Estimation of biomass and recommendations for management of wet meadows in Prespa

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1 Introduction

Great Prespa Lake is located in the southwestern part of the Republic of North Macedonia. The lake is shared between three countries: North Macedonia, Greece and Albania. Due to ample natural values, two protected areas have been designated: “Prespa Lake” as Monument of Nature and “Ezerani” Nature Park. To the east, Prespa Lake borders “Pelister” National Park and to the west, “Galichica” National Park. The surrounding protected areas contribute towards integral managament of the whole region. Along the shoreline, there are many diverse habitats, including the wet meadows.

The main goal was to conduct a study where we will determine the basic ecological parameters of the wet meadows of Prespa: estimation of biomass and nutrients’ quantity of different wet meadow habitat types, pedological characteristics, biological diversity on the bases of selected taxonomic groups (plants, beetles, grasshoppers, spiders and butterflies), as well as the social and economic importance of wet meadows to local inhabitants. All of these parameters will provide sound bases to establish recommendations for management and conservation practices of wet meadows.

1.1 Ecology of wet meadows

A wet meadow is defined as an area whose soils are inundated with water either permanently or temporarily during the growing season. Wet meadows are classified under wetlands and are said to act as the “sponge” for the surrounding areas. They can be formed due to poor drainage or a high water table in soils which are usually clay and organic materials. They can also be the result of high amounts of rain water. Wet meadows mostly occur in areas with poor drainage which include shallow lake basins, lowlands, and areas which are between upland places and shallow marshes while some are found in the mountains. Examples of such habitats include ditches on the roadside, retention basins, floodplains, and pond areas (Bada, 2018).

Wet meadows are different from other types of wetlands such as marshes and swamps because they do not possess standing water except during the growing season usually for only brief or moderate time periods. They are flooded with water only during short periods, and afterwards, the soil remains saturated with water for a long time due to the high water table. The wide variety of plant species that survive in wet meadows are usually buried seeds during the dry season that sprout and flourish after flooding. Recent studies have differentiated wet meadows as a distinct group of wetlands that have undergone a great deal of scientific research in recent years (Bada, 2018).

From an ecological point of view, they are very important for reducing lake eutrophication because they act as zones that retain the organic matter that flows into the lake along with the catchment waters. Wet meadows have the capacity to support a large number of animal and plant species, and are therefore very important for biodiversity conservation. They are suitable habitats for many invertebrates, amphibians, reptiles, birds and mammals. The vegetation in wet meadows is usually herbaceous like reed canary grass, rushes, wool grass, green bulrush tussock sedge, soft rush and wildflowers among others that prosper in wetlands due to the extra

fertile land. Shrubs like steeplebush, speckled alder, and broad-leaved meadowsweet can also be encountered in these areas (Bada, 2018). From a socio-economic aspect, wet meadows provide many services for livestock development. Livestock breeders receive large quantities of hay for winter feeding from wet meadows. Phyto-component of wet meadows can be used for compost production, for the production of firewood (briquettes, pellets, etc.) (Bada, 2018)

Despite their importance, wet meadows have significantly been decimated. Since they are mostly associated with agriculture, in some places, they have been drained to allow for agricultural activities. This destruction has made these habitats lose their biodiversity substantially. Overview of previous results and projects related to meadows

There are several projects related to grassland management in the Prespa region. Most of them were implemented in the Greek part of Prespa, especially in the area of Small Prespa Lake (Kazoglou et al., 2004). These projects yielded a number of recommendations and plans for wetland habitat management in Prespa.

1.1.1 Initial efforts (1991-1996)

For the Society for the Protection of Prespa (SPP), the 1991-1996 period was the preparatory phase for the implementation of measures targeting the restoration of wet meadows at Lake Mikri Prespa. In 1992, Grillas & Mesléard (1992) carried out a thorough analysis of all aspects related to the conservation of wet meadows and made proposals for future activities, such as the reintroduction of grazing and/or mowing and the optimum water level fluctuation. In 1995, Hirons & Self (1995) produced an outline management plan for the wetlands' fringe habitats, in which policy and on-the-ground measures were proposed for the implementation of active management. A common point seen in most of the above-mentioned works is that the 1986 water level regime should be used as a reference, since it provided both a satisfactory maximum in spring (854.60 m asl) and a slow rate of decrease in summer allowing for successful hatching of fish eggs. This view was further supported by important data deriving from the long term monitoring of fish populations, which was part of the international program for the conservation of pelicans (Crivelli & Catsadorakis personal communication). On the other hand, grazing and cutting seemed to be more appreciated as restoration techniques than burning. Although burning is a cheap and easily applied measure, it would also require careful planning and implementation; in the absence of a competent management authority, these prerequisites would not be attained. Additionally, its effects on the reedbed vegetation are only temporary, as high emergent macrophytes thrive in the growing season after fires and the result is again reedbeds and not a typical wet meadow (Mesléard & Perennou 1996, Hawke & José 1996). Hollis et al. (1989) also mention that burning releases important amounts of nutrients into the lake water and therefore cutting is to be preferred. Finally, the existing wet meadow areas fringing the island of Agios Achillios in the lake and at the northeastern shore (Slatina of Lemos) were very good examples of grazing and summer mowing regimes.

The on-site implementation of traditional management techniques in the reedbeds of Lake Mikri Prespa to restore wet meadows required great consideration by the SPP. At first, activities would have to take place in the core of the National Park and in habitats of outmost importance for endangered bird species. Secondly, there was a need to collect scientifically-based arguments in order to demonstrate the effects of management interventions on the vegetation and the target species and to propose the ideal detailed management regime. In this respect, the SPP decided to initiate an experiment aiming at the collection of information from

the site itself and not totally rely on the international experience on the management of reedbeds and wet meadows. By the end of 1996, the SPP had compiled a specific experimental plan (Mesléard 1996), with inputs from the Laboratory of Rangeland Ecology of the Aristotle University of Thessaloniki, while negotiations with the Municipality of Agios Achillios had also taken place in order to use a communal littoral site for the experimentation.

1.1.2 Experimental phase (1997-2001)

Within the context of the LIFE-Nature project titled "Conservation of the pygmy cormorant and the lesser white-fronted goose in Greece, 1997-1999", the SPP fenced an area of 18 ha at the western shore of Lake Mikri Prespa and introduced five adult water buffaloes (Bubalus bubalis) in late May 1997. Four plant communities were identified at the southern part of the experimental site, which are representative of the zonation pattern observed over the lakeshores with a low elevation gradient (Kazoglou et al. in press). From the topographically higher parts of the area to the lower ones, one can distinguish:

- A meadow covered by annual and perennial grasses and broad-leaved herbs. Species composition in this zone is not affected by the fluctuating water level;
- A narrow temporarily flooded zone, which is affected by the fluctuating water level. Characteristic species of this zone are the clubrush (*Scirpus lacustris tabernaemontani*), thistle (*Cirsium palustre*), buttercup (Ranunculus repens), white clover (*Trifolium repens*) and creeping bent (*Agrostis stolonifera*);
- The fringe of the reedbed, characterized by reed and relatively low-growing helophytes like cyperus sedge (*Carex pseudocyperus*), water mint (*Mentha aquatica*) and yellow iris (*Iris pseudacorus*);
- The reedbed, dominated by reed, accompanied by lesser reedmace, bur-reed (*Sparganium erectum*), gipsywort (*Lycopus europaeus*) and other helophytes or hydrophytes.

The experimental layout aimed at the investigation of the effects of grazing, cutting, burning and no management on the vegetation and the evaluation of its productivity and nutritional value. The results were very promising, as grazing and the combination of grazing and cutting, created a wet meadow habitat type within the experimental site. Since December 1998, the site became an important feeding ground for a number of bird species including dalmatian pelicans, pygmy cormorants, great white and little egrets, squacco, grey and purple herons, white storks, mallards, gadwalls and coots. Additionally, in spring 1999 and 2000, carp spawning was observed in the flooded wet meadow although the fish had to pass through a 300 m long and dense reedbed. Based on these results and on the international bibliography, the SPP study team produced a "management plan for the restoration and management of wet meadows at Lake Mikri Prespa" in May 2001, which was translated into English in November 2001. It is the only one of its kind in Greece to have been officially approved by the relevant forestry authorities.

Year 2001 was very productive in terms of "wet meadow-oriented" conservation efforts:

- Based on the management plan and with the agreement of the local authorities, the SPP received a new permission by the Ministry of Agriculture in order to initiate a rotational grazing management scheme of specific littoral sites. In March 2001, the buffalo herd was moved to the eastern shore to graze the reedbed near the premises of the abandoned fish hatchery;

– The Municipality of Prespa and the SPP assigned another important study on the "determination of the fluctuation of the water level of Lake Mikri Prespa" (Giannakis 2001). Its objective was to find a water level fluctuation scenario that maximizes the surface area of wet meadows while minimizing the loss of farmland area in the coastal zone. Supported by detailed topographical maps produced by the SPP in May 2001, this document provides consistent information on the amount of areas of wet meadows existing under three different water level maxima in relation to the farmland negatively affected by the same water level conditions. Moreover, it includes measures for the management of water and prevention of damage to agriculture (e.g. reconstruction of the Koula sluice, development of a drip irrigation network) and for the mitigation of losses to agriculture (e.g. exchange of low-laying plots with municipal or government owned plots).

1.1.3 Implementation of larger scale management (2002-2006)

Based on the: (i) experience gathered through previous conservation projects in the area, (ii) management plan for the restoration and management of wet meadows and the study on the determination of the fluctuation of the water level of Lake Mikri Prespa, (iii) European Action Plans for the dalmatian pelican (Crivelli 1996) and the pygmy cormorant (Crivelli et al. 1996), and (iv) ongoing international procedures for the operation and organization of the established Trans-boundary Prespa Park, the SPP prepared a project proposal, which was supported by five Municipal Departments owning littoral sites, the Prespa Municipality, the Regional Administration of Western Macedonia, the Ministry of Agriculture and the Ministry of the Environment, Land Planning and Public Works. The proposal was submitted for funding to the European Commission in September 2001 in the framework of the LIFE Nature project.

The project started in July 2002 aiming at resolving the threats related to the lack of vegetation management at the littoral zone and the lack of an adequate system to control the fluctuation of the water level of Lake Mikri Prespa (Society for the Protection of Prespa 2002). These two factors negatively affect the critical breeding and feeding habitats of Dalmatian Pelicans and Pygmy Cormorants, which are prioritized at the European Union level due to their conservation status. The project's main actions include the following:

– Compilation of a hydro-geological and technical study for the re-construction of the Koula sluice and of a management plan for the operation of the new sluice;
– Construction of a new sluice to efficiently control the water level;
– Management of the reedbed vegetation by grazing and cutting aiming at tripling the existing 33 ha total wet meadows surface area;
– Monitoring of the vegetation at the managed sites;
– Monitoring the bird use of the managed sites and recording of dalmatian pelican and pygmy cormorant colonies;
– Public awareness, wardening and dissemination of results;
– Networking with other LIFE Nature projects implemented at Greek Ramsar sites.

1.2 Overview of wetland habitats in Prespa

So far, several surveys and different mapping projects have been conducted along the Prespa Lakes shoreline. Basic mapping of littoral belts around Prespa Lake (Nikolov et al., 2012), in-depth studies of the distribution of different habitat types (Fotiadis et al., 2018), habitat management recommendations around the Prespa Lakes (Melovski et al., 2019) etc.

The distribution of all habitat types recorded in the Macedonian part of the Prespa region region is presented on the map (Figure 1). The total area (in hectares) of each habitat type, along with the number of patches (polygons) in the whole area is given in Table 1. Naturally, the Prespa Lake open waters habitat type (C1.27) covers the largest part of the Prespa area.

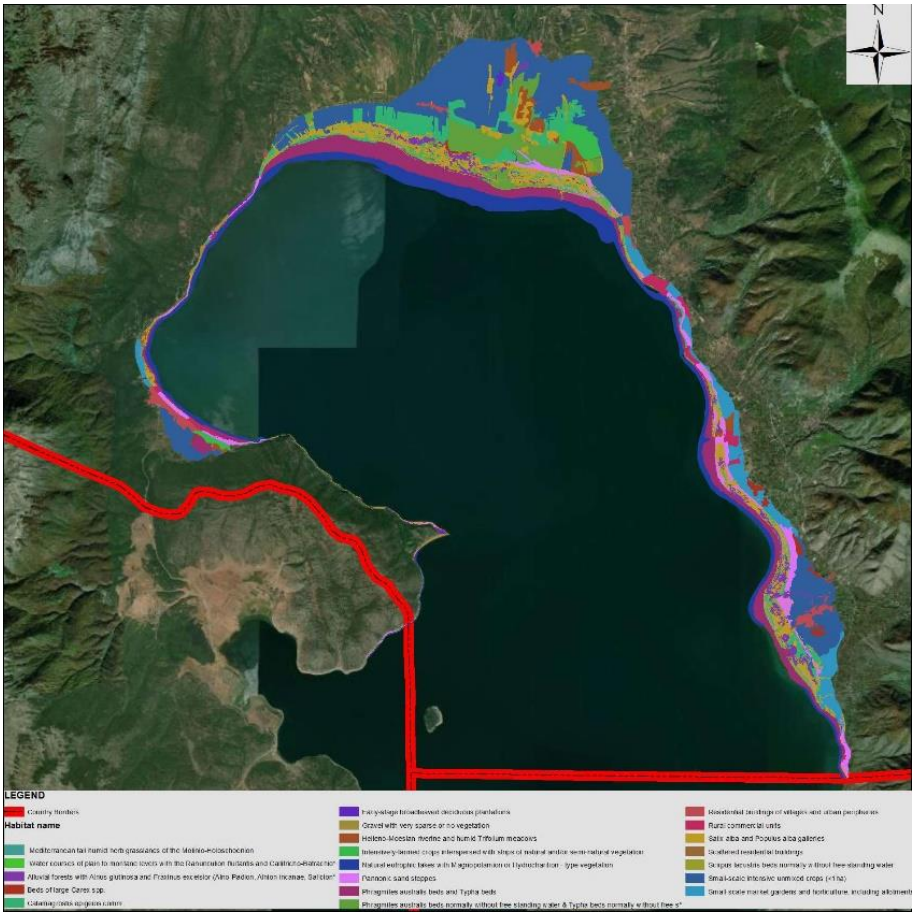

Figure 1 Distribution of habitats around Prespa Lake

The second largest part of the area is covered by the agricultural habitat types (about 1,534 hectares in total), which indicates that, to date, a large part of the Prespa wetland area (about 34 %) has been transformed into agricultural land (the majority during the last few decades).

Table 1 Spatial coverage of habitats along the shore of Prespa Lake

Habitat type	Total area (ha)	No. of polygons	Largest polygon (ha)	Importance
3150 Natural eutrophic lakes	531.86	12	415.327	National importance
3260 Water courses (stream and rivers)	0.61	4	0.323	
6260 *Pannonic sand steppes	195.26	121	30.456	EU Habitats Directive
6420 Mediterranean tall humid grasslands	0.04	1	/	Importance for Prespa
91E0 *Alluvial alder forests	129.51	122	14.554	EU Habitats Directive
92A0 Salix alba galleries	491.19	502	83.243	
C1.27 Mesotrophic standing waters (Prespa lake open waters)	15,352.19	9	15,343.158	National importance
C3.21 & C.3.23 Reedbeds and Typha beds (in the lake)	549.06	71	300.981	
Calamagrostis epigeios comm.	383.50	386	95.038	National importance
D5.11 & D5.13 Reed-beds and Typha beds (dry phase)	297.50	55	189.340	
D5.12 Scirpus lacustris beds (dry phase)	7.80	3	6.047	National importance
D5.21 Beds of large sedges	37.58	15	8.901	National importance
E3.31 Trifolium meadows	125.63	36	27.212	National importance
G5.72 Anthropogenic tree stands	14.31	9	5.640	
H5.35 Gravel banks	14.64	5	4.344	
I1.13 Intensive fields (<1 ha)	1,279.63	17	933.926	
I1.22 Small market gardens	254.09	9	164.255	
J1.2 Villages	88.54	6	31.770	
J2.1 Scattered individual objects	0.12	2	0.080	
J2.31 Rural commercial units	63.80	8	20.167	
X07 Intensive agriculture mixed with natural habitats	75.89	2	61.449	
Total	**19,892.76**	**1395**		

2 Study area and spatial setup

The area of interest is displayed in Figure 2. It can be noticed that the wet meadows cover almost the entire shoreline of Prespa Lake. From the map overview we can observe that the wet meadow belt in the Ezerani Nature Park is the broadest, especially on the northern shore of the Lake. We can also conclude that the east shore of the lake has a more continuous and better developed wet meadow belt, rather than the west.

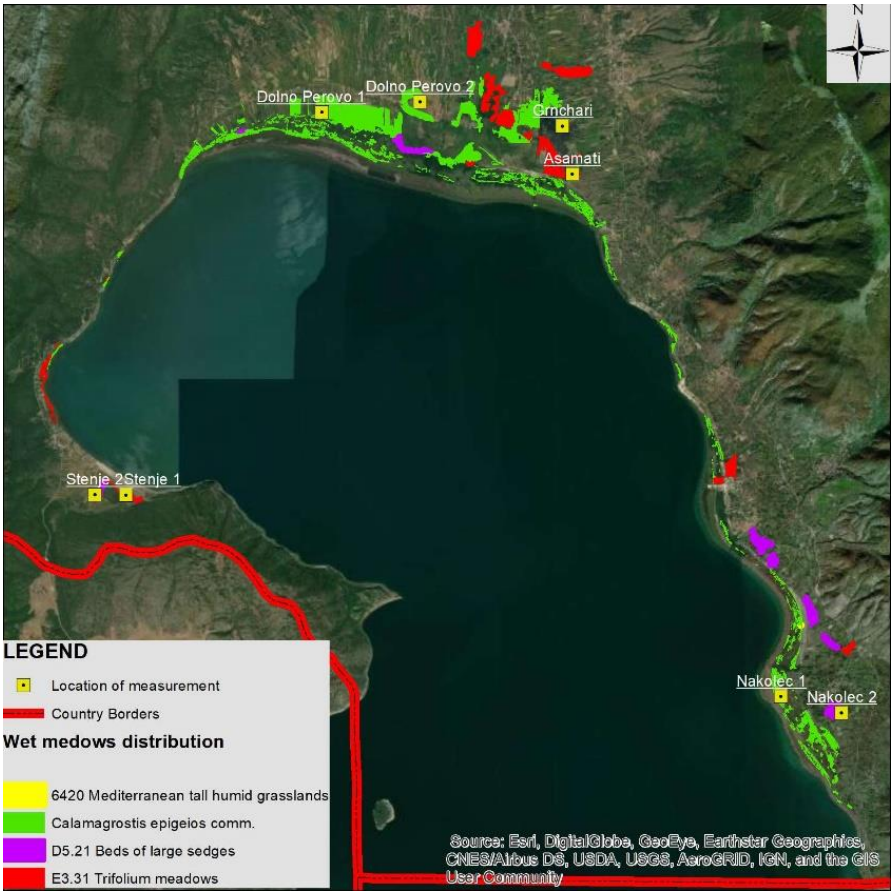

Figure 2 Overview of wet meadows' distribution along Prespa's shoreline with points of the studied meadows

For the purpose of this study, four types of wet meadows were taken as a subject of intereset (Table 2).

Table 2 Overview of surface areas of different habitat types of wet meadows in Prespa

Habitat type	Area (ha)
6420 - Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion	0,04
D5.21 - Beds of large Carex spp.	37,58
Calamagrostis epigeios comm.	383,5
E3.31 - Helleno-Moesian riverine and humid Trifolium meadows	125,63
Total	**546,75**

Eight sites for field research were selected. These sites are representative of the identified habitats having in mind their coverage and spatial distribution (Figure 3). The photos below show some of the wet meadow sites that were surveyed in June 2019**.**

Nakolec 1

Nakolec 2

Stenje 2

Grnchari

Stenje 1

Dolno Perovo 1

Figure 3 Selected sites

Various GIS layers and shapefiles (Prespa habitat map, High-resolution satellite imagery, GoogleEarth, BingMaps, ESRImaps, topographic maps scale 1: 100 000 and 1:25 000) were used as part of the planning methodology.

The selected locations are accurately tabulated (Table 3), showing the coordinates and toponyms of the 1:25 000 topographic maps. Biomass and production assessment materials, soil analysis materials, diversity surveys for different groups of organisms were sampled at each site.

Table 3 Overview of the studied localities

Site	Locality	Toponym	X-coordinate	Y-coordinate	Altitude	Community (according to the GIS map of Fotiadis et al. 2018)
1	Nakolec 1	Sredno Pole	21.095607	40.892396	847	D5.21 - Beds of large Carex spp.
2	Nakolec 2	Leska	21.111960	40.889236	857	Calamagrostis epigeios comm.
3	Dolno Perovo 1	Solejnca	20.972946	41.011197	851	Calamagrostis epigeios comm.
4	Dolno Perovo 2	Perovski livadi	20.999301	41.013274	852	D5.21 Beds of large sedges
5	Asamati	Ruzhin	21.040126	40.998642	851	E3.31 Trifolium meadows
6	Grnchari	Lokche	21.037445	41.008410	853	Calamagrostis epigeios comm.
7	Stenje 1	Blato (east)	20.920562	40.933417	848	E3.31 Trifolium meadows
8	Stenje 2	Blato (west)	20.912296	40.933483	850	D5.21 Beds of large sedges

3 Methodology

Data were collected from eight wet meadows along Prespa Lake at average altitude of 850 m.a.s.l. The meadows were analysed for their floristic composition, phytocenology, biomass and nutrient contents, as well as soil properties. The field research was carried out in the period 14-16.06.2019 and 05-07.08.2019. The approach can be divided into three segments.

1. At first, all available published information from literature were obtained and different methodological approaches were reviewed. The data collected from previous scientific research and studies, for easier analysis and comparison are embedded in the ArcGIS software. The data that could not be digitized in ArcGIS, were used as consultative data when working in the field or analyzing our results.
2. Field work was conducted for each objective set in the study, from which some activities were combined, and some were conducted independently. Phytosociological surveys were done on more localities along the shore, not just the targeted ones. The diversity of selected taxonomic groups was analysed in the selected sites/transects.
3. Laboratory work was carried out in the Laboratory of Plant Ecology at the Institute of Biology (Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University, Skopje).

3.1 Soil properties

Soil typization was assessed according to MASIS - Macedonian soil information system (http://www.maksoil.ukim.mk/masis/). One soil profile was excavated in each transect. Material was collected at different depths and kept in properly labeled bags (Figure 4). On site, soil material was analized for its water capacity using Kopetsky cylinders (volume of 100cm^3). Soil horizons were identified after air drying the soil with assistance of Prof. Dr. Marjan Andreevski, from the Institute of Agriculture, Skopje. Further chemical analyses were conducted on fractions of 2 mm absolute dry samples.

Figure 4 Field work for collection of soil samples

3.2 Phytosociology

Phytological studies were carried out during 2019, where meadow vegetation was investigated. Appropriate research-analytical methods were applied to realize the set goals and objectives.

Phytological studies were performed according to the standard vegetation research method of the Zurich-Montpellier School (Braun-Blanquet, 1964), whereby homogeneous, representative surfaces, designated as releves, were selected. For this purpose, a total of 22 vegetation images were taken at several sites along the narrow Prespa Lake - Dolno Dupeni, Nakolec, Slivnica, Perovo, Krani, Stenje, Asamati and Grnchari. In the frame of these field surveys, it was necessary to cover the wider area of the Prespa shoreline meadows.

