

## ANALYSIS OF THE FLAWED SPATIAL STRUCTURE OF LAND IN SELECTED VILLAGES OF THE SOUTH-EASTERN POLAND

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### Summary

Faulty spatial structure of villages in south-eastern Poland is a result of historical, socio-economic and demographic processes. They are responsible for many long-lived inconsistencies and errors in the Register of Land and Buildings (EGiB) acting as the Cadastre in Poland. The article discusses the problem of the flawed structure of the possession of land, land use and the fragmentation of cadastral parcels in the villages Konieczkowa and Lutcza in the Strzyżów District (powiat), Podkarpackie Voivodeship.

Correction of the flawed spatial structure of rural areas, through the known agricultural arrangement treatments such as consolidation and exchange of land, is a chance to improve the economic conditions of the Subcarpathian villages. This process is long-lasting, requiring the cooperation of local authorities with inhabitants and proper legal safeguards. The advantage of carrying out this process would provide a basis for EGiB reforms in order to transform it into the real estate cadastre.

### Keywords

fragmentation of land • wielding structure • use structure • plot • parcel • cadastre

### 1. Introduction

The original settlement systems influenced by human activities have been constantly evolving. Morphogenesis, which occurred in the first spatial systems of villages land, led to high fragmentation of making up farms cadastral plots and their dispersion. Small registration plots characterized by irregular and elongated shape often do not meet the requirements of carrying out field works in agriculture. The fragmentation of plots was not followed by building the access roads for their direct service, which meant that a significant part of plots does not have a direct road connection with the host habitat [Noga 1977].

In the south-eastern Poland the spatial structure of villages was formed in historical, socio-economic and demographic processes. A significant problem for rural areas in this part of Poland is a low level of agricultural development, which is largely due to the topography. The area with the diverse terrain relief is not conducive to the development of

agriculture both in terms of the structure of use and of the mechanization of farm works. In Podkarpace farms are characterized by a large number plots of irregular shape and relatively small areas. This is demonstrated by scientific research presented in a number of publications [Leń and Noga 2010, Leń 2010, Leń et al. 2015a, b, c; Janus and Tazakowski 2013a, b, 2014]. Due to the high fragmentation and dispersion of farms, farmers are exposed to significant costs of cultivation. The high degree of the development of mechanization, automation and robotization of agricultural machines in these difficult conditions is not applicable. An additional problem is the poor condition of the roads causing difficult or impossible access to the service of fields. These factors adversely affect the state of real estate cadastre in Poland and prevent its further development [Mika 2007, Mika and Siejka 2014]. The chance to improve the economic conditions of the Subcarpathian villages is the correction of the flawed spatial structure of rural areas through the known agricultural arrangement treatments such as consolidation and exchange of land. This process is long-lasting, requiring the cooperation of local authorities with inhabitants and proper legal safeguards. The advantage of carrying out this process would provide the basis for EGiB reforms in order to transform it into the real estate cadastre.

In the article the analysis of the flawed spatial structure of the plots in Lutcza and Konieczkowa villages was carried out. The study determined the structures of use, possession and land fragmentation. The study was conducted to illustrate the configuration of the borders of register plots and capturing areas showing significant failure of the spatial structure of the plots. Quantum GIS program was applied as a tool for presenting the results. The analysis was made on the basis of materials EGiB, obtained from the District Office in Strzyżów.

## 2. Analysis of the spatial structure of the investigated villages

### 2.1. The structure of the land use in investigated villages

The structure of land use is a result of presence of multiple factors. These include the terrain relief, soil and climatic conditions. Table 1 shows a comparative tabular listing of the land use in the studied villages.

**Table 1.** Use of the land in the studied villages

The type of agricultural use	Konieczkowa		Lutcza	
	Area		Area	
	[ha]	[%]	[ha]	[%]
Arable land	452.52	41.22	1341.01	47.63
Orchards	6.4	0.58	30.9	1.1
Meadows	27.09	2.47	212.57	7.55
Pastures	116.01	10.57	195.41	6.94
Built-up agricultural land	55.53	5.06	80.42	2.86

