8th International Scientific Conference
RURAL DEVELOPMENT 2017
Bioeconomy challenges
23–24 November, 2017, Aleksandras Stulginskis University

Proceedings of the 8th International Scientific Conference Rural Development 2017

Edited by prof. Asta Raupelienė

ISSN 1822-3230 / eISSN 2345-0916
eISBN 978-609-449-128-3

Article DOI: http://doi.org/10.15544/RD.2017.208

MULTIFUNCTIONAL RURAL DEVELOPMENT – A COMPARATIVE ANALYSIS OF MUNICIPALITIES ADJACENT TO THE CITY OF OLSZTYN

Katarzyna KOCUR-BERA, Institute of Geoinformation and Cartography, Faculty of Geodesy, Geospatial and Civil Engineering, University of Warmia and Mazury in Olsztyn, Oczapowskiego street 2, 10-719 Olsztyn, Poland, katarzyna.kocur@uwm.edu.pl

Rural areas have multiple functions. Four key functions can be identified in a synthetic approach: economic, environmental, social and cultural. Multidirectional rural development is strongly influenced by spatial attributes, demographics, environmental factors, infrastructure and capital. Multidirectional development is closely associated with the multiple functions of rural areas. In general, multifunctional rural development involves rural activation and rural business diversification which enables members of the rural community to derive incomes from non-farming activities. The growth potential of rural municipalities is an important determinant of multifunctional development. The aim of this study was to analyze the level of socioeconomic development in rural municipalities, which is an indicator of their multifunctional development. The analysis involved rural municipalities adjacent to the city of Olsztyn. These municipalities are bedroom communities whose residents commute to work in the urban center. The study analyzed 15 indicators describing the four key areas of multifunctional development: environmental, social, economic and infrastructural. Data for 2013-2015 were acquired from the Central Statistical Office and statistical tables of the agricultural productivity index. The results indicate that the municipality of Purda (with relatively poor soils) meets the highest number of criteria and the municipality of Dywity (with relatively high-quality soils) meets the lowest number of criteria for multifunctional development.

Keywords: multifunctional development, rural areas, indicators of environmental, social, economic and infrastructure potential

INTRODUCTION

The traditional role of rural areas as food producers is gradually fading away. Rural areas also have a variety of other functions, including business and commerce, environmental – where natural resources such as soil, water, air, timber, animals and crops cater to municipal needs and the needs of production processes, social – which determine the standards of living in rural communities and are associated with housing, education, culture, health protection and political activity, and cultural – which are linked with local traditions and the preservation of local, regional and national identity (Wilkin, 2007).

The European model of sustainable agriculture relies on two concepts of multifunctional rural development and multifunctional agriculture. These concepts are mutually complementary, and they determine the nature and principles of sustainable development in agriculture and rural areas. Multifunctional rural development is a broader concept than multifunctional agriculture because it encompasses agriculture and other types of economic activity, including commerce, as well as socioeconomic, environmental and cultural functions of rural areas. All of these functions should develop symbiotically and interact to promote rural growth (Knickel, Renting, 2000, van Ploeg et al., 2000, Hall et al., 2004, Dinis 2006). The agricultural sector is the main area of economic activity in rural areas, and it is governed by the principles of multifunctional development. For this reason, multifunctional agriculture is the key component of multifunctional rural development (Marsden et al., 2002, Ilbery et al., 2004). Multifunctional agriculture is also the main driver of success in sustainable agriculture. The European agricultural model relies on sustainable development which is attained through diversification of income-generating activities in rural areas as well as the high competitiveness of large-area farms on the global market (Renting et al., 2009).

Multifunctional rural development relies primarily on the diversification of social and economic activities in rural areas and the generation of income from non-farming sources (Hodge, Monk, 2004, Malinowski, 2006). Income diversification testifies to the entrepreneurial spirit of local communities that are engaged in both agricultural and non-agricultural activities. During the diversification process, non-farming functions are introduced to rural areas to break the agricultural monostructure that was predominant in the countryside in the Socialist era. The following measures contribute to socioeconomic diversification in rural areas: (1) support for non-agricultural activities in farms, (2) introduction of production and land-use profiles that enable members of the local community to effectively compete on the market, (3)

improvement of technical and social infrastructure to support local business growth, (4) promotion of higher educational attainment, creation of new educational opportunities, improved quality of vocational training, development of advisory services, (5) promotion of positive attitudes towards civic participation and local leaders to stimulate local business growth, (6) implementation of development policies that are tailored to local possibilities, cater to local needs and promote innovation and entrepreneurship (Spychalski, 2004, Roszkowska-Mądra, 2009).

