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Functional Classification of Rural Areas in the Lubelskie Voivodship Including Their Natural Values

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Abstract

The aim of the study is to determine the functional types of rural areas of the Lubelskie region and the characteristics of the functional structure depending on the value class represented by the area. In the light of the study the functional structure of rural areas of the region should be considered very diverse and dominated by units representing agricultural functions. The study revealed that the most valuable natural areas were characterized by a lower share of communes included in the agricultural and mixed functional types and a larger share of communes with a dominant forestry function and a major contribution to shaping and protection of the natural landscape and tourism.

Keywords: multifunctional development, rural areas functions

Introduction

The concept of function should be treated as a human activity with similar technical, social and economic features associated with the satisfaction of various types of human needs. With regard to rural areas we can speak of their multifunctionality including their functional potential (Hopfer, Bajerowski, and Suchta 2000, 219–220). The vast functional potential of rural areas is a consequence of the fulfillment of their basic socio-economic activities — agriculture and forestry — significant natural and cultural functions. Those functions in previous studies of multifunctional development of rural areas have too little or not at all have been taken into account. It is presently important that agricultural production, traditionally dominant in the functional structure of rural areas, is reducing its share in the set of functions that rural areas fulfill. At the same time there are increases in the share of non-agricultural production functions and consumer functions such as sharing of natural resources (tourist and recreational services), or the new place of residence (Bański and Stola 2002, 15–16).

Literature presents various classifications of functions of rural areas and a variety of methodological approaches for the delimitation of types of rural areas are used. Among the functional classification of rural areas, we can point out a focus exclusively on economic functions and integrating agricultural activities and other activities that are in varying connection with agricultural activities. Other classifications recognize economic functions in addition to such social functions as environmental protection. Still others emphasize the problem of the scale of impact functions — within the local system or outside.[1] Comprehensive review of the issues of typology of rural areas in local aggregation taking into account the achievements of Polish and European studies on the changes of spatial structure and functional rural areas has been done by Stanny (2013).

1. For example: Dietl and Gregor (1979), Kamiński (1995), Okuniewski (1995), Stola (1987).

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Rural areas generally have several functions, but it is rare that these functions have equal importance. Usually, leading features are complimented by other economic activities. We can distinguish several major functional types of rural areas: agricultural, forest, residential, tourist accommodation, and mixed production (Bański 2008). Also valuable natural areas, including protected ones, are rarely oriented to one function, usually they fill a variety of functions at the same time, the scope of which extends beyond modern protective functions. We can indicate the following objectives and functions of nature sites:

- protection and enhancement of biodiversity — regulatory functions
- generating regional and sub-regional social effects — habitat functions
- preservation of the gene pool and the prevention of natural disasters — support functions
- contribution to the sustainable development of the region — developmental function
- environmental education and training — information functions (Mose & Weixlbaumer 2007, 4–5).

The aim of the study is to determine the functional types of rural areas of the Lubelskie voivodship and the characteristics of the functional structure depending on the area represented by the class of ecological valuables. The selected study area belongs to the least developed regions of the country, with a peripheral position, insufficient progress of urbanization, and economic structure requiring modernization. Opportunities to support the transformation of rural areas of the region are seen in the use of the potential of the natural environment. The study hypothesis was formulated as follows: rural areas of the Lubelskie Voivodship are dominated by agricultural functions and require intensification of their multifunctional development; communes with high ecological values allow diversification of economies based on the exploitation of their natural resources and values through the development of tourism, other services and production activities. It seems, however, that the possibilities are not yet fully utilized.

1 Material and methods

The study sought to comprehensively cover possible socio-economic functions of rural areas which include rural communes and rural areas of rural-urban communes of the region. However, reduction in the availability, completeness and timeliness of the data of official statistics at NUTS 5 were found as limitations. The extracted features are ordered under the general division into agricultural and non-agricultural functions of production and service functions. The basis for selection of diagnostic features and their measures were sets of indicators used in the functional classifications of rural communes by Bański and Stola (Bański 2009; Bański and Stola 2002; Stola 1987). Due to the intention of the extended recognition of functions of rural areas and the lack of availability of current data for the construction of indicators used in those works, the set of indicators included in the study was modified and extended. In addition, a set of economic functions proposed by Stola and Bański has been extended to non-agricultural service functions: development and protection of the natural landscape and the development and protection of the cultural landscape proposed by the author.

