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THE ACTIVITY OF MAŁOPOLSKA AND POGÓRZE FARMERS IN LEVERAGING FUNDS FOR IMPLEMENTING AGRICULTURAL AND ENVIRONMENTAL PROGRAMS

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Abstract. The main purpose of the research was to identify factors determining spatial diversity of the activity of farmers in the area of the implementation of agricultural and environmental programs. The research was conducted using Statistica with the application of two research tools: the analysis of Correlation and Classification and Regression Tree (CART) analysis. The number of beneficiaries of the agricultural and environmental programs per 100 area payments' beneficiaries in a given territorial unit was adopted as a dependent variable. Based on the research, it was found that features of the agrarian structure had the greatest impact on the diversity of the dependent variable within the Małopolska and Pogórze regions. In poviats, characterized by high fragmentation of farms, the farmers' agricultural and environmental activities were determined by the scale of nature protection area and unemployment rate. Moreover, agricultural and environmental programs were statistically implemented more often at locations where other forms of support were taken advantage of, e.g. support for young farmers.

Keywords: Małopolska and Pogórze region, agricultural and environmental programs, classification and regression tree (CART), model

INTRODUCTION

With the introduction of new financing options, the Poland's accession to EU structures marked a major milestone in the Polish agriculture development and modernization processes. Access to EU funds became an important part of support for agricultural holdings at the social and ownership level, organizational and technical level, and structural and production level. They were covered by a broad set of instruments of the Common Agricultural Policy (Rudnicki, 2013) placing a major focus on the multidimensional interrelation between agriculture and natural environment. Rural development programs deployed in the 2004–2006 and 2007–2013 periods placed great emphasis on implementing the sustainable development concept and on numerous aspects of rural development while providing an opportunity to stabilize the conditions for structural policies and stimulating beneficial changes to the area structure of agricultural holdings (Wigier and Chmurzyńska, 2011). Also, these programs became one of the factors affecting the agricultural trends and adjustment processes in varying economic conditions (Płonka and Musiał, 2012).

Agri-environmental programs (AEP) implemented as a part of the 2004–2006 RDP and 2007–2013 RDP played a major role for environmental protection in rural areas. They comprised voluntary and informed activities taken by farmers to promote a production system compliant with the environmental protection requirements. To encourage the farmers to take such activities, a financial support system was put in place. To ensure a transparent scope and financing of the aforesaid actions, a series of thematic packages were identified in the agri-environmental programs. However, according to the

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experience from the past years, farmers themselves and agri-environmental advisors found the implementation of agri-environmental programs to be difficult because of the requirement to produce multiple complex documents, and due to frequent, in-depth inspections. On a countrywide basis, beneficiaries of agri-environmental programs implemented from 2007 to 2013 represented a relatively small share (below 10%) of beneficiaries of the most popular form of support, i.e. area payments. However, that index varied strongly from one region to another, and therefore the identification of factors favorable to agri-environmental activities was found to be important for agri-environmental programs implemented in the future financial perspective. A question of particular interest is whether the determinants of agri-environmental activities were natural factors (which could seem obvious in light of the purposes of agri-environmental programs) or was it mostly about other aspects (such as the condition and structure or economic environment of agriculture).

PURPOSE AND METHODOLOGY OF STUDIES

The purpose of this study was to assess the activity of Małopolska and Pogórze farmers in leveraging funds for implementing agri-environmental programs, and to identify the key determinants of the spatial differentiation of that process. Based on Statistica[1] software, this study used the Pearson linear correlation analysis and the Classification and Regression Trees (C&RT), a data mining tool. The statistical significance of estimated correlation coefficients was assessed at the $p \leq 0.05$ level. In the tree model, the quality of results was checked using the v-fold cross-validation (v = 10) and the one standard deviation rule. The final tree with the theoretically optimum structure (Sroka and Dacko, 2010; Dacko and Wojewodzic, 2012) was selected based on the cross-validation cost and re-substitution cost.

The dependent variable was assumed to be the number of beneficiaries of agri-environmental programs[2] per 100 beneficiaries of area payments (SAP, single area payments) in the territorial unit concerned (Y: number

of AEP beneficiaries 07-13/100 SAP). The dependent variable had a right-skewed unimodal distribution with a skewness coefficient of S = 1.78. In the analyzed territorial units, the dependent variable for most of the objects was below the average value of 5.97 AEP beneficiaries/100 SAP beneficiaries.