Coverage of individual taxa was estimated by a widely used methodology: + - very rare plant; 1 - covers less than 5% of the selected area; 2- covers between 5 and 25%; 3- covers 25-50%; 4- covers from 50-75% and with value 5 - covers between 75-100%.

Representative minimal surfaces of vegetation were selected for relevés, which are established for different types of vegetation, based on previous experience in phytoecological research. Thus, the surfaces of the recorded images range up to 100 m².

For each vegetation relevé, in addition to data on floristic composition and their quantitative part, baseline data as well as abiogenic and physiognomic characteristics of the stands were recorded: site name, date, altitude (m), area of the releve (m²) , inclination (°), exposure, total cover, geological ground, geo-coordinates, anthropogenic impact, etc.

The collected plant material was herbarised and labeled. A number of floristic works were used for the determination - Flora Europaea (Tutin, T.G. et al., 1968, 1972, 1976, 1980, 1993) Prodromus florae peninsulae Balcanicae (Hayek, 1924, 1928, 1932) Flora of the Republic of Macedonia (Micevski, K., 1985, 1993, 1994, 1995, 1998, 2001, 2005); Flora of the Republic of Macedonia (Matevski, 2010); Flora of Bulgaria (1963; 1979; 1995); Flora of SR Serbia (Josifović, 1970-1977) and others. Recent monographs and other floristic and taxonomic articles referring to the flora of the Republic of Macedonia have been used in the determination of taxa from taxonomically complicated genera from R. S. Macedonia, the Balkan Peninsula and Europe. The herbarium material deposited in the herbarium of the Institute of Biology (MKNH) at the Faculty of Natural Sciences and Mathematics - Skopje was used for comparison.

Taxonomic and nomenclature alignment of registered taxa from our vegetation releves was done using the "online" EURO + MED PLANT BASE (Vascular Plant Database from Europe and the Mediterranean Region - http://www.euromed.org.uk/) .

Our own vegetation releves data and those cited in the literature was entered into the Turboveg database (Hennekens & Schaminée, 2001). The basic computer problem is the scale by which the presence of each species in the vegetation releve is measured. In the Braun-Blanquet number and chord scale (r, +, 1, 2, 3, 4 and 5), where the presence of non-numeric data (r and +) precludes the possibility to quantify (calculate) the data immediately, therefore several proposed procedures were applied to transform the values into another scale containing only numbers (Van der Maarel, 1979).

Vegetation releves for further analysis were exported in the computer software JUICE (Tichy 2002) where hierarchical agglomerative cluster analyzes were first performed in the PC-ORD program (McCune & Mefford, 1999) for the definition of plant communities. OptimClass method (Tichý et al., 2010) was used for objective cluster selection and optimal number of clusters with maximum number of “faithful” species.

The diagnostically significant species for the individual clusters were determined by calculating the fidelity constancy and fidelity for each species in each cluster, using the phi coefficient (Chytrý, et al., 2002)

Biological or life forms according to Raunkiaer (1934): geophytes, terophytes, hemicryptophytes, hemophytes, and phanerophytes, were used to determine the biological spectrum of communities.

The results obtained from numerical analyzes helped us to process the analytical and later synthetic table. Using the relevant literature, as well as the information available to us, each of the taxa listed in the table was assigned its syntaxonomic affiliation to the appropriate syntax category.

The names of the registered syntaxes and their authors are given in accordance with the International Code of Phytocenological Nomenclature (Weber et al., 2000).

The chorological analysis used the floristic elements according to Gajić (1980); Pignatti (2005) and others. The registered taxa are arranged in 6 of 9 existing chorological groups I- Balkan and sub Balkan floral elements, II- Steno Mediterranean floral elements, III- Eurimediterranean floral elements, IV- Mediterranean mountainous floral elements, V- Eurasian floral elements, VI- Atlantic floral element, VII- Orophil-South European floral element, VIII- Boreal floral elements and IX- floral elements with wider distribution. Their percentile representation in the community was used to determine the chorological composition of the registered phytocenoses.

3.3 Biomass and production

Plant material was collected in five plots (0.0625m^2) placed along a line transect in each of the eight transects. Where possible, plants were directly cut on site, while some were processed afterwards. Material was stored in paper bags. Plants were identified using identification keys and the number of specimens was counted. Biomass was measured after air drying.

Figure 5 Field work (taking pieces with surface vegetation)

3.4 Diversity of butterflies, crickets, beetles and spiders

Regarding the animal component connected with these habitats, several groups were studied.

Butterflies - Sampled and collected material refers to field trips conducted in the period 1-4 July 2019. The sampling methodology involved standardized monitoring on eight transects (as described by Van Swaay et al. [2012]) while in parallel unsystematic sampling was also performed. Butterflies were registered via direct observation or when necessary, they were caught using an entomological net and released after identification. For all specimens date and place of collection (coordinates), name of collector, and elevation was noted in a Memento Database. Specimens were identified according to Tolman (1997, 2008), Pamperis (1997), Lafranchis (2004) and Popović (2011). The nomenclature is according to de Jong (2014). Data are stored into Microsoft Access and Microsoft Excel databases.

Crickets - The study was carried out within two days (July 1st and 2nd) by observing and net-sweeping in a variety of grassy habitats with high ground humidity along the shoreline of Prespa Lake. Orthopterans (bush-crickets, crickets and grasshoppers) were identified visually and only few samples were preserved in ethanol to be checked additionally.

Beetles and spiders - The collection of material for edaphic fauna (beetles and spiders) was carried out using the pit-fall trapping method. Pitfall traps were placed in line transects in eight

localities. All of the transects consisted of five pit-fall traps. Pit-fall traps were set in June 2019 (14-16.06.2019) and emptied in July 2019 (16.07.2019). The material was sorted by hand, preserved in 70% alcohol. Beetles were mounted as dry specimens after the extraction of male genitalia. The determination was performed using several determination keys. Spiders were determined after the extraction of male or female genitalia.

4 Physical soil properties

The extract of the soil map of the Republic of North Macedonia (MASIS - http://www.maksoil.ukim.mk/masis/) is presented in Figure 6.

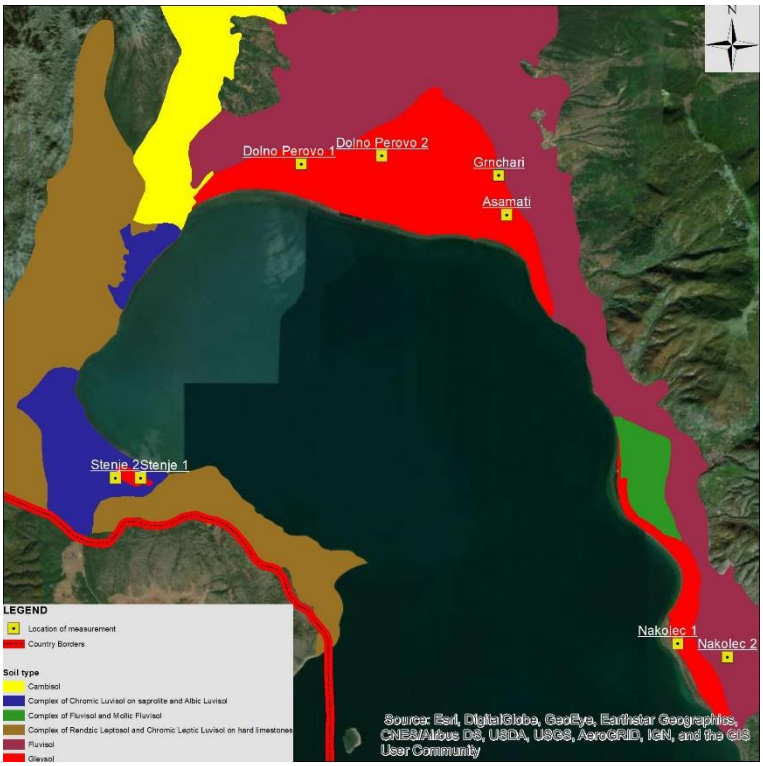

Figure 6 Soil types in the studied area (according to MASIS)

One soil profile was excavated in each transect. Samples were divided according to depths and rearranged according to soil horizonts classification (Table 4).

Water capacity is a very important physical characteristic of soil. Water capacity ranged from 15.24% to 59.5% in the analyzed soil profiles. This suggests that the retentive capacity is from very low to high. In general, top soils of the profiles had high water capacity (high organic matter content) while deeper soil horizons had low values due to the domination of sandy soil particles.

Soil bulk density was the lowest in the top soil due to the presence of high humus content (visual examination). The deeper soil horizons had higher values than the top soil although they show low compaction and low disturbance.

Table 4 Soil samples and determination of soil types

Soil profile	Sample dept. (cm)	Horizon dept. (cm)	Soil bulk density (%)	Retentive capacity %	Soil horizon (lab)	Soil type	Locality
1	(1-6)	(0-6)	0,88	43,66	(A)	Fluvisol	Nakolec 1
	(13-18)	(6-30)	1,30	39,38	(IIC)		
	(35-40)	(30 +)	1,36	19,66	(IIIC)		
2	(2-7)	(0-10)	0,43	38,91	(A)	Gleysol	Nakolec 2
	(23-28)	(10-38)	1,11	42,81	(Gso)		
	(42-47)	(38+)	1,44	41,1	(Gr)		
3	(1-6)	(0-9)	1,07	37,89	(A)	Fluvisol	Dolno Perovo 1
	(10-15)	(9-23)	1,31	15,24	(IIC)		
	(27-32)	(23+)	0,79	34,61	(IIIC)		
4	(2-7)	(0-9)	0,73	30,63	(A)	Gleysol	Dolno Perovo 2
	(14-19)	(9-21)	0,98	32,74	(A)		
	(34-39)	(21+)	1,04	31,81	(AC)		
5	(2-7)	(0-9)	0,77	48,6	(A)	Gleysol	Asamati
	(10-15)	(9-21)	1,28	42,89	(A)		
	(21-16)	(21+)	1,27	37,95	(Gso)		
6	(1-6)	(0-8)	0,91	45,38	(A)	Gleysol	Grnchari
	(15-21)	(8-22)	1,55	43,5	(Gso)		
	(24-29)	(22+)	1,58	40,43	(Gso)		
7	(2-7)	(0-12)	0,88	39,57	(A)	Mollic Fluvisol	Stenje 1
	(14-19)	(12-24)	1,40	30,68	(A)		
	(27-32)	(24+)	1,33	29,18	(AC)		
8	(0-5)	(0-5)	0,88	59,5	(A)	Gleysol	Stenje 2
	(15-20)	(5-38)	1,14	49,01	(Gso)		
	(40-45)	(38+)	1,26	48,05	(Gr)		

The chemical analyses of the collected soil profiles (chapter 3.1) should be performed in the next period. They will be targeted towards determination of nitrogen and phosporus soil concentrations as well as some other important nutrients (K, Mg, Fe, etc.). These results will enable assessment of the availability of nutrients in different soil horizons.

5 Phytosociology of wet meadows

For the purpose of this research, an attempt was made to encompass all available data on the flora and vegetation of the study area. The literature sources cover a relatively wide period of time (from the mid-20th century to the present). Other types of data are also used, such as phytoecological contributions, doctoral dissertations, research project reports and various administrative documents, such as management plans of Lake Prespa and more.

5.1 Results of the field investigation

In order to accurately determine habitats and assess their conservation status, 22 phytoecological releves of different grassland habitats were made in the Macedonian part of Prespa during field surveys. For further analysis, 15 wetland vegetation releves were considered. Further research is needed to definitively determine the syntaxonomic affiliation of the releves, so the subordering of vegetation units into a particular habitat type is provisional. The results of phytoecological analyzes are presented in the table below.

Biological spectrum best illustrates the environmental conditions, especially climatic characteristics of the reaserch area. They are hemicryptophytic-therophytic communities in whose composition hemicryptophytes (58%) and therophytes (21%) dominate (Figure 7).

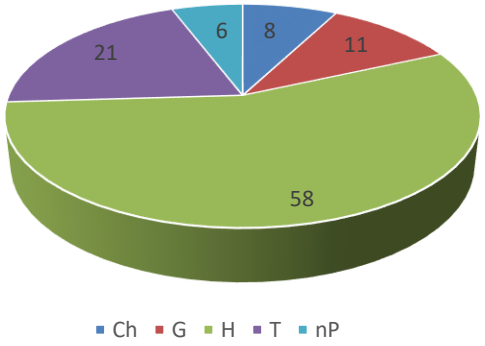

Figure 7 Spectrum of life forms
(Ch-Chamaephytes, G-Geophytes, H-Hemicryptophytes, T-Therophytes)

The most dominant, with 45% is the Eurasian geo element (Figure 8).

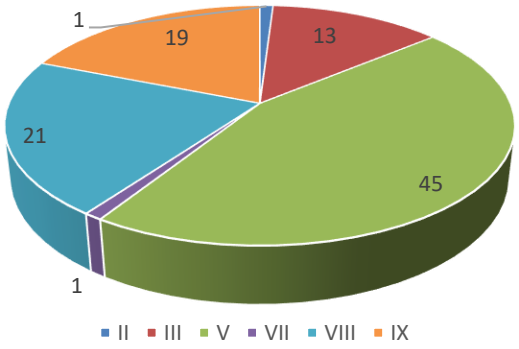

Figure 8 Spectrum of geo-elements (II- Steno Mediterranean floral elements, III- Eurimediterranean floral elements, V- Eurasian floral elements, VII- Orophil-South European floral element, VIII- Boreal floral elements and IX- floral elements with wider distribut

5.2 Valorization of habitats

In Chapter 1.2 the importance of habitats is presented (Table 1). Special attention was paid to the following habitat **6420. Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion** which is described in more detail.

> Habitat description. This habitat type includes plant communities dominated by tall grasses that occur locally in wetlands (wet meadows). In Prespa it occurs locally along the outer periphery of the reed belt.
>
> The habitat develops on flat, alluvial terrain, which is wet for almost nine months of the year. Elevation is about 830 meters (828-848 meters). The substrate inclination is absent or very low (Sirhan, 2%, NE).
>
> All releves are taken at locations where the structure and functions of the habitat are well preserved, while the stands do not show a pronounced presence of primary or secondary succession. *Phragmites australis* occurs only at the points of contact of the two communities, and no significant presence of alochtonous species is observed (*Erigeron annuus* in two releves near the village of Nakolec, *Erigeron canadensis* in one releve near the village of Asamati and *Rubus laciniatus* in a releve near the village Slivnica).
>
> One of the most important features of the habitat is its pronounced dynamics. An important factor for this dynamics are the water level oscillations of Prespa Lake. On the one hand, at times when the water from the Lake recedes (the present situation), the areas with the habitat are expanding, while as the water flows, they recede. No less important to the habitat dynamics is the natural succession of vegetation, whereby grassland vegetation is inextricably replaced by shrubby, and then appropriate forest vegetation.
>
> **Plant communities and characteristic species in Lake Prespa.** From this type of habitat on the territory of Prespa Lake, three plant communities have been registered so far. One of them, Cynosureto-Caricetum hirtae, was registered near the village of Stenje. According to the only releve made, by species *Cynosurus cristatus* и *Carex hirta*, with higher values for abundance are the species *Holcus lanatus, Anthoxanthum odoratum, Poa compressa, Phleum pratense* subsp. *bertolonii, Poa pratensis, Luzula pindica, Carex brizoides* and others.
>
> Most of the releves were taken with *Calamagrostis epigeios* community. Twelve releves were made - three at the village of Nakolec, two at the villages of Asamati, Grnchari, Slivnica and Perovo and one at Sirhan. According to research, the dominant species in the community with *Calamagrostis epigeios* (12), besides this species they are *Galium verum* (6), *Scirpoides holoschoenus* (6), *Lotus corniculatus* (3), *Poa pratensis* (3), *Holcus lanatus* (3) and *Rumex acetosella* (3). So far, about 100 species have been determined, and the total number is expected to be about 120 species.
>
> In the vicinity of the villages of Stenje and Dolno Perovo two releves have been made that undoubtedly belong to the meadow vegetation, but for now it is not possible to specify the community to which they belong. These are communities dominated by the species *Carex distans* (near the village of D. Perovo) and *C. cuprina* (near the village of Stenje), which probably speaks of a somewhat higher degree of humidity in these units.

6 Biomass of wet meadows

The measurements of the biomass of meadows was conducted in June and August at eight selected sites (transects). We were not able to measure the biomass of transect 5 in August because the meadow was already harvested by the owner. In any case, the results obtained are a good indication of the plant resources in the meadows.

The number of individuals counted per transect ranges from 631 plant individuals per squared meter in Nakolec 1 to 2487 in Stenje 1. The dominant species in transects 3 and 6 was

Calamagrostis epigejos, whereas *Elymus repens* was dominant in transect 5, and *Juncus conglomeratus* in transect 8.

Table 5 Number of individuals per square meter for June 2019

Species/Transects	1	2	3	4	5	6	7	8
Agrostis stolonifera	0	0	0	0	0	0	512	0
Alopecurus pratensis	0	118,4	0	0	0	0	0	0
Anthoxanthum odoratum	0	0	0	0	121,6	0	169,6	22,4
Calamagrostis epigejos	457,6	0	**1603,2**	0	0	**1040**	0	0
Carex hirta	9,6	0	0	0	44,8	0	105,6	268,8
Carex sp.	0	0	0	153,6	0	0	0	0
Carex sp.	0	614,4	0	0	0	0	211,2	0
Carex vulpinoidea	0	0	0	0	0	0	0	67,2
Caryophylaceae	0	0	0	0	6,4	0	0	0
Centaurium erythrea	0	0	0	0	0	0	0	9,6
Cirsium sp.	0	0	3,2	0	0	0	0	0
Compositae	0	0	0	0	16	0	0	0
Convolvulus arvensis	0	16	0	6,4	0	0	0	0
Cynodon dactylon	12,8	0	0	64	0	0	310,4	0
Cynosurus cristatus	0	0	0	0	12,8	0	0	0
Elymus repens	0	0	92,8	953,6	**1148,8**	0	377,6	0
Epilobium sp.	0	0	9,6	0	0	0	3,2	0
Epilobium tetragonum	0	0	0	0	0	0	0	108,8
Galium verum	0	0	28,8	32	265,6	16	6,4	0
Hieracium bauhinii	0	0	0	0	3,2	0	0	0
Hieracium sp.	0	0	0	0	185,6	0	0	0
Holcus lanatus	0	0	0	32	208	0	198,4	137,6
Hypericum perforatum	0	0	0	0	0	3,2	0	3,2
Hypochaeris maculata	0	0	0	0	28,8	0	0	0
Hypochaeris radicata	0	0	0	0	19,2	0	0	0
Juncus conglomeratus	0	0	0	0	0	0	0	**1017,6**
Lathyrus cicera	0	67,2	0	0	0	0	0	0
Lathyrus sp.	25,6	0	0	0	0	0	0	0
Linaria peloponesiaca	0	0	0	0	0	6,4	0	0
Lollium perenne	0	0	0	0	0	0	6,4	0
Lotus sp.	0	0	0	0	60,8	0	0	0
Lotus uliginosus	19,2	0	0	0	0	0	0	0
Luzula campestris	0	0	0	0	0	0	86,4	0
Lycops europaeus	0	0	0	0	0	0	0	6,4
Medicago lupulina	0	0	0	0	0	0	3,2	0
Medicago sp.	0	0	0	0	0	35,2	0	0
Myosotis sicula	0	0	0	0	0	0	0	464
Myosotis stricta	102,4	0	0	0	0	0	0	0

Species/Transects	1	2	3	4	5	6	7	8
Nepoznato	3,2	0	6,4	3,2	25,6	0	9,6	6,4
Phleum phleoides	0	0	0	0	0	0	3,2	0
Phragmites australis	0	0	0	0	0	6,4	0	0
Plantago lanceolata	0	0	0	0	112	0	32	0
Poa compressa	0	0	0	0	0	0	316,8	0
Poa palustris	0	0	0	0	0	0	0	3,2
Poa pratensis	0	0	0	19,2	0	12,8	0	0
Poaceae	0	0	0	0	12,8	144	0	0
Polygonum sp.	0	0	0	0	3,2	0	3,2	0
Potentilla reptans	0	0	0	0	25,6	0	6,4	150,4
Prunella vulgaris	0	0	0	0	0	0	9,6	0
Ranunculus rumelicus	0	0	0	0	6,4	0	0	0
Ranunculus sartorianus	0	0	0	0	83,2	0	0	0
Ranunculus sp.	0	0	0	0	0	0	0	3,2
Rhinanthus	0	0	0	0	6,4	0	0	0
Rhinanthus rumelicus	0	0	0	3,2	0	0	0	0
Rumex sp.	0	0	0	3,2	0	0	28,8	0
Sanguisorba minor	0	0	0	0	0	0	22,4	0
Stachys palustris	0	16	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	12,8	0
Valeriana officinalis	0	0	0	0	0	96	0	0
Vicia lathyroides	0	0	0	0	6,4	0	44,8	0
Vicia tetrasperma	0	0	0	0	0	22,4	0	3,2
Vicia villosa	0	0	0	0	0	6,4	0	0
Grand Total	**631,4**	**834**	**1747**	**1274,4**	**2408,2**	**1394,8**	**2487**	**2280**

The following table shows the values of the air-dry biomass of species expressed in g/m^2. As in the previous table, the highest values are obtained for *Calamagrostis epigejos*, *Carex* sp., *Elymus repens*, *Juncus conglomeratus* etc.