Extracting types of functions of rural areas of the Lubelskie region included the following steps:

- developing a set of twenty-three diagnostic variables (indicators) arranged in nine groups of indicators of socio-economic functions of rural areas characterized by the ability of discrimination functions of the units and an acceptable level of correlation with each other (tab. 1)
- determining the value of 23 research indicators for 171 rural communes and rural areas of 22 urban-rural communes of the Lubelskie Voivodship
- standardization of twenty-three diagnostic variables according to the formula

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{S_j}, \tag{1}$$

where:
x_{ij} — value for the i-th object and the j-th feature
$\bar{x}_j$ — mean with respect to the j-th feature
S_j — standard deviation with respect to the j-th feature

- calculating the arithmetic average of nine standardized coefficients assigned to groups of measures for individual functions

$$z_{ik} = \frac{\sum_{j=1}^{n_k} z_{ij}}{n_k}, \tag{2}$$

where n_k is size of the k-th aggregate variable

- taxonomic grouping of the units with k-means based on the averages of the groups of meters of individual functions assuming the presence of four clusters and selecting observation so as to maximize the distance of clusters.

Tab. 1. Indicators used in the study according to meters of functions and sources of data collection

Type of function	Number and name of meter functions	Index number and name	Source of indication
Farm functions	1. Agriculture	1.1. Percentage of agricultural land in the municipal area in total in 2011	CSO
		1.2. Percentage of households with an income of agricultural in general households in 2010	GAC 2010
		1.3. The average area of individual farms engaged in agricultural activity over 1 ha of agricultural land in 2010	GAC 2010
Non-agricultural production and service functions	2. Non-agricultural economic activity	2.1. The number of non-agricultural economic entities per 10,000 inhabitants of working age in 2012	CSO LDB
	3. Forestry	3.1. Percentage of the total area of forests in the commune in 2012	CSO LDB
		3.2. Acquisition of merchantable timber in m^3/100 ha of forest areas in 2012	CSO LDB
	4. Industrial Production	4.1. Proportion of people employed in industry and construction in the number of total employment in 2011	SO in Lublin
		4.2. Share of the exploitation fee proceeds in the total income of communes in 2012	CSO LDB
		4.3. Number of entities and construction industry sections per 1000 inhabitants in 2012	CSO LDB
	5. Services	5.1. Number of entities and service sections of the private sector (excluding sections I and R) per 1000 inhabitants in 2012	CSO LDB
		5.2. Proportion of subjects in the service section in all entities registered in the Regon system in 2012	CSO LDB
	6. Tourism	6.1. Total tourism accommodation per km^2 in communes in 2012	CSO LDB
		6.2. Number of overnight stays in tourist accommodation per 1,000 residents of communes in 2012	CSO LDB
		6.3. Number of entities representing the tourism section (Section I and R) per 1000 inhabitants in 2012	CSO LDB
	7. Housing	7.1. The number of people coming to work per 1 person leaving work in 2006	CSO LDB
		7.2. Migration attractiveness factor (the ratio of net migration to the market) in the years 2010-2012	CSO LDB
		7.3. Population density/km^2 in 2012	CSO LDB
	8. Shaping and protection of the natural landscape	8.1. The share of the municipal area covered by the Natura 2000 network in the commune area in 2011	RDEP
		8.2. The share of protected areas (national parks and nature reserves as well) in the total commune area in 2012	CSO LDB
		8.3. Expenditures of local communities for protecting the natural environment per 1 inhabitant in 2010-2012 (for the protection of ambient air and climate, wastewater management and water conservation, waste management)	CSO LDB
	9. Shaping and protection of the cultural landscape	9.1. Number of participants in cultural events organized by the municipality per 1000 inhabitants in 2012,	CSO LDB
		9.2. Number of artistic groups in the municipality per 1000 inhabitants in 2012,	CSO LDB
		9.3. Expenses of local authorities for culture and protection of national heritage per 1 inhabitant in 2010-2012	CSO LDB

The primary data source was the Local Data Bank of the Central Statistical Office (CSO LDB) and General Agricultural Census. Supplementary sources were the CSO and the Regional Directorate of the Environment Protection (RDEP).

The next stage of the study used the results of research on ecological valuables of the rural region carried out by Guzal-Dec,[2] she has identified five classes of natural valuables of rural areas of the studied region according to the model of "pressure-state-response" using Perkal's coefficient. Then the groups of communes were included in each of the 5 classes of natural valuables and subjected to a study aimed at capturing differences in the types of economic functions represented by them.

