Summary results of the photo-elicitation survey

about local preferences and local community perception on the most important ecosystem services in the studied area

The project “Mapping and assessing ecosystem services in Natura 2000 sites in the region Niraj - Târnava Mică” is financed by the Financial Mechanism of the European Economic Area (EEA).

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Background and methodology

A preference assessment survey was carried out in August 2015 to understand local inhabitants' and visitors' perceptions of ecosystem services (ES) and to prioritize them according to how respondents perceive the importance of ES in the local context. The results are important sources of information to the next steps of the research project: priority ecosystem services identified by the survey will be investigated in-depth through and indicator development process; and participatory scenarios for potential future land use alternatives will also build on priority ecosystem services (taken into account bundles and trade-offs among them). On the other hand, the preference assessment survey built on previous research activities, especially on the key informant interviews and on the regular interactions with the project's Stakeholder Advisory Board (SAB) consisting of experts and stakeholder representatives from the research area.

As a preliminary step, semi-structured interviews(total number: 30) with key local informants were carried out between June and August 2015 to collect information on how different stakeholder groups perceived nature and its benefits, and to shed light on the large variety of ecosystem services realized by them. The qualitative analysis of interview transcriptions highlighted a total number of 47 different ecosystem services which were grouped into the major groups of provisioning, regulating and cultural services (see Kalóczkai et al. 2015 for the detailed results of the interview analysis). We organized an interactive group discussion to present this all-encompassing list to the SAB members, who were asked to reorganize the list (i.e. reduce redundancy and sort out the locally irrelevant services) and define those 10-14 services which should be assessed during the preference assessment. This moderated group discussion resulted in a consensual list of 12 ecosystem services (edible wild plants, climate regulation, timber, water regulation, extensive orchards, game and hunting, tourism, soil fertility, pollination and honey, hay and grass, erosion control, local identity), which were then defined in lay language and illustrated by photographs taken in the research area. Based on these pictures and definitions a photo-panel (picture 1) was developed which we used as a visual aid to ask respondents to prioritize the five most important ecosystem services provided by various ecosystems within the research area.

The preference assessment survey followed a visual methodology where respondents were asked to review the photographs illustrating locally relevant ecosystem services and to choose the most important ones from the panel (for a more detailed description of the methodology see eg. Kelemen et al 2015; Kelemen et al. 2014, García-Llorente 2012). After each choice respondents were asked to justify why they thought that certain ecosystem service was of importance to them, which allowed us to collect qualitative information on what made different services valuable to local people (what are the relevant value dimensions in this specific context). Respondents were also asked if any relevant ecosystem services were missing from the panel to ensure that the priority list of ecosystem services was inclusive. The second part of the survey collected general demographic and socio-economic data as well as some additional information on having any specific stake or

interest in ecosystem management (i.e. if and how respondents were involved in agriculture or tourism and whether they took part in the activities of any non-governmental organization having an environmental orientation). This information was used to analyse which individual characteristics influenced respondents' preferences and whether there were any common patterns of preferences across different groups of respondents.

Picture 1: Photo-panel as a visual aid to support the choice of the top five ecosystem services of the research area

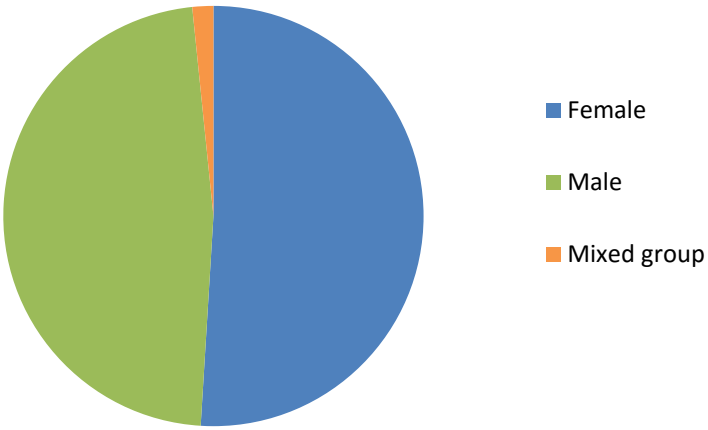
Data was collected by 28 undergraduate students through face-to-face discussions with respondents. Students participated in a half-day online training organized a priori to the field work by researchers of the MTA ÖK and ESSRG Ltd.. During the training they were informed about the whole project and the main goals of the survey, and they received detailed methodological information (including the step-by-step explanation of the questionnaire). In the field students were coordinated by two colleagues from the Association Milvus Group. They worked in pairs: one of them held the photo panel while the other one asked the questions and noted the answers. Seven pairs worked in settlements along the river Niraj, and another seven pairs worked along the river Târnava for three days.

Since data collection was scheduled to a weekend when the research area hosted its annual festivity, student pairs initiated discussions with respondents while walking on the streets of settlements belonging to the research area. No specific rules for sampling were followed, student pairs were asked to contact anybody (regardless of age, gender or any other demographic characteristics) and to do as many interviews as possible. Due to this practical approach to sampling, respondents are not representative of the entire research area in terms of age, school degree or occupation, but represent the two parts of the research area in approximately equal numbers. Due to the relatively large sample size, the error of margin is below 6% for the whole sample. To further increase the reliability of results, we prepared the priority list of ES for the main subpopulation of the sample (i.e. respondents dealing with farming, respondents below the age of 25). Beyond data collection students were also involved in recording the data in an excel sheet, which was cleaned and analysed later by researchers.

General information about the sample

A total number 310 questionnaires were filled during the field work. Women and men answered the questionnaire almost in equal proportion (50,9% and 47,4% respectively). In five cases respondents gave answer as a group and not personally (1,7% of the whole sample) – in these situations answers were recorded as 'group answers' and personal data (e.g. age, occupation etc.) were not asked by the responding group (figure 1).

