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AFFORESTATION FUNDED BY RPD IN THE PERIOD 2007-2013: THE EXAMPLE OF PODLASKIE AND WIELKOPOLSKIE VOIVODSHIPS

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ABSTRACT: The objective of this study is to identify differences between the afforestation subsidies from European Union (EU) obtained by beneficiaries from Podlaskie and Wielkopolskie Voivodships (918 and 618 beneficiaries respectively) as part of RDP 2007-2013. The survey results showed faster increase of forest rate growth in Podlaskie Voivodship, which is classified as a less economically developed region. When compared to Wielkopolskie Voivodship, Podlaskie Voivodship received higher subsidies; nevertheless, the average sum obtained (in thousand EURO) per beneficiary was lower in Podlaskie than in Wielkopolskie.

KEY WORDS: European Union funds, afforestation, private land

Introduction

The economic diversification of different regions of the world, continents, and countries is largely due to historical conditions. This is also true in the case of Poland, whose heritage is connected with the period of partitions (division of the state between Prussia, Austria, and Russia in the 18th century), the westward shift of Polish boundaries after WW2, the country's planned economy in the post-war communist period and, finally, the transition towards a market economy in the 1990s (Ministerstwo Rozwoju Regionalnego, 2008). The trends in institutional development and social capital building grew out of the need to push for restructuration of rural areas, including through effective use of European Union (EU) funds (Bober et al., 2007).

The forest ratio is a component of the category of land use ratios. Its role is to ensure sustainable development through providing environmental governance and to exert a positive influence on the shaping of climate and water balance, whilst serving productive and social functions (GUS, 2015). In 2013, the forest ratio in Poland equalled 29.4% (GUS, 2017). In 2013 the forest ratio equalled 30.7% in Podlaskie Voivodship and 25.7% in Wielkopolska (GUS, 2017). According to the Raport o stanie lasów (State of Forest Report) (Centrum Informacyjne Lasów Państwowych, 2013), based on the standard used in international assessment, which includes lands designated for forest management, Poland is listed among those countries with the largest forest acreage in the region (next to France, Germany, and Ukraine). Forestation share in Poland is an indicator which, starting from 1945 when it amounted to 21%, has been steadily increasing, enabling the implementation of sustainable development of rural areas (Central Statistical Office, Indicators of the sustainable development of Poland, 2015).

The process of afforestation of arable lands was subsidised by EU funds, distributed by the Agency for Restructuring and Modernisation of Agriculture (ARiMR) as part of the Rural Development Programme (RDP) 2007-2013. The tasks performed under axis 2 concerned "improvement of natural environment and rural areas". One of the objects of the tasks was to ensure sustainable use of arable lands. Axis 2 covered measures 221 and 223 (i.e. "afforestation of agricultural and non-agricultural land") which encompassed expansion of forest areas through afforestation (Ministerstwo Rolnictwa i Rozwoju Wsi, 2015). Land use and land cover (LUCC) modifications have become an important matter in studies on worldwide environmental changes in recent years (Fan et al., 2017). Populations face the challenge of a trade-off between current needs and assuring the ability of the biosphere to provide goods in the long period (Foley et al., 2005). In Poland, the area of agricul-

tural land has been declining over time. Moreover, modifications in land cover show a decrease in agricultural land, and an increase in the forest area (Cegielska et al., 2018). The abandonment of traditional agricultural lands has been happening in many regions of the world (Janus, Bozek, 2018). Land abandonment influences mainly areas characterized by the least favorable conditions for cultivation and the lowest soil fertility (Hatna, Bakker, 2011).

