Regional Differentiation in Uptaking the CAP Funds on Agri-environmental Programmes in Poland

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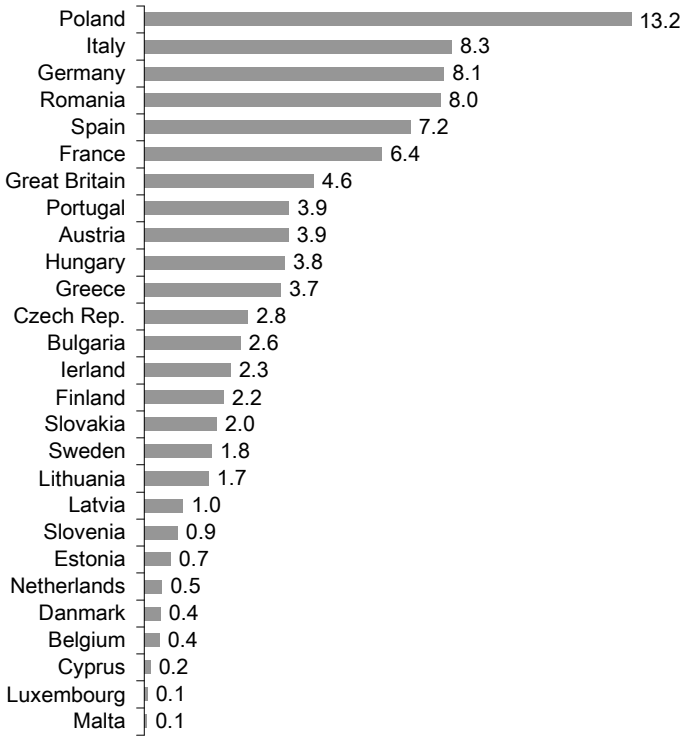
Abstract. This paper aims to present regional differences of the intensity of use of the CAP programmes dedicated to environment protection. The analysis covered the period of 2004-2009. The used data have been obtained from ARMA and CSO statistics. They are especially related to the implementation of particular programmes of Axis 2 of the Rural Development Programme (LFA, agri-environmental, afforestation). The study is based on the indicators as the number of applications per 1,000 farms, and the value of support for a one farm and per 1 ha of agricultural land. The cluster analysis method as well as Morgan spatial correlation coefficient was used for the division of provinces into groups. It was found that there were significant differences in the use of subsidies for agri-environmental programmes between the provinces in Poland. The lowest absorption of subsidies was in provinces in the South of Poland, and the highest in the provinces of Zachodniopomorskie, Pomorskie, and Lubuskie. In the latter, the number of applications per 1000 farm exceeded 800; whereas there were no more than 500 applications per 1000 farms in the group of provinces in the Southern part of Poland. The amount of subsidies granted exceeded PLN 200 per hectare in the provinces where the farmers very actively competing for the implementation of agri-environmental programmes; however, only about PLN 100 per hectare in such with low farmers activity. The main factors associated with the low use of subsidies for environment protection and conservation is the small acreage of farms and relatively high soil quality. The subsidies probably do not fully cover the costs of implementation of some of operations, especially in small farms. Only LFA subsidies have been used fully, since their uptaking does not involve any additional costs. The subsidies support environment protection mainly in the regions with larger farms.

Key words: CAP, Rural Development Programme, agri-environmental measures, spatial analysis, agriculture.

Introduction

The aims of the Common Agricultural Policy of the European Union cover many areas, including support of the environmental and landscape protection through activities at agricultural farms favouring the reduction of the negative impact of agricultural production on the environment. Within the framework of the European Agricultural Fund for Rural Development, the Rural Development Programme 2007-2013 is implemented in Poland, and the Rural Development Plan 2004-2006 was implemented in the period of 2004-2006. The total amount allocated for the implementation of RDP 2007-2013 from EAFRD funds is EUR 13.4 billion. This is the greatest amount among the funding allocated to 27 Member States (Figure 1). The large amount in comparison with, for instance, Germany or France also results from the fact that the "old" EU Member States allocate to the second pillar of the Common Agricultural Policy solely approximately 20% of total funds, while Poland allocates as much as 47% (Poczta W., 2010). The difference results from the fact that Poland still needs a long-term agriculture modernisation, which is supported by the second pillar of the CAP, while the "old" EU Member States have completed the intensive agricultural modernisation process, and now support income in the agriculture.

In Poland, the RDP 2007-2013 budget accounts for a total of more than EUR 17.4 billion, with EUR 4.0 billion from the domestic budget. As regards the division of funds into axes, the greatest amount, as much as 43%, is allocated for the agricultural modernisation,



Source: European Commission, Directorate-General for Agriculture and Rural Development, Directorate G, Horizontal aspects of rural development, AGRI/2009/412921-EN

Fig. 1. **Financial Plan of the European Agricultural Fund for Rural Development (EAFRD) for the Member States (in EUR billion)**

31% - for the improvement in the environmental quality, and 20% - for the improvement of the life quality in rural areas (Table 1).

The environmental protection is strongly supported by the CAP funds. It shows the significance assigned in Poland to the environmental protection. Rural areas occupy almost 60% of Poland's area, so agriculture shall adjust the scope of use of the environment to the limitations arising from the sustainable development paradigm. In addition, after 2013 the environmental protection is defined as one of the fundamental goals of the CAP until 2010 (European Commission, 2010).

