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The Impact of the Motorway Construction on the Size of Plot Patchwork within the Territory of the Czarna Sędziszowska Village – A Case Study

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ABSTRACT

Line investments, such as a motorway, have a negative impact on the spatial structure of agricultural land, which has disarrayed the lifestyle and human work in rural areas. Such projects have a measurable influence on increasing the distances between plots which are the property of a single owner, dividing the plots crossing the designed section of the project, increasing the number of plots, deteriorating the technical infrastructure and the road network or limiting the use of land. The routing of the A4 motorway splits the analyzed village of Czarna Sędziszowska, situated in the Ropczyce-Sędziszów district, into two parts: northern and southern. As a result, the plots forming part of a single farm are located on both sides of the motorway. The agricultural space in the village can be adjusted through the consolidation and exchange of land. The main goal of land consolidation is creating favourable conditions for the agricultural management, connected with improvement in the structure of farms, the configuration of land, as well as adaptation of plots to the terrain and the pattern of roads, including motorways. This paper aims to analyze the distribution of individual farmlands within the internal plot patchwork and to determine the size of land that is the property of non-resident owners in the village split by the motorway.

Keywords: non-resident owners, plot patchwork, village, consolidation, motorway

INTRODUCTION

Previous studies showed that line investments such as a motorway or expressway normally constitute a small share in the total area of the village. However, they cause irrevocable alterations in the spatial structure of land, crossing the complexes of plots and separating the plots forming part of a single farm that – after the motorway is built – will be situated on both sides of the village [Harasimowicz, Janus 2009; Wójcik-Leń, Stręk 2017b]. Such investments do not only disturb the spatial development of the village but also interfere with the ecosystems as new, foreign elements of land. They have a negative effect on cropland, tree stands, soils, orchards and human health [Noga, 1996a, 1996b]. According to studies, motorways are less harmful in comparison with conventional roads. This can be assigned to the fact that motor traffic is faster and collision-free. In addition, the costs are reduced [Suwara 1994]. It can be concluded that the construction of motorways provides considerable economic and social benefits, but it can also have a significant negative impact on the respective elements of the environment and on the local communities living near the motorways, in connection with the construction of motorways alone and then their operation [Gola-Szlachta et al. 2012].

The land owned by private farmers is very often located within the plot patchwork, so it is scattered between the plots forming part of other farms. In Poland, the internal and external plot patchwork is a serious problem, which inhibits building a full value cadastre of real estates in Poland [Mika, Leń 2016; Mika 2016; Mika 2017]. This problem is further aggravated by line investments. Large distribution of plots is, in the first place, a problem in the southeastern Poland [Leń 2017a; Leń at al. 2017], eastern

Poland [Stręk 2017] and central Poland [Hudecova et al. 2016; Leń 2017b, Leń et al. 2017]. Rural management works, allowing comprehensive changes to agricultural space such as consolidation of land, by improving the spatial structure of agricultural land and utilizing options of its alternative development, constitute a chance for remedying the discussed situation in rural areas [Wójcik-Leń, Stręk 2017a; Wójcik-Leń, Sobolewska-Mikulska 2017a; Wójcik-Leń, Sobolewska-Mikulska 2017b]. Consolidation of land in connection with the construction of line investments is called infrastructural consolidation, in contrast to classic consolidation. These two types of consolidation are considerably different. The most important difference is that the proceedings are carried out ex officio and the works are financed directly by the investor, that is, the General Directorate for National Roads and Motorways. In Poland, such activities are predominantly connected with the implementation of the motorways and expressways construction programme [Dobrowolski et al. 2007].

This paper analyzes the impact of the A4 motorway construction on the size of the plot patchwork within the territory of the village of Czarna Sędziszowska, commune of Sędziszów Małopolski, Ropczyce-Sędziszów district. The area covered by the study is 3249.60 ha.

