Transformation of Traditional Cultural Landscapes - Koper 2019

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Traditional agricultural landscapes in Uskopaljska valley (Bosnia and Herzegovina)

https://doi.org/10.1515/geo-2020-0024
received December 31, 2019; accepted November 10, 2020

Abstract: This article discusses changing trends in agricultural land use in Uskopaljska valley. Quite a large number of agricultural land exploitation orientations indicate that the geographical benefits for the development of certain types of agricultural production are very different. Detailed analysis of the exploitation orientations of land use leads to the opinion that they are determined mainly by social movements. The depopulation areas are numerous in the periphery of Uskopaljska valley, resulting in abandonment of agricultural land and an increase in unused areas. Large extensive production areas were abandoned after 1991, leaving uncultivated ploughlands and grass cover to be used occasionally by herders. In 2018, there were only 7.4 acres of ploughlands, I–IV class quality, per person that were mainly being cultivated, which was not enough to ensure sufficient food production. According to the analysis of available data and based on the practices, and among others a survey among the farmers, the general perception of basic conditions and main problems of agricultural land use and agricultural development is revealed.

Keywords: land use, depopulation, agricultural development, perception, agricultural geography

1 Introduction

Agricultural landscapes are dynamic, with a wealth of factors influencing the direction and degree of change [1]. Land cover and changes in land use have been recognized as major drivers of global change through their interactions with climate, processes in the ecosystem, biogeochemical cycles, biodiversity, and human activities [2]. Land cover and land use efficiency play an important role in global change [3]. Knowledge of the spatial and temporal characteristics of such processes is of great socioeconomic and environmental importance [4,5]. Global change studies require accurate, relevant, and consistent information on land cover and its dynamics to advance our understanding of how different elements of the global system currently operate, how they interact, and how to best reduce uncertainty in forecasting changes [6].

Vrišer [7] in his work "The size of farms in Slovenia" gives an account of the role of the size of the property and the ownership structure in agricultural production. Vujatović-Zakić and Tomić [8] argue that the fragmentation of farms can be overcome by land division. The importance of parcel size and parcelization was also discussed by Vrišer [9,10] and Stepić and Jaćimović [11] and Crkvenčić and Malić [12].

Chopra [13] in his book "Agricultural Geography" discusses the problems of overpopulation in agricultural areas of India and the problems of depopulation in them. Yusuf et al. [14] in "Methods of Demographic Analysis" explain the most important methods of population analysis, with particular attention to concentration levels and deployment, similar to Kulcsar and Curtis [15] in the rural demography handbook. Božović and Đurašković [16] in their paper emphasize the importance of the human factor in agricultural production, whether it is the total population, the active population, or the qualified workforce. Many of Mediterranean mountain regions in Europe present very similar features: a mid-mountain environment location, an inability to offer tourist attractions of any real weight, and insufficient agricultural or forestry potential that might serve as an economic engine in a globalized and liberalized economy [17].

Land abandonment particularly affects extensive agricultural areas, which often exhibit high levels of agricultural biodiversity [18]. Generally speaking, rural abandonment implies the conversion of mixed crops and grazing land to a limited number of monocultures and the expansion of homogeneous forest areas [19]. Abandonment in

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Slovakia predominantly occurs on areas with steep slopes (driven by increased use of heavy machinery that is not adapted for steep slopes) and less fertile soils (driven by decreased profitability of agriculture on less productive areas) [20].

The relative importance of the drivers that influence landowners' decision-making varies considerably between landscape types in Europe and thus also the opportunities for landowners to respond to incentives and other policy instruments [21]. Natural/spatial drivers were described as being more influential on land abandonment than on other change processes. Analysis showed that cases cluster in groups of a small number of shared characteristics, with land abandonment/extensification, agricultural expansion/intensification, and technological drivers being most relevant for separating clusters [22]. Sklenicka et al.'s study confirmed that differences in farmland proportion and in the proportion of permanent elements were similarly affected by environmental conditions in the two states, Czechia and Austria, regardless of their political and socioeconomic development [23].

The systematic review of case studies on agricultural land use change in Europe revealed intensification and disintensification of agricultural land manifested itself as expansion or contraction, changes in landscape elements, changes in land management intensity, changes in agricultural land use activity, and specialization or diversification. Demographic, economic, technological, institutional, and sociocultural drivers are all related to the observed changes, in combination with location factors and farm and farmer characteristics [24].

According to Hietala-Koivu [25], the intensification of agriculture means that the landscape of Ylane, Finland, has become more homogeneous, probably because of the decreasing number of open parcel ditches.

Masný and Zaušková study results [26] prove the disappearance of traditional agricultural forms and also the eminent changes of landscape structure in the period of collectivization. At the same time, their findings presented underline the seriousness of the phenomenon of agricultural land abandonment in the territory of Slovakia.

The aim of this paper is to examine main changes in traditional agricultural areas of Uskopaljska valley, Bosnia and Herzegovina. We explored changing trends in agricultural land use, orientations of land use, depopulation areas with related abandonment of agricultural land, the general perception of basic conditions, and main problems of agricultural land use and agricultural development.

2 Methodology

2.1 Study area

Analysis and evaluation of geoposition represent an important factor for the understanding of genesis, development, and function of any kind of area. The geographical position of the Uskopaljska valley has the following characteristics: it is situated in the Northern Hemisphere, in the field with geographic coordinates 43°51′ and 44°15′ North latitude, and between 17°16′ and 17°51′ East longitude. According to data acquired from the meteorological station of Bugojno, this area belongs to pre-mountain moderate continental climate type or, according to Köppen Climate Classification, this municipality's region is dominated by Cfb climate (moderate warm and wet climate with warm summer), while in the mountain areas especially in the east, northeast, and west, is presented Cfc climate as well (moderate warm and wet climate with fresh summer). On the high mountain, system of Vranica Dfb and ET climate are present. The main hydrographic skeleton of the Uskopaljska valley area is presented with the Vrbas River and its tributaries. The entire area of the region can be divided into three characteristic hypsometric zones important for agricultural production: the hilly zone with the domination of alluvial plains 420–600 m above sea level, covers approximately 7.35% of the observed area; the hilly zone with the dominance of depression hills covers altitudes from 601 to 750 m above sea level (15.6% of the total observed area); the mountain zone extends at altitudes above 750 m and occupies about 77% of the observed area [27].

Political-geographically, the Uskopaljska valley is situated in the state of Bosnia and Herzegovina, the entity of the Federation of Bosnia and Herzegovina, and within it, in the Central Bosnian Canton (Figure 1). Physiognomically, it belongs to the Mountain-Valley macroregion and the Upper Vrbas-Pliva mesoregion of Bosnia and Herzegovina. In Uskopaljska valley, there are three administrative municipalities: Bugojno (31,470 population), Donji Vakuf (14,739 population), and Gornji Vakuf-Uskoplje (22,304 population). By roads, Uskopaljska valley is almost equally away from the cities of Banja Luka, Sarajevo, Mostar, and Split (around 140 km). The total length of the border of Uskopaljska valley towards the neighboring municipalities is 259 km, and in those borders, the Uskopaljska valley is around 1,087.2 square kilometers in area. According to the Census 2013, in Uskopaljska valley

