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ECOSYSTEM SERVICES AT IGRIȘ -ȘEITIN AND FELNAC SITES, AS PERCEIVED BY LOCAL PEOPLE

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ABSTRACT: The purpose of the performed research is to investigate and asses changes in how local community used the natural resources over time, how individuals perceive their natural environment and changes in landscape due to historical human activities. Natural ecosystems are supplying various resources and services (processes) to the local communities and humankind in general. The ecosystem goods and services include resources like clean drinking water and processes such as the decomposition of wastes. While scientists and environmentalists have discussed ecosystem services for decades, these services were popularized and their definitions formalized by the United Nations 2004 Millennium Ecosystem Assessment (MA). The MA classified ecosystem goods services into four categories: *provisioning services*, such as the production of food and water; *regulating services*, such as the control of climate and diseases; *supporting services*, such as nutrient cycles and crop pollination; and *cultural services*, such as spiritual and recreational benefits. The modern concept of ecosystem services include's also socio-economic and conservation objectives. Through our study we looked to understand the importance of nature for a local community, how the communities can benefit from their environment and how land use change throughout the history.

Semi-structured interviews were conducted in 3 communities located within the Mures river valley, downstream Arad. The evaluated area comprises natural, semi-natural and antropic ecosystems/habitats. A series of ecosystem goods and services, as perceived by the local communities, were defined.

Keywords: ecosystem goods and services, landscape, land use, Mures river valley,

INTRODUCTION:

Geographical site description

In the framework of the HURO/0901/205 MAROS-HABITAT 8 sites were chosen for developing researches in two different fields, habitat evaluation and assessment of the ecosystems goods and services. 4 sites were located along the Romanian stretch of the Mures river and 4 sites were located along the Hungarian stretch of the Mures river. The 4 Romanian study sites are located in the vicinity of the following localities (counting them from upstream): Paulis-Lipova, Vladimirescu, Felnac and Igris-Seirin. This paper is focusing on two of these sites, located close one to another, respectively Igris-Seitin and Felnac. The study was focused on the actual floodplain, the area between the river and the protection dam and the area which is part of the former floodplain, located between the dam and the villages, up to the high terrace of the Mures river in the vicinity of Felnac. Most of the area is located within the Mures Floodplain Natural Park. Also, the Igris-Seitin site comprises part of the Igris Islands Nature Reserve.

The study area is located in the Arad Plain, geographic unit which presents altitudinal variations of low amplitude, between small hillocks which draw the old alluvial holms, reaching the negative shapes of the divagation and puddle cones or the plains formed by the former ponds, presently most of their surfaces being dried off. The plain within the study area is of Holocene origin, having a progressive inclination from east to west, with altitudes beneath 100 m, with a pronounced divagation character, built on mires, clays, sands and loess like formations.

The high floodplains have a dominant character and they are flooded in the dam – river shore area at medium high floods. The other relief shapes cover relatively small surfaces, island like, and they are flooded frequently or they are permanently covered with water.

Some meanders of the Mures River in the study sites were cut, but it comprises also natural stretches, making large meanders. Due to the low energy of it`s declivity of just 0,1 m/km, the Mures river bed is well developed and meandered with many secondary branches. The Mures River, in the study areas, has no tributary, but it`s discharge is variable, decreasing in summer to about 120 m^2/s, and provoking in the other seasons 2-3 floods with a high flood regime of over 2000 m^2/s. The water dynamic of the river depends mostly on the hydrological events taking place upstream. The water dynamic of the ponds, oxbows and canals present in the area depends on the water level in the Mures River, consequently on the dynamic of phreatic aquifers but also on the local rainfalls.

The frequent raise of the water level above the flooding quote provoked often changes of the of the shores configurations and even of the meandering river bed, with many secondary branches. The Mures River shifted many times its river bed and shifted its course direction. Due to this dynamic, many oxbows and a specific relief/landscape can still be seen in the area.

The Igris-Seitin study site is situated on both banks of the Mures River, limited in north by the Arad-Nadlac railway and agricultural fields, at west by the Igris village and the road connecting it with the Arad-Cenad county road, at south by agricultural fields and at east by Seitin village and agricultural fields (*figure 1, 2*). The discussed area has a surface of about 9 square kilometers.

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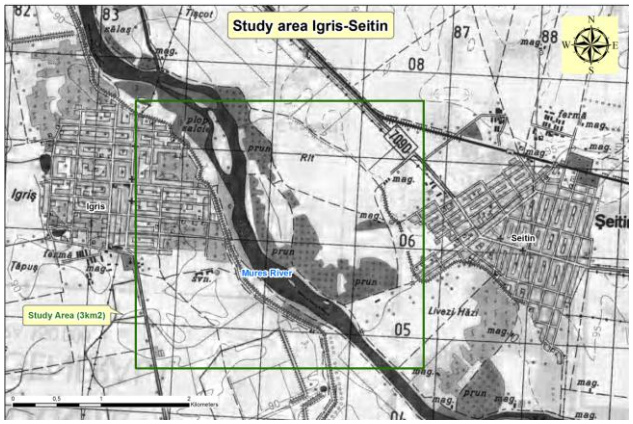

Fig. 1: 1980 year topographical map of the study area, near Igris and Seitin. Source: www.mmediu.ro (green square – the study area, grey patches – afforested surfaces, pale grey – pastures and agricultural fields, dark grey Mures River, hard grey and dashed line along the river – dam).

