

INDICATORS FOR INVESTIGATING TRADITIONAL HOME-GARDENS IN ROMANIA - CROPS DIVERSITY IN MOȘNA COMMUNE, SIBIU COUNTY

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Abstract

Traditional home-gardens surveyed in villages of the historical province of Transylvania of Romania are dedicated for cultivating crops, fruit trees, shrubs and ornamental plants as well as inside and outside urban planning areas. They are connected to the semi-natural and natural landscapes and as a consequence their role in the biodiversity conservation is high. However, this concept in Romania is not yet defined. The scope of this article is to reveal the high diversity of plant genetic resources for food and agriculture in Moșna commune from Sibiu county of Romania. Our results revealed that the commune is dominated for crops cultivation by maize, potatoes, and cabbage but not only. A series of crop species and landraces are unique for the region such as the ‘Moșna cabbage’, the maize landraces ‘Red of Moșna’ and ‘Lăpușneag’. There are landowners experimenting new varieties or new introduced species improving their skills for implementing different agricultural practices and saving seeds. Moreover, a series of other species are not officially recorded due to the constraints of the official forms in place. In this case they may become neglected crops species for the country at the official level. This situation can create the scene for vulnerabilities supporting their disappearance or crops erosion. It is the case of local carrots that disappeared due to the loosing of their capacity to save seeds as the species is cross pollinated. All these results support us to define the gastronomic footprint of the village as a major component in the agricultural policy to support food security.

Key words: home-gardens, landraces, food security, crops conservation

INTRODUCTION

Traditional home-gardens are considered at the global level that are important hot-spots of biodiversity due to the high diversity of cultivated crop species and varieties and their complex connectivity with other species into seminatural and natural ecosystems [12]. These small surface areas, as open systems, are ideal habitats for different other organisms setting the scene for resilient complex agro-ecosystems towards implementing climate changes’ adaptation and mitigation measures [10]. In Romania traditional home-gardens are not yet defined even at least in the European Union it has the highest rate of rural population living inside these peculiar cultural traditional landscapes [14].

The fast changing of life in rural area may have dramatic effects on the preservation of rural traditional values and afterwards negatively impacting their resilience under

climate change effects [19]. In this case, at the global level and in other European countries this process started years ago [6; 23].

To define traditional-home garden we need to understand and furthermore substantiate the way how can we better assess the diversity of crops in relationship to landscape peculiarities, householders believes and associated traditional knowledge. In this regard, we propose as a very first step the *on farm* survey of crops diversity residing in these ecosystems. The original pattern of the diversity of species and varieties recorded in the field may further support us to define the gastronomic footprint concept for an area closely connected to cultural heritage. This should be a relevant indicator in developing the definition of rural cultural heritage related to cultivated crops as genetic resources for food and agriculture and traditional knowledge.

In terms of crops inventory at the national level, in line with the European Union policy, Romania decided in 2001 through the Governmental Decision no 540/ 2001 to set the major indicators for agriculture namely to survey on a yearly basis crop species diversity relevant for trade [20]. These indicators are feeding the National Statistics Register in line to the European Union regulatory framework. Thus, the forms AGR 2A and AGR 2B, officially entered into force in 2001 with the scope to collect the major data related to field crop species, sparsely trees and orchards, regarding cultivated surface area (AGR 2A – for spring) and productivity (AGR 2B – for autumn). In terms of capacity building the main authorities involved, according the current regulatory system, are the City Halls and the County Directorate for Agriculture and Rural Development. The last is in charge to first data validation, followed by data feeding into the national statistics designated offices at the county level. The National Institute for Statistics and their county offices are in charge with final data validation at the national level and processing and furthermore of data transfer to their homologues at the European level. Finally, at the European level, a general image of crops production is created and refined into the annual statistical reports. There is a clear missing link in terms of capacity building at the local level between authorities working on one hand under agriculture and on the other hand on biodiversity. If authorities for biodiversity conservation are in charge under the Convention on biological diversity (CBD) and all related treaties in case of Romania the Plant Treaty that originates from the scope of the CBD as a complementary treaty to cover all biodiversity, it is only working under authorities of agriculture namely the Gene Bank of Suceava. Under these circumstances there is a great need to rising awareness of the importance of ensuring conservation measure for all genetic resources for food and agriculture to officials in the City Halls of communes in our country as well as in other European Union countries. This gap is not covered yet in terms of regulatory framework

or recommendations at the European level or national level.

