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USE OF PLANT RESOURCES ON CZECH ORGANIC FARMS WITH SPECIAL REFERENCE TO ETHNOBOTANICAL KNOWLEDGE, GENETIC MATERIAL ACQUISITION AND ORIGIN OF PLANT SPECIES

Master Thesis

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Declaration

I declare that I have elaborated my thesis independently and quoted only listed in References.

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Abstract

White Carpathians belong to the protected landscape areas (PLA) in the Czech Republic. A study was conducted because of high biodiversity in pastures and meadows in the White Carpathians. The question is, whether such a diversity of species is also on organic farms. Although the current agricultural policy places great emphasis on promoting ecological functions of agriculture, there is a risk that, for reasons of difficult circumstances will small and medium-sized farms, specializing now in crop production, refrain in particular, from organic farming and occurs a loss of biodiversity.

This is why the emphasis is being laid on understanding the range of plant species grown on organic farms. These materials will serve as a basis for the following study in the future, will be statistically compared the abundance of biodiversity on organic farms and only then we can say whether it is a loss of biodiversity or development.

Key words: agrobiodiversity, organic farming, seed exchange

Abstrakt

Bílé Karpaty patří do chráněných krajinných oblastí (CHKO) České republiky. Byla provedena studie o vysoké biodiverzitě na pastvinách a loukách v Bílých Karpatech. Otázkou je, zda taková druhová rozmanitost je i na ekologických farmách. I když současná zemědělská politika klade velký důraz na podporu ekologických funkcí zemědělského hospodaření, existuje hrozba, že z důvodů obtížných podmínek upustí zejména malé a střední zemědělské podniky, specializujících se nyní na rostlinnou produkci, od hospodaření na ekologických farmách a nastane tak ztráta biodiverzity.

Proto je nyní kladen důraz na poznání sortimentu rostlinných druhů pěstovaných na ekologických farmách. Tyto materiály budou sloužit jako podklad pro následující studii za několik let, kdy bude statisticky srovnána hojnost druhové rozmanitosti na ekologických farmách a teprve pak lze říci, jestli jde o ztrátu či rozvoj biodiverzity.

Klíčová slova: agrobiodiverzita, ekologické farmy, získání osiva

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1 INTRODUCTION

In part of Carpathian Mountains – White Mountains (Zlin Region) reviewed in this paper clearly demonstrate that species abundance and/or richness, across a wide-range of species.

National parks and protected landscape areas in the Czech Republic are human activity conditioned by species-rich grassland communities. Although the current agricultural policy places great emphasis on promoting ecological functions of agriculture, there is a threat that for reasons difficult conditions refrain in particular small and medium sized farms from farming on meadows and pastures, large protected territory and species-rich grasslands, dependent on sensitive and environmentally sound farming, will degrade (Piro and Wolfová, 2008). It is the reason of this study to make a research using of plant resources and agrobiodiversity on the Czech organic farms, if degradation of biodiversity on organic farms isn't on the same threat.

Organic agriculture often is described as a natural farming system (Lammerts Van Bueren et al., 2002). Agricultural biodiversity depends on the respective form of land-use (Jungmeier, 1997). In contrast, many ethnobotanical researches, including the topics of agricultural biodiversity, is carried out among the indigenous people of the developing world (Vogl-Lucasser and Vogl Ch. R., 2002). This research led to interesting results, new insights into seeds or vegetative material acquisition, plant species origin, their importance of agricultural ecosystems and its conservation of agricultural biodiversity.

From the very modest beginnings in the first half of the last century, organic fading has grown dramatically in importance and influence worldwide (Kruize et al., 2013).

Attractive properties of new species form the market, changing diets and culinary habits, developments in processing and storage, new information and knowledge on gardening, curiosity and the pleasure of experimentation have led to the introduction of species new to the region.

The use of agrobiodiversity in agricultural systems is worldwide under pressure. The loss of crop genetic diversity and its declining use has generated much concern about food security and environmental sustainability.

According to the research of Weatherell Ch. et al. (2003), were consumers assigned that “origin” of the crops is on the third position to buy of specific product and the “image” of some crop is even on the second place of their choice in the supermarkets and the other place to buy it. This is the reason to study agricultural biodiversity of plant resources and genetic material acquisition with the assertion on the market and local use of common people. If there are more information about origin, customer demand will increase, organic farmers will have bigger output and they will have more financial resources to provide more information about their product or improve their production of crop species.

2 LITERATURE REVIEW

2.1 Organic farming

2.1.1 Development of organic farming

Organic farming (OF) and organic food production have more than 20 years of tradition in the Czech Republic. The longest established organic farms have proven that this precisely-defined agricultural system is viable without any need for synthetic pesticides, fertilizer or other intensification methods (Action Plan for Organic Farming, 2011-2015). Some authors have found that fruits and horticultural organic crops contain more minerals and vitamins than conventional crops (Bourn and Prescott, 2002; Magkos et al., 2003).Worthington (1998, 2001) compared several studies about the nutritional quality of organic versus conventional crops, indicating that organic crops had significant higher levels of iron, magnesium, and phosphorus. In addition, some studies have shown differences in the content of nutrients in different crops from different farm systems (Warman and Harvard, 1997; Maqueda et al., 2001).

Unsolved problems also exist between the necessities of global harmonization and the local adaptability of the standards on organic farming (Kruize et al., 2013). Nowadays organic food is becoming more popular. Moreover, organic products could be sold at much higher prices than the conventional products (Kilcher, 2006). These products are grown in large, specialized farms (organic farms), factories or other facilities (Potravinářská Revue, 2009).

A configuration of various tools, applications, and variable rate implements, is required within each farm enterprise (Fountas et al., 2006). A comparative study of organically and integrated grown vegetables showed that the organic crops had 2.9 % higher dry matter content than the integrated crops (Fjelkner-Modig et al., 2000). Farmers' traditional knowledge and their awareness of ecological and of social affairs was the main base for the development of organic farming (Kruize et al., 2013). The convention on biological diversity has recognized the continued maintenance of traditional varieties in situ as an essential component of sustainable agricultural development (Sthapit and Jarvis, 1999).

The material of "Action Plan for Organic Farming" describes the strategy for the development of OF in the Czech Republic (CZ) until 2015. It shows that the areas of OF development guaranteed by the Czech Government are sufficiently ensured (legislation, government grants, system of inspection and certification, labeling organic food). On the other hand, there are areas in OF which are not yet sufficiently advanced and it is necessary to support their further development. For example education of farmers and research are not sufficiently developed, it is necessary to support the Czech organic produce market and make consumers better informed about organic products.

The main driving forces in the development of Czech OF are subsidies paid within agro environmental measures and, not insignificantly, the interest of consumers and traders in Czech organic raw materials and development of the domestic organic market. At present approximately 483,176 hectares of land in CZ are farmed organically; this figure represents 11.4% of total agricultural acreage. In this respect, the Czech Republic is above the EU average. There are about 4,022 farms varying significantly in size, with a predominant focus on grassland, although the number of cash crop producers has been increasing. There are small organic farms e.g. of just 5 ha acreage but also whole former cooperatives or state farms with acreage of over 1,000 ha. Czech Republic is the leader in the field of organic farming among new EU member countries. Every year 1 billion CZK (40 million EUR) is paid in the form of subsidies to Czech organic farmers (Action Plan for Organic Farming, 2011-2015).

2.1.2 *Field management*

The kind of field management style that takes into account in-field variability of soil and crop, also known as precision agriculture, aims to increase the profitability of crop production while simultaneously reducing the negative environmental impact by adjusting applications rates of agricultural inputs according to local needs (Pierce et al., 1999). For example, in the tropics, growing legumes for soil fertilization was almost non-existent there. While most organic and non-organic farmers has been much higher than the amount used by non-organic farmers. Bio-fertilizer made from crop residues and molasses was the second most popular organic fertilizer (Thapa and Rattanasuteerakul, 2011). Organic farming shares similarities with other agricultural technologies in terms of the adoption and diffusion process (Lapple and Rensburg, 2011). Different types of crops, e.g. field crops or vegetables, require different regulatory treatment (Tripp and Louwaars, 1997).

At present the priority is not to strive for the highest possible number of organic farmers and largest possible organic acreage. Supportive stimulus and control mechanisms for this area have been set (support for organic farmers, organic food producers, consumer demand) and these will lead to an increase in the number of organic farmers and producers in the future. There is now an apparent need to emphasize the quality of the whole established system (Action Plan for Organic Farming, 2011-2015), not so to emphasize the quantity.

2.1.3 *Organic production*

According to Kilcher (2006), Lampkin & Padel (1994) and Henning et al. (1991), organic agriculture, which is an agriculture entirely relying on organic inputs, is synonymous with sustainable agriculture. Organic farming is characterized by the prohibition of a majority of synthesis chemicals in crop production (Lampkin, 2002). Organic products are not harmed with chemical substances, neither before nor after harvest during storage. This is for instance the case with potatoes and onion where varieties with good long-term storage potential without the use of chemical sprouting inhibitors are much in demand (Lammerts Van Bueren and Van Den Broek, 2002). Attractive properties of new species from the market, changing diets and culinary habits, developments in processing and storage, new information and knowledge on gardening, curiosity and the pleasure of experimentation have led to the introduction of species new to the region (Vogl-Lukasser and Vogl, 2002).

Organic agriculture regards biodiversity as an irreplaceable production factor or even a driving force at different levels of the farming system, and as an instrument for preventing (too high a pressure of) pests, disease and weeds (Geier, 2000)

Activities that directly support farmers from the perspective of *in situ* conservation are: community seed banks, local germplasm collections, reintroduction of local varieties (Almekinders, 2001). *In situ* (on-farm) conservation is the maintenance of species populations in their natural habitats either as uncultivated plant communities or in farmers' fields as a part of existing agro-ecosystems (Jarvis et al., 1997). On-farm conservation, on Figure 1, is a process, which generates diversity (Sthapit and Jarvis, 1999).

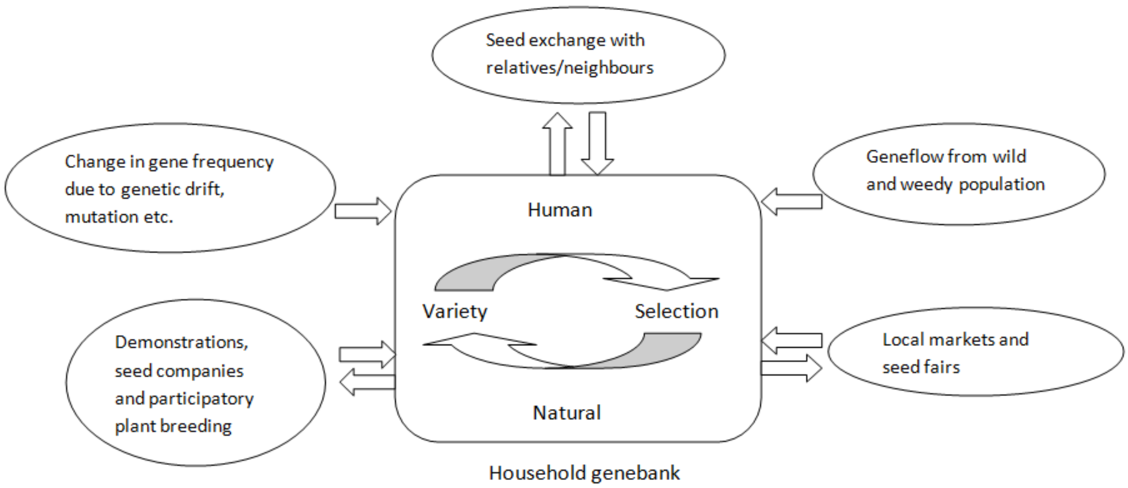

Figure 1: Informal seed supply systems in informal farming systems (Sthapit and Jarvis, 1999).