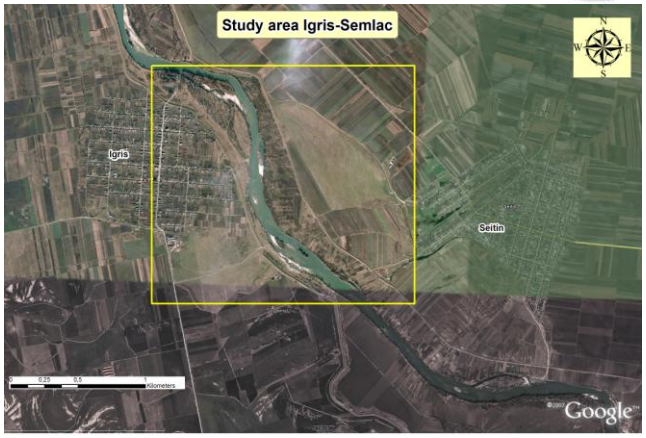

Fig. 2: Aerial image of the study area, near Igris and Seitin. Source: Google Earth

The Felnac study site is situated on the left banks of the Mures River, limited in north by the Mures River and the Sampetru-German Forest, at west by the agricultural fields, at south by agricultural fields and the high terrace of the Mures River and at east by pastures and agricultural fields (*figure 3, 4*). The discussed area has a surface of about 9 square kilometers, similar with all the sites taken in the study.

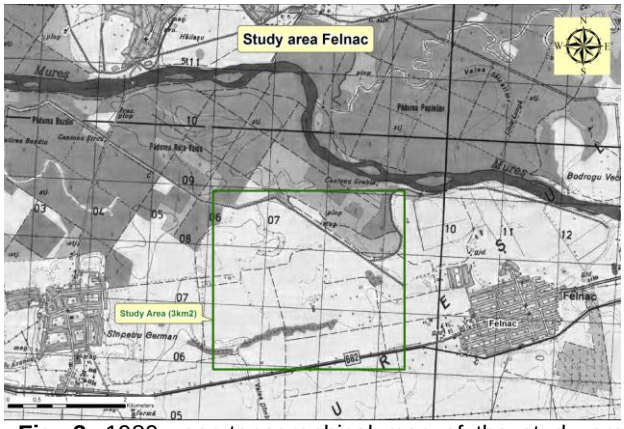

Fig. 3: 1980 year topographical map of the study area, near Felnac. Source: www.mmediu.ro (green square – the study area, grey patches – afforested surfaces, pale grey – pastures and agricultural fields, dark grey – the Mures River, double line and hard grey line along the river - da).

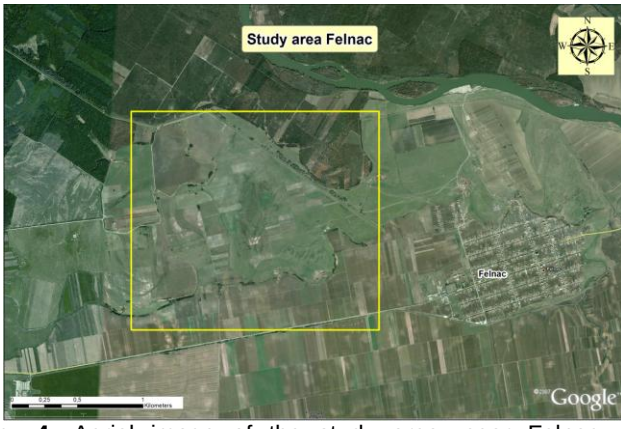

Fig. 4: Aerial image of the study area, near Felnac. Source: Google Earth

Due to river regulation works, dams built along the river, meander cuts in the Pecica vicinity, overbank aggradations can be observed. There are young alluvial soils on the floodplain area, but on the saved-side of the dikes there are mould soils, it is very good for agriculture.

Ecological description

A relatively complex landscape with a mosaic of different land-use may be observed: arable lands, orchards, pastures, meadows, and forests, mostly for the Igris-Seitin site. The landscape is characteristic for the entire area of Mures valley downstream Arad, on the Romanian sector. The actual floodplain is large in the Felnac site region, with a few hundreds of meters inside the dam, dominated by forests. In the Igris-Seitin site the actual floodplain is thin, a few tens of meters on the left bank, comprising afforested surfaces and grasslands, and larger on the right bank, comprising orchards (most of them deserted), bushes and pastures. Planted and natural forest stands can be observed inside the dam, at Felnac. Most of the grasslands are used as pastures. The extent of arable land is varying over time, but we can say that the today pastures were used as is for long periods of time, agricultural fields having the tendency to get larger. Only in Felnac site a small plot of about 3ha was used as hay meadow, but after the first cut is was also used for grazing sheep.

Some forest areas were deforested during socialist period and in the last years part of them were planted back again.

The botanical studies described the presence of 453 plant species in the Sampetru-German area. The most important species are: *Iris spuria, Vitis silvestris, Lythrum tribracteatum, Trapa natans, Leucojum vernum, Nymphaea alba, Potamogeton filiformis* and

orchid species of the genus *Platanthera, Orchis* and *Epipactis* (Paulovics 2002, Turcus & all. 2011).

The floodplains are endangered by invasive plants on the whole length of the Mures river course, inside the Mures Floodplain Natural Park. The lower Mures floodplain forests are invaded strongly by *Acer negundo*, and the forest clearings, grasslands and fallow lands by *Amorpha fructicosa*, observed also in our study areas. The closed native forest stands, the long lasting water surfaces or the continuous grazing or mowing could stop their spreading and dominance.

The vertebrate fauna of Mures River floodplain in the Igris-Bezdin and Felnac areas is quite well known, due to the activity of the Mures Floodplain Natural Park Administration, with studies and observations done in the recent years. The best known group is that of the birds, more than 200 species being observed in the whole length of the Mures Floodplain Natural Park. Nevertheless, in the last years, the extent of the watersheds in the area is decreasing and it gets more and more difficult to observe the former bird diversity. The most valuable bird species are *Aquila pomarina, Haliaetus albicilla, Ciconia nigra, Plegadis falcinellus, Platalea leucorodia, Buteo rufinus* and other strictly protected species.

An important and interesting aspect is the presence in the last 3-4 years of the Eurasian Beaver – *Castor fiber*. The beaver got extinct on the Mures River about 100 years ago, as consequence of intensive hunting. It`s actual presence is due to a reintroduction program implemented in the year of 2001 by the Forestry Research and Development Institute, when 6 pairs of beaver were released on the Mures River shore, on a river sector situated upstream Lipova. Since then, the beaver population grown quite rapidly and now it may be observed on a large river sector, from Cenad-Nadlac, to about 200km upstream at Ilia, near Deva. (Manci 2006).

