

Bode Xhulaj, D., Malaj, E., Duka, I., Mesiti, S. (2024): *In situ conservation of plant biodiversity in home gardens. (Case study of two vilages in central Albania)*. *Agriculture and Forestry*, 70 (4): 21-31. <https://doi:10.17707/AgricultForest.70.4.02>

DOI: 10.17707/AgricultForest.70.4.02

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IN SITU CONSERVATION OF PLANT BIODIVERSITY IN HOME GARDENS (CASE STUDY OF TWO VILAGES IN CENTRAL ALBANIA)

SUMMARY

Home gardens play an important role in the overall agricultural system. In addition to providing helpful information that can support and encourage local communities to develop their home gardens sustainably as a form of in situ management and conservation of plant biodiversity, the study seeks to understand the significant role and benefits of home gardens for the well-being of rural communities. In order to preserve these natural resources, a variety of data was obtained via field observations on the issues related to the use of plants and the variety of agricultural species found in the farms and home gardens of two villages in the central Albania. A total of 47 plant species, belonging to 29 families, were identified from field observations in the home gardens of the 82 farmers interviewed. Important plant species, such as *Sideritis raiseri* Boiss and Heldr, categorized as critically endangered by the IUCN Red List; *Origanum vulgareae* L. and *Juglans regia* L., categorized as endangered; *Salvia officinalis* L. and *Prunus persica* L. as vulnerable; and *Crataegus heldreichii* as low-risk, were also recorded in the home gardens under study. The outcome implies that there is a considerable degree of variability or variation in the plant species that the farmers have grown in their home gardens. These findings indicate that home gardens are suitable places for the conservation of these plants.

Keywords: biodiversity, conservation, farmers, home gardens, management

INTRODUCTION

A vital component of farmers' livelihood strategy is genetic variety, particularly in regions with high ecological, climatic, and economic risks and pressures. Agro-biodiversity, as defined by various studies (Negri and Polegri

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Notes: The authors declare that they have no conflicts of interest. Authorship Form signed online.

Received: 19/04/2024

Accepted: 09/11/2024

2009), is a subset of natural biodiversity that comprises plant genetic resources (crops, cultivars, weeds, and wild relatives) used for food and agriculture. Different studies suggest that the maintenance of genetic variation within crops (Tilman, 2000; Xhulaj and Gixhari 2020) provides a wide range of essential goods and services that support ecosystem functioning and has become an important element of sustainable agriculture (Paoletti, 2001; Le Coeur *et al.* 2002; Marshall and Moonen 2002). Additionally, farmers and breeders can select and continuously modify crops to meet changing environmental conditions (Xhulaj and Koto 2022) or to meet the demands of an expanding human population (Bode *et al.* 2013; IPGRI 1993) thanks to the raw materials provided by agrobiodiversity. Home gardening is a type of traditional conservation where farmers in the area produce some valuable plant species close to their homes (Galluzi *et al.* 2010). They have been the subject of numerous studies that have examined their capacity to support biodiversity or reduce poverty (Reyes-Garcia *et al.* 2010; Fraser *et al.* 2011; Salako *et al.* 2014). It's unclear, though, if the locals still possess the expertise needed to maintain this system. This study aims to contribute modestly to the addition of useful information that can support and encourage local communities to develop their home gardens sustainably. It recognizes the important role and benefits of home gardens for the well-being of the rural community, as well as the paucity of information currently available on home gardens in Albania.

MATERIAL AND METHODS

Study area: Roshnik and Qafë-Dardhë, two villages in the Berat District, were the study's locations. The village of Roshnik is situated in a region with latitude 40°43'53.29'N and longitude 20°2'32.56'E, roughly 18 km from the city of Berat. The village of Qafë Dardhë is situated in a region with latitudes of 40°44'31.37'N and longitudes of 20°7'12.10'E.

Data collection: The period for collecting information in 2023 was April through August. Eighty-two farmers-45 from Qafë-Dardhë and 37 from Roshnik village, were questioned in total from both villages. The study's participants were chosen at random (Table 1). Farmers shared information using a semi-structured questionnaire meant to gather information on a range of topics. They accompanied the researcher to the field for plant identifications after the interviews were completed. Participants initially used their colloquial names to identify the plants.

