is explained by independent (households' sizes, members). P-value is 0.0463 at the 0.05 level of significant which makes the model statistically significant.

Table 8. Information on NTFPs collection according to household size.

Walnuts		8 HH involved in		29 HH involved in		24 HH involved in	
		collection, 100%		collection, 97%		collection, 100%	
Distance to collection place	km	7.45	8.00	7.62	8.00	9.16	9.50
Amount collected per season	kg	988.00	1100.00	942.00	1000.00	5075.00	4950.00

Contribution to HH income	KGS	86625.00	84000.00	89700.00	90000.00	120909.00	110000.00
Apples		1HH involved in collection	16 HH involved in collection	12 HH involved in collection			
Distance to collection place	km	6.00	7.32	7.00	9.14	9.50	
Amount collected per season	kg	6000.00	3650.00	4000.00	5075.00	4950.00	
Contribution to HH income	KGS	36000.00	21488.00	24000.00	29708.00	29000.00	
Mushrooms		1HH involved in collection	13 HH involved in collection	11 HH involved in collection			
Distance to collection place	km	7.00	6.31	6.00	6.92	6.50	
Amount collected per season	kg	70.00	140.00	140.00	124.00	105.00	
Contribution to HH income	KGS	10500.00	23185.00	21000.00	20520.00	15975.00	
Barberry		6HH involved in collection	9HH involved in collection	5HH involved in collection			
Distance to collection place	km	6.22	6.50	4.33	4.00	6.00	5.50
Amount collected per season	kg	136.00	135.00	130.00	120.00	108.00	120.00
Contribution to HH income	KGS	7042.00	6750.00	7083.00	6000.00	5040.00	6000.00
Rosehip		4HH involved in collection	8HH involved in collection	6HH involved in collection			
Distance to collection place	km	8.32	8.00	7.50	7.00	7.00	7.00
Amount collected per season	kg	123.00	120.00	115.00	115.00	72.00	65.00
Contribution to HH income	KGS	3675.00	3600.00	3435.00	3450.00	2150.00	1950.00

The bigger the household is the more labor force it possess. Number of members involved in collection on and off farm activities logically grows.

In collection of apples are with higher efficient involved big households, from the small ones only one from the questioned families are commercializing apples. Barberry and rosehip patterns are very similar, woman in big families are more occupied in the farm and household and their families are collecting less.

Distances to collection places were grouped into two categories according to the minimum and maximum values. Was found that distance to a collection place have an influence on collected amounts and commercialization of NTFPs.

Table 9. Distance to collection place of apples, comparison

Apples	Less then 9 km from the farm		9 or more km from the farm	
	Average	Median	Average	Median
Distance,km	6.8	7	10.5	10
Time for 1 collection, hours	5.5	6	6.2	6
Frequency of collection, times per season	11.4	10	10.8	10
Amount collected per 1 time, kg	363	400	420	400
Amount for selling , kg per season	3989	4000	4218	4500
Price per kg	5.7	6	6.1	6
Selling of NTFP contribution to income, KGS	23289	24000	25709	27000

More remote forest is richer and per 1 time HHs collect less apples in closer perimeter to farm. Price for apples collected close is lower due to the apple quality - fruits are smaller. Even though HHs collection in the more remote area is less frequent contribution to income is higher. However testing in t-test under 0.05 significance level showed statistical insignificance of differences in apple's contribution to income of two groups.

t-Test: Two-Sample Assuming Unequal Variances		
	less than 9 km proximity	more than 9 km proximity
Mean	3989.47	4218.18
Variance	2562105.26	1753636.36
Observations	19	11
Hypothesized Mean Difference	0	
df	24	
t Stat	-0.4216	
P(T<=t) one-tail	0.3385	Significance level 0.05
t Critical one-tail	1.7108	
P(T<=t) two-tail	0.6770	
t Critical two-tail	2.0638	

Figure 24. t-test for contribution to households' income of apples collected in differently remote areas

Assumption was that there would be measurable statistical relationship between the distance to the collection place and apples contribution to the household income, however this is not visible from the data. Possible reasons could be limitations of the data set such as inaccurate estimations of the amounts and volumes by interviewed people and tendency to share data that make families worse – off to the surrounding community.