Table 6 Total biomass (g) of species per m2 June 2019

Species/Transects	1	2	3	4	5	6	7	8
Agrostis stolonifera	0,00	0,00	0,00	0,00	0,00	0,00	32,61	0,00
Alopecurus pratensis	0,00	24,13	0,00	0,00	0,00	0,00	0,00	0,00
Anthoxanthum odoratum	0,00	0,00	0,00	0,00	17,47	0,00	14,72	3,54
Calamagrostis epigejos	119,01	0,00	505,98	0,00	0,00	363,04	0,00	0,00
Carex hirta	0,11	0,00	0,00	0,00	3,33	0,00	28,00	30,02
Carex sp.	0,00	0,00	0,00	173,63	0,00	0,00	0,00	0,00
Carex sp.	0,00	186,75	0,00	0,00	0,00	0,00	13,86	0,00
Carex vulpinoidea	0,00	0,00	0,00	0,00	0,00	0,00	0,00	42,66
Caryophylaceae	0,00	0,00	0,00	0,00	0,77	0,00	0,00	0,00
Centaurium erythrea	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,33
Cirsium sp.	0,00	0,00	0,05	0,00	0,00	0,00	0,00	0,00

Species/Transects	1	2	3	4	5	6	7	8
Compositae	0,00	0,00	0,00	0,00	3,05	0,00	0,00	0,00
Convolvulus arvensis	0,00	2,83	0,00	0,16	0,00	0,00	0,00	0,00
Cynodon dactylon	0,32	0,00	0,00	2,37	0,00	0,00	36,83	0,00
Cynosurus cristatus	0,00	0,00	0,00	0,00	3,00	0,00	0,00	0,00
Elymus repens	0,00	0,00	4,90	82,85	29,73	0,00	28,74	0,00
Epilobium sp.	0,00	0,00	2,83	0,00	0,00	0,00	0,16	0,00
Epilobium tetragonum	0,00	0,00	0,00	0,00	0,00	0,00	0,00	8,48
Galium verum	0,00	0,00	5,15	8,70	77,15	12,48	1,90	0,00
Hieracium bauhinii	0,00	0,00	0,00	0,00	1,34	0,00	0,00	0,00
Hieracium sp.	0,00	0,00	0,00	0,00	7,24	0,00	0,00	0,00
Holcus lanatus	0,00	0,00	0,00	0,47	9,79	0,00	36,10	3,52
Hypericum perforatum	0,00	0,00	0,00	0,00	0,00	0,11	0,00	6,78
Hypochaeris maculata	0,00	0,00	0,00	0,00	11,14	0,00	0,00	0,00
Hypochaeris radicata	0,00	0,00	0,00	0,00	17,44	0,00	0,00	0,00
Juncus conglomeratus	0,00	0,00	0,00	0,00	0,00	0,00	0,00	216,64
Lathyrus cicera	0,00	4,07	0,00	0,00	0,00	0,00	0,00	0,00
Lathyrus sp.	0,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Linaria peloponesiaca	0,00	0,00	0,00	0,00	0,00	0,86	0,00	0,00
Lollium perenne	0,00	0,00	0,00	0,00	0,00	0,00	1,80	0,00
Lotus sp.	0,00	0,00	0,00	0,00	1,39	0,00	0,00	0,00
Lotus uliginosus	0,59	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Luzula campestris	0,00	0,00	0,00	0,00	0,00	0,00	12,54	0,00
Lycops europaeus	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,38
Medicago lupulina	0,00	0,00	0,00	0,00	0,00	0,00	0,30	0,00
Medicago sp.	0,00	0,00	0,00	0,00	0,00	1,24	0,00	0,00
Myosotis sicula	0,00	0,00	0,00	0,00	0,00	0,00	0,00	9,57
Myosotis stricta	0,94	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Nepoznato	0,11	0,00	0,04	0,10	1,64	0,00	1,44	0,07
Phleum phleoides	0,00	0,00	0,00	0,00	0,00	0,00	1,27	0,00
Phragmites australis	0,00	0,00	0,00	0,00	0,00	3,84	0,00	0,00
Plantago lanceolata	0,00	0,00	0,00	0,00	8,70	0,00	15,62	0,00
Poa compressa	0,00	0,00	0,00	0,00	0,00	0,00	51,94	0,00
Poa palustris	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,46
Poa pratensis	0,00	0,00	0,00	1,06	0,00	2,24	0,00	0,00
Poaceae	0,00	0,00	0,00	0,00	2,11	4,49	0,00	0,00
Polygonum sp.	0,00	0,00	0,00	0,00	0,39	0,00	5,25	0,00
Potentilla reptans	0,00	0,00	0,00	0,00	0,57	0,00	1,01	20,64
Prunella vulgaris	0,00	0,00	0,00	0,00	0,00	0,00	2,25	0,00
Ranunculus rumelicus	0,00	0,00	0,00	0,00	0,45	0,00	0,00	0,00
Ranunculus sartorianus	0,00	0,00	0,00	0,00	4,93	0,00	0,00	0,00
Ranunculus sp.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,25
Rhinanthus sp.	0,00	0,00	0,00	0,00	5,15	0,00	0,00	0,00
Rhinanthus rumelicus	0,00	0,00	0,00	2,02	0,00	0,00	0,00	0,00

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Species/Transects	1	2	3	4	5	6	7	8
Rumex sp.	0,00	0,00	0,00	0,38	0,00	0,00	67,87	0,00
Sanguisorba minor	0,00	0,00	0,00	0,00	0,00	0,00	0,62	0,00
Stachys palustris	0,00	3,74	0,00	0,00	0,00	0,00	0,00	0,00
Trifolium pratense	0,00	0,00	0,00	0,00	0,00	0,00	4,38	0,00
Valeriana officinalis	0,00	0,00	0,00	0,00	0,00	141,79	0,00	0,00
Vicia lathyroides	0,00	0,00	0,00	0,00	0,61	0,00	4,19	0,00
Vicia tetrasperma	0,00	0,00	0,00	0,00	0,00	24,74	0,00	0,06
Vicia villosa	0,00	0,00	0,00	0,00	0,00	0,28	0,00	0,00
Grand Total	**121,11**	**221,53**	**518,95**	**271,73**	**207,40**	**555,11**	**363,40**	**344,40**

In August, the number of individuals per transect ranged from 323 plant individuals in D. Perovo 2 to 2182 in Stenje 2. Again, *Calamagrostis epigejos* dominated in transect 3 and transect 6, while *Cynodon dactylon* was abundant in transect 7 and *Juncus conglomeratus* in transect 8.

Table 7 Table for number of samples collected per square meter for August 2019

species	1	2	3	4	6	7	8	Total
Agrostis+Poa palustris	0	0	0	0	0	0	38,4	**38,4**
Asteraceae	0	0	0	0	0	0	6,4	**6,4**
Calamagrostis epigejos	316,8	0	988,8	0	864	0	0	**2169,6**
Carex hirta	0	0	0	0	0	233,6	499,2	**732,8**
Carex sp.	0	508,8	0	99,2	0	0	0	**608**
Cirsium	0	0	0	3,2	0	0	0	**3,2**
Convolvulus	0	19,2	0	0	0	0	0	**19,2**
Cynodon dactylon	19,2	0	0	0	0	582,4	0	**601,6**
Elymus repens	0	0	0	220,8	0	44,8	0	**265,6**
Galium verum	12,8	0	32	0	64	3,2	0	**112**
Hieracium bauhinii	0	0	0	0	0	48	0	**48**
Hypochaeris sp.	0	0	0	0	0	16	0	**16**
Iris sp.	0	57,6	0	0	0	0	0	**57,6**
Juncus conglomeratus	0	0	0	0	0	0	1612,8	**1612,8**
Lamiaceae-Stachys palustris	0	22,4	0	0	0	0	0	**22,4**
Linaria sp.	0	0	80	0	0	0	0	**80**
Medicago lupulina+drugo	0	0	0	0	0	41,6	0	**41,6**
Mentha pulegium	0	0	0	0	0	0	3,2	**3,2**
Nepoznato	3,2	0	3,2	0	0	9,6	12,8	**28,8**
Nepoznato 1	0	0	0	0	3,2	0	0	**3,2**
Oenanthe sp.	0	0	0	0	16	0	0	**16**
Phragmites sp.	0	0	3,2	0	0	0	0	**3,2**
Plantago lanceolata	0	0	0	0	0	35,2	0	**35,2**
Poa compressa + Agrostis stolonifera	0	0	0	0	0	400	0	**400**
Polygonum amphibium	0	0	0	0	0	3,2	0	**3,2**

species	1	2	3	4	6	7	8	Total
Potentila reptans	0	0	0	0	0	32	6,4	**38,4**
Ranunculus sp.	0	6,4	0	0	0	0	0	**6,4**
Ranunculus repens	0	0	0	0	0	3,2	0	**3,2**
Rumex sp.	76,8	0	0	0	0	48	0	**124,8**
Sanguisorba sp.	0	0	0	0	0	12,8	0	**12,8**
Scirpoides holoschaenus	336	0	0	0	0	0	0	**336**
Scutelaria	0	0	0	0	0	0	3,2	**3,2**
Setaceae	0	0	0	0	0	48	0	**48**
Tanacetum vulgare	0	0	3,2	0	0	0	0	**3,2**
Taraxacum	0	0	3,2	0	0	0	0	**3,2**
Treva-Alopecurus pratense	0	28,8	0	0	0	0	0	**28,8**
Trifolium sp.	0	0	0	0	9,6	0	0	**9,6**
Typha sp.	0	0	0	0	6,4	0	0	**6,4**
***Vicia* sp. 1**	0	0	0	0	28,8	0	0	**28,8**
***Vicia* sp. 2**	0	0	0	0	9,6	0	0	**9,6**
Grand Total	**764,8**	**643,2**	**1113,6**	**323,2**	**1001,6**	**1561,6**	**2182,4**	**7590,4**

Table 8 Total biomass (g) of species per m^2 in August 2019

Species	1	2	3	4	6	7	8	g/m2
Agrostis+Poa palustris	0,00	0,00	0,00	0,00	0,00	0,00	10,11	**10,11**
Asteraceae	0,00	0,00	0,00	0,00	0,00	0,00	3,97	**3,97**
Calamagrostis epigejos	69,44	0,00	543,30	0,00	413,12	0,00	0,00	**1025,86**
Carex hirta	0,00	0,00	0,00	0,00	0,00	26,27	73,76	**100,03**
Carex sp.	0,00	157,95	0,00	95,04	0,00	0,00	0,00	**252,99**
Cirsium sp.	0,00	0,00	0,00	2,40	0,00	0,00	0,00	**2,40**
Convolvulus sp.	0,00	16,35	0,00	0,00	0,00	0,00	0,00	**16,35**
Cynodon dactylon	1,17	0,00	0,00	0,00	0,00	86,94	0,00	**88,12**
Elymus repens	0,00	0,00	0,00	85,25	0,00	3,94	0,00	**89,18**
Galium verum	0,13	0,00	1,97	0,00	14,43	1,08	0,00	**17,61**
Hieracium bauhinii	0,00	0,00	0,00	0,00	0,00	1,35	0,00	**1,35**
Hypochaeris sp.	0,00	0,00	0,00	0,00	0,00	11,97	0,00	**11,97**
Iris sp.	0,00	2,95	0,00	0,00	0,00	0,00	0,00	**2,95**
Juncus conglomeratus	0,00	0,00	0,00	0,00	0,00	0,00	322,98	**322,98**
Lamiaceae-Stachys palustris	0,00	2,94	0,00	0,00	0,00	0,00	0,00	**2,94**
Linaria sp.	0,00	0,00	90,18	0,00	0,00	0,00	0,00	**90,18**
Medicago lupulina	0,00	0,00	0,00	0,00	0,00	1,28	0,00	**1,28**
Mentha pulegium	0,00	0,00	0,00	0,00	0,00	0,00	0,39	**0,39**
Unknown	0,61	0,00	0,31	0,00	0,00	3,78	4,32	**9,02**
Unknown 1	0,00	0,00	0,00	0,00	0,52	0,00	0,00	**0,52**
Oenanthe sp.	0,00	0,00	0,00	0,00	1,80	0,00	0,00	**1,80**
Phragmites sp.	0,00	0,00	1,86	0,00	0,00	0,00	0,00	**1,86**
Plantago lanceolata	0,00	0,00	0,00	0,00	0,00	3,19	0,00	**3,19**

Species	1	2	3	4	6	7	8	g/m2
Poa compressa+Agrostis stolonifera (mixed sample)	0,00	0,00	0,00	0,00	0,00	47,97	0,00	**47,97**
Polygonum amphibium	0,00	0,00	0,00	0,00	0,00	0,60	0,00	**0,60**
Potentila reptans	0,00	0,00	0,00	0,00	0,00	1,63	14,78	**16,41**
Ranunculus sp.	0,00	1,65	0,00	0,00	0,00	0,00	0,00	**1,65**
Ranunculus repens	0,00	0,00	0,00	0,00	0,00	0,30	0,00	**0,30**
Rumex sp.	3,55	0,00	0,00	0,00	0,00	14,40	0,00	**17,95**
Sanguisorba minor	0,00	0,00	0,00	0,00	0,00	7,36	0,00	**7,36**
Scirpoides holoschaenus	162,14	0,00	0,00	0,00	0,00	0,00	0,00	**162,14**
Scutellaria sp.	0,00	0,00	0,00	0,00	0,00	0,00	2,59	**2,59**
Setaceae	0,00	0,00	0,00	0,00	0,00	1,97	0,00	**1,97**
Tanacetum vulgare	0,00	0,00	12,42	0,00	0,00	0,00	0,00	**12,42**
Taraxacum sp.	0,00	0,00	0,07	0,00	0,00	0,00	0,00	**0,07**
Treva-Alopecurus pratense	0,00	5,15	0,00	0,00	0,00	0,00	0,00	**5,15**
Trifolium sp.	0,00	0,00	0,00	0,00	0,15	0,00	0,00	**0,15**
Typha sp.	0,00	0,00	0,00	0,00	4,22	0,00	0,00	**4,22**
***Vicia* sp. 1**	0,00	0,00	0,00	0,00	8,19	0,00	0,00	**8,19**
***Vicia* sp. 2**	0,00	0,00	0,00	0,00	9,07	0,00	0,00	**9,07**
Total	**237,04**	**187,01**	**650,11**	**182,69**	**451,50**	**214,01**	**432,90**	**2355,26**

The following table shows the values of biomass of particular species expressed in g/m^2 in August 2019. As in the previous table, the largest values come from *Calamagrostis epigejos*, *Carex* sp., *Scirpoides holoschaenus*, *Juncus conglomeratus* etc.

The total dry biomass of investigated wet meadows ranged from 121.1 to 555.1 g/m^2 in June and 182.7 to 650.1 g/m^2 in August. The biomass in transects 2, 4, 6 and 7 was higher in June than the August measurements. Transects 1, 3 and 8 showed an opposite pattern. Nevertheless, the average values for biomass in June and August were very similar although the biomass was higher in August (336.5 g/m^2) than the value for June (325.5 g/m^2). The highest biomass was recorded in transect 3 and 6. Lower values of biomass production was recorded in transect 1 and 4.

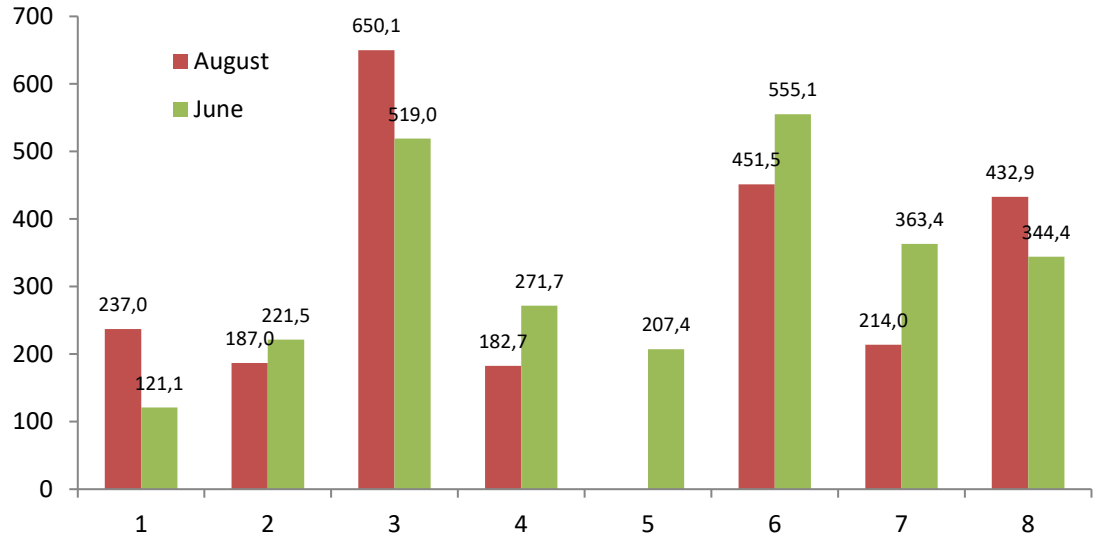

Figure 9 Comparative overview of biomass (g/m^2) for each transect in June and August 2019

7.1 Estimation of biomass in the Prespa watershed

After extrapolating this average value to each habitat type of wet meadows we calculated that wetlands in the Macedonian part of Prespa produce an annual biomass of 1809.74 tonnes. *Calamagrostis epigejos* has the largest biomass (1269.39 t), while the Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion have the lowest value.

Table 9 Estimation of average biomass by habitat type along the Prespa shoreline

Habitat type	Biomass (t)
6420 - Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion	0,13
D5.21 - Beds of large Carex spp.	124,39
Calamagrostis epigeios comm.	1269,39
E3.31 - Helleno-Moesian riverine and humid Trifolium meadows	415,84
Total biomass	**1809,74**

7 Diversity of species in wet meadow habitats

7.1 Ground beetles (Coleoptera, Carabidae) in wet meadows in Prespa

The review of literature data showed that there are records for 9 species in the Prespa area (surrounding mountains excluded): *Calosoma sycophanta* (Linnaeus, 1758), *Carabus*

coriaceus excavatus Charpentier, 1825, *Bembidion varium* (Olivier, 1795), *Perileptus areolatus areolatus* (Creutzer, 1799), *Harpalus atratus* Latreille, 1804, *Paradromius linearis linearis* (Olivier, 1795), *Amara lucida* (Duftschmid, 1812), *Amara fulva* (O. F. Müller, 1776), *Zabrus incrassatus* (Ahrens, 1814) (Drovenik & Peks, 1994; Guéorguiev, 1998; Hristovski & Guéorguiev, 2015). These species were probably collected in different habitats, but most of them in different wetland habitats.

The aim of the present study is to show the diversity of ground beetles in wet meadows in Prespa.

In total, 37 species of ground beetles were recorded by pit-fall trapping in the studied wet meadow in Prespa (Tab. 1). The most interesting species are:

- *Poecilus rebeli* – a Balkan endemic which is connected to different types of wetlands, previously known from a mountain wetland on Galichica mountain (Hristovski & Guéorguiev, 2015)
- *Carabus granulatus interstitialis, Parophonus mendax, Brachinus elegans* and *Drypta dentata* can be considered as rare and they prefer wetland habitats (Hristovski & Guéorguiev, 2015)

Table 10 List of ground beetle species (Coleoptera, Carabidae) in the wet meadows of Prespa and number of collected specimens per transect (locality)

	Species	Transect 1	Transect 3	Transect 4	Transect 5	Transect 6	Transect 8	Total
1.	***Acupalpus exiguus* Dejean, 1829**						1	1
2.	***Acupalpus maculatus* (Schaum, 1860)**						1	1
3.	***Amara aenea* (DeGeer, 1774)**			2				2
4.	***Amara bifrons* (Gyllenhal, 1810)**			1				1
5.	***Amara convexior* Stephens, 1828**	5						5
6.	***Amara lucida* (Duftschmid, 1812)**						1	1
7.	***Anisodactylus binotatus* (Fabricius, 1787)**						14	14
8.	***Anisodactylus nemorivagus* (Duftschmid, 1812)**			8				8
9.	***Brachinus crepitans* (Linnaeus, 1758)**	1						1
10.	***Brachinus elegans* Chaudoir, 1842**						3	3
11.	***Calathus distinguendus* Chaudoir, 1846**				2			2
12.	***Calathus melanocephalus* (Linnaeus, 1758)**		1					1
13.	***Carabus granulatus interstitialis* Duftschmid, 1812**					1	3	4
14.	***Chlaenius nigricornis* (Fabricius, 1787)**						1	1
15.	***Cicindela campestris campestris* Linnaeus, 1758**		1					1
16.	***Drypta dentata* (P. Rossi, 1790)**			1		1		2
17.	***Harpalus anxius* (Duftschmid, 1812)**			25	43	1		69
18.	***Harpalus cupreus fastuosus* Faldermann, 1836**						6	6
19.	***Harpalus dimidiatus* (P. Rossi, 1790)**		1	1	12	43		57
20.	***Harpalus flavicornis* Dejean, 1829**				31		1	32

21.	***Harpalus picipennis* (Duftschmid, 1812)**			2				2
22.	***Harpalus rubripes* (Duftschmid, 1812)**				5	4		9
23.	***Harpalus serripes* (Quensel, 1806)**			1				1
24.	***Harpalus taciturnus* Dejean, 1829**		1	1				2
25.	***Harpalus tenebrosus* Dejean, 1829**		3					3
26.	***Microlestes luctuosus luctuosus* Holdhaus, 1904**				1			1
27.	***Microlestes minutulus* (Goeze, 1777)**			2		3		5
28.	***Ophonus ardosiacus* Lutschnik, 1922**						1	1
29.	***Ophonus cribricollis* (Dejean, 1829)**				1			1
30.	***Parophonus maculicornis* (Duftschmid, 1812)**				1			1
31.	***Parophonus mendax* (P. Rossi, 1790)**				1			1
32.	***Poecilus cupreus* (Linnaeus, 1758)**						62	62
33.	***Poecilus rebeli* (Apfelbeck, 1904)**	1						1
34.	***Pterostichus anthracinus anthracinus* (Illiger, 1798)**	2					7	9
35.	***Pterostichus niger* (Schaller, 1783)**		2					2
36.	***Pterostichus strenuus* (Panzer, 1796)**			1				1
37.	***Pterostichus vernalis* Panzer, 1796**	1						1
	TOTAL	**10**	**9**	**45**	**97**	**53**	**101**	**315**

The most rich in species were transects 4 (Dolno Perovo), 5 (Asamati) and 8 (Stenje). Additional and targeted research is needed in order to get proper insight into the characteristics of the ground beetle community and propose sound indicators.

Table 11 Number of species per pitfall transect

Transect	Number of species	Number of specimens
Transect 1	5	10
Transect 3	6	9
Transect 4	11	45
Transect 5	10	97
Transect 6	6	53
Transect 8	12	101

7.2 Diversity of butterflies (Lepidoptera, Papilionidea & Hesperoidea)

Taking into consideration new findings (Kolev & van der Poorten, 1997; Krpač & Mihajlova, 1997; Melovski, 2004; Verovnik, 2009; Verovnik et al., 2010; Melovski & Bozhinovska, 2014) the total number of butterfly species in North Macedonia exceeds 200 species. Schaider and Jakšić (1989) conducted the last comprehensive study regarding butterfly diversity and distribution in the country. According to their 10x10 km grid cell provided maps, the Prespa region in the Macedonian side should number 124 butterfly species, which is 60% of the total number of butterflies of Macedonia, and 25% of the European species. This list of butterfly

species for the Prespa region is outdated and does not take into account the dynamic changes in the habitats, especially the ones close to the shore of Prespa Lake (Bozhinovska & Melovski, in press). The number is also relative, since it is not connected with information about the habitat type. Due to the complex life cycle of butterflies, they react extremely quickly to minor changes in the environment, making them a good biodiversity indicator and therefore provide an early warning system for biodiversity loss.
The aim of the present study was to conduct field observations in order to propose recommendations for next steps in butterfly research and management of the wet meadows in Prespa.

7.2.1 Results, discussions and recommendations

In total, 29 species of butterflies were recorded in the studied wet meadows in Prespa (Table 12). Because transect sampling as usually recommended (Van Swaay et al., 2012) did not provide sufficient data, we performed additional unsystematic observations in the neighboring wet meadows as well. In some sampled sites (such as both transects in Dolno Perovo, one in Nakolec or the transect in Grnchari) we were limited to the preselected transects, but in order to collect sufficient data the observation time was prolonged.