AREA COVERED BY THE STUDY

The Ropczyce-Sędziszów district is situated in the central-western part of the Subcarpathian voivodship. The area of the district is 54 831 ha. A motorway crossing the district splits its area into the northern and southern part. The motorway passes through the villages of Borek Mały, Kozodrza, Ostrów and Skrzyszów within the commune of Ostrów and the villages of Boreczek, Borek Wielki, Czarna Sędziszowska and Wolica Piaskowa within the commune of Sędziszów Małopolski, which is illustrated in Figure 1.

All the villages cover an area of 8720 ha and they are split into 18087 plots. The A4 motorway covers an area of 293.21 ha and it has introduced a new spatial structure of land in the analyzed villages. The motorway section passing through the territory of the district is 18.12 km long. In the west, it is linked to the rural Dębica commune, and in the east – to the rural Świlcza commune.

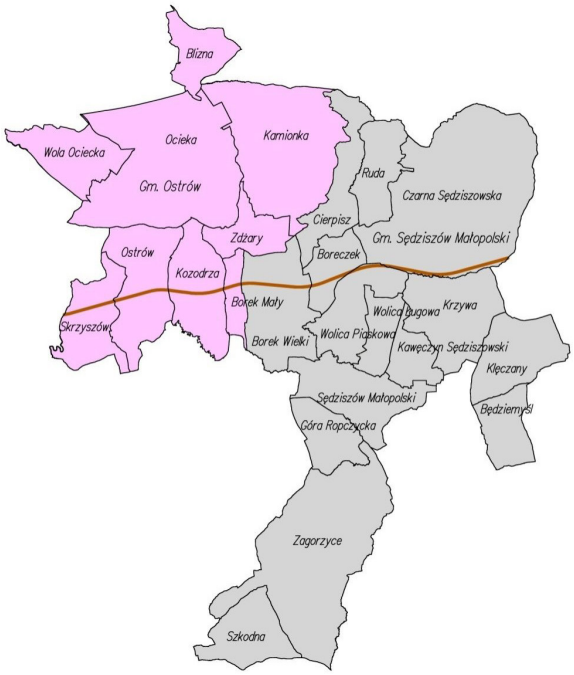

Fig. 1. The routing of the motorway in the communes of Ostrów and Sędziszów Małopolski

According to the data above (Table 1), the motorway crosses the villages of Borek Mały, Kozodrza, Ostrów, Skrzyszów, Boreczek and Borek Wielki, splitting the villages into the northern and southern parts. In terms of area, the result of the analysis is similar for each of the villages. In total, 5268.05 ha of land covered by the study are situated in the northern part and 3159.14 ha in the southern part. In Czarna Sędziszowska, the motorway passes right next to the border with Krzywa in the southern part of the village, whereas in Wolica Piaskowa – next to the border in the northern part of the village. The motorway covers an area of 293.21 ha and its total length is 18.12 km.

DESCRIPTION OF THE INTERNAL PLOT PATCHWORK

The shape of the present-day rural land has been the result of long-term human activity related to social, economic, business or legal transformations as well as natural conditions. Such changes have led to adverse alterations to the natural rural landscape, resulting in plot patchworks. The term was coined in 1907 by Koncent-Zieliński who defined a plot patchwork as *"an arrangement of land owned by a single village where plots owned by individual owners*

Table 1. Routing of A4 motorway in the analyzed villages

No.	Village	Northern part of the village [ha]	Southern part of the village [ha]	Motorway [ha]	Length [km]
Ostrów commune					
1	Borek Mały	87.77	150.6	12.88	0.73
2	Kozodrza	452.61	419.37	33.62	2.22
3	Ostrów	606.2	457.48	33.7	2.19
4	Skrzyszów	251.1	495.77	31.55	2.06
Sędziszów commune					
5	Boreczek	324.35	103.79	26.62	1.67
6	Borek Wielki	319.37	784.87	53.41	2.78
7	Czarna Sędziszowska	3223.85	25.75	73.1	5.01
8	Wolica Piaskowa	2.8	721.51	28.33	1.46
	Total:	5268.05	3159.14	293.21	18.12