After accession to the EU, Poland was also included in operational programmes intended for elimination of regional differences caused, among others, by historically rooted tensions. The new conditions created an impulse to undertake research in the field of determining the level of subsidies in the selected voivodships located in the eastern and western part of the country. The voivodships in Eastern Poland were covered by the Operational Programme for Development of Eastern Poland (OPDEP-PORPW) 2007-2013, the intent of which was to inhibit stagnation that is a cause of the marginalisation and peripheral significance of voivodships. The objectives are achieved through "acceleration of the pace of social and economic development in accord with the principle of sustainable development" (PORPW 2007-2013, 2012). The Programme encompassed construction of approx. 9,500 km of broadband infrastructure, funded by both domestic funds and funds from the European Regional Development Fund for 2007-2013. Central and Western Poland, including Wielkopolskie Voivodship, in turn, focused mainly on ensuring growth in employment and social cohesion in the region as part of the European Social Fund. In the years 2007-2013, Wielkopolskie Voivodship benefited from the Wielkopolskie Regional Development Operational Programme and the Human Capital Operational Programme, the major elements of which were investments in transport infrastructure, competitiveness of companies, natural environment, and HR infrastructure.

Overview of literature

The dominant types of land use changes have been the alterations in the area of forest distribution, which has been the result of complex historical, social, and economic processes in Poland (Poławski, 2006). Increasing the acreage of forests is the main objective of eco-policy and forestry (Polna, 2017). Moreover, afforestation programs strengthen the profitability of environmental policy (Łonkiewicz, 1994; Fonder, 2002). Forest growth rate in Poland grew from 28.4% in 1995 to 30.6% in 2016 because of afforestation of agricultural and non-agricultural land. Research shows concentration of forest mainly in rural areas (Polna, 2017). The National Programme for the Augmentation of Forestation Share (Krajowy Program Zwiększania Lesistości,

KPZL) supported afforestation in Poland since 1995. Klepacka et al. (2017) state that afforestation of agricultural land (referring to research of selected districts of Podlaskie Voivodship) increases the share of privately owned forested land and heavily impacts goal attainment for the KPZL. Since the growing share of private forests plays a large role in the rapid reduction of land area owned by the State Treasury that could be afforested, EU funds can be applied exclusively to private land owners, stressing their importance for reaching the desired share of afforested land in total land area in Poland. Kaliszewski (2016) noted that since 2004, the ability of farmers to obtain payments under the Common Agricultural Policy (CAP) has led to increased agricultural use of land, as such areas were classified unsuitable for profitable farming. As unsuitable for farming such areas were included in the earlier proposed pool of land intended for afforestation under the KPZL.

Moreover, afforestation is supported in line with the Act of June 8, 2001 regarding shifting agricultural land to forest (Dz.U. nr 73, poz. 764) (Polna, 2017). Funds for afforestation distributed through RDP 2007-2013 are considered in this study. Since May 1, 2004, Poland has adopted the tools of the EU CAP. The main funding source for agriculture and rural area support in the EU member states is the European Agricultural Guidance and Guarantee Fund. In Poland, the Agency for Restructuring and Modernization of Agriculture allocates funds supporting afforestation of low quality agricultural land, both arable and non-arable. Axis 2 covered measures 221 and 223, i.e. "afforestation of agricultural and non-agricultural land", which encompassed expansion of forest areas through afforestation, maintenance and strengthening of the ecological stability of forest areas by way of reducing fragmentation of forests, creation of ecological corridors, increasing the share of forests in the global carbon balance, and curbing climate change (Ministerstwo Rolnictwa i Rozwoju Wsi, 2015). Implementation of measures 221 and 223 "afforestation of agricultural and non-agricultural land" in axis 2 "improvement of natural environment and rural areas" provides the opportunity to improve forest rate by afforestation of areas which are economically inefficient and undeveloped agricultural land (GUS, 2015).

Afforestation is a tool for carbon sequestration to manage climate change. Consequently, there is a need for a rational approach to afforestation. Carbon sequestration, biodiversity conservation and forest and timber sector should be considered in a balanced way (The World Conversation Union, 2004). The annual amount of CO_2 absorbed by one hectare of a forest amounts to $39m^3/CO_2$ or 10 tons of carbon (Klepacka, Florkowski, Revoredo-Giha, 2017). Increasing forest resources is one of the major principle of forest management in Poland (Budnica-Kosior, Kwaśny, Szymański, 2016). The cooperation between the economic sectors and various countries can make an effective use of forests

resources (Wysocka-Fijorek, 2016). The gradually growing area of re-forested agricultural land contributes to changes in the agricultural landscape, increasing both the economic and environmental value of land (Sioma, Szymański, 2008). Forest performs various functions in European Union member countries, that is productive and non-productive, and compatible with the concept of sustainable development (Ossowska, Janiszewska, 2016).