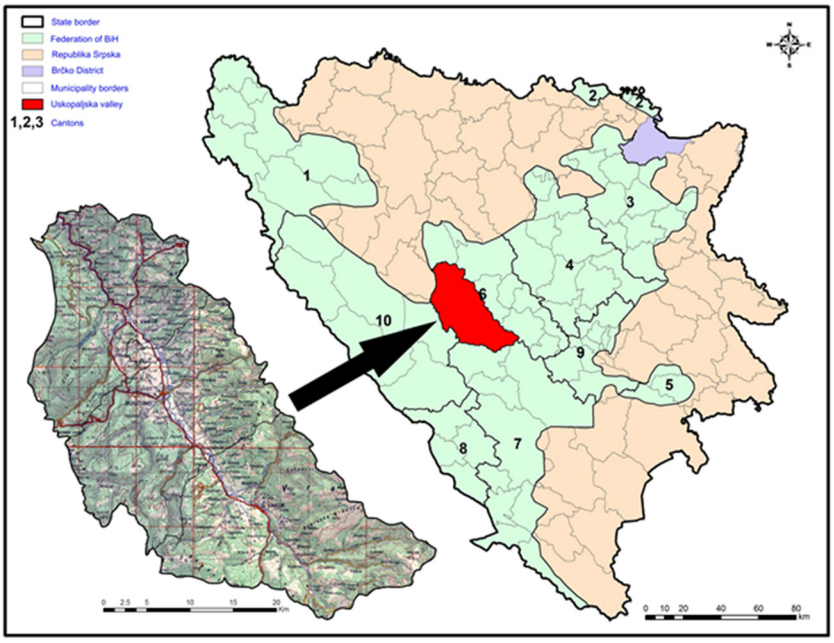

Figure 1: Location of Uskopaljska valley region in Bosnia and Herzegovina.

there are 68,513 people, which is 28,101 less than those in 1991 [28]. In traditional agricultural areas, around 58% of total population live (39,700 people) [29].

In addition to the favorable natural conditions for the cultivation of almost all types of cereals, fruits, and vegetables in the Uskopaljska valley, the hilly and mountainous parts have long offered great opportunities for the development of livestock breeding. In the area of the Uskopaljska valley, agriculture was the main activity of the population until the end of the 1950s when the industry began to develop rapidly.

Bugojno, as the urban center of the Uskopaljska valley, extended towards the northern and southern parts of the basin along the Vrbas river. With the development of nonagricultural activities, the number of employees outside their own farms in the Uskopaljska valley increased. The social restructuring of the agrarian population triggered two spatial processes: population relocation and the daily labor movement. The consequence of such developments was the spatial relocation of the population, increased depopulation of rural areas, which in some cases took the form of distinct depopulation and even extinction of the population, as well as major structural changes in population.

With the expansion of urban areas, the value of land is increasing, both in suburban cadastral municipalities and along roads in the Uskopaljska valley. The expansion of urban settlements took place at the expense of agriculture, as the highest quality agricultural lands were used for settlement construction. The total area of built land in urban cadastral municipalities today is 794 ha, which is only 0.7% of the area of the Uskopaljska valley. In total, there are 50 cadastral municipalities [30].

The development of economic activities is also evident in the GDP per capita in the municipalities of the Uskopaljska valley. In 2018, it ranged from the lowest EUR 2,160 in Gornji Vakuf municipality to the highest EUR 2,570 in Bugojno municipality. In the Uskopaljska valley, the GDP per capita was EUR 2,320, while the average in Bosnia and Herzegovina was EUR 4,770 per capita. The region is one of the less developed in Bosnia and Herzegovina. However, before the war (1992–1995), according to data calculated from 1981, GDP per capita ranged from the lowest EUR 1,539 in Gornji Vakuf municipality to the highest EUR 2,710 in Bugojno municipality. In the region, the national product was EUR 2,236 per capita. At the same time, the average in Bosnia and Herzegovina was EUR 1,120 per capita, which indicates twice the development of the region compared to Bosnia and Herzegovina [31].

2.2 Material and methods

The whole of the geographic research that has been carried out for the purpose of this paper can be identified as fundamental and applicative. For these purposes, field research was also conducted in order to obtain the

necessary additional statistical geographic materials and to understand better the whole spatiotemporal dimensions of changes in traditional agricultural landscapes. Basic socio-geographical statistic material was obtained through direct and indirect research methods such as surveys and various documentation. The thematic maps were made in order to visually present the geographical distribution of the analyzed parameters using the GIS tool.

Farmer's opinions are critical in the context of land practices as they are the key decision-makers behind the functional and structural changes of agricultural landscapes [32]. We conducted a survey of farms [33] that were designed in accordance with the requirements of the paper. The survey consisted of 25 questions answered by leading people at farms (from the size of the farm to their economic situation). It covered 310 farms with 1,054 inhabitants in the area of the Uskopaljska valley. We used a simple random sampling method.

The basic literature for land use assessment was the cadastral data and plans, which is also recommended by Vrišer [10] in his book on the methodology of agricultural geography. The cadastre provides data on land use categories, ploughlands, orchards, meadows, pastures, parcels, and the ownership structure.

After analysis of population distribution, we used Nejašmić [34] method for delimitation of population trends in cadastral municipalities. For this analysis, we used cadastral municipalities as territorial units and not settlements because one cadastral municipality consists of several settlements, and there are no data on land use for single settlement. According to this method, the population trend is the result of population change between two population censuses (in %). There are 9 population trends in this method (very strong progression with 12% and more change in population number; strong progression 7–11.9%; moderate progression 3–6.9%; weak progression 1–2.9%; stagnation –0.9 to 0.9%; weak depopulation –1 up to –2.9%; moderate depopulation –3 up to –6.9%; strong depopulation –7 up to –11.9%; extinction –12%; and more change in population number) [34].

We used the Lorenz curve to analyze the relationship between acreage and population. In his paper entitled "Geographical Perspectives on Population and Food System in Solapur District," Gavakare [35] uses the same method and also exhaustively cites the problem of population nutrition in Solapur District of India. We modified his method of food balance and food availability in the region for the needs of a population in Uskopaljska valley and after that calculated balance based on the agricultural production from 2018 (Table 1).

Table 1: Agricultural product/food balance per person

Agricultural product/food	Need per person in g/day
Grains	300
Potato	300
Leafy vegetables	100
Other vegetables	150
Milk	180
Meat	150
Fruits	100

The analysis of the use of agricultural land was done by the method applied by Kostrowicki in determining the orientations of land use in Poland. For determining the orientations of land use, the best results are obtained by the method of alternating divisors (successive quotients) developed at the Geographical Institute of the Polish Academy of Sciences and recognized by the International Geographical Union [36]. By dividing each category of land by numbers from 1 to 6 and taking into account the six largest numbers obtained by division, orientations of land use can be distinguished.

The value of the total agricultural production in the Uskopaljska valley is calculated on the basis of the results collected by the municipal offices (we used current market prices of agricultural products and compared them with agricultural land).

3 Results and discussion

3.1 Factors affecting agriculture

In an analysis of the development of the traditional agricultural landscapes of the Uskopaljska valley, we conducted a survey in which we found out which factors are most important for farmers (factors affecting agriculture). The survey was answered by managers in farms. The survey included 310 farms in the Uskopaljska valley. Most of the responses were received by the land factor, 26.7%. Most farmers have given great importance to the land, especially since the areas under quality ploughlands are scarce and are connected to the lower flow of the tributary of the Vrbas and its alluvial plain where the largest settlements are located. The land has become a major factor in the development of these areas due to the impossibility of employing the population in other activities. The survey showed that farmers lacked the area to expand production (Figure 2).