Table 12 List of butterfly species (Lepidoptera, Papilionidea & Hesperoidea) in the wet meadows of Prespa per transect (locality)

Species	Ezerani	Grnchari	Krani	Pretor	Stenje	Nakolec 1	Nakolec 2	Dolno Perovo 1	Dolno Perovo 2
1. *Aglais io* (Linnaeus 1758)	x	x	x		x	x	x	x	x
2. *Apatura ilia* (Denis & Schiffermüller 1775)						x			
3. *Aphantopus hyperantus* (Linnaeus 1758)			x			x			
4. *Aporia crataegi* (Linnaeus 1758)			x						
5. *Argynnis (Argynnis) paphia* (Linnaeus 1758)						x			
6. *Brintesia circe* (Fabricius 1775)				x		x			
7. *Coenonympha arcania* (Linnaeus 1761)			x						
8. *Coenonympha pamphilus* (Linnaeus 1758)	x		x	x		x			
9. *Colias croceus* (Fourcroy 1785)	x		x	x	x	x			
10. *Leptidea sinapis* (Linnaeus 1758)	x			x		x			
11. *Lycaena alciphron* (Rottenburg 1775)						x			
12. *Lycaena phlaeas* (Linnaeus 1761)	x	x							
13. *Lycaena tityrus* (Poda 1761)	x		x	x					
14. *Maniola jurtina* (Linnaeus 1758)	x		x		x	x			
15. *Melanargia galathea* (Linnaeus 1758)	x		x		x	x	x		
16. *Melitaea didyma* (Esper, 1778)	x		x		x	x			
17. *Melitaea phoebe* (Denis & Schiffermüller 1775)				x					
18. *Ochlodes sylvanus* (Esper 1777)						x			
19. *Pieris rapae* (Linnaeus 1758)	x	x	x		x	x			

20. *Plebejus (Plebejus) argus* (Linnaeus 1758)	x		x					
21. *Plebejus (Plebejus) idas* (L. 1761)	x		x					
22. *Polygonia c-album* (Linnaeus 1758)						x		
23. *Polyommatus icarus* (Rottemburg 1775)	x			x		x		
24. *Pontia edusa* (Fabricius 1777)						x		
25. *Pseudophilotes vicrama* (Moore 1865)	x							
26. *Thymelicus lineola*(Ochsenheimer 1808)	x							
27. *Thymelicus sylvestris* (Poda 1761)	x		x		x			
28. *Vanessa atalanta* (Linnaeus 1758)			x					
29. *Vanessa cardui* (Linnaeus 1758)	x	x	x	x	x		x	

The richest in species were the localities Nakolec 1 (transect towards the lake) and Asamati (Ezerani) with 17 species each, and Krani with 15 species (Figure 10). Poorest localities were transects in Dolno Perovo where treatment with pesticides onto the apple trees was ongoing at spot. Contributing factor for the obvious low number of species are the weather conditions. During this short survey, temperatures rose above 30˚C, creating unfavorable conditions for butterflies. At such summer temperatures, most of the species are conserving energy in order to protect themselves from drying out in the sun. In addition to this, a more intensive, full-season survey is needed, in order to collect data for all targeted species.

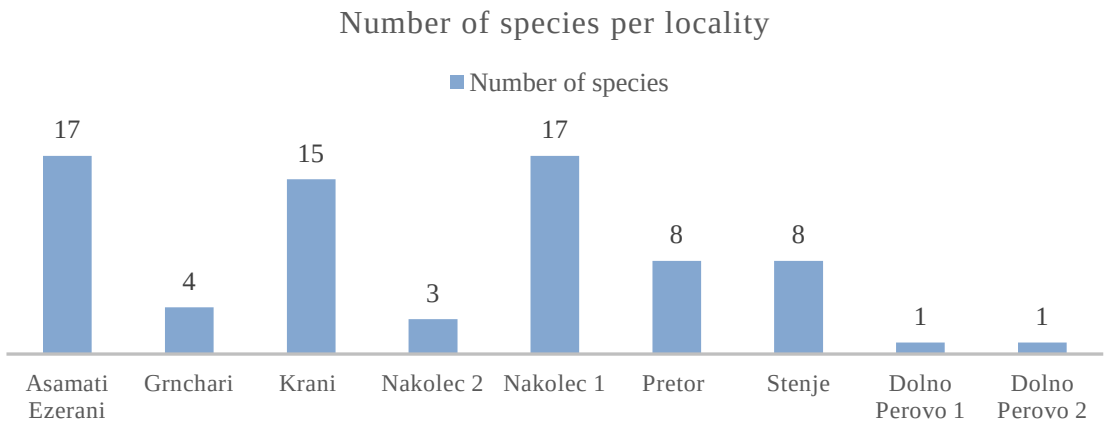

Figure 10 Number of butterfly species per locality in the wet meadows of Prespa

Even though with fragmentary character, the present survey confirms previous studies (Bozhinovska & Melovski in press.; Bozhinovska, 2010), revealing a worrying decline of the butterfly diversity in Prespa. On the spot, direct anthropogenic impact was observed, such as great amount of thrown rotten apples, application of insecticides and expansion of orchards. It is worth mentioning that the detected species are mostly common and are not of high conservation importance. Unfortunately, we did not confirm the presence of the Large Copper (*Lycaena dispar* (Haworth, 1802)), a flagship species of wetlands (Boggs & Ehrlich, 2008) and previously listed for the Prespa region (Schaider & Jakšić, 1989; Bozhinovska & Melovski, in press). The Large Copper is listed under the 1979 Convention on the Conservation of European Wildlife and Natural Habitats and is included in Annexes II and IV of the European Community Habitats Directive requiring strict protection in its own right and designation of special areas of conservation.

In conclusion, this survey incites future systematic and intensive research of the butterfly fauna of Prespa, especially targeting species such as the Large Copper and the Large Blue (*Phengaris arion* (Linnaeus 1758)). Constant monitoring and research need to be in place in order to detect and mitigate serious and constant threats to the butterflies in the area.

7.3 Spiders (Araneae) collected near Lake Prespa

Regarding the study of spider fauna, the Lake Prespa region is among the least studied regions in Macedonia. Scattered data on spider distribution in this region can be found in only three papers (Drensky, 1929; Lazarov, 2004; Deltshev et al., 2013). So far, there has been no systematic research on the spider fauna of this region.

A total of 68 species from 18 families were registered in the investigated area: Theridiidae – 1, Linyphiidae – 5, Tetragnathidae – 1, Araneidae – 1, Lycosidae – 17, Pisauridae – 1, Oxyopidae – 1, Cheiracanthiidae – 1, Miturgidae – 2, Liocranidae – 1, Phrurolithidae – 2, Clubionidae – 1, Trachelidae – 1, Zodariidae – 2, Gnaphosidae – 19, Philodromidae – 3, Thomisidae – 4 and Salticidae – 5. Three species, *Pisaura novicia*, *Trachelas minor* and *Berlandina cinerea* are registered for the first time for the spider fauna of North Macedonia (in table 2 marked with an asterisk *). At the same time, the family Trachelidae is a new family for the fauna of North Macedonia. Most of the registered species have a wider distribution. Of the 68 species, only *Zodarion ohridense* is a Balkan endemic. Significant is the discovery of the species *Zora prespaensis*, which is a local endemite.

Among the transects, transect 5 (Asamati) is the richest in terms of species richness with 33 species: *Agroeca cuprea*, *Alopecosa cuneata*, *Civizelotes gracilis*, *Drassodes pubescens*, *Drassyllus lutetianus*, *D. praeficus*, *D. pusillus*, *Haplodrassus dalmatensis*, *H. minor*, *H. signifer*, *Micaria albovittata*, *Oxyopes lineatus*, *Ozyptila sanctuaria*, *Pardosa bifasciata*, *P. paludicola*, *P. praivaga*, *P. proxima*, *Phlegra fasciata*, *Phrurolithus festivus*, *Pisaura novicia*, *Thanatus arenarius*, *T. atratus*, *Trachyzelotes malkini*, *T. pedestris*, *Trochosa hispanica*, *T. robusta*, *T. ruricola*, *Xerolycosa miniata*, *Xysticus kochi*, *Zelotes atrocaeruleus*, *Z. electus*, *Zodarion ohridense* and *Zora prespaensis*. Then follow transect 7 (Stenje) and transect 2 (Stenje) with 26 and 20 species respectively. Transects 3 and 4 (Dolno Perovo) are considered as transects with lowest numbers of species, with 9 and 3 species, respectively. The reason for this very low number of registered species might be explained by influence of domestic animals and anthropogenic factor, as some of the pitfall traps were destroyed.

Table 13 List of registered species, displayed by locality

Family Genus/Species/Author	Localities
THERIDIIDAE - 1	
***Euryopis flavomaculata* (C. L. Koch, 1836)**	D1 (1 ♂)
LINYPHIIDAE - 5	
***Agyneta ressli* (Wunderlich, 1973)**	C (1)
***Diplostyla concolor* (Wider, 1834)**	E1 (1 ♂)
***Neriene clathrata* (Sundevall, 1830)**	D1 (1 ♀)
***Scutpelecopsis krausi* (Wunderlich, 1980)**	E1 (1 ♀)
***Trichoncus hackmani* Millidge, 1955**	D2 (1 ♀)
TETRAGNATHIDAE - 1	
***Pachygnatha degeeri* Sundevall, 1830**	E1 (7 ♂♂ 3 ♀♀)
ARANEIDAE - 1	
***Cercidia prominens* (Westring, 1851)**	E1 (1 ♂)
LYCOSIDAE - 17	
***Alopecosa albofasciata* (Brullé, 1832)**	D2 (1 ♀)
***Alopecosa cuneata* (Clerck, 1757)**	A (12 ♀♀), C (1 ♀), E1 (3 ♀♀)
***Alopecosa farinosa* (Herman, 1879)**	D2 (2 ♀♀)
***Alopecosa pulverulenta* (Clerck, 1757)**	D2 (2 ♀♀)
***Arctosa figurata* (Simon, 1876)**	B1 (1 ♂), E1 (1 ♂)
***Hogna radiata* (Latreille, 1817)**	E1 (1 ♂)
***Pardosa bifasciata* (C. L. Koch, 1834)**	A (30 ♂♂ 12 ♀♀), B1 (32 ♂♂ 11 ♀♀), B2 (2 ♂♂), C (31 ♂♂ 2 ♀♀), D1 (2 ♂♂), D2 (1 ♂ 13 ♀♀), E1 (258 ♂♂ 43 ♀♀)
***Pardosa hortensis* (Thorell, 1872)**	E2 (2 ♀♀)
***Pardosa paludicola* (Clerck, 1757)**	A (1 ♀), C (5 ♀♀), E2 (6 ♀♀)
***Pardosa prativaga* (L. Koch, 1870)**	A (1 ♀), C (1 ♂ 1 ♀), D1 (3 ♂♂), E1 (1 ♂ 1 ♀), E2 (1 ♂ 1 ♀)
***Pardosa proxima* (C. L. Koch, 1847)**	A (3 ♀♀), E1 (4 ♀♀)
***Pardosa vittata* (Keyserling, 1863)**	E2 (75 ♂♂ 1 ♀)
***Piratula latitans* (Blackwall, 1841)**	D1 (1 ♂ 3 ♀♀)
***Trochosa hispanica* Simon, 1870**	A (3 ♀♀), C (3 ♀♀), E1 (2 ♀♀)
***Trochosa robusta* (Simon, 1876)**	A (1 ♀)
***Trochosa ruricola* (De Geer, 1778)**	A (1 ♂ 2 ♀♀), E1 (1 ♂♂), E2 (3 ♂♂ 3 ♀♀)

***Xerolycosa miniata* (C. L. Koch, 1834)**	A (4 ♂♂), B1 (49 ♂♂ 6 ♀♀), C (8 ♂♂), D2 (96 ♂♂ 8 ♀♀)
PISAURIDAE - 1	
****Pisaura novicia* (L. Koch, 1878)**	A (1 ♂), C (1 ♂)
OXYOPIDAE - 1	
***Oxyopes lineatus* Latreille, 1806**	A (1 ♂), C (2 ♂♂)
CHEIRACANTHIIDAE - 1	
***Cheiracanthium erraticum* (Walckenaer, 1802)**	D2 (1 ♀)
MITURGIDAE - 2	
***Zora armillata* Simon, 1878**	E1 (1 ♂)
***Zora prespaensis* Drensky, 1929**	A (1 ♀)
LIOCRANIDAE - 1	
***Agroeca cuprea* Menge, 1873**	A (2 ♀♀), C (1 ♀), D2 (2 ♀♀)
PHRUROLITHIDAE - 2	
***Phrurolithus festivus* (C. L. Koch, 1835)**	A (1 ♂ 3 ♀♀), C (1 ♂ 3 ♀♀), E1 (2 ♂♂)
***Phrurolithus szilyi* Herman, 1879**	E1 (4 ♂♂)
CLUBIONIDAE - 1	
***Clubiona pseudoneglecta* Wunderlich, 1994**	E1 (1 ♀)
TRACHELIDAE - 1	
****Trachelas minor* O. Pickard-Cambridge, 1872**	D1 (1 ♀)
ZODARIIDAE - 2	
***Zodarion frenatum* Simon, 1884**	D2 (1 ♂)
***Zodarion ohridense* Wunderlich, 1973**	A (1 ♂), C (9 ♂♂), D2 (48 ♂♂ 5 ♀♀)
GNAPHOSIDAE - 19	
****Berlandina cinerea* (Menge, 1872)**	D2 (2 ♀♀)
***Civizelotes gracilis* (Canestrini, 1868)**	A (9 ♂♂ 8 ♀♀), E1 (1 ♂)
***Drassodes lapidosus* (Walckenaer, 1802)**	E1 (1 ♂)
***Drassodes pubescens* (Thorell, 1856)**	A (2 ♂♂), B1 (2 ♂♂), D2 (1 ♂)
***Drassyllus lutetianus* (L. Koch, 1866)**	A (1 ♂)
***Drassyllus praeficus* (L. Koch, 1866)**	A (2 ♂♂ 1 ♀), B2 (1 ♂), C (2 ♀♀), E2 (1 ♂)

***Drassyllus pusillus* (C. L. Koch, 1833)**	A (1 ♂), C (1 ♂ 1 ♀), D1 (1 ♂ 1 ♀), D2 (2 ♀♀), E1 (1 ♂ 2 ♀♀), E2 (4 ♂♂)
***Haplodrassus bohemicus* Miller & Buchar, 1977**	D2 (2 ♂♂)
***Haplodrassus dalmatensis* (L. Koch, 1866)**	A (1 ♀), B1 (1 ♀)
***Haplodrassus minor* (O. Pickard-Cambridge, 1879)**	A (3 ♂♂), C (2 ♂♂ 4 ♀♀), D1 (1 ♂), D2 (1 ♀), E1 (1 ♂), E2 (5 ♂♂)
***Haplodrassus signifer* (C. L. Koch, 1839)**	A (3 ♀♀)
***Micaria albovittata* (Lucas, 1846)**	A (3 ♀♀), E1 (3 ♀♀)
***Micaria pulicaria* (Sundevall, 1831)**	C (1 ♂ 1 ♀), E2 (1 ♂)
***Trachyzelotes malkini* Platnick & Murphy, 1984**	A (1 ♂), E2 (1 ♀)
***Trachyzelotes pedestris* (C. L. Koch, 1837)**	A (1 ♀), C (1 ♀), D1 (1 ♀)
***Zelotes atrocaeruleus* (Simon, 1878)**	A (5 ♂♂ 1 ♀), C (1 ♂ 1 ♀), E1 (1 ♀), E2 (1 ♂ 1 ♀)
***Zelotes electus* (C. L. Koch, 1839)**	A (2 ♂♂), B1 (2 ♂♂), C (3 ♀♀), D2 (2 ♀♀)
***Zelotes hermani* (Chyzer, 1897)**	D2 (1 ♀)
***Zelotes latreillei* (Simon, 1878)**	E2 (1 ♀)
PHILODROMIDAE - 3	
***Thanatus arenarius* L. Koch, 1872**	A (2 ♀♀), D2 (2 ♀♀)
***Thanatus atratus* Simon, 1875**	A (8 ♂♂ 1 ♀), C (2 ♂♂), D2 (5 ♀♀), E1 (10 ♂♂), E2 (6 ♂♂)
***Thanatus striatus* C. L. Koch, 1845**	E2 (1 ♀)
THOMISIDAE - 4	
***Ozyptila sanctuaria* (O. Pickard-Cambridge, 1871)**	A (2 ♀♀), E1 (4 ♀♀),
***Ozyptila simplex* (O. Pickard-Cambridge, 1862)**	B2 (1 ♂), D1 (7 ♂♂ 1 ♀), E1 (4 ♂♂ 1 ♀), E2 (52 ♂♂ 7 ♀♀)
***Xysticus erraticus* (Blackwall, 1834)**	C (2 ♂♂), D1 (1 ♂), E1 (1 ♂ 2 ♀♀)
***Xysticus kochi* Thorell, 1872**	A (1 ♀)
SALTICIDAE - 5	
***Aelurillus v-insignitus* (Clerck, 1757)**	B1 (3 ♂♂), D2 (1 ♀)
***Chalcoscirtus infimus* (Simon, 1868)**	C (2 ♂♂)
***Heliophanus auratus* C. L. Koch, 1835**	B1 (1 ♂)
***Phlegra fasciata* (Hahn, 1826)**	A (1 ♂), B1 (1 ♂)
***Talavera aequipes* (O. Pickard-Cambridge, 1871)**	E2 (2 ♀♀)

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7.4 Orthopterans (Insecta, Orthoptera)

The review of literature data showed that there are records for 25 species in Prespa area (up to 1000 m altitude in the closer vicinity of the lake considered; surrounding mountains excluded ((Micevski et al., 2003); (Chobanov & Mihajlova, 2010)). Review of their ecological preferences suggests five species are related mostly to dry or semi-dry grassland and scrub habitats as follows: *Tylopsis lilifolia* (Fabricius, 1793), *Platycleis affinis* Fieber, 1853, *Platycleis grisea* (Fabricius, 1781), *Tessellana orina* (Burr, 1899), *Chorthippus dorsatus* (Zetterstedt, 1821), *Chorthippus mollis* (Charpentier, 1825); most species (13) occur in a variety of habitats including sandy wet of semi-dry areas around the lake: *Rhacocleis germanica* (Herrich-Schäffer, 1840), *Gryllus campestris* Linnaeus, 1758, *Melanogryllus desertus* (Pallas, 1771), *Oecanthus pellucens* (Scopoli, 1763), *Calliptamus italicus* (Linnaeus, 1758), *Pezotettix giornae* (Rossi, 1794), *Acrida ungarica* (Herbst, 1786), *Oedipoda caerulencens* (Linnaeus, 1758), *Aiolopus strepens* (Latreille, 1804), *Acrotylus insubricus* (Scopoli, 1786), *Omocestus minutus* (Brulle, 1832), *Omocestus rufipes* (Zetterstedt, 1821), *Euchorthippus declivus* (Brisout de Barneville, 1848); the remaining six species are narrowly connected with humid habitats, either staying on the vegetation – *Conocephalus fuscus* (Fabricius, 1793), or on the moist substrate – *Pteronemobius heydenii* (Fischer, 1853), *Tertix depressa* Brisout de Barneville, 1848, *Tertix subulata* (Linnaeus, 1758), *Tertix bolivari* (Saulcy, 1901), *Aiolopus thalassinus* (Fabricius, 1781).

The current study presents results from a two-day field observation of Orthopterans in the wetland and sandy habitats of Prespa.

In total, 11 species of bush-crickets and grasshoppers were recorded (Tab. 1). Three of them are new records for the area. The transects represent different habitats and species diversity as follows. Transect 1 (Asamati 1) – a transition from marshy meadows to sandy grasslands; Transect 2 (Asamati 2 or Grnchari) – sandy grasslands; Transect 3 (Nakolec) – wet meadows; Transect 4 (Dolno Perovo). In the last transect no orthopterans were observed therefore it is not included in Table 14.

The richest area in species were the surroundings of Asamati, where a wide variety of habitats are present, of which the moist meadows and small swamps represent habitats of higher value. The other three transects represented ruderal meadows in the vicinity of agricultural land (apple plantations), of which two supported only two species each, and one was lacking any orthopterans. In addition to the poor habitat type supporting most tolerant species, an ongoing insecticide treatment was observed along transect 4 (Dolno Perovo), which might be the reason for absence of orthopterans.

The most interesting species is *Chorthippus* sp. (*albomarginatus* group). As during our visit only nymphs and a single female were found, and this group includes a few morphologically similar species, whose identification relies on the male's song, this taxon is left unidentified. Two species of this genus occur in neighboring areas of the Balkan Peninsula – though the more common *Chorthippus oschei* Helversen, 1986 is expected, a local endemic species, *Chorthippus lacustris* La Greca & Messina, 1975, known from the surroundings of a few places in Epirus, Greece, cannot be excluded.

The following conclusions may be drawn from the study:

- A short study revealed three species previously not recorded for Prespa and a more detailed study would not only reveal the species composition in the wetlands of Prespa but will also clarify the species composition in different habitats.
- The species richness was highly dependent on the variety and natural state of habitats. Intensive agricultural practices in the area result in striking decreases in the diversity of orthopterans.

Table 14 List of bush-crickets and grasshoppers (Orthoptera) in the wet meadows of Prespa and relative population density per transect (locality) [(scale of 1 (low) to 5 (high)]

Species	Transect 1	Transect 2	Transect 3	Habitat
1. ***Acrotylus insubricus*** **(Scopoli, 1786)**	3			open sand and sandy grassland
2. ***Chorthippus*** **sp.** ***albomarginatus*** **group**	2			wet meadows and marsh
3. ***Chorthippus bornhalmi*** **Harz, 1971**	3	2		sandy grassland and meadows
4. ***Conocephalus fuscus*** **(Fabricius, 1793)**	3			marsh
5. ***Euchorthippus declivus*** **(Brisout de Barneville, 1848)**	3			semi-dry meadows
6. ***Metrioptera [Vichetia] oblongicollis*** **(Brunner von Wattenwyl, 1882)**	3			wet meadows
7. ***Omocestus minutus*** **(Brulle, 1832)**	4		5	open sand and sandy grassland
8. ***Omocestus rufipes*** **(Zetterstedt, 1821)**	3			wet meadows
9. ***Pezotettix giornae*** **(Rossi, 1794)**	3			wet meadows
10. ***Pseudochorthippus parallelus*** **(Zetterstedt, 1821)**	5	5	5	wet meadows
11. ***Tettigonia viridissima*** **(Linnaeus, 1758)**	1			wet meadows
Total species	**11**	**2**	**2**	

8 Survey of public opinion and consideration of the socio-economic aspects of mowing wet meadows (Questionnaire)

Before embarking on any field activities, we conducted a brief survey of public opinion. The survey was conducted in the form of a face-to-face questionnaire with local residents. With this research we wanted to know if the locals are aware of the presence of wet meadows near them and if they use ecosystem services from them.

8.1 Methodology (Questionnaire)

Since the potential commercial use of wet meadows is an important aspect of this study, we recognized the importance of the public opinion, particularly of land-owning locals, by conducting a quantitative PAPI (Face to face) survey. Having such socio-economic insight will importantly help reveal synergies and therefore potential collaborators. Interviews were made

in Resen Municipality with 59 respondents. The sample was predetermined from the national Agency for Real Estate Cadastres' database (Table 15). Owners of "meadow land" in the Prespa region were the targeted group of local inhabitants.