The 2009 Report on implementation of afforestation implemented under the rural development regulation 1698/2005 for the period 2007-2013 shows the improving competitiveness of agriculture and forestry sectors, including the addition of value to forestry products. The afforestation rate varies across voivodships in Poland. However, afforestation allows rational management of agricultural land poorly suited for agricultural production (Kurowska et al., 2014). Forests are important element of environment and spatial economy (Kurowska, Kryszk, 2017). Forests are recognized as an irreplaceable, lacking alternative social goods and contribute to the preservation of balance and self–regulation of the natural environment, while generating revenues from wood and forest resources (Zamelski, 2018).

Research methods

The objective of the study is to identify the rate of subsidies for afforestation of arable and non-arable lands received by beneficiaries based in Podlaskie and Wielkopolskie Voivodships as part of RDP 2007-2013. The temporal frames of the programme encompassed the years 2007-2013. During that time, EU support was received by 918 beneficiaries from Podlaskie Voivodship (natural persons: 98.6%) and 623 beneficiaries (natural persons: 96.6%) from Wielkopolskie. The analysis was carried out on the level of districts within the Voivodships in question. The source of data used for the analysis was information provided by the Agency for Restructuring and Modernisation of Agriculture and the Central Statistical Office of Poland (GUS), Local Data Bank (BDL). The Voivodships have been presented with the use of a descriptive and comparative method. The study contains selected survey results.

Results of the research

Characteristics of voivodships covered by the study

The differentiation of economic levels of individual regions has been a significant feature of Poland's territorial development (Przeglądy terytorialne OECD Polska, 2008). According to Przegląd Geograficzny (The Geo-

graphic Review, 2012), Poland was divided in two parts: the "eastern part with a very low development level, and central/western part with a mosaic-like distribution of development". NUTS Classification (Classification of Territorial Units for Statistics), officially introduced by the EU in 2005 for analyses of social and economic development levels in regions, shows Poland divided into northern, north-western, central, eastern, south-western, and southern regions (Eurostat).

The disproportion in development of regions is shown by the sustainable development indicators used for monitoring the achievement of objectives of the EU Sustainable Development Strategy. Among them is the factual GDP per capita (Eurostat). In 2010-2012, the economic growth measure (factual Polish GDP per capita) indicated Mazowieckie, Dolnośląskie, Wielkopolskie, Śląskie, and Pomorskie Voivodships as leaders – the voivodships were characterised by high investment attractiveness when compared to other voivodships, mainly due to diversified structure of the economy – whilst naming eastern voivodships, i.e. Podkarpackie, Lubelskie, Warmińsko-Mazurskie, Podlaskie, and Świętokrzyskie as those with the lowest GDP (Regional development in Poland, 2009). In 2015, the factual GDP per capita equalled 7,764 EURO (based on exchange rates NBP table of 2018-01-12 (1 EURO – 4,1669 PLN),http://www.nbp.pl/homen.aspx?f=/srodeken.htm [12-01-2018]) in Podlaskie Voivodship and 11,517 EURO in Wielkopolskie. Podlaskie Voivodship (2,018,702 ha) is located in the north-east of Poland, while Wielkopolskie Voivodship (2,982,650 ha) lies in western Poland (based on the prevalent climate of the two, it is clear that Podlaskie Voivodship is located in the climatic region of Masuria and Podlaskie, while Wielkopolska Voivodship lies within the climatic region of Central Wielkopolska, Southern Wielkopolska and Central Poland) (Woś, 1994). Podlaskie Voivodship is divided into 14 districts, 3 cities with district rights (Białystok, Łomża, Suwałki), 118 urban and rural municipalities, 40 towns and 3,859 rural settlements. Wielkopolskie Voivodship, in turn, encompasses 31 districts, 4 cities with district rights (Kalisz, Konin, Leszno, and Poznań), 226 urban and rural municipalities, 111 towns and 5,450 rural settlements (GUS, 2015). In 2013, arable lands in Podlaskie Voivodship amounted to 1,064,000 ha, while in Wielkopolskie Voivodship, the number reached 1,733 ha. In 2010, agricultural holdings with an area of 1-5 ha (25%) and 5-10 ha (21.4%) prevailed in Podlaskie Voivodship, while in Wielkopolskie, holdings of 0-1ha (23.8%) and 1-5ha (29.2%) were the most common (Urząd Statystyczny w Białymstoku – Statistical Office in Białystok, Urząd Statystyczny w Poznaniu – Statistical Office in Poznań, 2010). Between 2007 and 2013, forested areas grew by 1.4% (increase in the area of private forests by 3.8%) in Podlaskie Voivodship and by 0.6% (increase in the area of private forests by 5.1%) in Wielkopolskie Voivodship. Accord-