Table 10. Distance to collecting place of Mushrooms, comparison.

Mushrooms	<8km from the farm		>8 km from the farm	
	Average	Median	Average	Median
Distance, km	5.4	5.5	8.9	9
Time for 1 collection, hours	5.8	6	7.2	7
Frequency of collection, times	5.9	7	6.4	7

per season				
Amount collected per 1 time, kg	16.3	15	23.5	20
Amount for selling , kg per season	93.5	92.5	151.9	140
Price per kg	170.0	180	168.2	180
Selling of NTFP contribution to income, KGS	15530.0	13500	25915.4	25200

Influence of the remoteness of a collection place was tested with a t-test at a significance level 0.05. Null hypothesis assuming means for 2 distance ranges are equal was rejected as the p-value is less than the significance level. The difference between two means is statistically significant.

Table 11. t-test for amounts of apples collected in different remoteness of households.

t-Test: Two-Sample Assuming Unequal Variances		
	Less than 8km from the farm	8 or more km from the farm
Mean	93.5	151.9231
Variance	1528.056	6339.744
Observations	10	13
Hypothesized Mean Difference	0	
df	18	
t Stat	-2.30851	
P(T<=t) one-tail	0.016527	Significance level 0.05
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.033053	
t Critical two-tail	2.100922	

Distance from the farm to the collection place of mushrooms has influence on amount of collected product. From more remote areas collector bring 23 kg per 1 time and from close – 16 kg. Price when selling is not affected by the remoteness. Average income contribution is 10,000 KGS higher for the collection places situated from 8 to 13 km away from the farms.

For other NTFPs remoteness of collection does not play a role. Harvested amounts of the walnut as well as rosehip and barberry depend on environment conditions. Interviewed HH members with differently remote collection places admitted that walnut amount differs significantly from year to year. Barberry and rosehip collection is influenced by correct timing as all the places in the forest where there are a lot of berries to harvest are well known by local people and important is to come to the place before it is taken by other collectors.

More than half of the questioned HH are receiving remittances from abroad, as commercialization of NTFPs is taken as a way to increase income of the family was assumed that HH without remittances are collecting and selling more products from the forest. Results of calculations and HH characteristics are shown in the table below.

Table 12. HH resources with and without remittances comparison.

	HH with remittances, 34, 55%			HH without remittances, 28, 45%			p-value
	Mean	Median	St.dev	Mean	Median	St.dev	
People in HH, members	4.82	5.00	1.48	5.17	5.50	1.11	.176
Labour Force, members	2.76	2.00	0.97	2.92	3.00	0.84	.171
On-farm activities, members	4.12	4.00	1.61	4.50	4.00	1.08	.409
Off-farm activities, members	0.58	0.00	1.01	1.14	1.00	0.44	.001
Collection in the forest, members	3.81	4.00	1.44	4.35	5.00	1.23	.153
Land total rented (hayfields, fields), m2	18205.88	20000.00	9958.09	26428.57	30000.00	12566.24	.005
Forest size, m2	19676.47	20000.00	10825.89	27407.41	30000.00	11002.55	.006
Livestok (cows), heads	2.00	2.00	1.28	4.04	3.00	2.38	.001
Chicken, heads	16.38	17.00	7.38	23.78	25.00	10.85	.001
Salary per HH,	404.25	0.00	1641.47	4507.14	6350.00	3710.98	.001

KGS/month							
Total off-farm (salary, pensoun, children support)	2948.31	2400.00	1039.29	6914.28	7500.00	4701.57	.001
KGS/month							
Total NTFPS contribution, KGS/year	115650.0 0	106500.0 0	57631.92	131351.1 7	141675.0 0	49680.78	.038