Figure 1 The proportion of female, male and group responses within the sample

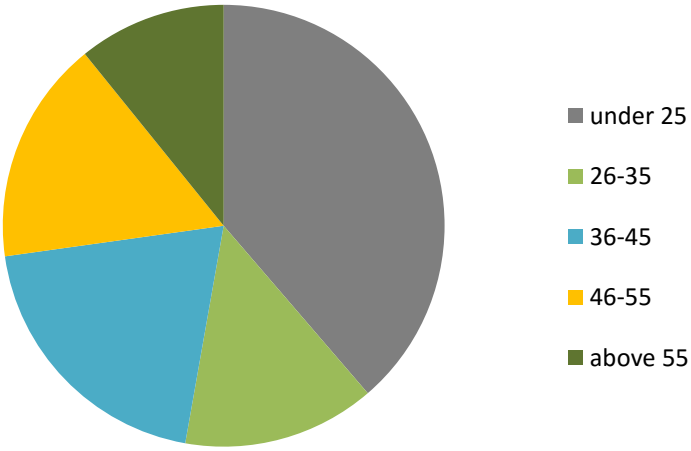


The majority of respondents (87,1%) live in the research area. Almost half of the local respondents came from one settlement, Sângeorgiu de Pădure (45,7%), that is located along river Târnava, while 29,7% of respondents came from three neighbouring settlements located along river Niraj (Miercurea Nirajului, Gălești and Tâmpa). The remaining 24,5% of local respondents live in small settlements scattered within the research area. Local respondents usually spent most of their life in the research area with an average time span of 26,5 year. Those who do not live in the research area usually came from Târgu Mureș (40,5%) or other nearby towns in Transylvania (32,4%); only a minority of respondents said they lived either in Hungary (16,2%) or in third countries (5,4%). The majority of non-local respondents visit the research area on a monthly or weekly basis (40,5%), and all except one respondent said they had already visited the area at several times. This suggests that despite these respondents live outside the area they are quite familiar with it, thanks to their regular visits.

Age groups were represented unequally in the sample: young groups were heavily overrepresented (38,7% of respondents belong to the age group under 25,) and the elderly were underrepresented (people above 55 represented only 10,8% of the sample) (figure 2). This can partly be the result of involving students in the field campaign (they approached similar age groups more easily than elder people) and partly traced back to the chosen

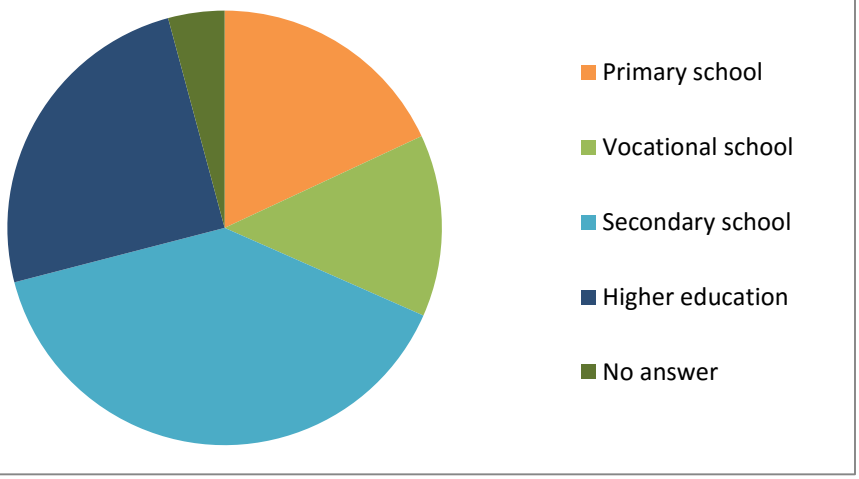
occasion for data collection (festivities attract more the younger generations than the elderly).

Figure 2 The proportion of different age groups within the sample



Respondents who finished secondary or higher education are overrepresented in the sample (39,3% and 24,8% respectively) which again reflects the unequal representation of different age groups (figure 3).

Figure 3 The school degree of respondents



The last few questions focused on the different ways respondents can get into a direct relationship with nature: whether they were active members of non-governmental organizations that focus on the natural environment (e.g. fishing or hunting associations or environmental groups); or if they are involved in tourism or agriculture at the local scale. Only a minority of respondents are engaged with civil associations (figure 4) or the tourism sector (figure 5), but nearly half of them have certain stake in agriculture. Those who are involved in agriculture usually do farming as a hobby or for self-subsistence. Only 12,2% of

respondents work in agriculture to receive regular income, either as the main source or as an adds-on to their regular monthly salaries (figure 6).

Figure 4 The proportion of respondents who are active in any civil organizations dealing with natural resources (Environmental NGOs)