ing to the data of FADN (Klepacka et al., 2017), a potentially forested area (a private forest in particular) in Poland corresponds to approximately 27% out of 159,300 ha of land in the period from 2001-2014. In 2013, the area of private forests in Podlaskie Voivodship exceeded 201,600 hectares. The highest forest ratio (between 56% and 82%) was reported in the urban and rural municipalities of Mielnik (Siemiatycze District), Hajnówka, Narewka (Hajnówka District), Gródek, Supraśl, Czarna Białostocka (Białystok District), Giby (Sejny District), Płaska, and Nowinka (Augustów District) (GUS, 2017). In Wielkopolskie, the area of private forests in 2013 was lower by more than 188.2 ha than in Podlaskie. The greatest forest cover, above 50%, was reported in the following urban and rural municipalities: Jastrowie (Złotów District), Miedzichowo (Nowo Tomyśl District), Wieleń, Drawsko (Czarnków-Trzcianka District), and Wronki (Szamotuły District). More than half of the urban and rural municipalities had a forest ratio below the average for Wielkopolskie Voivodship.

Funds for afforestation as part of RDP 2007-2013 in the selected voivodships

For the years 2007-2013, the RDP granted funds for afforestation (measures 221 and 223, afforestation of agricultural and non-agricultural land) in the form of a one-off reimbursement for the costs incurred in relation to the establishment of crops of 998-1502 EURO per hectare (ha), fencing of silvicultural lands with a metal mesh of 622 EURO per ha or 1,56 EURO per linear metre of the fencing, a carer's bonus for private persons granted for up to 5 years (except for plantations of fast-growing species) of 233-326 EURO per ha, and an afforestation bonus for land conversion from agricultural use granted for up to 15 years from the forest crop establishment of 379 EURO per ha. Additionally, the following subsidies were available for entities: funds for afforestation (i.e. works related to the establishment of a forest crop of 430-1502 EURO per ha and 622 EURO per ha of a fenced plantation) carer's bonuses paid once a year for 5 years for processes connected with treatment of the crops of 233 to 492 EURO per ha, and allowance for crop protection against animals of 46-168 EURO per ha. All in all, 129,304,759 EURO was paid from the budget of RDP 2007-2013 for 10,058 beneficiaries (ARiMR, 2015). 1,794 decisions to grant afforestation allowances were issued in the calendar year 2014, for the overall sum of 5,399,698 EURO. The budget distributed 34,078,091 EURO, of which 21,742,782 EURO was paid to 8,043 beneficiaries as part of RDP 2007-2013 and 12,335,309 EURO was distributed among 7,326 beneficiaries by virtue of liabilities resulting from RDP 2004-2006 (ARiMR, 2017). As part of EU subsidies for afforestation of arable and non-arable lands, Podlaskie Voivodship received 4,380,580 EURO (including cities with district rights) and Wielkopolskie received 3,660,330 EURO. Subsidies

obtained by Podlaskie and Wielkopolskie Voivodships, exclusive of cities with district rights, equalled 3,434,688 EURO and 3,154,815 EURO respectively. In Podlaskie Voivodship, the average subsidy per capita reached 3,960 EURO for afforestation of arable lands (ALA) and 1,776 EURO for afforestation of non-arable lands (NALA), while in Wielkopolskie, the numbers equalled 5,280 EURO (ALA) and 1,800 EURO (NALA).