Table 13. Households with and without remittances NTFPs collection comparison

	With remittances		Without remittances		P-value
	Mean	Median	Mean	Median	
Walnuts					
Amount for selling, kg	989.42	1000.00	1111.16	1000.00	0.341
Income from selling, KGS	92697.00	90000.00	109444.47	100000.00	.283
Importance of product	4.71	5.00	5.00	5.00	.284
Apples					
Amount for selling kg	4028.64	4000.00	4726.74	4900.00	.302
Income from selling, KGS	24771.45	25500.00	27166.71	25000.00	.374
Importance of product	3.00	3.00	3.17	3.00	.374
Mushroom					
Amount for selling kg	124.62	105.00	135.81	130.00	.492
Income from selling, KGS	19553.81	16200.00	23408.32	19500.00	.480
Importance of product	3.71	4.00	3.37	3.50	.363
Barberry					
Amount for selling kg	124.20	100.00	140.47	150.00	.363
Income from selling, KGS	6208.36	5000.00	6996.40	7350.00	.156
Importance of product	2.61	3.00	2.68	2.50	.460
Rosehip					
Amount for selling kg	96.41	90.00	113.72	120.00	.348

Income from selling, KGS	2890.91	2700.00	3411.42	3600.00	.348
Importance of product	2.25	2.00	2.30	2.00	.44

Local household that receive remittances are smaller, tend to be less involved in collection in the forest and off farm activities in comparison with HH with no cash flow from abroad. They also possess less natural resources (land for different purposes) both owned and rented and livestock. Interesting is the fact that HH without remittances thought are bigger have almost same labor force as ones without which make these two groups comparable.

Collection of walnuts is important for both groups, families with no remittances collect more, but not significantly. Situation with apples is the same.

Bigger collection of mushrooms, rosehip and barberry have households without remittances, though importance of the product for two groups is different only in case of mushrooms.

Assumption was that remittances would influent collection amounts to bigger extend then the table is showing, however calculations shows that even cash flow from abroad are not sufficient to cover the needs of the families to the level when collection in the forest is not vital any more.

4. Discussion

Very significant in understanding the importance of forest was the scale for evaluation of the forest products which was a part of a household's questionnaires, on the scale from 1 – not important to 5 – essential. Survey participants were asked to evaluate importance of each NTFP with a potential to contribution to HH income. When the question was not understood or the scale caused difficulties it was reformulated as “how bad it would be if you are not able collect product in forest anymore”. Results shown in Table 6 explain that products with higher potential to income generation are evaluated with higher importance, when products that don't have satisfactory ration of effort/contribution to income for HH were rated with lower importance.

Extent to which local people "depend" on the walnut-fruit forests for livelihoods has been questioned (Marti 2000, Carter et al. 2003), the land resources of forestries as a whole contribute to many local livelihoods, including the viability of agriculture and livestock raising. Some people have farm on rented plots within forestry territories and, although illegal, grazing in forestries territory is very much the norm. Forestry resources are an essential part of rural livelihoods. (Fisher et al. 2004)

Rural communities are often blamed for damaging the environment through using forest lands to grow crops or 'over-grazing' territories. However, they frequently have few options for making a living and are often struggling to survive in the face of much more destructive external influences (Fauna and Flora International).

Some of problems that were identified by the questionnaires were previously discussed by Fauna Flora International, Cartel et al. 2003 – grazing on the forest territories makes forest be unable to regrow and ensure its proper functioning as a biosystem. Sprout level is eliminated by the livestock and as a result forest is one levelled and no new trees are growing to replace growing old ones.

Another identified problem is decreasing of the amount of available for collection NTFP. This problem was discussed by Wilson et al. on the example from

Kara-Alma Forestry Unit situated next to Arslanbob- Atinsky forestry of a *Malus niedzwetzkyana* which belong between endangered species. Significant decrease in productivity of the forest is linked with climate change and the overuse of forest by local population.