Any resource and, in this case any plant genetic resource for food and agriculture (PGRFA) may be at the heart of developing new innovative economic activities for easy supplying the food and feed economic needs in our contest to ensuring food security for the future. Thus, one principle may be defined: *the more diverse the genetic resources are on which a village depends, the more its inhabitants are protected from the effects of climate change and implicitly from food insecurity.* Such ideas have been already published with different connotations already [5; 16; 18]. The cultural values of villages go behind food security and all rural cultural values. However, in terms of PGRFA, relevant for climate change are all of them including ornamentals and wild species residing inside the rural cultural landscapes. Why? There are long-term ecological connections between all these species. Furthermore, to define traditional home-gardens we need to also address climate change challenges such as drought, heavy rain falls or unusual meteorological conditions as well as the need to address food security for the future and furthermore the need for continuation of traditional culture so seldom mentioned or studied under social connotations [8]. In Romania, the direct connectivity between City Halls and landowners or householders is not officially defined for protecting landraces or PGRFA older than 100 years in the same agro-ecosystem [24]. It is still possible based on local decisions of the City Hall Council to further support the recognition of knowledge related to the continuous cultivation and dedication for cultivation of PGRFA.

The scope of this article is to survey the diversity of crops species in a village recognized to preserve traditions and to analyse the results against the official forms AGR 01 and AGR 02 that filled in by the City Hall officials to reveal the extraordinary crops heritage residing in their home-gardens. The results of this study are relevant to substantiate the gastronomic footprint of the cultivated crops species that may be accepted

as an indicator in the procedures for recognizing traditional home-gardens in certain rural areas of Romania. All data are analysed to reveal new opportunities for villages' development considering all genetic resources that are presently cultivated and their potential for new economic activities.

MATERIALS AND METHODS

Study area. Moşna is a commune positioned in Sibiu county, Romania (46°5'32"N 24°23'44"E), comprising other two villages Alma Vii (46°2'53.8"N 24°25'51.73"E) and Nemşa (46°5'9"N 24°26'43"E), a well-documented rural area relevant for agriculture in the historical province named *Transylvania* of the Middle Ages, based on the Fiscal Transcription of Transylvania from 1750 [13].

Methods of investigations. The complete survey of 12 households and officials regarding the current situation of crops cultivation as well as the connectivity with the historical arable land-use and land-use change (Fig. 1).

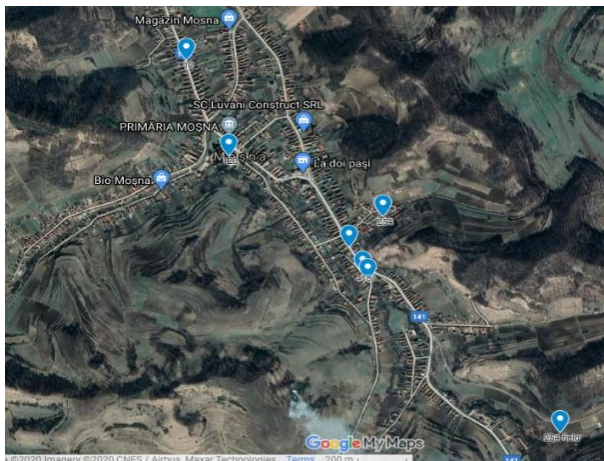


Fig. 1. A general view of the Moşna commune and the 12 locations of investigated home-gardens. Map realized by Antofie M.M. with the support of Google My Map on 14 August, 2020.

Source:

https://www.google.com/maps/d/viewer?mid=1NWQtu_Rcsvj8On1Q_osCAAMWEQ7X0kbn&ll=46.088106006013795%2C24.40285550000003&z=15

The 12 householders were selected mainly based on their continuous activity of cultivating the arable land and on their openness to allow a direct investigation inside their home-gardens and their own field for

crops. For this purpose, a questionnaire was applied that was recently published for the 12 landowners and officials from the City Hall [3]. The questionnaire includes among others a complete information related to the cultivated crops as well as the crops' management system at the local level. 12 missions took place during August and October, 2019.

Official records In order to evaluate the consistency of the current official recording with the commitments taken under the provisions of art. 5 of the Plant Treaty the City Hall Officials supplied us with their official transcripts to find official solutions to encourage the official recognition of their home-gardens as traditional hot-spot of biodiversity in Romania at the European Union level [4].