Table 1. Sum received for afforestation of arable and non-arable lands by Voivodships as part of RDP 2007-2013

Forest ratio 2007-2013	Voivodships			
	Podlaskie		Wielkopolskie	
	Number of beneficiaries	Amount obtained in thousand EURO	Number of beneficiaries	Amount obtained in thousand EURO
Arable land (AL)	826	3271,4	584	3084
Non-arable land (NAL)	92	163,3	39	70,6
Total	918	3434,7	623	3154,6

Source: author's own work based on (ARiMR, 2017).

Based on the data presented in table 1, it may be concluded that the funds for afforestation of arable and non-arable lands obtained by Podlaskie Voivodship were 279,872 EURO higher than those received by Wielkopolskie, but the number of beneficiaries in the former in the years analysed was higher as well. This can be justified by a higher acreage of lands to be afforested (713.48 ha of lands designated for afforestation in Podlaskie Voivodship in 2007-2013, compared to 555.65 ha in Wielkopolskie). As a result, the forest growth rate was lager in Podlaskie Voivodship and reached 1.3% (1.4% for Poland; 0.6% for Wielkopolskie Voivodship). In the course of further considerations, data concerning the sums (in EURO) obtained for afforestation of arable and non-arable lands in selected districts of Podlaskie and Wielkopolskie Voivodships as part of RDP 2007-2013 have been presented (figures 1 and 2).

Analysis of the data shown in figure 1 leads to the conclusion that the highest subsidies for afforestation of arable land were obtained by Hajnowski District (19% of the overall subsidy for ALA), with 166 beneficiaries (20.1% of all ALA beneficiaries). Sokółka District, in turn, received the highest subsidy for afforestation of non-arable land (37% of the overall subsidy for NALA), with 42 beneficiaries (45.7 of all NALA beneficiaries). In 2007-2013 the forest growth rate in Hajnowski District was high and reached 2.3%, with 2% in Sokółka District. For comparison, the forest growth rate in Suwałki District (the lowest obtained ALA subsidy) equalled 1.1%. In Sokółka District, the analysis also included the forest growth rate in individual urban-ru-

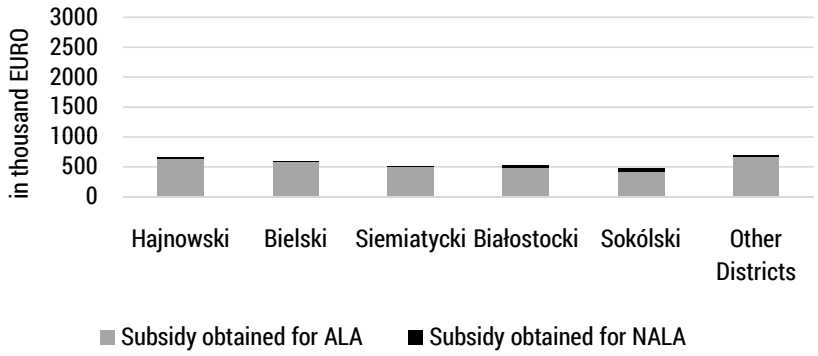

Figure 1. Share of the sum [in EURO] obtained for afforestation of arable land (ALA) and non-arable land (NALA) in selected districts of Podlaskie Voivodship as part of RDP 2007-2013

Source: author's own work based on (ARiMR, 2017).