Amount of species collected in the forest is huge, according to Table 5 there are 14 the most commonly collected by local households products with the purpose of commercialization, even more are collected for the usage in preparing food, medicine and supplies for the everyday activities.

According to FAO walnut is the most important forest product from the area, this fact was confirmed by the comparison of collected for selling amounts of NTFPs and their contribution to households' income.

The annual walnut harvest is a major source of cash income. It has always been important for the maintenance of the forestry in the area and walnuts remain the most important NTFP product (Fisher et al. 2004). Based on the data from FAO research in 2002 50-60 percent of family's income is coming from the walnut selling when it is a rich harvest, income from the selling walnuts is very important for local people (Fisher et al. 2004).

Remittances are a big topic in regards of post-Soviet Unit countries. Centralized management was not replaced by other convenient structure and floristries as well as other governmental institutions were left to deal with problems by themselves. Level of unemployment in rural area, especially in remote areas in the mountains as Arslanbob-Atinsky forestry is annually growing according to Kyrgyz statistical committee as well as is growing the amount of labor migrants in the country. More than half of the questioned households have a family member working abroad, cash flow from abroad is a source of living for a lot of families. Calculation and data analysis showed that HH receiving remittances are collecting and commercializing smaller amount of some NTFPs. Assumption was that those families have sufficient income from abroad and do not need to cover their basic needs. But according to study of Ukueva and Becker remittances in Kyrgyzstan do not affect the basic expenditures as are spending for food, fees and charges for living and others. Received from abroad

transfers are mostly spent on constructions and celebrations like for example weddings or anniversaries.

The market chains presented in the result section give an overview on a market chain segments that are involved in the commercialization of NTFPs collected by local population. Market chains of five selected products are described based on the observations and interviews with each segment actors. Ability to negotiate prices as was discussed by Marshal et al. confirmed to be very important to determine the satisfaction level of all involved actors on different stages of the chains. Tomish emphasizes that market chains of NTFPs are often diverse and opportunistic. Marshal et al. and Anders study shows that NTFPs market chains involve trade withing one segment actors. This phenomenon makes understanding of the whole process difficult and limits the possibility to estimate real values and profits for each segment.

5. Conclusions

Forests are playing fundamental role in life on the planet, it impacts climate, environment, flora and fauna and of course people worldwide. Forest products in general, as well as non-timber forest products are source of income, food and medicine and provide rural communities with amount of benefits for livelihoods. Five most important for the households living in a proximity of walnut fruit forest in Kyrgyzstan NTFPs are walnuts, apples, mushrooms, barberry and rosehip. Use patterns of five selected products, collection management, commercialization practices and problems connected were analyzed. Amount of available products are decreasing from year to year due to overuse of the forest and absence of sufficient governance of forestry, some species are becoming endangered and forest is losing its ability to regrow and regenerate.

Commercialization of NTFPs is essential for local population, it significantly affects income of families in situation of high unemployment rate. All household members are involved in the collection and commercialization to the extend they are able to contribute; only small children and very old members are not participating. Mapped market chains of identified NTFPs are to high extend interconnected withing one segment, include transaction between same level actors which leads to the difficulties in estimation of real amounts and values of production.

Results of documenting sociodemographic and economic characteristics of involved household showed that labor migration is an important topic in Kyrgyzstan, more then half of the questioned HH are receiving remittances from the family members. Cash flows from abroad only affect participation in collecting in the forest and the volumes of collection, not the fact of it. Households with remittances tend to collect less products where ratio effort for collection and contribution to income is low – barberry and rosehip. These household are also less involved in on and off farm activities.

Results of the present thesis are important in terms of understanding of the current natural and economic situation of the area; present practices of collection,

processing and selling of NTFPs. It also highlights importance of forests and negative impacts the forest deterioration can have on a population. Data can be used for further researches and for monitoring the patterns of changes in relationship of local people and the forest by students and research institutions.