Multifunctional development creates new jobs, lowers unemployment and encourages members of the local community to generate income from non-farming activities by relying on local resources. In Poland, the vast majority of non-farming jobs were concentrated in urban areas, and the multifunctional development concept was introduced to promote the creation of non-agricultural jobs in the countryside. This development model proved to be costly and ineffective, and it generated new problems in both urban and rural areas, including shuttle migration, shortage of housing in cities, high cost of developing new infrastructure, environmental degradation in cities, adverse demographic processes and the destruction of the traditional social structure in rural communities (Sawicka, 2003). Multifunctional rural development is a complex process that is influenced by various social and economic factors. It requires active participation on behalf of rural communities as well as the awareness that enterprising attitudes and non-agricultural functions drive positive change in the countryside. The above applies to social and economic initiatives that are undertaken by individuals as well as local governments and social organizations. Therefore, multifunctional rural development is strongly influenced by spatial attributes, demographics, environmental factors, infrastructure and capital. The above factors differ across rural municipalities, and they set different directions for multifunctional development (Sikora, 2012).

The aim of this study was to analyze the multifunctional development of rural municipalities adjacent to the city of Olsztyn whose residents commute to work in the urban center. The selected municipalities were analyzed to determine whether they are merely bedroom communities of urban workers or whether they are autonomous units that actively promote entrepreneurship in the local community.

RESEARCH METHODS

Data for 2013-2015 relating to the analyzed municipalities were acquired from the Central Statistical Office and statistical tables containing information about the quality of farmland in the examined area (agricultural productivity index). The analyzed municipalities are situated in the Region of Warmia and Mazury in north-east Poland. Olsztyn is the capital of the region, and the examined municipalities are adjacent to the city. In 2016, the region had a population of 1,439,675, and it accounted for 3.76% of the Polish population. Warmia and Mazury is one of the least densely populated Polish regions with 60 inhabitants per km^2 on average (national average – 123 inhabitants per km^2) and 25 inhabitants per km^2 in rural areas. The region has a north-to-south distance of 146 km with a latitude distance of 1°18′44″ and a longitude distance of 3°39′28″. The region's extreme points have the following geographic coordinates: (1) 54°27′11″ N, (2) 53°08′27″ S, (3) 19°07′39″ W, (4) 22°47′07″ E. Warmia and Mazury is a predominantly lowland region. Its highest point is the Dylewska Mountain at 312 m above sea level, and its lowest point is the depression in Raczki Elbląskie at 1.8 m above sea level. A large part of the region is situated on the territory of the Masurian Lake District, and it comprises the lakelands of Olsztyn, Mrągowo, Ełk, the Great Masurian Lake District and the Masurian Lake District. Warmia and Mazury is known as the Land of a Thousand Lakes. Many water bodies in the region are connected by a network of canals, most of which had been built in the 19th century. The region is situated in the catchment area of the Vistula River and rivers flowing into the Baltic Sea. Forests span the area of 745,900 ha and occupy 30.9% of the region's territory. The study analyzed the municipalities of Purda, Jonkowo, Stawiguda, Gietrzwałd, Dywity and Barczewo which are adjacent to the city of Olsztyn. Their location relative to Olsztyn is presented in Figure 1.

Figure 1. Map of the studied municipalities. Source: own elaboration.

Statistical data describing the analyzed municipalities is presented in Table 1.

Table 1. Basic statistical data of the analyzed municipalities.

No.	Parameter	Dywity	Jonkowo	Gietrzwald	Barczewo	Stawiguda	Purda
1	Area [km^2]	160.68	168.69	174.13	319.85	222.52	318.19
2	Farmland [%]	60	48	37	52	23	32
3	Forest [%]	25	38	48	31	54	50
4	Population	11 326	7 182	6 523	17 642	8 166	8 576
5	Population density [person/km^2]	70.3	42.6	37.9	55.1	36.6	27.0
6	No Territory	6283614042	2814072	2814052	6283614013	2814112	2814102

Source: own elaboration based on Central Statistical Office data (2016).