RESULTS AND DISCUSSIONS

Moşna is a famous commune for the last two centuries in Sibiu county, mainly due to the professor Stephan Ludwig Roth, of Saxon origin fighting for the protection of Romanian population and therefore considered as the main emancipator of the Romanians in the region of Mediaş during XIX century [9]. The commune is also famous for selling excellent quality legumes and wine on the agri-market of Mediaş (46°9'50"N 24°21'3"E), the main city of the region located at 5 km distance, and for more than 300 years documentary attested [13].

The connection with the landowners was mediated by the City Hall officials due to the complexity of the interview, duration of survey, including the visiting on spot of all home-gardens and fields, and privacy of the households' families.

The results of survey will be discussed below and grouped on cereals, potatoes and legumes.

Cereals. For more than 300 years the village was famous for cereal cultivation (spring and winter wheat, rye, oat, einkorn, millet) [13]. After 1750 maize entered the home-gardens together with other crops such as potatoes, tomatoes and peppers. The situation continues to be unchanged up to 1960 when commercial varieties of wheat dominated the agricultural

landscape and eliminating einkorn and millet. However, after 1960 maize entered into the field outside the village and shared a 10% average of the cultivated land up to late 1990 [4]. A complex situation was recorded after 1990 when maize started to dominate the agricultural landscape up to 90% of the cultivated field area. According to officials and landowners this change was generated by the arable land restitution without taking into account the need for any agricultural machinery (i.e. all rudimentary agricultural machinery was confiscated from all citizens before 1950) and the continuation of impoverishment of the population up today. Under such constraints, the local inhabitants continued to cultivate the agricultural fields as well as their home-gardens according to their fair possibilities. Thus, maize become slowly but continuously, the major cultivated crop due to its simple technology of cultivation compared to cereals. However, compared to cereals, maize will very soon spoil the soil [21]. The official claimed that due to this concern during 2018 the wheat and other common cereals were cultivated at higher costs on a larger surface compared to maize. Based on data provided by authorities during 2019 only 2% of the cereals were represented by traditional crops such as *Triticale* hybrids and *Avena sativa* L. (i.e. oat) and the rest of them by *Zea mays* L. (fig. 2, table no. 1).

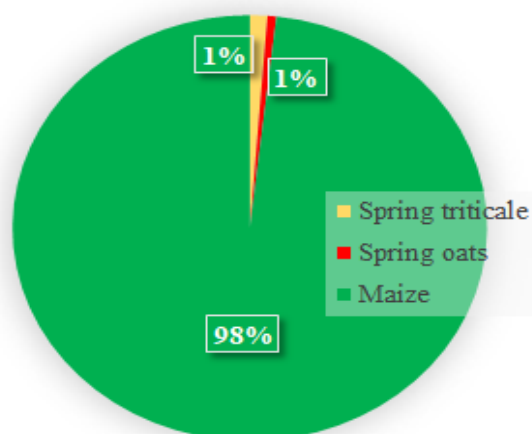


Fig. 2. The current share situation between the major cereals cultivated in Moșna, a commune with a long history of wheat cultivation.

Source: Original image based on collected data from the field.

This situation was confirmed by all respondents. However, what was not possible to officially record, was the variety or hybrids for any species. Unfortunately, at the local level only the species is officially recorded into the forms AGR 2A and AGR 2B. We underline that for more than 20 years it is recognized the relevance of the diversity of varieties for agro-ecosystems [2] and therefore a change can be realized at the local level – at the level of local authorities.

In this case we were able to identify one householder cultivating outside the urban area (i.e. inside the arable land) a large surface of maize local variety or landrace: ‘Lăpușneag’ (i.e. 10 yellow rows on the cobs) on 5.3 ha and another cultivating another landrace: ‘Red of Moșna’ (i.e. 12 purple rows on the cobs) on 4 ha. These two different landraces are cultivated for more than 100 years in the same agro-ecosystems of the county [4].

Table 1. The major crops species cultivated during 2018-2019 in the crops’ fields of Moșna commune.

Crt. No.	Crop species in the field in close connectivity to home-gardens	Old varieties	New varieties
1.	<i>Avena sativa</i> L.		x
2.	<i>Brassica oleracea</i> var. capitata L. ‘Moșna’, local variety	x	
3.	<i>Medicago sativa</i> L.		x
4.	<i>Solanum tuberosum</i> L.	x	x
5.	× <i>Triticosecale</i> Wittm. ex A. Camus.		X
6.	<i>Triticum aestivum</i> L.	x	
7.	<i>Zea mays</i> ‘Lăpușneag’, ‘Red of Moșna’	x	
8.	<i>Z. mays</i> L. hybrids of import		x
9.	<i>Z. mays</i> L. ‘Tuda 200’ national hybrid	x	

Source: all data are based on original investigations by correlating the official data to the field data collected from home-gardens during 2020 in Moșna commune, Sibiu county, Romania.