Table 1

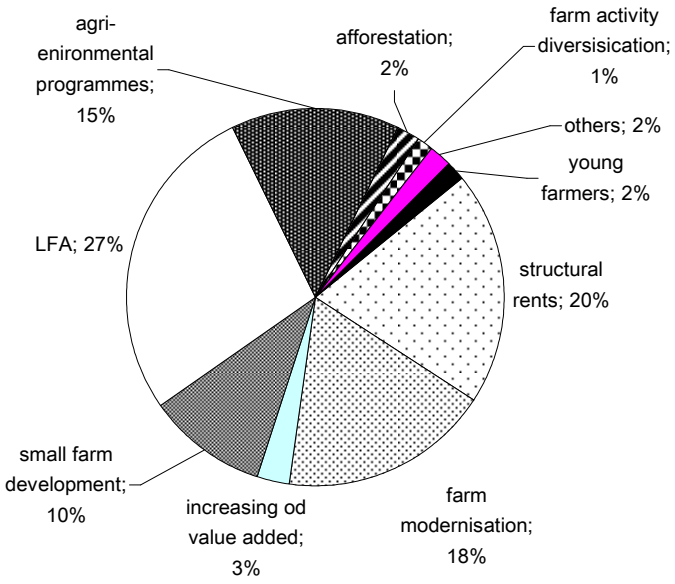
Rural Development Programme 2007-2013 in Poland and budget breakdown by priority axes (in EUR billion)

Item	**EAFRD**	**State budget**	**Total**	**%**
Axis 1: Improvement of competitiveness of agricultural and forestry sector	5.6	1.8	7.5	43.0%
Axis 2: Improving the environment and the countryside	4.3	1.1	5.4	30.9%
Axis 3: Improvement of the quality of life in rural areas and diversification of rural economy	2.6	0.9	3.5	20.1%
Axis 4. LEADER	0.6	0.2	0.8	4.5%
Technical assistance	0.2	0.1	0.3	1.5%
Total:	13.4	4.0	17.4	100.0%

Source: Commission Decision of 18 January 2010, the approval of amendments to the RDP 2007-2013 for Poland

Within the framework of RDP 2007-2013, the call for applications regarding activities of Axis 2 – environmental axis began in 2007 as regards LFA; while agri-environmental and afforestation programmes were launched in 2008. The delay resulted from the necessity to prepare new procedures for funds awarding.

Within the CAP mechanisms, also activities related to the environmental protection were performed in the period of 2004-2006. These were activities within the Rural Development Plan 2004-2006. The scope of activities involving the environmental protection significantly changed both, in the period of 2004-2006 and 2007-2013. The major directions include support of agriculture in LFA, agri-environmental, and afforestation programmes. Within the RDP 2007-2013, PLN 19 billion were spent by the end of November 2010, i.e. 27.5% of total funds under the programme. As regards programmes of Axis 2, the greatest amount of funds was spent on: LFA – 27% of total expenses under the RDP 2007-2013, agri-environmental programme – 15%, with only 2% spent on afforestation (Figure 2). In order to receive funds for activities involving the environmental protection, farmers shall be active, since they have to submit a relevant application and action plan. An exception includes support related to the location for an agricultural farm in the LFA. The recognition of areas with a higher or lower activity as regards the implementation of the agri-environmental programmes is necessary to establish the group of beneficiaries interested in a particular programme and the reasons for the interest, which will enable a more efficient implementation of the programme assumptions (Falconer, 2000).



Source: PROWieści no 12, 2010

Fig. 2. **Structure of payments disbursed under the RDP 2007-2013 up to 30 November 2010**

This article is to present the spatial differentiation of the farmers' activity in the uptaking of CAP funds on activities involving the environmental protection. Two research tasks have been carried out: one of them included the determination of the group of areas with a similar intensity of the use of funds, and the other, the determination of potential spatial relations between individual voivodships as regards the uptaking of the mentioned funds.

Data sources and research methods

The analyses use the statistical data derived from the Polish Central Statistical Office (GUS) regarding the number of farms and areas of arable land in individual voivodships. The data concerning the number of applications submitted, number of decisions issued and amounts paid are derived from the report of ARiMR (Agency for Restructuring and Modernisation of Agriculture). The analysis also includes data concerning the activities implemented under the RDP 2006-2006 and RDOP 2007-2013 until the end of 2009. Some spending from 2007 was made on the continuation of the financing of long-term activities commenced in the period of 2004-2006. The measures of intensity of the funds uptaking include: 1) the number of positively verified applications for payments under activities: agriculture support in LFA, agri-environmental programmes (sustainable agriculture, organic farming, extensive meadow and pasture farming, ground and water protection, buffer zones

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protection of local animal species), and afforestation programmes for 1000 farms, which applied for direct payments in a particular year; 2) the amount of subsidies paid per 1 farm applying for direct payments; and 3) the amount of subsidies paid per 1 ha of arable land. All the analyses were carried out in voivodships.

The following statistical methods were used in the study: cluster analysis, and Moran's spatial correlation coefficient. The cluster analysis determines the methods of a multi-dimensional statistical analysis, which are used to identify homogenous observation groups (Seber G., 2004). Clusters are created through an assessment of a similarity or distance between the objects analysed considering the analysed features. The study applies the hierarchical method of data analysis using the Minkowski metrics as follows:

$$d(i,j) = \sqrt[q]{\left|x_{i1} + x_{j1}\right|^q + \left|x_{i2} + x_{j2}\right|^q + \cdots + \left|x_{ip} + x_{jp}\right|^q}, \quad (1)$$

where:
p – number of variables;
q – number determining the metrics type;
x_{ip}, x_{pj} – determinants for the accomplishment of j-feature in i- object and p-object.

In the study, it was assumed that q = 4, and the Ward's method was used as a method of division, since the most transparent division of the objects analysed (voivodships) was achieved with such metrics value (q = 4) and applied method. The results of the classification of variables were traditionally presented on dendrograms and on a map of Poland. These variables were standardised due to the differences in their values. Three features in individual voivodships were analysed: the number of applications per 1000 farms, the amount of subsidies paid per 1 farm, and the amount of subsidies paid per 1 ha of arable land. At the same time, the divisions were made considering the afforestation rate, average LFA 2004 – 2009, and total R-S of operations 2007 – 2009 for each feature. The consolidated information for objects, with and without the LFA variable, was used to analyse spatial relations.