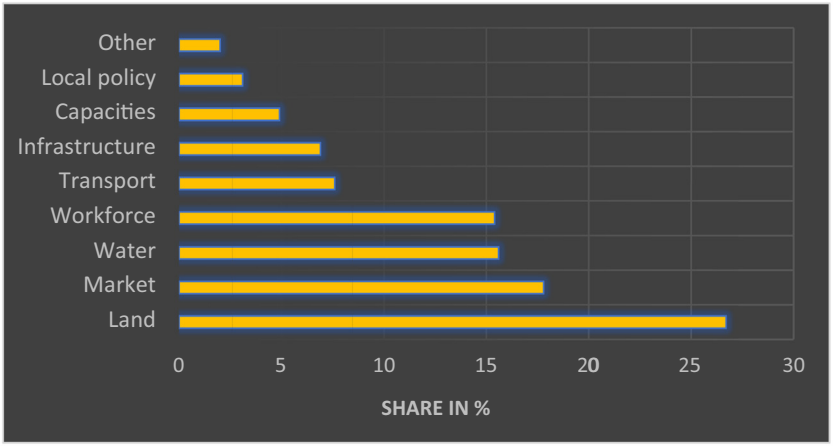

Figure 2: Factors affecting agriculture in Uskopaljska valley according to local farmers, 2018.

In second place was the market factor with 17.8% of responses, and in third place was the "water" factor, which received 15.6% of responses. The "water" factor is extremely important when considering the importance of water as a prerequisite for any agricultural production. The survey found that almost all farmers have water-related problems. Irrigation of agricultural land is necessary in the summer months and most farmers use water from urban water supply systems, which is not good because drinking water reserves are reduced and there occurred water reduction in the urban water supply (reducing or stopping water supply for a couple of hours).

In fourth place is the "workforce" factor, with 15.4% of responses. The industrialization of the Uskopaljska valley began intensively only after the Second World War and, until the mid-1960s, employed unskilled and low-skilled labor, and from that period onwards, with a planned migration to this area, came a workforce with a higher level of qualification, which elevated the industry of the Uskopaljska valley to a very high level if one considers the territory of the former Yugoslavia. The population in agriculture has been steadily declining and nowadays, it is very difficult for agricultural managers to find a workforce that can work efficiently and at a lower wage than that in other industries (around EUR 10 per day).

When it comes to the other factors by the number of responses, the most important are: transport, infrastructure, capacities, and local development policy. Most farms in the Uskopaljska valley have no significant problems with access to the parcels and road quality with the exception of the higher mountainous areas in the southeast. Infrastructure and facilities on farms are mainly outdated. These two factors are particularly significant for farms engaged in animal husbandry and processing of agricultural products. Surprisingly, little response was given to the "local development policy" factor, and the majority of respondents thought that it was either very weak or completely absent in the Uskopaljska valley. Respondents also expressed great dissatisfaction with the work of local services.

According to the Farm Survey [33], most irrigation is done by using tap water. As many as 52% of farms use this method, which significantly damages the drinking water reserves that serve the population, causing frequent water reductions in the Uskopaljska valley. As many as 24% of those surveyed said they were not irrigating their surfaces.

3.2 Land use changes

In 1991, the Uskopaljska valley had 38,353 ha of agricultural land. The most substantial parts were ploughlands with 16,804 ha and meadows with 11,508 ha. In 2001, the area under agricultural land was reduced by 1,072 to 37,281 ha. The area under meadows was reduced most significantly, by 234 ha. During the same period, the area under the orchards increased to 1,103 ha, namely, for 40 ha. The Uskopaljska valley in 2013 had 15,133 ha of ploughlands, which is 13.9% of the area of the Uskopaljska valley. In total, the agricultural land covers 36,270 ha or 33.4% of the total area of the Uskopaljska valley (Figure 3). Forest land covers as much as 68,061 ha and barren land 4,391 ha. Compared to 2001, areas under ploughlands have been steadily declining by 1,024 ha. A similar case is with areas under meadows and pastures – all of them at the expense of

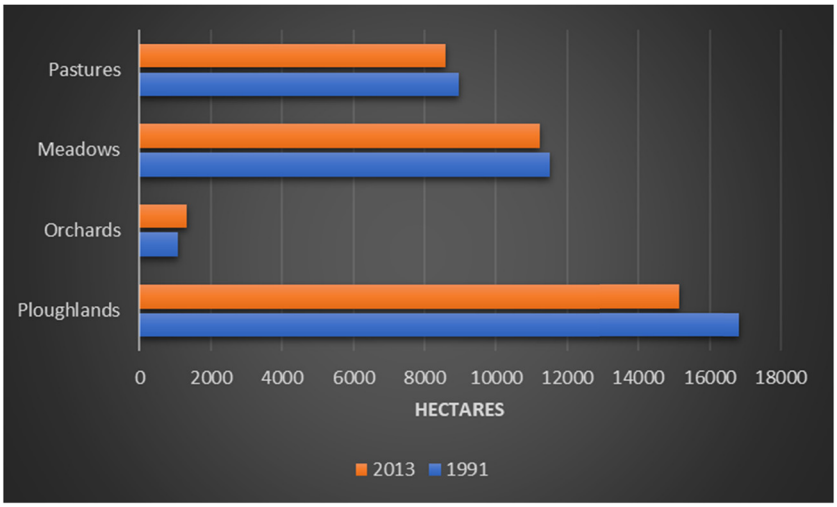

Figure 3: Agricultural land in Uskopaljska valley, 1991–2013.

forest and barren land. The share of agricultural land in the total area of the Uskopaljska valley is below the average for Bosnia and Herzegovina, 49.5%. Areas under orchards have been increased by 211 ha [30].

Most of the ploughlands pertain to the municipality of Bugojno, namely 6,495 ha, and the least is in the area of Gornji Vakuf municipality, namely 3,226 ha. There is a significant increase in the area under orchards in the municipality of Gornji Vakuf, which is today the leading fruit producer in the Uskopaljska valley. In the period 1991–2013, areas under meadows in the municipality of Bugojno decreased from 4,473 to 4,251 ha and in the municipality of Donji Vakuf from 2,926 to 2,695 ha; pastures in Bugojno municipality decreased from 1,836a to 1,825 ha, in Donji Vakuf municipality from 1,920 to 1,752 ha, and in Gornji Vakuf municipality from 5,222 to 5,027 ha. Also, there is a significant increase in barren land in the Uskopaljska valley, where new residential buildings were built from 3,973 ha in 1991 to 4,391 ha in 2013. The total suspected mine area in the Uskopaljska valley is 46 km^2, which is 4.2% of the entire region. These are forest areas, which are not included in agricultural land use. They are located in high mountain areas where there is no permanent population (areas of cadastral municipalities Mračaj and Planinica in the southwest, Drvetine and Skakavci in the northeast, and Uzričje in the south) [30].