Table 15 Overview of the parameters for the conducted questionnaire

Location	**Prespa region / Municipality of Resen**
Data collection method	Interviewing "face to face" in the respondent's homes
Exemplary Universe	Residents in the following settlements in the Prespa region: Gorno Perovo, Gorna Bela Crkva, Grnchari, Dolno Perovo, Drmeni, Ezerani, Jankoec, Lavci, Podmochani, Pervvenik, Rajca, Stenje and Carev Dvor.
Temporary framework	List of meadow owners according to AREC (Agency for Real Estate Cadastre) of MKD.
Sample type	Sample in two stages
1st Stage: PSU	Territory of the settlements: Gorno Perovo, Gorna Bela Crkva, Grnchari, Dolno Perovo, Drmeni, Ezerani, Jankoec, Lavci, Podmochani, Pervvenik, Rajca, Stenje and Carev Dvor
2nd Stage: TSU	Household member 18+ who owns meadows according to AREC[3] of MKD.
Stratification	Stratum: age group, number of household members, household structure, job status of the respondent, occupation of the respondent
Sample Size	59 respondents

PSU - Polling sample unit; TSU - Target sample unit; Agency for Real Estate Cadastre

8.1.1 Sample allocation

List of owners of wet meadows in the Prespa region was created and used as basis for the sampling. The field sample allocation was made in order to find the most suitable meadow owners who would accept to answer the survey questions. The sample allocation was fully conducted in rural areas in the Prespa region (Table 16).

Table 16 Number of individuals interviewed per settlement

Populated area	**Number of surveys**	**% of conducted surveys in each populated area from the total number of surveys**
Gorno Perovo	6	10.2
Gorna Bela Crkva	4	6.8
Grnchari	2	3.4
Dolno Perovo	11	18.6
Drmeni	9	15.3
Ezerani	2	3.4
Jankoec	1	1.7
Lavci	3	5.1
Podmochani	9	15.3
Pokrvenik	2	3.4
Rajca	1	1.7

Stenje	5	8.5
Carev Dvor	4	6.8
TOTAL	**59**	**100.0**

8.1.2 Collection and control of data

The data were collected by Lazar Nikolov and Daniela Zaec, who have previous experience in conducting environmental questionnaires. The interviews were conducted with direct face to face contact with the respondent.

8.1.2.1 Description of field work control and quality control

Field work control was entirely done by the interviewers. They were responsible to fully respect the following keys to the questionnaire and to note all answers originally, as stated by the respondents. Respecting the consistency in the process of conducting the questionnaire, lead to complete and successful implementation. The results have high degree of reliability, thereby satisfying the maximum quality requirements.

Data control and quality was overseen by experienced surveyors who assisted in this process. The following steps were taken prior to data analysis:

i. interactive logic and consistency control, where this approach allows 100% complete and automatic control with the programming and implementation of the questionnaire in SPSS software

ii. data processing will include:

a) cross-referencing the data by all relevant criteria regarding stratification of the sample

b) statistical analysis in SPSS.

8.2 Results from the questionnaires

Main results of the questionnaire are summarized below:

- Out of 59 respondents, almost 90% claim to be meadow owners, while 10% claim to have no meadows in their land possessions. Bearing in mind that the target group is exclusively made up of meadow owners (according to MKD AREC data), the 10% difference suggests that the national AREC data is not updated or that meadow owners reject to declare meadow ownership.
- 43.4% of the respondents who declared to be meadow owners, possess meadow/meadows with a total surface area of up to 1 ha, 28.3% possess between 1 - 5 ha, 7.5% possess meadows with a total survace area between 6 - 10 ha and 20.8% claim to own meadows with a surface area of over 10 ha.
- 35.6% of all respondents are engaged in cattle breeding, of which 72.7% have over 15 years of experience and practice.
- Respondents who breed domestic animals, most of them keep cows (59.1%), sheep (36.4%), goats (13.6%), chickens (4.5%) and pigs (4.5%).

- Out of the respondents who own meadows, 44% mow the meadows, while the remaining 56% do not mow them at all. All 56% declared that they have no need for hay which is the main reason why they do not mow their meadows.
- Out of all respondents who declared meadow ownership, 43% stated the intent to continue to mow the meadows, while others do not have such plans. On the other hand, of all meadow owners that do not mow their meadows (56%), 54% stated that they would mow meadows if they received subsidies for this activity.
- Out of the respondents who mow the meadows, 75% declared that they use the hay for household purposes, while only 4.2% are selling it. 20.8% of these respondents stated that they use the hay for both domestic needs and for sale (combined).
- Of the respondents who mow the meadows (41% of all respondents), 87.5% mow meadows by themselves, while 12.5% hire mowers. 87.5% mow meadows by using mechanization, while 12.5% mowed them manually.
- Of all respondents who mow meadows, as much as 75% do not enrich meadows with fertilizers. The rest (25%) enrich them with: 8.3% with manure and 16.7% with fertilizer.
- All 41% of the respondents who mow their meadows, do so once a year in June.
- In order to examine the satisfaction or attitudes of the owners of meadows that were mowed (41% of all respondents), statements were read where they should state how much they agree or disagree (in grade) with the given statement. The following evaluations are crucial:
    - Half of these respondents (58.3%) disagree or partially disagree that "The situation in livestock breeding in our region is currently favorable"
    - 91.3% of them completely agree that by mowing the meadows they manage to provide enough food for their livestock
    - 91.7% of them completely and partially agree that the meadows they mow give enough hay depending on the year.
    - 87.5% fully or partially agree that the meadows they own are in excellent condition
    - Regarding the assessment of the statement “The meadows I own are overgrown with other plants and trees”, the claims are almost even in both extremes: 41.7% disagree or partially disagree, 8.3% neither agree nor disagree while 50% partially or completely agree
    - In terms of assessing the statement “Mowing the meadows is a practice less used in animal husbandry”, the claims are almost even in both extremes: 41.7% disagree or partially agree, 12.5% neither agree nor disagree while 45.8% partially or completely agree
    - Even 87.5% disagree or partially disagree with the statement “If I have more hay I would have nowhere to sell it”
- Of all respondents who mow meadows, 83.3% agree with the statement that they will mow the same meadows they have mowed hitherto, while 16.7% of them claim that they would require more mowers for their needs.
- Of the respondents who mow meadows, 92% are interested in mowing more meadows, if they receive subsidies

8.3 General conclusions and recommendations

It should be noted that the following recommendations and conclusions were obtained as a result of the analysis of the answers given by the respondents in the conducted Questionnaire. It was especially important to consider the opinions of respondents who mow meadows and those who do not practice mowing.

- Subsidizing meadow mowing activities can be applied in some respects:
    - Generally in terms of all meadow owners who use meadows for their needs
    - Target only livestock breeding meadow owners
- Regarding the allocation of meadow owners, other than the cadastral data we used as a starting point, there is no other database or platform that unites meadow owners. It is necessary to create a network of active users of meadows through which successful subsidizing of the mowing activities can be established.
- According to the size of the area owned by meadow owners in the Prespa region, there is potential to establish a measure to support meadow mowing in the form of subsidies
- 1/3 of the owners of meadows are engaged in livestock breeding, half of which keep large livestock (cows). This is a good starting point for establishing a subsidy measure.
- Meadow owners need to mow the meadows (especially those involved in livestock breeding) as this activity fully satisfies their needs for animal food and intent to continue this activity. This applies to 87% of respondents who already practice this activity.
- Despite the fact that the respondents do not fertilize the meadows, they still manage to get enough hay for their own needs. In case of higher demand, farmers should turn to previously identified unmanaged meadow surfaces that would benefit from mowing or other management practices.
- The practice of informing farmers about the negative effect of fertilizing wet meadows on the lake waters quality, should be introduced.
- More than half of the respondents are not satisfied with the current situation of livestock breeding in the Prespa region. Subsidies should stimulate livestock breeding in the Prespa region, which would in turn stimulate mowing of meadows, i.e. management that would regularly remove nutrients from the ecosystem.
- Almost all respondents who mow meadows are aware that their crops have the potential to provide fodder for their needs. Additionally they consider their meadows to be in excellent condition, which points to the fact that those meadows already covered by mowing have the potential to increase hay yield, if appropriate training is applied.
- Almost all respondents agree that if the institutional authorities helped to open markets for the sale of hay in the wider region, they would mow more meadows.

9 Recommendations for future activities and management of wet meadows

The collected information on the ecological characteristics of wet meadows in the present report gives insight of basic parameters which are valuable for future management activities. The proposed recommendations and conclusions are a sublime of previous similar research (studies and other literature), the results of our research on the distribution and biomass of wet meadows in Prespa and the traditional practices of the local population.

However, this study should be amended by the following research activities:

- Analyses of soil chemistry (carbon, nitrogen, phosphorus content as well as content of some biogenic cations: K, Mg, Ca, etc.)
- Analyses of plant chemistry (carbon, nitrogen, phosphorus content as well as content of some biogenic cations: K, Mg, Ca, etc.)
- Estimation of the mowing of wet meadows on removal of nutrients
- Investigation of soil hydrology and hydrochemistry
- Estimation of pesticides in ground water and plant biomass
- Further research of diversity of species within different taxonomic groups and setting up monitoring schemes

After taking into account all the analyzed information and results, we constructed a framework with proposed activities for next year:

- Removal of overgrowth in selected meadows in order to prevent the succession due to the abandonment of mowing practices. This is the most appropriate activity for 2020.
- Stimulate summer mowing of wet meadows in order to use the biomass for fodder. This activity should be planned in 2020 and implemented afterwards. Through this activity it is planned to raise awareness among meadow mowers about the importance of removing hay from meadows to reduce the eutrophication of the lake.

  The best option is to start a pilot activity within Ezerani Nature Park. For this purpose a wet meadow(s) in state property should be selected. The most important (according to surface and biomass) is the *Calamagrostis epigeios* community. The Municipality of Resen should inform Ministry of Environment and Physial Planning. The main goals of this activity should be:

  - Nutrient dislocation by removal of plant biomass (after chemical analysis of plant material we will estimate the exact quantities of the main nutrients), in order to assess the impact of meadows on the eutrophication of the lake.
  - maintenance of meadows (mowing and grazing is the primary activity that sustains wet meadows), combined with monitoring in order to detect positive/negative trends on the community and of particular species
  - provision of fodder for local people (cooperation with 1-2 farmers should be established)
- Conduct monitoring in the changes of biodiversity
- Conduct monitoring for the changes in nutrient levels

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11 Appendices

11.1 Questionnaire forms and analyses

Прашалник за утврдување на користење на влажни ливади во преспанскиот регион

АНКЕТЕН ПРАШАЛНИК

Демографија

Претставување: *Добар ден. Јас сум AAAAA и работам за AAAAA. Во рамките на проектот "AAAAA", во моментов работиме на истражување во кое го забележуваме користењето на влажните ливади од страна на населението во преспанскиот регион. Бидејќи вашето мислење ни е многу важно, ќе во поставиме неколку прашања кои се однесуваат на оваа тема.*

1. **Дали вие или некој од вашето семејство поседува ливади?**
   1. Да => продолжи на прашање 2
   2. Не => крај на прашалникот

2. **Колку ливади поседувате** *(да се запише површина, декари, ари, хектари квадрати)*

   _____

3. **Пол**
   1. Машки
   2. Женски

4. **Возраст** _____(години)

5. **Место на живеење**
   - Општина _____, населено место _____

6. **Образование**
   1. Основно
   2. Средно
   3. Високо

7. **Колку членови живеат во вашето домаќинство?**
   1. 1 член
   2. 2 члена
   3. 3 членови
   4. 4 членови
   5. 5 и повеќе членови

8. **Структура на домаќинство?**
   1. Живее сам
   2. Живее со партнер
   3. Живее деца со/или без партнер
   4. Живее со родители
   5. Живее во повеќегенерациско домаќинство

9. **Работен статус**
   1. Вработен
   2. Невработен
   3. Студент
   4. Домаќинка
   5. Пензионер

10. **Занимање**

_____

11. **Дали се занимавате со сточарство?**
    1. Да => продолжи на прашање 12
    2. Не => крај на прашалникот

12. **Колку години се занимавате со сточарство?** *(да се запишат години)*

_____

13. **Каква стока поседувате на вашиот имот?** *(можни се повеќе одговори)*
    1. *Крави*
    2. *Овци*
    3. *Кози*
    4. *Свињи*
    5. *Кокошки*
    6. *Друго*

14. Колку стока имате на вашиот имот *(да се запише бројката на добиток кој е наведен го поседува во претходното прашање)*

_____
_____

15. **Дали ливадите кои ги поседувате ги косите?**
    1. Да => продолжи на прашање 19
    2. Не => продолжи на прашање 16

16. **Зошто не ги косите ливадите?**

_____
_____

17. **Дали имате намера да ги косите ливадите во иднина?**
    1. Да => продолжи на прашање 17
    2. Не => продолжи на прашање 16

18. **Дали би ги коселе ливадите доколку би добивале субвенции?**
    1. Да => Крај
    2. Не => Крај

19. **За што го користите сеното кое го собирате од ливадите со косење?**
    1. За употреба во домаќинството
    2. За продавање
    3. За употреба во домаќинството и за продавање
    4. Друго. Што?_____

20. **Колку сено добивање од косењето на ливадите отприлика?** *(да се запише количина, килограми или тони)*

_____

21. **Дали ливадите ги косите сам или најмувате лица за косење?**
    1. Да ги косам сам
    2. Најмувам лица да ми ги косат
    3. Ги косам сам и со најмување на лица

22. **Дали ливадите ги косите рачно или поседувате механизација за косење?**
    1. Ливадите ги косам рачно
    2. Ливадите ги косам со косилка (механизација)
    3. Некои ливади ги косам рачно а некои со косилка

23. Дали ливадите кои ги косите ги прихранувате со ѓубрива?

1. Ги прихранувам со арско ѓубриво
2. Ги прихранувам со вештачко ѓубриво
3. Ги прихранувам и со арско и со вештачко ѓубриво
4. Не ги прихранувам ливадите со ѓубриво

24. Колку пати во годината ги косите ливадите?

1. Еднаш
2. Двапати

25. Во кој период ги косите ливадите? *(можни се повеќе одговори)*

1. Во мај
2. Во јуни
3. Во јули
4. Во август
5. Во септември

26. На скала од 1 до 5 оценете колку се согласувате или не се согласувате со следните изјави, каде 1 е воопшто не се согласувам; 2 е делумно не се согласувам; 3 ниту се ниту не се согласувам; 4 делумно се согласувам; и 5 потполно се согласувам:

колку сметате дека природата е доволно зачувана во регионот

Состојбата со сточарството во нашиот крај во моментов е поволна	1	2	3	4	5
Со косењето на ливадите успевам да обезбедам доволно храна за мојот добиток	1	2	3	4	5
Ливадите кои ги косам даваат доволно сено во зависност од годината	1	2	3	4	5
Ливадите кои ги поседувам се во одлична состојба	1	2	3	4	5
Ливадите кои ги поседувам се повеќе зараснуваат со други растенија и дрва	1	2	3	4	5
Косењето на ливадите е пракса која се помалку се користи во сточарството	1	2	3	4	5
Доколку имам повеќе сено имам каде да го продадам	1	2	3	4	5

27. Кога последен пат ги косевте ливадите?

1. Оваа година
2. Минатата година

28. Дали имате намера и понатаму да ги косите ливадите?

1. Да
2. Не

29. Дали во блиска иднина имате намера:

1. Да ги косите сите ливади кои досега ги косевте
2. Да побарате повеќе ливади од други за косење за вашите потреби
3. Да косите помалку ливади од оние кои досега сте ги коселе

30. Дали би сакале да добивате субвенции за косење на ливади?

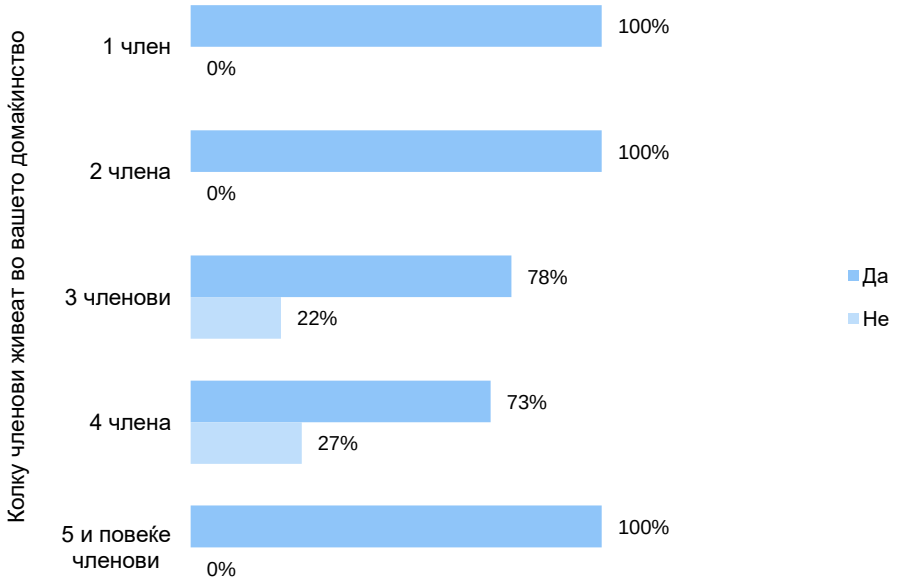
1. Да => продолжи на прашање 31
2. Не => Крај

31. Дали доколку добивате субвенции, би коселе повеќе ливади?

1. Да
2. Не

1. Дали вие или некој од вашето семејство поседува ниви?

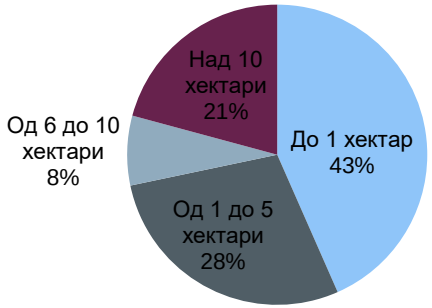
База: Сите испитаници

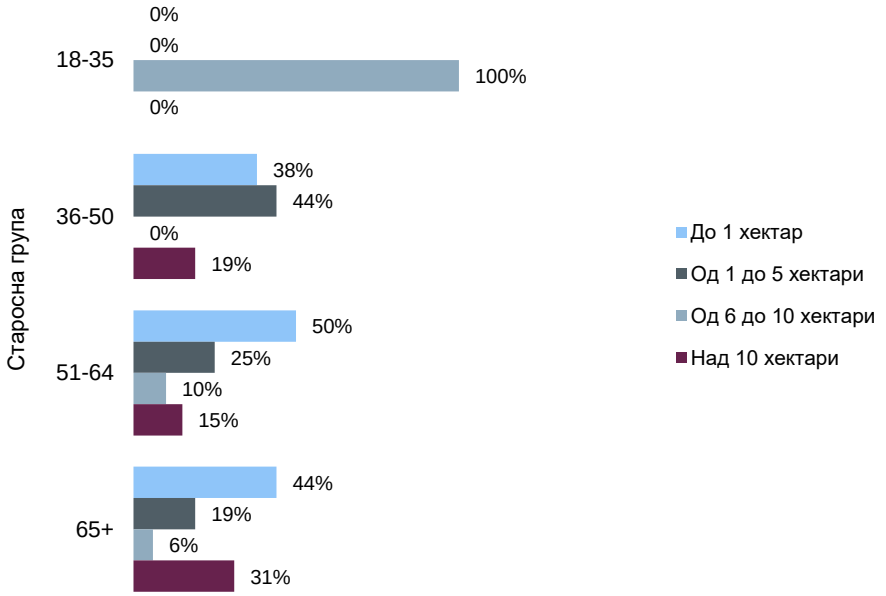


	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	59	4	17	20	18	4	11	9	15	20	4	11	10	7	27	10	25	4	20	4	4	34	17
sig		0.97				0.92					0.98					0.99				0.98			
Да	89.8	25	94	100	89	100	100	78	73	100	100	100	90	71	89	80	92	100	90	75	50	91	100
Не	10.2	75	6		11			22	27				10	29	11	20	8		10	25	50	9	
Total	100%																						

2. Колку ливади поседувате (да се запише површина во хектари, декари, ари или квадрати)?

База: 90% од испитаниците



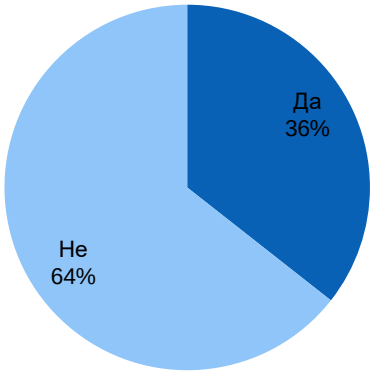


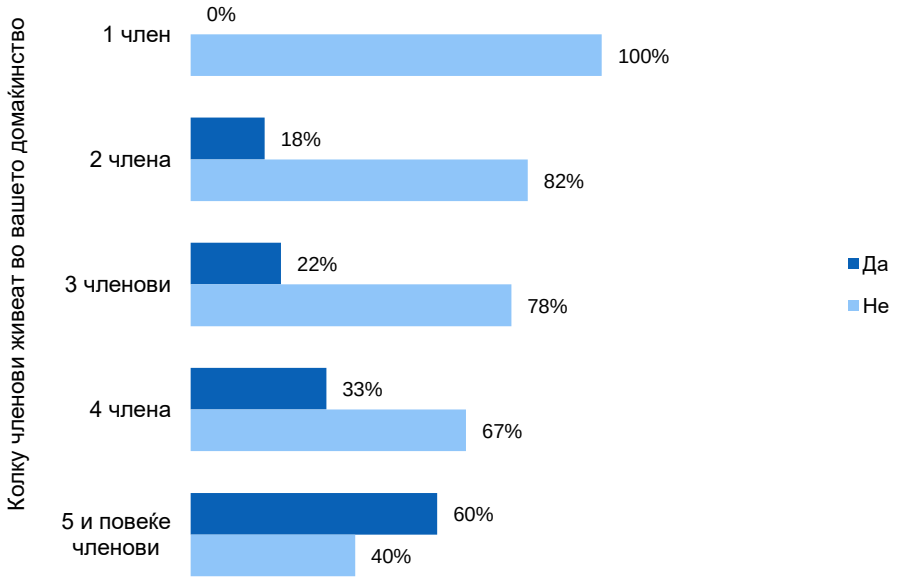
	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	53	1	16	20	16	4	11	7	11	20	4	11	9	5	24	8	23	4	18	3	2	31	17
sig		1.00				1.00					1.00					0.95				1.00			
До 1 хектар	43.4		38	50	44	75	45	29	55	35	75	45	44	20	42	25	35	75	56	33	100	42	41
Од 1 до 5 хектари	28.3		44	25	19		36	43	27	25		36	33	80	17	50	35	25	11			29	35
Од 6 до 10 хектари	7.5	100		10	6			14	9	10					17		13		6			10	6

Над 10 хектари	20.8		19	15	31	25	18	14	9	30	25	18	22		25	25	17		28	67		19	18
Total	100%																						

3. Дали се занимавате со сточарство?

