



## **ANALYSIS OF CHANGES IN LAND USE IN LUBELSKIE VOIVODESHIP IN THE PERIOD 2004-2013**

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### ***Abstract***

The aim of the study is to analyse and compare the changes in land use in rural areas in the Lubelskie Voivodship at the time of implementation of the Rural Development Plan (RDP) during the period 2004-2006 and 2007-2013. The assessment of changes in land use was made based on aggregate voivodship lists of the land and building register covering the years 2004-2013. In detailed analyses the changes in the register area of particular lands in 20 districts. For the purpose of research presentation QGIS software was used, which allowed to present the changes in land use in the form of a cartogram.

The research shows a decrease in the acreage of agricultural land and waste land at the time of implementation of the two programmes, at the expense of, among others, forests, wooded and bushy lands, urban and built-up lands, ecological lands and various land. The effect of financing activities related to the reduction of the human impact on the environment during the period 2007 – 2013 in Lubelskie Voivodship can be observed in the changes of ecological land acreage. It was observed the overall area increase of 22,21%. Ecological lands constitute a very small percentage of the lands in Lubelskie Voivodship. It is the authors' opinion that should strive to increase their acreage in order to increase biodiversity in rural areas.

**Key words:** land, Rural Development Plan, rural areas

## INTRODUCTION

Since the accession of Poland to the European Union in 2004 there have been implemented two Rural Development Plans (RDP). The first covered the years 2004 – 2006 and the second – years 2007 – 2013. Currently there is another programme being implemented for the years 2014 – 2020.

Under the RDP for the years 2004-2006 there were funded, among others, afforestation of agricultural land, support for agricultural activities in the areas of unfavourable farming conditions, support for agri-environmental projects as well as direct payments (ARiMR 2016). Some of the postulates of RDP for the years 2007 – 2013 were: improving the competitiveness of the agricultural and forestry sector by promoting restructuring, development and innovation, improving the environment and rural areas by supporting land management, improving the quality of life in rural areas and encouraging diversification of economic activity (Konieczna 2013). The support under the RDP 2004-2006 and 2007-2013, strengthened the attractiveness of ecological, which was noted by the high growth of the number of farms and organic farming (Łuczka-Bakuła 2013).

In Poland, the land use is dominated by agriculture and forestry (Gabryszuk *et al.* 2015; Bielecka, Całka 2012). Taking into account the 2010 year, agricultural land accounted for 51,6% of area of the country, including 38,7% represented arable land, 29,7% of the country covered forests, wooded and bushy land (Bielecka, Całka 2012). The area and the structure of agricultural land in Poland is changing for years. During the period 1946-2007 there was a decrease in total area by 20,86%. The biggest changes were recorded after 1995, while the area of arable land has decreased by almost 25,75% (Urban 2009).

Over the years, the structure of land use in Poland changed due to the economic, political and social transformation. In the national economy were diminished the role of the industry. In the agriculture there was made structural changes. The progressive population concentrating process led to development of urban agglomerations (Popławski 2009). In the last 40 years it has been noted a reduction of the agricultural space, mainly in aid of forestry, urban and built-up areas, communication areas and lands under water. The changes occurring in rural areas does not exceed the 3,0-3,2% of the total agricultural production areas (Woch 2014).

The aim of this study is the assessment of the direction and scope of changes in land use at the regional level at the time of the implementation of the two RDP programmes during the period 2004 – 2006 and 2007 – 2013. The area of the study includes rural areas from Lubelskie Voivodship with a division into individual districts.

## **MATERIAL AND METHODS**

The study was carried out at a regional level. The subject of the analysis are lands in rural areas in Lubelskie Voivodeship divided into individual districts.

The assessment of changes in land use was made based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013. In detailed analyses the changes in the register area of particular lands in 20 districts were considered. The analysis excluded 4 urban districts located within the voivodship area. For the purpose of research presentation QGIS software was used, which allowed to present the changes in land use in the form of a cartogram. The classes presented in cartograms were generated using the method of natural division such as Jenks. The method of Natural Breaks (Jenks) is based on searching for the largest gaps between the analyzed values and inserting dividing lines in these places. The Jenks algorithm minimizes variance within a given class (Iwańczak 2013).