Because the dependent variable was of quantitative nature and was measured on a ratio scale, it was converted into a qualitative variable measured on an ordinal scale. For that purpose, the results were divided into quartiles:

- districts with low levels of agricultural activity (Y ≤ 2.92),
- districts with moderate levels of agricultural activity (2.92 < Y ≤ 4.24),
- districts with high levels of agricultural activity (4.24 < Y ≤ 7.69),
- districts with extremely high levels of agricultural activity (Y > 7.69).

Upon completing this operation, the variable was ready for modeling based on classification trees.

The set of explanatory variables was created based on bulk statistics (Local Data Bank of the Central Statistical Office) and on resources of the Agency for Restructuring and Modernization of Agriculture (DPiS-052-19/WWZiIP-JS/14)[3]. It included indexes lending themselves to quantification in all 70 land districts of the Małopolska and Pogórze macroregion. Independent variables were used to describe the natural conditions for agricultural production, entrepreneurship and unemployment levels, farming patterns, agriculture intensity levels[4] and the interest of farmers in leveraging selected 2007–2013 RDP instruments.

The modeling was an iterative process. Based on the observed results of subsequent models, the initially large set of predictors was narrowed to keep those with a relevance rate above 30 under the C&RT algorithm. The final model uses 19 quantitative variables measured on a ratio scale (Table 1).

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[1] STATISTICA®, data analysis software system, version 12. StatSoft, Inc. 2014

[2] A series of packages comprise the agri-environmental programs, and are analyzed as a whole in this paper.

[3] As at the end of 2013.

[4] To assess the intensity, the organization intensity assessment method (Kopeć, 1978) was used which takes into account the potential intensity of specific activities.

AGRI-ENVIRONMENTAL PROGRAMS

Common Agricultural Policy (CAP) instruments implemented in Poland, including the area payments and selected RDP activities (i.e. LFA and agri-environmental payments), play an important role in shaping the area structure and improving the profitability of agricultural holdings. In addition to economic objectives, CAP instruments also pursue some environmentally-oriented goals. They were implemented in order to balance the agricultural development, preserve the natural environment in a proper condition, maintain biodiversity and shape the cultural landscape (Sroka and Wojewodzic, 2015). To that extent, a key role was assigned to agri-environmental programs deployed under the second pillar of the EU Common Agricultural Policy. So far, these programs have been implemented in Poland in two stages: as a part of 2004–2006 RDP and 2007–2013 RDP. Also, they are continued under the currently applicable 2014–2020 RDP.

From 2004 to 2006, agri-environmental programs were operated based on Activity 4 of RDP: "Support for agricultural and environmental projects and for improving animal welfare". They were composed of four subprograms: protection of biodiversity in rural areas, protection of landscape and natural environment, protection of organic farming, and protection of genetic resources in agriculture. As a part of these programs, activities included in the following packages have been implemented: sustainable agriculture (S01), organic farming (S02), maintenance of extensive meadows (P01), maintenance of extensive pastures (P02), protection of local breeds of farm animals (G01), water and soil protection (K01) and creation of buffer zones (K02). Sustainable agriculture (S01), maintenance of extensive meadows (P01) and maintenance of extensive pastures (P02) were the packages implemented solely in the so-called priority zones. The other four packages could be implemented on a countrywide basis. Also, one farm could implement up to three non-overlapping and non-exclusive packages (Kucharska, 2009; Kucharczyk and Różańska, 2012).

Under the 2007–2013 RDP, the rural development financing instruments were combined together (for reasons which include the creation of the European Agricultural Fund for Rural Development, EAFRD), and the LEADER+ initiative was also included in the scope. The agri-environmental programs operating within the 2007–2013 RDP were included in the second (environmental) axis: "Improvements for the natural environment and rural areas". Their objective was to promote a sustainable management system; restore the nature; maintain the status of valuable natural habitats used for agricultural purposes while preserving the biodiversity of rural areas; ensure the proper use of soils and water protection; and protect the genetic resources of native species of farm animals and native crop varieties. These objectives were pursued through 9 packages with 49 variants. Compared to the 2004–2006 period, the following packages remain unchanged: sustainable agriculture (1), organic farming (2), protection of local breeds of farm animals (7), water and soil protection (8) and buffer zones (9). Meanwhile, maintenance of extensive meadows (P01) and maintenance of extensive pastures (P02) were combined into one package: extensive permanent pasture (3). Also, three new packages were added: protection of endangered bird species and natural habitats outside the Natura 2000 areas (4), preservation of endangered bird species and natural habitats within the Natura 2000 areas (5) and preservation of endangered genetic resources in agriculture (6). Moreover, there are no longer any restrictions for the implementation of specific packages on a countrywide basis and for the number of packages implemented in a single farm, provided such packages are not mutually exclusive (Kucharska, 2009; Kucharczyk and Różańska, 2012).