In view of the methodology proposed by Wójcicki (2005) and Gawroński (2002, 2003), the analyzed rural municipalities were compared in the following categories: environmental, social, economic and infrastructural (Salomon, 2010). The quality of the local environment was assessed based on landscape value, climate, soil and air quality, natural resources, water resources, community involvement in environmental protection and formal protection measures (Roo-Zielińska et al. 2007, Poniżny 2008). The analyzed social criteria were economic activity rate, educational attainment, age dependency ratio and employment rate (Mrozowicki, 1998). The economic criteria were local government expenditures per capita, local government revenues per capita, area of agricultural land and farm area. The infrastructure criteria were the development of social and technical infrastructure. The analyzed indicators are presented in Table 2.

Table 2. Indicators analyzed in the study

No.	Symbol	Indicator
1	P1	Forest cover [%]
2	P2	Number of wastewater treatment plants in municipality
3	P3	Agricultural productivity index [dimensionless] (Witek et al., 1981)
4	S1	Economic activity rate [dimensionless]
5	S2	Age dependency ratio [dimensionless]
6	S3	Employment rate [dimensionless]
7	S4	Residential area per capita [m^2]
8	G1	Revenue per capita [PLN]
9	G2	Expenditure per capita [PLN]
10	G3	Number of businesses per 10,000 working-age population
11	I1	Number of schools, kindergartens and libraries
12	I2	Number of social housing units
13	I3	Households with access to public water supply [%]
14	I4	Households with access to the public sewer network [%]
15	I5	Households with access to public gas supply [%]

Source: own elaboration.

The economic activity rate (ratio of professionally active population to total population aged 15+ (formula 1), age dependency ratio (ratio of population not typically in the labor force to the labor force population; formula 2) and employment rate were calculated with the use of the following formulas (Salomon, 2001):

Economic activity rate (1)

$$S_1 = \frac{L_A}{L_{15}} \tag{1}$$

where:
LA – professionally active population
L15 – total population aged 15+
Age dependency ratio (2):

$$S_2 = \frac{L_P + L_{PP}}{L_{PR}} \tag{2}$$

where:
LP – population at pre-working age
LPP – population at post-working age
LPR – working age population
Employment rate (3):

$$S_3 = \frac{L_Z}{L_{15}} \tag{3}$$

where:
LZ – employed population
L15 – total population aged 15+

The indicators describing the evaluated variables were analyzed to eliminate non-significant variables. The main indicators of the evaluated variables are presented in Table 3.

Table 3. The main indicators of the evaluated variables

VARIABLE	Average	Median	Minimum	Maksimum	Variance	Std. dev.	CofV
	103,500	103,500	101,000	106,000	3,5	1,8708	1,8076
P1	43,133	44,350	27,900	54,800	126,8	11,2598	26,1046
P2	758,333	831,500	100,000	1532,000	294615,5	542,7849	71,5760
P3	59,150	59,000	55,100	63,200	7,4	2,7113	4,5837
S1	0,142	0,146	0,060	0,235	0,0	0,0609	42,8036
S2	0,514	0,518	0,485	0,533	0,0	0,0172	3,3521
S3	0,179	0,183	0,074	0,297	0,0	0,0773	43,2744
S4	101,017	100,850	81,900	114,100	139,6	11,8150	11,6961
G1	3728,000	3466,500	3028,000	4965,000	465048,8	681,9449	18,2925
G2	3480,333	3297,500	2895,000	4560,000	340380,3	583,4212	16,7634
G3	1632,500	1593,000	1273,000	2106,000	119574,7	345,7957	21,1820
I1	15,000	13,000	11,000	21,000	18,8	4,3359	28,9060
I2	17,667	10,500	0,000	66,000	613,1	24,7602	140,1520
I3	91,783	92,900	75,400	99,900	83,3	9,1289	9,9462
I4	65,733	57,650	41,500	95,000	413,8	20,3432	30,9481
I5	23,517	19,150	9,200	49,600	262,8	16,2121	68,9390

Source: own elaboration.

None of the analyzed variables were eliminated because all of them were characterized by coefficients of variation higher than 0.1 (10%).

All variables were normalized according to the following formulas:

For stimulants $\Longrightarrow \quad x_{ij} = \frac{xij - \min\{xij\}}{\max\{xij\} - \min\{xij\}}$ (4)

For destimulants $\Longrightarrow \quad x_{ij} = \frac{\max\{xij\} - xij}{\max\{xij\} - \min\{xij\}}$ (5)

where:
i – number of analyzed object;
j – number of analyzed parameter.

The multifunctional development index was calculated with the use of formula (6):

$$Wrw_i = \frac{100}{m} \sum_{j=1}^{m} \propto_j x'_{ij} \quad (6)$$

where:
Wrw – multifunctional development index (dimensionless quantity);
m - number of analyzed parameters;
$\propto_j$ – weight of j[th] parameter.