База: Сите испитаници



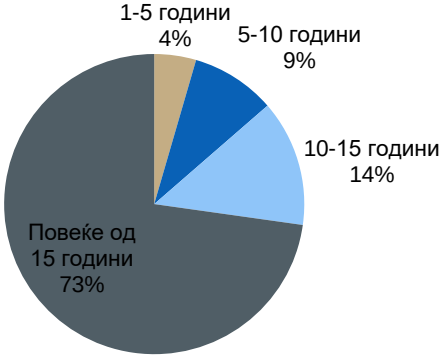


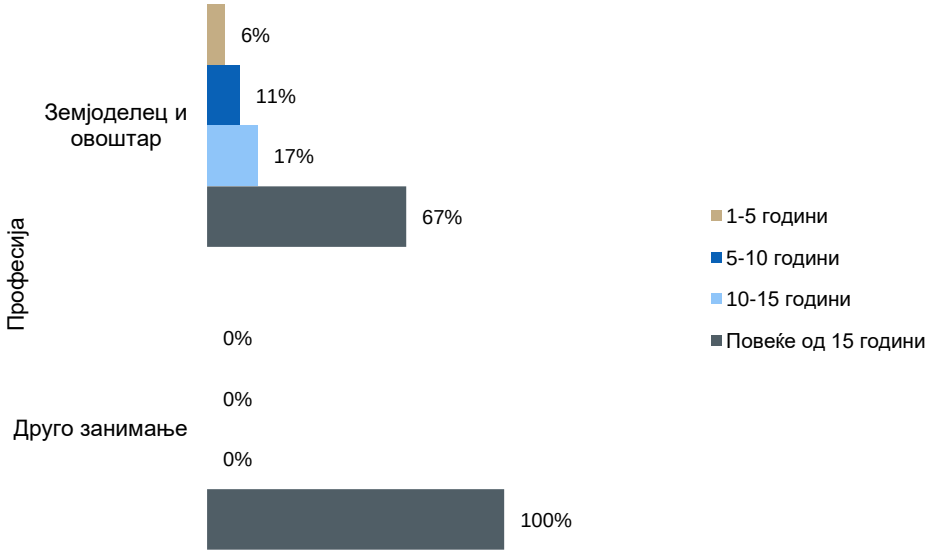
	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со [illegible]	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	59	4	17	20	18	4	11	9	15	20	4	11	10	7	27	10	25	4	20	4	4	34	17
sig		0.16				0.20					0.23					0.03				0.24			
Да	35.6	25	53	40	17		18	22	33	60		18	20	29	56	40	52	50	10			50	24

Не	64.4	75	47	60	83	100	82	78	67	40	100	82	80	71	44	60	48	50	90	100	100	50	76
Total	100%																						

4. Колку години се занимавате со сточарство? (да се запишат години)

База: 38% од испитаниците



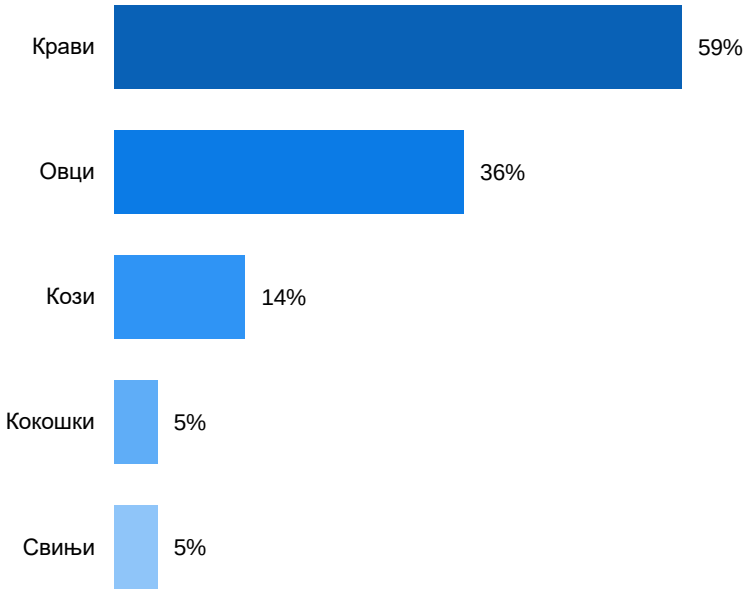


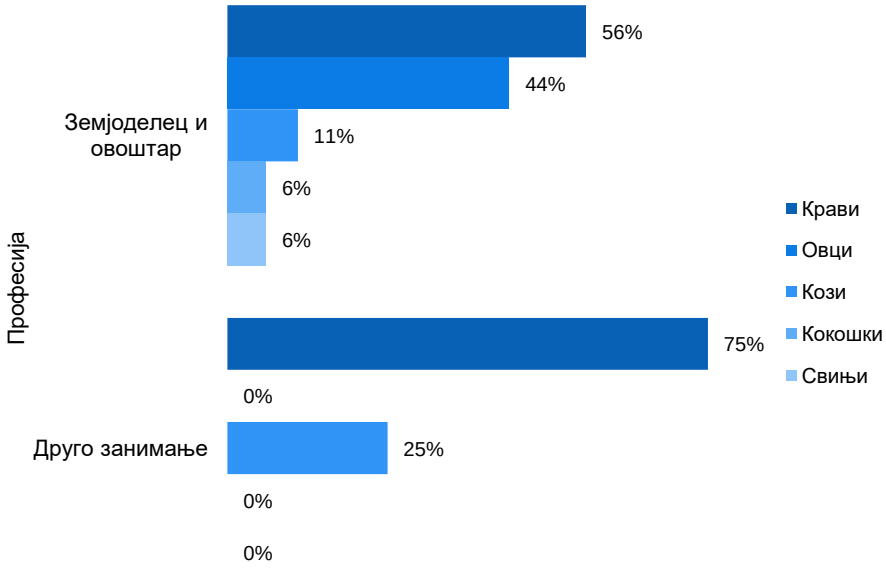
	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	22	1	9	8	4	0	3	2	5	12	0	3	2	2	15	4	13	3	2	0	0	18	4

sig		1.00				1.00					1.00					1.00				1.00			
1-5 години	4.5		11					50							50			8					6	
5-10 години	9.1			25						17						13		15					11	
10-15 години	13.6		22		25		33	50		8		33		50	7		15	33					17	
Повеќе од 15 години	72.7	100	67	75	75		67		100	75		67	100		80	100	62	67	100			67	100
Total	100%																						

5. Каква стока поседувате на вашиот имот? (можни се повеќе одговори)

Повеќе одговори; База: 38% од испитаниците





	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	22	1	9	8	4	0	3	2	5	12	0	3	2	2	15	4	13	3	2	0	0	18	4

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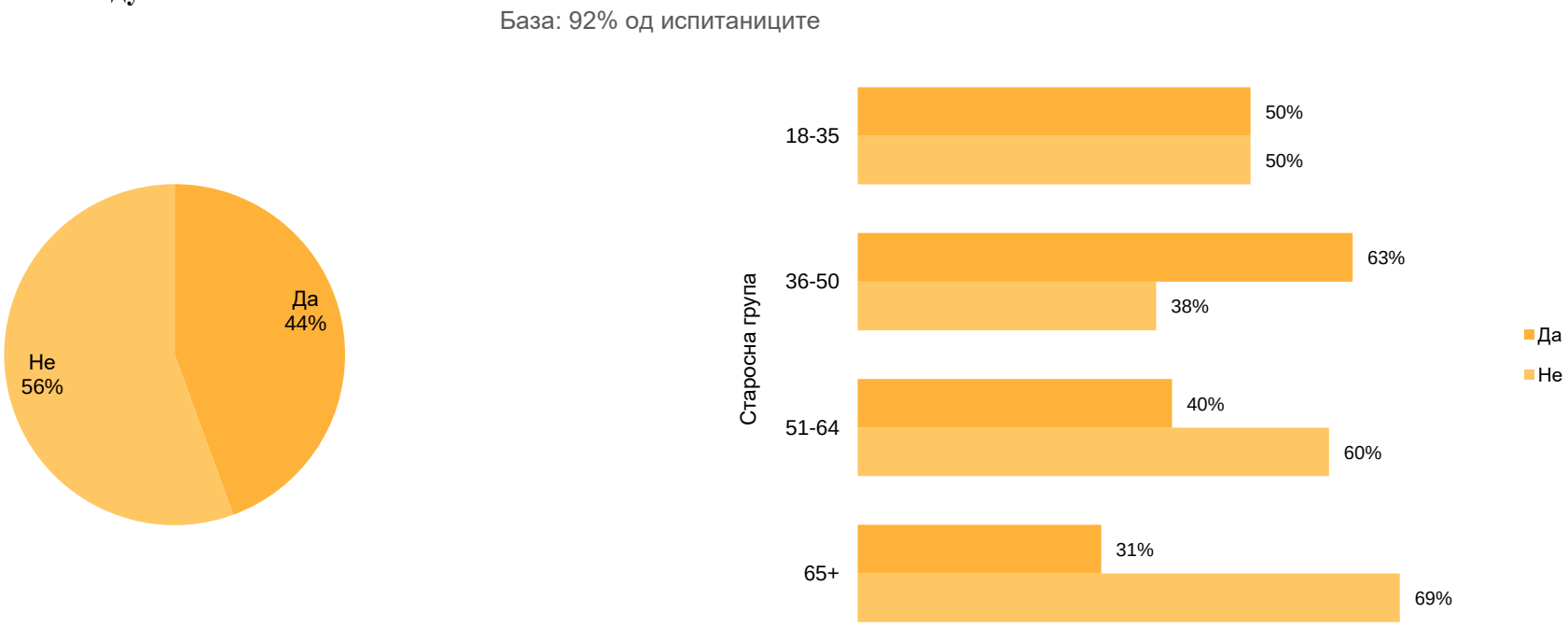
Крави	59.1	100	78	38	50		67	50	60	58		67	100	50	53	75	54	67	50			56	75
Овци	36.4	100	22	50	25		33	50	20	42		33		50	40		62					44	
Кози	13.6		11	25					20	17					20	25	8	33				11	25
Кокошки	4.5	100								8					7		8					6	
Свињи	4.5				25					8					7				50			6	

6. Дали ливадите кои ги поседувате ги косите?

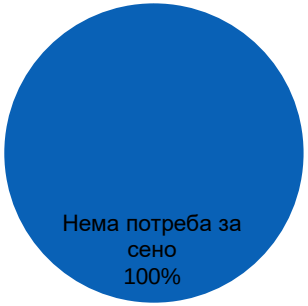


	Total	Старосна група	Колку членови живеат во вашето домаќинство	Структура на домаќинство	Работен статус	Професија

		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со [illegible]	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	54	2	16	20	16	4	11	7	12	20	4	11	9	5	25	9	23	4	18	3	2	32	17
sig		0.33				0.31					0.20					0.31				0.34			
Да	44.4	50	63	40	31	25	18	43	42	65	25	18	22	60	64	56	57	25	28	33		56	29
Не	55.6	50	38	60	69	75	82	57	58	35	75	82	78	40	36	44	43	75	72	67	100	44	71
Total	100%																						

6 а. Доколку одговорот на предходното прашање е НЕ, зошто не ги косите ливадите?

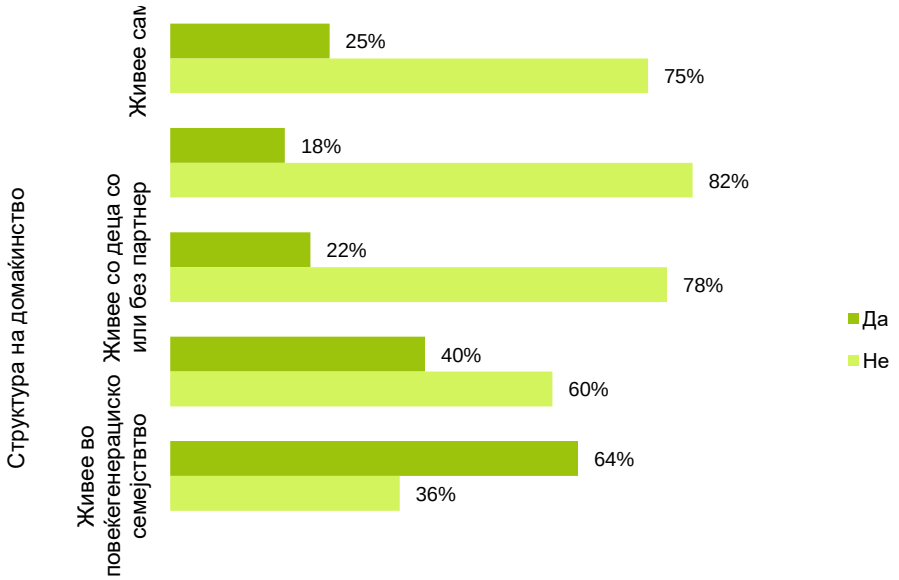
База: 53% од испитаниците



	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	31	1	7	12	11	3	9	5	7	7	3	9	7	3	9	5	10	3	13	2	2	15	12
sig		Na				Na					Na					Na				Na			
Нема потреба за сено	100.0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total	100%																						

7. Дали имате намера да ги косите ливадите во иднина?

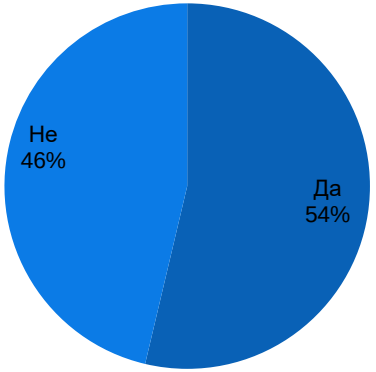
База: 92% од испитаниците

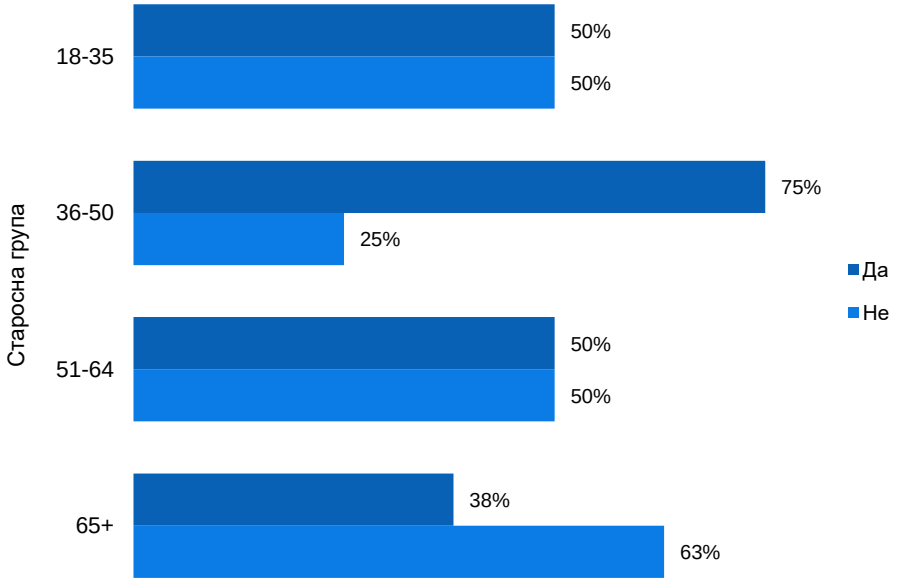


	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со [illegible]	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	54	2	16	20	16	4	11	7	12	20	4	11	9	5	25	9	23	4	18	3	2	32	17
sig		0.55				0.26					0.17					0.33				0.45			
Да	42.6	50	56	40	31	25	18	29	42	65	25	18	22	40	64	44	57	25	28	33		53	29
Не	57.4	50	44	60	69	75	82	71	58	35	75	82	78	60	36	56	43	75	72	67	100	47	71
Total	100%																						

8. Дали би ги коселе ливадите доколку добивате субвенции?

База: 92% од испитаниците

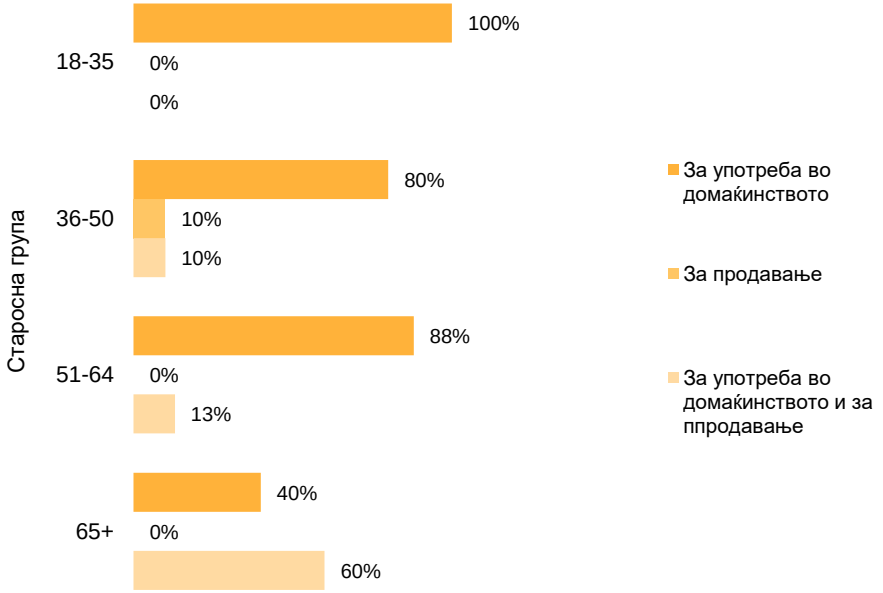




	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со [illegible]	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	54	2	16	20	16	4	11	7	12	20	4	11	9	5	25	9	23	4	18	3	2	32	17
sig		0.19				0.33					0.67					0.15				0.94			
Да	53.7	50	75	50	38		45	57	42	75		45	33	80	68	56	70	50	33		50	59	53
Не	46.3	50	25	50	63	100	55	43	58	25	100	55	67	20	32	44	30	50	67	100	50	41	47
Total	100%																						

9. За што го користите сеното кое го добивате од ливадите што ги коисте?

База: 41% од испитаниците



	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со [illegible]	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
sig		1.00				1.00					1.00					1.00				1.00			
За употреба во домаќинството	75.0	100	80	88	40		100	67	80	77		100	100	67	75	80	92	100	20			78	80
За продавање	4.2		10							8					6		8					6	

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За употреба во домаќинството и за ппродавање	20.8		10	13	60	100		33	20	15	100			33	19	20			80	100		17	20
Total	100%																						

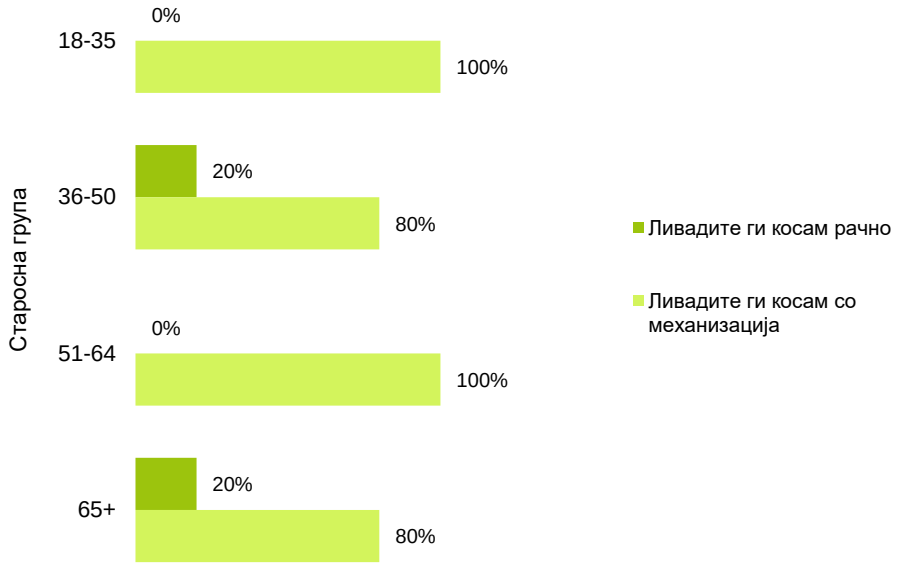
10. Дали ливадите ги косите сам или најмувате лица за косење?

База: 41% од испитаниците

	Total	Starosna grupa				Kolku clanovi ziveat vo vaseto domakinstvo					Struktura na domakinstvo					Rabotn status				Zanimanje			
		18-35	36-50	51-64	65+	1 clen	2 clenovi	Clenovi	4 clena	5 i poveke clenovi	Ĺ″ivee sam	Ĺ″ivee so partner	Ĺ″ivee deca do 18	Ĺ″ivee so rodite	Ĺ″ivee vo	Vraboten	Nevraboten	Domakinka	Penzioner	Penzioner	Domakinka	Zemjodelec i	Drugo
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
sig		1.00				1.00					1.00					1.00				1.00			
Да, ги косам сам	87.5	100	90	88	80	100	50	100	80	92	100	50	50	100	94	100	85		100	100		83	100
Најмувам лица за косење	12.5		10	13	20		50		20	8		50	50		6		15	100				17	
Total	100%																						

11. Дали ливадите ги косите рачно или поседувате механизација за косење?

База: 41% од испитаниците



	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5

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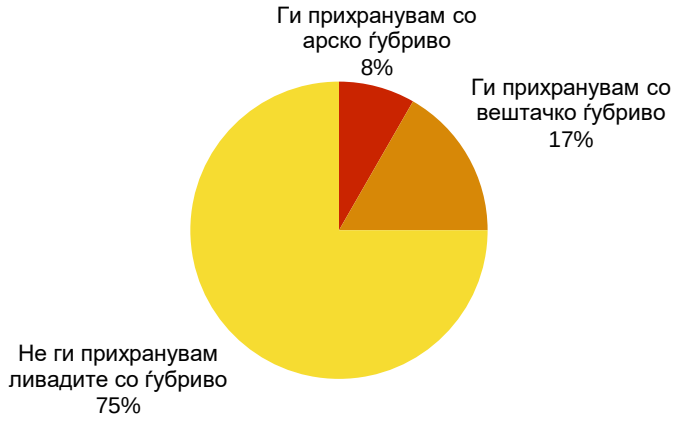
sig		0.98				1.00					1.00					0.97				0.99			
Ливадите ги косам рачно	12.5		20		20		50			15		50			13	40			20			6	40
Ливадите ги косам со механизација	87.5	100	80	100	80	100	50	100	100	85	100	50	100	100	88	60	100	100	80	100		94	60
Total	100%																						

12. Дали ливадите кои ги косите ги пприхранувате со ѓубрива?

База: 41% од испитаниците

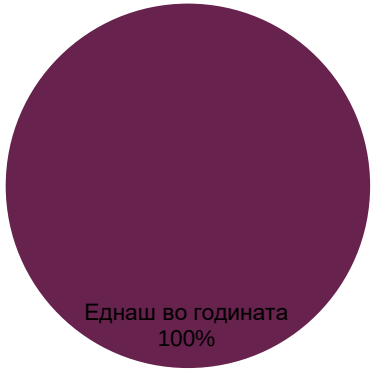


	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
sig		1.00				1.00					1.00					1.00				1.00			

Ги прихранувам со арско ѓубриво	8.3			25					40				50		6	20	8					6	20
Ги прихранувам со вештачко ѓубриво	16.7	100	30							31					25		23	100				22	
Не ги прихранувам ливадите со ѓубриво	75.0		70	75	100	100	100	100	60	69	100	100	50	100	69	80	69		100	100		72	80
Total	100%																						

13. Колку пати во годината ги косите ливадите?