In the 2004–2006 period, over 71,500 farmers from all over country participated in the implementation of agri-environmental programs. In the next financial perspective (2007–2013), their number increased to 131,500 with farmers from the Małopolska and Pogórze macro-region representing one fifth of all beneficiaries. In the 2004–2014 period, support granted to agricultural holdings located in that area was in excess of PLN 1 billion, with a share of 11.5% in funds used for that purpose on a countrywide basis.

As regards gaining access to funding for the implementation of environmentally-friendly practices, farmers from areas with highly fragmented agricultural land were definitely less active[5]. However, this does not provide any grounds for claiming that such practices were

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[5] As shown by other studies, beneficiaries from these areas were more active in the use of EU funds dedicated to the development of non-agricultural business activity on rural areas (Satoła, 2009). This may indicate that the famers have a slightly different scale of preference with respect to the offered set of support instruments.

less frequently implemented in these areas. Often, they were put in place without public aid which required specialized documentation to be kept. In the case of many small farms, the time and money spent to prepare such documents was beyond the potential benefits.

As regards gaining access to funding under the agri-environmental program, the farmers' activity highly varied from one region to another. On a countrywide basis, in the 2007–2013 period, such support was granted, on average, to 9.7 out of 100 beneficiaries of single area payments (SAP). Meanwhile, in south-eastern Poland, lower values were usually recorded, and only the Świętokrzyskie (9.8) voivodeship was rated above the average ranking. In other voivodeships, the number of farmers participating in the agri-environmental programs in the 2007–2013 period per 100 SAP beneficiaries was, respectively, 5.1 in the Małopolskie voivodeship, 8.3 in the Podkarpackie voivodeship, and 3.9 in the Śląskie voivodeship.

According to detailed analyses, the Pińczów district (18.3), Opatów district (19.9), Przemyśl district (20.8) and Lubaczów district (24.3) were the territorial units with the highest numbers of farmers actively seeking access to funding for the implementation of agri-environmental activities. In the Małopolskie voivodeship, outstanding results were recorded in the Dąbrowa district (9.6), Miechów district (9.4) and Gorlice district (9.3). Farmers from the Wodzisław district, Strzyżów district, Wadowice district, and Ropczyce and Sędziszów district showed very little interest in agri-environmental programs. This is where the aforesaid index dropped below 1.5 (Fig. 1). The lowest number of farmers actively seeking access to agri-environmental funding (only 0.5 beneficiary per 100 SAP beneficiaries) was recorded in the Sucha Beskidzka district.