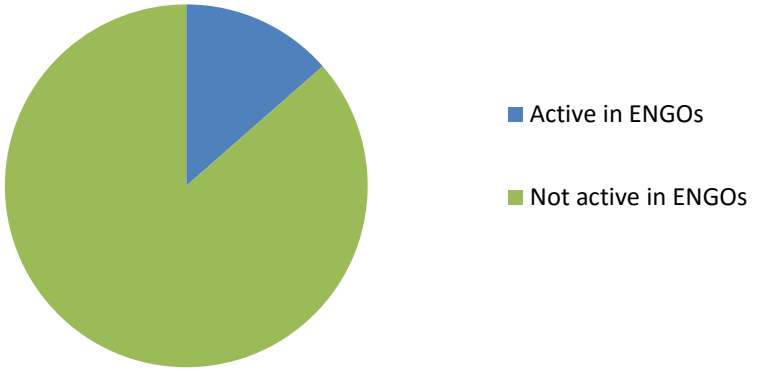


Figure 5 Respondents' involvement in tourism

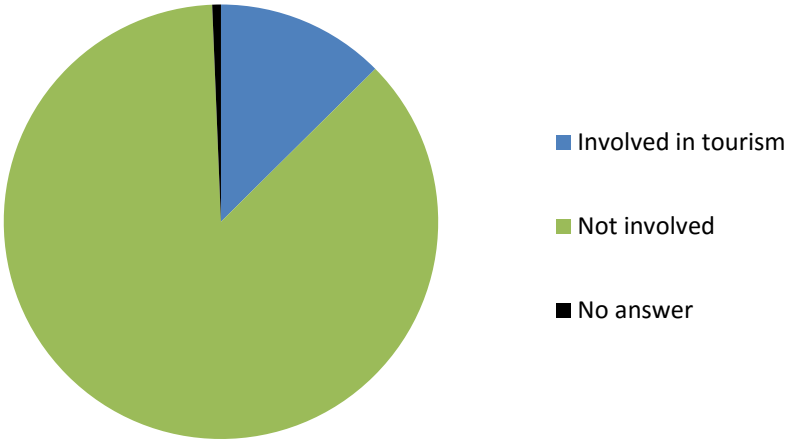
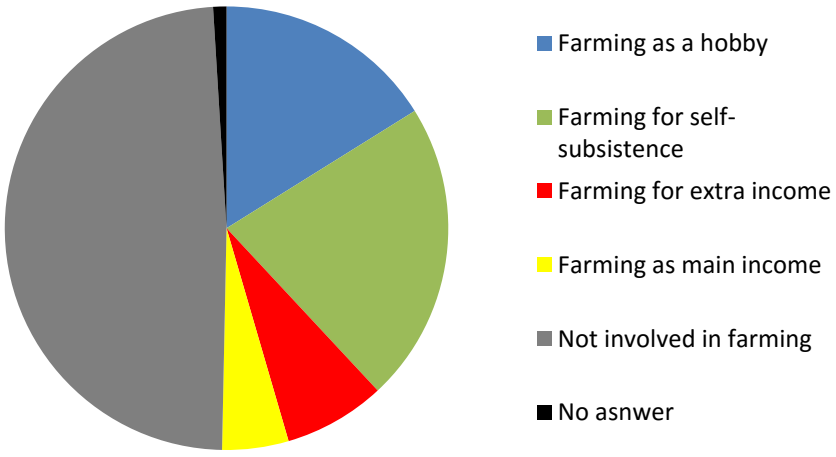


Figure 6 Respondents' involvement in agricultural activities



According to expert knowledge of the area, the proportion of respondents who are actively involved in agriculture seems significantly smaller in the sample than in reality. We can suppose that this is a result of biased sampling, and most likely stems from the overrepresentation of the young generations. We checked with a cross table analysis if there is significant differences between age groups in terms of the agricultural involvement of respondents and we found that non-farmer respondents are significantly overrepresented in the young generation (64,4% of respondents below the age 25 is NOT involved in agriculture) while farmers are overrepresented in the middle-aged and the elderly groups (57,8% of respondents between the age 25-55 and 72,7% of respondents above the age 55 are involved in agriculture).

Results: the priority list of ecosystem services

The priority list of ecosystem services was created on the basis of respondents' votes. Each respondent could choose five items from the complete list of 12 ecosystem services: they were asked to select and then to rank the five selected ones according to their importance (i.e. put them to the first to fifth place in their individual priority lists). Based on the votes we calculated two different priority lists. The first list shows all ecosystem services from the most important to the less important one based on a simple arithmetic summation of individual votes (not taking into account if a certain ES was selected to the first or to the fifth place) (figure 7). The second list shows the weighted ranking of ES taking into account the relative importance of each service. In this list we multiplied the number of votes for each service by 5 if selected at the first place, by 4 if selected at the second place, by 3 if selected at the third place and so on until the fifth place where no multiplier effect was calculated (figure 8).

Figure 7 The ranked list of ESs showing how many times they were selected as the first to fifth most important service

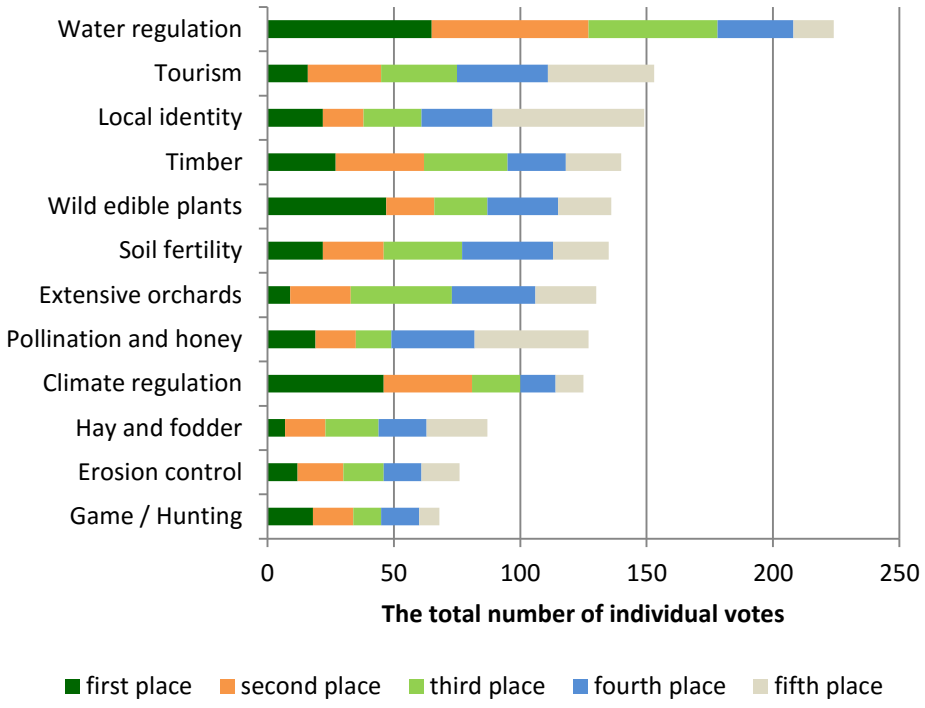
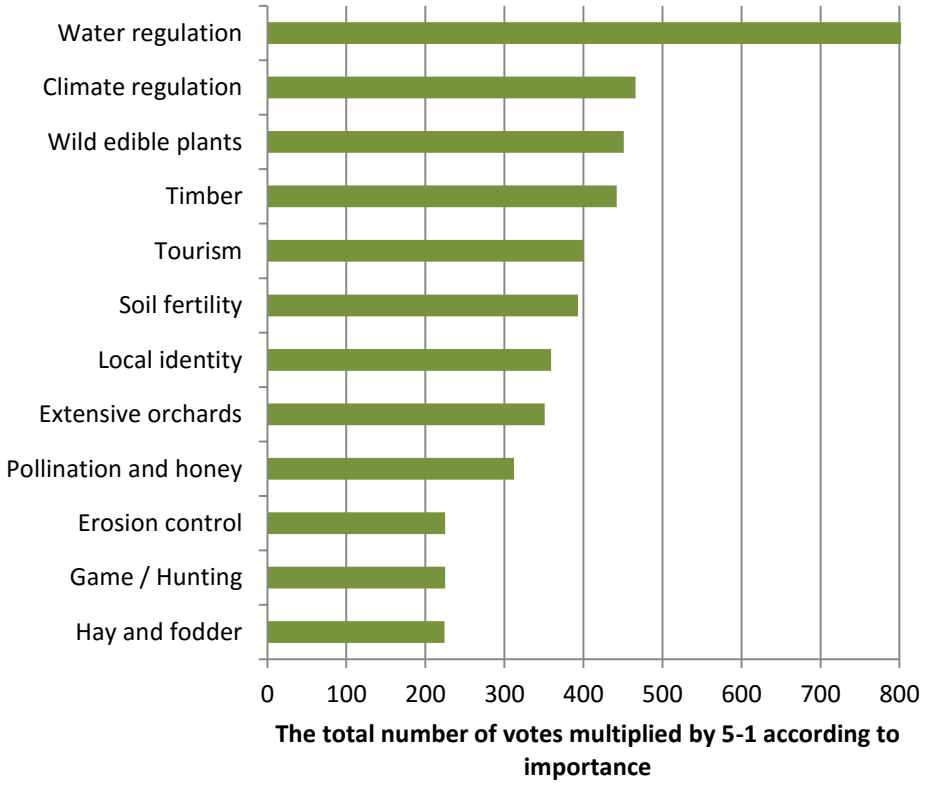