Over 10 bat species are described in the area (*Myotis daubentoni, Pipistrellus pipistrellus, Rhynolophus ferum-equinum, Rhynolophus euryale* etc.) (Ohlendorf et all. 2009).

The large mammals present in the area are *Cervus elaphus, Dama dama* (non-native, introduced species), *Capreolus capreolus* and *Sus scrofa*. These species play an important role for the local communities, as they are the most important game species.

A great and diverse fish population is mentioned in the Mures river, within the Mures Floodplain Natural Park. Over 45 fish species were observed, comprising important rare/protected species (*Zingel zingel, Barbus petenyi* etc.), or economically/fishing important species (*Stizostedion lucioperca, Silurus glanis, Esox lucius* etc.). Some introduced, non-native fish species may be found (*Hypophthalmichtys molitrix, Lepomis gibbosus* etc.).

The herpetofauna is also well represented, mostly by amphibian species, due to the high humidity regime (*Hyla arborea, Bombina variegata, Triturus cristatus, Rana esculenta, Emys orbicularis, Natrix tessellata* etc.).

The invertebrate fauna is less known, only the *Gastropoda* (*Chilostoma banatica* etc.), *Lamellibranchia* (*Unio crassus, Anodonta cygnea*), *Coleoptera* (*Lucanus cervus, Morimus funereus, Oryctes nasicornis* etc.), *Lepidoptera* (*Papilio machaon, Iphiclides podalirius, Euphydrias maturna* etc.), *Orthoptera, Heteroptera, Odonata* (*Ophiogomphus cecilia* etc.) and *Araneae*, being quite well studied. (Manci 2006, Duma 2011).

The history of land use

The area is populated since ancient times. Ziridava, a well known Dacian settlement, situated on the right river bank of the Mures river, is close to both sites. Pottery, weapons and even crops remains were found by archaeological diggings in the Ziridava site. More than this, Neolithic settlements and more recent remains were found on a large extent along the neighbourging Mures river high terrace. Smaller settlements were found on the river bank also, in different areas.

In the middle ages the Mures valley was densely populated, but this culture was destroyed during the Turkish occupation. Most of the ruined villages have never been rebuilt.

Very few details may be seen on an 1579 map, but we can see a meandering river, the Mures River, and large water surfaces and humid areas (*figure 5*).

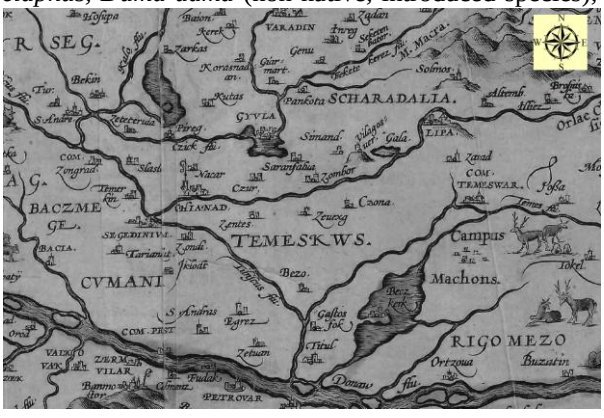

Fig. 5: The project study area in 1579 – the map made for Maximilian II, Holy Roman Emperor of the German Nation.

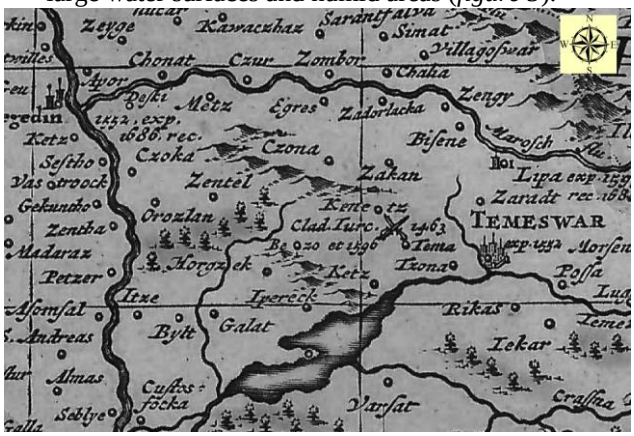

Fig. 6: The project study area in 1688 – the map of Frederici de Wit.

A map from 1687, shows that the Mures river had meanders on its entire length in the region, and that large surfaces were covered by humid areas (*figure 6*).

Igris (Egrisch) was surrounded by pastures in 1769 (Josephin`s Banat Map – section 15), as orchards and gardens as well. Igris is a rather smaller village, but still significant with potential high use of natural resources. The Mures river is strongly meandered. A couple of small ponds may be seen. Forests may be seen only in the meander next to Seitin (Schaitin). Many roads, most probably bounded by trees and bush lines, can also be seen. Canals and old oxbows may be observed. A single large island is located near Igris. Large arrable fields are stretching between villages (*figure 7*).

Fig. 7: The Igris-Seitin study area in 1769 – Josephin`s Banat Map – section 15.

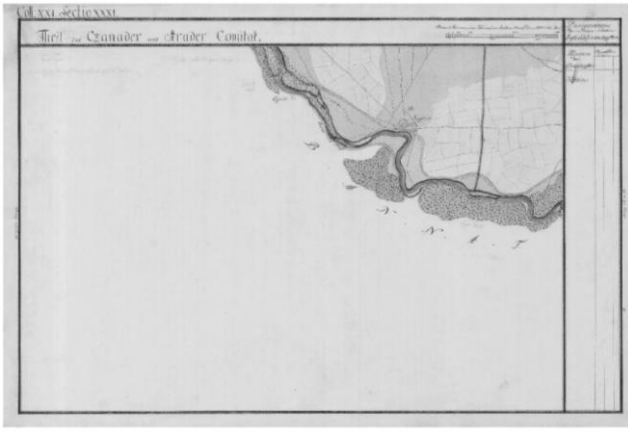

Fig. 8: The Igris-Seitin study area in 1769 – Josephin`s Banat Map – section 31.