2.2 Relationship between environment and organic farming

2.2.1 Landscape protection

The aim of the Action Plan for Organic Farming, 2011-2015 is to achieve a 15% proportion of total agricultural acreage along with a concurrent increase in the organic food proportion on the food market to 3%. The disproportion is the result of the non-production functions of organic farming. Approximately 80% of organic acreage is permanent grassland. For comparing with other countries, see to Table 1. At the same time it is a crucial resource for global agricultural and environmental sustainability (Almekinders, 2001). The reason for this is mainly the high proportion of less favorable areas in the Czech Republic, especially mountainous and uplands, where landscape maintenance is very important due to a high number of areas with restricted systems of management (Action Plan for Oragnic Farming, 2011-2015). Organic agriculture can actually provide better income than conventional agriculture (Rasul and Thapa, 2004). Jaffee and Strivastava (1994) divide their analysis into plant breeding, seed production and processing and seed distribution, marketing and quality control. The challenge is to understand, for any given crop and environment, the optimum mix of public and private (commercial or voluntary) contributions to these various elements of the seed provision process. During the next 50 years, global agricultural expansion threatens to impact worldwide biodiversity on an unprecedented scale that may rival climate change in its significance for the persistence of panoply of species (Tilman et al., 2001).

Organic farming is growing rapidly in its potential for producing healthy food and in decreasing environmental harm caused by farming practices (Woese et al., 1997; Healton, 2001). It has been adopted in a wide range of climate and soil types (Dorado et al., 2011). The perception among consumers is that organically produced crops possess higher nutritional quality (Woese et al., 1997; Healton, 2001). Loss of biodiversity on this scale has fulfilled the debate over the sustainability of current intensive farming practices, that includes fears over water pollution, soil erosion, landscape quality and food safety (DEFRA, 2002; EU, 2002).

Ethnobotany is the study of these plant-human interrelationships embeds in dynamic ecosystems of natural and social components (Alcorn, 1997). Sensory qualities like taste are not only the result of environmental but also of genetic influences (Simon et al., 1982; Simon, 1993). Farmers use crop genetic diversity to cope with soil and climatic variation, and to reduce production risks (Almekinders, 2001). Farmers shape the diversity of their crops through decisions affecting biological, social, economic processes, and land use (King, 1999). A genuine organic agriculture creates “integrated, humane, environmentally and economically sustainable production systems, which maximize the reliance on farm-derived renewable resources and the management of ecological and biological processes and interactions, in order to obtain acceptable levels of crop, livestock and human nutrition, protection from pest and diseases, and an appropriate return to the human and other resources" (Lampkin and Padel, 1994). Conservation of existing biodiversity in agricultural landscapes and the adoption of biodiversity-based practices have been proposed as way of improving the sustainability of agricultural production through greater reliance on ecological goods and services, with less damaging effects on environmental quality and biodiversity (Collins and Qualset, 1999; McNeely and Scherr, 2003).

Due to the need for an institutionalized solution to this issue, the Ministry of the Environment (MoE) appointed a work group "Organic Farming in Nature and Landscape Protection". The work group was appointed by a MoE Deputy Minister and was also an MoE advisory body in terms of organic farming. The work group consisted of experts from universities, researchers, organic farmers' associations and representatives of practitioners (Action Plan for Organic Farming, 2011-2015).

Farm managers, as a result, have to address new requirements, for example around improving quantity and quality while reducing environmental impact. Therefore, they will need more control over their production system (Kruize et al., 2013). There is three influencing factors, namely:

a) The amount of organic fertilizers such as farm yard manure and compost procedurs by farmers themselves,
b) Perception of the harmful effect of inorganic pesticides, and
c) The length of experience in growing vegetables (Thapa and Rattanasuteerakul, 2011).

Given that agricultural landscapes are prone to disturbance, succession can be more rapid when some indigenous plants remain, seed banks exist, and/or neighboring intact biodiversity-rich vegetation still serves as a source of dispersing organisms (Lamb et al., 2005).

Main outputs of Action Plan for Organic Farming, 2011-2015: The work group especially focused on providing more and better information for the specialist public; with the financial and organizational support of the MoE the following titles were published:

a) "Diversity and Organic Farming" - a study exploring the literary background of this theme and also focusing on the topic of grassland in organic farming,
b) Organic farming bulletin on the theme of grassland, dealing not only with its production aspect but also analyzing scientific approach with the aim of enhancing the species diversity of grassland communities,
c) A publication issued in 2005 by the former Institute for Agricultural and Food Information: Considerate forms of farm management in the landscape, including a description of up-to-date subsidy organs of the Ministry of Agriculture (MoA) and MoE in the field of nature conservation,
d) An MoA publication "Organic Farming and Biodiversity", part of which was a presentation of findings on the effect of organic farming on biodiversity and the landscape.

Table 1: Basic statistical indicators in organic farming compared to neighboring countries in 2009 (Action Plan for Organic Farming, 2011-2015).

Indicator	Austria	Germany	Poland	Slovakia	Czech Rep.
Number of organic farms	20,000	20,000	15,000	1,000	2,689
Organic farmland acreage	493,000	908,000	314,000	141,000	398,407
Proportion of organic farmland (%)	15.5	5.4	2	7.3	9.38
Arable land acreage	18.3	29.7	25.8	12.2	11.38
Permanent grassland acreage	68.7	49.7	37.6	69.1	82.63

2.2.2 Benefit of the environment

There is a worldwide trend towards the promotion of organic agriculture in view of its environmental, social and economic benefits (Thapa and Rattanasuteerakul, 2011). Organic agriculture bases its sustainable self-regulating production system on the concept of a farm as an agroecosystem. An agroecosystem, defined as an ecological system within the agricultural context (i.e. with inputs, withdrawal of products and interference by the farmer), is shaped by the strong interaction between the (variations in) biotic and abiotic environment, the genetic composition of species involved and the management resources available to the farmer (Swift and Anderson, 1993; Almekinders et al, 1995; Vandermeer, 1995).

Agrobiodiversity is most likely to enhance agroecosystem functioning when assemblages of species are added whose presence results in unique or complementary effect on ecosystem functioning, e.g., by planting genotypes with genes for higher yield or pest resistance, mixing specific genotypes of crops, or including functional groups that increase nutrient inputs and cycling (Jackson et al., 2007) The influence of organic farming on the environment has not yet been assessed to a sufficient extent in Czech Republic; therefore there is a lack of regionally specific information in this field. However, some research projects have proven a positive effect of organically managed land on biodiversity and stability of surrounding biotopes. Maintenance of ecosystem functions and protection of elements of the environment, which OF can offer to society, are not yet provided at a sufficient level. No indicators have been put into practice which would adequately enable the evaluation and reward of the positive effect of the OF system on the environment. At the same time there are no tools available, within subsidy support, which would allow a complex approach to be taken into account and would respect both production and non-production functions of organic farming (Action Plan for Organic Farming, 2011-2015).

Currently, organic farmers largely depend on varieties supplied by conventional plant breeders and developed for farming systems in which artificial fertilizers and agro-chemicals are widely used. The organic farming system differs fundamentally in soil fertility, weed, pest and disease management, and makes higher demands on product quality and yield stability than conventional farming (Lammerts Van Buern et al., 2002). On the basis of research carried out so far we can assume that the structure of organic production, the prohibition of easily soluble N-based mineral fertilizers and synthetic plant protection, among other measures, are a significant OF contribution to the protection of surface-water and groundwater. Farming land organically in itself requires the renewal of the natural processes in the soil, which is an important factor in protection of soil as a non-renewable resource. The majority of research studies (mostly foreign) proves a higher level of biological diversity on organically managed land (in Czech Republic this has been studied e.g. in vineyards) (Action Plan for Organic Farming, 2011-2015).

The desired variety traits include to adaption to organic soil fertility management, implying low (lower) and organic inputs, a better root system and ability to interact with beneficial soil microorganisms, ability to suppress weeds, contributing to soil, crop and seed health, good product quality, high yield level and high yield stability (Lammerts Van Bueren et al., 2002). It is fundamental to evaluate these benefits and prepare new settings for OF subsidy conditions after 2013. The new settings must enable further development of the OF system, although not primarily the quantitative increase in organic acreage but rather improvement in the quality of the whole system (Action Plan for Organic Farming, 2011-2015).

Organic farming will be fully developed sector of agriculture with all appropriate characteristics such as a stable market, services and a State policy – support for providing public goods including aspects, relating to the environment and animal welfare (Action Plan for Organic Farming, 2011-2015).

The limited area of organic agriculture will be the bottleneck for economic interest in establishing specific breeding programs for organic farming systems. The proposed organic crop ideotypes may benefit not only organic farming systems, but in the future also conventional systems that move away from high inputs of nutrients and chemical pesticides (Lammerts Van Bueren et al., 2002). Partial aims and activities in Action Plan for Organic Farming (2011-2015) proposed to achieve a 3% organic food share of total amount of processed foods; increase the proportion of Czech organic food to 60 % on the organic market: increase the transparency of origin in purchasing organic foods, support regional sale and establishment of new types of sales points, enhance awareness of the benefits of organic farming for the environment in Czech agriculture. The perspective for development of structure of agricultural land under organic management between 2010 and 2015 you can see on the next Table 2.

Table 2: Perspective for development of structure of agricultural land under organic management between 2010 and 2015 (Action Plan for Organic Farming, 2011-2015)

	2008	**2009**	**2010**	**2011**	**2013**	**2015**
Number of organic food producers	410	497	660	730	810	920

Number of organic farms	1,802	2,689	3,800	4,200	5,200	5,800
Organic arable acreage	338,722	398,407	464,000	511,000	571,000	650,000
OF share of total farmland acreage (%)	7.97	9.38	10.9	12	13.4	15.3
Arable land (ha)	34,990	44,906	58,000	68,000	80,000	94,500
Permanent grassland acreage (ha)	278,913	329,232	381,690	418,888	467,286	532,784
Permanent culture acreage (orchards) (ha)	2,777	3,678	5,200	5,800	6,200	6,500
Permanent culture acreage (vineyards) (ha)	408	645	1,100	1,300	1,500	1,700
Permanent culture acreage (hop-fields) (ha)	0	8	10	12	14	16
Other areas (ha)	21,634	19,890	18,000	17,000	16,000	15,000

For organic farming, there are also threats. The most common example is given:

a) Unclear ownership of land.
b) Low purchasing power of the population.
c) Low accessibility of loans on the common financial market.
d) WTO (removal of subsidies, changes in policy etc.)
e) Low stability of the economic environment, unstable market
f) Deceptive labeling of organic products
g) Introduction of GMO's within EU and worldwide.
h) Negative natural and climatic phenomena.
i) Ecological consciousness of the population still at a low level (Action Plan for Organic Farming, 2011-2015).

Farmers will continue maintaining landraces as long as they see benefits, but they may choose to replace them with modern varieties for the following reasons:

1) Poor yields of local landraces;
2) Lack of market for local varieties;
3) Disease and pest susceptibility;

4) Poor economic returns;
5) Unwanted traits such as taste;
6) Access to seed of modern varieties, input and credit facilities and technical support (Sthapit and Jarvis, 1999).

2.3 Crop diversity

2.3.1 Agrobiodiversity management

Agrobiodiversity refers to the variety and variability of living organisms that contribute to food and agriculture in the broadest sense, and that are associated with cultivating crops and within ecological complexes (Kruize et al., 2013). It controls undesirable quantities of crop associates by stimulating the self-regulating capacity of agro ecosystem as much as possible, for example by using agrobiodiversity at different levels of management (farm, crop species, variety) within the farming system (Anonymous, 1991; 2002). Organic farming has less impact on hedge bottom vegetation, with hedges on organic farms displaying significantly higher species diversity than those on conventional farms (Aude et al., 2003). In addition to understanding the basis for farmer decision-making and management of diversity, there are a number of additional reasons for the use of participatory methodologies in research on genetic diversity (Godbole and Eyzaguirre, 1997). Evaluating the value associated with agrobiodiversity or the opportunity costs that would result from conserving it, is a complex undertaking (Gollin and Smale, 1999). There is a lack of adequate knowledge of how the ecological functions that are provided by agrobiodiversity translate into tangible benefits for society (Jackson et al., 2007).