## **THEORY AND CALCULATIONS**

Direct payments were introduced in 1992 in order to support the income of agricultural producers as part of the reform of the Common Agricultural Policy. The main premise of that reform was to maintain the current level of the income of agricultural producers whilst reducing production (Žmija 2011). The amount of subsidy was established among others on the basis of cultivated areas, it was often varied depending on the type of agricultural product (Marks-Bielska, Babuchowska 2010). During the period 2007 – 2013 a great amount of emphasis was placed on financing activities related to the reduction of the human impact on the environment. At that time Lubelskie Voivodship was in the 3rd place in terms of the amounts paid for the implementation of the agri-environmental programme. This was approximately 2853,10 zł·ha<sup>-1</sup>. The agri-environmental package associated with water and soil protection was very popular (Pawlewicz, Bórawski 2013).

Changes in the spatial structure of rural areas are usually a result of arrangement and agricultural actions carried out, such as: division of real estates, land consolidation, melioration, afforestation and introduction of woodlots and land reclamation (Konieczna 2013). The implementation of the RDP 2004 – 2006 and 2007 – 2013 programmes enabled the financing of these actions, resulting in partially analyzed changes in land area in this work.

In Poland in accordance with the decree MRRiB dated 29.03.2001 on land and building registration (Regulation 2001) there are 7 groups of lands: agricultural land (R, S, Ł, Ps, B-R, Wsr, W), forests, wooded and bushy land (Ls, Lz), urban and built-up land (B, Ba, Bi, Bp, Bz, K, dr, Tk, Ti, Tp), ecological land

(E-Ws, E-Wp, E-Ls, E-Lz, E-N, E-Ps, E-R), waste land (N), land under water (Wm, Wp, Ws), various land (Tr).

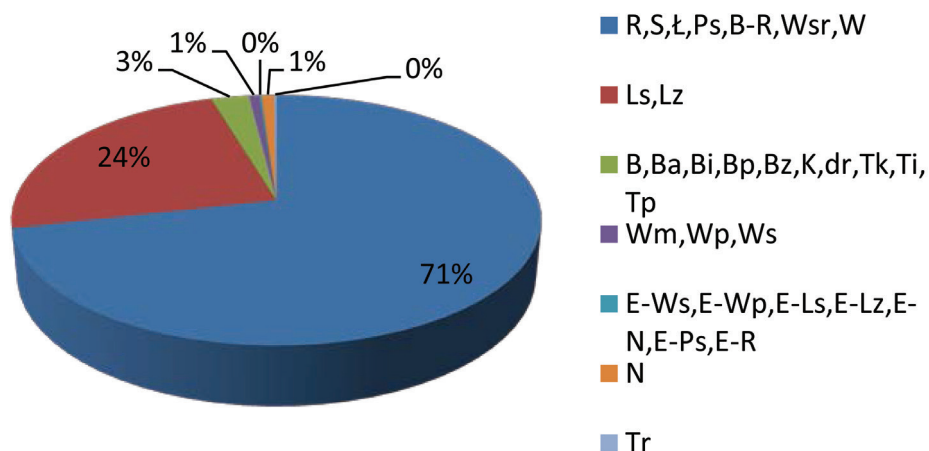
## RESULTS AND DISCUSSION

In Lubelskie Voivodship dominate rural areas. In the years 2004 – 2013 they constituted on average 96% of the voivodship area. In the table 2, we can observe the average areas of rural lands in particular districts during the years 2004-2013, and its share in Lubelskie Voivodeship in percentage.