There is a need to address limitations of the thesis which should be taken in consideration in future researches. Seasonality of research could affect respondents' answers as they were mostly concentrated on the current actions to be done. Also should be found a different approach to eliminate difficulties with sensitive issues, especially income level, as this information either was not shared or was obviously distorted. Limitations of the data set such as inaccurate estimations of the amounts and volumes by interviewed people and tendency to share data that make families worse – off to the surrounding community was observed during the field research

For the improvement of current situation further researches and strong cooperation with local government are needed to find the ways of using forest sustainable.

6. References

1. Adams Jr. and Page, 2005. Do international migration and remittances reduce poverty in developing countries?. *World Development*, **33(10)**:1645-1669.
2. Ahenkan A, Boon E. 2008. Enhancing Food Security, Poverty Reduction and Sustainable Forest Management in Ghana through Non-timber Forest Products Farming: Case Study of Sefwi Wiawso District. GRIN Publishing
3. Akylai M, Seyitov T, Jenish N. 2015. Working paper of the National Bank of the Kyrgyz Republic Remittances and Expenditure Patterns of Households in the Kyrgyz Republic Prepared. National Bank of the Kyrgyz Republic
4. Anders J. 2009. Valuation of non-timber forest products value chains. *Forest Policy and Economics* **11(1)**:34-41.
5. Angelsen A, Jagger P, Babigumira R, Belcher B, Hogarth NJ, Bauch S , Börner J, Smith-Hall C, Wunder S. 2014. Environmental income and rural livelihoods: a global-comparative analysis. *World Dev* **64**: 12-28.
6. Arora D. 1994. From state regulation to people's participation: case of forest management in India. *Econ. Political Wkly* **29**. Available from www.jstor.org (accessed May 2020)
7. Atamanov A, Berg A. 2010. Determinants of Remittances in Central Asia: Evidence Based on the Household Budget Survey in the Kyrgyz Republic. SSRN. DOI:10.2139/ssrn.1609732
8. Beishenaly N, Levant H, Ormonbekova L, Shamsiev Ch. 2013. Labor Migration and Human Capital of Kyrgyzstan: Impact of the Customs Union. EDB Centre for Integration Studies.
9. Belcher B, Schreckenber. 2007. Commercialization of non- timber forest products: A reality check. *Development Policy Review* **25(3)**:355-377.

10. Belcher BM. 2005. Forest product markets, forests and poverty reduction. *International Forestry Review* **7**: 82-89. Available from www.ingentaconnect.com (accessed March 2020)
11. Bland JM, Altman DG. 1996. Statistical notes: measurement error. *NCBI* **313**: 744. doi: 10.1136/bmj.312.7047.1654
12. Borchardt P, Schmidt M, Schickhoff U. 2010. Vegetation Patterns in Kyrgyzstan's Walnut-Fruit Forests Under the Impact of Changing Forest Use in Post-Soviet Transformation. *DIE ERDE* **141**: 255-275.
13. Bourne W. 2012. Analysis of the Walnut Value Chain in the Kyrgyz Republic. Working Paper. PROFOR, Washington D.C.
14. Calibre Consultants. 2012. Numbers of Forest Dependent People: A Feasibility Study. Calibre Consultants and the Statistical Services Centre (SSC), University of Reading, UK. Available from www.yumpu.com (accessed April 2020)
15. Cavendish MWP. 1997. The economics of natural resource utilization by communal area farmers of Zimbabwe. [PhD dissertation]. Oxford University, UK.
16. Chao S. 2012. Forest Peoples: Numbers Across the World. Forest Peoples Programme, Moreton-on-Marsh, UK.
17. CIA. 2015. Central Asia – Kyrgyzstan. Available from <https://www.cia.gov> (accessed April 2020)
18. Colfer C, Pierce J. 2005. The complex forest: communities, uncertainty, and adaptive collaborative management. *Resources for the Future*. DC/CIFOR, Washington.
19. Cook KC. 1997. Participant observation. *Methods in human geography*. Sage Publications, London
20. Country Economy. 2019. Kyrgyzstan – Migrant remittances. Available from <https://countryeconomy.com> (accessed April 2020)
21. Damodar N, Gujarati F. 2006. *Econometrics*. McGraw-Hill, Boson.
22. Dodge Y. 2003. *The Oxford Dictionary of Statistical Terms*. OUP.