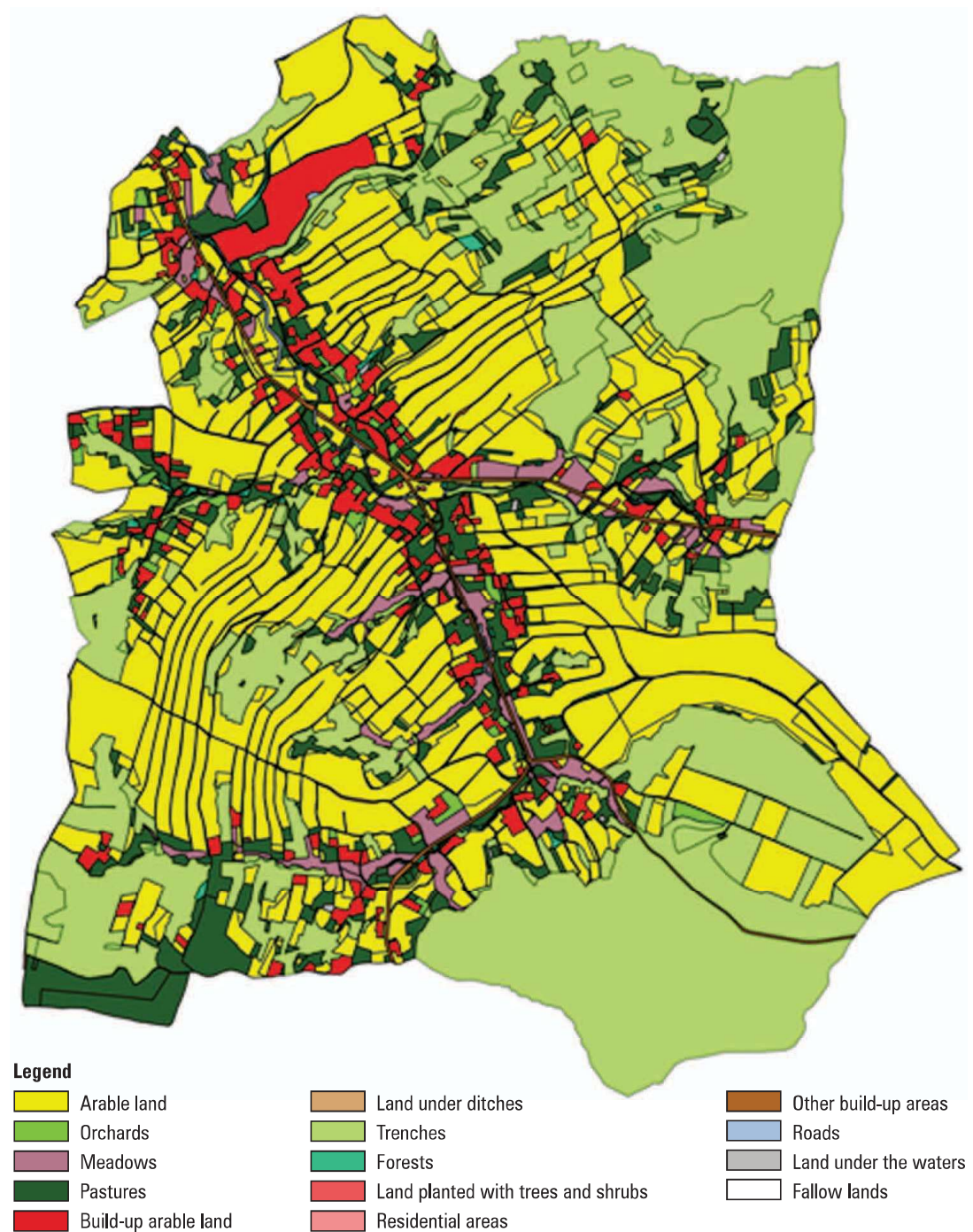
Ditches	0.11	0.01	6.17	0.22
Forests	401.32	36.56	817.36	29.03
Wooded land and shrubland	4.55	0.41	17.13	0.61
Residential areas	0.31	0.03	1.67	0.06
Industrial areas	–	–	0.96	0.03
Other built-up areas	0.11	0.01	3.66	0.13
Urbanized undeveloped areas	–	–	0.27	0.01
Recreation areas	–	–	3.43	0.12
Roads	28.06	2.56	74.9	2.66
Waters	5.24	0.48	23.41	0.83
Fallow lands	0.54	0.05	6.01	0.21
Various areas	–	–	0.43	0.02
	1097.79	100.00	2815.71	100.00