Figure 8 The ranked list of ESs taking weighted by the order of selection



As we indicated at the methodology, there is a possibility of biased results due to the overrepresentation of the young generations (which is also a reason for the underrepresentation of respondents involved in agriculture) in the sample. To visualize this possible distortion, we created the same ES priority lists for two subpopulations of the sample. Figure 9 shows the ranked priority list of respondents under the age 25, while Figure 10 shows the ranked priority list of respondents who are involved in agriculture. Comparing these particular lists to figure 7 (the priority list for the whole sample) we can see relatively small divergence:

- in both sub-groups tourism (2nd place in the whole sample) is replaced by local identity compared to the whole sample, but difference between the number of votes is minor
- except the higher importance of local identity, the sub-group of respondents involved in agriculture created the very same ranking for all the other services as the whole sample
- respondents under age 25 perceived soil fertility a bit more important than wild edible plants and ranked these two services to the 5th and 6th place (contrary to the 'farmers' group and the whole sample where these services were ranked to the 6th and 5th place respectively)
- respondents under age 25 perceived pollination and honey somewhat more important than extensive orchards and ranked these two services accordingly to the 7th and 8th place (contrary to the 'farmers' group and the whole sample where these services were ranked to the 8th and the 7th place respectively)
- respondents under age 25 ranked hunting higher than erosion control (11th and 12th respectively), contrary to the 'farmers' subgroup and the whole sample where these services were ranked to the 12th and the 11th place.

We also calculated the weighted ranks of ecosystem services for the two sub-groups mentioned above. Results can be seen on figure 11 and 12.

Figure 9 The ranked list of ES for the age group under 25

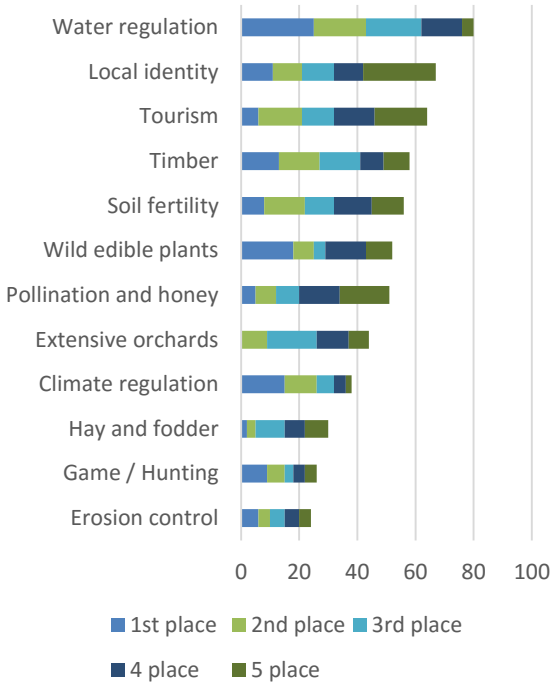


Figure 10 The ranked list of ES for respondents involved in agriculture

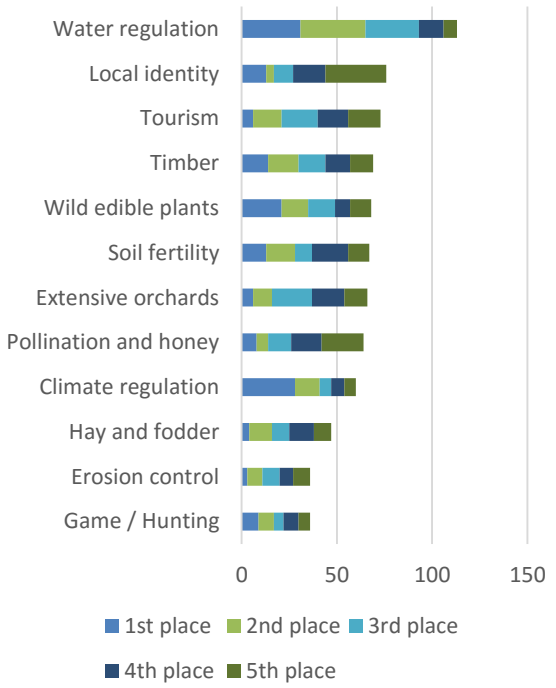


Figure 11 The ranked list of ES weighted by the order of selection: the perception of respondents under age 25