are not situated in a single common share of land next to their dwelling but they are fragmented into more plots, most often narrow and elongated, distributed over a considerable area and partitioned by plots being the property of other owners" [Koncent-Zieliński, 1907]. Other authors, such as Radwan [1938], Tkocz [1971] or Hopfer [1978], gave similar definitions of plot patchwork but extended it with reference to agricultural land, crops or soil classes. The plot patchwork can be divided into internal or intervillage patchwork if the owner is a resident in the village in which his/her land is located and external or intravillage patchwork if the owner is not a resident in the village in which his/her land is located. The owners of land in the plot patchwork are referred to as 'non-resident owners' [Rabczuk 1968]. They can be classified as:

- "out-of-village non-resident owners – owners of land in a specific village who live in another village,
- local non-resident owners – owners of land outside the village they live in,
- out-of-village non-resident owners' land – land in a specific village being the property of owners not resident in the village (except land they own in their place of residence),
- local non-resident owners' land – land outside the village in which the owner lives (except land they own in their place of residence)" [Noga 1977].

Plot patchwork was created as a result of a few factors in long-term historical processes connected, among other things, with social and economic changes, legal and ownership relations, the borders fixed in the first cadastral maps, inheritance and division of estates, family relationships, migration of people, as well as purchase of land by residents of cities and towns for leisure and housing purposes. Plot patchwork is a negative phenomenon which has a negative effect on the agricultural production. Along with the expansion of the field area, the distance between the plots forming a part of a single farm increases, which raises the costs of production and transport, while the farmer's income is lower.

DETAILED STUDIES – INTERNAL PLOT PATCHWORK

One of the core parameters of the plot patchwork is the location of human dwellings in relation to the plots owned by the farm. For economic reasons, the dwelling should preferably be central in relation to other plots.

Such an arrangement ensures proper distance from the agricultural land, which contributes to reducing fuel consumption and the farmer's workload. Other significant factors affecting the spatial structure of land are: area and number of plots owned by a single farm, shape and elongation of plots and plots with no access road. The number of plots per farm depends on the area of the farm, valuation class, the structure of farmland and natural conditions in the specific area. With regard to production economics, a farm should not consist of more than six plots [Noga 2006].

The specified parameters have an extremely adverse influence on the internal plot patchwork. An excessive number of plots, and in addition their size, shape or scattering, have a negative impact on the farmer's work effectiveness.

The internal plot patchwork was analyzed based on a sample of 10% of farms with different

technical parameters of soil, all located in the analyzed village. The number and average area of plots forming part of a single farm were presented in tables no. 2 and no. 3.

Czarna Sędziszowska has the highest number of farms out of all the villages crossed by the motorway. Detailed studies were carried out in 30 farms (Table 2). The analysis indicates that the area of farms ranges from 2.39 to 10.23 ha. The number of plots is from 3 to 20. The average plot area for the selected farms ranges from 0.27 to 1.37 ha. The analyzed area is characterized by the plots with very disadvantageous geometry, which makes rational agricultural management difficult. The motorway runs in the southern part of the village right next to the border with the village of Krzywa, so it passes through the plots and impedes work in the fields to a slight extent. Some farms have plots arranged next to one another from the north towards the south, split into smaller, narrow plots, e.g. farm no. 3, 9, 13. However, other plots are scattered throughout the village as smaller, unshapely and narrow strips. The largest farm is farm no. 20 with an area of 10.23 ha, consisting of 19 plots covering 0.54 ha on average. The plots form long and narrow strips on the west side of the village and a single small plot is situated in the northwestern part. The smallest farm, no. 16, consists of 5 plots with an area of 3.37 ha. The average area of the plot is 0.67 ha. Part of the plots are irregularly shaped, others are narrow and have medium length.