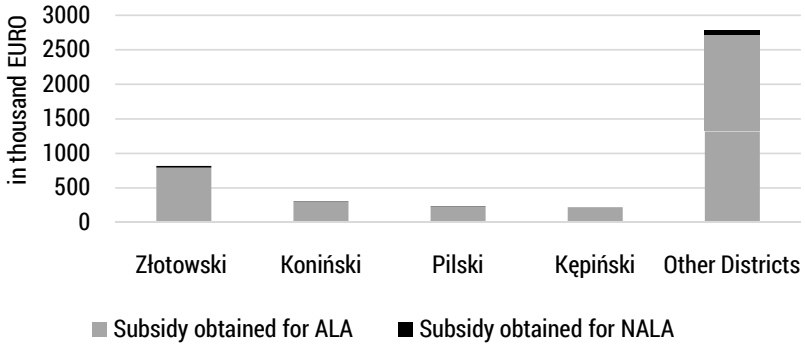

Figure 2. Share of the sum [in EURO] obtained for afforestation of arable land and non-arable land in selected districts of Wielkopolskie Voivodship as part of RDP 2007-2013

Source: author's own work based on (ARiMR, 2017).

ral municipalities. The results indicated two of them, i.e. Sokółka and Suchowola. In the municipality of Sokółka, afforestation of arable land constituted 48%, and afforestation of non-arable land 26% of the overall afforestation in the district. In Suchowola municipality, in turn, the numbers were 0.3% and 6%, respectively. In addition, the Pearson correlation coefficient value was very high (1) (Cohen, 1998) for both municipalities, and indicated a dependency between the sum obtained for afforestation in the years 2007-2013 and the amount received for biogas installation (utilisation of biomass as fuel).

In Wielkopolskie Voivodship (figure 2), the highest subsidies for afforestation of both arable and non-arable lands was obtained by Złotów District (25.75% of the overall ALA subsidies, with 102 beneficiaries – 16.11% of all ALA beneficiaries and 34.67% of the overall NALA subsidies, with 11 beneficiaries – 25.0% of all NALA beneficiaries. In the years 2007-2013 the forest growth rate in Złotów District equalled 1.5%. For comparison, the slowest forest growth rate was recorded in Krotoszyń District, which amounted to 0.2% (the lowest ALA subsidy obtained). Despite the slow growth of the forest rate, Krotoszyń District had a high total industrial production – 634,884,446 EURO and a low unemployment rate – 5.8% in 2015, compared with 179,509,947 EURO of industrial production and an unemployment rate of 12.1% in Złotów District. A high share of total industrial output could have caused a reduction of afforestation in Krotoszyń District. In general, in Wielkopolskie Voivodship a large majority of the subsidies were transferred to the remaining districts suggesting a greater territorial distribution of the amounts allocated under the ALA. This distinction is shown in the distribution of subsidies especially between the districts of the Podlaskie (figure 1) and Wielkopolskie Voivodships (figure 2).

Conclusions

In accordance with the National Forest Improvement Programme (KPZL), afforestation in Poland after 2050 is expected to reach 33%. Therefore, certain actions were undertaken to increase the acreage of forests, among others, though the use of EU subsidies granted under RDP 2007-2013. By using the EU subsidies for afforestation, Podlaskie and Wielkopolskie Voivodships contributed to the growth of arable land afforestation in Poland (GUS, 2015).

Selected (location-specific) survey results showed the following differences in private land afforestation in the years 2007-2013:

- Podlaskie Voivodship had a larger area of land to be afforested when compared to Wielkopolskie Voivodship. This translated, among other things, into a faster forest growth rate in Podlaskie Voivodship.
- At the level of districts in Podlaskie Voivodship, the fastest and the slowest forest growth rates were reported in Hajnówka and Sokołów Districts, respectively. In Wielkopolskie Voivodship, the fastest forest growth rate was noted in Złotów District and the slowest in Krotoszyn District.
- When compared to Wielkopolskie, Podlaskie Voivodship received higher subsidies, with a higher number of beneficiaries. Nevertheless, the average amount (in EUROs) obtained per capita in Podlaskie was lower than in Wielkopolskie Voivodship. It seems that this is due to the predomi-

nance of a number of farms in the range 0-1ha (23.8%) in the Wielkopolskie Voivodship.