In order to determine spatial regimes for the features analysed, Moran's correlation coefficient was used (Upton G., Fingleton B., 1985) (global and local). Global Moran's correlation coefficient (Ig) is used to analyse the existence of a global spatial autocorrelation. The global spatial autocorrelation determines the extent of correlation of the value of a variable in a certain voivodship with the value of the same variable in a neighbouring voivodship. In consequence of the relation, similar values are subject to spatial grouping. There are two types of spatial autocorrelation: positive autocorrelation and negative autocorrelation. The positive autocorrelation involves spatial gathering of high or low values of the variables observed. Negative autocorrelation is the inverse of the positive autocorrelation. Moran's global statistics I_g are as follows:

$$I_g = \frac{N}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \cdot \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)}{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}, \quad (2)$$

and in the case of rows standardisation

$$I_g = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)}{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}, \quad (3)$$

where: w_{ij} – spatial weight for the interaction between areal item *i* and *j*;
N – all objects covered by the analysis;
x_i – value of a variable of a particular object at i –location;
x_j – value of a variable of a particular object at j –location;
$\bar{x}$ - average value of a variable for all objects.

Weight matrix **W** determines mutual relations between neighbours, their distances and interactions (Ramirez M., Loboguerrero A., 2002). In the study, the weight matrix was determined through a common border of regions and first order neighbourhood was achieved. Weight matrix is symmetric and square-shaped. Individual columns of the weight matrix

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describe the neighbourhood of a certain voivodship with the other ones, due to which they determine the mutual neighbourhood structure. The study applies the rows standardised weight matrix, i.e. all components of a particular row summed up to one. Global coefficients of Moran's correlation were calculated in accordance with Equation 3. The spatial autocorrelation was also presented on a Moran's scatterplot. The standardised value of the variable analysed was presented on the horizontal axis of the diagram and the standardised value of delay based on weight matrix **W** was presented on the vertical axis. Moran's scatterplot is divided into four parts. Points in the right-hand upper quarter and left-hand lower quarter show a positive spatial autocorrelation, and points in the left-hand upper quarter and right-hand lower quarter show a negative autocorrelation. Moran's scatterplot presents also deviating values, i.e. values that explicitly stand out in the group of voivodships analysed. The classification of individual voivodships to four quarters of Moran's scatterplot was also presented on the map of Poland.
In addition, local Moran's coefficient was used, which was calculated based on the following equation:

$$I_g = \frac{(x_i - \bar{x})\sum_{i=1}^{n} w_{ij}(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}, \quad (4)$$

where: all figures as in Equation 3.

The authors interpret local statistics similarly as global Moran's statistics, i.e. if it is negative, the i-object is surrounded by objects (neighbours) different from each other as regards the feature analysed. If it is positive, the i-object is surrounded by similar objects (neighbours). The analysis results for the local statistics were presented on spatial diagrams (map of Poland).

Results

The uptaking of funds within Axis 2 related to the RDP was different depending on the region. It resulted from the fact that individual voivodships are very different as regards arable land and the number of agricultural farms.

Table 2

Number of farms, agricultural land area and the use of the RDP Axis 2 programmes

Voivodship	Number of farms 000	Agric. land '000 ha	Number of application '000			Amount of subsidies paid [PLN million]		
			LFA (avg. annually)	agri-environmental programme	afforestation	LFA (avg. annually)	agri-environmental programme	afforestation
Dolnośląskie	57.6	951	20.4	5.8	0.5	45.9	109.4	13.0
Kujawsko-pomorskie	66.3	1087	30.3	9.0	0.7	66.9	86.2	10.9
Lubelskie	178.5	1584	64.1	21.9	1.1	84.7	145.5	14.1
Lubuskie	19.9	500	15.9	4.9	0.3	38.9	97.6	7.5
Łódzkie	126.4	1098	73.5	9.4	0.9	95.9	45.9	10.0
Małopolskie	127.4	691	54.4	7.9	0.3	50.1	40.7	2.8
Mazowieckie	209.0	2190	133.5	14.0	2.0	231.7	108.8	37.6
Opolskie	28.1	561	6.7	4.5	0.2	10.8	44.6	2.7
Podkarpackie	121.0	747	43.6	10.0	1.8	41.4	80.7	14.5
Podlaskie	81.5	1149	67.5	8.9	0.9	168.9	67.7	11.1
Pomorskie	38.3	772	22.9	9.1	0.5	61.5	116.0	15.4
Śląskie	50.0	454	18.1	2.5	0.2	19.8	25.1	4.8
Świętokrzyskie	89.4	578	37.3	12.8	1.0	34.8	51.1	8.9
Warmińsko-mazurskie	42.6	996	30.4	5.9	1.4	91.4	103.4	40.4
Wielkopolskie	121.0	1807	75.9	15.6	0.7	159.1	185.9	12.3
Zachodniopomorskie	28.0	952	18.2	8.3	0.3	55.8	234.1	10.9
Total:	1385.1	16120	712.7	150.6	12.8	1282.9	1542.7	216.9

EUR1 = approximately PLN 4
Source: authors' calculations based on ARMA and CSO of Poland data

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In Mazowieckie voivodship, there are more than 200 thousand farms, and the arable land area accounts for nearly 2.2 million ha. The second largest voivodship as regards arable land area is Wielkopolskie voivodship, with a lower number of agricultural farms being merely 121 thousand. With only 19.9 agricultural farms, Lubuskie voivodship ranks the lowest as regards the number of farms. They use only 500 thousand ha of arable land (Table 2). The great differentiation renders it difficult to compare directly the voivodships in terms of uptaking the RDP funds. In the largest voivodships, also the number of subsidy applications and the amount of subsidies paid was high. In order to compare the intensity of utilisation of the funds, the number of applications and amounts paid had to be compared with the number of agricultural farms or arable land area (Table 3).