Data Analysis: The consistency and depth of the data were meticulously examined. In the analysis, descriptive statistics such as percentage and frequency were employed using XLSTAT software. The Jaccard Index (Jaccard, 1912), commonly referred to as the Jaccard similarity coefficient, was determined using the quantitative data that were gathered. It is defined as the size of the joint divided by the size of the union of the sample sets and is used to quantify the similarity and diversity between small groups of samples. As stated, (the number in both sets) / (the number in either set) *100 is the Jaccard Index.

Table 1. Sociological characteristics of the study sample

Category	% of representation for the Village	
	Qafë-Dardhë	Roshnik
Age		
15-30	6.66	8.01
31-45	13.33	10.81
45-60	35.55	56.75
61-75	35.55	24.32
≥ 75	8.88	-
Gender		
Men	55.5	67.56
Women	44.5	32.44
Main Activity		
Agriculture	100	75.67
Private company	-	5.41
Public administration	-	18.91
Level of education		
Primary school	91.1	40.54
High school	2.22	27.02
University degree	6.66	32.43

RESULTS AND DISCUSSION

It is crucial to comprehend the social traits of farmers to comprehend their perspectives and adaptation strategies. According to different studies (Ball, 2020), gender reveals the roles that men and women play in rural communities and aids in determining the proportion of each group's involvement in agriculture. Women in agriculture, play a significant role in managing animals, processing and preparing food, trading agricultural and livestock crops, and maintaining families and homes. According to our findings, 44.5% of the farmers questioned in the village of Qafë-Dardhë were women (Table 1), a level of 32.44% participation had a representative percentage higher than that of Roshnik village. Farmers' years of experience in agriculture have a significant impact on how they perceive and make decisions in their day-to-day agricultural activities, including choosing the right cultivar, treating the soil, and meeting other requirements for producing as safely as possible (Zhou D and Li L 2022). In the village of Qafë-Dardhë, the majority of our respondents (71%) had over 41 years of experience in the agricultural field (Table 1.). This was followed by periods of 10 to 30 years, where 11.1% of respondents had experience, and 6.66% of our farmers had 11 to 20 years of experience.

Diversity of plant species cultivated in the farms of the two villages under study

The possibility for farmers to improve their standard of living and their income stream is correlated with the availability of agricultural land. The chance of climate change adaptation is also influenced by the size of the farm. A large

farm can help spread the risk of erratic weather fluctuations and offer opportunities for crop diversification (Belay *et al.* 2017).

Based on field observations and data collected from study participants, it can be concluded that all farmers in Qafë-Dardhë village (100%) possess a small plot of land ranging from 0 to 1 hectare. In the meanwhile, compared to the first village, where land ownership ranges from 1 to 3 ha, farmers in Roshnik village (100%) own a bigger portion of the land. Four categories of crops (Figure 1) were produced by the farmers in the village of Qafë-Dardhë as their primary agricultural output: cereals, fruits, and vegetables. More recently, the cultivation of fragrant therapeutic plants has been introduced.

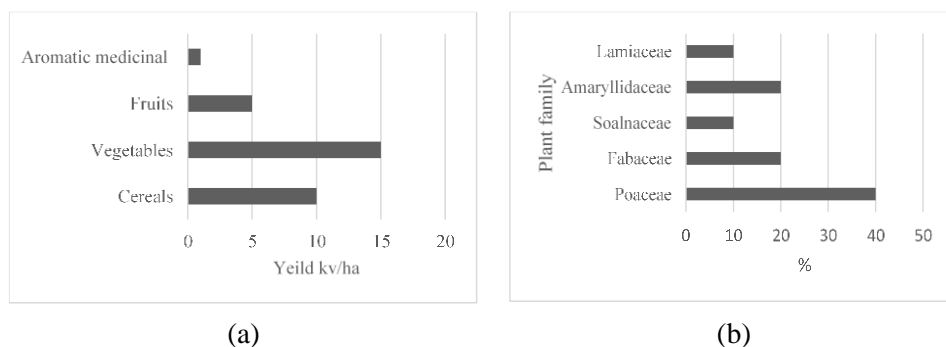


Figure 1. (a) Data on the main products' average yields planted on agricultural lands of Qafë-Dardhë farms. (b) Data on the families of the main crops