23. Dulock HL. 1993. Research Design: Descriptive Research. *Journal of Pediatric Oncology Nursing*, **10(4)**:154–157. DOI: 10.1177/104345429301000406.
24. Easterling W, Aggarwal P, Batima P, Brander K, Erda L, Howden S, Kirilenko A, Morton J, Soussana J, Schmidhuber J. 2007. Food, fibre and forest products. *Climate change 2007: impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK
25. FAO. 2009. *State of the World's Forests 2009*. Rome
26. FAO. 2017. Sustainable forest management in the Kyrgyz Republic. Available from <http://www.fao.org> (accessed March 2020)
27. FAO. No date. Why are forests important?. Available from www.fao.org (accessed February 2020)
28. Fauna and Flora International. No date. Endangered species. Available from www.fauna-flora.org (accessed April 2020)
29. Fisher RJ, Schmidt K, Steenhof B, Akenshaev N. 2004. Poverty and Forestry. A Case Study of Kyrgyzstan with Reference to Other Countries in West and Central Asia. FAO
30. Ganti A. 2019. Descriptive Statistic Terms. Investopedia. Available from www.investopedia.org (accessed February 2020)
31. Greene SM, Hammett AL, Kant S. 2000. Non-timber forest products marketing systems and market players in Southwest Virginia: Crafts, medicinal, herbal and specialty wood products. *Journal of Sustainable Forestry* **11(3)**:20-37.
32. Harris SA, Robinson JP, Juniper BE.. 2002. Trends in Genetics **18(8)**: 426. DOI:10.1016/s0168-9525(02)02689-6
33. Hay I. 2004. *Qualitative Research Methods in Human Geography*. Oxford University Press, Oxford.
34. Hemery GE, Popov SI. 1998. The walnut (*Juglans regia* L.) forests of Kyrgyzstan and their importance as a genetic resource. *Commonwealth Forest Rev.* **77**:272–276.

35. Jacobs HR. 1994. Mathematics: A Human Endeavor. Freeman, NY.
36. Jensen, Anders. 2009. Valuation of non-timber forest products value chains. *Forest Policy and Economics* **11**: 34-41. DOI 10.1016/j.forpol.2008.08.002.
37. Judy S. Yang. 2015. KG LABOR MIGRATION AND WELFARE IN THE KYRGYZ REPUBLIC (2008-2013). Poverty Global Practice Europe and Central Asia Region. The World Bank
38. Leakey RRB, Temu AB, Melnyk M, Vantomme P. 1997. Domestication and commercialization of non-timber forest products in agroforestry systems. *Non-Wood Forest Products*. FAO, Rome.
39. Luni P, Maharjan KL, Joshi NP, Dangol DR. 2011. Collection and marketing of non-timber forest products by Chepang community in Nepal. *The Journal of Agriculture and Environment* **1**.
40. Mamadzhanov D, Rehnus M, Venglovsky B, Sorg JP .2012 . The importance of agroforestry hay and walnut production in the walnut-fruit forest od southern Kyrgyzstan. *Agroforestry systems*. DOI:10.1007/s10457-012-9516-6
41. Mann PS. 1995. *Introductory Statistics* (2nd ed.). Wiley, UK
42. Margoluis RA. 1994. Conservation for health: exploring the association between the small-scale commercial utilization of non-timber forest resources and human health in a tropical forest biosphere reserve. [PhD dissertation.] Tulane University, USA
43. Marshall E, Schreckenber K, Newton AC. 2006. Commercialization of Non-timber Forest Products: Factors Influencing Success. Lessons Learned from Mexico and Bolivia and Policy Implications for Decision-makers. UNEP World Conservation Monitoring Centre. Cambridge, UK.
44. Martin. 1995. *Ethnobotany-A methods manual*. Springer US, NYC
45. Mikolo Yobo C, Ito K. 2015. Trade of the most popular indigenous fruits and Gabon nuts, threats and opportunities for their sustainable management around Ivindo national Park (INP), Gabon. *Biodivers Conserv* **7(2)**:85–102.