Seitin (Schaitin) had completely different landscape characteristics in 1769 (Josephin`s Banat Map – section 31), missing completely forest vegetation. The village was surrounded by extensive grasslands and arable fields. Many roads, most probably bounded by trees and bush lines, can also be seen. A couple of islands are located on the Mures river meander which is flowing close to the village. The village is located on the river shore (*figure 8*).

Felnac (Fellnack) was surrounded by pastures in 1769 (Josephin`s Banat Map – section 16), as orchards and gardens as well. Felnac citizens seemed to be animal breeders, because arable lands can be observed only in the south-western part of the village, quite far of it. The Mures river is strongly meandered. The surface of our study was covered by forests and grasslands. The high terrace is marked on the map. Many roads, most probably bounded by trees and bush lines, can also be seen. Canals and old oxbows may be observed. Small water flows seem to be Mures river tributaries, having their source most probably in the watershed. Aranca creek has its source in this region. Not many islands were marked along the Mures river course (*figure 9*).

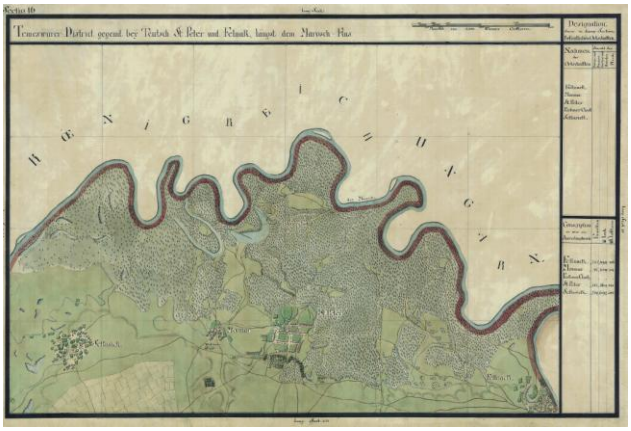

Fig. 9: The Felnac study area in 1769 – Josephin`s Banat Map – section 16.

Fig. 10: The Igris-Seitin study area in mid XIXth century – the IInd Military Survey, sections 62&63. Dams can be seen on both riverbanks.

From our historians registrations results that catastrophic floodings were happening regularly all over Romania, this being a consequence of the temperate continental climate. In the XVIth century ten heavy floodings were happening, in the XVIIth century 19 floodings, in the XVIIIth century 26 floodings, in the XIXth century 28 floodings and in the XXth century 42 floodings are mentioned. The number of floodings increased due to the reduction of transport capacity in the minor river beds, as due to cogging, dam buildings,

deforestation in the reception-collection basins and of different buildings made in the major river beds.

Towards the middle of the XIXth century, dams were built along the Mures river in the study region. The meander in the vicinity of Seitin (Sajteny) locality is still present (*figura 10*). The localities have grown. The arable lands are more extended. The river course had shifted and the large island near Igris (Egres) is now outside the river course and we can see a smaller island replacing it. Canals were built to loose the areas humidity excess.

The situation of Felnac (Fenlack) had changed in some aspects. Arable fields have occupied large surfaces, getting very close to the village. Pastures and grasslands may be found only in the Mures river floodplain. Many drainage canals were built to loose humidity. The Mures river meander neighbourging the village was cut. Forests occupy almost same surfaces (*figure 11*).

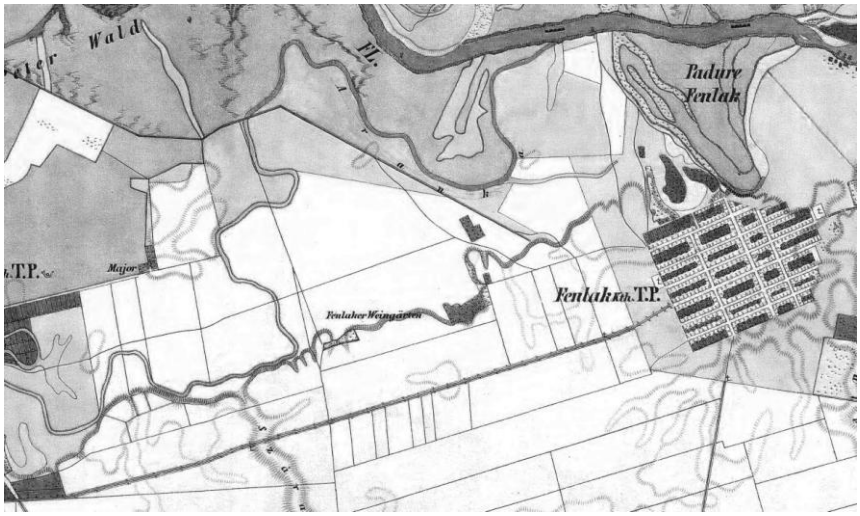

Fig. 11: The Felnac study area in mid XIXth century – the IInd Military Survey, sections 62. A dam can be seen getting out of the forest from Sampetru-German to Felnac.

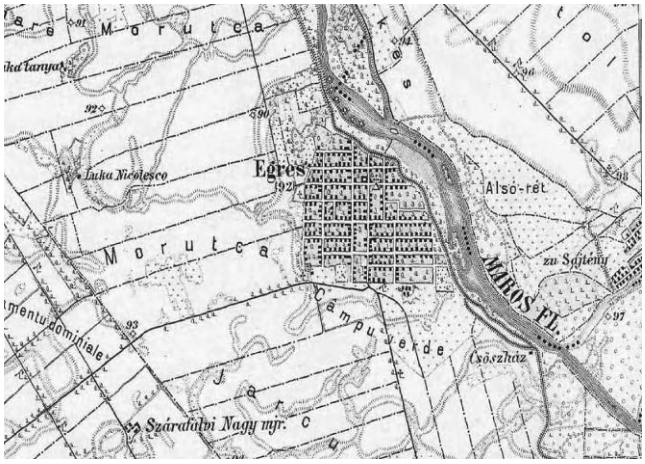

Fig. 12: The Igris-Seitin study area in 1884 – the IIIrd Military Survey, sections 21, sheet 23.