The greatest activity as regards applications for payments within Axis 2 – environmental axis of RDP was observed among farmers from Zachodniopomorskie and Lubuskie voivodships. In Lubuskie voivodship, the number of applications was higher than the number of agricultural farms, which means that, on average, each agricultural farm implements at least one programme within Axis 2. Less than 50% of farms applied for funds related to the environmental protection in Śląskie, Podkarpackie, and Opolskie voivodships. Śląskie voivodship is highly industrialised, and the two other voivodships are characterised by relatively good soils. The foregoing does not favour the extensification of production involving the implementation of agri-environmental programmes.

Table 3

The number of contracts per 1000 of farms and amount of subsidies paid per 1 farm and per 1 ha under Axis 2 of the RDP

Voivodship	Number of contracts per 1000 of farms	Amount of subsidies paid per 1 farm in PLN	Amount of subsidies paid per 1 ha of AL, PLN
Dolnośląskie	465	2922	177
Kujawsko-pomorskie	603	2473	151
Lubelskie	488	1369	154
Lubuskie	1063	7255	288
Łódzkie	662	1200	138
Małopolskie	492	734	135
Mazowieckie	715	1809	173
Opolskie	404	2068	103
Podkarpackie	457	1129	182
Podlaskie	947	3037	216
Pomorskie	850	5030	250
Śląskie	417	992	109
Świętokrzyskie	573	1061	163
Warmińsko-mazurskie	884	5519	237
Wielkopolskie	762	2952	198
Zachodniopomorskie	958	10751	316
Poland - average	633	2197	189

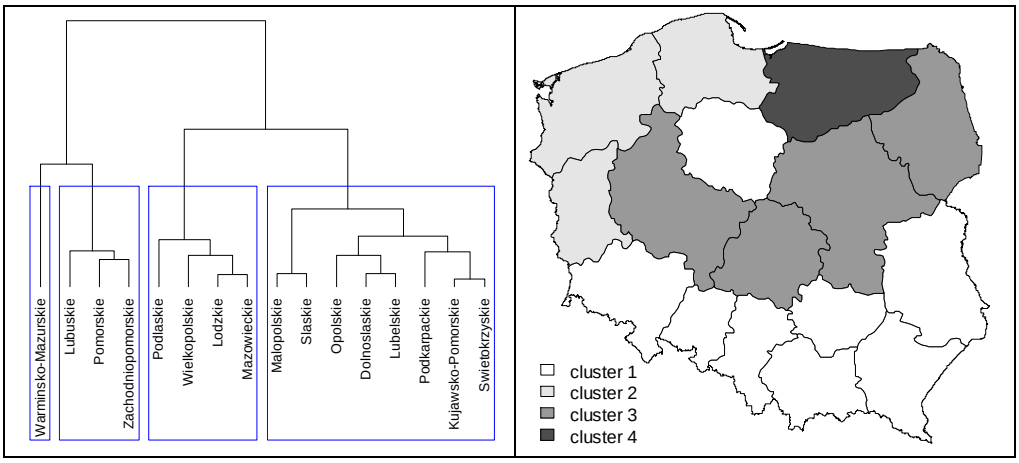
Source: authors' calculations based on data from ARMA and CSO of Poland

The value of subsidies per farm was correlated with the farm size and intensity of applying for funds. In the voivodships, where the average farm area accounts for or exceeds 20 ha, the average amount paid exceeded PLN 5 thousand per farm (Lubuskie, Pomorskie, and Zachodniopomorskie voivodships). The amount paid was only PLN 1000 per farm, where the average agricultural farm area was below 6 ha. Subsidies exceeding PLN 200/ha per 1 ha of arable land were paid in five voivodships: Zachodniopomorskie, Lubuskie, Pomorskie, Warmińsko-Mazurskie, and Podlaskie voivodships. These voivodships are characterised by large agricultural farms. The lowest amount of subsidies was used in Małopolskie, Śląskie, and Opolskie voivodships, i.e. those dominated by small farms and good soils.

The cluster analysis has been prepared in order to create uniform groups of voivodships characterised by different uptaking of funds within Axis 2 – environmental axis of the RDP. Figure 3 presents the division into three clusters and sub-groups. With such division, the following division of voivodships was created:

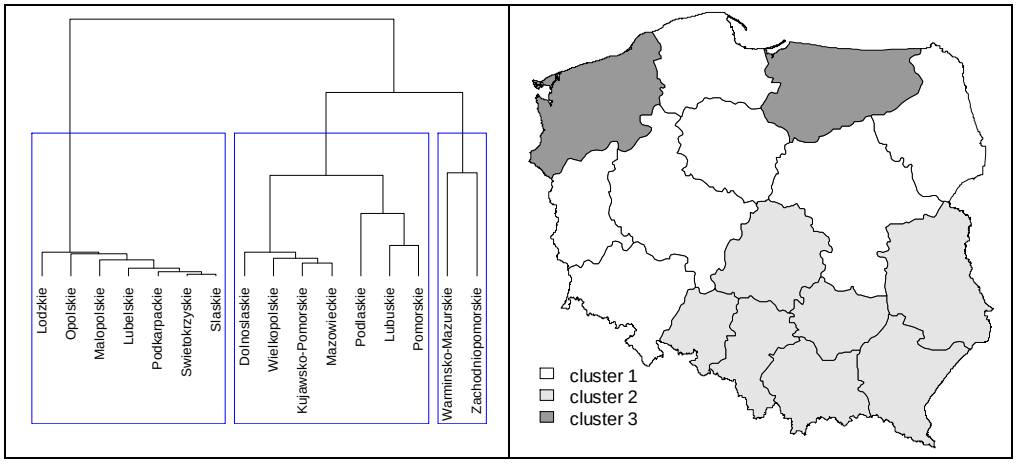
Group 1

Sub-group 1: Warmińsko-Mazurskie
Sub-group 2: Zachodniopomorskie, Lubuskie, Pomorskie
Group 2
Opolskie, Dolnośląskie, Podkarpackie, Świętokrzyskie, Śląskie, Kujawsko-Pomorskie, Lubelskie
Group 3
Sub-group 1: Wielkopolskie, Łódzkie, Małopolskie
Sub-group 2: Mazowieckie, Podlaskie