This spatial analysis clearly confirms that higher interest in agri-environmental programs was shown by farmers from Podkarpackie and Świętokrzyskie
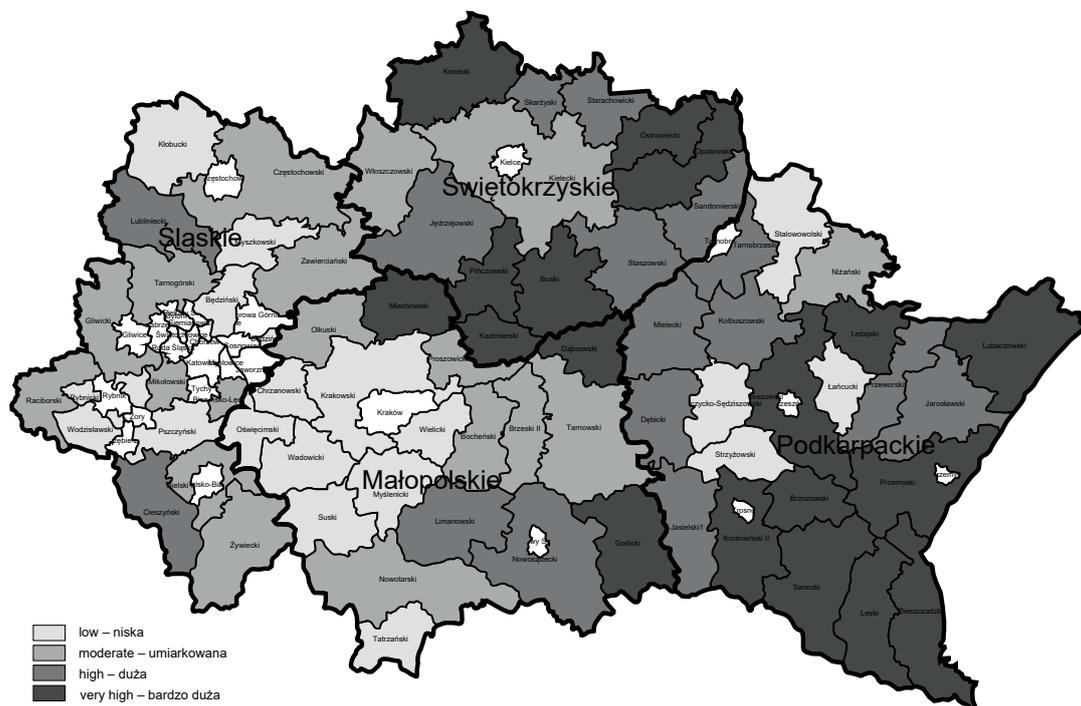

Fig 1. The number of beneficiaries of agri-environmental programs in 2007–2013 per 100 area payments' beneficiaries (SAP) (excluding townships)
Source: own calculations based on data provided by the Agency for Restructuring and Modernization of Agriculture (ARiMR) (file no.: DPiS-052-19/WWZiIP-JS/14).
Rys. 1. Liczba beneficjentów programów rolno-środowiskowych w latach 2007–2013 w przeliczeniu na 100 beneficjentów płatności obszarowych (JPO) (w analizie pominięto powiaty grodzkie)
Źródło: obliczenia własne na podstawie danych ARiMR (znak sprawy: DPiS-052-19/WWZiIP-JS/14).

voivodeships. On the other hand, less interest was demonstrated in districts located next to the Śląskie agglomeration and Krakow which are strong labour markets.

The correlation analysis (Table 1) revealed statistically significant positive relationships between the index of farmers actively seeking access to funding for the implementation of agri-environmental activities and the active involvement in other RDP activities, i.e. setting up of young farmers; early retirement; diversification towards non-agricultural activity; and modernization of agricultural holdings. This would show that the aid, with its multidimensional nature, was generally disbursed to the same group of recipients. Also, the index of interest shown by farmers in environmentally-oriented activities demonstrated a positive correlation with the share of legally protected areas, the unemployment rate in the subregion, the average size of holdings, and the number of holdings beyond 10 ha of agricultural area. On the other hand, interest shown by farmers in environmentally-oriented activities was negatively correlated to the fragmentation of the farms' area structure, the share of land in poor agricultural condition, and the level of entrepreneurship. These are the conclusions from a simple correlation analysis, as summarized in Table 1. Note however that most of the phenomena taking place in the socio-economic area are of non-linear nature. A specific event rarely results from a single reason, and multiple reasons usually demonstrate synergy. It can be assumed that the farmers' activity in seeking access to funding for the implementation of agri-environmental programs resulted from synergies between several or more concurrent factors. Therefore, the correlation analysis is considered to be only a preliminary study. A more in-depth explanation of the nature of this phenomenon was carried out with the use of a C&RT-based classification tree.

C&RT MODEL DESCRIBING THE DIVERSIFICATION OF THE FARMER'S ACTIVE INVOLVEMENT IN THE IMPLEMENTATION OF AGRI-ENVIRONMENTAL PROGRAMS

The C&RT classification tree is essentially a set of logical "if-then" splitting conditions (Breiman et al., 1984). In economic and agricultural sciences, classification and regression trees are being used on an increasingly wide basis. They were used, for instance, to study the impact of the populations' activity on the standard of living in

municipalities (Łapczyński, 2005). Also, trees proved to be successful in assessing the development factors of leading agricultural holdings (Sroka and Dacko, 2010), and in evaluating the impact of setting up Natura 2000 areas on the condition of local economy in rural areas (Dacko, 2010). This method was also used to study the impact of investments and divestments on the increase of income levels of agricultural holdings covered by the Polish FADN from 2004 to 2009 (Dacko and Wojewodzic, 2012).