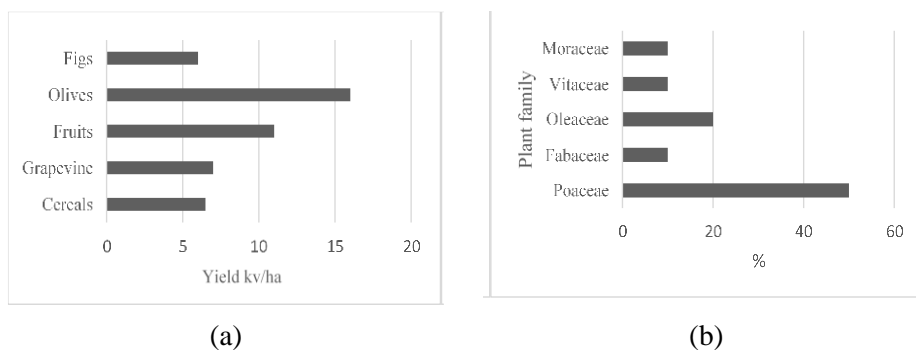


Figure 2. (a) Data on the primary crop average yields cultivated on Roshnik farms' agricultural area. (b) Data about the families of the principal crops

According to the findings of the field observations conducted with the farmers in Roshnik village, Table 2 shows that the three primary crop types planted on their property were grains, fruits, and vegetables.

At the same time, other plots containing grapevines, olives, and figs are developing. The highest yield was obtained from olives cultivated for oil production, followed by various fruits and then cereals (Figure 2).

Table 2. Data on the primary crops planted in the agricultural lands of the farms under study

Scientific name	Vernacular name	Family	Habitat/ life form	Main Use
Data on the primary crops planted in Qafë-Dardhë farms				
<i>Triticum sp.</i> L.	Wheat	Poaceae	Herb	Commercial
<i>Avena sativa</i> L.	Oat	Poaceae	Herb	Commercial
<i>Hordeum vulgareae</i> L.	Barley	Poaceae	Herb	Commercial
<i>Zea mays</i> L.	Corn	Poaceae	Herb	Commercial
<i>Phaseolus vulgaris</i> L.	Beans	Fabaceae	Herb	Commercial
<i>Solanum tuberosum</i> L.	Potatoes	Solanaceae	Perennial plant	Commercial
<i>Allium cepa</i> L.	Onion	Amaryllidaceae	Perennial plant	Commercial
<i>Medicago sativa</i> L.	Alfalfa	Fabaceae	Perennial plant	Commercial
<i>Allium sativum</i> L.	Garlic	Amaryllidaceae	Perennial plant	Commercial
<i>Sideritis raiseri</i>	Mountain tea	Lamiaceae	Perennial plant	Commercial
Data on the primary crops planted in Roshnik farms				
<i>Triticum sp.</i> L.	Wheat	Poaceae	Herb	Commercial
<i>Olea europea</i> L.	Olive	Oleaceae	Tree	Commercial
<i>Avena sativa</i> L.	Oat	Poaceae	Herb	Commercial
<i>Hordeum vulgareae</i> L.	Barley	Poaceae	Herb	Commercial
<i>Zea mays</i> L.	Corn	Poaceae	Herb	Commercial
<i>Phaseolus vulgaris</i> L.	Beans	Fabaceae	Herb	Commercial
<i>Vitis vinifera</i> L.	Grapevine	Vitaceae	Shrub	Commercial
<i>Ficus carica</i> L.	Fig	Moraceae	Tree	Commercial

Source of crop seeds or seedlings for field planting: farmers for most of the previously mentioned plant groups admitted that, in Roshnik village, the largest percentage (70%) obtained their seed from agricultural pharmacies as certified seeds; in contrast, at least two plant groups, vegetables and cereals the farmers got their seeds from previous planting seasons through annual seed exchanges. In contrast, 60% of the planting material utilized in the lands of farms in the village of Qafë-Dardhë was native, and it was shared among farmers season after planting season.