**Table 1.** The average areas of rural lands in district during the period 2004-2013 (ha).

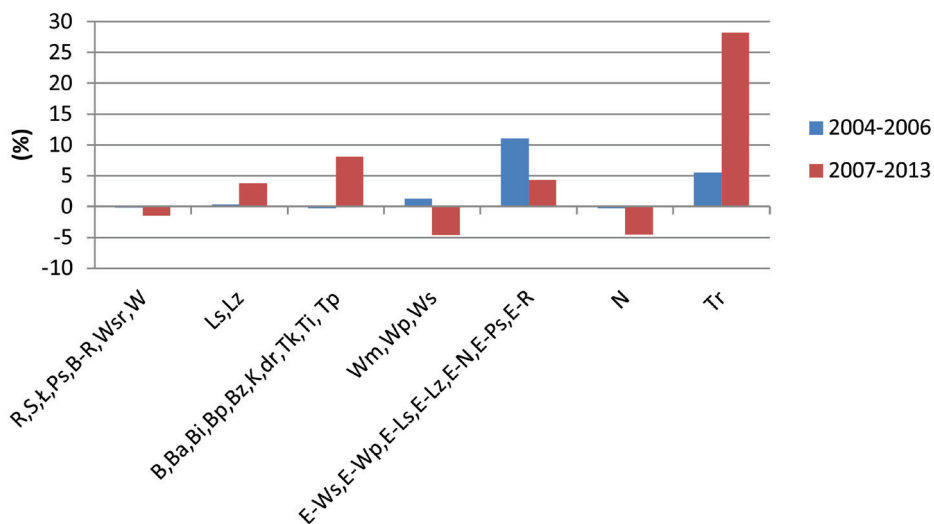
Lp.	Powiat	The average areas of rural lands in district during the period 2004-2013 (ha)	The share of rural areas in Lubelskie Voivodeship in %
1	bialski	275227	11,07
2	biłgorajski	168091	6,76
3	chełmski	187522	7,54
4	hrubieszowski	126955	5,11
5	janowski	87545	3,52
6	krasnostawski	104202	4,19
7	kraśnicki	100602	4,05
8	lubartowski	128840	5,18
9	lubelski	167911	6,76
10	łęczyński	63637	2,56
11	łukowski	139407	5,61
12	opolski	81057	3,26
13	parczewski	95211	3,83
14	puławski	93329	3,75
15	radzyński	96501	3,88
16	rycki	61463	2,47
17	świdnicki	46831	1,88
18	tomaszowski	148652	5,98
19	włodawski	125652	5,06
20	zamojski	186985	7,52

Source: author's study based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013



Source: author's study based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013

**Figure 1.** The average land surface in Lubelskie Voivodship during the period 2004 – 2013

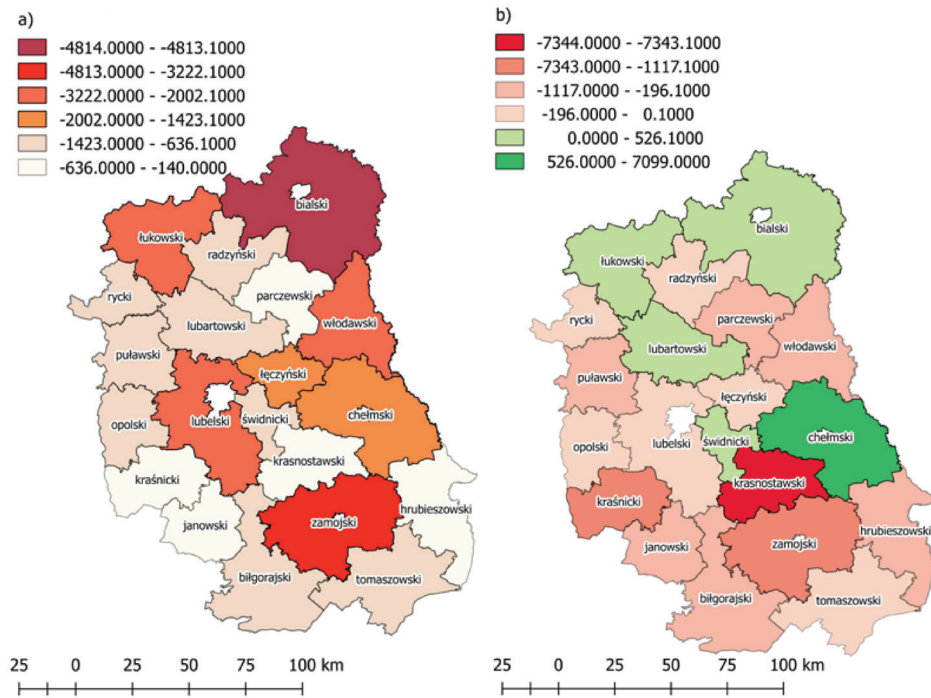


Source: author's study based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013

**Figure 2.** Changes in land surface in Lubelskie Voivodship during the period 2004 – 2013

Figure 1 shows the percentage share of average land areas at rural areas during the same period. We can notice that in the rural areas of Lubelskie Voivodship were dominated by agricultural lands (71%) and forests, wooded and bushy land (24%).