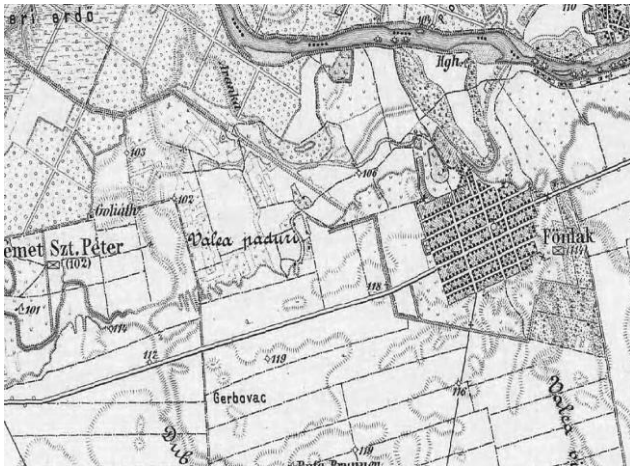

Fig. 13: The Felnac study area in 1884 – the IIIrd Military Survey, sections 21, sheet 24.

The Third Military Survey, map section 21, sheet 23 from 1884, reveals significant modification only with respect to the Mures river course. The meander in close vicinity to the Seitin village was cut. Two small islands are to be seen near Igris (*figure 12*).

For Felnac (Fonlak), the Third Military Survey, map section 21, sheet 24 from 1884, reveals little changes regarding land use and various surfaces distribution. Many agricultural roads were built. Some forest stands were cut and got occupied by grasslands (*figure 13*).

Land use during the socialist period (between 1945 and 1990)

In the communist period the pastures, grasslands and agricultural fields got administrated in common, in co-operatist system. One may see that a large forest area was cut down inside the dam area, located north of Felnac, near the Mures River. In the same area, poplar and black walnut plantation were made. Nevertheless, large areas of natural forest remained in the far north-western part of the study area, and tree plantations were created in the forest cut surfaces. The pattern of the land use types was similar to the present situation (*figure 14, 15*). Pastures near Felnac occupy almost same surfaces as in the previous period. The arable fields were used mainly for crops like wheat and corn, but also for fodder, trefoil and lucerne. Only the dam

surfaces and the areas located inside the large exterior oxbow were used to produce hay. The rest of the grassland, not cultivated, was used to graze sheep. About 1000 sheep were fed on these pastures in Felnac and 2500 sheep in Igris and Seitin.

Fig. 14: The Igris-Seitin study area in 1968 (Corona map) – in light colour large cut down forest areas may be seen.

Fig. 15: The Felnac study area in 1968 (Corona map) – in light colour large cut down forest areas may be seen.

The pastures south of Igris were used since long time as is. The surface of these pastures had been reduced over time. Inside the dam, on the left bank of the river, vegetation preserved it`s semi-natural characteristics. Part of the trees have been cut, completely or partly, and grassland surface have increased. Sand exploitation had been started in the south-eastern part of the study area.

On the right riverbank, in Seitin vicinity, we can see that inside the dam a large surface is covered by gardens and orchards. Large grasslands surround the village at west, north and east. A thin tree line may be observed connected to the riverbank. *2.4. Contemporary period land use (after 1990)*

In the period after 1989, the co-operatist system was dissolved and land was transferred to former owners. Large agricultural fields, formerly administrated in common, were split in many small surfaces, administrated in familial regime. Consequently, due to lack of resources and the drop down of the markets, many lands were transformed in fallow land or got used as pastures. In this period, a smaller number of sheep are grazing in the area, about 2500 sheep in Igris and Seitin and 1500 sheep in Felnac. The forest is administrated by the National Forest Administration – Forestry Directorate Arad. The Forestry Directorate Arad maintained the same administration methodology as formerly. Three kinds of forests may be found in the study area: near natural forest stands of willow and poplar, near natural and exploited forests of ash and pedunculate oak, forest plantations of poplar and black walnut. Only the meadow vegetation on the dam declivities is still mowed. Small surfaces of grasslands are used "accidentally" as hay meadows. *Amorpha fruticosa*, an invasive species, gained large surfaces on the Mures riverbank at Seitin. This species was managed during the communist period, being cut regularly where appeared in agricultural fields vicinity, but after 1990 a few people kept cutting it down. It`s use as support for vegetables is less intensive as it`s regeneration capacity. Consequently, the species covers large surfaces along the Mures river course and it`s tributaries.

Both study sites started to be managed as nature protection areas since 2001, when the National Forest Administration, through the Forestry Directorate Arad, started a Phare project, with the purpose to organize the administration center for a natural park. The Mures river valley, downstream Arad to the Romanian-Hungarian border, has been designated as nature park since 2004. The river valley has in the same time the following statutes: Ramsar site, nature reserve (partly), Natura 2000 sites (birds, habitats and species preservation), important bird areas.

In recent years, the situation of the grazing sheep flocks has changed dramatically in all the study sites. An important factor which regulated the effect of grazing on pastures vegetation was the phenomena of transhumance. Many sheep, grazing in the study region, were not present year round, because part of the sheep flocks were actually getting in the region for wintering, coming from Central Romania, Fagaras Mountains near Sibiu. These flocks came on the ground in the study region, led by shepherds, searching for a warmer climate and more resources. In this respect, during summer, there were less sheep on the grazing yards and more surfaces could be used to produce fodder for the winter period. About 10 years ago, due to legal regulations and also by the desire for improved living conditions, Sibiu shepherds, and other shepherds involved in transhumance from other regions of the country, stopped doing this activity and remained permanently in the region. We encountered a shepherd from Alba county in the Igris site and a shepherd from Sibiu county in the Felnac site. Their sheep added to those existing in the villages. Consequently, the grazing pressure on the pasture increased significantly, in some cases the number of grazing sheep doubling.