EXTERNAL PLOT PATCHWORK

Studies (Table 3, figure 2) concerning the size of external plot patchwork in the village of Czarna Sędziszowska revealed that 380 owners own 968 plots with a total area of 427.47 ha, which accounts for 28.7% of the total area of the villages. The largest percentage share in the area of land is that of owners residing in the village of Kamionka with the area being 12.57 ha. The villages of Bratkowice and Mrowla are situated in another district but they are close to each other, whereas Będziemyśl is a neighbouring village.

In Mrowla, 6 owners own 30 plots covering a total area of 11.56 ha. The non-resident owners from Bratkowice own 35 plots, which is the highest number for rural land. The owners in the village of Będziemyśl own 14 plots covering an area of 9.70 ha. The share of other villages is insignificant and it was distributed among other plots in the district, and then in the voivodship and in the country.

In the analyzed village, the largest percentage of land is owned by the owners from the neighbouring cities and towns (Fig. 3). The owners of land from Sędziszów Małopolski have 321 plots corresponding to 8.47 % share, whereas in terms of area they cover 154.27 ha, which accounts for 10.36% of the land owned by individuals. Such a huge impact of the above-mentioned town is due to the location of the village close to the town of Sędziszów Małopolski, as well as the terrain that is well-adapted for leisure. Other cities and towns account for up to 2.0% of the area of private lands.

Table 2. Comparison of selected farms

No.	Area [ha]	Number of plots	Average plot area [ha]	No.	Area [ha]	Number of plots	Average plot area [ha]
1	6.55	7	0.94	16	3.37	5	0.67
2	4.92	8	0.62	17	2.75	6	0.46
3	5.42	12	0.45	18	2.39	8	0.3
4	3.57	8	0.45	19	5.11	16	0.32
5	5.5	18	0.31	20	10.23	19	0.54
6	2.94	11	0.27	21	5.32	8	0.67
7	6.68	19	0.35	22	5.57	6	0.93
8	6.12	11	0.56	23	7.1	12	0.59
9	4.73	7	0.68	24	4.07	7	0.58
10	4.11	7	0.59	25	3.86	6	0.64
11	2.82	4	0.71	26	9.18	20	0.46
12	3.66	10	0.37	27	4.12	3	1.37
13	5.49	20	0.27	28	4.98	9	0.55
14	3.41	9	0.38	29	4.45	10	0.45
15	4.79	15	0.32	30	5.38	6	0.90

Source: Own elaboration based on data from the land and buildings register (EGiB)

Table 3. External plot patchwork in the village of Czarna Sędziszowska

No.	Village	Owners	Area [ha]	% share in total area	Number of plots	% of plots
Villages						
1	Kamionka	5	12.57	0.84	14	0.37
2	Mrowla	6	11.56	0.78	30	0.79
3	Bratkowice	12	10.06	0.68	35	0.92
4	Będziemyśl	9	9.7	0.65	14	0.37
5	Other – district	48	29.17	1.96	65	1.71
6	Voivodship	41	46.15	3.1	108	2.85
7	Country	26	36.48	2.45	80	2.11
Cities and towns						
8	Sędziszów Młp.	140	154.27	10.36	321	8.47
9	Kolbuszowa	14	28.99	1.95	79	2.08
10	Ropczyce	21	28.32	1.9	61	1.61
11	Rzeszów	36	22.07	1.48	78	2.06
12	Kraków	8	14.18	0.95	35	0.92
13	Głogów Młp.	5	12.78	0.86	25	0.66
14	Dębica	9	11.17	0.75	23	0.61
Total		380	427.47	28.7	968	25.53

Source: Own elaboration based on data from the land and buildings register (EGiB)