All variables were given an equal weight. The calculated values of the multifunctional rural development index are presented in Table 4.

Table 4. Calculated values of the multifunctional rural development index

Research objects	**P1s**	**P2s**	**P3s**	**S1s**	**S2s**	**S3s**	**S4s**	**G1s**	**G2s**	**G3s**	**I1s**	**I2s**	**I3s**	**I4s**	**I5s**	**Wrw**
DYWITY	1,000	0,321	0,000	0,367	0,180	0,369	0,000	0,493	0,545	0,193	0,100	0,848	0,416	0,708	0,000	0,369
JONKOWO	0,602	0,505	0,630	0,000	0,437	0,000	0,068	0,792	0,829	0,487	0,800	1,000	0,376	0,718	0,985	0,549
STAWIGUDA	0,000	1,000	1,000	0,553	0,577	0,546	0,516	0,000	0,000	0,000	0,900	1,000	0,000	0,000	0,381	0,432
PURDA	0,045	0,000	0,605	1,000	1,000	1,000	0,547	0,772	0,723	1,000	0,800	0,833	1,000	1,000	1,000	0,755
GIETRZWAŁD	0,175	0,942	0,432	0,796	0,184	0,794	0,307	0,775	0,794	0,744	1,000	0,712	0,196	0,168	0,589	0,574
BARCZEWO	0,781	0,473	0,333	0,466	0,000	0,480	1,000	1,000	1,000	0,986	0,000	0,000	0,000	0,688	0,918	0,542

Source: own elaboration.

The analyzed variables differed across the studied rural municipalities. The following municipalities received the most and least satisfactory scores in the evaluated categories: environmental – Stawiguda and Dywity (most satisfactory) and Purda (least satisfactory), social – Purda and Barczewo (most satisfactory) and Jonkowo and Dywity (least satisfactory), economic – Purda (most satisfactory) and Stawiguda (least satisfactory). The calculated values of the multifunctional rural development index demonstrate that Purda is a municipality with the highest social, economic and environmental potential, whereas Dywity is characterized by the lowest social, economic and environmental potential.

CONCLUSIONS AND DISCUSSION

In this study, 15 indicators in economic, environmental and social categories were evaluated to determine the value of the multifunctional rural development index in the analyzed municipalities. Data for analyses were acquired from the Local Data Bank and statistical tables of the agricultural productivity index. The levels of multifunctional development in the municipalities adjacent to the city of Olsztyn were compared. The municipality of Purda was characterized by the highest social, economic and environmental potential despite the lowest number of wastewater treatment plants, whereas the lowest score was noted in Dywity, a municipality with the lowest agricultural productivity index, lowest residential area per capita and the lowest percentage of households with access to public gas supply. Dywity is situated in close proximity to Olsztyn, along a public trunk road which directly connects the municipality with the regional capital. Dywity is a bedroom community whose residents commute to work in the urban center, and it is least interested in pursuing multifunctional development. The main limitation of the study was that the analyses were performed based on generally accessible data. It is highly probable that a wider selection of variables would generate different results.