База: 41% од испитаниците



	Total	Старосна група	Колку членови живеат во вашето домаќинство	Структура на домаќинство	Работен статус	Професија

		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
sig		Na				Na					Na					Na				Na			
Еднаш во годината	100.0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100
Total	100%																						

14. Во кој период ги косите ливадите? (можни се повеќе одговори)

Повеќе одговори; База: 36% од испитаниците

	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	21	1	7	8	5	1	2	2	5	11	1	2	2	2	14	3	13	0	5	1	0	16	4
Во јуни	100.0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100		100	100
Во јули	4.8	100								9					7		8					6	

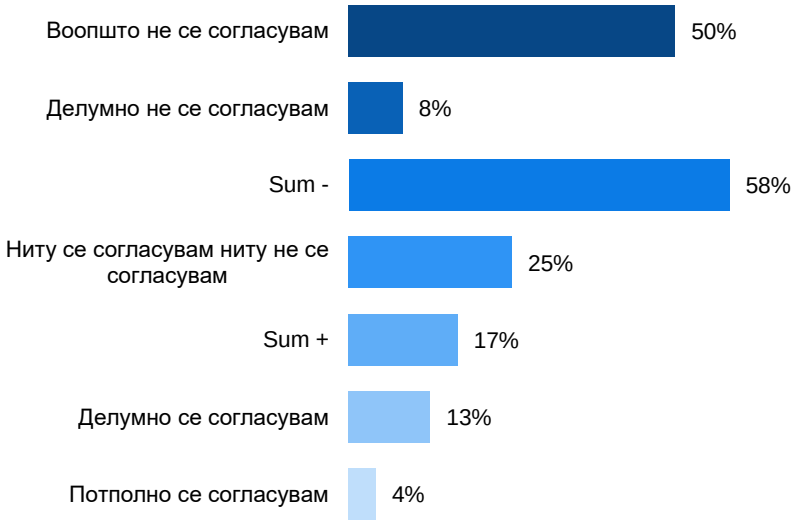
15. Сумарен табеларен приказ на оценување на изјави од страна на испитаниците

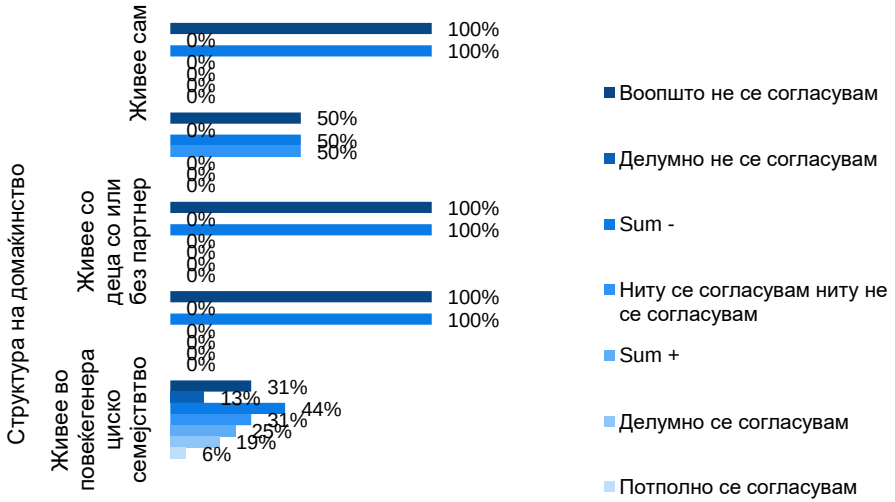
База: 41% од испитаниците

	N	Воопшто не се согласувам	Делумно несе согласувам	Ниту се согласувам ниту не се согласувам	Делумно се согласувам	Потполно се согласувам	Total
Оценете ги следниве изјави: Состојбата во сточарството во нашиот крај моментално е поволна	24	50.0	8.3	25.0	12.5	4.2	100%
Оценете ги следниве изјави: Со косењето на ливадите успевам да обезбедам доволно храна за мојот добиток	24		4.2	4.2	8.3	83.3	
Оценете ги следниве изјави: Ливадите кои ги косам даваат доволно сено во зависност од годината	24		4.2	4.2	37.5	54.2	
Оценете ги следниве изјави: Ливадите кои ги поседувам се во одлична состојба	24		4.2	8.3	25.0	62.5	
Оценете ги следниве изјави: Ливадите кои ги поседувам се повеќе зараснуваат со други растенија и дрва	24	29.2	12.5	8.3	29.2	20.8	
Оценете ги следниве изјави: Косењето на ливадите е пракса која се помалку се користи во сточарството	24	12.5	29.2	12.5	25.0	20.8	
Оценете ги следниве изјави: Доколку имам повеќе сено имам каде да го продадам	24	54.2	33.3	4.2	8.3		

16. Оценете ги следниве изјави: Состојбата во сточарството во нашиот крај моментално е поволна!

База: 41% од испитаниците

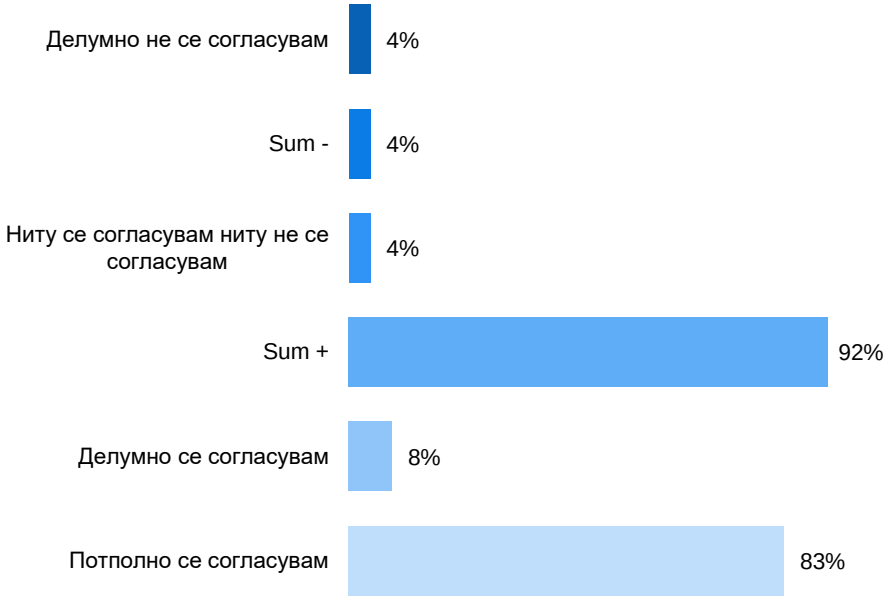


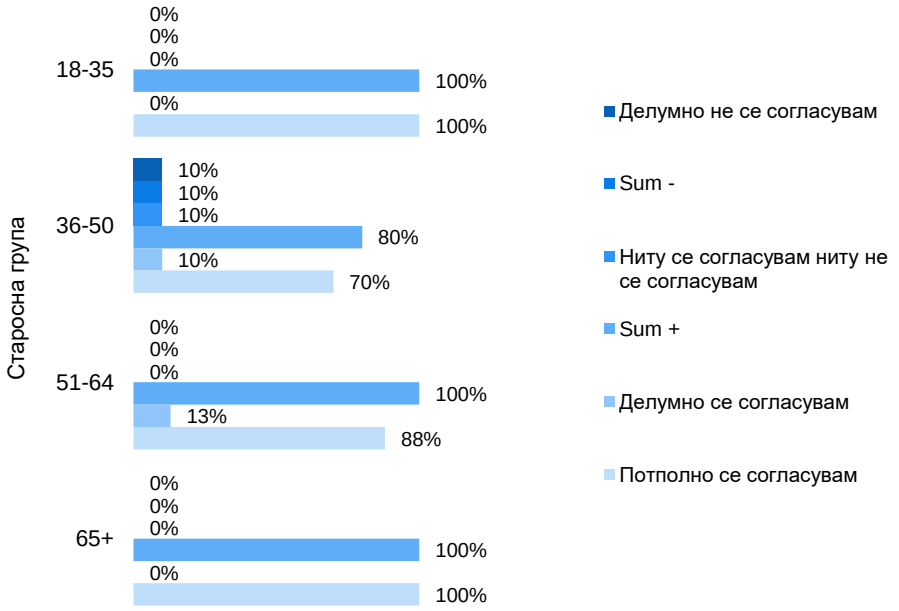


	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со деца или без	Живее со родители	Живее во повеќегенерациско	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и овоштар	Друго занимање
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Воопшто не се согласувам	50.0		60	50	40	100	50	100	60	31	100	50	100	100	31	40	62	100	20	100		61	
Делумно не се согласувам	8.3		10	13						15					13	20	8					6	20
Sum -	58.3		70	63	40	100	50	100	60	46	100	50	100	100	44	60	69	100	20	100		67	20
Ниту се согласувам ниту не се согласувам	25.0		30	13	40		50			38		50			31	20	23		40			17	60
Sum +	16.7	100		25	20				40	15					25	20	8		40			17	20
Делумно се согласувам	12.5			25	20				40	8					19	20			40			11	20
Потполно се согласувам	4.2	100								8					6		8					6	
Total	100%																						
Mean	2.1	5.0	1.7	2.1	2.4	1.0	2.0	1.0	2.2	2.5	1.0	2.0	1.0	1.0	2.6	2.2	1.8	1.0	3.0	1.0	N	1.9	3.0

17. Оценете ги следниве изјави: Со косењето на ливадите успевам да обезбедам доволно храна за мојот добиток!

База: 41% од испитаниците



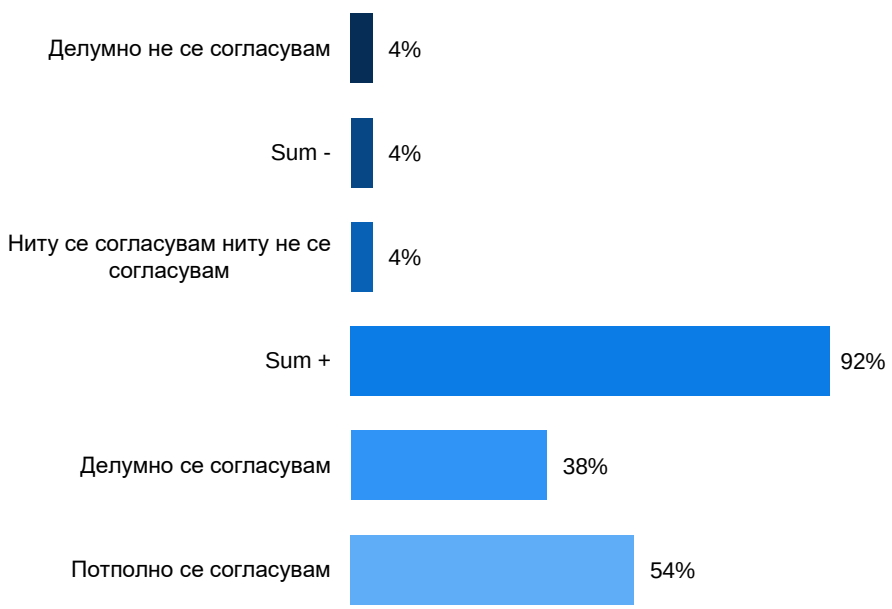


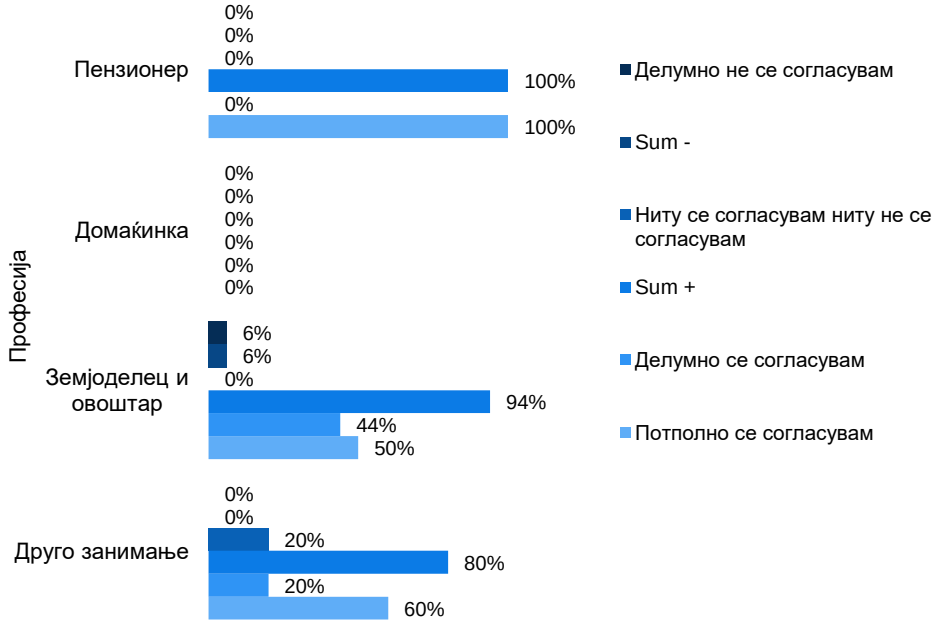
	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со деца или без	Живее со родители	Живее во повеќегенерац	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и овоштар	Друго занимање
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Делумно не се согласувам	4.2		10							8					6			100				6	
Sum -	4.2		10							8					6			100				6	
Ниту се согласувам ниту не се согласувам	4.2		10					33						33		20						6	
Sum +	91.7	100	80	100	100	100	100	67	100	92	100	100	100	67	94	80	100		100	100		89	100
Делумно се согласувам	8.3		10	13				33	20				50	33			15					11	
Потполно се согласувам	83.3	100	70	88	100	100	100	33	80	92	100	100	50	33	94	80	85		100	100		78	100
Total	100%																						

Mean	4.7	5.0	4.4	4.9	5.0	5.0	5.0	4.0	4.8	4.8	5.0	5.0	4.5	4.0	4.8	4.6	4.8	2.0	5.0	5.0	N	4.6	5.0

18. Оценете ги следниве изјави: Ливадите кои ги косам даваат доволно сено во зависност од годината!

База: 41% од испитаниците





	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со деца со или	Живее со родители	Живее во повеќегенер	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Делумно не се согласувам	4.2		10							8					6			100				6	
Sum -	4.2		10							8					6			100				6	
Ниту се согласувам ниту не се согласувам	4.2		10							8					6	20							20
Sum +	91.7	100	80	100	100	100	100	100	100	85	100	100	100	100	88	80	100		100	100		94	80
Делумно се согласувам	37.5	100	30	50	20		50	33	80	23		50	100	33	31	40	38		40			44	20
Потполно се согласувам	54.2		50	50	80	100	50	67	20	62	100	50		67	56	40	62		60	100		50	60

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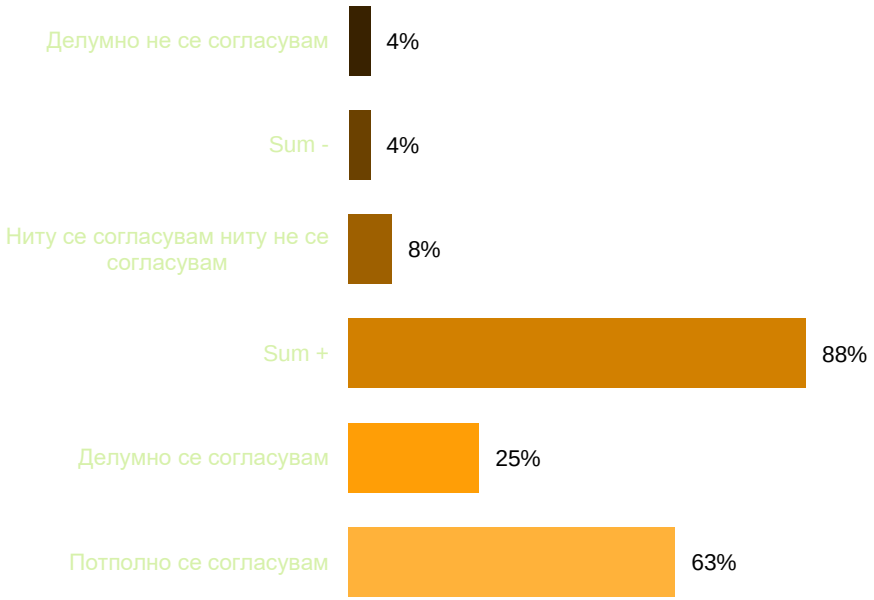
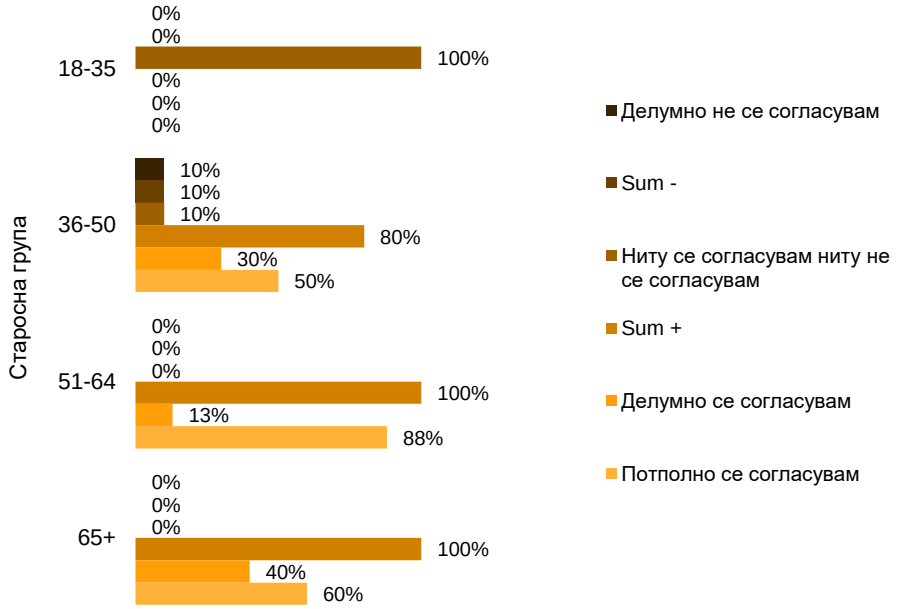
Total	100%																					
Mean	4.4	4.0	4.2	4.5	4.8	5.0	4.5	4.7	4.2	4.4	5.0	4.5	4.0	4.7	4.4	4.2	4.6	2.0	4.6	5.0	N	4.4	4.4

19. Оценете ги следниве изјави: Ливадите кои ги поседувам се во одлична состојба!

База: 41% од испитаниците





	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со деца или без	Живее со родители	Живее во повеќегенерац	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и овоштар	Друго занимање
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Делумно не се согласувам	4.2		10							8					6			100				6	
Sum -	4.2		10							8					6			100				6	
Ниту се согласувам ниту не се согласувам	8.3	100	10							15					13	20	8					6	20
Sum +	87.5		80	100	100	100	100	100	100	77	100	100	100	100	81	80	92		100	100		89	80
Делумно се согласувам	25.0		30	13	40	100		67	40	8	100		50	67	13	60	8		40	100		17	40

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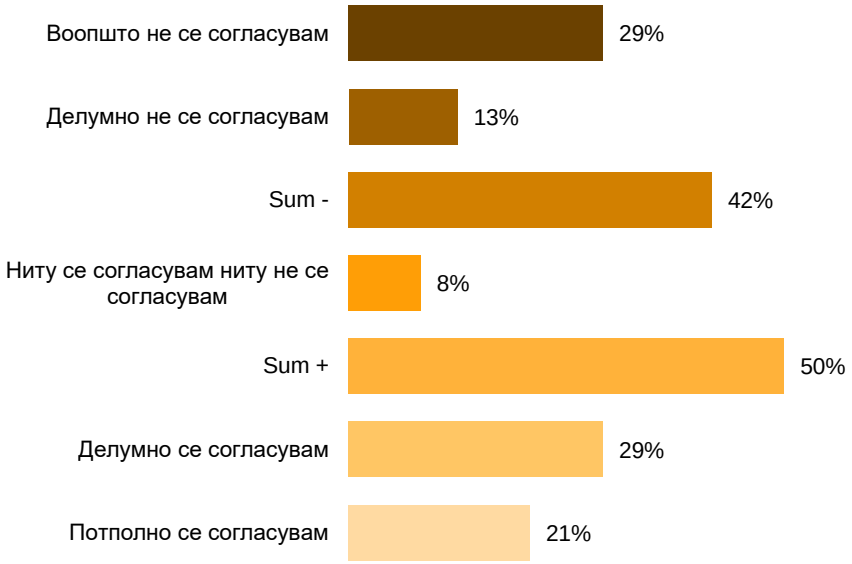
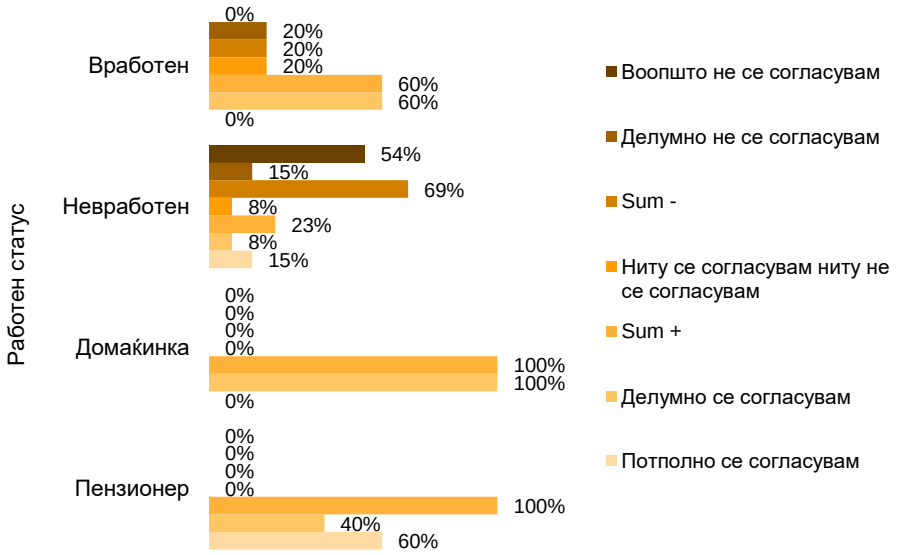
Потполно се согласувам	62.5		50	88	60		100	33	60	69		100	50	33	69	20	85		60			72	40
Total	100%																						
Mean	4.5	3.0	4.2	4.9	4.6	4.0	5.0	4.3	4.6	4.4	4.0	5.0	4.5	4.3	4.4	4.0	4.8	2.0	4.6	4.0	N	4.6	4.2

20. Оценете ги следниве изјави: Ливадите кои ги поседувам се повеќе зараснуваат со други растенија и дрва!