The highest share in the total agricultural land is in the cadastral classes V and VI, which participate with 46.2% and are characterized as conditionally favorable, which indicates a less favorable production capacity of agricultural land (Figure 4). They are bound to the parent substrates of limestone and dolomite, and shale, which

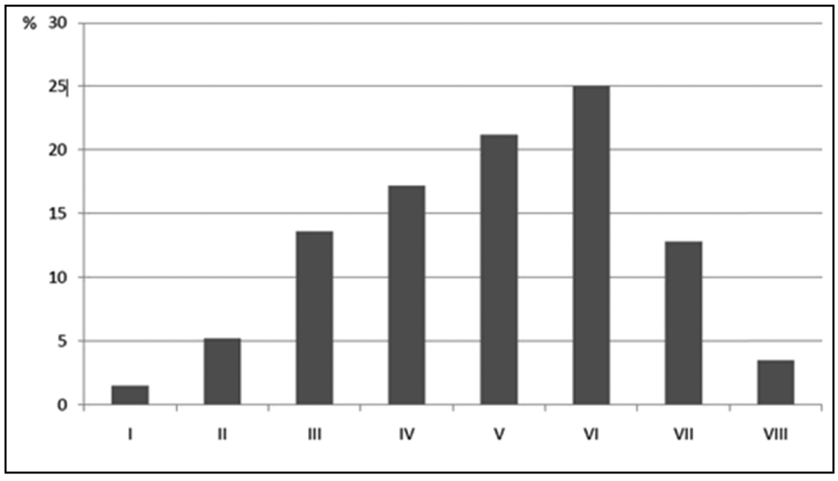

Figure 4: Cadastral classes of agricultural land in Uskopaljska valley, 2018.

are rankers and calcocambisols and are only partially bound to Neogene and Quaternary structures. They are suitable mostly for meadows and pastures.

Agricultural land favorable for intensive agricultural production comprises 37.5% of the total agricultural land. The lands of these cadastral classes are mainly cultivated with arable crops and fruits. Of the total agricultural land within cadastral class I–IV, only about 57% of the land is used for intensive agricultural production. The lands of the first four cadastral classes are related almost exclusively to lake freshwater sediments and Quaternary deposits as the parent substrate. The agricultural lands of Uskopaljska valley pertaining to the VII and VIII class are of the lowest quality and have a share of 16.3% or 6.198 ha. They are located in areas of more than 900 m above sea level where the slopes are above 19 degrees and are not suitable for agricultural production.

3.3 Population change

According to the 2013 census report, most of the inhabitants lived in the central part of the Uskopaljska valley, where the town of Bugojno is located. The concentration of the population decreases with the distance from the central part of the region, and the decrease is more pronounced in the eastern part. The far western, southern, northern, and eastern parts are distinctly mountainous, so there is hardly any population in the area. The western part is more populated than the eastern part of the region. In total, the higher, inter-field, space is characterized by sporadic population with scattered and often remote and disconnected settlements, as a reflection of the smaller local amenities of this area, which is generally sparsely populated. Here, the population follows the Valley orientation of the stream in the catchment area of the Vrbas river. Sparsely populated areas, with less than 10 inhabitants/km^2, are very spacious and occupy 32.4% or 352.2 km^2 and only 1,349 inhabitants or 2% of the total population live there. These are areas most unfavorable to life, the mountain west and the mountain east. The population in this area is scattered in more favorable localities.

The connection between the geographical area and the population in the Uskopaljska valley is very disturbed and unfavorable. It is determined by cumulative and the Lorenz curve. The analysis of the distribution of the population by percentage shares of the area and the number of inhabitants and their cumulative clearly shows that the cadastral municipality of Bugojno, which represents only 0.4% of the total area, is inhabited by almost ¼ of the population of the Uskopaljska valley or 23.3% (Figure 5). Also, in the cadastral municipalities of Bugojno, Donji Vakuf I, and Gornji Vakuf, 44.3% of the total population live on 3.3% of the total area [29].

This shows that the cumulative of each individual cadastral municipality in the Uskopaljska valley with area and population gives an idea of the total geographical area in terms of share, i.e., share of the population. The variability in area and population is shown by the Lorenz curve, which represents a graph showing the deviation from the line showing a uniform distribution according to the percentage on the axis where the population is represented. The gap between the surface and

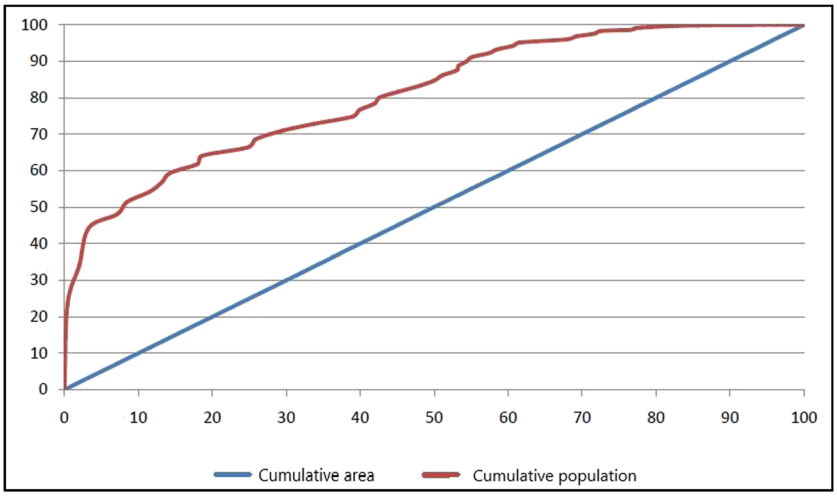

Figure 5: Cumulative area and cumulative population in Uskopaljska valley by cadastral municipalities 2013 (share in %).

the population is disproportionate and quite disrupted, mostly at its inception due to the presence of an urban center in the cadastral municipality of Bugojno.

Food security is another important indicator of the agro-geographical potential of the Uskopaljska valley. The term food security means the possibility of some space to provide the necessary quantities of food for the existing population from the available ploughlands. The adopted standard is 20 acres of ploughlands per inhabitant [37]. If this normative is accepted, Uskopaljska valley could feed about 75,700 inhabitants, 10.5% more than the current number. However, if we analyze ploughlands that are best suited for cultivation, the optimal population is only 26,500.

In view of the adopted standard, Uskopaljska valley has been gradually reducing its ability to feed on its own since 1961, until 1991, with the increase of population. In 1961, there was an average of 22.2 acres of ploughlands per inhabitant, which is close to the food security threshold. As early as 1991, that amount had dropped to 17.3 acres/per inhabitant, which was not enough to feed on its own ploughlands in Uskopaljska valley.

According to data for 1991, 2/3 of the population of Uskopaljska valley lived in areas where food security could not be provided since there were less than 20 acres of ploughlands per inhabitant. After 1991, with the decrease in the number of inhabitants in the Uskopaljska valley, nutrition security was enabled, as a potential 22 acres of ploughlands came per inhabitant. In 2013, 58% of the population lived in areas where food security could not be provided.

It's a completely different picture if we look at the highest quality ploughlands. In 2013, there are only 7.4 acres/per inhabitant of I–IV class ploughlands that are mostly cultivated, which is not enough to provide food security. Therefore, the main problem of ensuring the food security of the inhabitants of the Uskopaljska valley potentially lies in the unfavorable partial-assessment structure of ploughlands. In 2013, mountainous cadastral municipalities in the north, east, and west had high food security because they had a very small population. Areas that can provide food to their population with respect to the total ploughlands, with the exception of the population-largest cadastral municipalities, especially the urban ones, Donji Vakuf I, Bugojno, and Gornji Vakuf, which have less than 20 acres/per inhabitant, dominate.

Spatially speaking, almost all cadastral municipalities do not have enough quality areas to provide necessary food to their population. The only exceptions are Kandija and Odžak along the Vrbas River, and mountainous cadastral municipalities, Komar, Novo Selo, Zijamet, Slatina, and Skakavci, which have a small population. The inhabitants of the cadastral municipality of Čaušlije have the highest food security, amounting to almost 134 acres/per inhabitant.

Urbanization, industrialization, deagrarization, and adverse geographical conditions, as well as dominant factors of population migration, have led to the emergence of concentration of people in more favorable areas. The depopulation of the population in the Uskopaljska valley is expressed in typically agricultural and population-less cadastral municipalities, connected by roads that cannot attract individual central functions and thus retain the population. In almost all cadastral municipalities of the Uskopaljska valley, although some have significant agricultural potential, depopulation is pronounced.