Diversity of plant species in the home gardens of Qafë-Dardhë village

Our results are based on 45 residential gardens of various sizes that encircle homes. The majority of cases (73.3%) have gardens that range in size from 1000 to 1500 m², followed by 17% with gardens that range in size from 700 to 1000 m², and 6.66% of family gardens have sizes less than 700 m² (400-700m²). A vast array of plants, ranging in size from tiny herbs to trees, can be found in home gardens. From the field visit to 45 home gardens, 41 species belonging to 18 families were recorded for this study (Table 3, Figure 3).

The number of species in each family as well as the representative families were determined. The family *Lamiaceae* has 9.75% of its species, whereas the *Rosaceae* family has the most at 26.82 %. The families of *Brassicaceae* and *Amaranthaceae* comprise 4.87% of species, while the families of *Solanaceae*, *Cucurbitaceae*, *Apiaceae*, and *Fabaceae* account for 7.31% of species each. The remaining families are represented by 2.43% of species each (Table 3, Figure 3).

A number of useful plant species that are planted for personal use are noted in home gardens and can be found in the forests surrounding farms. Some of these species, like *Crataegus heldreichii*, *Salvia officinalis* L., and *Sideritis raiseri* Boiss and Heldr, are used medicinally by farmers and are listed on the country's red list following IUCN criteria (FAO, 2016).

Table 3. Floristic information of 45 home gardens in Qafë Dardhë village

Scientific name	Vernacular name	Family	Life form	Main Use
<i>Chenopodium album</i> L.	Wild spinach	Amaranthaceae	Herb	Food
<i>Spinacia oleracea</i> L.	Spinach	Amaranthaceae	Herb	Food
<i>Daucus carota</i> L.	Carrots	Apiaceae	Shrub	Food
<i>Petroselinum crispum</i> L.	Parsley	Apiaceae	Herb	Food supplement
<i>Anethum graveolens</i> L.	Dill	Apiaceae	Herb	Food supplement
<i>Lactuca sativa</i> L.	Salad	Asteraceae	Shrub	Food
<i>Corylus avellana</i> L.	Hazelnut	Betulaceae	Shrub	Food
<i>Brassica sp.</i>	Cabbages	Brassicaceae	Shrub	Food
<i>Brassica oleracea</i> L.	Wild cabb.	Brassicaceae	Shrub	Food
<i>Cucumis sativus</i> L.	Cucumber	Cucurbitaceae	Shrub	Food
<i>Citrullus lanatus</i> Thunb.	Watermelon	Cucurbitaceae	Shrub	Food
<i>Cucumis melo</i> L.	Melon	Cucurbitaceae	Shrub	Food
<i>Cornus mas</i> L.	Cornel	Cornaceae	Tree	Tea, Liquor
<i>Diospyros lotus</i> L.	Persimmon	Ebenaceae	Tree	Food
<i>Phaseolus vulgaris</i> L.	Bean	Fabaceae	Shrub	Food
<i>Pisum sativa</i> L.	Peas	Fabaceae	Shrub	Food
<i>Vicia faba</i> L.	Fava bean	Fabaceae	Shrub	Food
<i>Sideritis raiseri</i> *	Mountain tea	Lamiaceae	Herb	Medicines
<i>Origanum vulgare</i> L.**	Oregano	Lamiaceae	Herb	Spice, tea
<i>Salvia officinalis</i> L.**	Sage	Lamiaceae	Shrub	Medicines
<i>Mentha piperita</i> L.	Mint	Lamiaceae	Herb	Spice
<i>Abelmoschus esculentus</i>	Okra	Malvaceae	Shrub	Food
<i>Ficus carica</i> L.	Fig	Moraceae	Tree	Food
<i>Primula veris</i> L.	Cowslips	Primulaceae	Herb	Tea, Liquor
<i>Crataegus heldreichii</i>	Hawthorn	Rosaceae	Tree	Medicines
<i>Malus sieversii</i> .Roem.	Wild apple	Rosaceae	Tree	Medicines
<i>Prunus spinosa</i> L.	Wild plum	Rosaceae	Tree	Tea, Liquor
<i>Malus domestica</i> Borkh.	Apple	Rosaceae	Tree	Food
<i>Pyrus species</i> L.	Pear	Rosaceae	Tree	Food
<i>Prunus avium</i> L.***	Cherry	Rosaceae	Tree	Food
<i>Prunus persica</i> L.	Peach	Rosaceae	Tree	Food
<i>Solanum lycopersicum</i> L.	Tomato	Solanaceae	Shrub	Food
<i>Prunus amygdalus</i> L.	Almond	Rosaceae	Tree	Food
<i>Cydonia oblonga</i> Mill.	Quince	Rosaceae	Tree	Food
<i>Prunus domestica</i> L.	Plum	Rosaceae	Tree	Food
<i>Fragaria vesca</i> L.	Strawberries	Rosaceae	Shrub	Food
<i>Capsicum annum</i> L.	Pepper	Solanaceae	Shrub	Food
<i>Solanum melongena</i> L.	Eggplant	Solanaceae	Shrub	Food
<i>Urtica dioica</i> L.	Nettles	Urticaceae	Herb	Food supplement
<i>Juglans regia</i> L.**	Walnut	Juglandaceae	Tree	Food
<i>Vitis vinifera</i> L.	Grape vine	Vitaceae	Shrub	Food