Source: authors' study based on Szewczyk 2016

The analysis of the land use structure in the village Konieczkowa (Table 1) indicated that the largest area was occupied by agricultural lands. They cover 657.66 ha, or 59.91% of the total area of Konieczkowa. The predominant method of the use is arable lands, which cover 508.04 ha, making up 46.28% of the total land area. The second largest group of agricultural lands are pastures that occupy 116.01 ha, or 10.57% of the total land area in the analyzed village. The forest land, shrubs and trees as a whole occupy 405.87 ha, of which 36.56% is covered by forests, and the remaining 0.41% are wooded lands and shrublands. Built-up and urbanized areas represent 2.60% of the total area of Konieczkowa, and the road surface is 28.06 ha, or 2.56% of the studied area. A relatively small area, in the village Konieczkowa, is occupied by the lands under water of 0.48% and a wasteland of 0.05% of the total land use structure. The spatial picture of land use in the studied village is illustrated in Figure 1.

The similar analyses were conducted based on data from the EGiB for the Lutcza village. These studies showed that the largest area in the use structure of the village occupy agricultural lands, which occupy 1866.48 hectares, that is 66.29% of the total area. Similarly to the Konieczkowa village, the area is dominated by arable lands, which take 1341.01 ha and represents 47.63% of the total land area. The next group of agricultural land in relation to the surface of the whole village are meadows, representing 7.55% of the analyzed area. Pastures occupy 195.41 ha, or 6.94% of the total area of the village. Agricultural lands amount to 80.42 ha built, which makes 2.86% of the studied area. Orchards and ditches altogether constitute only 1.32% of Lutcza. Forest lands, bushes and plantings occupy 834.48 hectares, of which 29.03% is covered by forests, and the remaining 0.61% are wooded lands and shrublands. Built-up and urbanized areas represent 3.02% of the total area of Lutcza, of which road area occupy 2.56% of the surface of the land, that is 28.06 ha. The relatively small area is occupied by the lands under water of

0.83%, wasteland 0.21% and different areas 0.43% of the total land use structure in Lutcza village. The spatial structure of land use in the studied village is presented in Figure 2.