Based on the tendencies expressed in the movement of the total population, it is possible to distinguish, on the one hand, the vast areas of depopulation and the area of stable demographic development, as well as the areas of concentration of the population, on the other hand, in the period 1948–1991. The whole process was disturbed by the events of the 1992–1995 war, so the areas of depopulation extended to almost the entire Uskopaljska valley. Therefore, in order to gain a better understanding of the depopulation process in Uskopaljska valley, it is necessary to observe it in two separate periods.

In the depopulation areas, the regression areas, in the period 1948–1991, according to the 1948 census, there lived 5.051 inhabitants or 11.5%. These areas cover about 19% of the total area and eight cadastral municipalities of the Uskopaljska valley. They are related to the high wooded mountain ranges of the west and northeast of the Uskopaljska valley. In 1991, 3,526 people lived in depopulation zones, or 3.7% or about 30% less.

In areas of population concentration, areas of progression, 96.3% of the population lived on 81% of the total area of the Uskopaljska valley. Depopulation is manifested in the rapid aging of the population, a decrease in the agrarian population and its unfavorable natural regeneration, changes in distribution and population density, etc. Therefore, intensive depopulation, despite its significant natural potential, significantly threatens the social and economic development of the Uskopaljska valley, which is especially evident in the period after 1991–2013 when only one cadastral municipality, Tihomišlje, was of a progressive type, and all others were depopulation type, which can best be seen in Figure 6. The distinctive feature of the Tihomišlje cadastral municipality is that its population is concentrated along its eastern border,

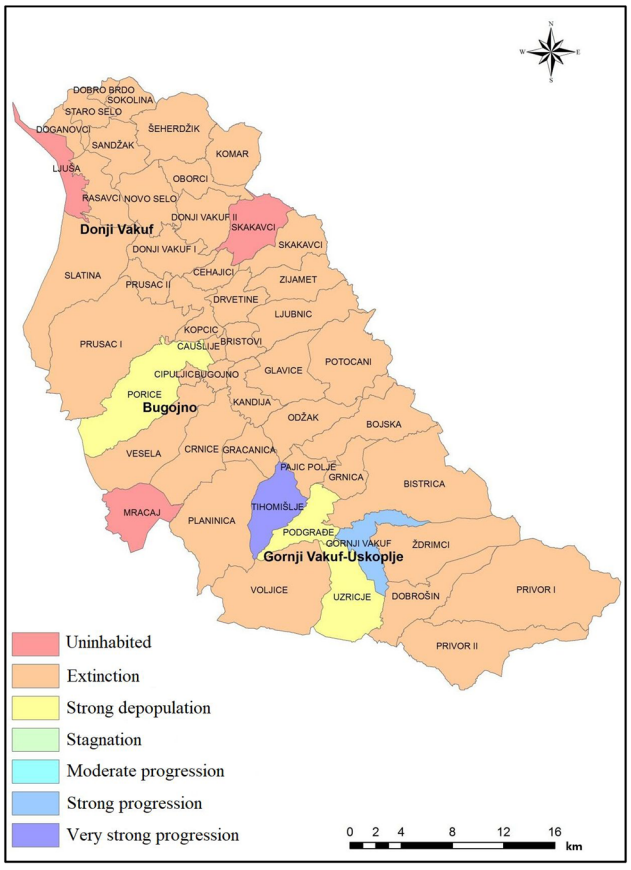

Figure 6: Population trends in Uskopaljska valley, 1991–2013.

and by its geographical position, it is located in an area that was not significantly exposed to war in comparison with other cadastral municipalities and also has extremely favorable natural conditions for agricultural development. The typical dispersal population on the mountain rim of the Uskopaljska valley, similar to some parts of Slovenia, makes it almost impossible to create a reasonable system of infrastructure and public services or efficient land use. The dispersion of population and activity contributes to the intensification of the use of natural resources in different locations and increases the impact of traffic [38].

3.4 Land use orientations

In total, 15 orientations of agricultural land use can be distinguished in the Uskopaljska valley. Use of Kostrowicki method [36] for determining land use orientation for cadastral municipality Planinica, located in the mountainous southwest of the region, is shown in Table 2.

By dividing each category of land by numbers from 1 to 6 (successive quotients) and taking into account the six largest numbers obtained by dividing the land use orientation in cadastral municipality Planinica would be O2P4 – predominantly pasture agricultural land use orientation with a significant share of ploughlands.

Land use orientations arise from the combination of land categories that dominate the land structure of Uskopaljska valley. A detailed analysis of the obtained land use orientations leads to the conclusion that they are determined by different natural conditions, but also by social trends.

Land use categories indicate the degree of development and intensity of agriculture, i.e., the extent to which the available agrarian-geographical potential has been used for optimal agricultural production.

In the lowest part of the Uskopaljska valley, there is still persistent alienation of agricultural land for nonagricultural purposes. Permanent confiscation of agricultural land is particularly pronounced in the immediate vicinity of the town settlements, Bugojno, Donji Vakuf, and Gornji Vakuf, as well as in the areas of the lower flows of the larger tributaries of Vrbas: Bistrica, Voljišnica, Trnovača, and Veseočica.

The rather large number of agricultural land use orientations indicates that the natural and geographical benefits for the development of certain types of agricultural production in the Uskopaljska valley are different. Out of a total of 15 agricultural land use orientations, in only 4, or 26.7%, the ploughlands are predominant. The predominance of ploughlands is in 23 cadastral municipalities out of 50 of them. If we also connect the orientations with equal use of ploughlands and other categories

Table 2: Planinica

Divisors	Ploughlands (O)		Orchards (V)		Meadows (L)		Pastures (P)	
	Hectares	Quotients	Hectares	Quotients	Hectares	Quotients	Hectares	Quotients
1	340	2/	10		480	1/	109	
2	170	4/	5		240	3/	54	
3	113		3		160	5/	36	
4	85		2		120	6/	27	

of utilization, then we can see the importance of ploughlands for agricultural production (Figure 7).

The absolute ploughlands land orientation O6 occurs in six cadastral municipalities, dominantly ploughlands orientation in four, and predominantly ploughlands orientation in 13 cadastral municipalities. The absolute ploughlands land use orientation O6 is spatially related to the central part of the Uskopaljska valley, that is, to the alluvial plain of Vrbas, partly to the east and west perimeter constructed from lake sediments, as well as to the area of the cadastral municipality of Dobro Brdo in the far north, dominated by ploughlands of extremely poor quality. Apart from the cadastral municipality of Dobro Brdo, this land use orientation is linked to land types with significant production potential such as fluvial soils and pseudogley. In addition, other natural-geographical conditions such as slope inclination, exposure, and water conditions allow for rational crop production.

The spatial distribution of the dominantly ploughlands orientation with the participation of O5L1 meadows and the predominantly ploughlands orientation with the larger participation of O4L2 meadows is determined by both natural advantages and some social factors. These orientations are related to the slope in the lake sediments as well as to certain lower parts of the western and northern rims in the cadastral municipalities of Kopčić, Poriče, and Sokolina.

