INFRASTRUKTURA I EKOLOGIA TERENÓW WIEJSKICH
INFRASTRUCTURE AND ECOLOGY OF RURAL AREAS

Nr 1/4/2012, POLSKA AKADEMIA NAUK, Oddział w Krakowie, s. 5–14
Komisja Technicznej Infrastruktury Wsi
Commission of Technical Rural Infrastructure, Polish Academy of Sciences, Cracow Branch

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IMPLEMENTATION OF THE ”SOIL AND WATER PROTECTION” AGRI-ENVIRONMENTAL PACKAGE IN POLAND

Summary

The paper presents the territorial differences in the implementation of ”soil and water protection” agri-environmental package within the scope of the Rural Development Plans, RDP 2004-2006 and RDP 2007-2013, in Poland. The research material involved data provided by the Management Information System of the Agency for Restructuring and Modernisation of Agriculture developed on 16.04.2010 by the Department of Analyses and Reporting. The main beneficiaries were farmers in the voivodships in the north-western part of the country. The most interesting variant for farmers was the ”stubble catch crop”. The greatest interest in cereals and cruciferous was noted for catch crops. Ratio of area covered by the implementation of the package in the RDP 2004-2006 to agricultural land in farms (%) was positively correlated with the average area of arable land per farm (ha), percentage share of cereals in cropping area and negatively correlated with cattle stock in head per 100 ha of AL. In RDP 2007-2013 this ratio was positively correlated with consumption of nitrogenous fertilizers per 1 ha of AL (kg), average economic size of farm (ESU) and Standard Gross Margin (SGM) of farm (PLN).

Key words: agri-environmental programmes, ”soil and water protection” package, variant, voivodship, spatial differentiation.

INTRODUCTION

Agricultural production processes have an influence on the natural environment. They can be a source of threats to the state of water, soil, air, landscape and its diversity. It is necessary to introduce actions integrating the agricultural activities with an environmental protection. To fulfill this role, agri-environmental programmes were developed as an important instrument of the European Union ecopolicy [Liro 2003].

The aims of the agri-environmental activities are: restoring the values of or conserving valuable habitats in agricultural use and conserving biodiversity in rural areas, promoting sustainable management system, appropriate use of soil and water conservation, protection of endangered local breeds of livestock and local crop varieties. The beneficiary of the programme can be anyone who is a farmer, has a farm, exercises agricultural activity on the area of at least 1 ha of agricultural land (AL) and undertakes to carry out the tasks within the specified packages and their variations over a period of 5 years. The farmer provides services for the protection of nature, maintains good environmental status and obtains financial support. The agri-environmental payment is to compensate for the lost income due to the extensive conversion of farm production methods and additional costs incurred [Kucharska 2010]. Studies in Poland [Mickiewicz et al. 2010] and in other European Union countries [Defrancesco et al. 2008] show that the main motives that lead farmers to participate in the agri-environmental programmes are financial benefit and ease of meeting the requirements.

One of the most popular among implemented packages of the agri-environmental programme is ”soil and water protection” [Bujanowicz-Haraś, Kasztelan 2009]. It aims to maintain cover crops on arable land in autumn and winter by intercrop cultivation. The package includes three variants: ”under-planted catch crop”, ”winter catch crop” and ”stubble catch crop”. According to Bieńkowski [2007], its popularity is related to the possibility of obtaining higher payments after a slight technological and organizational change. Payment rates for different variants in agri-environmental programmes, in 2004-2006 and 2007-2013 are as follows: ”underplanted catch crop” - 330 PLN/ha in both periods, ”winter catch crop” - 570 PLN/ha and 420 PLN/ha, ”stubble catch crop” - 520 PLN/ha and 400 PLN/ha. The package can be implemented throughout the country except of areas of ”nitrate vulnerable zones” covered by the activities aimed at reducing the outflow of nitrogen from agricultural sources [Duer 2009].

The aim of this study is to assess the scale and circumstances of the implementation of the “soil and water protection” package in voivodships in Poland.

