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The Use of Local Property Markets Analyses in the Preparation of the Evaluation of Land in Consolidation and Exchange***

1. Introduction

The carrying out of comprehensive works of consolidation and exchange of land is a process that plays an important role in the shaping of rural areas. These activities stimulate the functions of these areas, in the economic, social and environmental spheres. The change of land ownership and use is beneficial both for the development of agriculture, and for the development of non-agricultural functions the area covered by consolidation. Consolidation processes increase the efficiency of agricultural production by reducing the number of plots and increasing of their surface area, improving the shape of the plots, the improvement of the road networks, reduction of costs at the farm and allow the introduction of modern technology [1, 6, 8, 11].

The improvement of the system, density and width of the roads agriculturally supporting fields and their quality, is an important decisive element in the improvement of management conditions. Improvement of the spatial structure of land contributes to the increase of the number of land transactions, with a consequent increase of their market value.

According to Frelek and others [5], the basis for the proper performance of consolidation and exchange of land is to carry out the valuation of the land free from errors and defects. The multivariate method of valuation of land for the purpose of their consolidation and exchange, is based on the point values taking into account the productive value of soils, developed by the Institute of Soil Science and Plant Cultivation (IUNG) [8, 10, 14].

Currently, because of better and better growing real estate market also in the area of agricultural land, it is reasonable to use transaction prices for the valuation of land for the purposes of consolidation and exchange of land. This solution will simplify the mutual settlements between the land consolidation participants; will

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allow the land transactions in the process of consolidation, and will affect the accuracy of determining the value of land owned by the consolidation participants. In addition, the use of transaction prices to estimate the value of the land covered by the consolidation process will authenticate the valuation process, which is particularly important in contested cases.

The justification for this approach is also the fact that in accordance with Article 2 section 1 of the Act on consolidation and exchange of land, consolidation area is formed by the land located in one or several villages or parts of them [12]. Whereas the basic feature affecting the transaction price variability is the location of the transaction object. Therefore, the purpose of this study is to check the correlation between the transaction prices of arable land and their indicator of the quality and location, on example, of the Brzozów district in Podkarpackie voivodship.

2.   The Area and Method of Research

The study area includes the Brzozów district, as one of the 25 districts of the Podkarpackie voivodeship. This district borders on the north with the Rzeszów and Strzyżów districts, on the east with the Przemyśl district, on the south with the Sanok district, while on the west with the Krosno district (Fig. 1). The district includes 45 villages within 5 rural communes (Domaradz, Dydnia, Haczów, Jasienica Rosielna and Nozdrzec) and one urban-rural commune (Brzozów). The biggest in terms of area is the Dydnia commune (24% of the total area of the district, 15 cadastral precincts, and the smallest communes are Domaradz and Jasienica Rosielna (about 11% of the total area of the district and respectively 3 and 4 cadastral precincts. The remaining communes: Nozdrzec and Brzozów are divided into eight cadastral precincts. While the Haczów commune includes 7 precincts.
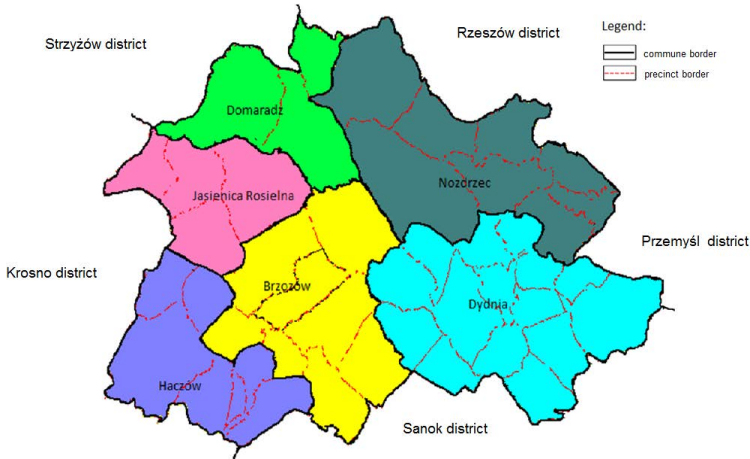

Fig. 1. Administrative division of Brzozów district

The research was conducted for 43 rural localities of the Brzozów district. Due to the objective of the work the Brzozów city was excluded from the research and the locality of Hroszczówka, because of the lack of data on transaction prices for the studied real estate. The data contained in the database of land and buildings registry and in the register of prices and real estate values were used. The study period covers the years 2004–2014. During the analyzed period 1571 sale and purchase transactions of arable land have been undertaken. All transaction prices were adjusted due to the passage of time between the transaction date and the date of analysis, ie. on the day 31.12.2014, by the rules defined in accordance with Article 5 of the Law on Real Estate Management [13].