An important point to remember is that crop diversity, according to Long et al. (2000), is to a greater or lesser extent created and maintained with active human intervention. This means:

1) Agricultural ecosystems are disturbed environments, usually managed by farmers in order to maintain early stages of ecological succession; many aspects of crop diversity would not survive without this human interference;

2) Agricultural ecosystems rely on a large extent of alien species: the majority of economically important crop species have been introduced into many countries beyond their original area of origin. This means there is a very great interdependence between countries for the genetic resources on which our food systems are based.
3) Much crop diversity is held *ex-situ* (off-farm) in gene banks and other reserves, and not on-farm in the farming system.

Genetic and population diversity provides the essential basis for continuing crop improvement. Breeding programs have exploited landraces and crop wild relatives for genes for increased pest resistance, yield and quality (Briggs and Knowles, 1967; Cooper et al., 2001; Tisdell, 2003). The use of agrobiodiversity in agricultural systems is under pressure worldwide. The loss of crop genetic diversity and its declining use has generated much concern about food security and environmental sustainability (Almekinders, 2001). Farmers have been involved in various stages of formal research processes from the initial documentation of genetic diversity and indigenous knowledge associated with plant genetic resources in the field, (Sandoval, 1994) to the identification of methods to assist the continued selection and maintenance of local cultivars (Sperling and Berkowitz, 1994; Mowbray, 1995). This is focused on the value of landraces (traditional and local crop varieties) to farmers in centers of agricultural diversity (Brush and Meng, 1998) of Carpathian Mountains on the north-east of the Czech Republic in Zlín Region.

Biodiversity refers to all living things and the interaction between them: a vast array of organisms with an almost infinite complexity of relationships (Lenné and Wood, 2011). The agrobiodiversity in small-scale farming systems in developing countries is recognised to be a threatened resource of great value. Farmers are the principal managers of this diversity (Almekinders, 2001). Agricultural biodiversity, that is, 'agrobiodiversity', is an exceptionally important subset of biodiversity. Agrobiodiversity has been defined by Qualset *et al.* (1995) as including all crops and livestock and their wild relatives, and all interacting species of pollinators, symbionts, pests, parasites, predators and competitors (Lenné and Wood, 2011).

Agrobiodiversity through agriculture, that is management of the interactions between crops and domestic animals and their associated biodiversity and the environment, provides most of our food with less than 5% from the wild (Prescott-Allen and Prescott-Allen, 1986).

This study aimed to crop associated biodiversity and the environment, only. Traditionally, the farmers in the humid tropics used organic fertilizers regularly to manage soil fertility that contributed to make agriculture both environmentally and economically sustainable (Charlton, 1987).

Agrobiodiversity is the part of biodiversity that is directly relevant for agricultural production. It includes the genetic diversity within and between crops and animals used for agricultural production (Almekinders, 2001).

Most of our food is also derived directly or indirectly form plants. It has been estimated that more than 80% of our calories and edible dry weight comes from crop plants (Evans, 2003).

Most information on the management of crop genetic diversity at the community level relates to the major seed-propagated annual grain crops, which are in general the most important group of crops for small-scale farmers. Minor grain, root and tuber crops are, however, locally very important food and cash crops (Almekinders, 2001). The biodiversity benefits are likely to derive from the specific management practices employed within organic systems (Gardner and Brown, 1998).

Agriculture is the large global user of biodiversity (Wood and Lenné, 1999). Agriculture has selected and added value to wild biodiversity over more than 10,000 years of managing agrobiodiversity. Agriculture has conserved biodiversity on the hoof and as seed and planting materials over this long period.

Biodiversity that closely interacts with crops is usually considered part of agrobiodiversity. It includes pests, diseases, soil organisms, pollinating insects, etc (Almekinders, 2001).

The management of agrobiodiversity will determined our future, both in cities and the countryside. Agroecosystems – mediated through agrobiodiversity – have always provided the essential ecosystem service of food production (Lenné and Wood, 2011). The function of agrobiodiversity in agricultural systems is still poorly understood. The objective to increase agrobiodiversity for more sustainable agriculture is still largely based on assumptions and unofficial information, rather than on solid ecological and socio-economic evidence (Almekinders, 2001).

Present knowledge extends from a greater appreciation of traditional agriculture and the needs of farmers, through classical agricultural research in genetics, statistics, replicated experiments, plant breeding, agronomy, crop protection, rural sociology, information management and many more through to biotechnology (Lenné and Wood, 2011). Participatory methods in agricultural research and their use on crop diversity is to strengthen the ability of researchers to identify, understand, and better serve all those whose decisions influence agricultural diversity (King, 1999).

The prime candidate in the search for relevant wild ecosystem in the 'Near Eastern' centre of crops origins – the arc from Palestine, Jordan and Israel, though Syria, southern Turkey, Iraq and south-western Iran. As the source of important cereals and pulse crops (wheat, barley, pea, lentil, faba bean and others) this region has been the focus of extensive botanical, genetic and, to a lesser extent, ecological research, which has resulted in a multiplicity of theories on the origins of plant domestication (Lenné and Wood, 1999).

We believe that a greater appreciation of the obvious success of the independent and multiple domestication of crops is a valuable resource for the future and sustainability of agriculture (Lenné and Wood, 1999).

Lenné and Wood (1999) wish to refocus the debate to other facets of agricultural origins perhaps of diversity management and our food security than current academic controversies over the origin of agriculture.

A key concept of wild ecology is the idea of plant succession. Simply put, bare ground will be colonized by smaller, annual plants with easily dispersed seed. But, as with many ideas in ecology, concepts of succession have changed over time (Tansley, 1935).

At present, international socio-economic developments, including market conditions and, in particular, advances in the field of biotechnology, are negatively affecting the conditions for farmers' access and use of agrobiodiversity (Almekinders, 2001).

2.3.2 Resource management

Crops originated from their wild relatives though single, or at the most, few events of domestication in limited regions (Lenné and Wood, 1999).

In organic agriculture the basis of sound crop production is the care for building-up soil fertility, which is based on three inextricably interrelated components of soil management:

the physical (water-holding capacity, structure, etc.), chemical (nutrientdynamics, pH), and biological (soil biota) component (Vandermeer, 1995). Soil fertility in organic farming means: well managed soil organic matter, good soil structure, diverse soil biota, and a high nutrient and water-holding capacity by using compost and stable manure (Koopmans and Bokhorst, 2000). Agrobiodiversity is necessarily based on farmers' needs and priorities. Only when addressing farmers’ needs communities can be expected to utilize and maintain agrobiodiversity in a sustainable way (Almerinders, 2001). Information about specific variety characteristics that the farmer finds important will provide insight on household preferences and behavior (Brush and Meng, 1998). Improving the articulation of farmer perspectives and developing community skills are also important aspects of in-situ conservation strategies, which work directly with the genetic resources that farmers value and conserve, and which build off of farmer’s own breeding and selection systems (Khon Kaen University, 1987).

Organized collection, evaluation, and conservation of crop genetic resources have gone on for two hundred years, confirming the fact that politicians, scientists and consumers value these resources. The social value of crop genetic resources has been described anecdotally by examples of the economic contribution of exotic crops and crop varieties (Iltis, 1989). The existence of crop genetic resources in farming systems implicitly suggest that farmers also value them, a suggestion that is confirmed by research on farmers’ knowledge and their use of different crops and crop varieties (Brush, 1995). Diversity of crop genetic resources, according to Almekinders (2001), has two vital functions for farmer households:

1) It serves multiple purposes of consumption, use and marketing.
2) It enables farmers to cope with variable or unpredictable environment and market conditions. These functions are particularly important in complex, diverse and risk-prone environments.

On the other hand, the main drivers of biodiversity loss according to Heywood (2011) are:

a) Habitat loss, degradation, simplification
b) Global change
c) Invasive species
d) Overexploitation of resources
e) Pollution

These are of a wide variety of types, including wind, water and animals. But crops, the main dispersal mechanism are humans, so much so that wild-type dispersal mechanisms may be lost by evaluation – as with the case of maize, where the seeds are enveloped by bracts (Lenné and Wood, 1999). It is important to find out the factors explaining the variation in the extend of organic vegetable farming from one farm household to another (Thapa and Rattanasuteerakul, 2011). We concentrate on a part of the on farm Plant Genetic Resources (PGR), i.e. crop genetic diversity (Kohler-Rollefson, 2000). Although in general the local PGR system is dynamic and contains relatively high level of crop genetic diversity, there is also a need for the introduction of exotic genes to improve yields and yield stability in situations where the local varieties are not performing satisfactorily. In other situations, new genes are needed to adapt to changing agro-ecological and socioeconomic conditions (Almekinders, 2001).

Participatory research involves working directly with organic farms and individual farmers to understand the variables which influence their patterns of crop management. The use of participatory methodologies strengthens the ability of researchers to locate diversity, to identify multiple uses for different crops (King, 1999). Two approaches to describing farmers' variation of landraces and crop genetic resources exist in the literature. Economic analyses of variety choice can be used to impute value, while ethnobotanical description of farmers' uses of and attitudes towards different varieties provides information on value. The synthesis of these two approaches is desirable particularly in peasant production systems with missing or imperfect markets where ethnobotany can provide useful information (Brush and Meng, 1998). Crop genetic diversity that is managed by farmers in marginal areas, i.e. areas that are usually characterized by a complex combination of stresses, may in particular provide important genes and gene combinations for future crop improvement (Almerinders, 2001). This could be a gradual process of diffusion, as settlements were established away from the homelands of crops (Lenné and Wood, 1999).

Farmers are the principal managers of crop genetic diversity. They develop agricultural crops and varieties from wild plants through crop cultivation. They decide which crops and varieties to plant; select and store seeds for next season; and exchange seeds with other farmers from the same or other communities to obtain new or lost varieties, and to replace degenerated varieties (Almekinders, 2001). The role of farmer knowledge in particular areas has long been recognized, but has become increasingly important within the context of in situ conservation and participatory plant breeding (King, 1999). There is ample evidence of local production of quality seed, but there is much difference between farmers' seed production. In many cases, farmers' seed production and storage are sub–optimal, affecting seed vigour and seed health. Furthermore, seed exchange is not effective under all circumstances. Geographic, cultural, social and gender factors can be barriers in the flow of seeds between households and communities (Almekinders, 2001). Household crop production and farmer decision-making may be influenced by inter-household factors such as the land tenure system or the size of land holdings. In addition, crop management may be shaped by factors within the household such as differential access to inputs, responsibility, and control over products (King, 1999).

Collection of materials for *ex situ* storage in gene banks and the distribution of improved varieties are the only intentional points of contact (Almekinders, 2001). Giving support to gene banks for the reintroduction of local varieties into communities and rescuing threatened varieties for storage in gene banks establishes a functional link between *ex situ* and *in situ* conservation (Almekinders, 2001).

2.3.3 Crop varieties

Much scientific literature shows that some of the comparisons are not experimentally valid due to variation in crop varieties, timing in fertilization, and handling and storage after harvesting (Warman and Harvard, 1997). To obtain varieties adapted to organic farming systems, ideotypes have to be elaborated per crop per market segment (Lammerts Van Buern et al, 2001). That organic farmers use modern varieties does not mean, that these are optimal for their farming system. The current modern varieties are adapted to conventional agriculture that has put in a lot of effort to minimize or simply overrule diversity in the cultivation environment, and breeding has mainly been focused on such relatively standardized farming systems (Jongerden and Ruivenkamp, 1996). For further optimization of organic product quality and yield stability new varieties are required that are adapted to organic farming systems (Lammerts Van Bueren et al., 2002). Organic farmers do not required varieties with a higher yielding capacity in the first place because of risking to lose such profit by (increased) disease susceptibility, but need varieties with a higher yield stability through improved adaption to organic farming systems and because of that less yield reduction (Lammerts Van Buern et al., 2002). Performance testing of new varieties is done to ensure that they meet certain standards (such as yield), and is usually accomplished through field trials from a specified number of seasons and locations (Tripp and Louwaars, 1997). Over the last 20 or 30 years, plant breeders have been trying to produce higher yielding varieties of crops. As a result, for many crops we now rely heavily on a few modern varieties (Long, 2000). Teklewold et al. (2006) and Rasul et al. (2004) found out that marketing problem also constrains the adoption of any new technologies. In general, yield attributes are ranked higher for modern varieties than traditional varieties (Brush and Meng, 1998).When modern varieties are grown by farmers for the first time they can only replace landraces and hence will reduce the extent of their cultivation (Witcombe et al., 1996). Landraces are varieties developed by farmers over many generations of selection without the intervention of formal plant breeding (Sthapit and Jarvis, 1999). Diffusion of new varieties through exchange of seeds from farmer-to-farmer has been shown in many cases to be more important than formal sector seed distribution (Almekinders, 2001). Participatory plant breeding can increase the availability of genetic diversity for farmers and contributes to developing well-adapted improved varieties (Almekinders, 2001). Farmers can also, by themselves, be the source of inspiration and served as very influential agents for the promotion of any agricultural innovations (Jintrawet, 1995).