MATERIALS AND METHODS

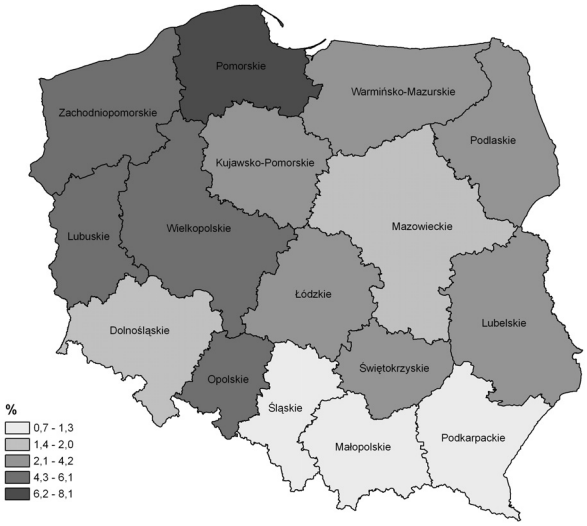
The basis for the study were the data on the ”soil and water protection” agri-environment package within the scope of the Rural Development Plan 2004-2006 (RDP 2004-2006) and the Rural Development Programme 2007-2013 (RDP 2007-2013), including the number of applications and areas covered by the package and its variants. The source of information was the Department of Analyses and Reporting Management Information System of

Agency for Restructuring and Modernisation of Agriculture (ARMA, as of 16.04.2010). On the basis of ARMA and Central Statistical Office (GUS) [2011] a package for spatial analysis in Poland between 2004-2010 was implemented. The relationship between the ratio of the area covered by the package implementation to the area of AL in farms above 1 ha of AL (%) and some indicators of agricultural production in Poland were analyzed. The dependence was studied by means of rank correlation coefficients.

RESULTS AND DISCUSSION

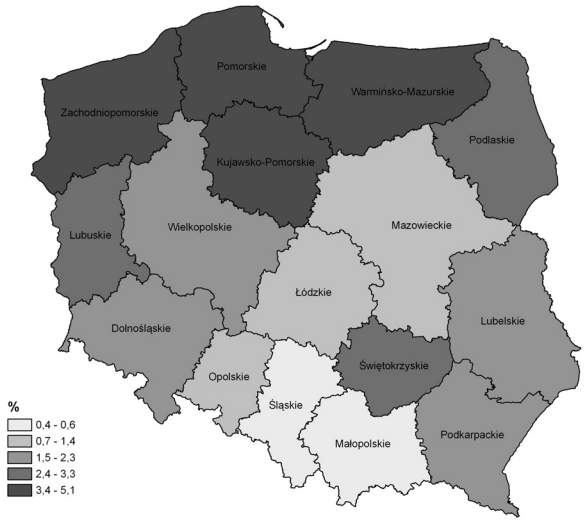
After analyzing a number of applications of the "soil and water protection" package in relation to farms number above 1 ha of AL, it can be stated that there is a strong differentiation between voivodships (Fig. 1 and 2). The greatest activity in the implementation of the package in the agri-environmental programme in RDP 2004-2006 showed the farmers from the following voivodships: Pomorskie (8.1%), Opolskie (6.1%), Zachodniopomorskie (5.9%), Wielkopolskie (5.2%) and Lubuskie (5.0%), and RDP 2007-2013: Warmińsko-Mazurskie (5.1%), Kujawsko-Pomorskie (4.7%), Zachodniopomorskie (4.4%) and Pomorskie (4.3%). The smallest interest of the package in the RDP 2004-2006 was characterized by voivodships: Małopolskie (0.7%), Podkarpackie (1.2%) and Śląskie (1.3%), in RDP 2007-2013: Małopolskie (0.4%) and Śląskie (0.6%).