Variability of transaction prices of arable land in the analyzed market of the Brzozów district, is mainly due to location and production value of land. The location is understood as the distance from the main administrative centers – commune, district (city of Brzozów, Krosno, Sanok) or the voivodeship city of Rzeszów. The production value of land is understood as a soil quality class, the level of agrarian culture and economic-natural factors determining the size of the harvest [8]:

$$W = \frac{\sum_{i=1}^{n}(K_n \cdot P_n)}{P},$$

where:

K_n – the point values for each index of soil quality classes, according to IUNG (Tab. 1),

P_n – the area of soil quality class for arable land [ha],

P – the total area of arable land in the village [ha],

n – the soil quality class for arable land.

Table 1. Point production values of arable land by IUNG

No.	Soil quality class	Value, K_n
1	I	100
2	II	92
3	IIIa	83
4	IIIb	70
5	IVa	57
6	IVb	40
7	V	30
8	VI	18
9	RZ-VI*	10
10	PsZ-VI*	10
11	N*	5

* values adopted by [9] in the paper [16]

Source: [15]

The research material collected in the form of average transaction prices of arable land, index of production value of the land and distance of each village from the commune village, district towns and the capital of the voivodeship, are shown in Table 2.

Table 2. Transaction prices and attribute parameters characterizing the studied area

No.	Location	Number of trans-actions	The distance from the main administrative centers					Index W	Average price [PLN/m²]
			commune location [km]	Brzozów [km]	Krosno [km]	Sanok [km]	Rzeszów [km]		
BRZOZÓW COMMUNE									
1	Górki	29	7.6	7.6	31.9	20.0	61.5	62.93	2.14
2	Grabownica Starzeńska	109	6.1	6.1	34.1	16.5	60.9	61.82	8.69
3	Humniska	114	3.5	3.5	32.0	19.1	58.3	58.83	9.21
4	Przysietnica	27	5.4	5.4	33.3	28.0	57.1	51.82	3.96
5	Stara Wieś	F0	3.2	3.2	27.9	25.8	52.0	60.61	6.11
6	Turze Pole	51	5.3	5.3	27.2	25.5	60.1	66.14	3.47
7	Zmiennica	65	4.8	4.8	24.3	29.6	59.1	58.51	4.50
DOMARADZ COMMUNE									
8	Barycz	28	9.7	23.0	37.6	45.6	36.3	46.55	3.14
9	Domaradz	85	0.0	13.3	27.9	35.9	41.5	52.49	5.97
10	Golcowa	72	7.7	13.6	35.7	36.2	47.4	45.41	3.06
DYDNIA COMMUNE									
11	Dydnia	22	0.0	16.6	43.7	26.3	61.1	48.43	2.14
12	Grabówka	1	11.2	12.7	40.7	23.3	67.5	50.57	1.00
16	Hroszczówka	0	9.8	26.4	54.4	24.6	60.7	49.33	no data
14	Jabłonica Ruska	3	5.2	21.9	49.9	32.4	55.8	62.07	3.30
15	Jabłonka	23	4.9	11.7	39.7	22.3	55.8	48.71	2.10
16	Końskie	11	6.8	23.4	51.4	21.3	64.8	51.44	1.89
17	Krzemienna	40	3.3	23.4	47.9	30.5	56.8	50.86	4.82
18	Krzywe	13	3.5	20.2	48.2	23.6	61.6	43.41	1.10
19	Niebocko	24	7.6	9.1	37.0	19.6	63.9	61.18	2.32
20	Niewistka	2	8.3	24.9	52.9	35.5	53.2	57.79	0.78
21	Obarzym	10	6.3	22.9	50.9	33.5	56.7	43.08	0.90
22	Temeszów	31	5.7	22.3	50.3	32.9	59.2	42.11	5.70
23	Ulucz	7	11.3	34.9	62.1	23.0	62.3	75.00	3.21
24	Witryłów	11	7.2	23.9	51.9	21.8	65.3	55.89	1.22
25	Wydrna	6	4.7	17.6	45.6	28.2	64.6	46.94	0.93

Table 2 cont.