Numerous recurrent splits are performed when building the classification tree. The essence is to search for a predictor and for its specific value that will enable separating dichotomous subsets of the dependent variable. To the maximum possible extent, the subsets should be internally homogenous and different from each other.

The v-fold cross-validation may be used to check if the increasing complexity of the tree entails a higher accuracy. Afterwards, a whole sequence of trees are built. The one standard deviation[6] rule is used to identify the tree which, while not being excessively complex, offers the best predictive properties. As emphasized by Dacko and Szajdecka (2015), this approach is consistent with the general rule of modeling simplicity. The one standard deviation rule confirmed the results of the preliminary analysis of cross-validation costs and re-substitution costs. Both costs should tend to decrease as the tree detail level increases. Tree No. 3 with 6 splitting nodes and 7 final nodes was selected for further analysis.

The first and the most important tree splitting criterion was the holdings' average agricultural area in specific districts. Territorial units with an average agricultural holding area above 3.5 ha in 2010 were more active in using the agri-environmental programs. However, in the vast majority of districts, the average agricultural holding area was lower. In these cases, the key differentiator was the share of small holdings with an agricultural area of up to 5 ha.

As shown by the classification tree, farmers were highly active in seeking funding for the implementation of agri-environmental programs in districts with a relatively lower share of small holdings (≤83.2%) and of land in poor agricultural condition (≤12,2%).

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[6] The optimum-sized tree is a tree with the smallest size (in the entire tree sequence) whose cross-validation (CV) costs are no greater than the smallest CV costs (in the entire tree sequence) increased with the value of one standard error for these costs.

High levels of activity in implementing agri-environmental programs were recorded in 6 out of 33 territorial units with a high share (>83.2%) of small holdings. This means land fragmentation does not always hamper the agri-environmental activities. Activity was also demonstrated in districts with a high share (>35.7%) of legally protected areas where more than 1 out of 300 SAP beneficiaries used the funding for setting up of young farmers.

As revealed by the tree diagram, situation on the non-agricultural labour market was another factor of major importance. In districts with highly fragmented agricultural land, and in those with a significant share of protected areas and a high unemployment rate, farmers were highly active in using agri-environmental programs while showing less interest in other forms of aid (in these districts, less than 1 out of 300 SAP beneficiaries used the funding for setting up of young farmers).

The group of territorial units where farmers were poorly active in using the support as a part of agri-environmental programs (final node No. 8) was separated based on a relatively low average size of agricultural holdings, a high share of small holdings, and a small share of legally protected areas.

Another advantage of using the classification tree method when analyzing the differentiators of the farmers' active participation in agri-environmental programs was the ability to assess the importance of specific predictors. The use of C&RT allowed to rank the explanatory variables by significance (Table 1). Note however that the importance of predictors does not need to strictly correspond to the model of the final classification tree. Some predictors are ranked high even though they were not used in any split of the selected tree. This is because the relevance of explanatory variables is determined in respect to the entire sequence of trees of different complexity and to all possible splitting options (Dacko and Szajdecka, 2015).