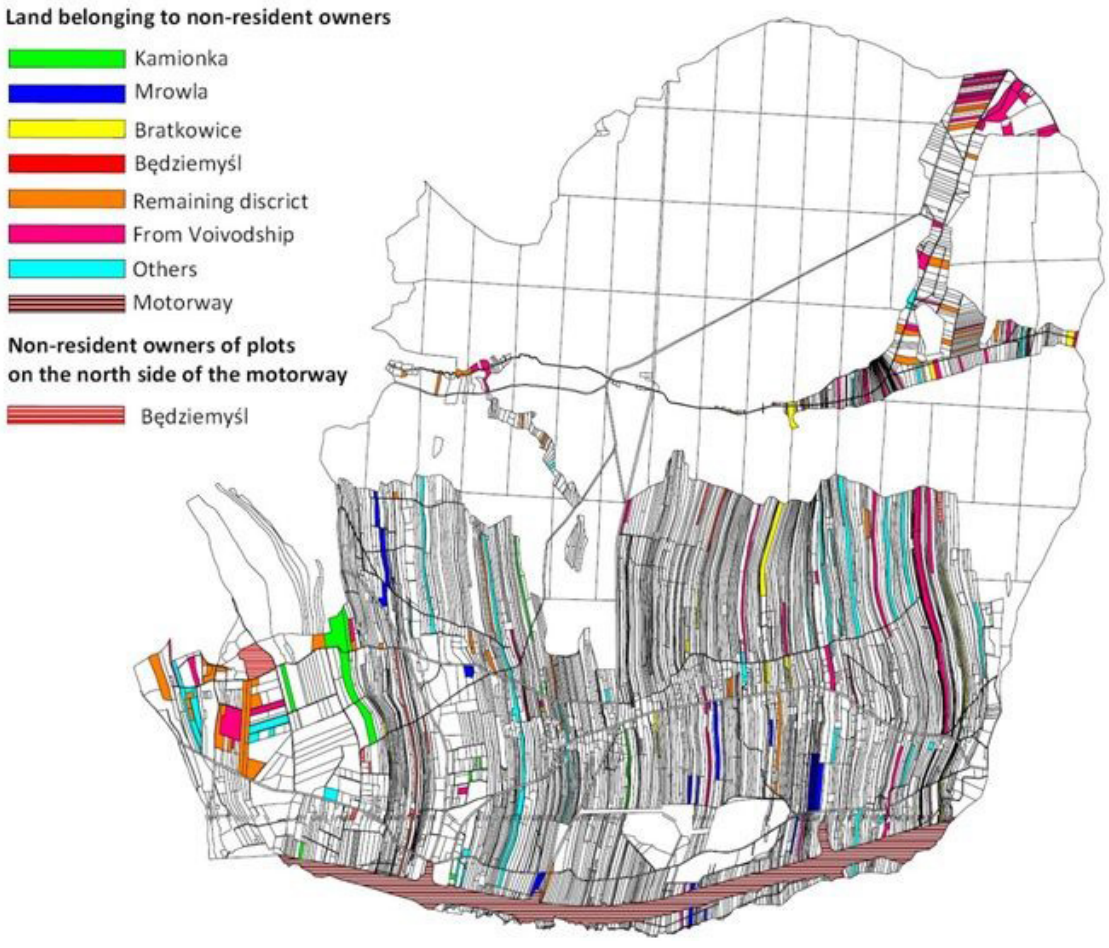

Fig. 2. Spatial distribution of land being the property of out-of-village non-resident owners on both sides of the motorway