In both 2004 – 2006 and 2007 – 2013 in Lubelskie Voivodship there was a decrease in agricultural lands area (up to 32517 ha – 1,87%), land under watern(465 ha – 2,62%) and waste lands (1165 ha – 5,10%), at the expense of, among others, forests, wooded and bushy lands (25418 ha – 4,48%) and urban and built-up lands (5113 ha – 8,81%). The percentage changes in each of lands register groups in two RDP programme shows Figure 2.

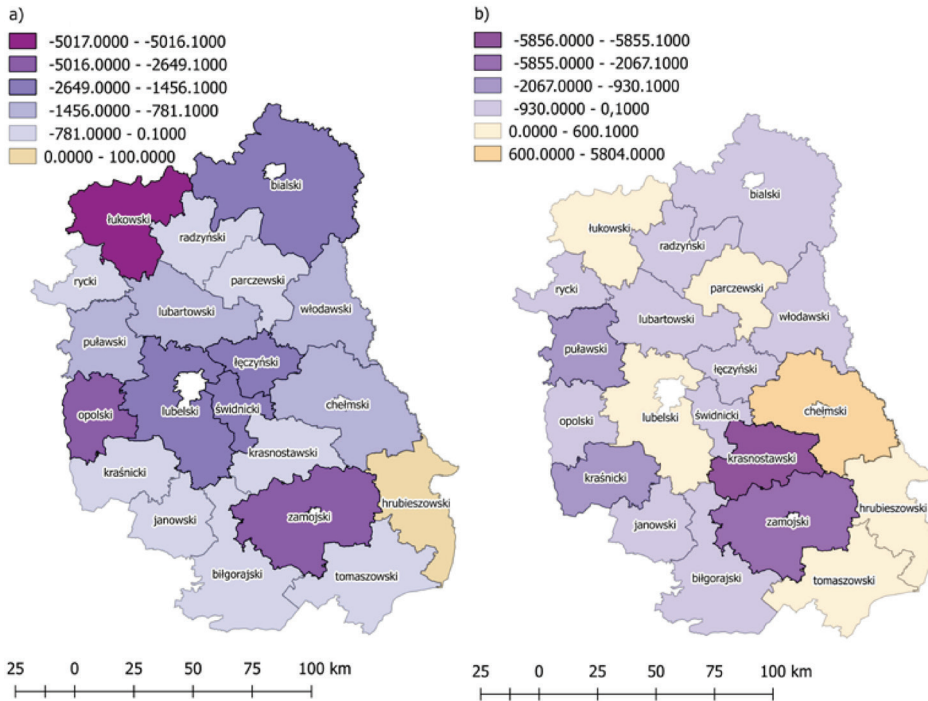


Source: author's study based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013

**Figure 3.** Agricultural land acreage changes a) during the period 2007 – 2013, b) during the period 2004 – 2006

QGIS software allowed to present changes in the land area in the form of a cartogram. Figures 3, 4, 5, 6, 7 shows in sequence the comparison of area changes of chosen lands from particular districts of Lubelskie Voivodship at

the time of the implementation of the two RDP programmes during the period 2004 – 2006 and 2007 – 2013.