46. Muktarbek A, Seyitov T, Jenish N. 2015 Remittances and Expenditure Patterns of Households in the Kyrgyz Republic. SSRN. DOI:10.2139/ssrn.2733425.
47. National Statistical Committee of Kyrgyz Republic. 2012. Kyrgyz info. Available from www.stat.kg (accessed February 2020)
48. National Statistical Committee of Kyrgyz Republic. 2020. Population of regions, districts, cities, urban-type settlements and villages of Kyrgyz Republic 2020. Available from www.stat.kg (accessed February 2020)
49. Newton P, C.Miller D, Augustine M, Byenkyab AAA. 2016. Who are forest-dependent people? A taxonomy to aid livelihood and land use decision-making in forested regions. *Land Use Policy* **57**: 388-395.
50. Orozumbekov A, Musuraliev T, Toktoraliev B, Kysanov A, Shamshiev B, Ormon S. 2009. Forest rehabilitation in Kyrgyzstan. *Keep Asia green IV "West and Central Asia"*: 131-182
51. Osmonaliev A, Mursanbekova G, Mamayeva V, Bakachiev M, Denkevich M. 2010. 2009 population census of the Kyrgyz Republic: Jalal-Abad Region, Bishkek, 2010. Available from the original (PDF) (accessed May 2018)
52. Quang DV, Anh TN. 2006 A Commercial collection of NTFPs and households living in or near the forests: Case study in Que, Con Cuong and Ma, Tuong Duong, Nghe An, Vietnam. *ECOLOGICAL ECONOMICS* **60** (2006):65–74
53. Shackleton SE. 2006. The Significance of the Local Trade in Natural Resource Products for Livelihoods and Poverty Alleviation in South Africa. [PhD thesis], Rhodes University.
54. Tagaev B, Samangina S. 2017. A walk in the walnut forest of southern Kyrgyzstan. *Flora and Fauna International*. BarakElde, KG
55. Taylor F, Mateke SM, Butterworth KJ. 1996. A holistic approach to the domestication and commercialization of non-timber forest products. FAO
56. The forest Recourse Assessment. 2018. The statement of the World's forest. FAO. Available from www.fao.org (accessed May 2020)

57. The Rainforest Alliance. 2019. The Coolest: How Forests Affect Climate Change. Available from www.rainforest-alliance.org (accessed February 2020)
58. The World Bank. 2010. Transfers from abroad. Available from data.worldbank.org (accessed March 2020).
59. The World Bank. 2015. Labour migration. Available from data.worldbank.org (accessed March 2020).
60. The World Bank. 2019. Forest area. Available from data.worldbank.org (accessed March 2020).
61. Timko J, Waeber P, Kozak R. 2010. The socio-economic contribution of non-timber forest products to rural livelihoods in Sub-Saharan Africa: knowledge gaps and new directions. *International Forestry Review*. Available from www.ingentaconnect.com (accessed May 2020).
62. Tomich IP. 1998. Markets, policies and institutions in NTFP trade; nothing is perfect.
63. TRADING ECONOMICS. No date. Personal remittances. Available from tradingeconomics.com (accessed February 2020)
64. Ukueva N & Becker C. 2010. Private Transfers in Kyrgyzstan's Post Transition Environment: Results from a New Household Panel Dataset. Migration, Remittances, and Growth. [Ph D. Dissertation] Department of Economics, Duke University
65. United Nations Development Programme (UNDP). 2004. The Equator Initiative. Money Grows on Trees. Cameroon. Series 5
66. Wickens GE. 1994. Sustainable Management for Non-wood Forest Products in the Tropics and Subtropics. Royal Botanic Gardens, UK
67. Wilson B, Mills M, Kulikov M, Clubbe C. 2019. The future of walnut-fruit forest in Kyrgyzstan and the status of the iconic Endangered apple *Malus Niedzwetzkyana*. Cambridge University Press, UK

68. WWF - World Wide Fund For Nature. No date. The importance of forests cannot be underestimated. Available from wwf.panda.org (accessed March 2020)

Appendices

List of the Appendices:

Appendix 1: Full Table of data on HH sizes.