Both landowners declared that they are content with a production that is varying between 3,000 up and 4,000 kg/ha because this is constant even for very dry weather conditions. Moreover, they are using for food the ‘Lăpușneag’ maize variety because *the polenta is much sweeter and ‘velvet-like’*

when eating based on the local opinion. The 'Red of Moşna' is used for improving the milk quality providing a full taste of sweetness to the cheese they are producing (Table 1).

Among the old Romanian hybrids 'Turda 200' is well established in these agroecosystems covering more than 90% of the arable land area. The officials claimed that also there are landowners cultivating new hybrids but there is no official record to establish their identity. In this regard, related to cereals as PGRFA it can be considered that in Moşna it is possible to preserve old and new cereals, the landowners are open to the new but they are also cultivating old varieties. Their traditional knowledge is strong, and they can easily adopt new crops in the region. The change from classic cereals to maize production was catalysed by landowners' financial difficulties, to borrow common agricultural machinery that are needed for cereal technology based on the declaration of all respondents as well as of that of officials. However, during 2018, only 4.4 t/ha of winter wheat were produced on 327 ha due to dramatic weather conditions (i.e. high temperature and humidity were perfect for supporting the occurrence and spreading of wheat rust). All these factors were decisive to the locals to renounce to furthermore cultivate wheat in 2019. We mention that the region may be considered as a hot spot area for *wheat rust* also considering historical data provided by the Fiscal Conscriptio of Transylvania for 1750.

It can be concluded that in 2019 a large part of the arable land was cultivated with maize against traditional cereals (i.e. wheat, rye, barley, oat) that proves the excellent integration of maize as a crop into the agricultural landscape of this rural area (Fig. 2). The total grain production for 2019 was 832 t with a productivity of 16 t/ha that was similar to that of 2018 (15.5 t/ha).

In the last 30 years in the case of cereals it is a clear shift between classic cereals such as wheat against maize. If cereals dominated these agroecosystems for more than 5,000 years, after less than 30 years maize dominates the entire arable land area. It is

obviously that this shift is due to a regression in terms of *access to technology* related to the present life needs.

This shift is not unique in Romania and similar situations have been recorded in Poland [17], Hungary [7] also countries that follow the communism breakdown and completely changing their political regime. However, at least in case of cereals, local authorities should be aware of the negative impact of maize cultivation under such an extensive way on long term over the quality of soils, decreasing food security for the future.

Potatoes entered as a garden species in this village area in the beginning of the XVIII century, in the same manner like in other parts of the country, and since then, it becomes one of the most important crops of the region [13]. During 2019, 52 ha of arable land were cultivated with autumn potatoes a comparable surface to 2018 when 48 ha were cultivated. There are at least two families declaring that they are using saved seed potatoes each year for many years. They weren't able to provide for sure the exact information of how many years they are saving seed's potatoes or the source. However, their productivity is not so high (below 5,000 kg/ha) they considered that the need to use pesticides decreased and both of them were content with a moderate production. The rest of eight investigated families are using commercial seed potatoes and associated pesticides due to the need to respond their needs. They were not able to provide the exact name of new introduced varieties. The major pests and diseases recorded based on this survey are as following: potato cysts nematodes (i.e. *Globodera rostochiensis* or *G. pallida*) in the region as well as wart disease (*Synchytrium endobioticum*) and late blight disease (*Phytophthora infestans*) mainly expressed during rainy summers.

There are no boundaries related to the way of choosing potatoes varieties, each of the locals respect the other neighbour's decision related to the management of their own arable land. In case of local seed potatoes these families may be of interest considering the programme of mountain potato seed collection from

Romania that started recently at the global level [11; 15].

Table 2. The major legumes species cultivated during 2018-2019 inside home-gardens of Moşna positioned half inside the urban area and half outside urban area – in the field of crops.