- At the level of districts in Podlaskie Voivodship, the highest subsidies for arable land afforestation were granted to Hajnówka District, while Sokołów obtained the greatest support for afforestation of non-arable lands. In Wielkopolskie, in turn, it was Złotowski District that received the greatest support for afforestation of both arable and non-arable lands. In Wielkopolskie Voivodship, in Złotów District the greatest support was given to afforestation of arable land (ALA) and non-arable land (NALA). However, in the Wielkopolskie Voivodship spatial concentration of funds allocated to afforestation was lower than in the Podlaskie Voivodship.

The contribution of the authors:

Anna M. Klepacka – conception of framework, literature review, acquisition of data, analysis and interpretation of data – 50%
Patrycja Szmulewicz – literature review, data collecting, analysis and interpretation of data – 50%

Literature

ARiMR, *Sprawozdanie z działalności ARiMR za rok 2014*, http://www.arimr.gov.pl/fileadmin/pliki/zdjecia_strony/223/Sprawozdanie_ARiMR__2014.pdf [09-09-2017]

Bober J. et al. (2004), *Instytucjonalny program rozwoju instytucjonalnego. Poradnik dla samorządów terytorialnych*, Kraków

Budnica-Kosior J., Kwaśny Ł., Szymański P. (2016), *The role of spatial planning in shaping the afforestation rate on the level of district*, „Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej" Vol. 18

Cegielska K. et al. (2018), *Land use and land cover changes in post-socialist countries: Some observaions from Hungary and Poland*, "Land Use Policy" No. 78, p. 1-18

Centrum Informacyjne Lasów Państwowych (2013), *Raport o stanie lasów w Polsce 2012*, Warszawa

Cohen J. (1998), *Statistical power analysis for the behavioral sciences* (2nd ed.), Hillsdale, NJ, Lawrence Erlbaum Associates

European Commission Directorate – general for agriculture and the rural development (2009), *Report on implementation of forestry measures under the rural development regulation 1698/2005 for the period 2007-2013*

Eurostat, Wskaźniki zrównoważonego rozwoju SDI, https://stat.gov.pl/wskazniki-monitorujace/ [22-10-2017]

Fan Y. et al. (2017), *Entropies of the Chinese Land Use/Cover change from 1990 to 2010 at a County level*. "Entropy" No. 19(2), p. 51

Foley J.A. et al. (2005), *Global consequences of land use*, "Science" No. 309(5734), p. 570-574

Fonder W. (2002), *Stan i perspektywy realizacji programu zwiększania lesistości kraju*, in: A Grzywacz (ed.), *Rola leśnictwa w ekorozwoju regionalnym*, Orzechowo, p. 93-113

GUS (2015), *Wskaźniki zrównoważonego rozwoju Polski 2015*, Katowice

GUS, BDL (2017), http HYPERLINK https://bdl.stat.gov.pl/BDL"s://bdl.stat.gov.pl/BDL [22-10-2017]

Hatna E., Bakker M.M. (2011), *Abandonment and Expansion of Arable Land in Europe*, "Ecosystems" No. 14(5), p. 720-731

Instytut Geografii i Przestrzennego Zagospodarowania im. Stanisława Leszczyńskiego PAN (2012), Przegląd Geograficzny

Janus J., Bozek P. (2018), *Using ALS data to estimate afforestation and secondary forest succession on agricultural areas: An approach to improve the understanding of land abandonment causes*, "Applied Geography" No. 97, p. 128-141

Kaliszewski A. (2016), *Krajowy program zwiększania lesistości – stan i trudności realizacji z perspektywy lokalnej*, „Studia i Materiały CEPL w Rogowie" Vol. 18. No 49B/5, p. 7-19

Klepacka A.M., Florkowski W.J., Bagińska M. (2017), *Zmiany w użytkowaniu ziemi – ilustracja skutków wsparcia programów regionalnych w zwiększaniu udziału lasów na przykładzie województwa podlaskiego*, „Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu" Vol. 19. No 5, p. 106-112

Klepacka A.M, Florkowski W.J,Revoredo-Giha C. (2017), *Farmers and their groves: Will cost inefficiency lead to land use change?*, "Land Use Policy" Vol. 61, p. 329-338