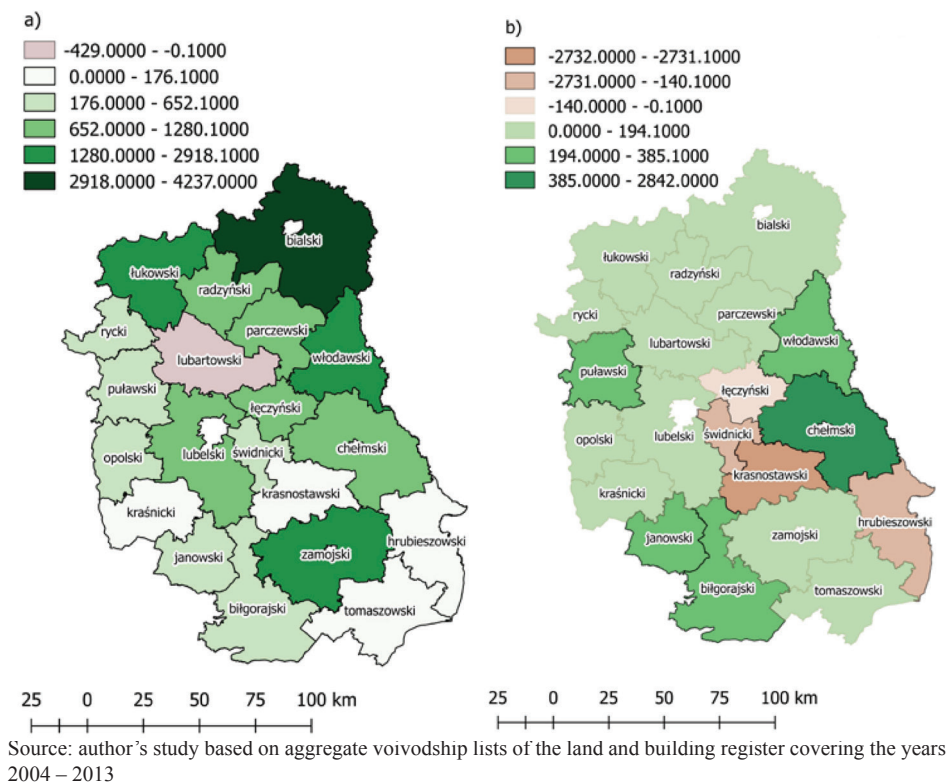


Source: author's study based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013

**Figure 4.** Changes in the arable land area a) during the period 2007 – 2013, b) during the period 2004 – 2006

Big changes were noted in the area of agricultural lands (Figure 3). Immediately after the accession of Poland to the EU, there has been a reduction in the area of those lands in almost all districts of Lubelskie Voivodship on average 185 ha (0,22%), with the exception of 5 districts, including chełmski district, in which the area of that lands has been increased the most – by about 7099 ha, i.e. 5,35%. During the implementation of the second RDP for the years 2007 – 2013 a decline trend in the agricultural land area in all districts an average by 1320 ha (1,5%) was noted, with the largest fall recorded in włodawski district – 4,39% . The biggest changes took place here in arable lands (Figure 4). In 2004 – 2006 there was a decrease in arable lands on average of 199 ha (0,31%) per district, again in the years 2007 – 2013 on average 1181 ha (1,81%) per district.





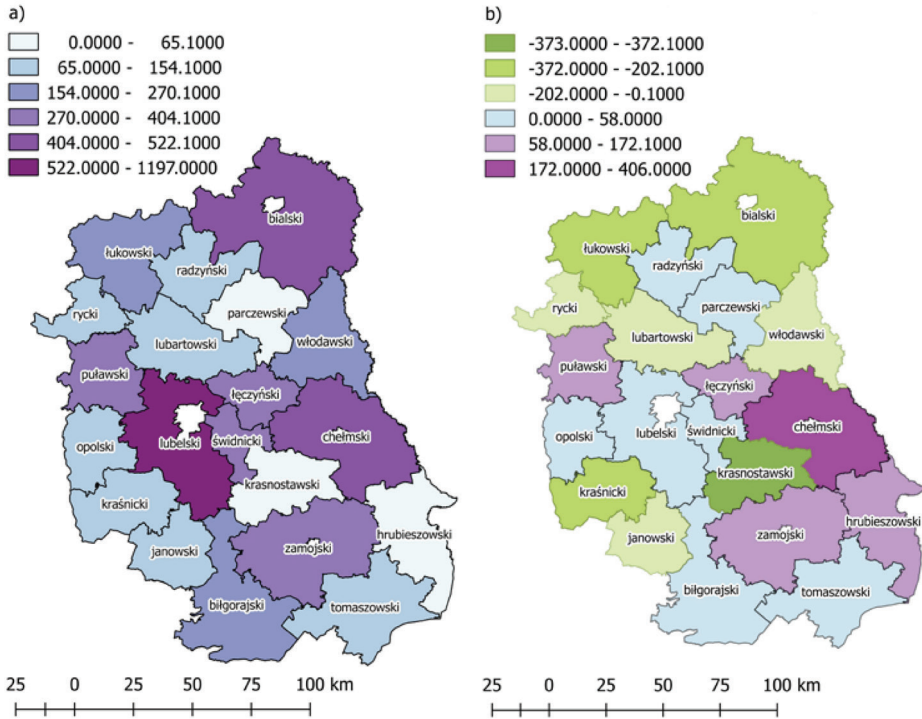
**Figure 5.** Changes in the forest, wooded and bushy lands area a) during the period 2007 – 2013, b) during the period 2004 – 2006

In the case of forests, wooded and bushy lands (Figure 5) in the analyzed periods a different phenomenon was observed, namely the average increase in the area of these lands in 2004 – 2006 by 102 ha (0,36%), and in 2007 – 2013 by about 1067 ha (3,74%). The largest increase in the area of forests, wooded and bushy lands occurred in 2007 – 2013 in *łęczyński* district (1280 ha – 15,07%). But *lubartowski* district – as the only district in Lubelskie Voivodeship – noted a decrease in the area by 429 ha – 1,685. During the period 2004 – 2006, the largest increase in the area of the land occurred in *chełmski* district (2842 ha – 8,68%), while the largest decrease in *krasnostawski* district – about 2732 ha (14,97%).