Source: authors' research

Fig. 3. **Dendrogram *(left)* for the number of application per 1000 of farms for three variables and spatial distribution of clusters *(right)***



Source: authors' research

Fig. 4. **Dendrogram *(left)* for the value of subsidy per one farm for three variables and spatial distribution of clusters *(right)***

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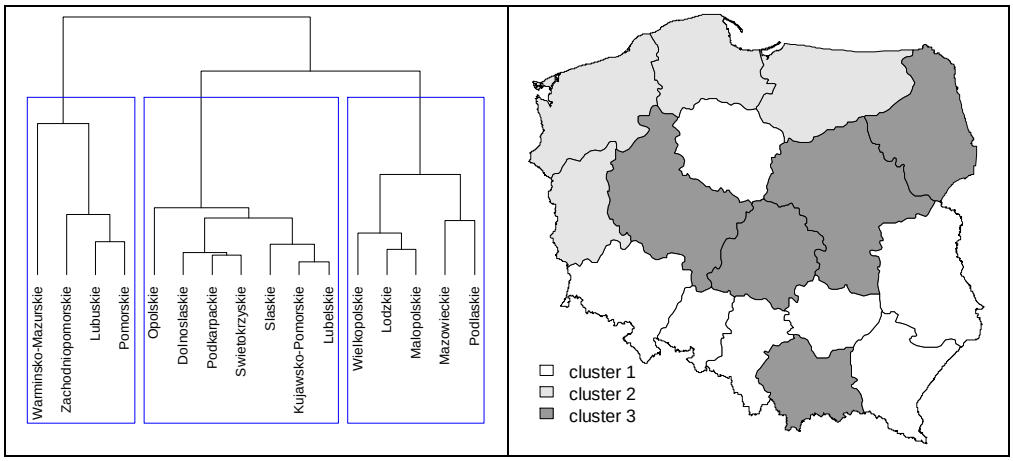


Source: authors' research

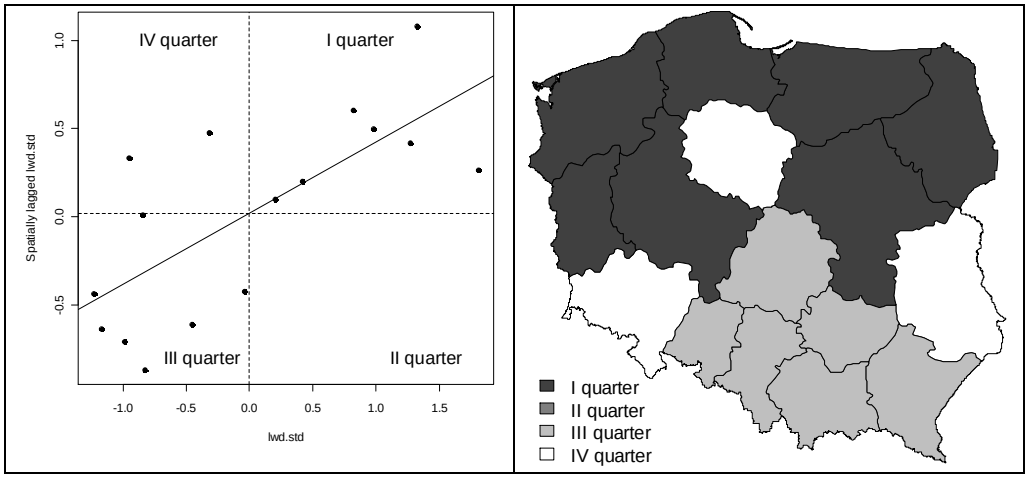
Fig. 5. **Dendrogram *(left)* for the value of subsidy per one hectare for three variables and spatial distribution of clusters *(right)***

A similar number of applications per 1000 farms was submitted in individual groups. Only Warmińsko-Mazurskie voivodship was classified to a separate cluster (sub-group of Cluster 1). It resulted from the greatest number of afforestation decisions and a high number of applications for LFA and agri-environmental programmes.

According to the cluster analysis for subsidies per farm, the figures are strongly correlated with the farm size. Voivodships with the largest average agricultural farms form a separate cluster in the Northern Poland, and 7 voivodships in the South form a separate cluster characterised by a low amount of subsidies per farm (Figure 4). Another cluster analysis using the subsidy per 1 ha of arable land as a variable confirms the results obtained in the analysis based on the number of applications per 1000 farms. Funds within Axis 2 – environmental axis of RDP were most intensively used in voivodships situated in the Northern Poland (Figure 5). It may be concluded that the intensity of utilisation of the funds allocated to the activities involving the environmental protection was higher in voivodships characterised by larger agricultural farms. In such farms, inclusion of some of the land in the agri-environmental programme enables the owners to obtain considerable refunds and achieve production advantages due to a higher quality of field for next plants.