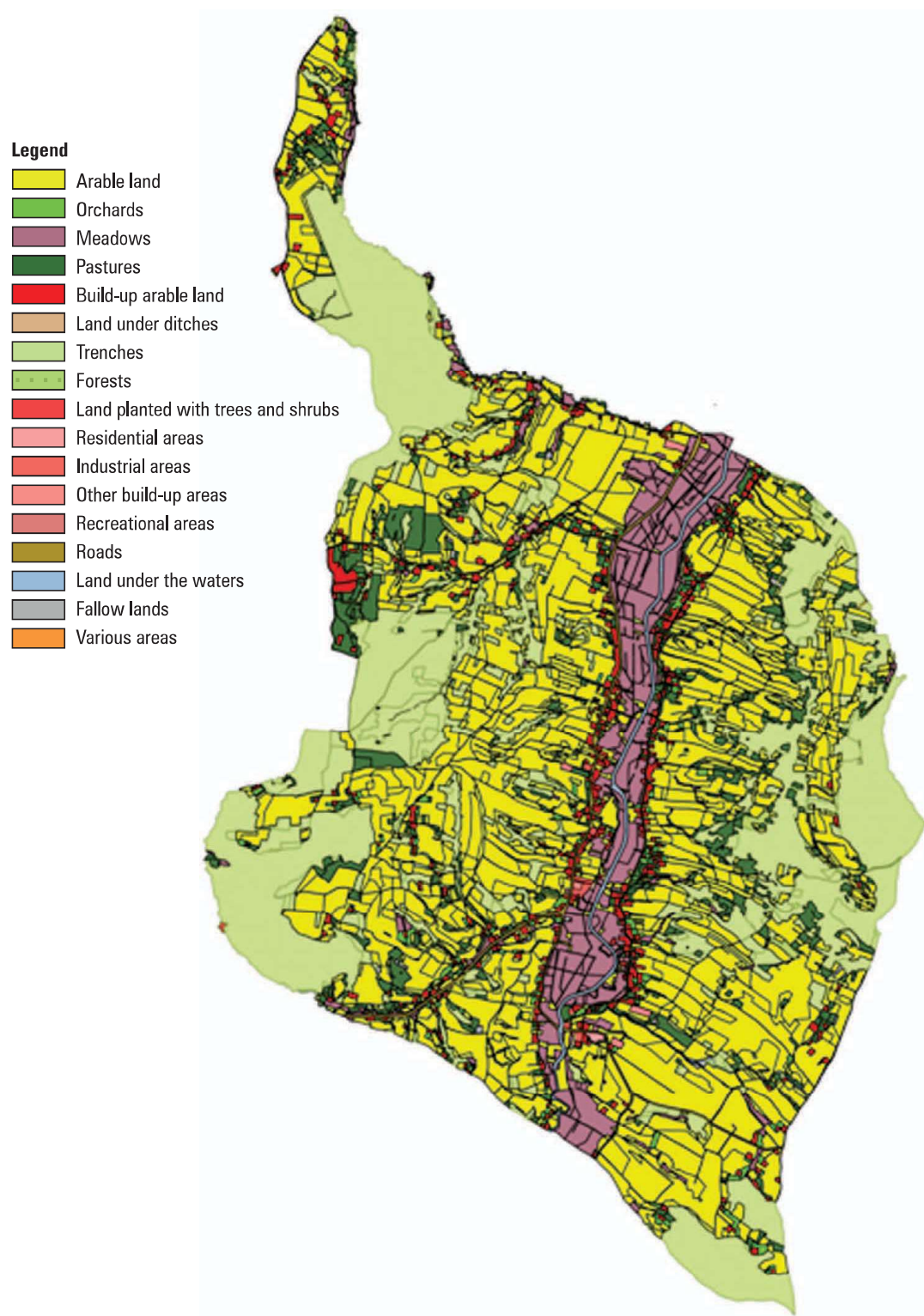


Source: Szewczyk 2016

Fig. 1. Land use structure in Konieczkowa

W legendzie tego rys. (w podstawie) jest o jeden opis więcej niż kolorowych prostokątów

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Source: Szewczyk 2016

**Fig. 2.** Land use structure in Lutcza

## 2.2. Analysis of the structure of possession of land

As it is clear from the analysis (Table 2) of the structure of land possession, from 3057 parcels with total area of 1097.79 hectares, the largest percentage in the surveyed village falls to natural persons, which is as much as 75.98% of the total area of the Konieczkowa village. The area of the land is 834.11 hectares and counts 2 700 parcels. The Treasury is another big owner of these lands. As for the size of the land area, the State Treasury lands occupy an area of 213.27 hectares, i.e. 19.43% of the studied village. On the other hand, the area of land in the hands of companies is 20.13 ha, which is at 1.83% of the total area of the village. Land municipalities and inter-municipal associations own 94 register plots, and they occupy 8.58 ha, which represents 0.78% of the total studied area. The next group of land owners in the village are cooperatives. They own 11 plots with a total area of 8.35 ha. In turn, the land of churches and religious associations occupy 5 plots with a total area of 8.37 ha. The cooperatives and churches and religious associations have the same percentage of the total area of the analyzed village.

