
Current State and Circumstances of Agri-Environmental Policies and Eco-Services Development in Poland

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Waldemar Bojar¹, Wojciech Żarski²

Abstract:

Purpose: The aim of this paper is to analyze and evaluate the efficiency of realized Agri-Climate-Environmental policies in view of ecosystem services development, and to point out the circumstances determining the effects of such policies.

Design/Methodology/Approach: Considering the case of Poland, using implementation data from the period of validity of the Rural Development Program for 2014-2020, in terms of the Agri-Environmental-Climate Measure and selected indicators from created datasets allows the evaluation of the effectiveness of actions taken in the case of ecosystem service development.

Findings: As part of the Agri-Environmental-Climate [Action]Measure, beneficiaries fulfill obligations consisting of the implementation of detailed requirements, favoring various elements of the natural environment in rural areas. The results of the analysis concerning the implementation of the measure show a significant regional variation both in terms of the number of applications and the value of the amounts paid out. The assessment of the development of ecosystem services requires the definition of specific indicators.

Practical Implications: The results of the analysis may indicate improvement directions for methods and tools used for evaluating the effectiveness of Agri-Climate-Environmental policies and their programming in the case of ecosystem service development.

Originality/Value: Quantitative reports presented indicators useful for the evaluation of ex-ante policy results, and expectations of policy changes in the future.

Keywords: Rural Development Policy, Ecosystem Services Management, Agri-Environmental-Climate Action.

JEL codes: Q14, Q15, Q18, Q54, Q57.

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¹UTP University of Science and Technology in Bydgoszcz, Faculty of Management.

E-mail: waldemar.bojar@utp.edu.pl

²Corresponding author, University of Science and Technology in Bydgoszcz, Poland, Faculty of Management. E-mail: wojciech.zarski@utp.edu.pl

1. Introduction

Increasing degradation of the natural environment is pressing policy makers into using appropriate instruments to stop this harmful process. Among several different EU programs and projects, one is Agri-Climate-Environmental-Action (RDP, inter alia M10 action) directed at farmers to motivate them to undertake such activities that can reach assumed objectives and integrated economic and climate-environmental goals simultaneously. Different RDP actions are to update the state of environment and climate conditions guaranteeing farmers a competitive advantage for their enterprises. Such actions are connected to widely understood eco-services that quantify, measure, and achieve many environmentally friendly goals.

The aim of this paper is to analyse and evaluate the efficiency of realized Agri-Climate-Environmental policies in view of ecoservices development, and to point out the circumstances determining the effects of such policies. The main objectives of RDP 2014-2020 are to improve the competitiveness of agriculture, sustainable management of natural resources, climate action, and balanced territorial development of rural areas.

The program implements six priorities set for the EU rural development policy for 2014-2020 and Technical Assistance, i.e., facilitating knowledge transfer and innovation in agriculture, forestry and rural areas, improving the competitiveness of all types of farming and increasing the profitability of farms, improving the organization of the food chain and promoting risk management in agriculture, restoring, protecting, and enhancing ecosystems dependent on agriculture and forestry, supporting resource efficiency and the transition to a low-carbon and climate-resilient economy in the agriculture, food, and forestry sectors and increasing social inclusion, reducing poverty and promoting economic development in rural areas. Obviously, such ambitious goals are difficult to put into practice because, sometimes, some of them may be contradictory, such as the economic and environmental goals of the farm.

Among many RDP actions, it is of great importance to underline that the M10 action budget allocated for the implementation of RDP 2014-2020, Agri-Environmental-Climate-Action obtained the 4th largest amount of funds assigned in the overall RDP budget with a quota of 1366,7 million EUR among 17 different actions.

M10 action has crucial meanings for Polish stakeholders especially because of such a high share of agriculture in domestic GDP and due to the large potential of natural resources in Poland (i.e., wide areas of forestry) as well as big parts of rural areas being located in areas of NATURE 2000. This is important not only for this country but also for Europe as a whole and the planet to sustain the natural environment for future generations.

2. Analysis and Assessment of M10 Action Within Agri-Environmental-Climate Actions: Introduction Effects in Poland

The need to respect development standards in agriculture is particularly important since intensive agriculture uses natural resources as well as ecological systems. Sustainable agriculture is not only the issue of agriculture as an application with food production but also concerns the entirety of socio-economic relations, both in agriculture itself and outside it. Due to its social nature, it also belongs to the space of Life for the social economy (Niewęłowska, 2010). The implementation of the idea of the development of research and rural areas is associated with some barriers like optimization of investment, social (rural income), and ethical and environmental activities (ecological awareness). The opposition to its implementation in practical terms often results from the fact that it is an idea that tries to achieve common goals, especially within a shorter time span. In response to this, the focus was primarily based on environmental conditions and, to a large extent, it developed in parallel with the developing ecological policy of the European Union, and especially from one of its principles; integration of this policy with sectoral policies (Kociszewski, 2011).

