

# Socio-economic and land-use changes in the Pedja River catchment area, Estonia

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## Abstract

During the last 15 years, large-scale socio-economical changes have occurred in Estonia. This has been influencing agricultural activities and has resulted in land-use changes with ecological consequences. The relative share of agriculture in GDP has dropped from 19% to 3.1 during the last 20 years, the number of people employed in agriculture has decreased from 136 800 to 31 500 during the last 15 years. This has caused a loss of jobs and the abandonment of agricultural land. The biggest change in land use has been the overgrowing of ecologically valuable wooded meadows, floodplains, alvars, and natural grasslands. The area of wooded meadows has decreased from 850 000 ha in the 1940s to 800 ha at present. Also, in the community of Puurmani, the human population has dropped 11% during the last 3 years. Agricultural activities have declined significantly; the number of pigs has decreased 24 times and the number of cattle, 1.6 times during last 15 years. 514 ha of former flooded meadows and wooded meadows of River Pedja have reverted to forest and 33 ha to dense bush at present.

*Keywords: biodiversity, flooded meadows, land-use changes, socio-economic changes, wooded meadows.*

## 1 Introduction

During the last years, considerable socio-economic changes have occurred in the whole of Europe. For Eastern European countries these changes have been remarkable during the last 15 years as a result of political changes. At the beginning of the 90s a rapid change in the political system, from Soviet Socialist Republic to the independent state of Estonia, took place, which gave new opportunities for the development of the country. This included ownership changes, which in rural areas meant the liquidation of the old system of



*kolkhozes* and *sovkhoses*, which were replaced with small private farms and cooperative farms. Also, agriculture as a whole had to refocus from the eastern to the western market, in a situation where, during first years of independence, agriculture was not subsidised by the state. This resulted in a considerable decrease in agricultural production, loss of jobs, and finally in the set-aside of agricultural land.

These fast socio-economic changes resulted in several ecological consequences that, in some cases, have had a negative impact to ecosystems. Especially rapid changes took place in old traditional semi-cultural landscapes with extensive cultivation (mowing, grazing) like wooded meadows, alvars, and coastal and riparian meadows, which have high ecological value and increase the heterogeneity of the landscape. For example, wooded meadows in Estonia have very high plant diversity: up to 74 species per one m<sup>2</sup>, which is one of the highest in Europe [1]. Wooded and alvar meadows are rich in butterflies including several species protected by EU Directive *Natura 2000* (*Euphydryas aurinia*, *Coenonympha hero*, *Lopinga achine*, *Lycaena dispar*). Likewise, the number of bumblebee species has been found to be higher in semi-natural areas than in agricultural areas of Estonia [2]. The extensive management of grasslands also increases the number of other insects like grasshoppers, bees and wasps [3]. Flooded meadows, riparian meadows and buffer strips have a high ecological value, since they increase biodiversity and create important migration corridors in landscapes [4]. In Estonia, many valuable species, such as dragonflies (*Aeshna viridis*, *Ophiogomphus cecilia*), hermit beetle (*Osmoderma eremita*), are linked to riparian habitats along rivers. Also, the protected butterfly, Clouded Apollo (*Parnassius mnemosyne*) is related to such a habitat, since 78% of all observed occurrences of Clouded Apollo in Estonia have been registered in the riparian meadows of rivers [5].

According to the Estonian Red Book, the overgrowth of semi-cultural landscapes is a threat to 7 mushroom, 23 lichen, 80 plant and 23 animal species in Estonia [6]. Meadow habitats are also important constituents of protected areas, constituting 10% of all the protected areas in Estonia.

Therefore, socio-economic changes in rural areas can have a direct impact on the ecosystems and the ecological value of landscapes. This paper deals with general socio-economic changes in rural areas of Estonia and with the related land-use changes in one rural municipality in more detail.