Agricultural plant germplasm id found in wild relatives of cultivated plants, weedy forms, locally selected crop varieties, plant used in crop breeding, and modern cultivars (Fowler and Mooney, 1990; Hawkes 1983).

Currently organic farmers largely depend on varieties supplied by conventional plant breeders, who use conventional breeding and seed production techniques and develop varieties for farming systems in which artificial fertilizers and agrochemicals are widely used (Lammerts Van Bueren et al., 2002a; Lammerts Van Bueren & Osman, 2002). Farmers need genetic diversity for the multiple subsistence purposes of the farmer-household (consumption, market, etc), as well as to cope with environmental variation. Farmers’ use of crop genetic diversity is described as a local system of integrated management of Plant Genetic Resources (PGR) in which farmers' seed production practices are inseparably linked with crop development and conservation (Almekinders, 2001). The success of *in situ* conservation strategies depends on how well researchers are able to identify the factors that affect farmer decisions to maintain local cultivars and develop ways to assist with their continued selection (Sandoval, 1994).

To attain yield stability organic farmers require varieties adapted to lower and organic input conditions. However, some modern varieties require high nitrogen levels to realize their high-yield potential (Schroen, 1986). Modern varieties need good land and a lot of fertilizer in order to yield well: so it means, that they are useless for poorer farmers on less fertile land. Other reasons for maintaining crop diversity are in order to provide different dishes to eat, to ensure a harvest at different times of year, and also simply as a safe-guard for the future (Trupp, 1998). Nevertheless, variability in organic amendments, crop rotation and soil fertility in each crop cycle, unpredictable and uncontrollable production variables such as year-to-year weather variation, planting and harvest dates, nitrate in irrigation water, and plant disease, produced in some cases higher data variability that even led to contradictory results (Dorado et al., 2011). Variety characteristics should not only suit and optimize the non-chemical and agroecological cultivation practices of organic farming systems and benefit the quality of the environment, but should also lead to optimal product quality for traders, processors and consumers. Part of the quality concept is the absence of chemical residues (Lammerts Van Buern et al., 2002).

The impact of national variety and seed legislation on the access and use of genetic diversity at the farmers' level asks for action in an entirely different field of actors (Almekinders, 2001). Variety registration requires the recording of sufficient morphological and agronomic data about a new variety so that it can be identified and distinguished from other varieties (Tripp and Louwaars, 1997). It is estimated that about 60% of the world's agriculture consists of traditional subsistence farming system in which there is both a high diversity of crops and species grown and in the ways in which they are grown, such as polycropping and intercropping, that leads to the maintenance of a greater or lesser amounts of a variation within the crops (FAO, 2010a). Irretrievable valuable genetic resources have left the farmers' seed system as the principal system for supply of seeds and the diffusion of new varieties (Almekinders, 2001). It is for instance not clear to what extent local varieties in marginal conditions are better yielding and more stable than improved varieties, or to what extent yield stability can be explained by a variety's genetic (Almekinders, 2001). It is known, that poor farmers are often the source of seeds taken from local varieties (Almekinders, 2001). It was revealed, as you can see on Figure 1, six famers use seed only from their own source of crops, three farmers only buy seeds, twenty eight farmers use both of the cases – it means buying and using from their own production. Local seed exchange is an important mechanism for seed supply and the diffusion of new varieties (Almekinders, 2001). From respondents sixty nine organic farms, only four of them use seed exchange.

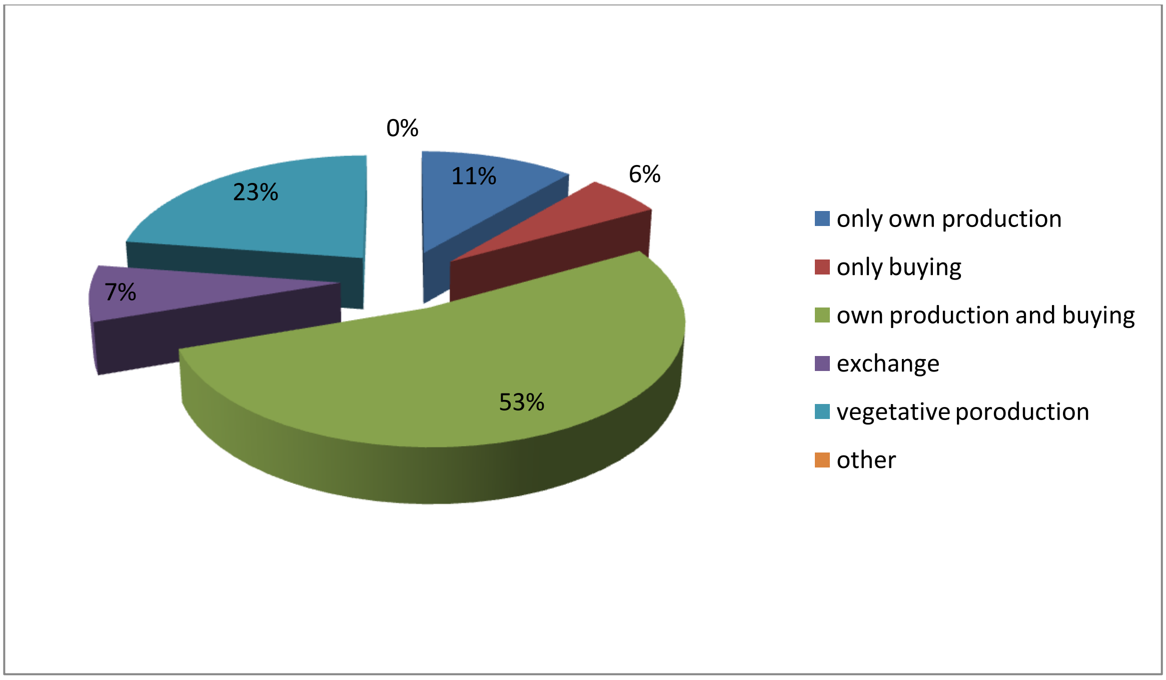

Figure 2: Acquisition of seeds or vegetative materials at organic farms in White Carpathians.

2.3.4 Seed exchange

Seed exchange, the introduction of new diversity from informal systems and seed fairs enhance the gene flow in villages and meet farmers' immediate needs, which you can see in Figure 2. Gene flow through seed exchange between the formal/informal sectors and through local seed merchants results in a dynamic seed supply system (Sthapit and Jarvis, 1999). Farmers' seed production, selection, storage and exchange, in combination with natural crossing between varieties and wild species, mutations and environmental conditions, represents an integrated, dynamic and evolving Plant Genetic Resource (PGR) system. Alternative methods, such as developing market for landraces, developing seed savers exchanges, participatory breeding programs (Eyzaguirre and Iwwanaga, 1996) and educational campaigns are arguably more effective for meeting conservation and agricultural development goals (Brush and Meng, 1998). Variety release is an official authorization that allows seed of a variety to be sold or made available to farmers. The variety release decision is based on the results of registration and/or performance testing (Tripp and Louwaars, 1997). Hence, farmers produce food and seeds, while at the same time they practice a form of crop development and maintain genetic diversity *in situ* (Almekinders, 2001). Recently, farmers have started to take on a more central role in research and experimentation (King, 1999). Ramaswami (1991) describe a four-stage evolution of national seed systems which begins with farmer seed supply; progresses to the emergence of public plant breeding programmes; continues to the development of commercial seed enterprises, often marketing public varieties; and culminates with private firms producing and marketing most varieties, with some basic plant breeding research still managed by the public sector.

Seed regulation examine can be divided into two areas: variety regulation (including regulation, performance testing, and release), and seed quality control (including certification and seed testing) (Tripp and Louwaars, 1997).

Seed programs have generally overestimated farmers’ interest in buying seed, and underestimated the advantages and qualities of on-farm produced seeds, particularly in the case of self-pollinated crops (Almekinders, 2001). Seed quality control has two components, seed certification and seed testing. Seed certification verifies the genetic quality of seed. Seed testing examines various seed quality parameters, such as germination capacity, analytical purity, and pathogen levels. Certification of genetic quality requires that the certifying agency has access to the parent lines of the variety, which raises questions of control over genetic material (Grobman, 1992).

Questionnaires will assess the methods used by farmers for obtaining genetic material (for example exchange of seeds among farmers, purchasing seeds, gift from another farmer or other methods). Emphasis is placed on quality and biodiversity of crops that farmers grow. Questionnaires will also focus on farmers' knowledge about unusual species, specifically for these special types of crops. And as well from where were brought to the region, whether it is imported crops or the crops directly from abroad and crops are from tropical and subtropical areas.

The most frequently mentioned sources, where organic farmers acquire (buy) genetic material are:

a) ZEMASPOL Uherský Brod a.s.
b) PRO BIO.cz
c) SEMO a.s. (only certified seeds for organic production)
d) Radim Pešek – stare odrůdy.org
e) DLF trifolium, Hladké Životice, s.r.o.

Traditional seed supply systems are important source of diversity. Most farmers obtain the seeds of new varieties from informal seed source generally within their own community (Sthapit and Jarvis, 1999). Figure 1 indicates the importance of farmer-to-farmer seed exchange mechanisms.

2.4 Education, legislative and aim of organic farming

Organic farming is a promising agricultural method with positive effects on the human ecological and social environment. Governments have taken over a major role in defining organic farming by creating legal standards. Many countries all over the world have established a certification and accreditation system in order to protect the justified expectations of consumers with regard to processing and controlling the product quality of organic goods and to protecting producers from fraudulent trade practices (Kruize *et al.*, 2013).

Purportedly 'sustainable' farming system such as organic farming are now seen by many as a potential solution to this continued loss of biodiversity and receive substantial support in the form of subsidy payments through EU and government legislation (Hole et al., 2004).

Direct and indirect support to community management of agrobiodiversity is distinguished between. Direct support to farmer-communities by the formal sector is described from the perspectives of (*in situ*) conservation, crop development and seed supply. Indirect support involves market development, awareness-raising and capacity building. This also involves the generation of an institutional, policy and legal environment that supports and stimulates farmers' use of crop genetic diversity (Almekinders, 2001).

It is obvious that the main stimuli for further Czech OF development must be implemented through subsidy policy because legislative rules for OF are clearly set at a European level. European legislation allows such a situation (Action Plan for Organic Farming, 2011-2015).

As they are relevant to international trade, these standards do not only influence the organic farming movement on the national level but also have a converse impact across national borders. Organic farming was established in a bottom-up process as farmers aimed to design sustainable ways of using natural resources (Kruize *et al.*, 2013).

The potential of subsidy policy is significant in terms of stimulation of organic production. The subsidy title for organic farming is part of agro-environmental measures; this means it primarily focuses on supporting non-production functions. It is nevertheless obvious that the production function of OF is at least equally important. Organic production development has been and will be supported by the following stimuli:

1) The main stimulus is to increased consumer awareness of the advantages of OF and organic foods which consequently increases the demand for organic foods from well-informed consumers,
2) Stable demand for organic foods from consumers is necessary for the development of organic production,
3) Organic arable acreage has been gradually growing for several years as well as the number of Czech organic food producers which increases the demand for organic raw materials form organic farms,
4) According to OF law every organic farmer must have a certificate for a given organic product (their organic production must be certified) (Action Plan for Organic Farming, 2011-2015).