. База: 41% од испитаниците



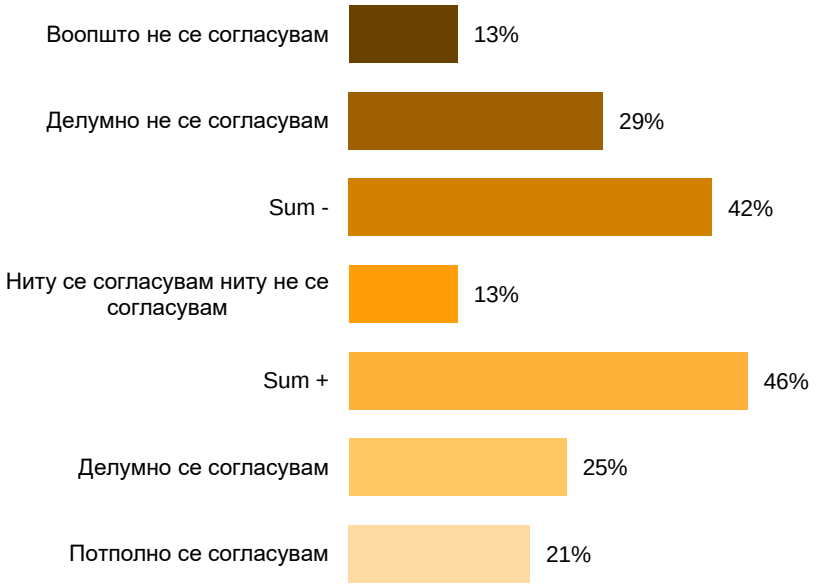


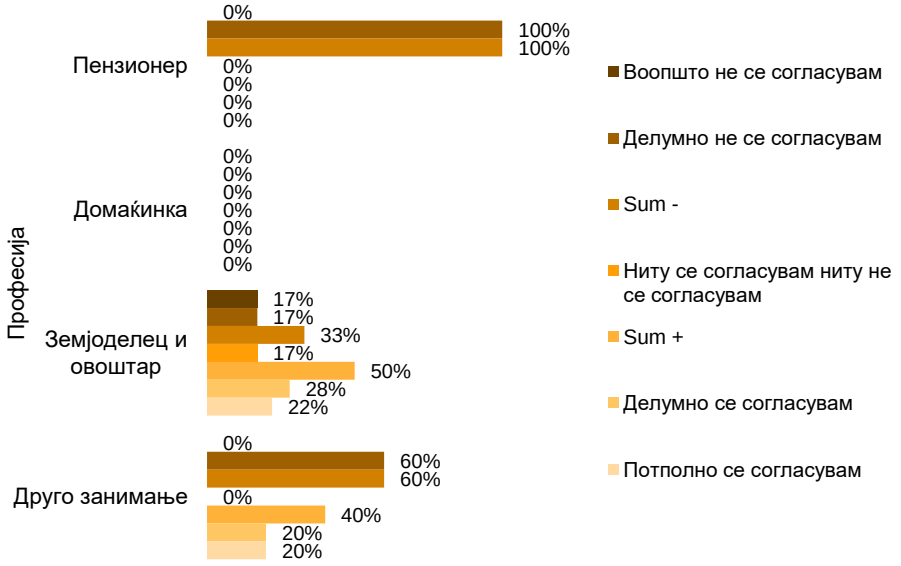
	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со деца	Живее со деца	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Воопшто не се согласувам	29.2		30	38	20		50	67	40	15		50	50	67	19		54					33	20
Делумно не се согласувам	12.5		10	25				33		15				33	13	20	15					17	
Sum -	41.7		40	63	20		50	100	40	31		50	50	100	31	20	69					50	20
Ниту се согласувам ниту не се согласувам	8.3	100	10							15					13	20	8					6	20
Sum +	50.0		50	38	80	100	50		60	54	100	50	50		56	60	23	100	100	100		44	60

Делумно се согласувам	29.2		30	25	40	100			40	31	100		50		31	60	8	100	40	100		22	40
Потполно се согласувам	20.8		20	13	40		50		20	23		50			25		15		60			22	20
Total	100%																						
Mean	3.0	3.0	3.0	2.5	3.8	4.0	3.0	1.3	3.0	3.3	4.0	3.0	2.5	1.3	3.3	3.4	2.2	4.0	4.6	4.0	N	2.8	3.4

21. Оценете ги следниве изјави: Косењето на ливадите е пракса која се помалку се користи во сточарството!

База: 41% од испитаниците



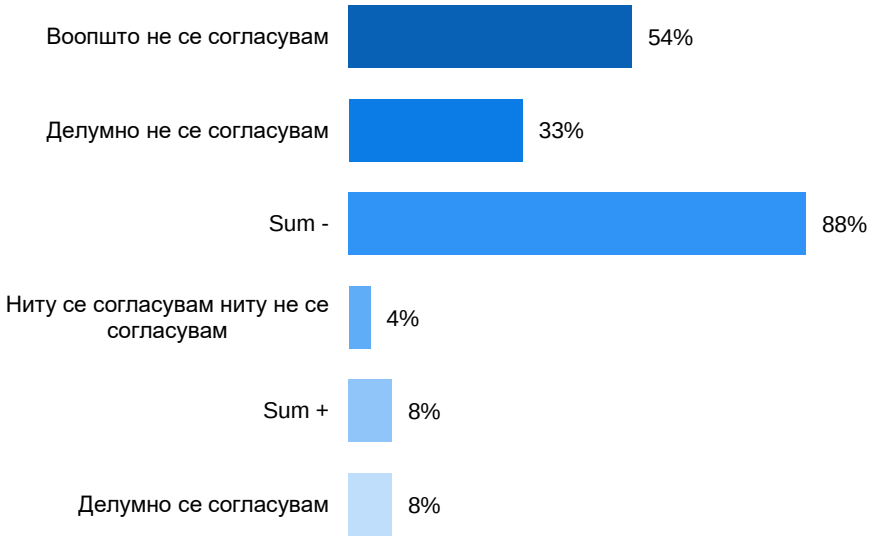


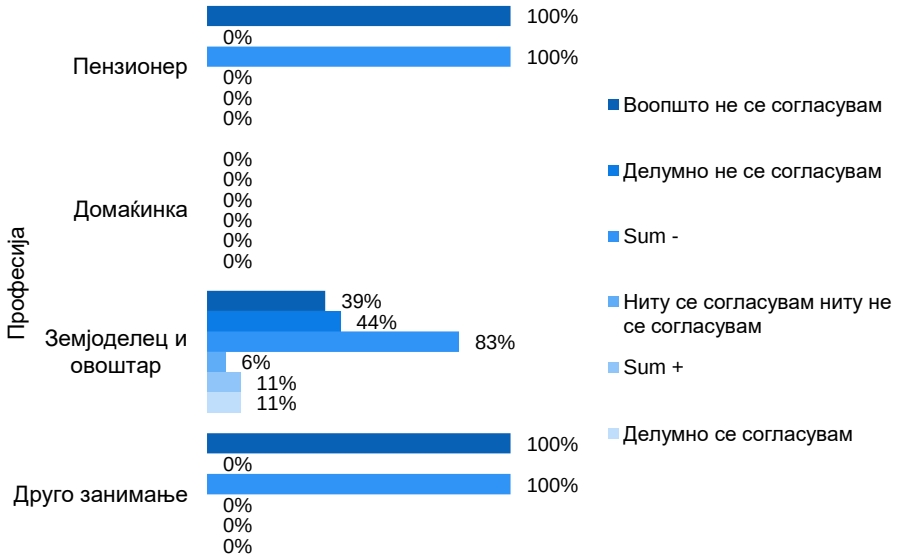
	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со деца без партнер	Живее со родители	Живее во повеќегенер.	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и овоштар	Друго занимање
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Воопшто не се согласувам	12.5		20	13				33	20	8				33	13		15	100				17	
Делумно не се согласувам	29.2		20	25	60	100	50		40	23	100	50	50		25	60	8		60	100		17	60
Sum -	41.7		40	38	60	100	50	33	60	31	100	50	50	33	38	60	23	100	60	100		33	60

Ниту се согласувам ниту не се согласувам	12.5			25	20		50		20	8		50	50		6		23					17	
Sum +	45.8	100	60	38	20			67	20	62				67	56	40	54		40			50	40
Делумно се согласувам	25.0		30	25	20			33	20	31				33	31		31		40			28	20
Потполно се согласувам	20.8	100	30	13				33		31				33	25	40	23					22	20
Total	100%																						
Mean	3.1	5.0	3.3	3.0	2.6	2.0	2.5	3.3	2.4	3.5	2.0	2.5	2.5	3.3	3.3	3.2	3.4	1.0	2.8	2.0	N	3.2	3.0

22. Оценете ги следниве изјави: Доколку имам повеќе сено имам каде да го продадам!

База: 41% од испитаниците



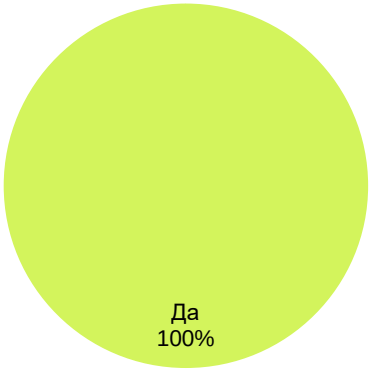


	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
Воопшто не се согласувам	54.2		60	50	60	100	50	67	60	46	100	50	50	67	50	100	31		80	100		39	100

Делумно не се согласувам	33.3	100	40	13	40		50	33		46		50		33	38		46	100	20			44	
Sum -	87.5	100	100	63	100	100	100	100	60	92	100	100	50	100	88	100	77	100	100	100		83	100
Ниту се согласувам ниту не се согласувам	4.2			13						8					6		8					6	
Sum +	8.3			25					40				50		6		15					11	
Делумно се согласувам	8.3			25					40				50		6		15					11	
Total	100%																						
Mean	1.7	2.0	1.4	2.1	1.4	1.0	1.5	1.3	2.2	1.6	1.0	1.5	2.5	1.3	1.7	1.0	2.1	2.0	1.2	1.0	N	1.9	1.0

23. Дали имате намера и понатаму да ги косите ливадите?

База: 41% од испитаниците

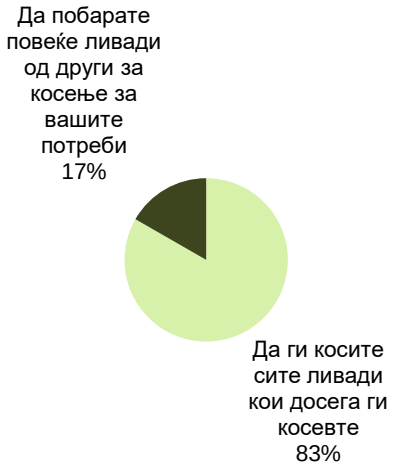


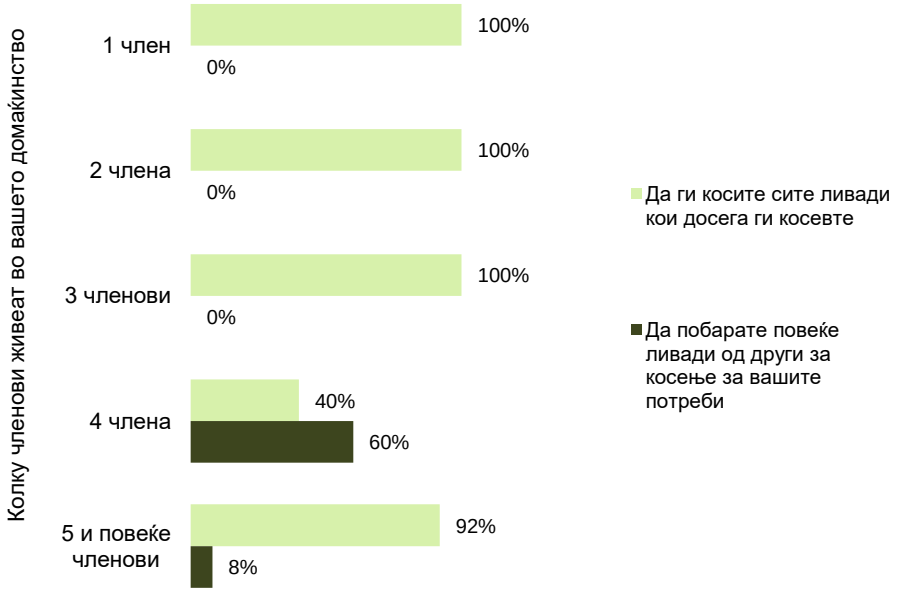
	Total	Старосна група	Колку членови живеат во вашето домаќинство	Структура на домаќинство	Работен статус	Професија

		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со	Живее со	Живее со	Живее во	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
sig		Na				Na					Na					Na				Na			
Да	100.0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100
Total	100%																						

24. Со кое од следниве две тврдења повеќе се согласувате? Дали во блиска иднина имате намера да:

База: 41% од испитаниците



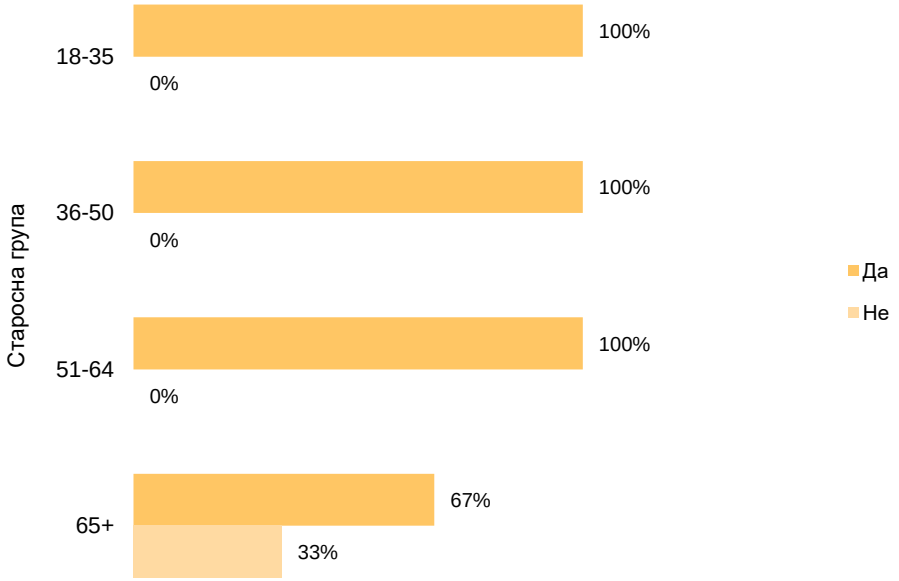


	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со партнер	Живее со деца до 18 год.	Живее со возрасни	Живее во повеќегенер.	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и сродни	Друго
N	24	1	10	8	5	1	2	3	5	13	1	2	2	3	16	5	13	1	5	1	0	18	5
sig		0.99				1.00					1.00					0.99				1.00			
Да ги косите сите ливади кои досега ги косевте	83.3	100	80	75	100	100	100	100	40	92	100	100	50	100	81	60	92		100	100		83	80

Да побарате повеќе ливади од други за косење за вашите потреби	16.7		20	25					60	8			50		19	40	8	100				17	20
Total	100%																						

25. Дали доколку добивате субвенции би коселе повеќе ливади?

База: 43% од испитаниците



	Total	Старосна група				Колку членови живеат во вашето домаќинство					Структура на домаќинство					Работен статус				Професија			
		18-35	36-50	51-64	65+	1 член	2 члена	3 членови	4 члена	5 и повеќе членови	Живее сам	Живее со [illegible]	Живее со [illegible]	Живее со [illegible]	Живее во [illegible]	Вработен	Невработен	Домаќинка	Пензионер	Пензионер	Домаќинка	Земјоделец и [illegible]	Друго [illegible]
N	25	1	10	8	6	1	3	3	5	13	1	3	2	3	16	5	13	1	6	1	0	19	5
sig		0.91				1.00					1.00					0.92				1.00			
Да	92.0	100	100	100	67	100	33	100	100	100	100	33	100	100	100	100	100	100	67	100		95	80
Не	8.0				33		67					67							33			5	20

Да	100%

11.2 Phytosociology tables

Table 1. Analytical table, meadow vegetation, Prespa Lake

Releve (original numbers)	**3**	**4**	**7**	**11**	**12**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**13**	**14**	**22**
Locality	Nakolec			Slivnica		Sirhan	Asamati		Grnchari		Perovo		Stenje		Perovo
Correspondence to sites/transects for biomass estimation	**Transect 1**	**Transect 1**	**Transect 2**	+	+	+	+	**Transect 5**	**Transect 6**	**Transect 6**	**Transect 3**	**Transect 3**	**Transect 7**	**Transect 8**	**Transect 4**
Date	2-Jul-2019	2-Jul-2019	3-Jul-2019	3-Jul-2019	3-Jul-2019	4-Jul-2019	4-Jul-2019	4-Jul-2019	4-Jul-2019	4-Jul-2019	4-Jul-2019	4-Jul-2019	3-Jul-2019	3-Jul-2019	4-Jul-2019
Coordinates	40.89265438 21.09570885	40.89212632 21.09584036	40.88859138 21.11184418	40.96627817 21.06715187	40.96692919 21.0664259	40.99795887 20.93494202	40.99554735 21.03082253	40.99830232 21.03577749	41.00827142 21.03721683	41.00787189 21.03587447	41.01078632 20.97304548	41.01214977 20.97432355	40.93349256 20.92063964	40.93345941 20.91232086	41.0133252 20.99324813
Altitude (m)	828	831	846	843	847	845	838	845	844	849	845	843	846	849	848
exposition						NE									
slope	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
area (m²)	20	20	20	30	25	60	50	60	60	60	60	60	16	20	20
cover (%)	100	100	100	100	100	100	95	100	100	95	100	100	100	100	100
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Calamagrostis epigejos	**2**	**2**	**1**	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	.	.	.
Scirpoides holoschoenus	**3**	**2**	.	+	**2**	+	**3**	.	.	.	.	.	.	.	.
Lotus corniculatus	**1**	.	+	+	.	**1**	+	.	+	.	.	.	.	.	.
Anthoxanthum odoratum	.	.	.	.	.	.	.	.	.	.	.	.	**2**	**2**	.
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	**2**	**1**	.
Holcus lanatus	+	+	+	.	.	.	.	.	.	.	.	.	**2**	**1**	.
Poa trivialis subsp. sylvicola	.	.	.	.	.	.	.	.	.	+	.	.	+	**1**	.
Hypericum perforatum	+	.	.	.	.	.	+	.	.	.	.	+	+	**1**	.
Phleum pratense subsp. bertolonii	.	.	.	.	.	.	.	.	.	.	.	.	**2**	.	.
Hieracium pilosella	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.	.
Platago lanceolata	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.	.
Luzula pindica	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.	.
Carex brizoides	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.	.
Cynosurus cristatus	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.	.

Releve (original numbers)	3	4	7	11	12	15	16	17	18	19	20	21	13	14	22
Cynodon dactylon	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.	.
Trifolium sp.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Tragopogon sp.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Trifolium campestre	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Cerastium sp.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Dianthus pinifolius	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Carex cuprina	.	.	.	.	.	.	.	.	.	.	.	.	.	**2**	.
Veronica serpyllifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.
Mentha aquatica	.	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.
Epilobium sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.
Phleum nodosum	.	.	.	.	.	.	.	.	.	.	.	.	.	**1**	.
Bromus arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Sysimbrium sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Ranunculus repens	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Gratiola officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Oenanthe silaifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Moenchia sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Carex distans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	**2**
Galium aparine	.	.	.	.	.	.	.	.	.	.	.	.	.	.	**1**
Arrhenatherum elatius	.	.	.	.	.	.	.	.	.	.	.	.	.	.	**1**
Heracleum sphondylium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Elymus repens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Alcea officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Convolvulus arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Galium verum	.	.	+	+	+	1	.	.	2	1	.	.	1	.	.
Rumex acetosella	1	1	.	.	+	.	+	.	+	.	.	.	1	.	.
Poa pratensis	.	.	.	+	2	+	.	.	.	.	.	1	1	.	.
Potentilla reptans	.	.	.	.	.	+	.	.	+	.	.	1	+	1	+
Verbascum sp.	+	+	.	.	+	.	1	.	.	.	+	.	.	.	.
Linaria genistifolia	+	+	.	.	+	.	+	.	.	.	1	.	.	.	.
Cirsium vulgare	.	.	.	+	.	.	.	.	.	+	+	.	.	1	+
Centaurea sp.	+	+	.	.	1	.	.	.	.	.	.	.	+	.	.
Trifolium arvense	1	+	.	.	.	.	+	.	.	+	.	.	.	.	.
Trifolium repens	.	+	.	+	.	.	.	.	.	.	.	+	.	+	.
Polygonum sp.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+
Daucus carota	.	.	+	.	.	+	+	.	.	.	.	+	.	.	.
Taraxacum	.	.	.	.	+	.	.	.	.	.	+	+	+	.	.
Petrorhagia prolifera	1	+	.	.	.	+	.	.	.	.	.	.	.	.	.
Hieracium bauchinii	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.
Sanguisorba sp.	+	.	.	.	.	+	.	.	.	.	.	.	1	.	.
Poa compressa	.	+	.	.	.	+	.	.	.	.	.	.	2	.	.
Rosa sp.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
Lysimachia vulgaris	.	.	2	.	.	.	.	.	+	1	.	.	.	.	.
Vulpia myuros	.	.	.	.	+	.	+	.	.	.	.	.	.	+	.
Tragopogon pratense	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.

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Releve (original numbers)	3	4	7	11	12	15	16	17	18	19	20	21	13	14	22
Cichorium intybus	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.
Vicia sp.	.	.	.	.	.	.	.	+	3	2	.	.	.	.	.
Phragmites australis	.	.	+	.	.	.	.	1	.	.	+	.	.	.	.
Cucubalus baccifer	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.
Valleriana officinalis	.	.	.	.	.	.	.	.	2	2	.	+	.	.	.
Jasione sp.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Valerianella coronata	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia articulata	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Dactylis glomerata	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Musci	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Erigeron annua	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Aira elegantissima	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Odontites sp.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Lythrum salicaria	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Apera spica-venti	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Vicia angustifolia	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Myosotis palustris	+	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Silene armeria	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Plantago lanceolata	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
Stachys	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.
Iris pseudacorus	.	.	2	.	.	.	.	.	+	.	.	.	.	.	.
Equisetum palustre	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.
Potentilla sp.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.
Hypochoeris sp.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.
Rumex acetosa	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Medicago lupulina	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.
Juncus conglomeratus	.	.	.	.	.	+	.	.	.	.	.	.	.	2	.
Dipsacus sp.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.
Vicia sp.	+	.	.	.	.	+	.	.	.	.	.	1	.	.	.
Arabidopsis thaliana	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.
Triolium velenovsky	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.
Galium palustre	.	.	.	.	.	.	.	+	.	.	.	.	.	1	.
Epilobium angustifolium	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
Rhinanthus	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.
Carex hirta	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+
Poa angustifolia	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Populus nigra	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus sanguineus	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia villosa	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anacamptis coriophora	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla inclinata	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Erigeron acer	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix alba	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia sp.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Carthamnus sp.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.

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Releve (original numbers)	3	4	7	11	12	15	16	17	18	19	20	21	13	14	22
Geranium dissectum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus glycyphyllos	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Filago sp.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex acutiformis	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.
Calystegia sepium	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum sp.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
Sonchus sp.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Valeriana sp.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Scrophularia nodosa	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus acris	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Dipsacus vulgaris	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Alopecurus arundinaceus	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Humulus lupulus	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus sp.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia vulgaris	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Lathyrus inermis	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Bromus tectorum	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Pulicaria dysenterica	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Epilobium hirsutum	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Galega officinalis	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Juncus effusus	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Cirsium sp.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Schedonorus arundinaceus subsp. orientalis	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Salix purpurea	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Torilis sp.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Trifolium pratense	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Eryngium campestre	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Lactuca sp.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Erigeron canadensis	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Schoenoplectus lacustris	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Vicia cracca	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Hireacium bauchinii	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
Silene italica	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Tanacetum vulgare	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Chaenopodium album	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.