## 2 Material and methods

### 2.1 The socio-economic analyses

The analyses of socio-economic changes were made using the database of the Statistical Office of Estonia (SOA). The analyses of land-use changes were made by comparing Estonian cadastral maps from the 1930s and from the beginning of the 1990s.



## 2.2 Location and natural conditions of the Puurmani community

The Puurmani community is situated in the central part of Estonia, in the southwestern part of Jõgeva County (Fig. 1).

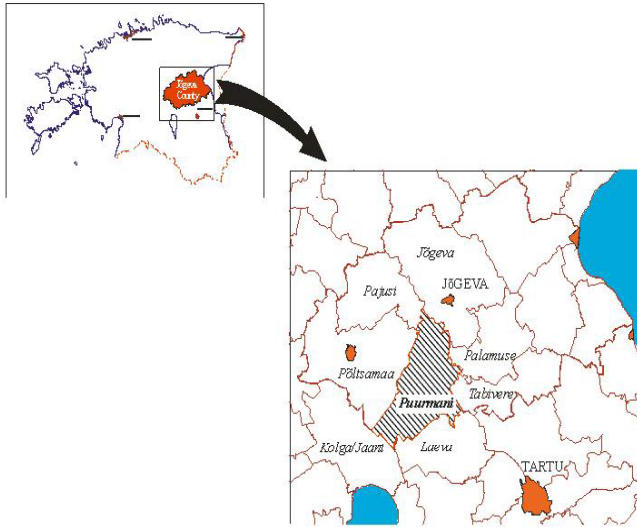


Figure 1: Location of the Puurmani community.

The territory of the Community is 292.7 km<sup>2</sup>, which is slightly bigger than the average area of Estonian rural municipalities – 212 km<sup>2</sup>. The central village of the rural municipality – Puurmani, is situated 27km from the county centre – Jõgeva; 38km from the second largest town in Estonia – Tartu and 150km from the capital of Estonia – Tallinn.

The Puurmani community is in the transition zone between Estonia's two contrasting bedrock types. The whole municipality and all of Northern Estonia lie on limestone bedrock; Southern Estonia, South from Puurmani, lies on sandstone. This dictates the characteristic conditions for the soils of the municipality. The limestone bedrock is covered with a thin (1-3m) sandy-loam moraine layer and with calcareous soils, forming flat landscapes. Soils of the community are mainly podzolic soils that, in the case of moderate moisture conditions, have high fertility; however most of the soils are humid or wet and are suitable for agriculture only after drainage. In the western part of community the bedrock is covered with clay sediments topped with peatlands. In the floodplains of rivers, wet peat soils can be found. The eastern and central part of the community is covered with soils suitable for agriculture, which have a relatively high quality (55 points from maximal 100, according to the local soil quality scale) for Estonian conditions (40 is the average for Estonia; less than 35 is considered not suitable for agriculture) [7].

In the western part of the community is situated a large wetland system that, from 1952 until 1991, was a Soviet Air Force bombing practice area. In 1994, the Alam-Pedja Nature Protection area was established in this area and is included in the list of Ramsar sites. 82% of the protection area is wetland, its total area is 260 km<sup>2</sup>. The Emajõgi, Pedja and Põltsamaa rivers flow through the protection area; their flooding area in spring time can reach 92km<sup>2</sup>, which creates valuable habitats of European importance.

### 3 Results and discussion

#### 3.1 Socio-economic changes in Estonia

During the last 10-15 years, tremendous structural changes in agriculture have taken place in Estonia. The re-orientation of agriculture to the new economic conditions has resulted in the marginalisation of rural areas.

The relative share of agriculture in Estonia's GDP dropped from 19% in 1984 to 5.8 in 1997 and finally to 3.1% in 2002 [8]. The re-structuring of the economy did not take place so fast, the unemployment rate increased, agricultural land was set aside, nearly 25% of arable land was temporarily disused and many people moved away from rural areas. According to the SOA, the population has dropped 10-40% in 83 rural municipalities and 0-10% in 80 municipalities, from a total of 416 municipalities, during the last ten years. In 1960, 25.4% of all employed people were employed in agriculture; in 1980 this number was 13.5, and in 1996, 8.1%; in 2000 this figure fell to 5.2%. In just one decade the number of people employed in agriculture decreased from 136 800 in 1990 to 31 500 in 2000.