There is no completely new stimulus to support organic production which has not been used at all yet. In the further period it will be necessary to develop the existing stimuli, especially maintain consumer confidence in organic foods, the conditions for annual renewal of certification for organic production etc (Action Plan for Organic Farming, 2011-2015).

The formulation of seed and variety legislation and intellectual property rights favourable to farmers' use and conservation of crop genetic diversity ask for the support of national and international policy makers (Almekinders, 2001).

Organic farming has been developing for 20 years. Great progress has been made during this time. European legislation for OF and organic food has been unified (Council Regulation No. 834/2007 and Commission Regulation No. 889/2008); there is also national legislation for OF (Act No. 242/2000 Coll., and MoA1 Decree No. 16/2006 Coll.). Instruments for support of development have also been set (Action Plan for Organic Farming, 2011-2015).

The Czech Republic has the main standard that defines organic agriculture and sets criteria for labeling products as "environmentally friendly products" logo BIO Act No. 242/2000 Coll., on organic agriculture and amending Act No. 368/1992 Coll. Administrative Fees, as amended, which meets international standards IFOAM (International Federation of Organic Agriculture Movements) and 1.5. 2004 Council Regulation 2092/91 on organic farming, which is binding on all Member EU countries. Czech organic farming is also accredited by IFOAM EU (Potravinářská Revue, 2009). Organic farmers have the steady support of the Government through the Rural Development Program (RDP) 2007-2013 (Action Plan for Organic Farming, 2011-2015).

Inspection in organic farming has been carried out for many years in the Czech Republic. At the present time, supervision of adherence to the principles of OF and inspection activities relating to certification of the origin of organic products, either food or otherwise, is carried out by three private inspection bodies authorized by the Czech MoA (KEZ o.p.s., ABCE RT AG - organizational dept., and Biokont CZ , s.r.o.) and now also a State inspection authority – Central Institute for Supervising and Testing in Agriculture (ÚKZ ÚZ).This organization ensures official inspection according to Regulation (EC) No. 882/2004 of the European Parliament and of the Council on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules (Action Plan for Organic Farming, 2011-2015).

The increase in the number of inspection bodies from one to three has bought competition to this field of activity, so it was necessary to unify their approach to the certified companies. Therefore, from the year 2010, the MoA has issued procedural instructions for inspection of organic farms which the inspection bodies are obliged to adhere to. The instructions include e.g. the question of granting exceptions in OF or the management of organic orchards (Action Plan for Organic Farming, 2011-2015). This costumer confidence and organic food market you can see in Table 4.

Nevertheless, it must be noted that numerous Czech-produced organic foods contain imported raw materials or are only re-packed in the Czech Republic. Despite this the number of Czech producers of organic food is increasing, along with the volume of Czech organic produce (Action Plan for Organic Farming, 2011-2015).

Organic foods sold directly on farms or market places amounted to approximately 25 million CZK which gave direct sale a 1.4% share of total market turnover. A project of farmers markets was launched in 2010 in Prague and other Czech cities, where direct sale by organic farmers has been very successful (Action Plan for Organic Farming, 2011-2015).

The farming public should be provided with serious and relevant information about the comparison of conventional, integrated and organic agriculture, the comparison of important parameters, e.g. productivity, economic sustainability, market success etc., including information on innovation and new findings from research, as well as information on foreign demand together with information on the best options for sale of various OF products (Action Plan for Organic Farming, 2011-2015).

One of the key factors of OF as a newly developing sector is the system of know-how, an important part of which is the education system which prepares the required specialists. OF is primarily taught at certain secondary schools and universities. There is still a lack of experts in this area – specialists with sufficient practical experience are lacking in the school system. Research still does not provide enough information for agricultural practitioners and its range and focus does not correspond to the importance of organic farming and thus cannot meet the need for relevant knowledge (e.g. techniques of growing individual crop species) (Action Plan for Organic Farming, 2011-2015).

Farmers were upset about EU funds, that they are distributed flatly, that means that the farmer with wide scale of crops will receive the same amount of money, as the farmer with only meadow, field etc. But if you compare with the Table 3, the subsidy from EU for permanent grassland (till 2013) is 2,339 CZK/ha/year for organic farmers and for arable land with vegetable and special herb is 14,824 CZK/ha/year. That means, the subsidy for permanent grassland is lower than for arable land.

Therefore it’s more valuable for farmers to reorient mostly to combinated or livestocked production and biodiversity of crops growing in the Czech Republic, specifically in Zlínský region located in White Carpathians. Due to this problem I visited Doc. Ing. Čuba PhD. and he informed me about actual request to the president of Czech Republic about remaking distribution of EU funds into organic agriculture.

After consultation with the Czech agronomist Doc. Ing. Čuba PhD., who has an overview of Czech agriculture on the market situation and may make proposals to amend certain laws to president of the Czech Republic, particularly in the area of agriculture and organic farms, I learned that Doc. Ing. Čuba PhD. just filed a motion to amend the grant. This document contains the following:

a) Distribution of food requires expansion of the assortment. For crop production, these include: fresh vegetables and fruits.
b) Assortment of crop production expanded to: food, buckwheat, beans, peas, lentils, potatoes and flowers.
c) Example of program: Agriculture will change. Increase exports of vegetables and reduced traffic intensity. In the Czech Republic, 20 years ago, it was 1.000 ha of greenhouses. Today is 25 ha of greenhouses. Production of 1.000 ha greenhouses is an event for 25 to 30 billion CZK. Greenhouses will increase production by up to 1 billion CZK a year.
d) Obtaining money from the EU: All EU Member States to the EU budget of 106 billion EUR. Within this budget, Member States benefiting both on settlement prices, both on their development. EU, however, is heavily bureaucratized institutions. Therefore, the EU budget will get not those who are entitled to them or need them, but gets is all those who know where the funds for the purpose are, and those who know how to have to fill a form, from which the

allocation of money assessed. The Czech Republic did not solve the obtaining 30 billion CZK this year.

e) Czech agriculture is particularly damaging due to the grant system and the inappropriate targeting of subsidies.

An interesting opinion is Doc. Ing. Čuba PhD. to organic farming, who considers it as deception, he said in an interview. The only positive step is to reduce meat consumption about 10-30% and replace it by growing vegetables in greenhouses. Now growing vegetables in greenhouses should be restored. Previously, the decayed area of 1,000 ha today is only 25 ha of greenhouses.

Doc. Ing. Čuba PhD. has seen for future especially in the cultivation of crops with the highest yield as corn, wheat and barley (for malt). For agriculture, it is advantageous to liquidate everything and it should focus on the above-mentioned cultivation of wheat or grass over a field.

For obtain genetic material, Doc. Ing. Čuba PhD. prefers to purchase seeds, because the preservation of seeds from its own resources does not guarantee such a high yield, as just purchased seeds.

Table 3: Level of subsidies for organic farming 2004 - 2013 (Action Plan for Organic Farming, 2011-2015)

Type of culture	2004-2006 (HRDP) (CZK/ha/year)	2007-2013 (RDP) (EUR/CZK/ha(year) Rate of exchanging in 2010: Euro = 26,285 CZK
Arable land	3,520	155/ 4,074
Permanent grassland	1,100	71 (89)*/ 1,866 (2,339)*
Vegetables and special herbs on arable land	11,050	564/ 14,824
Permanent culture (orchard, vineyards)	12,235	849/ 22,382
Permanent culture (extensive orchards)	12,235	510/ 13,405

* the lower rate for organic farmers with parallel conventional production, the higher rate is for 100 % organic farmers

Table 4: Organic food market and consumer confidence (Action Plan for Organic Farming, 2011-2015).

Activity	Responsibility	Until	Cooperation	Priority
1. Increasing consumer demand for organic foods in the form of education				
Information support for traders in their communication with the medics and customers	PK	2010–2015	PRO-BIO, CTPOA	medium
2. Support for regional organic food sales				
Provide advisory and educational services for traders in the area of organic food sales and marketing in so sales channels not yet exploited: public catering, direct marketing, hotel trade, tourism, processing organic produce and organic food production including craft-style on-farm processing	PRO-BIO, Bioinstitut	2011–2015	PK	high
Support for the establishment of local sales initiatives by farmers, producers, traders and consumers, using regional marking	PRO-BIO PK - BIO section	2011–2015	TPOA	medium
3. Support for effective cooperation within the organic food supply chain				
Continuously monitor and publish information and data about market, availability and demand, price development and consumer trends.	MoA	2011-2015	IAEI	high
Draw a proposal of measures for the reduction of production costs and improved effectiveness of cooperation within the organic food supply chain	PRO-BIO PK	2011	IAEI	medium
Support cooperation between farmers towards common marketing and sale	PRO-BIO	2011-2015	PK and other NGOs	medium
4. Building and improving confidence in the organic farming system				
Introduce national labeling for organic foods made from Czech raw materials	MoA	2012-2013	PRO-BIO PK	medium
Improve transparency and consistency in the inspection system.	MoA	2011-2015	OF inspection bodies, ÚKZÚZ	high

3 OBJECTIVE

Objective of this study is screening of organic plants/crops and fruit trees which are produced on organic farms in Czech Republic, in the area of high biodiversity, in White Carpathians. Another objective seeks to provide an overview of gathering of seeds or vegetative materials origin in some case of farms. It means how farmers gain seeds or vegetative material, it by buying, by seed exchange or by some other ways.

Collect information on seed selection practices, seed storage and maintenance method. Also development of knowledge system in the area of organic farming and food with emphasis on genetic material acquisition and agricultural technique. A comparison of the practice of individual organic farmers leads to presenting of local land practices, land preparation and crop rotation in Carpathian Mountains.

The main objective of this study is to find some connections with the area of tropics and subtropics or elsewhere abroad of the Czech Republic by focusing on the production and processing of traditional or introduced crops. The principle aim will focus on identification of farms which have great unusual crops diversity.

Also a big part of this thesis will be finding, which way local people treat crops and fruit trees and on the other hand, what benefits do they have from them. Whole study will be connected with this and supplemented by etnobotanical knowledge.

4 MATERIALS AND METHODS

The information has been completed with literature research. The methodology of the project is divided into three phases; the first stage-collecting of baseline data by questionnaire to organic farmers. The second consist of identification tradition and unusual species on organic farms; include crops and also old varieties of fruit trees in orchards. The third refer to conservation strategy, genetic material acquisition and seed exchange.

Semi-structured and structured interviews were carried out with each of the farmer responsible for these organic farms.

Questionnaires were sent to sixty nine organic farms located in White Carpathians area. However not all of organic farmers, as you can see in Figure 3, were willing to cooperate in the way of researching biodiversity.

Eighty four percent of respondents to questionnaire filled and have sent it back. Seven percent responded negatively, but concisely and decently answered, that they don't want to attend in this research, as well they're not interested in cooperating about what types of plants/crops they are producing. The most common reason was that they're busy. Nine percent of asked farms, which were listed in the roster of organic farms in „Informační středisko pro rozvoj Moravských Kopanic, o.p.s., Starý Hrozenkov " are no longer active in the organic agriculture and were canceled.

The interview collected information on the crop agrobiodiversity of farm and on unusual different plants which you can see in Table 5. Verbal evidence was used for appraising and confirming of structured and semi-structured interviews.

Data was collected to determine what factors or combination of factors affect the conservation and use of this diversity (Watson and Eyzaguirre, 2001).