**Table 2.** Analysis of the possession of land in the surveyed villages

Number of register group	Land	Konieczkowa			Lutcza		
		Number of plots	Area		Number of plots	Area	
			[ha]	[%]		[ha]	[%]
1	Land of Treasury	117	213.27	19.43	274	519.95	18.47
2	Land of Treasury let for perpetual usufruct	12	1.02	0.09	–	–	–
4	Land of municipalities and intercommunal unions	94	8.58	0.78	148	30.19	1.07
5	Municipalities land in perpetual usufruct	–	–	–	4	0.77	0.03
7	Natural persons land	2700	834.11	75.98	6116	2201.47	78.19
8	Cooperatives land	11	8.35	0.76	–	–	–
9	Churches land	5	8.37	0.76	29	16.19	0.57
11	Districts land	16	3.96	0.36	15	6.54	0.23
13	Voivodeships land				4	5.77	0.20
15	Companies land	102	20.13	1.83	248	34.83	1.24
	Total	3057	1097.79	100.00	6838	2815.71	100.00

Source: authors' study based on Szewczyk 2016

Lands belonging to the district occupy 0.36% of the total area. Negligible percentage in the possession of land has the land of the Treasury let for perpetual usufruct. They occupy 1.02 hectares which is only about 0.09% of the area of the studied village. The spatial image of the possession of land in the Konieczkowa village is presented in Figure 3.