Appendix 1: Full Table of data on HH sizes (1/2)

HH size	ppl	2-3members, 8 HH, 13%					4-5members, 30 HH, 48%					6+ members, 24 HH, 39%				
		Average	Median	Min	Max	St.dev	Average	Median	Min	Max	St.dev	Average	Median	Min	Max	St.dev
HH members involved in collection in the forest	ppl	2.5	2.5	2.0	3.0	0.5	3.9	4.0	0.0	5.0	1.1	5.5	5.0	5.0	8.0	0.9
HH members employed or involved in off-farm activities	ppl	0.5	0.5	0.0	1.0	0.5	0.6	0.0	2.0	0.7	1.2	1	0	3	0.9	
Off farm income, excluding remoteneees	KGS	3250	4500	0	7000	2803	3622	2400	0	12000	3486	6950	6550	0	15500	5428
Income from NTFP commercialization	KGS	99556	100050	37500	162000	42952	110562	110000	18250	200880	52811	148173	143125	57000	266600	54523
Walnuts		8 HH involved in collection					29 HH involved in collection					24 HH involved in collection				
Distance to collection place	km	7.4	8.0	2.0	10.0	2.6	7.6	8.0	2.0	13.0	2.9	9.1	9.5	5.0	13.0	2.1
Amount collected per season	kg	988	1100	400	1500	394	942	1000	250	1700	407	5075	4950	2000	9000	1795
Contribution to HH income	KGS	86625	84000	35000	150000	38184	89700	90000	21000	170000	43315	120909	110000	30000	200000	50347
Apples		1HH involved in collection					16 HH involved in collection					12 HH involved in collection				
Distance to collection place	km			6.0			7.3	7.0	5.0	10.0	1.6	9.1	9.5	5.0	13.0	2.1
Amount collected per season	kg			6000			3650	4000	2000	6000	1268	5075	4950	2000	9000	1795
Contribution to HH income	KGS			36000			21488	24000	10000	40000	8140	29708	29000	10000	54000	10935

Full Table of data on HH sizes (2/2)

HH size	ppl	2-3members, 8 HH, 13%					4-5members, 30 HH, 48%					6+ members, 24 HH, 39%				
		Average	Median	Min	Max	St.dev	Average	Median	Min	Max	St.dev	Average	Median	Min	Max	St.dev
Mushrooms		11 HH involved in collection														
Distance to collection place	km		7.0				6.3	6.0	4.0	10.0	1.6	6.9	6.5	5.0	10.0	1.7
Amount collected per season	kg		70				140	140	30	280	65	124	105	40	280	74
Contribution to HH income	KGS		10500				23185	21000	5400	42000	11593	20520	15975	6000	50400	13933
Barberry		5HH involved in collection														
Distance to collection place	km						4.3	4.0	3.0	7.0	1.5	6.0	5.5	5.0	8.0	1.4
Amount collected per season	kg						142	120	75	300	71	108	120	20	180	64
Contribution to HH income	KGS						7083	6000	3750	15000	3571	5040	6000	1000	7500	2754
Rosehip		8HH involved in collection														
Distance to collection place	km						7.5	7.0	5.0	10.0	1.8	7.0	7.0	5.0	10.0	2.0
Amount collected per season	kg						115	115	70	150	34	72	65	50	120	26
Contribution to HH income	KGS						3435	3450	2100	4500	1023	2150	1950	1500	3600	792