This situation was a bit balanced by the fact that the number of grazing animals belonging to peoples from villages decreased in the same period of time, due to difficulties in accessing the markets and difficulties in

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covering necessary expenditures. The surfaces used for semi-subsistence agriculture decreased considerably in whole the region, as all over Romania.

Actually we observe overgrazing regimes in the whole study region, due to the increase of sheep flocks. The quality of grazing changed, when cattle were changed with sheep, with high impact on the grasslands flora and vegetation.

MATHERIAL AND METHODS

The purpose of our research was to understand the way people living and using the regions resources perceive the value of different ecosystem services. In order to achieve this goal, and to understand the social phenomena, in-depth personal interviews and focus group interviews were performed.

During the research that took place in the winter 2011 and spring-summer 2012 period, 51 in-depth semi-structured interviews were conducted with local residents and land users about the ecosystem services they perceive. Working in pairs and as single interviewer 51 semi-structured interviews were made with local farmers, forest rangers, water company ranger, land owners, deputy head of the National Watern Administration – Arad Branch, head of the Arad Forestry Directorate etc. The team has chosen semi-structured interviews because (1) this method has already been proven to be suitable in exploring and understanding the opinion of local people about nature in previous researches (Kelemen et al. 2009, Málovics-Kelemen 2009), and (2) because it allows unexpected observations which was important for us because of the explorative nature of the research.

The first round of the subjects was selected by the teams specialist, who worked previously in the area and had contacts with local forest rangers, water company ranger, the nun etc. Other subjects were identified locally, approaching people (generally old people) on the street. The interviews were carried out in Igris, Seitin and Felnac as well.

One of the serious problems that may occur in a social study is that stated preferences (what people tell in a survey) may differ significantly from revealed preferences (what people really think about certain subjects or how they would really act in certain situations) (Babbie 2008). Thus we paid special attention to formulate questions that do not remind our subjects directly of the field of environmental protection and nature conservation. We did so knowing that today environmental protection and nature conservation have become social expectations, so in a survey where subjects are aware of the green aspect of the research, the stated and revealed preferences are very likely to differ. Stated preferences will appear greener than revealed ones (Kelemen – Gómez-Baggethun 2008).

The following topics were discussed during the interviews depending on the subjects' occupation, current situation, options and prospects in life:

- Life and work of the subject. Local life options, farming possibilities.
- Natural values of the area.
- Changes of the natural environment.

For part of the interviews notes have been taken but we used also sound recording. When quoting an interview we refer to our notes and our recordings as well. The interviews are indicated with codes V1-V51, each code indicating a different interview.

The typology of ecosystem services used in the research was developed based on the Millennium Ecosystem Assessment (2005) distinguishing four types of services: provisioning services (e.g. food, raw materials, fodder), regulating services (e.g. climate regulation, protection against floods, pollination), cultural services (e.g. education, recreation, artistic inspiration) and supporting services (MEA 2005) (*Table 1*). Due to recent criticism of the evaluation of supporting services (pl. Hein et al. 2006) we avoided dealing with them in this survey.

Table 1.
Ecosystem services in functional alignment

Provisioning services	- Food - Fodder - Energy source, fuel - Timber or other raw materials - Biochemicals, natural medicines and pharmaceuticals - Genetic resources - Ornamental resources
Regulating services	- Air quality regulation - Climate regulation - Water regulation - Flood protection - Erosion regulation - Regulating species reproduction - Break down of pollutants - Pollination - Pest control and disease protection - Storm protection - Protection against noise and dust - Biological nitrogen fixation - Conservation of nature and biodiversity
Cultural services	- Cultural, historical and spiritual heritage values - Scientific and educational services - Recreation and ecotourism - Aesthetic values - Other cultural or artistic information, inspiration - „Sense of place"
Supporting services	- Soil formation - Nutrient cycling - Primary production

Source: MEA 2005, Hein et al. 2006

RESULTS:

Inventory of the ecosystem services perceived by locals

4.1.1. Provisioning services

Performing the interviews in Igris, Seitin and Felnac, we observed that the most mentioned ecosystem services, perceived by local people, are related to **livestock production**, thus provisioning services. All the interviewed persons mentioned the sheep grazing when discussing about how the lands are used in the area. Even though this fact would indicate sheep grazing as a common situation for local families, actually the number of small, family farms has decreased dramatically, due to market loss. Only few persons still grow animals at home, mostly for family use. Generally, at the village edges, house birds (hens, goose, ducks, turkeys, pearl hens) may be seen.

„We used to breed sheep, our entire family. We were shepherd for more than 40 years, me and my husband. The village (Igris) was surrounded by pastures. ... The area you mention about was always a pasture. We also have other pastures on the other side of the village. ... We breed now at home only small animals, hens, ducks and rabbits. ... We are old and we can't breed any longer sheep or pigs." V13 – old shepherd family, Igris

„On this pasture there were always grazing sheep. Seitin was renown for it`s animals. We were breeding since centuries sheep and cattle. ... We had only few black buffalos, but this was not their region, they did not adapted, it was too hot and they needed lot of mud, and we lost them. ... I have animals in my courtyard (cattle, along pigs and other smaller animals). Even though I was some time ago the mayor of Seitin, and I have a university degree in law, I was raised in a small family farm (salas), outside the village, and I always enjoyed taking care of animals." V7 – former mayor, Seitin

„We breed here (Felnac site) sheep, but we also breed pigs and birds. ... We stay here, outside the village, year round, were we can take care of our animals. We have here now almost 700 sheep, which are grazing year round on 75ha of grasslands. ... We don`t perform any longer the transhumance because of the laws and because it is difficult and we want a better life. When I was a child I used to stay in the summer on the mountain and in the winter we were getting down at plain, along the Mures river in different sites." V29 – Sibian shepherd, Felnac

„I breed sheep since about 30 years. My father was shepherd and by grandfather was shepherd too. I am a bit old now and don`t work any longer with the animals, but I have a son in law which is dealing of the business, together with hired people. On the Seitin grassland, by the Mures River, we have now maybe 3000 sheep, belonging to 5 shepherd. ... The grazing yard is almost entirely owned by an Italian guy, which is now obliged by the Romanian law to maintain the pasture status of the surface." V2 – sheep flock owner, Seitin

Due to the fact that there are also arable fields in the area, the **food production** is also mentioned, both for intensive agriculture and for gardening. Some fallow lands can also be seen.