Source: Szewczyk 2016

Fig. 3. Structure of the possession in Konieczkowa

As the analysis shows, for the Lutcza village, the structure of the land possession, among 6838 parcels with total area of 2815.71 ha, the largest percentage in the studied

village falls to natural persons, which is as much as 78.19% of the total area of the village. The area of the land is 2201.47 ha in 6116 register plots. Land belonging to the State Treasury is another group in terms of the areas under its possession. They occupy an area of 519.95 hectares, representing 18.47% of the studied village. Companies have 34.83 ha of land, what makes 1.24% of the village area. Municipalities and their associations possess 148 register plots of land, covering an area of 30.19 hectares and representing 1.07% of the total area of the village. Land of churches and religious associations occupies 29 plots with a total area of 16.19 hectares. Lands belonging to the district authorities occupy 0.23% of the total area. The voivodeships lands cover 5.77 hectares which is 0.20% of the area of the studied village. Negligible percentage in the possession structure are 4 plots of municipalities land in perpetual usufruct. The area of this land is 0.77 ha representing only 0.03% of the Lutcza area (Figure 4).

### 2.3. Analysis of land fragmentation

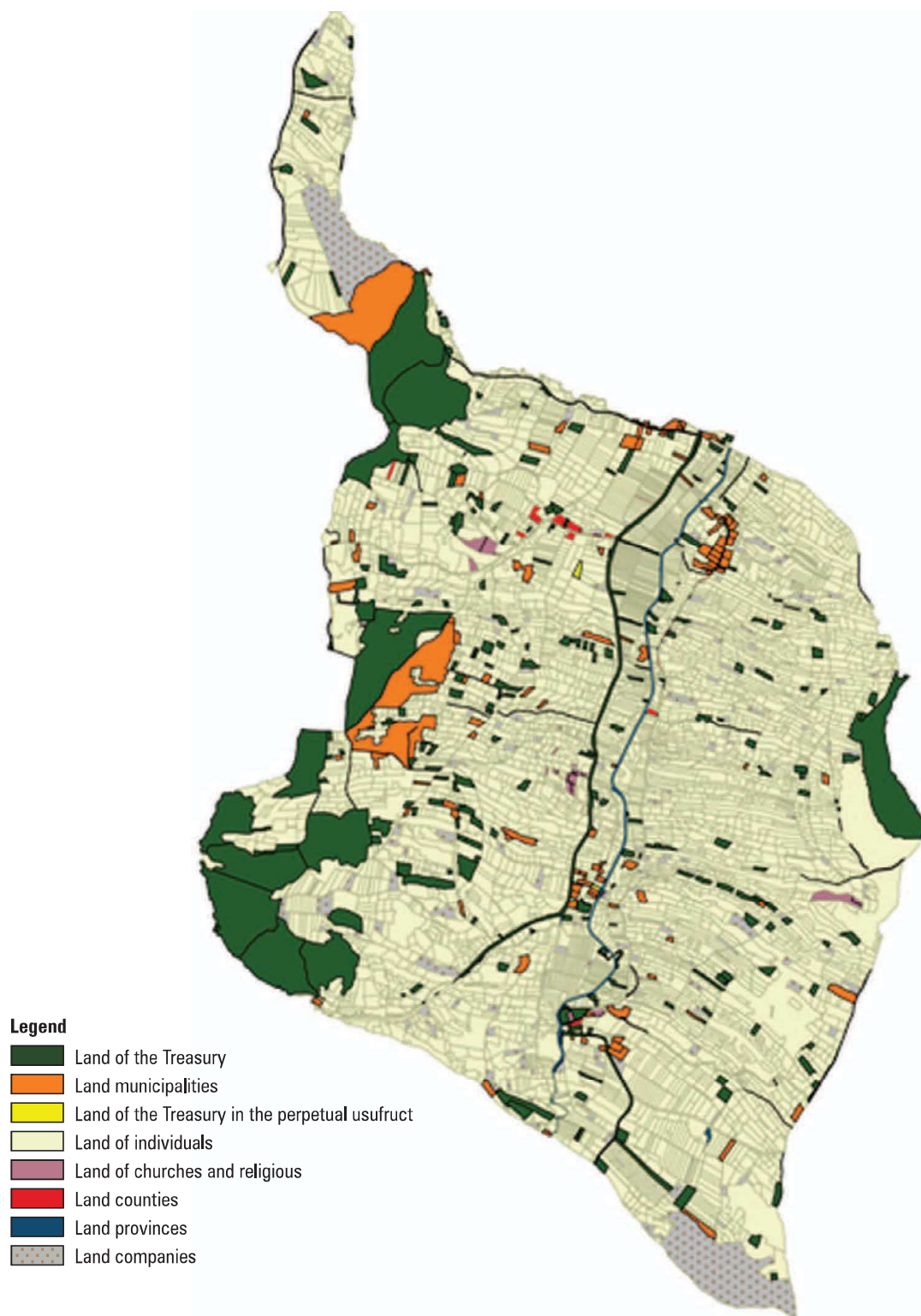
The studies of Konieczkowa village demonstrated that out of 3057 register plots, the most numerous are the plots within the area range from 0.11 ha to 0.20 ha. Their number is 774, which represent 25.32% of the total number of plots. In the analyzed village 739 plots smaller than 0.10 ha was found, which represents 24.17% of all parcels. On the other hand, within the range 0.21–0.30 ha there are 559 parcels representing 18.29% of all parcels. Size of plots representing 22.18% of the total number of plots is between 0.31 and 0.60 ha, including 678 parcels. Percentage of the number of parcels in the group ranging between 0.61 and 1.00 ha area is 6.18%. The smallest group of 118 parcels, is a group of area above the 1.01 ha. It represents 3.86% of the total number of plots and 34.49% of the total area of analyzed village. The spatial image of the fragmentation of land in the Konieczkowa village illustrates Figure 5.