Application of the indication of the principle related, *inter alia*, to the conditional policy of respecting environmental obligations by producers in the EU and the transfer of economic resources under CAP. In Poland, the action of transcription of the Environmental aspect into agriculture was teaching farmers in the Agri-Environmental [-Climate] Measure (RDP 2007-2013). The continuation of the above program in the perspective of RDP 2014-2020 remains an agri-environmental and climate measure. Agricultural activities, except for the environmental impact, can also have a strong influence on the climate due to GHG gases emitted both by crops and animals. This can have positive or negative effects depending on CO₂ growth or its decline in the atmosphere. A number of research projects have been undertaken to analyse the impact of farming on climate; however, some of them have served to convince researchers that there is now a necessity to pursue transregional sustainable development policies, resulting in a huge space for phenomena and processes occurring on a continental and even global scale, like climate change. On the other hand, partial research results, both in the methodological and more substantive sense, at a regional and local level, are necessary. Many authors think there is need for elaborating micro-regional climate change scenarios due to the specificity of local natural, economic, and social conditions (Bojar, 2018; Ghisellini *et al.*, 2017; Murray, Skene, and Haynes, 2017).

M10 action in the frame of Agri-Climate-Environmental-Action faces such challenges. The essence of M10 action is to promote practices contributing to sustainable land management (to protect soil, water, the climate), and to protect valuable natural habitats and endangered species of birds, landscape diversity, and to protect endangered genetic resources of crops and farm animals as well as protect landscape diversity.

The action was planned as one of the components implementing strategic EU and national environmental goals, considering the economic and social importance of agriculture in the context of the growing demand for agricultural raw materials and the still high importance of agricultural activity for employment and territorial development in Poland. This action is part of the EU and national strategic legal framework. The measure considers the diversity of Polish agriculture, which is characterized by two tracks, being traditional, extensive farming, which is particularly important for the preservation of naturally valuable areas, and then this is accompanied by a tendency to intensify production, especially in areas with a favourable agricultural structure.

It was affected by distinguishing nature packages targeted at Natura 2000 areas and beyond (Packages 4 and 5), and packages addressed mainly at intensive production farms (Packages 1 and 2). Three separate Packages (3, 6, and 7) serve to maintain traditional orchards, varieties of fruit trees, and genetic resources of plants and animals.

Under sub-measure (10.1), payments under Agri-Environmental-Climate commitments, aid will be granted for the following types of operations (packages): 1. Sustainable agriculture; 2. Soil and water protection; 3. Preservation of orchards with traditional varieties of fruit trees; 4. Valuable habitats and endangered species of birds in Natura 2000 areas; 5. Valuable habitats outside Natura 2000 areas. Under sub-measure (10.2), support for the conservation and sustainable use and development of genetic resources in agriculture, aid will be granted for the following types of operations (packages): 6. Preservation of endangered genetic plant resources in agriculture; 7. Preservation of endangered genetic resources of animals in agriculture.

The commitment under the measure is made for a period of 5 years. The support under the measure may be used (Agri-Environmental Action Guide 2016), according to Polish law, by a farmer, which means a natural or legal person, or a group of natural or legal persons, irrespective of the legal status of such group and its members, land manager - entity (natural person, legal person, group of natural or legal persons) farming in natural areas, i.e. non-agricultural land, on which there are certain types of natural habitats or bird nesting habitats or group of farmers or group of farmers and land managers. Packages under the Agri-Environmental-Climate measure are mostly a continuation of the packages implemented under the agri-environmental program RDP 2007-2013.

However, with the experience of implementing the agri-environmental program, they have undergone some modifications. Organic farming, from the financial perspective 2014-2020, is functioning in Poland as two independent actions (M11), which are different from the previous one within RDP 2007-2013, where organic farming was one of the packages of the agri-environmental program.

So far, six application campaigns have been carried out by the end of 2019 (RDP PL 2014-2020): from March 15 to July 10, 2015 - (Campaign 2015), from March 15 to July 11, 2016 - (Campaign 2016), from March 15 to June 26, 2017 - (Campaign 2017), from March 15 to July 10, 2018 - (Campaign 2018), from March 15 to June 25, 2019 - (Campaign 2019), and in 2020.

The number of farms being beneficiaries of the M10 action compared to the entire population of farms in Poland, on average (according ARMA and FADN), is 99,891, which is 14,00% compared to the total number of market farms (746,000), and 7,01 % compared to all farms in Poland (1,400,000).