„The arable fields in the area are used only by different farmers to produce crops, mainly cereals (Seitin). ... Their owners allow us to graze the sheep after harvesting, mostly if they know the sheep owner." V6 – shepherd, Seitin

„We have few arable fields in the area you mention (Felnac). There were always only few arable fields, cultivated mainly with fodder. Lately, people begin to cultivate cereals also." V33 – agriculture engineer, Felnac

„There are no arable fields here ... There are many agricultural fields on the other side of the road (eg. the road which connects Igris with the Arad-Cenad county road), and there corn, crops, rape and other large cultures are made. We have a small garden, surrounded by fence, to grow some vegetables for the family." V21 – young Alba shepherd, Igris

„What could I say about food production. In the area we have only some fields used by the locals for vegetables, corn and others. Along the Mures river there were gardens and many orchards, but nowadays only some gardens are still used by local people." V11 – villager, Seitin

Game is a provisioning service mentioned frequently only in Felnac, due to the forest proximity, where large game may still be found (Red Deer, Fallow Deer, Wildboar). **Fishing** is mentioned in all the three villages evaluated. Fishing has reduced its significance lately, due to the Mures fish population diminution. Hunting is still an important source of income, for certain individuals, but it lost also it`s importance, due to decreasing game populations. There can still be hunted European Roe Deers, Red Deers, Fallow Deer, Wildboar, Hare, Pheasants etc, but their populations have decreased.

„Here in Seitin we have only European Roe Deer, Rabbits and Pheasants. We don't have forests and that`s why we don`t get larger game. ... Yes, there are people fishing in the Mures river, but not like the other days when they could fish 100 kilo Catfish. Formerly there were people fishing to gain some money, today this is not possible." V4 – villager, Seitin

„In the Felnac forest there are European Roe Deer, Red Deer, Fallow Deer, and Wildboar, and of course in the fields there are Rabbits and Pheasants. ... People are still going to fishing in the Mures, but the fish they catch is small and few. Formerly people captured very large fish. There were also people in the village, fishing to sell their capture and getting money out of it. But now they can not do this any longer. They woun`t find fish large enough." V42 – villager, Felnac

„I have seen many animals here, European Roe Deer, Red Deer, Fallow Deer, Wildboar, Pheasants. There are still people hunting, but I am pretty sure that there are not so many anymore. – The fishing is problematic due to the lost of the ponds." V13 – old shepherd family, Igris

„The whole region is divided in several hunting areas, administrated by private and state companies.

Hunting tourism is organized by the Forestry Directorate Arad, and recently some private companies too." V5 – hunting ward

„I have seen many animals in the forests neighbourging the Mures river, European Roe Deer, Red Deer, Fallow Deer, Wildboar, Pheasants. I seen from by boat even beavers and otters. Beavers were just introduced recently. People started to get afraid that the beavers might destroy their crops. ... Illegal fishing still appears. It is difficult to counter act because we don`t have enough physical and legal means to stop and punish the poachers. " V20 – fishing ward

Only **biomass** (wood) is mentioned by the locals as renewable energy source. The wood extracted locally is used by the locals for heating, and not for building. Only the Forestry Directorate Arad is extracting wood for building purposes from the area, but there is no mill saw in non of the evaluated villages.

„We heat our house with the wood we get from the forest or from the local market (Igris). All the people in the village is heating with wood." V13 – old shepherd family, Igris

„Almost everybody uses for heating the wood we get from the forest (Seitin). ... Recently there was built a natural gasses pipe in the village, but is too expensive to get to it and then to use the gas for heating, so most of the people are still heating with wood. " V8 – villager, Seitin

„People get wood from one of the local forest rangers (Felnac). The ranger prepare's coupons (selling coupons) and we go in the forest and cut the trees ourselves, under their supervision." V17 – villager, Felnac

„We have a great problem, which is not solved by the local policeman. The gypsies are stealing wood from the orchards located along Mures river. This is one of the reasons why people don`t care any longer of their orchards." V7 – former mayor Seitin

People from local communities can perceive also the natural potential of the flood plain, but they refer generally only to large mammals and birds. This is a provisioning service related to **genetic resources**.

„There are many animals in the Felnac forest. We hear and we see birds, Red Deers, Wildboars, Hare, Pheasants, even badger. Sometimes we have to take care of the little chickens, not to be catch by the hawks. I have seen lots of Foxes. I also heard that Jackals were caught on the fields." V16 – villager, felnac

„We have no Wolfs here, but somebody shot a Jackal some years ago. There are many animals in the forests and on the fields, like Pheasants, Wildboars, Roe Deer, Fallow Deers, Red Deers, Foxes, Hare …." V44 – villager, Felnac

„Our island is very nice (eg. – the Igris Islands Nature Reserve). Many times I heard flocks of birds on it. I was told that otter footprints were seen on it`s bank. In the fields we have Roe Deer, Phaesants and Hare." V23 – villager, Igris

„There were many fish in the Mures river, but now their number had decreased. There is still good fish species in the Mures, as the Catfish, the Sterlet, the Pike, but they don`t grow as big because they don`t have time." V20 – fishing ward

The **Fodder** production is still a significant provisioning service for the area, but generally, at community level, it lost part of it`s importance, due to the decrease of the animal husbandry.