*Critically endangered, ** Endangered, ***Vulnerable. (FAO, 2016)

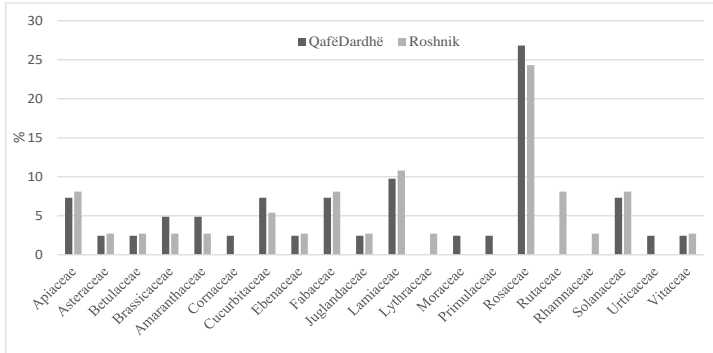


Figure 3. Species families represented in the home gardens of 82 farms

Proper dynamics have been established in home gardens by the integration of several plant species with varying life forms, such as trees, shrubs, and herbs. According to reports in the literature, most home gardens consist of a variety of plants with slightly variable compositions and levels of dominance. In accordance with other studies (Sujarwo and Caneva 2015), climbers, shrubs, and herbs were the most common plants in residential gardens, after trees. According to Barbhuiya *et al.* 2016, trees dominated residential gardens, with shrubs and plants coming in second and third. As previously reported (Mekonen *et al.* 2015) on botanical study of home gardens, herbs dominated, followed by trees, shrubs, and climbers.

Diversity of plants life forms and their use in Qafë-Dardhë village

The environment benefits from the interactions between plants and other living beings. According to reports, trees can increase soil nutrient availability through litter fall, absorb rainfall, move water from the soil to the atmosphere through transpiration, and reduce irradiance through shading (Holmgren *et al.* 2015). In our survey, shrubs accounted for 43.9% of the plant species grown in home gardens, followed by trees (34.14%) and herbaceous plants (21.95%) (Figure 4(a)). Farmers used them for personal consumption as food in 68% of the cases, while those with aromatic medicinal origins accounted for 14.6% of the cases, in the form of extract to treat flu, kidney-related diseases, etc. In 4.8% of cases, farmers employed them as spices, to be added as such to different cuisines. (Figure 4(b)).