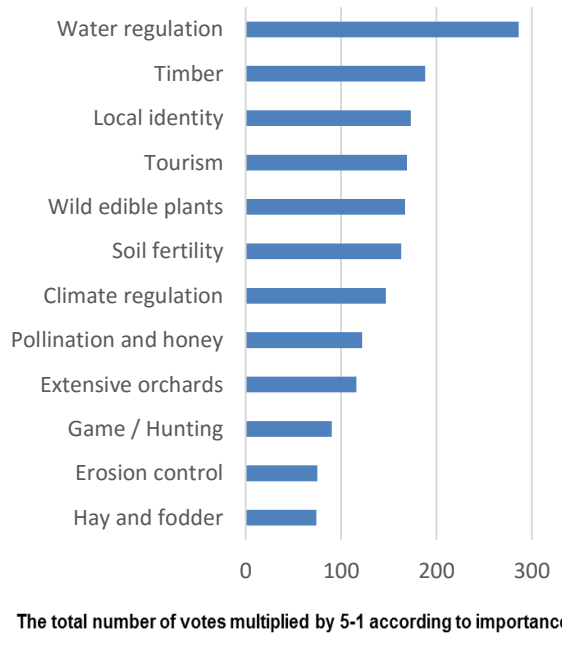
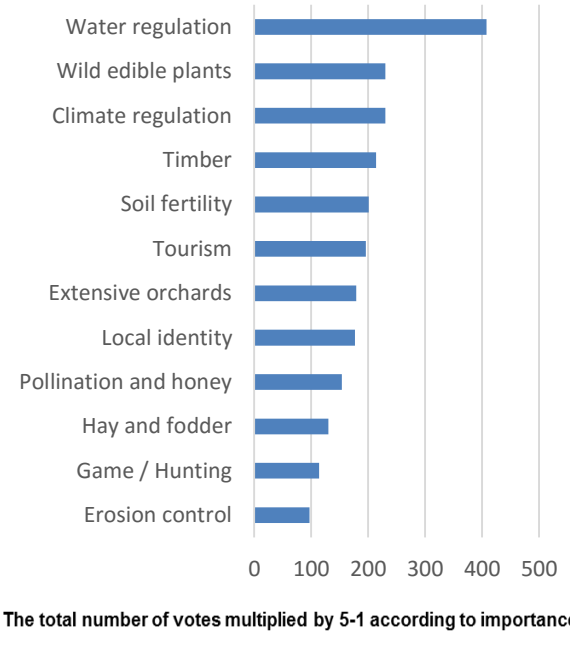


Figure 12 The ranked list of ES weighted by the order of selection: the perception of respondents involved in agriculture



Comparing the weighted lists differences between the sub-groups' and the whole sample's preferences become more visible, although in all three lists the differences between the ranks are very small. It is remarkable that the sub-group of respondents involved in agriculture created a weighted list where ES related to the agriculture use of the area are ranked higher than other services: wild edible plants, soil fertility, extensive orchards and hay and fodder were attributed with more importance here than in the subgroups of the 'youth', as well as in the whole sample. The sub-group of the 'youth' shows more divergence from the whole sample than the sub-group of 'farmers'. Local identity is much more appreciated by respondents under age 25 (ranked to the 3rd place instead of the 7th in the whole sample and the 8th in the sub-group of 'farmers'), while climate regulation is perceived much less important (ranked to the 7th place instead of the 2nd and 3rd place in the whole sample and in the 'farmers' subgroup, respectively). There are other smaller divergences as well, which shows an increased interest of the young generation in services with relatively high economic value potential (e.g. timber ranked to the 2nd place, tourism ranked to the 4th place, honey ranked to the 8th place, game and hunting ranked to the 10th place).

Qualitative analysis of the justification of votes

Each respondent were ask to justify their votes in a few words. The justifications were collected and coded: every justification got a keyword (code) that express the containment of the respondents' answers (justifications with the same meaning but expressed in different words got the same keyword). After this step the justifications were quantified. In the following we summarize the most frequently mentioned justifications and their keywords. Table 1 shows justifications groups with three or more votes.

Table 1: Ecosystem services and the most frequently mentioned justifications

Ecosystem services	Justification category ID	Detailed justification	Type of consideration behind the justification
Wild edible plants (WEP)	WEP are healthy	WEP contribute to maintain the human health. They contain vitamins therefore they are good for preventing illnesses.	physical well-being
	medicine	These plants have therapeutic effects, they can be used as medicine in case of illnesses.	physical well-being
	chemical free	As wild edible plants can be found mainly in the forests, they are not polluted with chemicals. This justification is closely related to the justification "healthy".	physical well-being
	"because I like it"	Some of the respondents chose WEP because they simply like their flavour.	physical well-being, emotional considerations
	food	WEP are food for the human and for the animals, as well.	physical well-being
	livelihood	Gathering and selling raw or processed WEP is an important income for the locals.	economic considerations
	relaxation	During the collection of these plants, people can relax and enjoy the nature.	emotional considerations
	WEP are free	Wild edible plants are available for free, it is easy to obtain.	economic considerations
	other	They are delicious; they are readily and locally available; they have several uses; raw materials for pálinka or tea	physical well-being, economic considerations
Climate regulation	climate change as a global problem	Climate change must be prevented, reduced or stopped. Some respondents emphasized that climate regulation is important to avoid natural catastrophes, such as	physical well-being