Moran's correlation coefficients were also used when assessing the spatial differentiation. Figure 6 presents spatial regimes for the number of applications or decisions per 1000 farms in LFA. A positive autocorrelation was shown (Ig = 0.4038, p-value = 0.001801), which may be also observed on Moran's dispersion diagram (Figure 6a), where the values for individual voivodship are located in the 1st and 3rd quarters. The map of Poland (Figure 6b) transparently shows spatial regimes connected to the positive autocorrelation, i.e. grouping of voivodships with a similar level of a feature analysed. The voivodships that form a cluster with high values, i.e., where the greatest number of applications or decisions per 1000 farms in LFA was observed, are marked grey. The lowest values were observed in the voivodships marked light grey. Figure 6a shows the direction of the spatial regime from the North to the South. Dolnośląskie, Kujawsko-Pomorskie, and Lubelskie voivodships achieved the worst results.

Figure 7 presents the results of the analysis of local coefficients of Moran's spatial correlation. Two voivodships stand out: Zachodniopomorskie voivodship in the North and Opolskie voivodship in the South. They were characterised by considerably different values of the variable (number of applications per 1000 farms) in comparison with those observed in adjacent voivodships. Zachodniopomorskie voivodship observed a very high and Opolskie voivodship observed a very low intensity of submitting applications for funds within Axis 2 of the RDP. There are no outliers on the map, i.e. regions surrounded by voivodships with other values of the variable analysed. Other voivodships were characterised by insignificant values of the local Moran's correlation coefficient, i.e. they may be considered similar in terms of the feature analysed.



Source: authors' research

Fig. 6. **Number of application per 1000 of farms (incl. LFA application): *(left)* global Moran's Ig scatterplot; (*right)* spatial distribution of the provinces by Moran scatterplot quadrant**

Source: authors' research

Fig. 7. **Local Moran's I_{li} values of provinces calculated for variable: number of application per 1000 of farms (incl. LFA), Slaskie 0.7999 (p-value 0.0229), Zachodniopomorskie 1.5271 (p-value 0.0001)**

In addition, the intensity of utilisation of the funds was analysed without taking account of the support for LFA, since subsidies related to LFA require farmers to show minimum activity only and it is easy to obtain them without the necessity to perform additional activities. Figure 8 presents spatial regimes for the number of applications or decisions per 1000 farms excluding LFA. The voivodships that stand out include Zachodniopomorskie and Lubuskie voivodships, where the values of the said feature were the highest (Figure 8 *(left)* – Moran's scatterplot). The value of Moran's correlation coefficient is positive and significant (Ig = 0.2844, p-value = 0.01489). It shows a similar distribution as in the case of activities with LFA.

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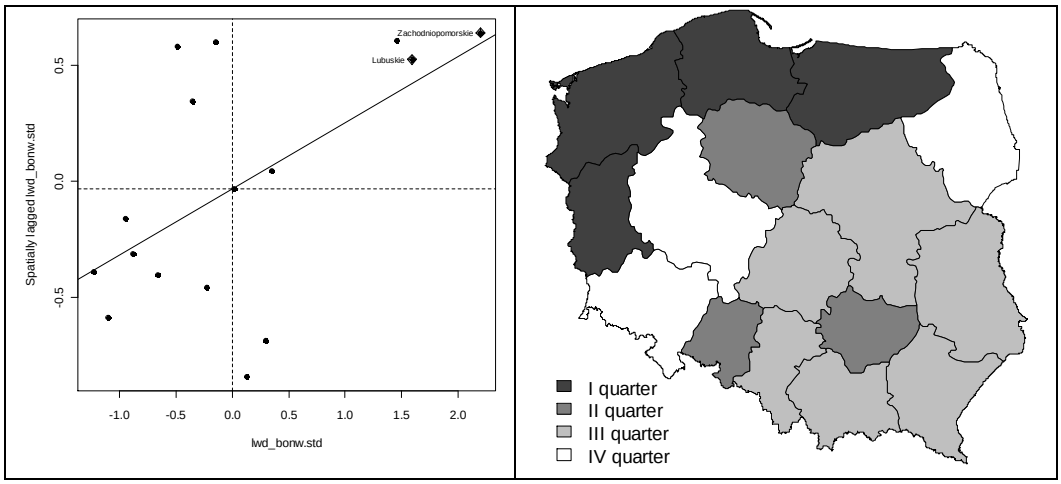
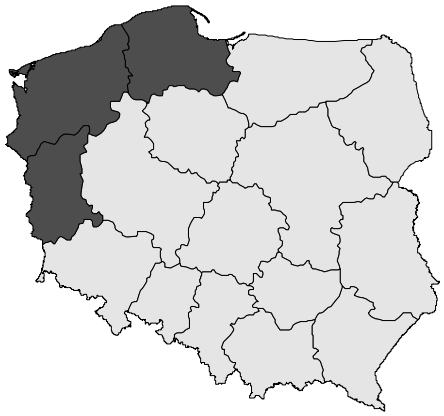


Source: authors' research

Fig. 8. **Number of application per 1000 of farms (excl. LFA application): (*left*) global Moran's Ig scatterplot, (*right*) spatial distribution of the provinces by Moran scatterplot quadrant**

When analysing local Moran's coefficients, one may observe a visible cluster in the North-Western Poland including Lubuskie, Zachodniopomorskie, and Pomorskie voivodships. The said voivodships were characterised by the greatest number of applications or decisions per 1000 farms excluding LFA, and they are surrounded by voivodships with a lower value of the feature (Figure 9). A high activity of agricultural farms as regards the acquisition of funds for activities related to the environmental protection was observed in all the aforementioned voivodships.



Source: authors' research

Fig. 9. **Local Moran's I_{li} values of provinces calculated for variable: number of application per 1000 of farms (excl. LFA), (Lubuskie 0.8885 (0.02943), Pomorskie, 0.9408 (0.0085), and Zachodniopomorskie 1.4975 (0.0001))**

Similar analyses using Moran's spatial correlation coefficient were carried out for the other two features: value of subsidies per farms and value of subsidies per 1 ha of arable land. The figures are annexed hereto. The said analysis shows that three groups of voivodships may be singled out. The first group includes voivodships in the North and North-West, which are characterised by the greatest uptaking of funds under RDP allocated to the environmental protection. The second group includes three voivodships situated in the South of Poland (Śląskie, Opolskie, and Świętokrzyskie voivodships). The said voivodships observed the lowest uptaking of funds under the programmes analysed. The third group includes all other voivodships. A similar division was created because of research concerning the technical efficiency of agriculture (Rusielik R., 2010).