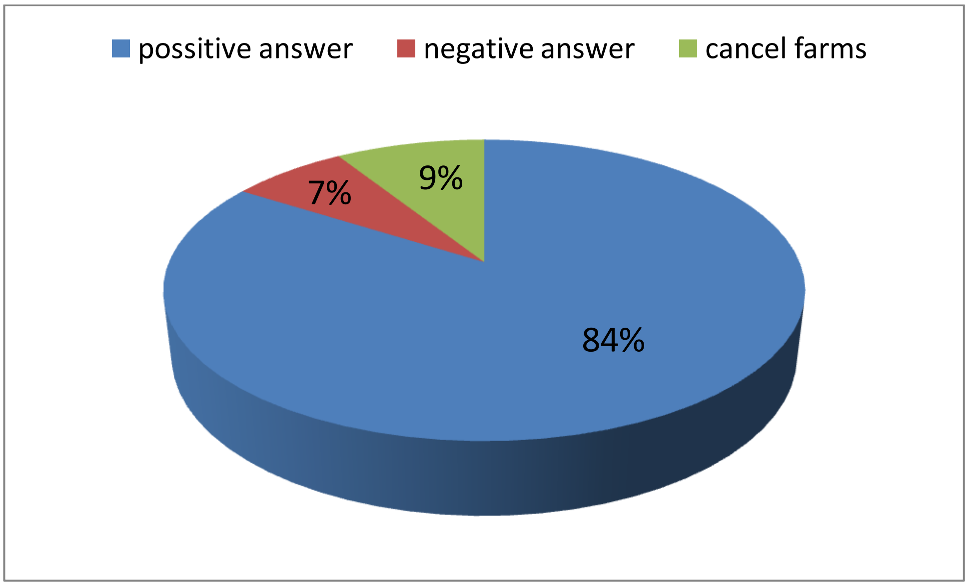

Figure 3: Answers of 69 respondents to questionnaire in White Carpathians.

Table 5: Unusual species grown in White Carpathians.

Latin name	English name	Czech name	Variety	*Family*
Amelanchier alnifolia	pacific serviceberry	muchovník olšolistý	cussikii	*Rosaceae*
Amelanchier canadensis	canadian serviceberry	muchovník kanadský		*Rosaceae*
Amelanchier grandiflora	serviceberry	muchovník velkokvětý	Prince William	*Rosaceae*
Aronia melanocarpa	aronia	jeřáb černý	nero	*Rosaceae*
Castanea sativa	sweet chestnut	kaštanovník setý		*Fagaceae*
Cornus mas	cornelian cherry	dřín obecný		*Cornaceae*
Corylus avellana	common hazelnut	líska velkoplodá	hallská obrovská	*Corylaceae*
Cucurbita maxima	arikara squash	tykev velkoplodá	hokkaidó	*Cucurbitaceae*
Cydonia oblonga	quince	kdouloň obecná		*Rosaceae*
Eruca sativa	roquette	roketa setá		*Brassicaceae*
Hippophae rhamnoides	common sea-buckthorns	rakytník úzkolistý		*Elaeagnaceae*
Lonicera kamtschatica	honeysuckle	zimolez kamčatský		*Caprifoliaceae*
Mespilus germanica	medlar	mišpule německá		*Rosaceae*
Morus alba	white mulberry	moruše bílá		*Moraceae*
Morus nigra	black mulberry	moruše černá		*Moraceae*
Morus rubra	red mulberry	moruše červená		*Moraceae*
Ribes aureum	Black Giant Missouri	meruzalka plodová		*Grossulariaceae*
Rubus fruticosus	black satin	ostružina beztrnná		*Rosaceae*
Rubus idaeus	red rasperry	malinoostružina		*Rosaceae*
Sorbus aucuparia	mountain-ash rowan	jeřáb sladkoplodý	moravica	*Rosaceae*
Sorbus domestica	service tree	jeřáb oskeruše		*Rosaceae*

4.1 Located area

In 2013 the number of organic farms was investigated from all area of Czech Republic (Offermann et al., 2007). One of few areas in Czech Republic with high biodiversity is area of Carpathian Mountains.

White Carpathians, on Figure 4, was established 3rd November 1980. Total Square ofthe protected area is 715 square kilometers and lies at an altitude of 175-970 m PLA (Protected Landscape Areas) intervenes in Hodonín, Uherské Hradiště and Zlín. In 1996 it was included in the UNESCO list of biosphere reserves (AOPKČRa).

White Carpathians are geomorphological unit and mountains located on the Czech-Slovak border, south-east of the Czech Republic. Geographically, it is a part of the Outer Western Carpathians. The emergence of mountain range was prompted by folding of marine sediments (AOPKČRa).

The PLA Beskydy Mountains and the Carpathian Mountains part of the Western Carpathian flysch zone, which was the result of seismic activity Alpine folding. The mountains stand out of Lower and Upper Moravian, that were still in the late Tertiary (Neogene) embedded sea. The described area is mostly built sedimentary rocks of the Magura Nappe. Only the northern part of the Beskydy Mountains is formed cover of Silesia. Flys means multiple alternating layers of claystone, siltstone, sandstones and conglomerates. Thickness of the layers is strongly varying from a few centimeters to several tens of meters. Flys in the Carpathian Mountains characterized containing limestone grains in sandstones, which mainly reflected in numerous sedimentary calcareous tufa the springs and richer in species' composition of the vegetation. Only in the wider PLA in the Carpathian Mountains in places called Nezdenický Fault System occur igneous rocks (neovulkanics) (Piro, 2008).

The information collected in the survey will identify the most commonly found organic farm species. With the information collected in the species inventory, it will be possible to develop a plant community ideotype (Watson and Eyzaguirre, 2001).

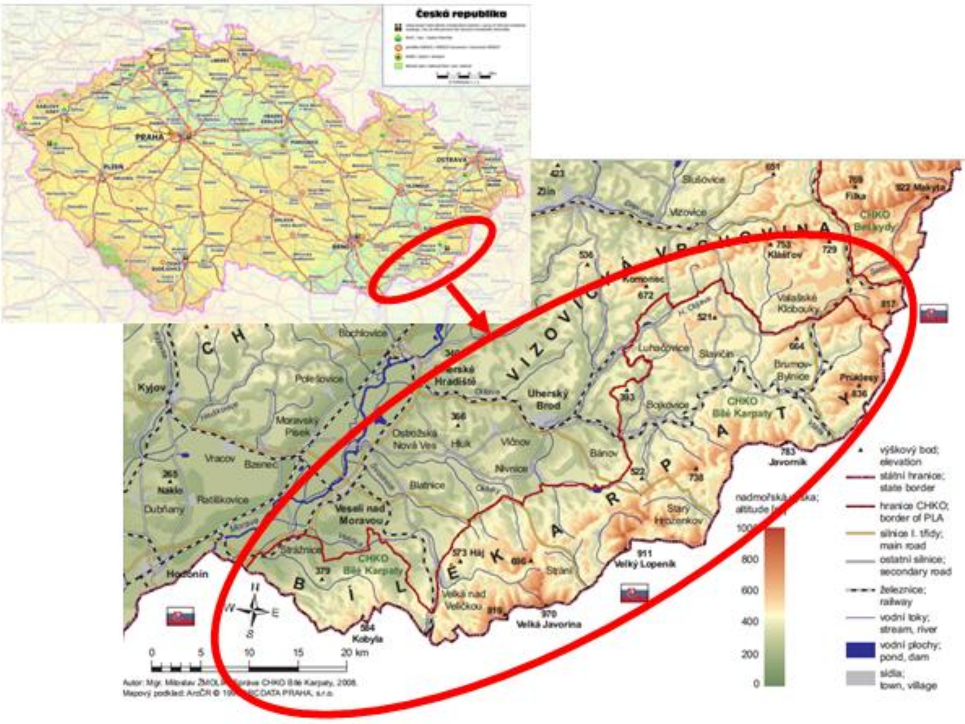

Figure 4: Map of the area of the White Carpathians in the Czech Republic (Žmolík, 2008).

4.2 Specialization of organic farms

Information centre of Moravské Kopanice (*Informační středisko pro rozvoj Moravských Kopanic, o.p.s.*) provides register of organic farms in Zlín region and Hodonín region in the area of Carpathian Mountains. Organic farms in the Carpathian Mountains covers an area of 335.82 ha of meadows and pastures, orchards 10.83 ha, 191.48 ha of arable land, 14,763.90 ha of land without resolution. Altogether this is a large area of 15,302.03 ha. Organic farms were divided according to their specialization to animal production, crop production and combination production. This study is focuses on crop and combination production.

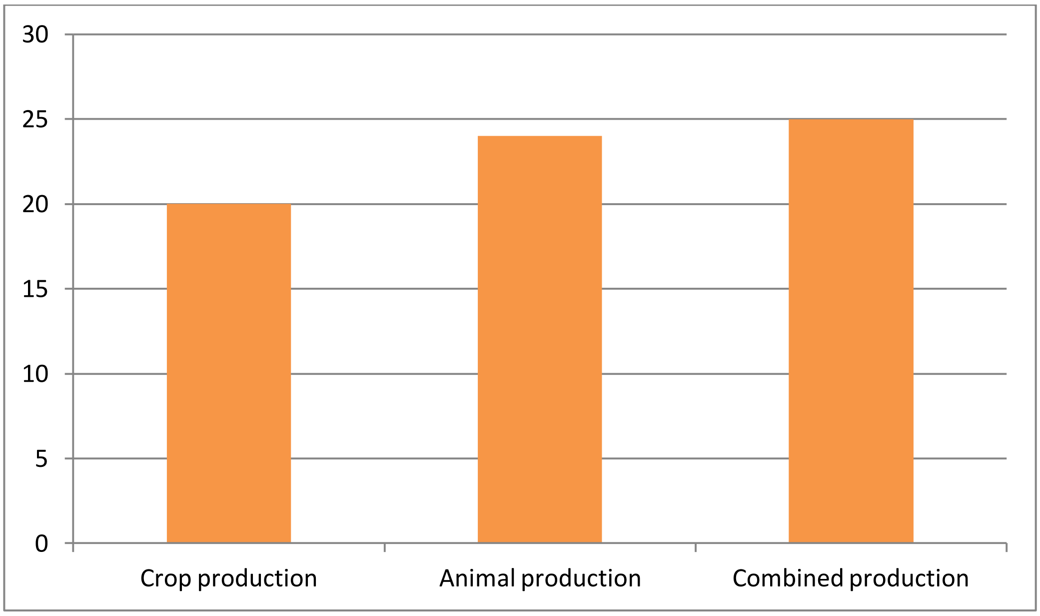

Figure 5: Specialization of organic farms in White Carpathians.

4.3 Local species

On visited organic farms in the White Carpathians, there were registered crops that are grown by local organic farmers. It is a common crop in the garden or in the field used for their farmers' own requirements and also for sale. The list of crops is set out in Table 6. Represented are the following families: Alliaceae, Apiaceae, Poaceae, Chenopodiaceae, Bassicaceae, Cucurbitaceae, Polygonaceae, Rosaceae, Asteraceae, Juglandaceae, Fabaceae and Solanaceae.

Another part of crop production, which has a long tradition of this region are undoubtedly fruit trees in a large orchards. Some farmers are engaged in new varieties, other prefer the old ones. One opinion from organic farmer was so interesting. He does not accept the old varieties, but rather the new varieties because they are the future for our market, but if you do not go in the old footsteps and will not take example from that, it's bad again. The best way is something between. Local farmers grow various varieties (see in: Table 7, Table 8, Table 9, Table 10 and Table 11) of fruit trees such as: *Malus domestica*, *Pyrus communis*, *Prunus domestica*, *Prunus avium*, *Prunus cerasus*, *Prunus persica*, *Prunus armeniaca*.

Table 6: Growing crops on organic farms in White Carpathians.