The largest agricultural area covered by the package of measures in RDP 2004-2006 was in the voivodships: Wielkopolskie, Zachodniopomorskie, Lubelskie and Pomorskie , and in RDP 2007-2013: Wielkopolskie, Lubelskie, Kujawsko-Pomorskie and Warmińsko-Mazurskie. In the period 2004-2006 of the implementation of the package, the smallest area characterized by voivodships: Małopolskie and Podkarpackie, in 2007-2013: Lubuskie, Śląskie and Małopolskie (Table 1). The ratio of the total surface of the package to the area of agricultural land in the RDP 2004-2006 was greatest in the voivodships: Opolskie, Zachodniopomorskie, Pomorskie, Lubuskie, Śląskie and in RDP 2007-2013: Kujawsko-Pomorskie, Pomorskie, Zachodniopomorskie, Wielkopolskie, Warmińsko-Mazurskie, Lubelskie. In RDP 2004-2006, this ratio was the lowest in the Mazowieckie, Małopolskie, Podlaskie, Łódzkie and Podkarpackie, and in RDP 2007-2013: Mazowieckie, Łódzkie, Dolnośląskie and Małopolskie.



Source: own calculation based on ARMA data

Figure 1. Ratio of number of applications of the ”soil and water protection” package to farms number above 1 ha of AL within the scope of RDP 2004-2006 by voivodships (as of 16.04.2010)



Source: own calculation based on ARMA data

Figure 2. Ratio of number of applications of the “soil and water protection” package to farms number above 1 ha of AL within the scope of RDP 2007-2013 by voivodships (as of 16.04.2010)

Table 1. Area covered by the implementation of the "soil and water protection" package within the scope of RDP 2004-2006 and RDP 2007-2013 by voivodships

Voivodship	Area covered by the implementation of the package (ha)			Ratio of area covered by the implementation of the package to AL area in farms above 1 ha of AL (%)		
	RDP 2004-2006	RDP 2007-2013	Share of RDP 2004-2006 in RDP 2007-2013 (%)	RDP 2004-2006	RDP 2007-2013	Difference in points (%)
Dolnośląskie	82058.9	6865.5	8.4	11.0	0.9	10.1
Kujawsko-Pomorskie	58836.6	28834.0	49.0	6.4	3.0	3.4
Lubelskie	115014.0	31187.9	27.1	8.3	2.1	6.2
Lubuskie	57713.1	4324.1	7.5	15.8	1.1	14.7
Łódzkie	45793.4	8684.1	19.0	4.3	0.8	3.5
Małopolskie	19995.2	5539.4	27.7	3.2	0.9	2.3
Mazowieckie	56084.0	15186.6	27.1	2.8	0.7	2.1
Opolskie	86231.6	6742.9	7.8	23.2	1.7	21.5
Podkarpackie	30501.0	8773.3	28.8	4.6	1.3	3.3
Podlaskie	34707.1	12581.4	36.3	3.3	1.1	2.2
Pomorskie	104110.2	16630.5	16.0	16.5	2.7	13.8
Śląskie	62399.0	4940.0	7.9	15.6	1.3	14.3
Świętokrzyskie	34920.7	9546.5	27.3	6.2	1.7	4.5
Warmińsko-Mazurskie	73702.1	17823.5	24.2	9.0	2.1	6.9
Wielkopolskie	156494.2	32613.9	20.8	10.7	2.2	8.5
Zachodniopomorskie	121759.0	15333.9	12.6	18.4	2.3	16.1
Poland	1140319.8	225607.4	19.8	8.3	1.6	6.7

Source: own calculation based on ARMA data (as of 16.04.2010)

For the 2007-2013 agri-environmental programme there has been generally less interest in the package noted than for the period 2004-2006. Area covered by its activities to the greatest extent decreased in the following voivodships: Lubuskie (92.5%), Opolskie (92.2%), Śląskie (92.1%), Dolnośląskie (91.6%) and Zachodniopomorskie (87.4%). The smallest changes in the analyzed surface region characterized Kujawsko-Pomorskie (51.0%) and Podlaskie (63.7%). It should be emphasized that despite this decrease in the period 2007-2008 when 5-year commitments from RDP 2004-2006 and starting obligations with RDP 2007-2013 overlapped, the increase in intercrops sown area might have occurred. Taking into account the difference in the area covered by the package implementation to the area of AL on farms in RDP 2004-2006 and RDP 2007-2013, the largest decline occurred in the voivodships: Opolskie (21.5 %), Zachodniopomorskie (16.1 %), Lubuskie (14.7 %), Śląskie (14.3 %) and Dolnośląskie (10.1 %). While the smallest changes were noted in the Mazowieckie

(2.1 %), Podlaskie (2.2 %), Małopolskie (2.3 %), Podkarpackie (3.4 %) and Kujawsko-Pomorskie (3.3 %).