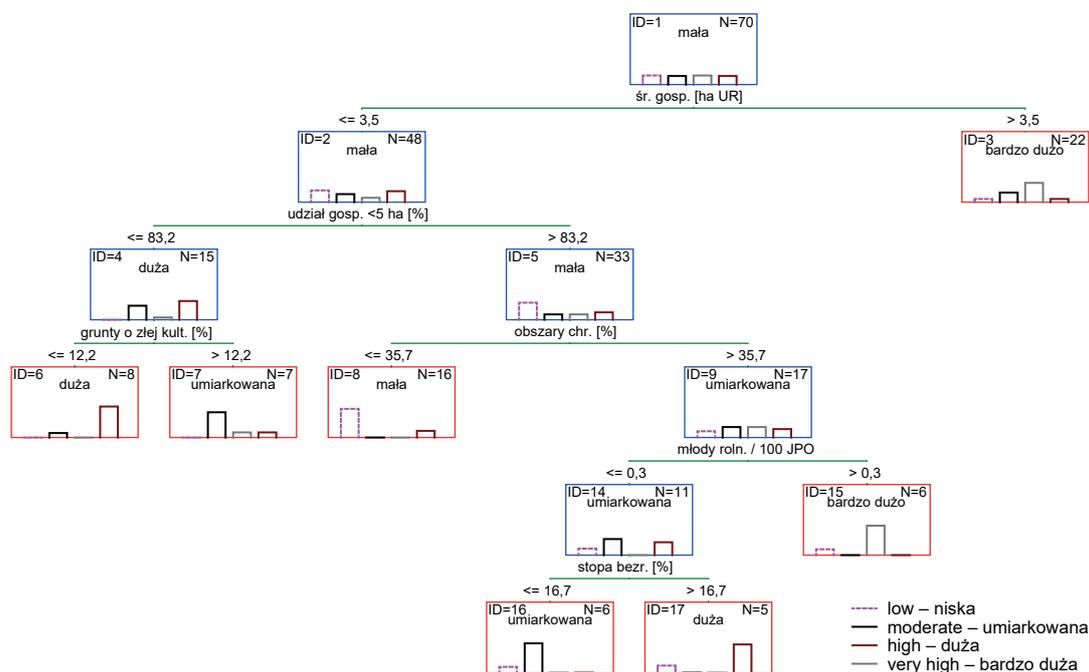Predictors with the highest impact on the farmers' activity in implementing agri-environmental programs

Fig. 2. Tree no. 3 for: the number of agricultural and environmental programs' beneficiaries 07-13/100 SAP beneficiaries. Symbols (code): see Table 1
Source: own eaboration.
Rys. 2. Drzewo nr 3 dla: liczba beneficjentów PRŚ 07-13/100 beneficjentów JPO. Oznaczenia (kody): patrz tabela 1
Źródło: opracowanie własne.

Table 1. Characteristics of predictors applied in the modelling process
Tabela 1. Charakterystyki predyktorów zastosowanych w procesie modelowania

Name Nazwa	Code Kod	Variation range Zakres zmienności	Pearson's linear correlation with dependent variable[a)] Korelacja liniowa Pearsona ze zmienną zależną[a)]	Importance from the perspective of CART results Ważność w świetle wyników metody drzew
1	2	3	4	5
Environment and natural conditions – Środowisko i warunki naturalne				
The land quality index according to IUNG point-based method Wskaźnik waloryzacji rolniczej przestrzeni produkcyjnej według punktowej metody JUNG	WRPP	34,0–100,0	0,13	52
The share of legally protected areas in the *poviat* in total* Udział obszarów prawnie chronionych w powiecie ogółem*	protected areas (%) obszary chr. (%)	0,00–99,6	0,37	84
The level of economic development of a given territorial unit* Poziom rozwoju gospodarczego danej jednostki terytorialnej*				
The number of economic entities per 1,000 people at the working age Liczba podmiotów gospodarczych na 1 tys. osób w wieku produkcyjnym	business entities on thous. people podm. gosp. na tys. os.	67,9–211,9	–0,34	57
Unemployment rate – Stopa bezrobocia	stopa bezr. (%) unemployment rate (%)	8,2–27,9	0,35	100
The level of economic development of adjacent territorial units* Poziom rozwoju gospodarczego ościennych jednostek terytorialnych*				
The number of economic entities per 1,000 persons at the working age in the adjacent poviat being the most highly entrepreneurial Liczba podmiotów gospodarczych na 1 tys. osób w wieku produkcyjnym w powiecie ościennym o najlepiej rozwiniętej przedsiębiorczości	business entities.[s)] on thous. people podm. gosp.[s)] na 1 tys. os.	78,6–211,9	–0,20	56
Unemployment rate in the adjacent poviat with the lowest unemployment rate Stopa bezrobocia w powiecie ościennym o najniższym bezrobociu	unemployment rate[s)] stopa bezr.[s)]	4,8–22,2	0,32	69
Agriculture's internal structure** – Struktura wewnętrzna rolnictwa**				
The intensity of the plant production organization in 2010 Intensywność organizacji produkcji roślinnej w 2010 roku	Ir	39,3–207,3	0,20	42
The intensity of livestock production organization in 2010 Intensywność organizacji produkcji zwierzęcej w 2010 roku	Iż	28,5–196,2	–0,14	53

Table 1 cont. – Tabela 1 cd.