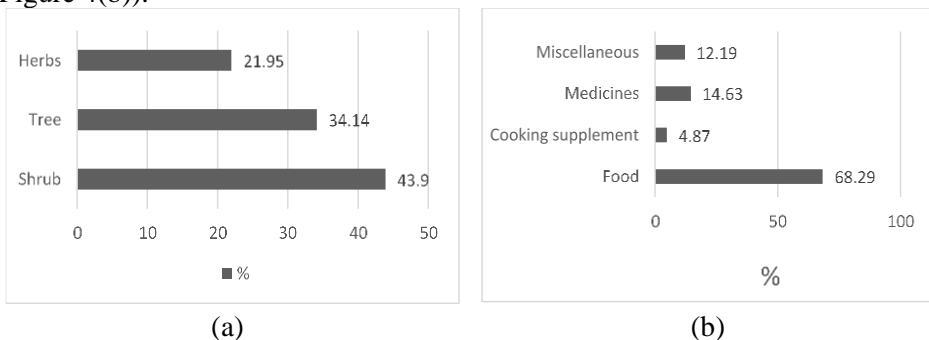


Figure 4. (a) Diversity of plants life forms; (b) Use of home garden plants

Diversity of plant species in the home gardens of Roshnik village. Our results refer to 37 home gardens which are presented with similar sizes ranging from 500 to 1000 m². Home gardens are represented by a wide variety of plants, varying in their life forms, from small herbs to trees. 37 species, belonging to 17 families, were identified during the field visit to 37 home gardens for this study (Table 4).

Table 4. Floristic data on the main species of home gardens in the 37 farms of the village of Roshnik

Scientific name	Vernicular name	Family	Life form	Main Use
<i>Spinacia oleracea</i> L.	Spinach	Amaranthaceae	Herb	Food
<i>Petroselinum crispum</i> (Mill.)	Parsley	Apiaceae	Herb	Food supplement
<i>Anethum graveolens</i> L.	Dill	Apiaceae	Herb	Food supplement
<i>Daucus carota</i> L.	Carrots	Apiaceae	Shrub	Food
<i>Lactuca sativa</i> L.	Salad	Asteraceae	Shrub	Food
<i>Brassica sp.</i>	Cabbages	Brassicaceae	Shrub	Food
<i>Citrullus lanatus</i> (Thunb.)	Watermelon	Cucurbitaceae	Shrub	Food
<i>Cucumis sativus</i> L.	Cucumber	Cucurbitaceae	Shrub	Food
<i>Diospyros lotus</i> L.	Persimmon	Ebenaceae	Tree	Food
<i>Phaseolus vulgaris</i> L.	Bean	Fabaceae	Shrub	Food
<i>Pisum sativa</i> L.	Peas	Fabaceae	Shrub	Food
<i>Vicia faba</i> L.	Fava bean	Fabaceae	Shrub	Food
<i>Juglans regia</i> L.**	Walnut	Juglandaceae	Tree	Food
<i>Sideritis raiseri</i> Boiss & Heldr*	Mountain tea	Lamiaceae	Herb	Medicines
<i>Origanum vulgare</i> L.**	Oregano	Lamiaceae	Herb	Spice, tea
<i>Salvia officinalis</i> L.***	Sage	Lamiaceae	Shrub	Medicines
<i>Mentha piperita</i> L.	Mint	Lamiaceae	Herb	Food supplement
<i>Punica granatum</i> L.	Pomegranate	Lythraceae	Shrub	Food
<i>Abelmoschus esculentus</i> L.	Okra	Malvaceae	Shrub	Food
<i>Ficus carica</i> L.	Fig	Moraceae	Tree	Food
<i>Ziziphus jujuba</i> Mill.	Ziziphus	Rhamnaceae	Tree	Food
<i>Prunus amygdalus</i> L.	Almond	Rosaceae	Tree	Food
<i>Cydonia oblonga</i> Mill.	Quince	Rosaceae	Tree	Food
<i>Prunus domestica</i> L.	Plum	Rosaceae	Tree	Food
<i>Fragaria vesca</i> L.	Strawberries	Rosaceae	Shrub	Food
<i>Malus domestica</i> Borkh.	Apple	Rosaceae	Tree	Food
<i>Pyrus species</i> L.	Pear	Rosaceae	Tree	Food
<i>Prunus avium</i> L.***	Cherry	Rosaceae	Tree	Food
<i>Prunus persica</i> L.	Peach	Rosaceae	Tree	Food
<i>Mespilus germanica</i> L.	Medlar	Rosaceae	Shrub	Food
<i>Citrus × sinensis</i> (L.) Osbeck	Orange	Rutaceae	Tree	Food
<i>Citrus × limon</i> (L.) Osbeck	Lemon	Rutaceae	Tree	Food
<i>Citrus reticulata</i>	Mandarine	Rutaceae	Shrub	Food
<i>Capsicum annuum</i> L.	Pepper	Solanaceae	Shrub	Food
<i>Solanum lycopersicum</i> L.	Tomato	Solanaceae	Shrub	Food
<i>Solanum melongena</i> L.	Eggplant	Solanaceae	Shrub	Food
<i>Vitis vinifera</i> L.	Grape vine	Vitaceae	Shrub	Food