2 Results

2.1 Types of functions of rural areas and their distribution in the Lubelskie Voivodship

The use of *k*-means cluster analysis allowed the isolation of relatively internally homogeneous, in terms of the criteria adopted for the analysis of four clusters of territorial units, types of functional communities. The analysis of variance shows that all measures of function of groups were significant in the distribution of areas of focus into individual clusters, but the most important was meter 6 ($F = 212{,}78$, tourism), and the smallest 9 (development and protection of the cultural landscape $F = 2{,}71$) and 8 (development and protection of the natural landscape $F = 10{,}69$).[3]

Cluster 1 (mixed, highly diversified) brings together communes with highly diversified, compared to other groups, structure of the economy. It is characterized by the highest level of saturation of non-agricultural economic entities, the most developed industrial production and most educated sector of services (with the selected functions of tourism). The transformed structure of economic functions accompanied the strongest, compared to other groups of communes, developed housing function. In the case of diversified communes, their role in the rural settlement system is clearly marked. Very well-developed non-agricultural techno-production functions and services are accompanied by a very low level of bio-production function development associated with local natural resources. This group is characterized by underdeveloped agricultural function and the smallest, compared to other groups, contribution to the formation and protection of natural and cultural landscape in conjunction with the least-developed forestry.

Cluster 2 (forest type) concentrates municipalities with significant natural potential for conditioning the development of non-agricultural production functions. This group is formed with units of very well formed forestry functions and the highest, compared to others, contribution to shaping and protecting the natural landscape and a very well formed industrial production function. In the communes representing this type favorable conditions for agricultural production do not exist, it is the least developed compared to other groups and somehow "displaced" by forestry. The economic structure includes groups with clearly indicated industrial function, but at the same time characterized by a relatively low penetration in non-agricultural entrepreneurship. The least developed, compared to other types, is the non-agricultural economic activity in the field of services, including a very low level of development of tourism. Natural conditions are therefore not a factor positively influencing this function. In conjunction with the dominance of forest functions in the economic structure of units included in this type of functional group, the least developed function is housing. In the communes, their role in shaping and protection of the cultural landscape is clearly marked.

Cluster 3 (agricultural type) includes communes with a dominating agricultural function in the structure of their economies, the best developed against the background of other groups. The group has the highest average size of individual farms and the smallest intensity of non-agricultural activities. The least developed, compared to other groups, is the sector of industrial production. Slightly better developed than processing, is the service function, but tourism has little relevance to the other groups. Communes representing the agricultural type, as in the case of the first group

2. The procedure is described in detail in (Guzal-Dec 2013).

3. [In the journal European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). — Ed.]

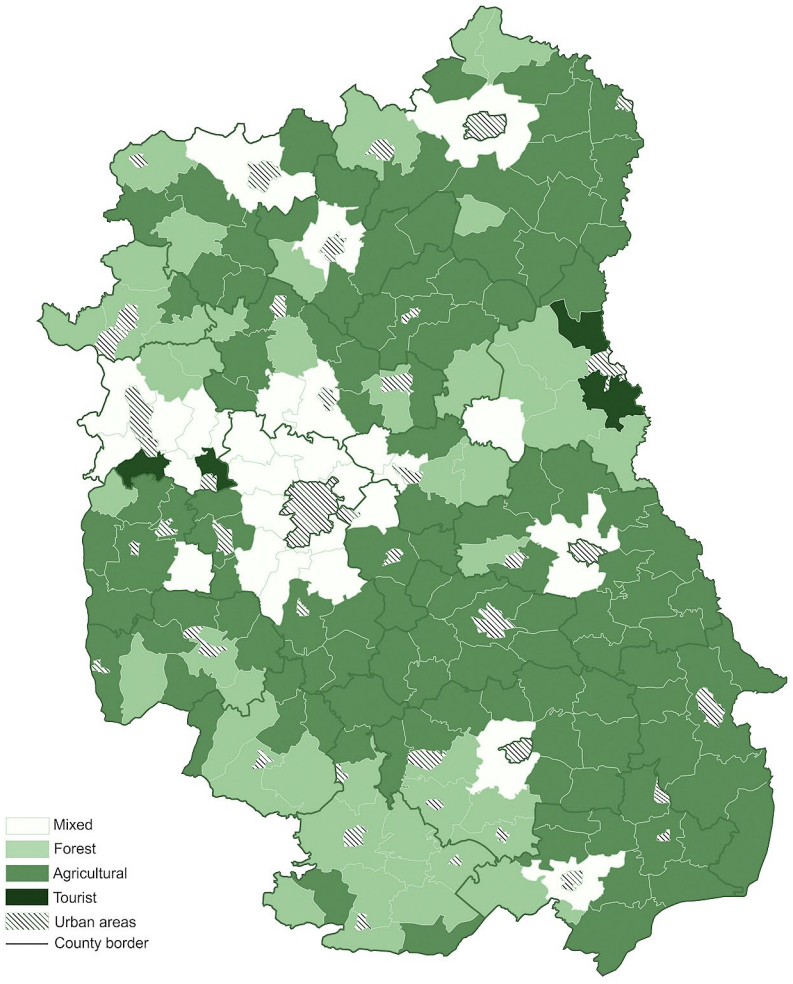
discussed (diversified), do not make a significant contribution to the formation and protection of the natural landscape. This situation is related to the characteristic for this group low level of development of forestry. It makes clear the mono-functionality of the economic structure accompanied by a very low level of development of the housing function and contribution to the shaping and protection of the cultural landscape.