		desertification or water level rise of seas and oceans.	
	optimal climate	Some of the respondents gave a more focused justification. They said that climate regulation is important as it is contribute to keep the temperature in a level that make the Earth liveable.	physical well-being
	negative effects	A small group of respondents associated something negative but they could not expressed it in more details.	emotional considerations
	other	Many respondents chose climate regulation as one of the most important ecosystem service, but lot of them gave a justification that is not reflect directly to the real meaning of the ecosystem service. For example, they associated to the air pollution or they emphasized the importance of environmental protection. Some of the respondents said that climate regulation is important because of the fresh air or the oxygen production. These misunderstandings may emerge due to the complex meaning of this ecosystem service or the picture that we showed was misunderstandable.	physical well-being, ethical considerations
Timber	wood as fuel	More than one third of the respondents who chose timber said that it is important because it is used for heating.	economic considerations
	timber as the base of livelihood	The forest and the timber provide jobs therefore it contributes to the well-being of these people.	economic considerations
	timber as building material	Timber is one of the most important basic material of constructions.	economic considerations
	timber as furniture making material	Timber is one of the most important basic material of furniture.	economic considerations
	stop the felling	Some of the respondents said that they chose the picture of timber because people should face the problem of immoderate felling. Environmental awareness and well-	emotional/moral consideration

		being aspects are appear in this justification.	
	oxygen production and clean air	Ecological functions of forests, mainly the ability of oxygen production, are important because it make the Earth liveable. Environmental awareness and well-being aspects are appear in this justification.	physical well-being
	other	Versatile use: timber is important because it can be used for many purposes and it is easy to process; easy to extractive; forests as habitats; timber as the material of paper; carving as hobby	economic considerations, psychical considerations
Water regulation	essential needs	High majority of the respondents did not understand correctly this ecosystem service, as they reflected to the importance of water. The main justification was that the water is a fundamental element of the life and without water there is no life. People need water every day.	physical well-being
	clean water	High number of people said that they chose this ecosystem service as the clean water is essential for the human. It is the basis of the human health therefore it is important to preserve the fresh water and keep the drinking water clean. The emphasis is on the cleanness.	physical well-being
	health	Some people linked together the essentiality and the importance of water and said that clean water is the basis of the human health. Clean water contributes to prevent infections.	physical well-being
	wildlife	Fresh water as habitat of animals and plants that needs liveable environment. This justification links to the previous one (clean water).	value-based considerations
	feeding, drinking water	A group of people chose this ecosystem service as it is contribute to the production of drinking water. Water is the habitat of fish that is an important source of food.	physical well-being
	fishing as livelihood	As fresh water provides habitat for fish, it provides income for fishermen.	economic considerations

	water pollution	Some of the respondents emphasized the problem of water pollution.	physical well-being
	relaxation	Water gives opportunity to relax and have fun.	physical and psychical well-being
Extensive orchards	healthy	Fruit are healthy in itself, as they contain a lot of vitamins. Fruit are inevitable for the proper functioning of the human body.	physical well-being
	pálinka	Pálinka is a traditional short drink in Transylvania and Hungary, and it is made from fruit. Extensive orchards are valuable sources of fruit that can be used for making pálinka.	economic considerations, physical well-being
	chemical free	Extensive orchards are important as they are not treated with chemicals.	physical well-being
	livelihood	Extensive orchards provide economic basis for the locals. Selling fruit and fruit-based products make available for them to get some perquisite.	economic considerations
	home made	Fruit that people produce for themselves have intrinsic value. Respondents said that these fruit are more delicious as they know and saw how the fruit was grown.	psychical well-being
	delicious	Fruit are simply delicious.	physical well-being
	feeding	Fruit is food.	physical well-being
	national	Those who answered like this said that is important for them to eat national products.	psychical well-being
	resistivity	Extensive fruit species are more resistant (against plant illnesses) than the intensive species.	economic consideration
	genetic resource	Extensive fruit species contribute to the maintenance of the diversity of species.	value-based considerations
	tradition	Extensive orchards preserve the traditional fruit producing techniques.	emotional considerations
	jam	Fruit is the ingredient of jam which is delicious, cheap and local.	economic consideration
Game/Hunting	delicious	Most of those who chose this ecosystem service said that game meat is more delicious than the meat of domesticated animals.	physical well-being, psychical well-being
	feeding	Game meat is an important basis of the food production.	physical well-being, economic considerations

	relaxation	Hunting is a form of relaxation, it is a hobby.	psychical well-being
	wildlife	Game are part of the wildlife, they must be protected and the management of them should be sustainable.	value-based considerations
	game damage	A small group of respondents by choosing this ecosystem service tried to give emphasis to the expense of game.	economic considerations
	personal attachment	Some of the respondents chose this ecosystem service because they think that hunting is necessary and they also hunt.	emotional considerations
Tourism	livelihood, development	Tourism is a fundamental economic opportunity for the locals. It maintains jobs, increases the income of the villages. Tourists bring money to the region and this is the way of development that locals would kindly promote.	economic considerations
	knowledge of the landscape	It is important to explore and learn about the nature, the landscape. Tourism is an opportunity to show how nice and valuable is the area of Niraj and Târnava Mică.	psychical well-being
	the pleasure of having an excursion	Tourism means that people can enjoy the nature. It is a good way of relaxation as nature is comforting. Respondents who chose this ecosystem service like to have excursions.	physical and psychical well-being
	good conditions	The area of Niraj and Târnava Mică has good conditions for tourism as there are a lot of natural spectacle.	economic, emotional and value-based considerations
	nice landscape	Some people chose this ecosystem service because the picture reminded them to the beautiful landscapes of the area of Niraj and Târnava Mică.	psychical well-being
	more tourists	Some of the respondents chose this picture as they wanted to see more tourists in the area.	economic considerations
	clean environment	According to some respondents an landscape is impressive for the tourists, if it is clean and well-kept.	physical and psychical considerations
	valuable nature	The landscape is part of the life of locals. It represents the cultural	emotional considerations