*Critically endangered, ** Endangered, ***Vulnerable. (FAO, 2016)

The representative families and the number of species in each family were identified, with the *Rosaceae* family having the highest percentage of species (24.9%), followed by the *Lamiaceae* family with 10.81%. Eight percent of species are represented by the families *Solanaceae*, *Apiaceae*, *Fabaceae*, and *Rutaceae*, respectively; 5.4% of species are represented by the *Cucurbitaceae* family, and 2.7% of species each by the remaining families (Table 4).

Diversity of plants life forms and their use in Roshnik village.

Three different life forms were represented among the plant species grown in home gardens: shrubs made up 51.35% of the cases, trees made up 32.43%, and herbaceous plants made up 16.22% (Figure 5(a)). In 86.48% of cases, the plant species were utilized by farmers for personal consumption as food; in 5.4% of cases, mostly those with medicinal aromatic origins, the plant species were used medicinally, typically in the form of extracts to cure illnesses like the flu. In 8.1% of the cases, farmers utilized them as spices to be added as such to different foods. (Figure 5(b)). Farmers surveyed for the study in both communities had similar views about the sections of the plant they used for their purposes, demonstrating that uses vary based on the type of plant.

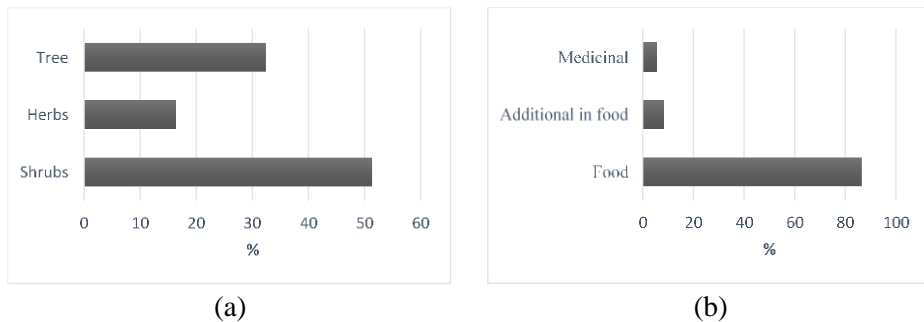


Figure 5: (a) Diversity of plant life forms (b) Use of home garden plants

The degree of diversity and similarity between the garden species groups of the two villages under study was measured using the Jaccard coefficient, often known as the Jaccard Similarity Index (IJ). The two populations are more similar, the larger the percentage. For the plant species that were displayed in the home gardens of the two villages that were the subject of the study, our computed value yielded an IJ of 39.74%. The outcome implies that there is a considerable degree of variability or variation in the plant species that the farmers have grown in their home gardens in the two communities. These findings indicate that home gardens are suitable places for the conservation of these plants.

CONCLUSIONS

The results of our study, based on interviews and field observations, support the assertion that family gardens are important sources for maintaining agricultural plant biodiversity. In the 82 family gardens of the two villages selected for study, a total of 47 plant species belonging to 29 families were identified.

Meanwhile, in the agricultural lands, farmers mainly cultivated for commercial use about 14 plant crops, which belonged to 8 plant families. Important plant species, such as *Sideritis raiseri* Boiss & Heldr, categorized as critically endangered by the IUCN Red List; *Origanum vulgareae* L. and *Juglans regia* L., categorized as endangered; *Salvia officinalis* L. and *Prunus persica* L. as vulnerable; and *Crataegus heldreichii* as low-risk, were also recorded in the home gardens under study. Given the significant benefits and contribution of home gardens to human well-being and the dearth of research on home gardens in Albania, this study may provide useful information that might support and encourage locals to grow their home gardens in a sustainable manner.

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