1	2	3	4	5
Potential farming intensity in 2010 Potencjalna intensywność rolnictwa w 2010 roku	Io	81,2–291,6	0,02	61
Stocking density – Obsada zwierząt	SD/100 ha UAA SD/100 ha UR	13,0–105,3	–0,20	42
The share of land in a poor agricultural condition in total farming area Udział gruntów o złej kulturze rolnej w powierzchni ogółem gospodarstw rolnych	lands of bad cult. (%) grunty o złej kult. (%)	1,3–48,6	–0,24	50
Mineral fertilization in 2010 Poziom nawożenia mineralnego w 2010 roku	kg NPK/ha UAA kg NPK/ha UR	1,1–180,0	0,01	43
The share of farms ≤ 5 ha UAA Udział gospodarstw ≤ 5 ha UR	farms <5 ha gosp. <5 ha	48,2–100,0	–0,39	56
The number of farms with an area above 10 ha per 1,000 ha UAA Liczba gospodarstw o powierzchni ponad 10 ha na 1 tys. ha UR	farms >10 ha UAA gosp. >10 ha UR	0,0–24,0	0,27	39
An average area of farms' UAA in ha Średnia powierzchnia użytków rolnych gospodarstwa w ha	av. farm (ha UAA) śr. gosp. (ha UR)	1,1–8,1	0,38	55
The number of beneficiaries of selected measures of the Rural Development Programme for 2007–2013 per 100 SPA beneficiaries Liczba beneficjentów wybranych działań PROW 2007–2013 w przeliczeniu na 100 beneficjentów JPO				
Support for young farmers Ułatwianie startu młodym rolnikom	young farm./100JPO młody rol./100JPO	0,0–3,1	0,30	84
Structural pensions Renty strukturalne	pens./100JPO rent/100JPO	0,1–3,7	0,27	71
Diversification towards non-agricultural activities Różnicowanie w kierunku działalności nierolniczej	diversific./100JPO różnicow./100JPO	0,0–1,6	0,28	55
Modernization of farms Modernizacja gospodarstw rolnych	modern./100 JPO	0,1–6,8	0,32	62

* Average rate value in 2004–2009.
** 2010 data.
[a] Statistically important correlation coefficients at p ≤ 0.05 were underlined.
Source: own research.
* Średnia wartość wskaźnika dla okresu 2004–2009.
** Dane dla roku 2010.
[a] Poprzez podkreślenie wyróżniono współczynniki korelacji statystycznie istotne na poziomie p ≤ 0,05.
Źródło: badania własne.

included the unemployment rate (relevance = 100), share of protected areas (84), and characteristics of the farmers' activity in using the support instruments under 2007–2013 RDP, i.e. setting up of young farmers (84), early retirement (71), and modernization of agricultural holdings (62).

Production intensity was of no major importance because with the diversity of agri-environmental packages dedicated to farmers, all holdings (whether using extensive or intensive farming methods) could implement practices that protect the environment. As noted by Sroka and Wojewodzic (2015), farmers with high levels

of production intensity often selected packages which impose weaker restrictions on highly efficient agricultural production, i.e. package 8 (water and soil protection) and package 1 (sustainable agriculture).

SUMMARY

Both the tree diagram (Fig. 2) and the predictors ranking (Table 1) show that key determinants of the farmers' activity in seeking access to funding for agri-environmental activities were of structural (fragmentation of agricultural land) and economic (unemployment) nature. Thus, the location of territorial units on protected areas was not the most important factor. While in the relevance ranking that predictor was ranked second behind the criterion of average holding area, it was only the third narrowing split criterion behind the agricultural structure features.

As demonstrated by the studies, statistically significant relationships exist between the farmers' activity in implementing agri-environmental programs and their activity in seeking support as a part of other 2007–2013 RDP instruments. Combining different forms of support is definitely an important element of the agriculture development strategy in districts where holdings with a larger area and a larger economic potential are located. Nevertheless, the improvement of the agricultural structures is of major importance for reaching the agri-environmental goals.

REFERENCES

Breiman, L., Friedman, J., Olshen, R. A., Stone, Ch. J. (1984). Classification and Regression Trees. Monterey, CA: Wadsworth & Brooks/Cole Advanced Books & Software.

Dacko, M. (2010). Sieć Natura 2000 a stan lokalnej gospodarki obszarów wiejskich Zielonych Płuc Polski – ujęcie modelowe. Wieś Roln., 1(146), 202–217.