Crt. No.	Crop species as legumes cultivated in home-gardens	Old varieties	New varieties
	<i>Allium cepa</i> L. 'red' and 'white'	x	x
	<i>Allium sativum</i> L.	x	
	<i>Anethum graveolens</i> L. 'local variety'	x	
	<i>Apium graveolens</i> L. 'local variety'	x	
	<i>Armoracia rusticana</i> G.Gaertn., B.Mey. & Scherb. 'local variety'	x	
	<i>Artemisia dracunculus</i> L. 'local variety'	x	
	<i>Beta vulgaris</i> L. ssp. <i>vulgaris</i> var. <i>rubra</i> L.	x	
	<i>Brassica oleracea</i> var. <i>botrytis</i> L.		x
	<i>Brassica oleracea</i> var. <i>capitata</i> L. 'Moşna', local variety	x	
	<i>Brassica oleracea</i> var. <i>gongyloides</i> L.		x
	<i>Capsicum annuum</i> var. <i>grossum</i> Sendt.		x
	<i>C. annuum</i> L. var. 'Kapia' and 'Alma Paprika'		x
	<i>C. annuum</i> var. <i>microcarpum</i> (Cav.) Voss in Vilm.		x
	<i>Cucumis sativus</i> L. 'local variety'	x	
	<i>Cucurbita maxima</i> Duchesne	x	x
	<i>Daucus carota</i> L.		x
	<i>Helianthus annuus</i> L.	x	
	<i>Lactuca sativa</i> subsp. <i>capitata</i> (L.) Schübl. & G.Martens 'local variety'	x	
	<i>Lycopersicon esculentum</i> Mill. 'local variety'	x	
	<i>Mentha piperita</i> L.	x	
	<i>Ocimum basilicum</i> L.	x	
	<i>Petroselinum crispum</i> f. <i>vulgare</i> (Nois.) Danert	x	x
	<i>Phaseolus vulgaris</i> L. dwarf and climbing local beans	x	x
	<i>Pisum sativum</i> L.		x
	<i>Rheum rhabarbarum</i> L.	x	
	<i>Satureja hortensis</i> L.	x	
	<i>Solanum melongena</i> L.		x
	<i>Spinacia oleracea</i> L.		x

Source: original data based on original investigations by correlating the official data to the field data collected from home-gardens during 2020 in Moşna commune, Sibiu county, Romania.

Another risk is associated to the lack of control for using pesticides as their application need a specific knowledge and to respect some strict protocols even for the use eco-friendly pesticides. This should be another vulnerability of the official system identified at the local level.

Legumes The commune and its two villages were and still are famous for legumes cultivation [13].

The cultivated surface was 48 ha for both years 2018 and 2019 with a total production of 740 t for 2018 and 710 t for 2019. The slight increase for 2018 was due to the weather conditions: warm and humid that are positively influencing vegetable cultivation.

The surface is comparable with that of potatoes cultivation. Among these species we describe the cultivation of tomatoes, onion, garlic, cabbage, pepper, cucumber, carrots, beans, eggplants, cauliflower and other not mentioned by the official forms (i.e. AGR 2A and AGR 2B) and they were cultivated in similar proportions during both investigated years. It can be considered that 25% of the arable land is covered with legumes and to a certain extent it follows the history of the village for legumes cultivation (Fig. 4).

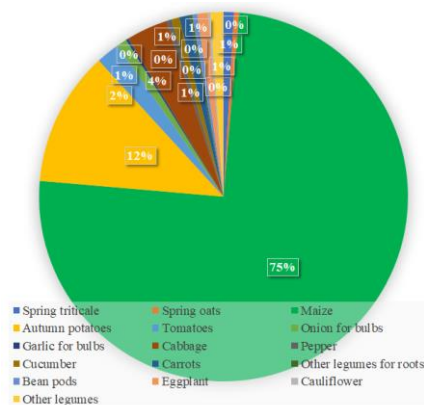


Fig. 3. A diagram presenting the proportions of the land use for cereals and home-gardens shows that for Moşna village one quarter of the arable land is covered by home-gardens that can be in the urban area as well as out-side urban area.

Source: original data based on original investigations by correlating the official data to the field data collected from home-gardens during 2020 in Moşna commune, Sibiu county, Romania.

By analysing the species listed into the Table 2, and by comparing with the species listed into the forms AGR 2A and AGR 2B, it appears that they are cultivating more species, that today are not recorded officially. It can create a false impression that other species than those officially recorded are not important and here is not the case.

In case of onion both red and white varieties local as well as commercial, are cultivated on a surface of 5 ha on a yearly basis in the last two years: 2018 and 2019. Only local garlic landraces are cultivated here due to its taste and gastronomic qualities as well as for its traditional preservation over winter (i.e. cool and well air drained basement rooms) and officially recorded for 1 ha on a yearly basis. However, the local needs are not addressed when we are talking of very small parcels and all together can easily extent the surface with at least 2 ha for onion and 0.5 ha for garlic according to officials.