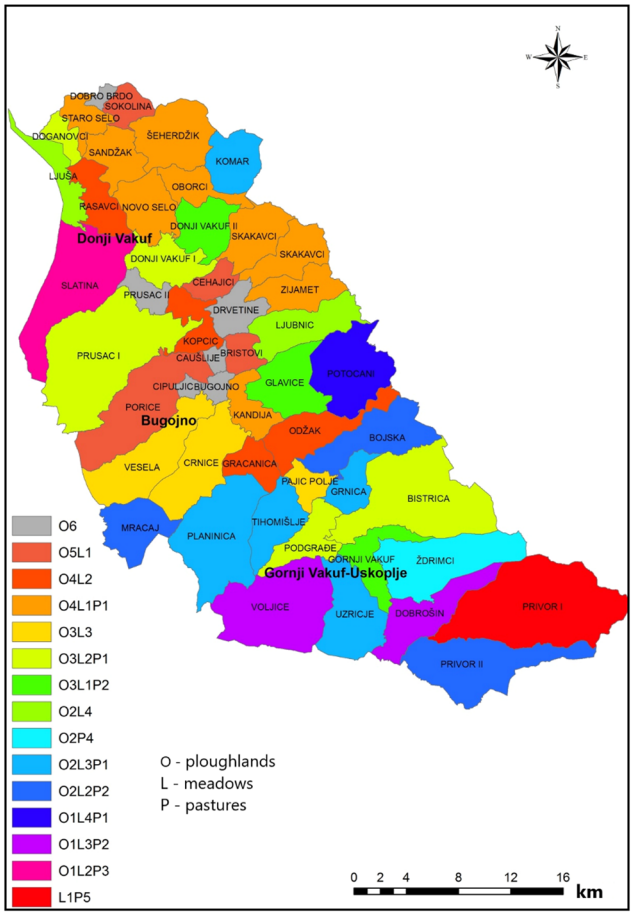

Figure 7: Orientations of agricultural land use in Uskopaljska valley 2018.

In the structure of utilization of agricultural areas of alluvial plains, river terraces, and hills in the Uskopaljska valley, the orientations with the majority of ploughlands are represented and they are to a great extent adapted to the available natural conditions. The analysis shows that the structure of the utilization of agricultural land in the Uskopaljska valley is characterized by a high degree of spatial differentiation. Spatial differences in the structure of land use are conditioned by geomorphological, agroclimatic, pedological, and other conditions. With the increase of altitude, deterioration of natural conditions, and decrease in the possibility of applying modern agrotechnical measures, the share of ploughlands decreases and the participation under natural grasslands and forests increases. Changes in the structure of use were conditioned, especially by demographic processes after 1991, when all the areas of the Uskopaljska valley that make up the mountain rim lost a significant part of their population.

Considering the participation in the structure of arable and agricultural land, the potential of land types, and the importance for arable and total agricultural production, ploughlands represent the most important category of land in the Uskopaljska valley.

If we look at the structure of the utilization of ploughlands, we can see that the areas sown with cereals were reduced by 52.1%, i.e., from 3,001 ha in 1991 to 1,438 ha in 2013. A particularly significant decline occurred after 1991 when the Uskopaljska valley was affected by the war, which caused huge casualties and emigration, and a large part of ploughlands were abandoned. In 2001, the area sown with cereals was 60.6% lower than that in 1991. After 2001, there is an increase in areas sown with cereals.

The areas planted with vegetables in 1991 in the Uskopaljska valley amounted to 4,680 ha and accounted for 27.8% of ploughlands. Increases in demand for vegetables, the introduction of high-yielding varieties of vegetable plants, and the improvement of transport conditions for the placement of products in further markets are factors that influenced the increase in areas under vegetables in the period until 1991. After 1991, due to the aforementioned reasons, the area under vegetables in 2018 decreased by 2,706 ha or by 57.8%.

With the development of industry and urbanization of settlements, the development of cattle breeding in the Uskopaljska valley is becoming increasingly important. In addition, there is a logical reorientation from the cultivation of cereals to the cultivation of forage, especially alfalfa, clover, and forage maize. In the last 20 years, it should be noted that there has been a large decrease in the areas under grass fodder. In 2013, forage accounted for 20.1% of the ploughlands of the Uskopaljska valley, and 3,038 ha were planted under it. Compared to 1991, the area under fodder decreased by 509 ha or by 14.3%.

The untreated ploughlands of the Uskopaljska valley in the period 1991–2013 increased by about 1.5 times, from 5,576 ha in 1991 to 8,683 ha in 2013. It should be pointed out that most of the untreated ploughlands are located in the mountainous part of the Uskopaljska valley and that they are of lower quality, lower than the IV class [39].

According to the share of untreated ploughlands in the Uskopaljska valley, the cadastral municipalities of Ljuša, Skakavci, and Mračaj stand out, with almost no ploughlands under cultivation. There are very few cultivated ploughlands in the cadastral municipalities: Slatina, Zijamet, Potočani, and Planinica. These are all areas of scarce agro potential and higher slope inclinations, with limited application of modern machinery. In addition to the natural conditions, the formation of the modern structure of the use of ploughlands was greatly influenced by demographic trends, i.e., the emptying of the mountain rim of the Uskopaljska valley and the possibility of applying modern mechanization and irrigation.

3.5 The value of agriculture

The value of the total agricultural production in the Uskopaljska valley, calculated on the basis of the results collected by the municipal services and later published by the Statistical Office of the Republic in 1991, amounted to about 285 billion Yugoslav dinars, or about DEM 52.8 million. The largest share of production value was accounted for by beef meat of 32.4%, vegetables 23.8%, and milk 23.3%. A significant share in the total value of production was also forage 6.3% [39].

In 2001, the total value of agricultural products was around BAM 41.6 million, or EUR 21.3 million. The highest value in 2001 had vegetable production, BAM 12.1 million, which accounted for 29.2% of the total production value. Beef accounted for 27.8% of the total production value, and forage production 13.2%. In this period, the largest increase of the share in the total value of production was recorded by the production of forage by 6.9%, while the largest decrease was recorded by milk production of 11.4%.

In 2013, the highest value was recorded in fruit production, with a share of 31.7%. Vegetable production ranks second with 26.8%, while fruit production achieved the largest increase of 20.4% compared to 2001, thanks to the growing production of raspberries. The largest decrease was recorded in beef production of 9.5% compared to 2001, mainly due to low investments in beef production. The total value of agricultural production in 2013 was BAM 51.7 million or EUR 26.5 million and was 5.2 million higher than that in 2001.

The average value of agricultural production in the Uskopaljska valley in 2001 amounted to 1,116 BAM/ha of agricultural land or 572 EUR/ha of agricultural land (Figure 8). At the municipal level, agricultural production in the Bugojno municipality, which has the most favorable conditions for agricultural development, is of the highest value, amounting to 1,286 BAM/ha, and by far the lowest value is recorded in the Donji Vakuf municipality of only 782 BAM/ha of agricultural land [33]. There are large areas of unused and underused land in the mountainous areas of the Donji Vakuf municipality. The above data indicate a great dependence of agricultural production on natural conditions, especially on the terrain. In contrast to the area of the Uskopaljska valley, the value of agricultural production, according to Vrišer [7] in Slovenia, is 1,541 EUR/ha of agricultural land, which is 2.7 times higher than the value in the Uskopaljska valley.

In 2013, the value of agricultural production per ha of agricultural land improved significantly as a result of the rise in prices and production of large quantities of fruits and vegetables, which was underrepresented in 2001, such as raspberries, strawberries, and cucumbers. The average value of agricultural production in the Uskopaljska valley in 2013 amounted to BAM 1.425/ha of agricultural land, i.e., EUR 731/ha of agricultural land, which represents an increase of 27.7% compared to 2001. At the municipal level, agricultural production in the municipality of Bugojno is of the highest value of BAM 1,806/ha. The municipality of Gornji Vakuf has an agricultural production value of BAM 1,650/ha, while the municipality of Donji Vakuf reduced its value to BAM 775/ha of agricultural land [33]. It is important to notice that according to the Farm survey [27] in the Uskopaljska valley, slightly less than 2/3 of the surveyed farmers sell their products, while others produce for their own needs. Milk is sold by 52.7% of farmers selling their products, while only 5.9% of them sell eggs.