Latin name	English name	Czech name	Variety	Family
Allium cepa	onion stuttgart giant	cibule jarní	stuttgartská	*Alliaceae*
Allium cepa	kitchen onion	cibule kuchyňská	dagmar	*Alliaceae*
Allium cepa	kitchen onion	cibule kuchyňská	karmen	*Alliaceae*
Allium cepa	kitchen onion	cibule kuchyňská	oválná	*Alliaceae*
Allium cepa	onion	cibulka jarní	aggegatum	*Alliaceae*
Allium porum	leek	pór zahradní		*Amaryllidaceae*
Allium sativum	garlic	česnek kuchyňský	jovan	*Alliaceae*
Allium sativum	garlic	česnek kuchyňský	karel	*Alliaceae*
Allium schoenoprasum	chives	pažitka pobřežní		*Alliaceae*
Allium ursinum	great headed garlic	česnek medvědí		*Alliaceae*
Apium graveolens	celery	miřík celer		*Apiaceae*
Avena nuda	oat	oves nahý		*Poaceae*
Avena sativa	oat	oves setý		*Poaceae*
Avena sativa	oat	oves jarní		*Poaceae*
Beta vulgaris	swiss chard	řepa cukrová		*Chenopodiaceae*
Beta vulgaris	red swiss chard	řepa červená	vulgaris	*Chenopodiaceae*
Brasiica oleraceae	kale	kapusta kadeřavá	acephala	*Brassicaceae*
Brassica campestris	brassica rapa	zelí pekingské	pekinensis	*Brassicaceae*
Brassica chinensis	chinese cabbage	zelí čínské		*Brassicaceae*
Brassica oleracea	broccoli	brokolice květáková	italica	*Brassicaceae*
Brassica oleraceae	cauliflower	květák	botrytis	*Brassicaceae*
Brassica oleraceae	kohlrabi	kedluben	gongylodes	*Brassicaceae*

Brassica oleraceae	savoy cabbage	kapusta hlávková	sabauda	*Brassicaceae*
Brassica oleraceae	brussels sprout	růžičková kapusta	gemmifera	*Brassicaceae*
Cucurbita pepo	pumpkin	tykev obecná	giromontiina	*Cucurbitaceae*
Daucus carota	carrot	mrkev obecná		*Apiaceae*
Fagopyrum esculentum	buckwheat	pohanka obecná		*Polygonaceae*
Fragaria ananassa	strawberry	jahody		*Rosaceae*
Hellianthus annuus	sunflower	slunečnice		*Asteraceae*
Hordeum vulgare	winter barley	ječmen ozimý		*Poaceae*
Hordeum vulgare	spring barley	ječmen jarní		*Poaceae*
Juglans regia	walnut	ořech vlašský		*Juglandaceae*
Lactuca sativa	iceberg lettuce	locika setá	saladin	*Asteraceae*
Lupinus angustifolius	narrow leafed-lupin	lupina úzkolistá		*Fabaceae*
Lupinus luteus	yellow lupin	lupina žlutá		*Fabaceae*
Lycopersicum esculentum	tomato	rajčata jedlé	cherry	*Solanaceae*
Malus domestica	apple	jabloň domácí		*Rosaceae*
Petroselinum crispum	garden parsley	petžel kadeřavá		*Apiaceae*
Pisum sativum	spring field pea	peluška jarní	Speciosum	*Fabaceae*
Pisum sativum	garden pea	hrách setý	radovan	*Fabaceae*
Pisum sativum	garden pea	hrách setý	oskar	*Fabaceae*
Prunus armeniaca	apricot	meruňka obecná		*Rosaceae*
Prunus avium	wild cherry	třešeň ptačí		*Rosaceae*
Prunus cerasus	sour cherry	višeň obecná		*Rosaceae*
Prunus domestica	plum	slivoň švestka		*Rosaceae*
Prunus persica	peach	broskvoň obecná		*Rosaceae*

Pyrus communis	european pear	hrušeň obecná		*Rosaceae*
Raphanus sativus	radish	ředkvička setá	sativus	*Brassicaceae*
Secale cereale	rye	žito seté		*Poaceae*
Sinapis arvensis	wild mustard	hořčice polní MP		*Brassicaceae*
Solanum tuberosum	yellow flesh potato	brambory žlutomasé		*Solanaceae*
Trifolium pratense	clover	jetel luční		*Poaceae*
Trifolium pratense	red clover	jetel červený		*Fabaceae*
Triticale	winter triticale	triticale ozimé		*Poaceae*
Triticum aestivum	winter wheat	pšenice ozimá		*Poaceae*
Triticum aestivum	spring wheat	pšenice jarní		*Poaceae*
Triticum spelta	drinker wheat	pšenice špalda		*Poaceae*
Vicia tetrasperma	sparrow vetch	vikev čtyřsemenná		*Fabaceae*

4.4 Tradition of fruiting trees

The White Carpathians are one of the very few locations in Czech Republic, where you can still find ancient and local varieties of fruit trees. The zone is mainly filled with plum and pear trees (ZO ČSOP Veronica, 2001).

Disappearing aged fruit trees forced keepers of the nature from Veselí nad Moravou to map with local farmers, specializing in fruit, old and zone local varieties of fruit. At first in Horňácko and later in whole White Carpathians is noted opulence of fruit varieties transmitted by farmers. Summary of local genofond is being created, which is important in the same way for the future breeding and for variety of regional products, as well as keeping scenery. Grafts from registered varieties are being moved to genofond orchards, which are one of the options, how to maintain keeping of varieties and their future spreading. The safest varieties will be those, growing in people's orchards and gardens (ZO ČSOP Veronica, 2001).

Utilization of production for example in organic orchard in small town Pitín, according to Ševčík (2003), is roughly as follows:

1) Apples – approximately:
    a) 5% - torn to direct consumption in really fresh consistency
    b) 25% - fallen, temporarily stored for drying
    c) 70% - fallen, for making a must (cider house in Hostětín)
2) Pears, cherries, plums and nuts are intended almost solely for drying.

During cultivation of zone local varieties it offers to prioritize principles of cultivation verified by years. Besides the choice of suitable varieties, it's also important to preserve life-giving conditions for various types of plants and animals. Such farming, which is considerate to the nature, is marked as organic agriculture (ZO ČSOP Veronica, 2001).

Because in many cases are old orchards, where we can find most of noted varieties, treated (with age, lack of maintenance and care or even with cutting down), from the start of mapping are all of the endangered species growing in so called genofonds orchards. First of them established in 1991 in Velké nad Veličkou and its a part of "Národní rezervace Zahrada pod Hájem". On three hectares of orchard, which is still being expanded, are more than 500 trees of various fruit varieties and every year are few of them grafted by a new species (ZO ČSOP Veronica, 2001).

Similar orchard was established by Kosenka in 1999 in Poteč. On one hectare of land are around 200 trees – more than 50 varieties of apple, plum, pear, cherries, sour-cherry trees, nuts and service trees from South Valašsko. In the future two more genofond orchards are planned to be established, to equally cover area and nature conditions of region (ZO ČSOP Veronica, 2001).

Table 7: Czech local name of apples' varieties.

Malus domestica - apple - *Rosaceae*	
Variety - czech name	
Aderslebenský kalvil	Královnino
Api hvězdicovité	Krasokvět žlutý
Astrachán bílý	Kronenprinz Rudolf
Aurora	Kyselík
Banánové zimní	Landsberská reneta
Baumannova reneta	Lebelovo
Bernské růžové	Limburské
Blenheimská reneta	Londýnské
Bojkovo	Madame Galopin
Borovinka (Charlamowski)	Malináč holovouský
Boskoopské ("koženáč")	Malináč hornokrajský
Car Alexandr	Markova zlatá reneta
Coulonova reneta	Matčino
Coxova reneta	Ontario
Croncelské	Oranienské
Červené tvrdé	Panenské české
Eduard VII	Parkerovo
Elise Rathke	Parména zlatá zimní
Gascoygneho šarlatové	Peasgoodovo
Gdánský granáč	Průsvitné letní
Gdánský hranáč	Ribstonské
Grahamovo	Rote Walze
Grávštýnské červené	Rozmarýnové bílé
Gustavovo trvanlivé	Řehtáč soudkovitý
Hammersteinovo	Signe Tilisch
Hedvábné červené letní	Sikulské
Honťanské	Smiřické vzácné
Hvězdnatá reneta	Strýmka červená
Chodské	Studničné

Jadernička moravská	Sudetská reneta
Jadernička pruhovaná	Trevírské vinné
Jeptiška	Vejlímek červený
Kalvil červený podzimní	Vilémovo
Kalvil z Vlčí	Vlkovo
Kanadská reneta	Watervlietské
Kardinál žíhaný	Wealthy
Kasselská reneta	Wesenerovo
Knížecí zelené	Zuccalmagliniova reneta
Kožená reneta zimní	

Table 8: Czech local name of pears' varieties.

Pyrus communis -pear - Rosaceae	
Variety - czech name	
„Hýle“	Krvavka letní
„Jakubínka“	Madame Verté
„Jurigova“	Medula (z Blatničky)
„Michálky“	Merodova
Amanliská	Nagevicova
Beregriska podzimní	Pařížanka
Boscova lahvice	Praskula
Clappova máslovka	Solanka
Červencová	Solnohradka
Hardyho máslovka	Šídlenka
Charneuská	Špinka
Jačmenka (majdalenka)	Williamsova
Konference	

Table 9: Czech local name of plums' varieties.

Prunus domestica - plum - *Rosaceae*	
Variety - czech name	
„Švestička“	Mirabelka nancyská
„Žlutá slíva“ (Bílá slíva)	Myrobalán „Obilnaja“
Althanova renklóda	Ontario (renklóda)
Čačanská rodná	Opál (renklóda)
Durancie	Oullinská renklóda
Gabrovská	Stanley
Hanita	Špendlík žlutý
Katinka	Švestka domácí
Lovaňská	Valjevka
Malvazinka	Wagenheimova

Table 10: Czech local name of cherries'/ sour cherries' varieties.

Prunus avium/Prunus cerasus - cherry/sour cerry - *Rosaceae*	
Variety - czech name	
Dönissenova žlutá	Burlat
Kaštánka	Karešova
Kordia	Královna Hortenzie
Rivan	Napoleonova
Újfehértoi Furtos	Donissenova žlutá
Érdi Botermo	Hedelfingerská

Table 11: Czech local name of peaches'/apricots' varieties.

Prunus persica/ Prunus armeniaca - peach/ apricot - Rosaceae	
Variety - czech name	
Amsdenova	Hargrand
Pinckot	Vynoslivij
Primissima Delbard	Harlayne
Kompakta	

4.5 Acquisition of plant material

As you can see on Figure 2, the most frequent way how to take plant material or seeds by organic farmers is from their own production and by buying.

It should be noted that the maintenance of genetic diversity within local production systems also favors the conservation of local knowledge (FAO, 2010b).

In particular, we recognize that organic farms are valuable sites for the conservation of agrobiodiversity (Hammer, 1998) and related knowledge.

Evaluating the potential for the utilization and conservation of biodiversity in agricultural landscapes requires new types of communication and cooperation, e.g., among agriculturalists, ecologists, and economists to identify and establish adequate assessment strategies (Robertson and Swinton, 2005), between anthropologists and ecologists to preserve ethnobotanical species and functions (Brush, 2004), and between conservation biologists and agriculturalists to seek common ground for managing genetic, species and ecosystem diversity in agricultural landscapes (Banks, 2004).

4.6 Ethnobotanical connection

Some kind of attention in genofond plantations must be given to local fruit production, especially how they are treated. Particularly when traditions of fruit manufactory, mainly using method of drying, are so extensive in the White Carpathians. Dried fruit were in huge amount exported abroad and for the farmers it was enhancing their table, as well as increasing their income (ZO ČSOP Veronica, 2001).

Nongovernment organizations (NGOs) often take care of preserving of genofond heritage. For example, the Gengel institution (named after barley landraces) cooperates with voluntary growers, trying to preserve old varieties of crops and also publishes "*A list of old landraces and lesser-known crops"* (Gengel).

Old orchards are typical for the White Carpathians. As time flows, they are disappearing and being replaced by new varieties. But zone local varieties have many attributes, which we lack by modern varieties – resistance to diseases, adaptation to local stand and microclimatic conditions, as well as various options of use. While some of them are good for direct consummation, others are better for must, wine, distillates, and jams or for drying. Fruit was very important source of food and income of local farmers. In the past was also used during healing various diseases and till nowadays its part of traditional cuisine. Besides that in the White Carpathians are still present variations of fruit, which were enhancing varied offer of traditional fruit types. On bright and warm places or near fruit dryer cornelian cherries grow, in gardens by houses there are white, black and red mulberry. In warmer locations service trees are present, their berries which look similar to little pears are helpful during belly problems and very tasty spirits is being made of it (ZO ČSOP Veronica, 2001).