		traditions. It is a heritage that should be maintained and showed to the tourists.	
Soil fertility	fertility	Fertile and quality soil contributes to the production of healthy and quality food. Soil is the basis of the food production therefore it is inevitable to maintain its fertility and keep it clean. Fertility is a value.	physical well-being and economic considerations
	agriculture and plant production	Soil is necessary for the plant production. Justifications in this group emphasized the importance of plant production and agriculture. Soil must be easy to process and fertile to get good harvest. Soil is the source of food, the basis of the agriculture.	economic considerations, physical well-being
	livelihood	Fertile soil has economic value. It is vital for the agriculture that is a basis of living in the rural areas.	economic considerations
	soil as habitat	Soil is a habitat for many useful living organism therefore its quality must be maintained.	value-based considerations
Pollination and honey	pollination	Pollination is inevitable for the plants to go to seed. Without pollination there is no harvest.	economic considerations
	health	The honey is part of the healthy living as it contains a lot of vitamins.	physical well-being
	delicious	Honey is delicious.	physical well-being
	food	Honey is an important food and sweetener, it can be used for cooking	physical well-being
	medicine	Honey is good for preventing and treating illnesses.	physical well-being
	livelihood	Producing and selling honey provides income for the beekeepers.	economic considerations
Hay and fodder	animal keeping	More than two-thirds of the respondents thought that hay and fodder is an important ecosystem service because hay is an essential need for livestock farming.	economic considerations
	livelihood	Livestock farming is one of the main way of living in the area. To maintain the livestock farming, reach hay fields are needed.	economic considerations
Erosion control	tree cutting	Most of the respondents thought that forests have a great contribution to preventing erosion. According to them, tree cutting had an increasing	value-based considerations

		tendency and it should be controlled and stopped.	
	landslides	Some people associated to landslides that can cause serious damages.	economic considerations, physical well-being
	preventing soil erosion	A few respondents emphasized simply that soil erosion is a negative process and it should be prevented.	economic considerations
	crop production	Preventing soil erosion is important to get rich harvest.	economic considerations
Local identity	to honour the tradition	More than half of the respondents thought that local identity is important as communities must maintain their traditions. Local values such as culture, folk custom, folk-tales, folk-dances must be taught to children and acquainted with tourists and other communities. Maintaining traditions means respect to the ancestors.	emotional and value-based considerations
	emotional attachment	Emotional attachment is part of the local identity. People live here are attached to their families, friends, to the landscape. Strong attachment to the homeland.	emotional and value-based considerations

Cross-table analysis

The last section of our analysis focused on specific patterns of preferences of different sub-groups of the sample. We carried out cross-table analyses to check if there are group-specific preferences towards the 7 most important ecosystem services (taking into account the ranked list of the whole sample). Key characteristics that have been checked against group-specific preferences were the gender, the school-degree and the location of the home town of respondents, as well as whether the respondents were involved in agriculture or not. Significant differences among sub-groups could be identified along two aspects: gender (figure 13) and location (figure 14). Figure 13 suggests that women perceive local identity much more important than men, and also attribute somewhat more importance to wild edible plants, tourism and climate regulation, while men perceive timber and soil fertility more important than women. This finding is in line with previous results from Hungary, where timber seemed to be a masculine, and herbal plants and biodiversity conservation were considered a feminine ES (Kelemen et al. 2015), and can be partly explained by feminist literature pointing to the fact that family and work relations determines male and female roles and how male and female family members participate in resource management (i.e. both gender will appreciate those ES which are used by them).

Figure 13 Diverging preferences according to gender
(Which proportion of respondents belonging to the different groups selected the given ES as a priority one)

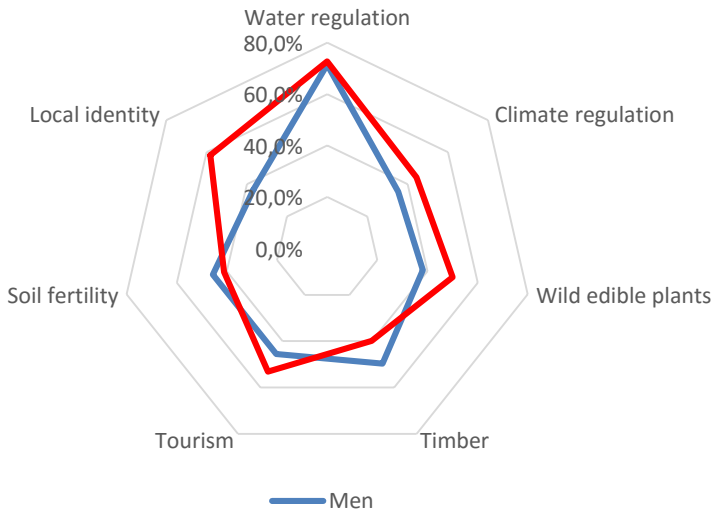


Figure 14 suggests that soil fertility and climate regulations are specific ES that are highly appreciated by respondents living along the River Niraj, than inhabitants of the Tarnava valley. On the other hand, respondents living along the River Tarnava perceived timber and local identity significantly more important, and wild edible plants, tourism and water regulation somewhat more important than the inhabitants of the Niraj valley. This result shows explicit links to the differences of habitat types and the actual use of ecosystem services between the two parts of the research area: the Tarnava valley is rich in forests

(providing timber and wild edible plants), while grasslands and small-scale agricultural fields are more prominent in the Niraj valley (most dependent on soil fertility).