REFERENCES

1. Central Statistical Office, 2016. Available at: http://olsztyn.stat.gov.pl/vademecum/vademecum_warminsko-mazurskie/portrety_gmin/olsztynski/ (Accessed on 10/03/2017) [In Polish].
2. Dinis A., 2006. Marketing and innovation: useful tools for competitiveness in rural and peripheral areas. *European Planning Studies*, Vol. 14, pp. 9–22. https://doi.org/10.1080/09654310500339083
3. Hall C., McVittie A., Moran D., 2004. What does the public want from agriculture and the countryside? A review of evidence and methods, *Journal of Rural Studies*, Vol. 20, pp. 211–225.https://doi.org/10.1016/j.jrurstud.2003.08.004
4. Hodge I., Monk S., 2004. The economic diversity of rural England: stylized fallacies and uncertain evidence. *Journal of Rural Studies*, Vol. 20, pp. 263–272.https://doi.org/10.1016/j.jrurstud.2003.11.004
5. Ilbery B., Maye D., Kneafsey M., Jenkins T., Walkley C., 2004. Forecasting food supply chain developments in lagging rural regions: evidence from the UK. *Journal of Rural Studies*, Vol. 20, pp. 331–344. https://doi.org/10.1016/j.jrurstud.2003.09.001
6. Knickel K., Renting H., 2000. Methodological and conceptual issues in the study of multifunctionality and rural development, *Sociologia Ruralis*, Vol. 40, pp. 512–528. https://doi.org/10.1111/1467-9523.00164
7. Malinowski P., 2006. Wielofunkcyjność rolnictwa i obszarów wiejskich w polityce Unii Europejskiej. *SERiA Roczniki Naukowe*, Vol. VIII, Iss. 4, pp. 224–228. [In Polish]
8. Marsden T., Banks J., Bristow G., 2002. The social management of rural nature: Understanding agrarian-based rural development. *Environment and Planning*, Vol. A 34, pp. 809–825.https://doi.org/10.1068/a3427
9. Mrozowicki E., 1998. *Zróżnicowanie obszaru badań pod względem demograficznym i poziomu bezrobocia* [w:] Więckowicz Z. (red). Przekształcenia obszarów wiejskich makroregionu południowo-zachodniego. Wydawnictwo Akademii Rolniczej we Wrocławiu. Wrocław. [In Polish]
10. Poniżny L., 2008. Wpływ jakości środowiska przyrodniczego na nasze zdrowie. Analiza przestrzenna na przykładzie Poznania. Wydawnictwo UAM, Poznań. [In Polish]
11. Renting H., Rossini W.A.H., Groot J.C.J., Van der Ploeg J.D., Laurent C., Perraud D., Stobbelaar D.J., Van Ittersum M.K., 2009. Exploring multifunctional agriculture. A review of conceptual approaches and prospects for an integrative transitional framework. *Journal of Environmental Management*, *Vol.* 90, pp. 112–123.https://doi.org/10.1016/j.jenvman.2008.11.014
12. Roszkowska-Mądra B., 2009. Koncepcje rozwoju europejskiego rolnictwa i obszarów wiejskich**.** *Gospodarka Narodowa*, Nr 10/2009, pp. 83–102. [In Polish]
13. Roo-Zielińska E., Solon J., Degórski M., 2007. *Ocena stanu i przekształceń środowiska przyrodniczego na podstawie wskaźników geobotanicznych, krajobrazowych i glebowych (podstawy teoretyczne i przykłady zastosowań)*. PAN, IGiPZ, Seria Monografie, nr 9, Warszawa. (in Polish)
14. Sawicka J., 2003. Wielofunkcyjny rozwój obszarów wiejskich. *Acta Universita Tislodziensis Folia Oeconomica*, Vol. 170, pp. 93–105. [In Polish]
15. Salomon J., 2001. *Metodyka oceny środowiskowych społeczno-gospodarczych uwarunkowań wielofunkcyjnego rozwoju obszarów wiejskich*. Uniwersytetu Rolniczego im. Hugona Kołłątaja w Krakowie, ISSN 1732-5587. [In Polish]
16. Sikora J., 2012. Wielofunkcyjność obszarów wiejskich w Polsce. Journal of Agribusiness and Rural Development 2(24) 2012, pp.215-226.
17. Spychalski G., 2004. Wielofunkcyjność jako czynnik rozwoju obszarów wiejskich. Prace Naukowe SGGW nr 33, Wiejskie gospodarstwo domowe w obliczu problemów transformacji, integracji i globalizacji, (red.) M. Adamowicz. Wyd SGGW, Warszawa, 43-54. [In Polish]
18. Wilkin J., 2007. Wielofunkcyjność rolnictwa i obszarów wiejskich. *Nowe Życie Gospodarcze*, No. 21, pp. 3–5. [In Polish]

19. Van Ploeg J.D., Ranking H., Brunowi G., Nick K., Mannion J., Marsden T., Roest K., Sevilla-Guzman E., Ventura F., 2000. Rural development: From practices and policies towards theory. *Sociologia Ruralis*, Vol. 40, pp. 391–408. https://doi.org/10.1111/1467-9523.00156
20. Witek T., Górski T., Kern H., Bartoszewski Z.,Biesiacki A., Budzyńska K., Demidowicz G., Deputat T., Flaczyk Z., Gałecki Z., Ganowicz M., Gondek W., Huczyński B., Ochalska L., Jarubas M., Jastrzebski M., Kuczaj W., Kwiecień L., Mrozowski J., Olejniczak E., Ostrowski K., Partyka A., Sotniczuk M., Zbysław B., Langhmer L., 1981. Waloryzacja Rolniczej Przestrzeni Produkcyjnej Polski Według Gmin. IUNG Puławy. [In Polish]