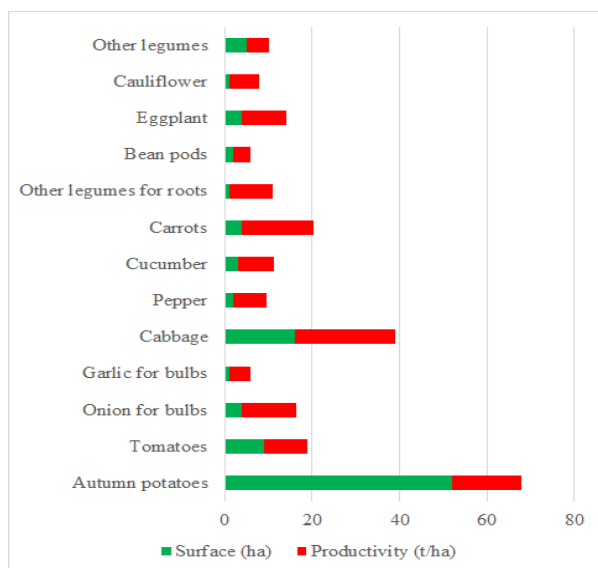


Fig. 4. A diagram presenting the connection between the cultivated area of the species and their productivity supports further the idea that the region is suitable for legumes, potatoes and cereal cultivation as well.

Source: original data based on original investigations by correlating the official data to the field data collected from home-gardens during 2020 in Moşna commune, Sibiu county, Romania.

Vegetables such as red beet, lettuce, different local varieties of dwarf and climbing French beans, cucumber are claimed to be all local varieties. The householders officially declared a total arable land area of 5 ha as being

cultivated with cucumbers but appears also that the surface is probably higher with 1-2 ha due to very small, cultivated parcels also inside the urban area. A similar situation is for French beans, officially recorded for 2 ha which in reality, it easily can increase at 3 ha as it is a basic food vegetable.

Due to different difficulties it was a common issue to preserve carrot seeds and this is not only in this region [22].

All householders are using seeds of commercial origin, that was not a common use in the past. The great infusion at low costs seeds into the commercial network fuelled the loss of local seeds of carrots that claims a specific knowledge and certain barriers in order to avoid cross-pollination [1].

A similar situation is for peas, spinach and different subspecies and varieties of pepper. In case of pepper we mention the introduction of the new variety ‘Alma Paprika’ of Hungarian origin, very much appreciated by locals, extensively cultivated and used as a pickle.

Into the official records we may find only 3 ha of pepper subspecies as a total. However, based on the opinion of the officials the surface is doubled for the village considering more than 500 small parcels from the gardens. The pea surface may be around 0.5 ha for the entire village but there are no official records.

An interesting situation is for cabbage for some of the householders.

Even there are householders that are claiming that they are cultivating the original local variety ‘Moşna cabbage’, with a history of centuries (i.e. the leaves are very thin and elastic and the best for pickling) still some of them renounced to the local seeds for commercialized seeds or seedlings, very easy to be found.

Regarding the famous ‘Moşna cabbage’ we need to underline that it is a cross pollinated species and therefore it should be very hard to consider that still the old variety survived, and local carrots doesn’t. A molecular analysis is compulsory to officially recognize this variety as a local landrace. A close analysis of official data shows that the highest productivity was recorded for potatoes followed by the traditional cabbage and carrots.

CONCLUSIONS

An integrative screening of crops diversity in Moşna commune (i.e. cereals, potatoes and legumes) reveals an impressive diversity in terms of varieties and species compared to the official forms that are supporting the monitoring of PGRFA at national and European's levels.

The householders are equally oriented to preserve old varieties and to import or test new crop species or varieties, proving real skills for adopting new technologies and being interested in the commercialization of their products.

It can be considered that the gastronomic footprint of Moşna locality is dominated by maize, cabbage and potatoes and these local varieties should be at the core of further molecular investigations to prove if they really are landraces.

Traditional home-gardens of Moşna are dominated by legumes propagated by saved seeds and are open for new varieties too to their strong traditional knowledge related to crops cultivation.

In the village are also problems in saving seeds for cross-pollinated species such as the case carrots and therefore concerns should be raised to improve this capacity for locals.

All home-gardens for legumes includes ornamental plants for all village and further investigations will be realized.

Traditional home-gardens are split into two areas: inside and outside urban area, depending on the surface of the households. A strong connectivity between these urban areas exists and the landowners are dedicating to improve their cultivation skills and productivity.

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