	HACZÓW COMMUNE							
26	Buków	18	8.0	9.9	22.6	30.2	64.8	69.10	1.57
27	Haczów	97	0.0	17.9	17	31.7	59.4	62.23	2.38
28	Jabłonica Polska	48	5.4	11.8	17.3	40.5	54	69.02	1.95
29	Jasionów	62	10.9	7.8	26.1	28	62.6	66.20	2.70
30	Malinówka	13	7.6	9.4	19.7	34.1	56.3	51.99	2.15
31	Trześniów	19	6.1	11.5	21.1	31.7	62.8	63.02	5.78
32	Wzdów	20	11.6	9.3	26.3	23.1	64.1	70.97	1.51
	JASIENICA ROSIELNA COMMUNE							
33	Blizne	71	3.2	8.2	29.6	30.9	46.6	53.28	3.58
34	Jasienica Rosielna	37	0.0	11.4	24.2	34.1	46.1	50.50	4.26
35	Orzechówka	74	2.6	8.8	22.5	31.4	49.3	57.58	2.86
36	Wola Jasienicka	9	5.0	18.6	22.5	41.3	50.2	38.85	2.40
	NOZDRZEC COMMUNE							
37	Hłudno	104	4.5	18.0	46.8	46.6	51.1	52.52	2.21
38	Huta Poręby	9	16	46.0	68.0	56.1	52.3	57.74	2.02
39	Izdebki	86	14.5	12.8	40.7	34.3	59.8	52.13	0.89
40	Nozdrzec	75	0.0	31.5	59.5	42.1	46.6	57.02	3.20
41	Siedliska	13	11.1	41.2	47.4	51.8	47.3	60.99	1.93
42	Wara	31	5.3	22.0	50.0	41.2	50.6	58.32	1.69
43	Wesoła	75	8.6	28.1	41.3	50.6	40.1	46.17	2.72
44	Wołodź	1	14.5	44.7	66.5	55.3	50.8	70.06	1.97

Source: own study based on [7]

The matrix of complete correlation coefficients for all combinations of unit prices and the selected features determining the variability of prices collected in the database was created to indicate the dependence between the average transaction prices characterizing the arable land in all communes of Brzozów district, and village location and also an indicator of arable land production value in the selected locality [2–4].

On the basis of the correlation matrix, the weight correlations specifying the influence of the mentioned features on the variability of average real estate prices were determined.

3.   Results of Research and Discussion

Investigation of the relationship between transaction prices and the features characteristic for arable land were carried out in the area of the local property market in Brzozów district. Since the transaction prices were determined, as averages

for individual precincts (villages) in the district, carrying out analyzes within one commune does not meet the conditions required for statistical analysis. In addition, communes have relatively small areas, and the number of precincts in the commune only in one case exceeds 10 – Dydnia commune has 15 cadastral precincts.

The following tables show the calculation results, in the form of a matrix of complete correlation coefficients for the random multidimensional variable, carried out in the STATISTICA software.

Table 3 shows the complete correlation coefficient matrix for the local market in Brzozów district. From this analysis the feature that reflects the distance of the village from the town of Krosno was eliminated, because the correlation coefficient for a feature characterizing the distance from the city of Brzozów and the city of Krosno was equal 0.80, which means that the two indicated features explain the same part of the price variability.