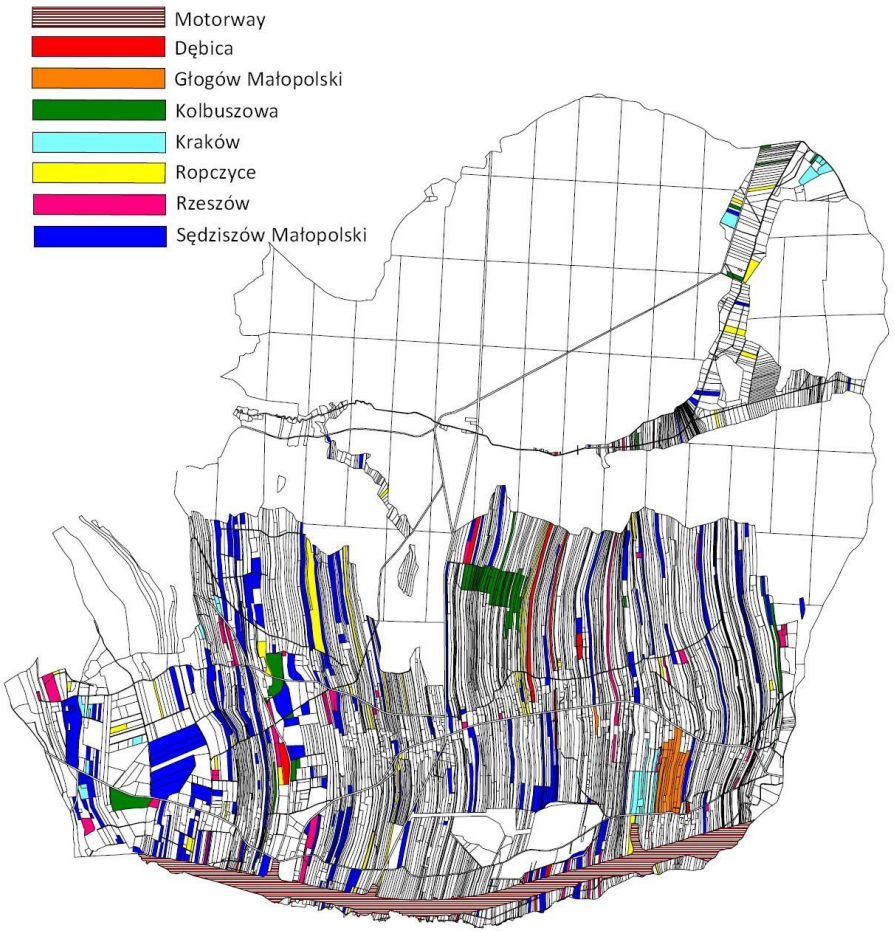

Fig. 3. Spatial distribution of land being the property of out-of-village non-resident owners from cities and towns intersected by the motorway

CONCLUSIONS

Plot patchwork is a phenomenon which has a negative impact on the effectiveness of agricultural production. The farmers whose plots are scattered over a wide area spend more time to reach their land and move between respective plots. This generates increased costs of transport and excessive workload. Apart from the internal plot patchwork, external plot patchwork is also a very important aspect. Its formation is connected with the impact of villages in the commune, district, voivodship and the country. The occurrence of the land owned by non-residents is an adverse phenomenon generated by inheritance, transfer of land to successors, and thus the division and fragmentation of land.

The construction of a motorway had negative effects on the configuration and location of plots in the analyzed villages. The land was split into smaller parts situated on the northern and eastern side of the village, which increased the fragmentation of plots. The motorway split the village, including the built-up zone. The internal and external plot patchwork is another problem. Following the construction of a motorway, the plots forming part of a single farm are not situated on the same side on which the farmer's dwelling is located. The problem of plots being the property of non-resident owners was aggravated – the percentage of such land in the total number of plots in the village increased. In addition, the plots owned by the residents of other villages were separated from the plots located on the other side of the motorway. The construction of a motorway made the access to plots difficult. Despite service roads being built on both sides of the motorway, there are no roads providing access to the agricultural land, which increased the cost of access.

Land consolidation and exchange works in the analyzed villages would help eliminate the negative effects for land management caused by the construction of the A4 motorway. The results of

such works will provide many advantageous solutions to improve the terrain and farmers' work. These include: elimination of internal patchwork by ensuring that the plots that are the property of one owner are located near the owner's dwelling, on the same side of the motorway on which the farm is located, as well as exchange of the land that is the property of non-resident owners to the land in their home locations, which would result in a reduction in the number of plots. Land consolidation works should also include a design of a network of agricultural transport roads connected to service roads.

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