**Table 3.** Fragmentation of individual farms land in the studied villages

Area range [ha]	Konieczkowa				Lutcza			
	Number of plots	Percentage of plots number [%]	Plots area [ha]	Percentage of plots area [%]	Number of plots	Percentage of plots number [%]	Plots area [ha]	Percentage of plots area [%]
0.00–10.00	739	24.17	38.24	3.48	1341	19.61	70.48	2.50
0.11–0.20	774	25.32	115.76	10.54	1542	22.55	230.91	8.20
0.21–0.31	559	18.29	137.15	12.49	1381	20.20	341.75	12.14
0.31–0.60	678	22.18	285.8	26.03	1668	24.39	718.11	25.50
0.61–1.00	189	6.18	142.25	12.96	561	8.20	427.73	15.19
>1.01	118	3.86	378.59	34.49	345	5.05	1026.73	36.46
–	3057	100.00	1097.79	100.00	6838	100.00	2815.71	100.00

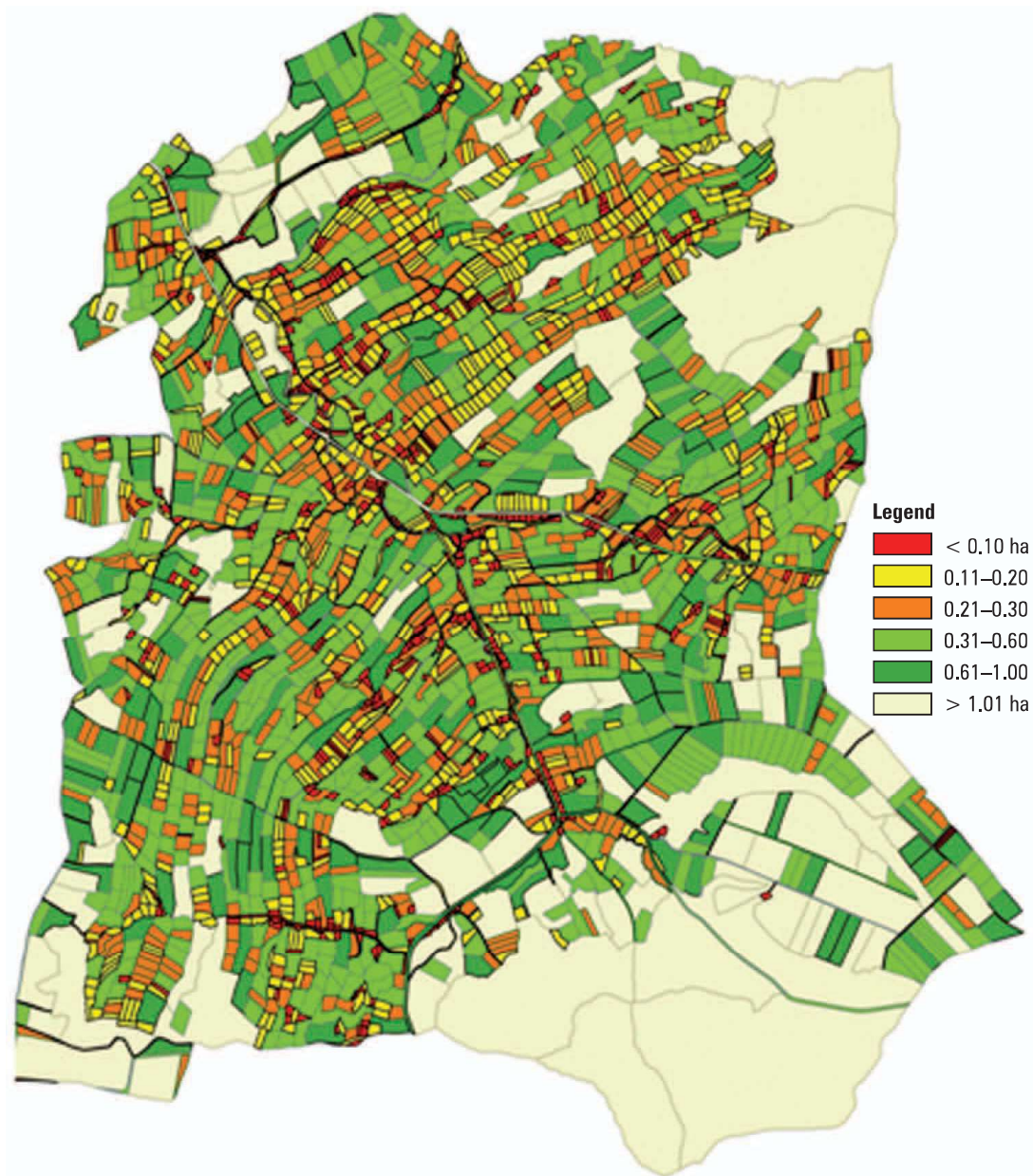
Source: authors' study based on Szewczyk 2016