Kurowska K. et al. (2014), *Spatial analysis of afforestation in Poland under rural development programme 2001-2013 Forestry and Wood processing*, "Research for rural development" Vol. 2

Kurowska K., Kryszk H. (2017), *Profitability of the farm land afforestation within the Rural Development Programme*, Sylwan Vol. CLXI (12), p. 1035-1045

Łonkiewicz B. (1994), *Przestrzenne modele kształtowania lesistości kraju*, „Człowiek i Środowisko" No. 18(1), p. 97-113

Ministerstwo Rolnictwa i Rozwoju Wsi (2017), http://www.minrol.gov.pl/Wsparcie-rolnictwa/Program-Rozwoju-Obszarow-Wiejskich-2007-2013/Dzialania-PROW-2007-2013/Os-2-Poprawa-srodowiska-naturalnego-i-obszarow-wiejskich/Zalesianie-gruntow-rolnych-oraz-zalesianie-gruntow-innych-niz-rolne [22-10-2017]

NBP (2017), http://www.nbp.pl/homen.aspx?f=/srodeken.htm [12-01-2018]

Ossowska L., Janiszewska D. (2016), *The Diversification of Forestry Function in European Union Contries*, Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie, Problemy Rolnictwa Światowego, Vol. 16 (XXXI) No. 3, p. 292-300

Polna M. (2017), *Zmiany lesistości obszarów wiejskich w latach 1995-2016*, „Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu" Vol. XIX (2), p. 197-199

Poławski Z. (2006), *Zmiany powierzchni i przestrzennego rozmieszczenia lasów w Polsce w II połowie XX wieku*, „Leśne Prace Badawcze" Vol. 3, p. 57-70

Program Operacyjny Rozwój Polski Wschodniej 2007-2013 (2012), *Narodowe Strategiczne Ramy Odniesienia 2007-2013*, dokument opracowany na podstawie Pro-

gramu Operacyjnego Rozwój Polski Wschodniej 2007-2013, zatwierdzonego wydanym w dniu 28 czerwca 2012 r. przez Komisję Europejską sprostowaniem nr C(2012)4173 do decyzji z dnia 23 grudnia 2011 r. nr K (2011) 9789 zmieniającej decyzję Komisji z dnia 1 października 2007 r. nr K (2007) 4568

Przeglądy terytorialne OECD (2008), *Polska*, Ministerstwo Rozwoju Regionalnego, opublikowane w uzgodnieniu z OECD, Paryż

Rozwój regionalny w Polsce, Raport 2009 http://mazowsze.hist.pl/42/Mazowsze_Studia_Regionalne/895/2009/34265/ [22-10-2017]

Sioma S., Szymański L. (2008), *Przestrzenno-powierzchniowy aspekt zwiększania lesistości kraju zrealizowanego w ramach planu rozwoju obszarów wiejskich w latach 2004-2006*, Zarządzanie ochroną przyrody w lasach

The World Conversation Union (2004), *Afforestation and Reforestation for Climate Change Mitigation: Potentials for Pan-European Action*, Warsaw

Urząd Statystyczny w Białymstoku (2010), *Powszechny Spis Rolny 2010. Raport z wyników województwa podlaskiego*

Urząd Statystyczny w Poznaniu (2010), *Powszechny Spis Rolny 2010, Raport wyników województwa wielkopolskiego*

Woś A. (1994), *Klimat Niziny Wielkopolskiej*, Poznań

Wskaźniki Zrównoważonego Rozwoju Polski, Katowice 2015, p. 269, https://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5501/5/2/1/wzr_2015_-_publikacja.pdf [27-11-2017]

Wysocka-Fijorek E. (2016), *The Role of Forestry in the Creation of Gross Domestic Product*, Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie Problemy Rolnictwa Światowego Vol. 16 (XXXI), No. 2, p. 363-371, Zakład Zarządzania Zasobami Leśnymi, IBL

Zamelski P. (2018), *Principles of the forest management in the context to concern for the common welfare and public health in Poland*, Sylwan Vol. CLXII (8), p. 658-663