From the analysis of changes in the urban and built-up land areas (Figure 6) it follows that the districts with the largest increase of those lands are *lubelski* and *świdnicki* district respectively by 30,49 and 28,23%. The main reason for this is the attractiveness of the region in terms of a labor market. The

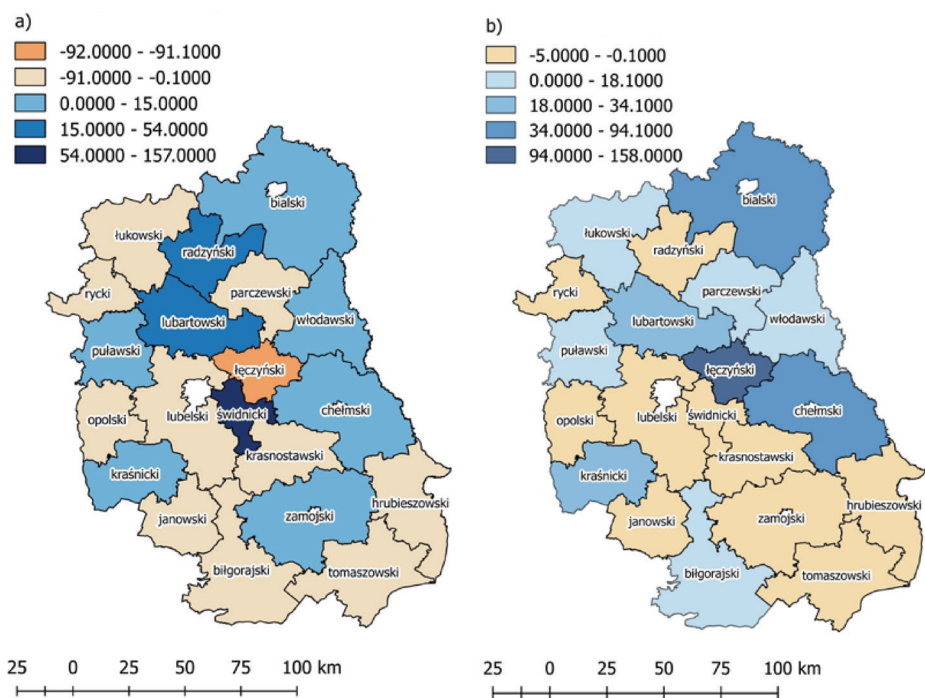


increase of this lands occurred mainly at the expense of agricultural lands. In the years 2007 – 2013 the smallest increase in the area of urban and built-up lands was recorded in the parczewski district – only 6 ha (0,22%). In the years 2004-2006, the decrease of this lands were recorded in krasnostawski and kraśnicki district respectively by 13,64% and 13,50 %.



**Figure 6.** Changes in the urban and built-up land area a) during the period 2007 – 2013, b) during the period 2004 – 2006

Based on the cartogram showing the changes in the area of ecological lands (Figure 7), we can say that the regions, in which their area increased most during the execution of two task of RDP are in the years 2007-2013 świdnicki district (157 ha – new area), and in the years 2004-2006 biański (94 ha – 74,60%) and łęczyński (158 ha – 23,83%) district. However, in łęczyński district in the years 2007 – 2013 the area fell by 92 ha (8,80%). The total increase in the area of ecological land during the period 2004-2013 was 22,21%.



Source: author's study based on aggregate voivodship lists of the land and building register covering the years 2004 – 2013

**Figure 7.** Changes in the ecological land area a) during the period 2007 – 2013, b) during the period 2004 – 2006

## CONCLUSIONS

1. The study showed a reduction in the agricultural land area (by 32517 ha – 1,87%), waste lands (1081 ha – 5,10%) and land under water (by 465 ha – 2,62%) during the two completed Rural Development Plan programs, at the expense of among others forests, wooded and bushy lands (23373 ha – 4,48%), urban and built-up lands (4930 ha – 8,08%), ecological lands (593 ha – 22,21%) and various lands (887 ha – 28,52%).
2. The largest decrease in the agricultural land area was recorded in włodawski district (4,39%) in the years 2007 – 2013. The main reason was the reduction of the area of land not used for agricultural and grazing land.