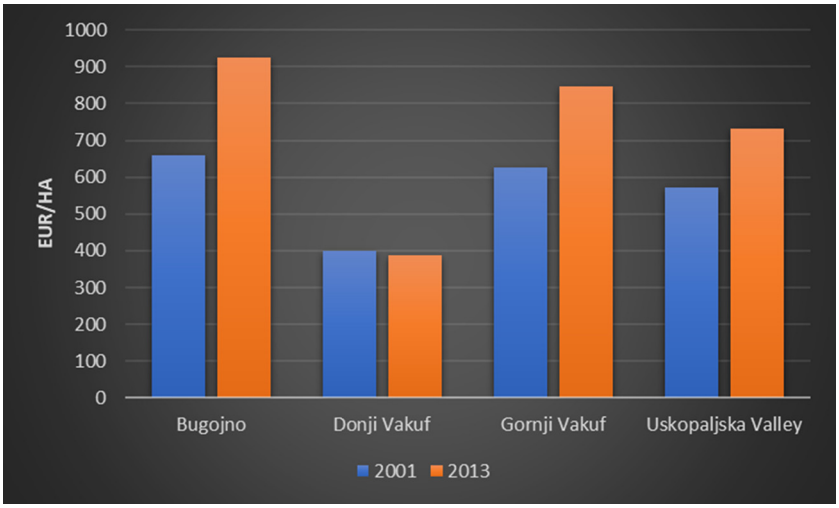

Figure 8: Value of agricultural production (EUR/ha of agricultural land) in Uskopaljska valley, 2001–2013.

3.6 Fragmentation of farms, consequences, and farmers opinions

The concentration of the population has led to a fragmentation of the farms and an increase in the number of mixed households in the Vrbas Valley and its significant tributaries. The vast mountainous parts of the Uskopaljska valley are characterized by the abandonment and alienation of entire farms, especially after 1991. Ploughlands that are more remote and of poor quality, with a higher slope inclination, are completely abandoned. In 2013, the farms of the Uskopaljska valley experienced even greater fragmentation than in previous periods. According to the farm survey [33], very small farms of up to 1 ha in size dominate the Uskopaljska valley (Figure 9). Their share is as high as 47.7%, an increase of 10.6% compared to that in 1981. The largest share of small farms is 54.2% in the Bugojno municipality, followed by 47.2% in the Gornji Vakuf municipality and 46.2% in the Donji Vakuf municipality. In the second place are small farms with a size from 1 to 3 ha, whose share in the Uskopaljska valley is 27.7%. Together, farms with a size of less than 3 ha make up 75.4% of the total [31,33].

Such small holdings are often further subdivided into 7 to 9 smaller parcels that are often several kilometers away from each other. The above is greatly contributed by the splitting of parcels, inheritance procedures, or other forms of co-ownership. The average size of farms in the Uskopaljska valley is 2.8 ha. The largest in the municipality of Gornji Vakuf is 3.3 ha and the smallest in the municipality of Donji Vakuf is 1.8 ha. The largest number of farms in the size group up to 1 ha is as high as 47.7%, while only 5.6% are with a holding of over 10 ha.

It is also important to highlight a significant share of 1–3 ha farms of 27.7%. However, their characteristic is the unfavorable structure of the utilization of agricultural land, and most of them are meadows and pastures that are poorly used. The largest farms are found in areas outside the alluvial plate of Vrbas and near river flows. The aforementioned analysis clearly indicates that one of the most important problems in the modern development of agriculture in the Uskopaljska valley is the fragmented estate, which prevents greater production of cereals in particular. That is why the agricultural production of the Uskopaljska valley should be directed as much as possible towards the cultivation of vegetables and fruits, especially berries.

For the sake of comparison, the agrarian structure, for example, of Polish agriculture is in a better position than that of Bosnia and Herzegovina in terms of the size of the estate. However, it is more fragmented than that in Germany. Very small farms of up to 5 ha, which make up 55.2% of the total number of farms in Poland, do not have the conditions to use labor effectively and provide adequate income to support families and develop farms. Moreover, such farms are unable to compete in the European market. Polish agriculture is dominant with the family ownership model similar to that in the Uskopaljska valley [40].

The agricultural structure is undoubtedly unfavorable, especially when compared to developed European countries. This is a problem for most transition countries. The only advantage over other territories and countries in transition is that the ownership of land on a large scale has been retained in the area of the Uskopaljska valley.

A detailed analysis of the size and structure of the farms and parcels of the Uskopaljska valley inevitably

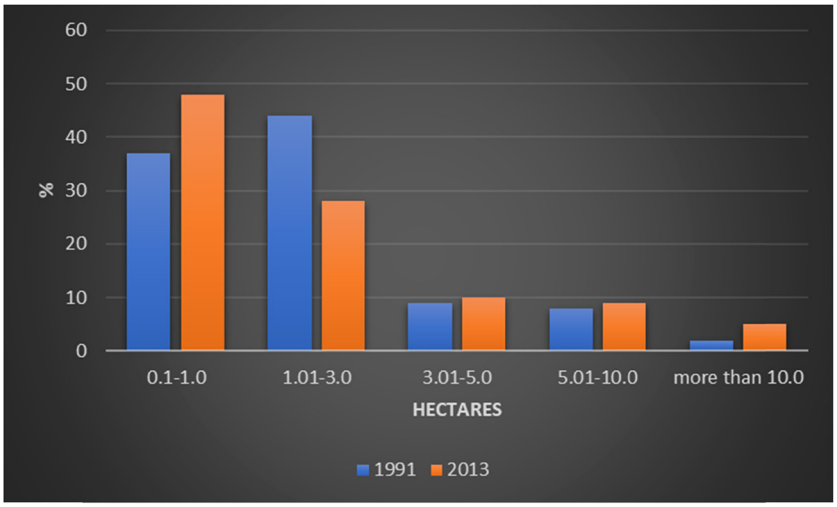

Figure 9: Size of farms in Uskopaljska Valley, 1991–2013.

indicates its disadvantage. A more favorable agrarian structure is characterized only by holdings that have larger farms and parcels of a larger area. The area of socially owned ploughlands ranges from 5 to 20 ha, with an average parcel size of about 1 ha. In the private sector, farms of up to 3 ha are predominant, divided into parcels of different lengths, shapes, and sizes. The existing agrarian structure of the Uskopaljska valley reduces the rationality of land cultivation and the profitability of agricultural production. That is why the grouping of agricultural land and farms, and the creation of such land complexes on which rational application of modern agricultural technics and technology and modern labor organization will be possible, is one of the significant measures of land policy.