The number of cattle and pigs dropped during ten years to the pre-Second World War level [8]. New economic activities did not replace agriculture as rapidly as expected, although many people moved out to the bigger cities and industrial centres.

Large changes have occurred in land use through the whole century. The area of forest has increased almost three times from 1940 to 2000. This is mainly due to a large decrease in the area of natural grasslands, most of the grasslands being overgrown by forests. In contrast, the area of arable land has been fairly stable through the century [9]. At the beginning of the 19<sup>th</sup> century, the area of wooded meadows comprised 850 000 ha, a level similar to that before the 1940s. Today about 800 ha of wooded meadows remain and cutting of hay is taking place only on 200 hectares [6].

#### 3.2 Socio-economic changes in the Puurmani community

The population of the Puurmani community on 01.01.2003 was, according to SOE, 1904, which is close to the average number – 2244, for Estonian rural municipalities. In 1959, there were 2577 people living on the territory of present-day Puurmani community, and that number has decreased steadily over 50 years. A larger change took place in between 1959 and 1979, when the population



decreased from 2577 to 2137; this was followed by a more stable period until 2000. Rapid change has been taking place during short period 2000 to 2003, when the population decreased about 11% from 2145 to 1904. Although, the share of the old people in the community is high, and natural population growth has been negative during the last years (2 to 12 people per year) it is still very small in comparison with the total decrease of the population due to migration away from the area. Also, the number of people working outside of the community has increased rapidly during the last years, from 150 in 1997 to 250 in 2000 [7]; this may lead to their eventual migration away from the municipality. This pressure is caused by the general difficulties in the agricultural sector, lack of professional jobs in the area and the strong impact of neighbouring cities.

### 3.3 Land-use changes in the Puurmanni community

Agriculture has been the main economical activity in the area for many years. One kolkhoz and one sovkhov were sited within the territory of the present Community. Their highest level of production was at the end of the 1980s; after this, agricultural production has been decreasing steadily. As a result, the number of pigs has decreased 24 times during the period 1989 to 2001 and the number of cattle, 1.6 times, both being even lower than that before the War (Table 1), even though the data from 1939 was from a much smaller area than that from 1989 and 2001. Also, the kolkhoz and sovkhov did not farm sheep and poultry in 1989, but these animals were quite often bred in family farms that were not represented in the statistics of the time.

Table 1: Number of animals in the Puurmani Community in 1939-2001.

	1939*	1989**	2001***
Number of cattle	2696	4581	2879
Number of pigs	1817	7261	301
Number of sheep	2145	-	6
Number of poultry	7549	-	3099

\* in the Kursi Community, which constituted about 65% of the area of the present Puurmani Community (Estonian Statistics, 1939)

\*\* kolkhoz "Rahva Hääl" and sovkhov Saduküla [10]

\*\*\* according to the agricultural counting, database of SOE.

The most drastic change has taken place in the number of sheep: from 2145 before the war to 6 in 2001. Sheep are related to old traditional extensive agriculture; they were grazed in natural meadows, floodplains and wooded meadows of River Pedja, which are the most valuable habitats for many species and which are now overgrowing and disappearing.