One of the organizations, enhancing program of supporting traditional fruit production in White Carpathians is „Tradition of White Carpathians". It's bringing together organizations and singles, who are interested in growing, manufacturing and mapping of varieties. The „Tradition of White Carpathians" delivers from the year 2000 apple must to inland market, made by wine cellar in Hostětín (ZO ČSOP Veronica, 2001).

In addition to the assurance of origin to the White Carpathians brand guarantees that they are often unique products made by traditional technology, with the proportion of manual or craft work of local raw materials, high quality and environmentally sound manner. Between manual and craft work includes, for example: production of tea service on a potter's wheel, "hl'adění" (it is one of the most decorative part of festive woman's folk costume, apples' must and syrups, coopers products and wines' barrique, burning barrels for wine and calvados, hand woven products, dried fruit, herb teas, grower distilleries, bobbin lace, decorative gingerbread, basketry products, puppets, marionettes, puppet theater, wine, wood carving and others (Tradice Bílých Karpat, 2009).

It aims to raise the profile of local products. The customer will contribute to the economic recovery of the region and will help to restore the regional market by purchasing of labeled products. Mark also assures customers that purchased product meets strict conditions attached to the authorization.

5 RESULTS

Results of these interviews serve as an agrobiodiversity basic description of occurrence of exotic or unusual species composition and obtaining ways of genetic material.

In the Carpathian Mountains there is higher amount of farms with combined production, followed by strictly animal production and then strictly crop production. A little, of interviewed sixty nine organic farms, was canceled. As the main reason organic farmers said, that organic farming is not their main subsistence and it was loss-making business. The second reason, which they said, is inconvenient subsidies from the European Union. They were mostly complaining on distributing of EU funds, for example the same amount of money headed to permanent grass growth as well as to fields with crops. The second example is logically more money challenging. But when we compare complaints of farmers with the official dates, it’s not so unfair. However some changes in the law about distributing EU funds are planned.

Czech subsistence organic farming was primarily based on cultivation of cereals, field vegetables, fiber crops, hay meadows near the homestead and orchards. In White Carpathians are commonly present species, grown on gardens with different varieties, according to the year season. It is for example: *Allium cepa* (varieties - aggegatum, dagmar, karmen, etc.), *Allium sativum* (varieties – jovan and karel), *Brassica oleracea* (varieties – italica, botrytis, gongylodes, sabauda and gemmifera), *Pisum sativum* (varieties – radovan and oscar) and others, listed inTable 6.

Next, organic farmers listed species, which they consider as uncommon or introduced for this region or whole Czech Republic. All of these species are listed in Table 5. Most frequently noted species are: *Aronia melanocarpa* (variety – nero), *Cornus mas*, *Hipophae rhamnoides, Lonicera kamtschatica*, three species from family *Moraceae: Morus alba, Morus rubra, Morus nigra,* and some species from family *Rosaceae: Mespilus germanica, Sorbus aucuparia, Sorbus domestica* and others.

Family *Rosaceae* isn't presented only by uncommon species for region; it excels also with fruit trees like: *Malus domestica, Pyrus communis, Prunus domestica, Prunus avium, Prunus cerasus, Prunus persica* and *Prunus armeniaca*. Farmers grows them in their orchards, mainly focusing on the old varieties, which have in this location, long tradition.

With help of questionnaire and consecutive personal interview with farmers we can say, that most common way of gaining seeds or vegetative material is by buying them by following companies/organizations/specialists: ZEMASPOL Uherský Brod a.s., PRO BIO.cz, SEMO a.s., Radim Pešek – stare odrudy.org and DLF trifolium, Hladké Životice,m s.r.o.

In the area of White Carpathians are a lot of farmers focusing on fruit trees and orchards. Follow-up use of fruit (apples, pears, plums and others) is determined by quality and variety. Afterward is appropriately used to direct consummation, mainly gathered fresh fruits, for making must, spirit or for drying, that means longer time of storage. For drying are farmers using modern dryers, that heat the fruit to around 60°C to keep all the vitamins inside as well as the fresh taste. With higher temperature, vitamins and taste are fading away.

But White Carpathians are not only about organic agriculture, we can find here traditional crafts like: production of tea service on a potter's wheel, "hl'adění" (it is one of the most decorative part of festive woman's folk costume, apples' must and syrups, coopers products and wines' barrique, burning barrels for wine and calvados, hand woven products, dried fruit, herb teas, grower distilleries, bobbin lace, decorative gingerbread, basketry products, puppets, marionettes, puppet theater, wine, wood carving and others, which is proved by regional trademark "Tradition of White Carpathians" – helping the residents to show the magic of local products.

6 DISCUSSION

First, a minority of studies indicated little or no difference between systems or that conventional systems are beneficial for some species, across a variety of families (Hole et al., 2004).

Total area of the protected area of White Carpathians is 715 square kilometers and lies at an altitude of 175-970 m PLA (Protected Landscape Areas). It is located on the south-east of the Czech Republic (AOPKČRa, 2014). Protected Landscape Area Jizerské Mountains is situated in Jizerské Mountains and on the east directly touches KRNAP. Its total square is 368 square kilometers, of which 274 square kilometers is forest. Attitude range is 320-1124m (difference is 804m). This Protected Landscape Area is one of the oldest in Czech Republic (AOPKČRb, 2014).

Most of the area consists of krkonossko-jizersky pluton, which is made of granite of many types. Apart from White Carpathians, where flysch zones dominate flysch zones, this was the result of seismic activity Alpine folding (AOPKČRa, 2014).

According to my interest, in Jizerské Mountains, the most frequent botanical species are found for example: black currant *(Ribes nigrum)*, red currants *(Ribes rubrum)*, gooseberries *(Ribes uva-crispa)*, Canadian blueberries (*Vaccinium corymbosum)*, fruit trees from family *Rosaceae* such as apple *(Malus domestica)*, pear *(Pyrus communis)* and plum *(Prunus domestica)*. These are the same species as in White Carpathians, but local people don’t focus on growing crops and rather are sheeps and goats breeding. Even, before said, fruit trees from family *Rosaceae* are grown only on gardens, but not in orchards for manufacturing such as drying, must making as its common in the White Carpathians.

On organic farms in Jizerské Mountains, even if they are focused on animal husbandry, we can still find small gardens, located tightly by the houses, but only for self needs. Not like in the White Carpathians, where some organic farmers spend their whole life on growing crops and it’s their main income.

Less common, but also quite frequently growing crops in Jizerské Mountains for consumer use, are: strawberries, lettuce, radishes, turnip cabbages, tomatoes, courgette, potatoes and more. In White Carpathians is biodiversity more varied, whole scale of crops is growed here, always according to the actual season.

However, since Jizerské Mountains are situated in higher attitude than White Carpathians, winter here is crueler and comes earlier, according to the locals it last from the end of October to the half of April. But needless to say, also in White Carpathians are few places with same conditions, for example village "Lopeník" which is local famous thanks to herb spirit from local farmer, has similar snow conditions but the crops on the field are much various, even they are not farmers main business.

In Jizerské Mountains, we can find also unusual species like Buckthorn *(Hippophae rhamnoides),* Aronia *(Aronia arbutifolia 'Nero'/'Viking')* or rhubarb *(Rheum officinale)*. Two of this species –buckthorn and aronia are also located in White Carpathians and locals, similar as in Jizerské Mountains, are making organic juice, organic jam of them, or are using them for direct consummation. Herb gardens with herbs like lavender, rosemary, mint, oregano and other are people drying and use them in cuisine as seasoning whole year.

7 CONCLUSION

The White Carpathians are well known for their rich biodiversity. 89 species from 19 families were noted on organic farms. Of that, 21 species are marked by local farmers as not origin for this region or for Czech Republic. They are represented by following families: *Rosaceae, Brassicaceae, Moraceae, Grossulariaceae, Cornaceae, Corylaceae, Elaegnaceae, Caprifoliaceae* and *Fagaceae.*

According to questionnaire organic farmers are acquiring seeds mostly by buying them and by using their own produced seeds. Sadly, not too many farmers are into seed exchange, because more frequent exchange would help to development of biodiversity in the region.

Rosaceae trees have a very long tradition in this area. There are many orchards focusing on growing apples, pears, plums, cherries, sour-cherries etc. Subsequent use of fruits are: direct consummation, for drying, must making or spirit making. Not only this tradition is typical for region of White Carpathians. We can also find here puppets carver, wine and calvados barrel maker, women making decorative gingerbread and others.

List of grown species on organic farms should be helpful in the future studies, for example to recognize, if the biodiversity in White Carpathians is rising or falling.

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9 APPENDIX

1) Questionnaire
2) Photos of White Carpathians (by Bc. Kateřina Šalková and Ing. Zdeněk Ševčík)
   a) Spring in White Carpathians
      i) Organic orchard in Komňa
      ii) Detail of flowers of *Malus domestica*
      iii) Old variety of *Pyrus communis* in Pitín
      iv) Organic farm of combined production in Kostelec
      v) Organic farm in Pitín specialized in orchard
      vi) Organic farms' market of local products
   b) Autumn in White Carpathians
      i) Fruit dryer
      ii) Packaging of apples
      iii) Yield

1) Questionnaire

ROSTLINNÉ ZDROJE NA ČESKÝCH EKOLOGICKÝCH FARMÁCH

Česká zemědělská univerzita v Praze

Využití rostlinných zdrojů na českých ekologických farmách se zaměřením na etnobotanické znalosti, získávání genetického materiálu a původu druhů rostlin

Use of plant resources on Czech organic farms with special reference to ethnobotanical knowledge, genetic material acquisition and origin of plant species

Bc. Kateřina Šalková

Salkova.Katerina@seznam.cz

Jedná se o dotazník určený specializovaným farmářům pracujících na ekologických farmách v České republice – oblast Bílých Karpat. Prosím o vyplnění následujících otázek, které poslouží k výzkumu v mé diplomové práci s výše uvedeným názvem (práce je psána v anglickém jazyce, avšak pro snadnější komunikaci dotazníkovou formou s českými eko-farmáři byl zvolen jazyk český).

Zaškrtněte zaměření farmy:
O Rostlinná výroba O Živočišná výroba O Kombinovaná
Jak využíváte půdní fond?
O Pastviny O Sady O Pole O Zahrada - ovocné stromy + traviny - užitková zahrada (= tzv. kuchyňská zahrada přímo u domu) O Záhumenky O Jiné (vypsat):
Který z výše uvedených typů využité půdy obsahuje největší sortiment užitkových druhů plodin?
Vyjmenujte sortiment plodin, které pěstujete (v sadu, na poli,…..):

Vyjmenujte hlavní plodiny (a jiné, meziplodiny), které využíváte v osevním postupu:
Považujete některé z plodin, nebo jejich produktů, za netradiční v ČR nebo v regionu?
O Ano --------------→ Které: O Ne
Pěstujete krajové odrůdy?
O Ano -------------→ U kterých plodin? O Ne
Jaké metody využíváte pro zlepšování úrodnosti půdy?
Jak postupujete při zjištění výskytu nákazy, viru, napadení škůdci aj. z hlediska ochrany rostlin
O Odvar z bylin O Hnojivo (vyhovující požadavkům pro EZ) O Poradenská firma O Vyřešíte sám/sama O Jiné:

Využíváte (zkoušíte pěstovat) i plané rostliny? Pokud ano, které:
Které plodiny jsou nyní spotřebiteli žádanější než dříve?
Které ze svých plodin považujete za:
- nejžádanější: - méně žádané:
Způsob získávání (osiva popř. vegetativního materiálu – pokud se plodina/rostlina množí vegetativně) (zaškrtněte, popřípadě očíslujte priority):
a/ Vlastní osivo (část vlastní úrody = osivo) b/ Kupujete (sedlák, firma) c/ Výměna d/ Dostanete darem e/ Jiné:
Napište prosím příklad plodin, které získáváte dle výše zvoleným způsobem:

2) Photos of White Carpathians (by Bc. Kateřina Šalková and Ing. Zdeněk Ševčík)

a) i

a) ii

a) iii

a) iv

a) v

a) vi

b) i

b) ii

b) iii