Table 2. Area covered by the implementation of the "soil and water protection" package within the scope of RDP 2004-2006 and RDP 2007-2013 by voivodships (ha)

Voivodship	RDP 2004-2006			RDP 2007-2013		
	Undersown catch crop	Winter catch crop	Stubble catch crop	Under-sown catch crop	Winter catch crop	Stubble catch crop
Dolnośląskie	9.8	26462.2	55586.9	0.0	2445.6	4419.9
Kujawsko-Pomorskie	10.5	10468.1	48358.0	4.6	4536.6	24292.8
Lubelskie	4.9	37681.2	77327.9	12.1	9832.0	21343.8
Lubuskie	0.0	17823.1	39890.0	0.0	1481.9	2842.2
Łódzkie	21.7	20487.5	25284.2	7.9	4386.3	4289.9
Małopolskie	15.5	10364.1	9615.6	4.3	1374.6	4160.5
Mazowieckie	36.4	20281.6	35766.0	6.3	5135.6	10044.7
Opolskie	0.0	12562.9	73668.7	0.0	964.7	5778.2
Podkarpackie	30.0	13017.9	17453.1	0.2	2169.5	6603.6
Podlaskie	23.5	16467.3	18216.3	2.0	5402.8	7176.6
Pomorskie	168.1	62666.8	41275.2	18.8	9261.1	7350.5
Śląskie	1.0	29744.1	32654.0	3.2	2774.8	2162.0
Świętokrzyskie	1.9	6692.7	28226.0	0.5	1544.1	8001.9
Warmińsko-Mazurskie	26.3	25956.3	47719.5	13.6	8952.0	8857.9
Wielkopolskie	12.3	41963.9	114518.0	5.5	7351.0	25257.4
Zachodniopomorskie	0.0	42487.2	79271.8	0.5	7129.1	8204.3
Poland	361.9	395126.9	744831.0	79.5	74741.6	150786.3

Source: own calculation based on the ARMA data (as of 16.04.2010)

High intensity of production limits the implementation of certain agri-environmental activities, as it brings greater economic benefits than environmental payments [Staniak, Feledyn-Szewczyk, 2006]. However, as it was indicated by Sadowski and Czubak [2010], the "soil and water protection" package is characterized by versatility of applications, regardless of size, economic strength and direction of farm production. The authors display great interest in the package in the regions characterized by strong agriculture, predominantly commercial farms. In our own study, the area covered by the implementation of RDP 2004-2006 in relation to the area of AL on farms (%) was positively correlated with the average area of arable land per farm (ha), percentage share of

cereals in cropping area, and negatively correlated with cattle stock in head per 100 ha of AL (Table 3). In RDP 2007-2013, this ratio was positively correlated with consumption of nitrogenous fertilizers per 1 ha of AL (kg), average economic size of farm (ESU) and Standard Gross Margin (SGM) of farm (PLN).

Table 3. Correlation coefficients between share of area covered by the implementation of the "soil and water protection" package in relation to the AL area in farms above 1 ha (%) and some agricultural production indices in Poland

Indices	RDP 2004-2006	RDP 2007-2013
Average area of arable land per farm (ha)	r = 0.63*	r = 0.47
Valorization index of agricultural area (points)	r = 0.41	r = 0.29
Percentage share of cereals in cropping area	r = 0.61*	r = 0.25
Cattle stock in head per 100 ha of AL	r = -0.64*	r = -0.05
Consumption of nitrogenous fertilizers per 1 ha of AL (kg)	r = 0.43	r = 0.50*
Intensity of organisation of agriculture production (points)	r = -0.49	r = 0.16
Average economic size of farm (ESU)	r = 0.38	r = 0.69*
Standard Gross Margin (SGM) per 1 ha of AL (PLN)	r = -0.17	r = 0.34
Standard Gross Margin (SGM) of farm (PLN)	r = 0.38	r = 0.69*
Market agricultural output per 1 ha of AL (PLN)	r = -0.29	r = 0.04
Market agricultural output in voivodships (PLN)	r = -0.40	r = 0.02