Cluster 4 (tourist type) is a group of three municipalities of prominent tourist profile and significantly diversified structure associated with the strongest economies in comparison with other types of marked contribution to the formation and protection of the cultural landscape. Other analyzed features are well and fairly evenly developed. In this group, non-agricultural economic activity is well-outlined, including industrial production and other (apart from tourism) service functions. Characteristic of this type in the case of rural areas is a significant contribution to shaping and protecting the natural landscape associated with the development of forestry and a very well developed housing function. Agricultural functions do not have significance for this group. Another important factor affecting the development of tourism in the group is a significant contribution of these units to the formation and protection of both the natural landscape and cultural heritage.

Among the distinguished functional types of the rural areas of the Lubelskie Voivodship there were the most numerous types in which the structure of socio-economic functions clearly was dominated by bio-production features — agriculture and forestry, respectively — 60,1% and 23,8% of the surveyed units. Other municipalities, representing a mixed type and tourism accounted for — 14,5% and 1,6%.

Rural areas of the Lubelskie Voivodship are characterized by spatial variation in the type of functions (map 1). Distribution of municipalities with developed non-agricultural functions shows its clear relationship to the impact of the urban settlement. Diversified rural areas are primarily

Map 1. Rural areas of the Lubelskie Voivodship by the type of represented function



focused around the main center focusing the economic potential of the region, Lublin, and the centers with a high level of concentration of such functions as: Biała Podlaska, Puławy, Chełm, or Zamość. These units are also disclosed in the range of impact of urban centers with a medium level of concentration of functions which include: Lubartów, Świdnik, Radzyń Podlaski and Tomaszów Lubelski and along national roads (e.g., Lublin-Puławy). Therefore the role of neighborhood urban centers is revealed in stimulating multifunctional development and deagrarianisation of economic structures (Stanny 2013, 283).

The spatial arrangement of communes with developed forest functions is largely consistent with the spatial layout of the system of protected areas of the Lubelskie Voivodship, while the spatial arrangement of communes with predominating agricultural production corresponds to a large extent, to areas and agricultural production regions extracted under the conditions of production and the main types of agricultural production. The northern area of the region, has lowland areas, poor soils, and larger farms than in the southern region. The southern area, including the upland areas of the region, with more favorable soil conditions allow greater possibilities of specialization of agricultural production and greater concentration of processing plants.[4] The separated tourist units — Kazimierz Dolny, Nałęczów and Włodawa — are the areas connecting the valuable qualities of natural and cultural environment.

2.2 Functional structure and ecological value of rural areas

The areas classified as ecologically valuable (first value class) were dominated by units of the leading features of forestry and a major contribution to shaping and protection of the natural landscape and a very well developed function of industrial production (forest type). The share representing the forest type in the first value class accounted for 61,9%. Furthermore, this class focused almost 1/3 units of this type. A larger share (37,0%) occurred only in the medium (third) value class (tab. 2a, 2b and 3).