The results of the analysis excluding LFA show even greater polarisation of regions as regards the intensification of utilisation of funds for the environmental protection. They were most intensively utilised in voivodships, where the largest agricultural farms are found. The foregoing means that the activities involving the environmental protection, in particular those requiring additional efforts at farms, are more efficiently performed by large agricultural farms. Small agricultural farms are not able to obtain significant benefits from the implementation of agri-environmental programmes due to their small arable land area, because they require additional outlays not covered by the subsidy. They allocate additional funds, in particular, to the consumption (Kokoszka K., 2010). The larger the agricultural farm, the easier it is to achieve economies of scale. The foregoing means that the effectiveness of the environmental protection may be greater in areas dominated by large agricultural farms, and the equalisation of the number of environmental programmes implemented would require a differentiation of amounts paid per 1 ha depending on the farm size or the area to participate in agri-environmental programmes within one farm. A more difficult access to the information at small agricultural farms may form an additional obstacle (Sadowski A., Czubak W., 2010).

Conclusions

In Poland, the uptaking of funds within Axis 2 – environmental axis of RDP is different depending on the region. The greatest uptaking of funds for pro-environmental programmes is observed in the Northern Poland. The analysis of the subsidy amount including LFA subsidies showed a smaller differentiation and less transparent voivodship clusters. A stronger differentiation is observed if only activities in which the obtaining of a subsidy must be preceded by an additional application and additional activities at a farm are taken into account. It confirms the results of other analyses showing that the environmental policy instruments, assuming that it is voluntary, shall be attractive from the economic point of view, and easy to obtain and implement for the beneficiaries (Defrancesco E., Gatto P., Runge F., Trestini S., 2008). Only in such case, the production-related goals (improvement in the soil quality) and general social goals (environmental protection) will be attained.

A higher intensity of acquisition and utilisation of funds for agri-environmental programmes was connected with a greater average farm area in a voivodship. The foregoing means that the interest in relatively expensive programmes involving a refund of costs incurred or loss of income is connected to the possibility of their full implementation with the use of the farms' resources. At small farms, which often do not have their own tractive forces, the cost of additional pro-environmental efforts may be higher than the subsidy obtained.

The results obtained show that it may be necessary to differentiate the action promoting agri-environmental activities financed by RDP depending on the region, and to analyse the costs of implementation of agri-environmental programmes by regions and farms with equal sizes.

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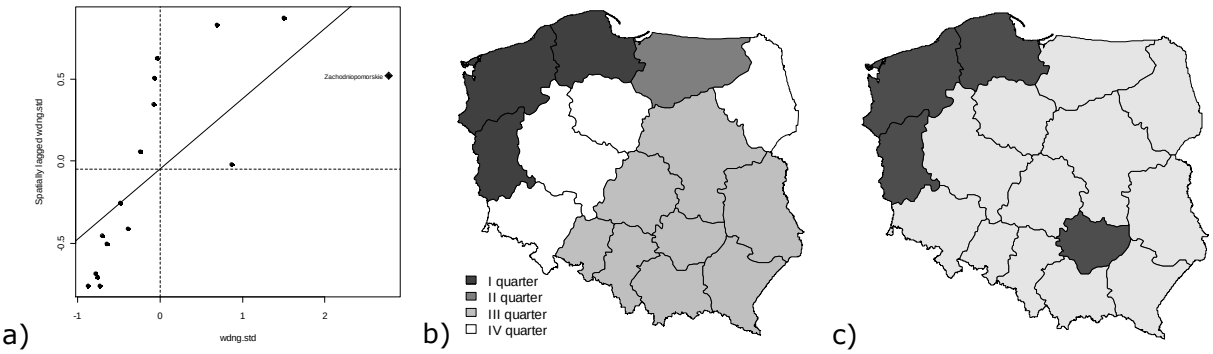
11.

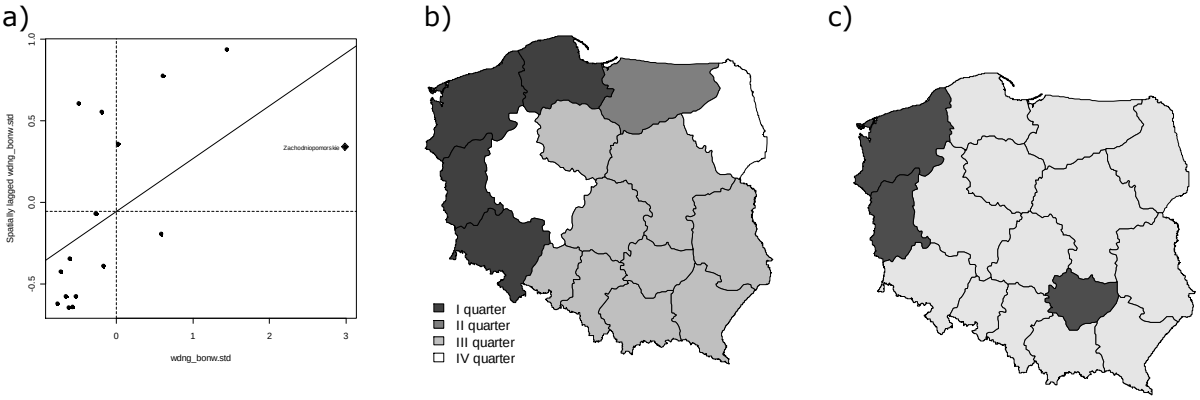
Annex



a) b) c)