* - significant coefficient value at the $\alpha = 0.05$ level

Obtaining the expected outcomes from the cultivation of intercrops requires selection of suitable plant species. The deadline set of cropping, soil and water requirements and the duration of the growing season of the plant secondary crops, as well as equipment and the cost of the cultivated seeds should be taken into account. The purchase of the seed makes up about 69-76% of the expenditure incurred on implementation of the package. Choosing more expensive seeds, plant species such as yellow lupine, results in an increase in expenditure (up to 100%) and less "premium" for the farmer for services to the environment [Bereżnicka 2007]. The analyzed data show that during the implementation of the package, most often cruciferous and cereals were sown as intercrops (Table 4). On the other hand, the share of small-seed legumes was small.

Table 4. Percentage share of crop plant group in the implementation of the ”soil and water protection” package within the scope of RDP 2004-2006 and RDP 2007-2013 by voivodships

Voivodship	Legumes		Small-seed legumes		Cruciferous		Cereals		Others	
	RDP 2004-2006	RDP 2007-2013	RDP 2004-2006	RDP 2007-2013	RDP 2004-2006	RDP 2007-2013	RDP 2004-2006	RDP 2007-2013	RDP 2004-2006	RDP 2007-2013
Dolnośląskie	2.1	0.7	0.0	0.0	37.5	80.2	39.9	15.0	20.5	4.0
Kujawsko-Pomorskie	4.1	1.3	0.4	0.2	10.6	81.3	70.5	13.4	14.4	3.8
Lubelskie	11.8	6.0	0.7	0.2	38.4	69.8	40.4	21.1	8.7	2.9
Lubuskie	11.4	2.2	0.0	0.0	35.8	71.1	47.6	23.0	5.3	3.7
Łódzkie	5.0	2.1	0.5	0.4	28.9	60.0	56.7	29.2	8.9	8.3
Małopolskie	4.8	6.1	0.0	0.1	45.7	80.7	46.2	11.2	3.3	1.9
Mazowieckie	9.7	4.1	0.9	1.2	25.4	62.8	58.3	28.8	5.8	3.2
Opolskie	10.0	0.5	0.0	0.1	11.7	73.9	40.8	12.2	37.5	13.4
Podkarpackie	3.3	4.3	0.5	0.2	53.3	80.0	38.2	13.3	4.8	2.2
Podlaskie	6.6	3.6	0.3	0.2	16.7	53.6	74.5	41.4	1.9	1.2
Pomorskie	2.1	3.6	0.0	0.1	44.4	67.2	46.5	27.4	7.0	1.7
Śląskie	23.6	5.5	0.2	0.6	28.2	54.7	45.7	38.6	2.3	0.6
Świętokrzyskie	10.0	3.0	2.1	0.7	10.2	79.7	65.9	14.2	11.8	2.4
Warmińsko-Mazurskie	6.0	3.1	1.5	0.3	47.4	67.1	38.3	22.0	6.7	7.5
Wielkopolskie	6.5	5.9	0.5	0.4	23.0	72.8	63.1	17.4	6.9	3.5
Zachodniopomorskie	3.7	2.3	0.0	0.0	26.4	54.7	60.0	39.5	9.8	3.5
Poland	7.5	3.7	0.4	0.3	32.0	69.7	50.7	22.5	9.3	3.8

Source: own calculation based on the ARMA data.

CONCLUSIONS

1. Implementation of the "soil and water protection" package in RDP 2004-2006 and RDP 2007-2013, in terms of both the ratio of number of applications to the number of farms and the area covered by the activities in relation to total agricultural area, was highly variable between voivodships. The greatest activity in the implementation of the package showed farmers located in the north-western part of the country.

2. The use of analyzed agri-environmental package in the second stage of implementation (RDP 2007-2013) in relation to the first period (RDP 2004-2006) significantly decreased (on average in Poland - 80.2% of occupied area).

3. In the test package, the greatest interest concerned the"stubble catch crop" variant due to its ease of implementation.

4. Plants of the cruciferous and cereals group were usually sown within the package. This is related to nature and organizational factors that influence the selection of intercrop plant species.

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