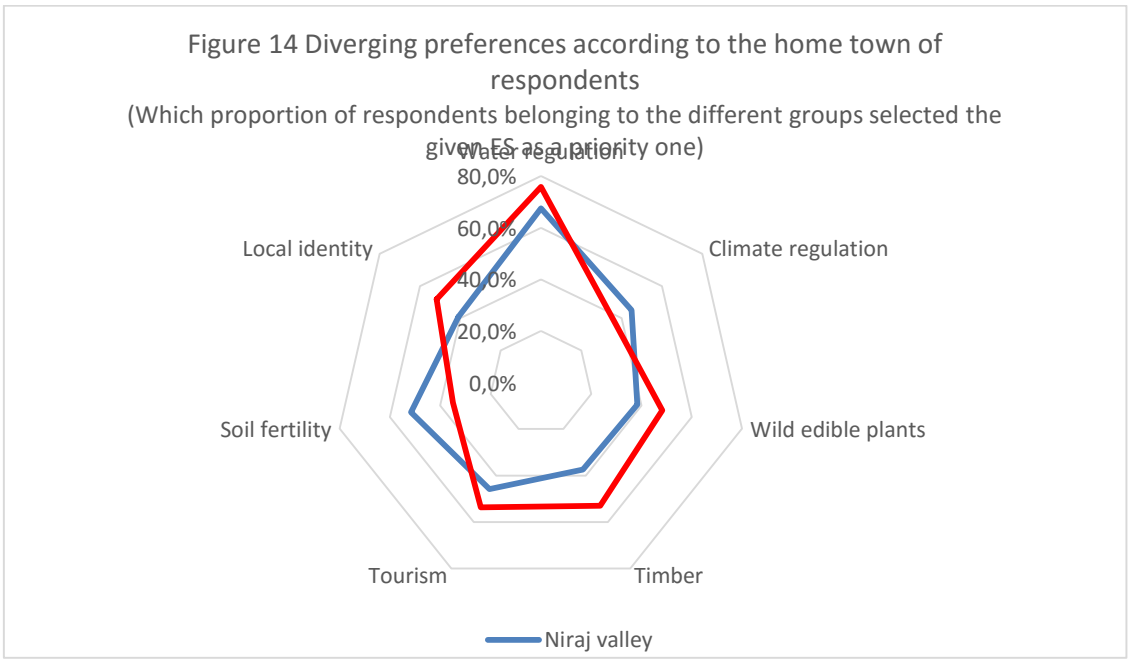


Figure 14 Diverging preferences according to the home town of respondents
(Which proportion of respondents belonging to the different groups selected the given ES as a priority one)

Figure 15 shows the relationship between the level of education and preferences to ES. Except climate regulation there is no systematic and significant differences among the different groups, however, it is notable that the perceived importance of climate regulation increases with higher school degree.

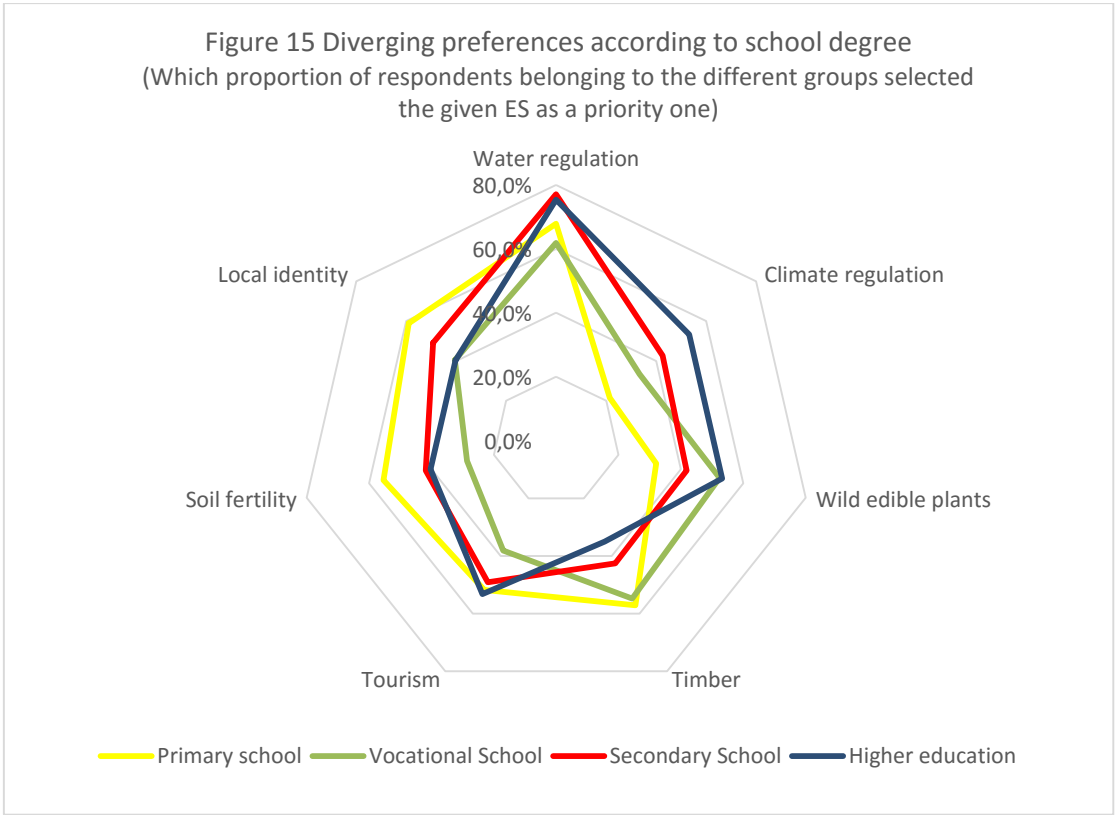


Figure 15 Diverging preferences according to school degree
(Which proportion of respondents belonging to the different groups selected the given ES as a priority one)

Figure 16 compares the preferences towards the 7 most important ES of respondents who are involved in agriculture and who indicated no direct links to farming and shows no significant differences in the preferences of these two groups. This is in line with previous results where we compared the priority list of the 'farmers' sub-group and that of the whole sample. We suppose that the only significant divergence would be the perceived importance of hay and fodder (although it is not indicated here as hay and fodder was not ranked among the most important ones).

Figure 16 Diverging preferences according to involvement in agriculture
(Which proportion of respondents belonging to the different groups selected the given ES as a priority one)