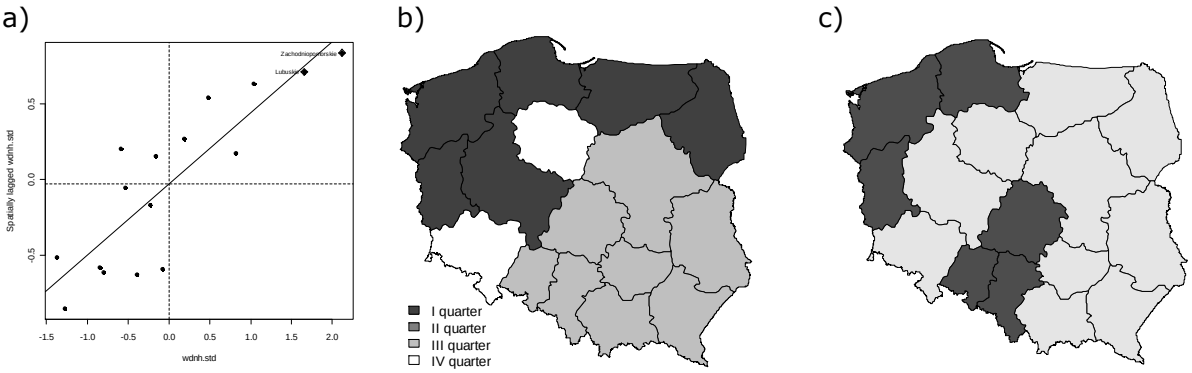
Source: authors' research

Fig. A1. Amount of subsidies per 1 farm (incl. LFA applications) a) global Moran's Ig scatterplot b) spatial distribution of the provinces by Moran scatterplot quadrant, c) local Moran's I_{li} values of provinces



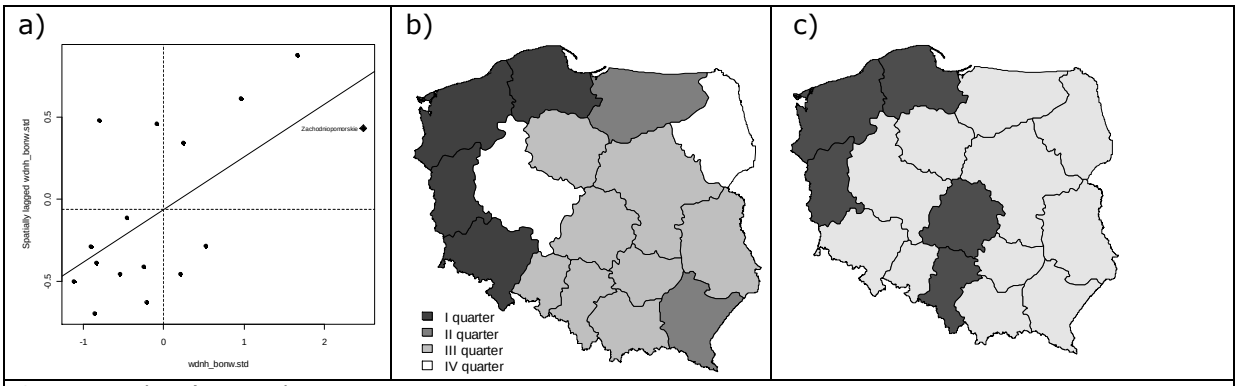
Source: authors' research

Fig. A2. Amount of subsidies per 1 farm (excl. LFA applications) a) global Moran's Ig scatterplot b) spatial distribution of the provinces by Moran scatterplot quadrant, c) local Moran's I_{li} values of provinces



Source: authors' research

Fig. A3. Amount of subsidies per 1 hectare (incl. LFA applications) a) global Moran's Ig scatterplot b) spatial distribution of the provinces by Moran scatterplot quadrant, c) local Moran's I_{li} values of provinces



Source: authors' research
Fig. A4. Amount of subsidies per 1 hectare (excl. LFA applications) a) global Moran's Ig scatterplot b) spatial distribution of the provinces by Moran scatterplot quadrant, c) local Moran's I_{li} values of provinces

Table A1

Local Moran's I_{li} statistics for provinces of Poland

Province	Local Moran's I_{li} values			
	variable: subsidies per one farm		variable: subsidies per one hectare	
	incl. LFA	excl. LFA	incl. LFA	excl. LFA
Dolnoslaskie	-0.0297	0.0089	-0.0268	0.0891
Kujawsko-Pomorskie	-0.015	0.0202	-0.1268	0.0549
Lodzkie	0.3437	0.3283	**0.5238***	**0.5965***
Lubelskie	0.3473	0.3236	0.0318	0.108
Lubuskie	**1.3931****	**1.4395****	**1.2601****	**1.556****
Malopolskie	0.7094	0.5109	0.5287	0.2783
Mazowieckie	0.1322	0.2248	0.0413	0.3457
Opolskie	0.1714	0.0722	**0.7546***	0.2639
Podkarpackie	0.5948	0.3929	0.0506	-0.1014
Podlaskie	-0.0259	-0.3197	0.2766	-0.4120
Pomorskie	**0.6077***	0.4996	**0.6991***	**0.6302***
Slaskie	0.5711	0.4042	**1.1639****	**0.6368***
Swietokrzyskie	**0.5705***	**0.4306***	0.2627	0.1412
Warminsko-Mazurskie	-0.019	-0.1199	0.1527	-0.1592
Wielkopolskie	-0.0375	-0.1146	0.0524	-0.0435
Zachodniopomorskie	**1.5316****	**1.0785****	**1.8929****	**1.1424****

* significant for 0.05. ** significant for 0.01
Source: authors' research

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