Another, the most numerous group with the share in the structure constituting 19,0% of the ecologically valuable areas, was that including communes with an economy dominated by agriculture and least developed compared to other groups of the non-agricultural sector. Communes representing this type are located in ecologically valuable areas, however, they only accounted for 3,4% of the communes, of which almost half were located in the communes of the third value class.

In the first value class, participation could be noted of communes with a highly diversified economic structure clearly influenced by the impact of urbanization and educated housing function (mixed type representing 14%) and a very tourist profile (4,8%).

Tab. 2a. Structure of areas representing the ecological value class by functional types (sums in rows)

Value class		Functional type				Total
		Mixed	Forest	Agricultural	Tourist	
1	***n***	3	13	4	1	21
	%	14,3	61,9	19,0	4,8	100,0
2	***n***	1	8	14	1	24
	%	4,2	33,3	58,3	4,2	100,0
3	***n***	12	17	55	1	85
	%	14,1	20,0	64,7	1,2	100,0
4	***n***	8	6	28	0	42
	%	19,0	14,3	66,7	0,0	100,0
5	***n***	4	2	15	0	21
	%	19,0	9,5	71,4	0,0	100,0
	N	28	46	116	3	193
	%	14,5	23,8	60,1	1,6	100,0

n — population in a group, *N* — population in all class of value groups together

4. Areas of agricultural production have been presented in the Spatial Development Plan of the Lubelskie Voivodship worked out by Spatial Planning Office, Lublin in 2002.

Tab. 2b. Structure of areas representing the ecological value class by functional types (sums in columns)

Value class	Functional type									
	Mixed		Forest		Agricultural		Tourist			
	n	%	***n***	%	***n***	%	***n***	%	***N***	%
1	3	10,7	13	28,3	4	3,4	1	33,3	21	10,9
2	1	3,6	8	17,4	14	12,1	1	33,3	24	12,4
3	12	42,9	17	37,0	55	47,4	1	33,3	85	44,0
4	8	28,6	6	13,0	28	24,1	0	0,0	42	21,8
5	4	14,3	2	4,3	15	12,9	0	0,0	21	10,9
Total	28	100,0	46	100,0	116	100,0	3	100,0	193	100,0

n—population in a group, *N*—population in all functional type groups together

Tab. 3. Rural communes and rural areas in rural-urban communes of the Lubelskie Voivodship by belonging to a particular functional type and natural value class

Value class	Functional type			
	Mixed	Forest	Agriculture	Tourist
1	Janowiec, Tomaszów Lubelski, Urszulin	Aleksandrów, Bełżec, Dzwola, *Janów Lubelski*, *Józefów*, *Krasnobród*, Łukowa, Modliborzyce, Roskosz, Stary Brus, Susiec, Tereszpol, *Zwierzyniec*	Adamów, Dubienka, Potok Wielki, Sławatycze	*Kazimierz Dolny*
2	Wąwolnica	Janów Podlaski, Jeziorzany, Konstantynów, Potok Górny, Sosnowica, Stężyca, Wilków, Wola Uhruska	Białopole, Borzechów, Dębowa Kłoda, Kraśniczyn, Lubycza Królewska, Łabunie, Obsza, Radecznica, Ruda-Huta, Rybczewice, Skierbieszów, Stary Zamość, Tarnawatka, Uścimów	Włodawa
3	Chełm, Chodel, Głusk, Końskowola, Kurów, *Łęczna*, Markuszów, Mełgiew, Niedrzwica Duża, Spiczyn, Wólka, Zamość	Adamów (zam.), Baranów, Biłgoraj, Borki, Cyców, Firlej, *Frampol*, Gościeradów, Hańsk, Księżpol, Puchaczów, Rejowiec Fabryczny, *Szczebrzeszyn*, *Tarnogród*, Ułęż, Wyryki, Żyrzyn	Batorz, Biszcza, Czemierniki, Dołhobyczów, Dorohusk, Drelów, Dzierzkowice, Goraj, Hanna, Horodło, Izbica, Jarczów, Józefów nad Wisłą, Kamień, Karczmiska, Kąkolewnica Wschodnia, Kodeń,Komarów-Osada, Krzczonów, Leśna Podlaska, Leśniowice, Ludwin, *Łaszczów*, Łaziska, Łopiennik Górny, Miączyn, Milejów, Mircze, Nielisz, Nowodwór, *Opole Lubelskie*, Ostrówek, Piszczac, Podedwórze,*Poniatowa*, Rachanie, Rokitno, Rudnik, Sawin, Serniki, Serokomla, Siennica Różana, Sitno, Sosnówka, Sułów, Telatyn, Terespol, Trzeszczany, Tuczna, Ulhówek, Urzędów, Wojciechów, Wola Mysłowska, Zalesie, Żmudź	*Nałęczów*
4	Garbów, Jabłonna, Jastków, Konopnica, Lubartów, Łuków, Puławy, Strzyżewice	Kłoczew, Kraśnik, Krzywda, *Ostrów Lubelski*, Stoczek Łukowski, Szastarka	Abramów, *Annopol*, *Bełżyce*, *Bychawa*, Chrzanów, Godziszów, Grabowiec, Jabłoń, *Kock*, Krasnystaw, Krynice, Łomazy, Michów, Milanów, Niedźwiada, *Parczew*, *Piaski*, Rejowiec, Siedliszcze, Siemień, Trawniki, Uchanie, Werbkowice, Wierzbica, Wilkołaz, Wojcieszków, Wojsławice, Zakrzówek	–
5	Biała Podlaska, Kamionka, Niemce, Radzyń Podlaski	Międzyrzec Podlaski, *Ryki*	Fajsławice, Gorzków, Hrubieszów, Komarówka Podlaska, Stanin, Trzebieszów, Trzydnik Duży, Turobin, *Tyszowce*, Ulan-Majorat, Wisznice, Wohyń, Wysokie, Zakrzew, Żółkiewka	–