Dacko, M., Szajdecka, K. (2015). Multifaceted analysis of the process of price developments on the local real estate market by means of the regression trees method (CandRT). Acta Sci. Pol. Oecon., 14(2), 27–38.

Dacko, M., Wojewodzic, T. (2012). Statystyczna analiza czynników sukcesu indywidualnych gospodarstw rolnych objętych polskim FADN. Rocz. Nauk. SERiA, XIV, 8, 27–33.

Kopeć, B. (1978). Systemy gospodarcze w rolnictwie polskim. Warszawa: PWRiL.

Kucharczyk, K., Różańska, E. (2012). Programy rolnośrodowiskowe jako instrument WPR dla ochrony środowiska w UE i Polsce. Ochr. Środ. Zas. Nat., 54, 26–38.

Kucharska, A. (2009). Przewodnik po Programie Rolnośrodowiskowym. Biblioteczka Programu Rolno-Środowiskowego 2007–2013. Warszawa: Ministerstwo Rolnictwa i Rozwoju Wsi.

Łapczyński, M. (2005). Wpływ aktywności mieszkańców na poziom życia w gminach woj. małopolskiego. Retrieved from: http://media.statsoft.nazwa.pl/_old_dnn/downloads/wplyw_aktywnosci.pdf

Płonka, A., Musiał, W. (2012). Reakcje dostosowawcze gospodarstw drobnotowarowych w okresie dekoniunktury gospodarczej na przykładzie woj. małopolskiego. Rocz. Nauk. SERiA, XIV, 8, 292–296.

Rudnicki, R. (2013). Zróżnicowanie przestrzenne absorpcji funduszy Unii Europejskiej w rolnictwie polskim jako problem badawczy i aplikacyjny. Acta Univ. Lodz. Folia Geogr. Soc.-Oecon., 13, 71–92.

Satoła, Ł. (2009). Przestrzenne zróżnicowanie absorpcji funduszy strukturalnych przeznaczonych na rozwój pozarolniczej działalności na obszarach wiejskich. Zesz. Nauk. SGGW Ser. Probl. Roln. Świat., 7(XXII), 133–142.

Sroka, W., Dacko, M. (2010). Ocena czynników rozwoju przodujących gospodarstw rolniczych z wykorzystaniem metody drzew regresyjnych typu C and RT. Zagad. Ekon. Roln., 2, 100–112.

Sroka, W., Wojewodzic, T. (2015). Stan oraz perspektywy rozwoju rolnictwa w województwie małopolskim ze szczególnym uwzględnieniem wsparcia środkami Unii Europejskiej. Opracowanie eksperckie na zlecenie Małopolskiego Obserwatorium Polityki Rozwoju w Krakowie.

Wigier, M., Chmurzyńska, K. (2011). Interwencjonizm w agrobiznesie na przykładzie PRO 2007–2013 – teoria i praktyka. Zesz. Nauk. SGGW Ekon. Org. Gospod. Żywn., 90, 25–40.

AKTYWNOŚĆ ROLNIKÓW MAŁOPOLSKI I POGÓRZA W POZYSKIWANIU ŚRODKÓW NA REALIZACJĘ PROGRAMÓW ROLNO-ŚRODOWISKOWYCH

Streszczenie. Głównym celem podjętych badań była identyfikacja czynników determinujących przestrzenne zróżnicowanie aktywności rolników w zakresie wdrażania programów rolno-środowiskowych. Badania przeprowadzono w programie Statistica, wykorzystując dwa narzędzia badawcze: analizę korelacji oraz model drzew klasyfikacyjnych C&RT. Jako zmienną zależną przyjęto liczbę beneficjentów programów rolno-środowiskowych w przeliczeniu na 100 beneficjentów płatności obszarowych w danej jednostce terytorialnej. Wyniki badań wskazywały, że największy wpływ na zróżnicowanie zmiennej zależnej na obszarze Małopolski i Pogórza miały cechy opisujące strukturę agrarną. W powiatach o dużym rozdrobnieniu gospodarstw aktywność rolno-środowiskowa rolników była zdeterminowana skalą obszarowej ochrony przyrody i poziomem bezrobocia. Ponadto wdrażanie programów rolno-środowiskowych było statystycznie częstsze tam, gdzie korzystano z innych form wsparcia, tj. wsparcie dla młodych rolników.

Słowa kluczowe: Małopolska i Pogórze, programy rolno-środowiskowe, drzewo klasyfikacyjne, model