The reasons for the poor economic position of agriculture in the Uskopaljska valley in 2018 were established by a survey. When asked if there were economic difficulties in the agricultural holding, only 20.5% of the respondents said that they had no problems. The causes of the problems that have received the most response from farmers in the Uskopaljska valley are weather conditions with 20.9% and lack of mechanization with 19.5% of responses. In addition to these causes, product placement with a 13.5% response is a significant cause for farmers. Poor incentives from the government received 9.2% of responses. Labor shortages and low product prices received 8.0% responses each. A significant problem is the inaccessibility of land and parcel with 7.4%, as well as

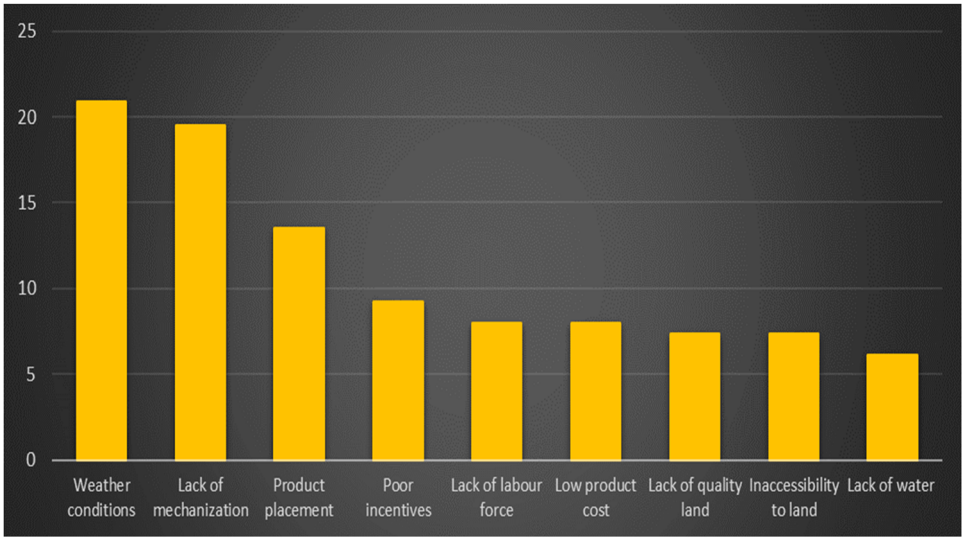

Figure 10: Perception of causes of the poor economic position of farms 2018 (share in %).

the lack of their own land with the same share. Water deficiency is seen as the main cause of the problem by 6.1% of respondents [33] (Figure 10).

The main recommendations to the authorities for the development of agricultural areas of farmers in the Uskopaljska valley are assistance in the procurement of machinery, protection of domestic production, greater and more regular payment of incentives, improvement of the road network, and greater involvement of people employed in agriculture at all levels. Then, when asked if they needed help distributing their products, 45.8% of those who sold their products answered in the affirmative. Farmers in the Uskopaljska valley also expressed in a significant percentage, 40.8%, that they also needed assistance in promoting their products, which would later lead to more successful distribution. It should be pointed out that in the case of such questions, there were those farmers who did not provide the required answer because they produce only for their own needs [33].

3.7 Possibilities and perspectives

The processes of restructuring of rural areas in Bosnia and Herzegovina have taken place at different intensities and with spatially differentiated effects, depending on the interdependent impact of several factors. Among these, the following three factors are fundamental:

- Developmental specifics caused by differences in sociopolitical order up to the beginning of transition or state-planning management,
- The way of deconstructing the collectivist system of a complex state by war,
- Recent position of the country within the framework of European integration processes [41].

When analyzing the possibilities and perspectives of agriculture in the Uskopaljska valley, it is very important to consider the balance of availability and food needs of the population. Gavakare [35] investigated the balance of availability and need for food in Solapur District, India. As a basis, he has taken the recommended nutritional quantities of individual products and product groups per person per day, as suggested by experts from the United Nations FAO. Subsequently, the surplus or deficit of these needs was calculated.

A similar method was used to analyze the balance of availability and food needs in the Uskopaljska valley, except that the percentage coverage was also included. Livestock products, meat and milk, were considered, and when it came to fruits, apples, plums, raspberries, strawberries, and pears included as the most widespread fruits.

There is a significant food deficit in the Uskopaljska valley. When considering the availability of bread cereals, the deficit is –280 g/person per day, and the coverage is only 24%. There is also a significant deficit in the availability of meat of –91 g/person per day and slightly smaller potatoes and other vegetables. The Uskopaljska valley produces more than its population needs to feed on milk, fruits, and leafy vegetables [39] (Table 3).

In order to meet the needs of the population of the Uskopaljska valley for these products, it is necessary to increase the area under bread cereals by as much as 76% or 1,880 hectares, under potatoes by 9% or 119 hectares, and under other vegetables by 31% or 82 hectares. At the municipal level, the situation is very different. The food is most accessible to the inhabitants of the municipality of Gornji Vakuf and the least to the inhabitants of the municipality of Donji Vakuf.

The discrepancy between available potential and modern agricultural production is determined by agrarian policy, tradition, demographic trends, agrarian structure, and market. These factors have highlighted that, despite the significant agricultural potential, the achieved volume and structure of agricultural production are not satisfactory in relation to the available opportunities. The main assumption for the future development of agricultural production in the Uskopaljska valley is the further production specialization in terms of establishing a system of cultivation of agricultural crops in accordance with the available natural and social conditions. In modern agrarian development, it has been achieved only in certain parts of the Uskopaljska valley.

More adequate and rational use of available potentials for agricultural development can be achieved by optimizing the spatial distribution and structure of agricultural production. Such optimization implies the adaptation of agricultural production not only to available natural conditions, but also to market, demographic,

Table 3: Balance of availability and need for food in the Uskopaljska Valley, 2018

Agricultural product	Coverage in (%)
Grains	24
Potato	91
Leafy vegetables	243
Other vegetables	69
Milk	329
Meat	39
Fruits	682

infrastructural, and other conditions of agricultural development.

4 Conclusion

The post-World War II period, and especially the last four decades, brought abrupt deagrarization and deruralization in the Uskopaljska valley, which was followed by relatively rapid industrialization, which together caused the rupture of the autarchic agrarian economy and demographic structure.

Until 1991, the population growth in the Uskopaljska valley was constant, and at the beginning of the 1992 war, there was a period of depopulation. In 2013, the Uskopaljska valley had a population of 28,101 less than that in 1991. Depopulation areas are numerous in the peripheral parts of the Uskopaljska valley, which has resulted in the abandonment of agricultural land and the increase of unused areas. In 2013, only 7.4 acres of ploughlands of I–IV quality class, which are mostly cultivated, were recorded per inhabitant, which is not enough to provide food security.

Depopulation areas in the Uskopaljska valley coincide with areas of low agricultural land use. Areas with the most pronounced population loss have little or no utilization of agricultural land. Formerly, large expansive production areas were abandoned after 1991, with untreated ploughlands and pastures used by occasional livestock farmers.

A detailed analysis of the obtained orientations of the utilization of the land space of the Uskopaljska valley leads to the conclusion that they are determined by different natural conditions, but also by social movements. Fifteen land use orientations are represented in total. In the period 1991–2013, changes in the manner of utilization in the orientation of the decrease of the areas under ploughlands and pastures occurred in the structure of agricultural areas of the Uskopaljska valley, and on the other hand, the increase of areas under meadows and orchards.

Constituting a consistent vision for the development of the traditional agricultural landscapes of the Uskopaljska valley should be based on the agro-geographical research conducted so far on natural and social conditions and the manifested global development trends. Changing the orientation of development so far is necessary to eliminate the current, highly emphasized, disproportions in spatial and material development and incompatibilities of agricultural and environmental development.

There are numerous limitations to the development of traditional agricultural landscapes in the Uskopaljska valley as follows:

- a large number of family farms do not have a starting position for the competition from the environment,
- the unfavorable economic situation at all levels,
- very fragmented property with low-intensity level, difficult production conditions, and the backlog of technical and technological solutions,
- insufficient financial input in grants and inadequate credit policy.

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