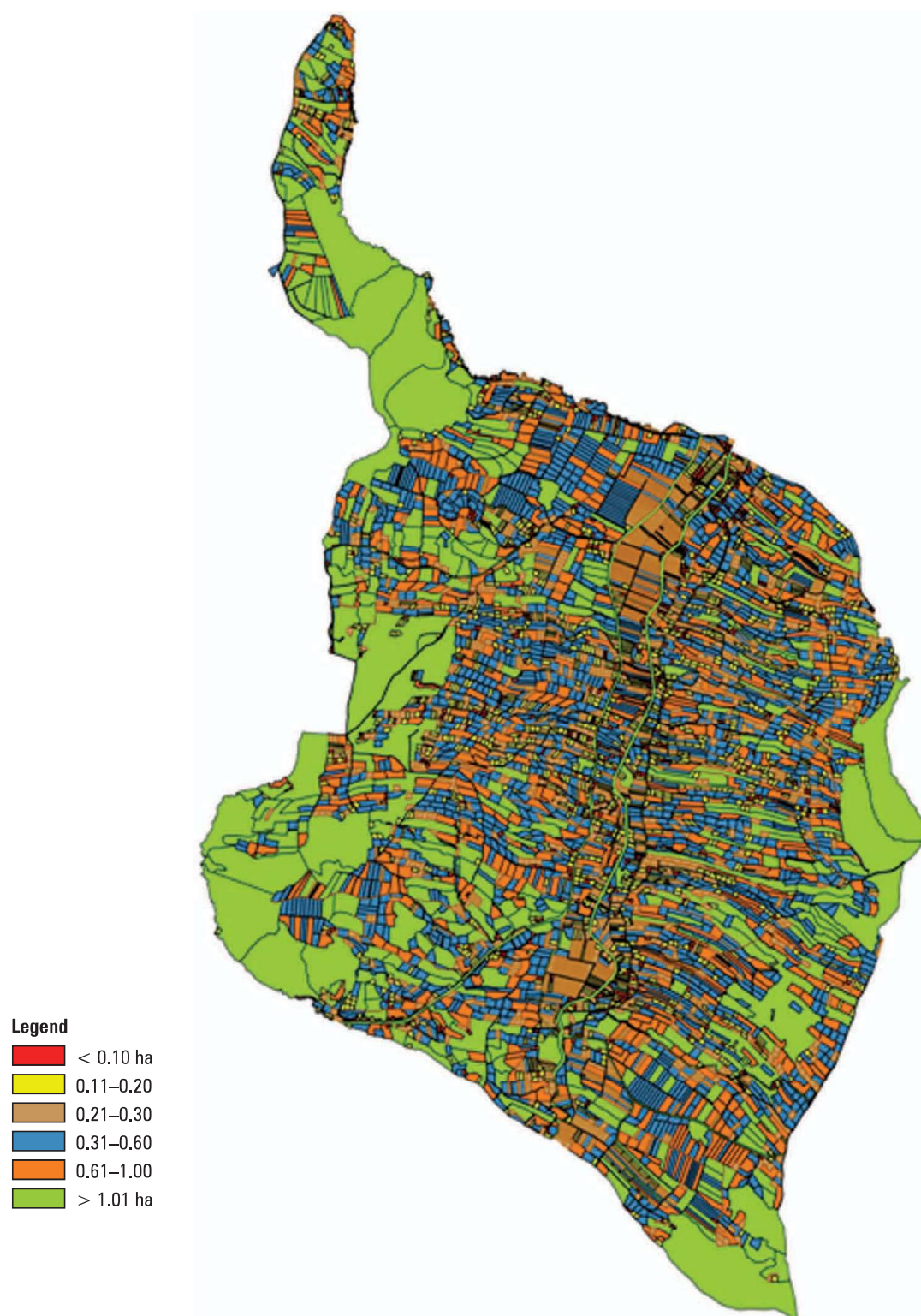
Source: Szewczyk 2016

**Fig. 4.** The structure of possession in Lutcza



Source: Szewczyk 2016

Fig. 5. Fragmentation structure in Konieczkowa



Source: Szewczyk 2016

**Fig. 6.** Fragmentation structure in Lutcza

The research of fragmentation of land in the second village (Lutcza) showed that among the 6838 parcels, the most numerous are plots within the range of 0.31–0.60 ha (Figure 6). Their number is 1668 representing 24.39% of the total number of plots. In the analyzed village 1341 plots do not exceed the area of 0.10 ha, which represents 19.61% of all parcels. In the area range from 0.11 to 0.20 ha there are 1542 parcels representing 22.55% of the total number of plots. On the other hand 20.20% of the total number of plots in the studied village have between 0.21 and 0.30 ha, representing 1381 register plots. Percentage of the number of register plots in the group between 0.61 and 1.00 ha is 8.20%. The smallest number of parcels is found in a group of more than 1.01 ha (5.05% of the total number of plots which represents 36.46% of the total area of analyzed village). Number of plots in this group is 345.

### 3. Conclusions

The analysis carried out on the basis of the EGİB materials showed that in both locations the greatest area in the spatial structure in terms of land use are arable lands. In the first of the analyzed villages (in Konieczkowa) they occupy an area of 657.66 ha, which represents 59.91% of the total area of the village. On the other hand, in the second village (in Lutcza) agricultural land has an area of 1866.48 hectares which makes up 66.29% of the village.

Both in Konieczkowa and Lutcza the dominant group in the structure of possession of land are natural persons. This indicates a further possibility of growing of the fragmentation in the near future, due to the legal consequences of inheritance of land. In Konieczkowa natural persons are in possession of 834.11 ha, which is at 75.98% of its area and includes 2700 register plots. In Lutcza natural persons are in possession of 6116 plots, with a total area of 2201.47 hectares, which represents 78.19% of the total area of the village.

Analysis of the fragmentation performed in both locations indicated that in Konieczkowa the most numerous are plots within the area range from 0.11 to 0.20 ha, including 774 plots, while in Lutcza the largest number of plots is between 0.31 and 0.60 ha and includes the 1668 register plots.

The scale of the fragmentation in the studied area can be described as large and typical of its region. The results of analyses confirm the outcomes of other studies carried out in southern and south-eastern Poland. They show clearly that the analyzed area is characterized by large imperfection of the spatial structure, adversely affecting not only the level of development and comfort of the inhabitants work, but also contribute to the deterioration of cadastral data. The characteristics of the studied area makes them suitable for carrying out comprehensive consolidations works and exchange of land.

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