Table 3. The matrix of correlation coefficients for the local market in Brzozów district

Variable	Commune	Brzozów	Sanok	Rzeszów	Index W	Price
Commune	1.0000	0.3980	0.2699	0.1566	0.2603	–0.3596
Brzozów	0.3980	1.0000	0.6556	–0.2711	–0.0367	–0.3486
Sanok	0.2699	0.6556	1.0000	–0.6957	–0.1282	–0.2363
Rzeszów	0.1566	–0.2711	–0.6957	1.0000	0.2848	–0.1350
Index W	0.2603	–0.0367	–0.1282	0.2848	1.0000	0.0806
Price	–0.3596	–0.3486	–0.2363	–0.1350	0.0806	1.0000

According to the data in Table 3, calculated complete correlation coefficients in particular pairs take the values from 0.0806 to 0.6957. This is the correlation on levels from low to high. The lowest is the link between the prices of arable land and the ratio of its production value.

On the basis of revised matrix of correlation coefficients, weight correlations and their standard deviations were calculated for the features indicated in Table 3, what is shown by data in Table 4.

Table 4. Weight correlations of the analyzed features of the local market in Brzozów district

No.	Feature	Weight correlation	Standard deviation
1	The distance from the commune village	–0.1683	0.1720
2	The distance from Brzozów city	–0.1293	0.1981
3	The distance from Sanok city	–0.4277	0.2777
4	The distance from Rzeszów city	–0.5005	0.2312
5	Index of production value of arable land W	0.2074	0.1487

The calculation results presented in Table 4 show that in the analyzed database the variability of the average price per unit of arable land in the area of the local market in Brzozów district is explained in the following steps:
- the distance from from the commune village in 0.17 part,
- the distance from the city of Brzozów in 0.13 part,
- the distance from the city of Sanok in 0.43 part,
- the distance from the city of Rzeszów in 0.50 part,
- index of production value in 0.21 part.

The biggest influence on price variability in the analyzed database has the distance from the district town of Sanok and the voivodship capital Rzeszów. This relationship results from the possibility of obtaining employment in these centers.

4.   Summary and Conclusions

The market for agricultural real estate in the Brzozów district has relatively high activity, because, in the analyzed period, there were more than 2500 sale and purchase transactions of agricultural properties. After verification and rejection of the transactions which do not meet the terms of the free market transaction 2158 of them left, with 1537 transactions concerning arable land real estate, 232 transactions for the property specified in the land registry, as meadows, and 389 transactions for pastures. The presented statistics show that on average, over 150 transactions concerning arable land are concluded each year. Two groups of investors are the buyers of these properties. In the first group there are farmers purchasing land to expand the farm. The second group is investors who are looking for relatively low-cost agricultural land as their capital investment. Different goals of investors can often cause large and difficult to properly explain differences in prices. Therefore, analyzing the land real estate market of this very nature, especially for use of transaction prices in the process of consolidation and exchange of land, the transactions, which relate to the acquisition of land for purposes not related to agricultural activity, must be rejected from the analysis of.

Variability of transaction prices in this market segment is caused by factors such as: location, type of use and soil quality classes, the shape of cadastral plot, topography, the type of the access road, the occurrence of difficulties in cultivation. In the research conducted in this work all of the above factors, with the exception of the location, are taken into account by the index of arable land productive value. However the location was taken into account, as the distance from the commune and district centers.

On the analyzed area of the local real estate market in Brzozów district the weight correlation determining the influence of production value on the transaction prices variability is not the dominant feature. This feature explains the variability of the average price in 0.21 part which is characterized by the distance from the

commune village or Brzozów – as the district town. While the impact of the towns Sanok and Rzeszów on price variability is significant. Weight correlations are respectively equal here 0.43 and 0.50.

The presented results of the research clearly show that estimating of land values for consolidation and division of property should be performed with the use of the transaction prices and factors influencing their variability on local markets.

The methods used for converting the point values of soil quality classes in the valuation of land to market prices are vitiated by errors. These errors result from the application of the method based on the linear interpolation or extrapolation of prices of particular classes of soils. Assuming the price of the best and the worst quality class of the soil in the area, as the highest and the lowest recorded transaction price, the prices between classes are obtained by the linear interpolation method. Application of the method of linear interpolation or extrapolation of quality classes of soil prices is a too big a simplification because it does not reflect the true variability of their market values on the local market.

Currently, in the situation of the developing real estate market, also in the sector of agricultural property, there are more and more agricultural land transactions. It is, therefore, possible to estimate the market value of the quality classes of soil for each locality. This is important from the point of view of the accuracy of land valuation conducted in the process of their consolidation and exchange.

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