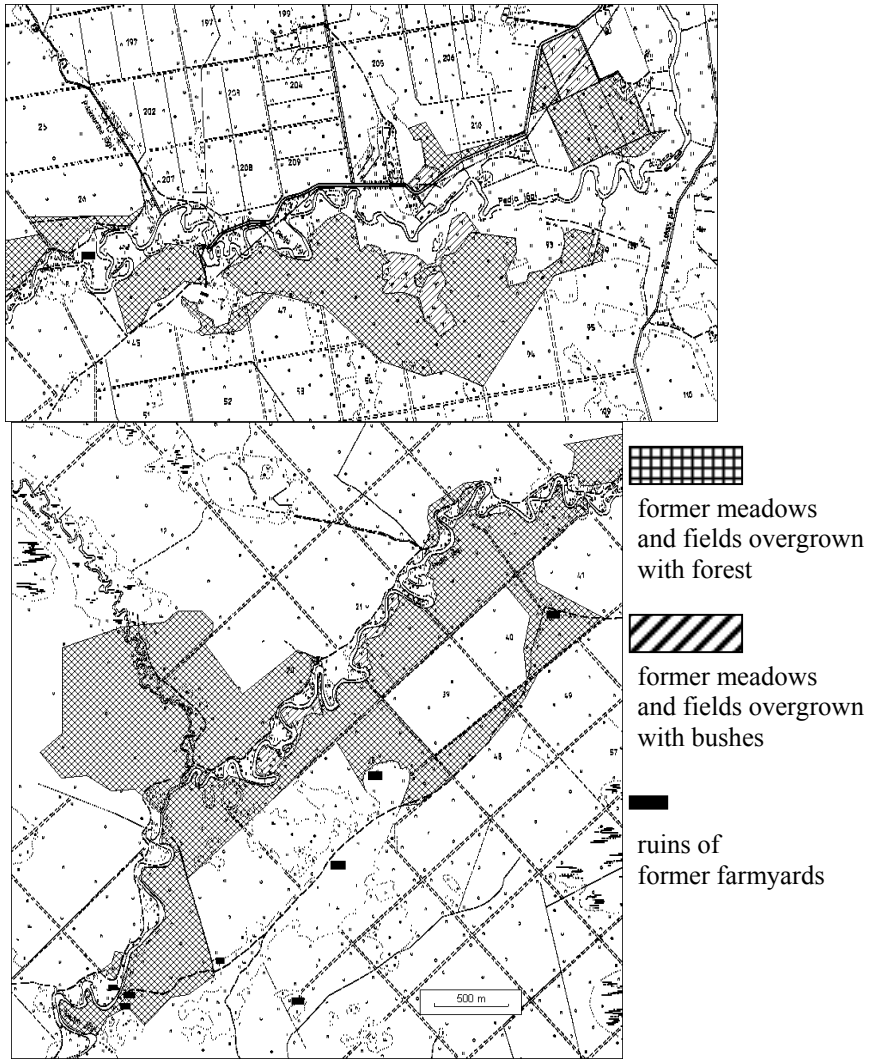


Figure 2: Land use changes in floodplains of River Pedja since 1936 (according to land cadastral map) to about 1990 (present cadastral map).

These changes are expressed in Figure 2. The area has also undergone such large-scale changes because between 1952 and 1991 it belonged to the Red Army and was entirely closed to all the public. Therefore, many people moved away from the area, farms were set aside, and now only ruins remain of the former farmsteads. All together in the territory of the Puurmanni Community, on the floodplains of the River Pedja, 547.2 ha of former meadows and flooded

meadows are now overgrown; 514 ha have been replaced by forests and 33.2 ha by dense bushes.

## 4 Conclusions

During a short period, serious socio-economic changes took place in Estonia; these have certainly also had consequences for ecosystems and their ecological value. In the whole country, the share of agriculture in the GDP is steadily decreasing; agricultural production is decreasing and has resulted in the loss of jobs and the migration of people away from rural areas. Even a rural municipality with good physico-geographical conditions, such as fertile soils and proximity to cities, has suffered a decrease in agricultural production and in the number of animals and has witnessed the abandonment of agricultural areas. This has resulted in the loss of very valuable communities – wooded meadows and flooded meadows, which will have a direct impact on the diversity of plant and insect species in the area.

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