Rural areas in the rural-urban communes are *italicized.*

Along with the transition to lower, in terms of ecological value, classes we can observe an increase in the participation in each class of communes with diversified structure of economic functions and changes in the bio-production function share reducing the share of communes representing the forestry type and increasing the share of communes in which the investigated structure of functions is clearly dominated by the agricultural function. In addition, communes with an outstanding tourist profile, show that locations are related to the existence of environmental values.

Analysis of the structure of areas representing the different classes of natural values by functional types leads to the following observations:

- Communes within a developed non-agricultural sector of the economy, were significantly more frequent in areas belonging to the lower classes in terms of natural values with a larger share of their structure. These communes have focused in the third value class accounting for 42,9% of the total. In the fourth and fifth class, their share accounted for, respectively — 28,6% and 14,3%, while in the first and the second, in total — 14,3%.
- Occurrence of the communes with the dominant forestry functions and a major contribution to shaping and protecting the natural landscape and very well developed industrial production function exhibits a relationship with the value class. Conditions of formation of these functions are the best areas with the greatest natural values. Communes with developed forestry functions in the first, the highest value class account for 61,9% and least valuable — the fifth — 9,5%. Most communes representing the discussed functional type are concentrated in the third value class — 37,0%, and the first and the second — respectively — 28,3% and 17,4%.
- Along with the decreasing value class of communes the share of units representing agricultural functions increases — from 19,0% in the first class to 71,4% in the fifth. Most of these units are focused in: the third and fourth class — respectively — 47,7% and 24,1%. The agriculture function, as indicated earlier, is thus limited by the large areas devoted to the implementation of the functions of forestry and nature conservation.
- Communes of a tourist profile focused with one of the three classes with the greatest environmental values.

Summary

The hypothesis formulated in the study was verified positively. In the light of the study, the functional structure of rural areas of the region should be considered very diverse and dominated by units representing agricultural functions. This situation requires the search for possibilities to create new and strengthen existing non-agricultural functions. Expansion of the functional structure of rural areas must take into account the environmental problem of their values. In the case of areas representing high-class ecological values, we should take care of the more comprehensive use of their functional potential which consists of economic and social functions. A particular direction is to exploit the potential of the natural environment to develop various forms of tourism and other services, not causing conflicts with respect to: the "protective function of the area — the socio-economic development." Areas with lower classes require more intensive development of production activities in the wider bio-economy sector focused on the use of resources in rural areas.

The results obtained are consistent with the results of research carried out thus far. They show that the Lubelskie Voivodship is one of the regions with the lowest saturation of non-agricultural entities, with a mono-functional, based on agriculture structure of the economy. The high degree of diversification of the economic structure usually is present in the suburban communes surrounding major cities, along main routes and in communes with a particular position conditioned (e.g., by functioning of border crossings, or the occurrence of areas with high tourist values) (Brodowski and Falkowski 2007; Rosner 2008)

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