„We kept about 3 ha of grassland to produce hay. But after the first cut we allowed the sheep to graze because that grass was small and there was to rain to make it grow." V29 – Sibian shepherd, Felnac

„Fodder is produces generally by the farmers which own many cattle, on arable fields. ... (Igris)" V14 – villager, Igris

Besides the provisioning services listed above, **drinking water** is mentioned and **medical resources**. **Honey** production is less mentioned.

„I am collecting lime-tree and chamomile flowers to prepare tea. ..." V22 – villager, Igris

„We use fountains to pump drinking water from the deep phreatic water, which many people get it by drilling in their own court yard. There are public wells in the village, but they are used for animals. Our watershed was polluted during the communist period, when in Semlac people started to use many chemicals in agriculture. ..." V7 – former mayor, Seitin

„There are people in the village keeping bee hives, but not so many. ..." V32 – villager, Igris

In the whole region, an interesting provision service is based on using the young **stems of *Amorpha fruticosa***, an invasive species, as posts to support the tomato plants cultivated at home. The plant gained many surfaces in the last years, due to lack of management measures, and being cut for posts offers some usage.

*„The young stems of "Japanese black locust" (*authors note: the locals name for *Amorpha fruticosa), to support tomato plants in the garden. Anyway, the plant made a real "forest" along the river and nobody is getting rid of it."* V10 – villager, Seitin

4.1.2. Regulating services

A few regulating services were mentioned when performing the interviews. Such regulating services are **flood protection, protection against erosion, safeguarding species reproduction, nature conservation** and **protection of biodiversity** – as shown by the quotations below.

„Is good that we have a nature reserve which protects our animals (eg. – the Mures Floodplain Natural Park) . They should get involved better in protecting the fish in the Mures river" V1 – villager, Seitin

„I know that the nature park was established in the forest an the Bezdin Pond. It is good that they protect the rare animals and plants. Perhaps game will be safe also. We have the White Water-Lilly on the Bezdin Pond, which is a rare plant." V27 – villager, Felnac

4.1.3. Cultural services

A few categories of cultural services were mentioned by the interviewed subjects. The ones that got most attention (highest number of times mentioned) were **cultural, historical and religious**

heritage as ecosystem service. The subjects also mentioned **other cultural and spiritual heritage** values of the natural environment.

„There were many farmsteads here, "sălaș", but they were put down by the communists. A couple of hundreds years ago there was also a small settlement belonging to Seitin, bult by Serbian border guards, but it was put down by the oppressed citizens and never built back." V7 – former mayor, Seitin

„There are many churches in the village, belonging to different religions: Orthodox, Unitarian, Catholic, neo-protestant. There are also two monasteries in the region, at Bodrogul Nou and at Bezdin." V39 – villager, Felnac

„Our village life changed significantly, mostly after the fall of communism. We used to get out in the village in the week-ends to dance. People were meeting in the evening on the street to discuss about the village life. Nowadays everybody stays inside and watches the TV's. Only old people still gather, mostly at the church." V24 – old biology teacher, Igris

Recreation and **tourism** are mentioned too. Mostly the area close to Igris Islands, neighbourging the Igris village, serve as a recreation area. Many people come here in summer for sunbaths and swimming.

„Many people of the village come for picnic and swimming at the cross river ferry. Sometimes people from Timisoara or Arad come here too." V16 – villager, Igris

„We have a nice place, near the cross river ferry. In the summer there are many people coming to swim and to tan." V24 – old biology teacher, Igris

A less mentioned but sensible cultural service is the so called **sense of place** ecological service. Even if people don`t mention specifically that they "belong" to the village in which they lived in for all their life, one can understand by the way they speak about different aspects of their young life that they have roots there, a real spiritual connection with the space they live in.

„Old people still like living in the village. They cherished the village life and everything the environment give them. Today people are not interested but of the TV, politics and to have fun." V13 – old shepherd, Igris

some subjects mentioned **scientific and educational services** can still be considered.

„I saw people from the reserve (eg. – the Mures Floodplain Natural Park Administration) in the field studying animals and plants. I understood that we have many protected species. ... " V14 – villager, Igris

„When I was still teaching, I used to get my students out and take a walk along the Mures river to show them the plants and animals and to have good time . ... " V14 – old biology tacher, Igris

According to our research, the most important ecosystem services are the provisioning and cultural services, which locals perceive that affect their lives the most directly. The most important provisioning services are the ones that affect the livelihood of the community directly: services related to food production, animal husbandry and biomass (wood). The most valued cultural services are tourism and recreation.

CONCLUSION:

Our study was not an attempt to clarify exact information and value of the ecosystem goods and services benefiting the local communities, but to get an image of how actual rural society values/perceives the natural environment, and to identify trends with respect to community behavior towards nature/natural resources and their way of living.

The ecosystem services which were mentioned the most and defined to have a key importance are those which affect directly the individuals life quality. Food production is the most important provisioning service.

Services as religious tourism, sense of place, are cultural services appreciated mostly by elders. Tourism and recreational activities are still significant and appreciated services for the area.

Our study revealed a less important service, but which may turn to be significantly beneficial for natural ecosystems quality and their preservation, as harvesting the stems of *Amorpha fruticosa* to be used in the households for vegetables cultivation.

We did not identify any conflict among the Mures Floodplain Natural Park Administration and the locals, mostly due to the fact that no restrictions were imposed after the designation of this protected area. No regulation adverse to the way of living of the local community was enforced, and consequently no reaction was arisen by it. Many locals didn`t even hear by this nature protected area, or they are connecting it only to the forest, in which the activity was previously regulated by the forestry administration.

Our study identified a situation which may offer the answer to the pastures status in the region – stopping the transhumance activity. Many of the shepherds which were performing the transhumance from mountain to plain, stopped and located themselves permanently in the plain region. This fact conducted to the increase of the sheep flocks in the plain region, and consequently determined an overgrazing pressure for most of the pastures.

Further studies while be needed to connect the information regarding the land use, ecosystem goods and services, biodiversity status and evolution trends.

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