3. The greatest increase in forests, wooded and bushy lands areas occurred in 2007-2013 in łączyński district (15,07 %). And in lubartowski district – as the only district in Lubelskie Voivodeship – noted a decrease by 1,68 %. During the period 2004 – 2006 the largest increase in the area of these lands occurred in chełmski district (8,68%). Funds from the RDP programme had a great influence on this phenomenon.
4. The directions of land-use changes are consistent with the objectives of the RDP programme for the years 2004 – 2006 and 2007 – 2013.
5. The effect of financing activities related to the reduction of a human impact on the environment during the period 2004 – 2013 in Lubelskie Voivodeship can be seen in the changes of ecological land areas. It was observed the overall area increase of 22,21%. In świdnicki district, in the years 2007-2013, there was noted an occurring of these lands in amount of 157 ha, which represented 3,62% of ecological land in the Voivodeship. During the period 2004-2006 the largest increase occurred in bialski district (74,60%). This show that system based on high-stakes payments proved to be an effective financial instrument for enhancing the attractiveness of organic farming.
6. Ecological lands represent a very small percentage of lands in Lubelskie Voivodship. According to the authors we need to strive to increase their acreage in order to increase biodiversity in rural areas.

## REFERENCES

- ARiMR (2016). Rural Development Plan 2004-2006 retrieved from <http://www.arimr.gov.pl/dla-beneficjenta/biblioteka/archiwum/programy-i-dzialania-wdrozone-w-poprzednich-latach/plan-rozwoju-obszarow-wiejskich-2004-2006.html> (access: 25.04.2016)
- Bielecka, E., Całka, B. (2012). Analiza procesu wyłączeń gruntów z produkcji rolnej i leśnej na terenach wiejskich. *Infrastruktura i Ekologia Terenów Wiejskich 2(III)*, s. 163-173.
- Gabryszuk, J., Król, Ż., Mazur, A. (2015). Zmiany użytkowania gruntów leśnych na terenie województwa lubelskiego w latach 2009-2014. *Inżynieria ekologiczna 44*, s. 12-18.
- Iwańczak, B. (2013). *Quantum GIS. Tworzenie i analiza map*. Wydawnictwo Helion, s. 192
- Konieczna, J. (2013). Znaczenie jakości danych katastralnych w pracach realizowanych na obszarach wiejskich. *Infrastruktura i Ekologia Obszarów Wiejskich 3(III)*, s. 165-177
- Łuczka-Bakuła, W. (2013). Rozwój rolnictwa ekologicznego na tle wsparcia w ramach PROW 2004-2006 i PROW 2007-2013. *Journal of Agribusiness and Rural Development*, 4(30), 161-175

Marks-Bielska, R., Babuchowska, K. (2010). Funkcjonowanie systemu dopłat bezpośrednich w Polsce i w innych krajach UE. *Journal of Agribusiness and Rural Development*, 3(17), 1-7

Pawlewicz, A., Bórawski, P. (2013). Realizacja programu rolnośrodowiskowego w Polsce. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu XV*, (2), 271-276

Poławski, Z.F. (2009). Zmiany użytkowania ziemi w Polsce w ostatnich dwóch stuleciach. *Teledetekcja Środowiska*, 42, 69-82

Regulation (2001). Rozporządzenie Ministra Rozwoju Regionalnego i Budownictwa z dnia 29 marca 2001 r. w sprawie ewidencji gruntów i budynków (Dz. U. nr 38, poz. 454)

Urban, S. (2009). Zmiany w użytkowaniu ziemi rolniczej w Polsce. *Journal of Agribusiness and Rural Development*, 2(12), 257-265

Woch, F., Woch, R. (2014). Zmiany użytkowania przestrzeni wiejskiej w Polsce. *Infrastruktura i Ekologia Terenów Wiejskich*, 1(1), 111-124

Żmija, D. (2011). System płatności bezpośrednich w Polsce w kontekście rozwiązań stosowanych w Unii Europejskiej. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie. Problemy Rolnictwa Światowego*, 11(1)

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