Based on the issued decisions granting the payment, support covered over 1.5 million ha of physical agricultural land. The average number of animals on farms was nearly 97.7 thousand. Of the supported areas under the measure, 27.0% is the area of agricultural land located in Natura 2000 areas, and 13.5% is the area of arable land on organic farms. The largest amounts were paid out in the following voivodeships: Lubelskie (PLN 354.5 million), Zachodniopomorskie (PLN 354.3 million), Warmińsko-Mazurskie (PLN 339.4 million), Wielkopolskie (PLN 333.9 million), and Pomerania (PLN 322.2 million), and the lowest in Śląskie (PLN 45.5 million), Opolskie (PLN 61.7 million), Łódzkie (PLN 72.9 million), and Świętokrzyskie (PLN 83.0 million) (Figure 1).

The largest payments made concerned Package 4. Protection of endangered species of birds and natural habitats for the commissioning of Natura 2000 RDP 2007–2013 - PLN 1,016.9 million (31.8% of all final payments); Package 5. Valuable habitats outside Natura 2000 areas of RDP 2014-2020 and Package 4. Protection of endangered birds and natural habitats with Natura 2000 areas (RDP 2007–2013) - PLN 795.9 million (24.9%); Package 1. Sustainable agriculture RDP 2014–2020 and RDP 2007-2013 - PLN 759.4 million (23.8%) 22,472 producers, who had not previously applied for support under the RDP 2007-2013 agri-environmental program, participated in the Agri-Environmental-Climate measures implemented under RDP 2014–2020.

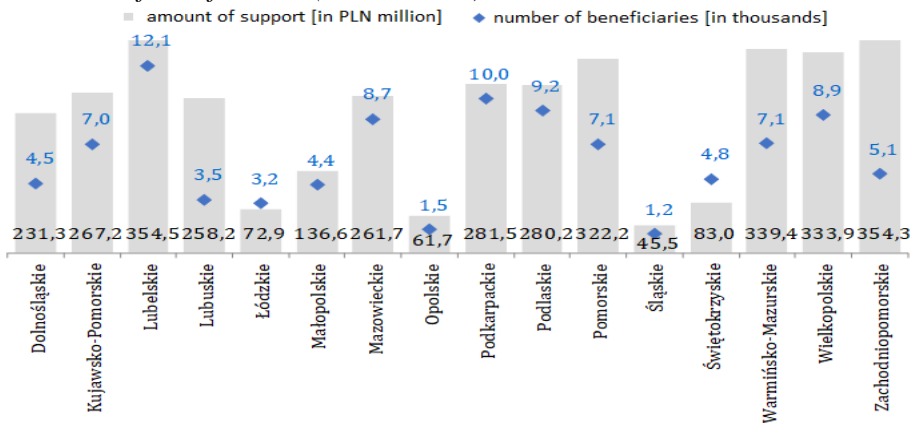
The above-presented facts highlight that priorities for farmers and farm characteristics determined the kind of applications submitted for Agri-Environmental-Climate-Actions subsidies. Differentiated natural, economic, and social conditions of the huge population of farms in Poland are the reason for such essential differences in the number and value of absorbed funds across the country, depending on location, size, type, etc.

Because the M10 action is part of the RDP initiative, it is interesting to analyse the effects of its introduction in a view of the realisation of RDP goals. According to the ARMA report on Poland, the net contribution of the RDP to the CAP objective of ensuring sustainable management of natural and active resources in the context of impact of agriculture is both indirect and moderate. The impact of the RDP on the

improvement of the state of the environment in this context can be described as small (insignificant). In the context of water quality - pollution of groundwater and surface waters with nitrates - it is not possible to assess the impact of RDP measures in 2014-2018 on the quality of groundwater and surface water due to a significant delay in the reaction of the water-soil environment. RDP measures have a direct and indirect impact on water quality, potentially large (significant), but possible to assess in the future.

On the other hand, the impact of the RDP on the state of the environment in terms of gross nitrogen and phosphorus balance can be described as high (significant), and the type of impact as both direct and indirect. RDP measures contributed to the CAP objective of sustainable management of natural resources and climate action through measures to improve soil management and prevent soil erosion. The criteria to be assessed are an increase in the content of organic matter in the soil, a reduction in the share of agricultural soils exposed to water erosion, and a reduction in soil losses exposed to erosion.

Figure 1. The amount of support, including advance payments (in PLN million) and the number of beneficiaries (in thousands)



Source: Own study.

The reduction of greenhouse gas emissions from agriculture was also achieved through the implementation of operations under the DRCW (Package 1. Sustainable agriculture and Package 2. Protection of soil and water) and organic farming. Extensive soil cultivation by limiting or not ploughing prevents the increase in the amount of oxygen reaching the deeper layers of the soil, which intensifies the process of decomposition of organic matter, thus increasing the amount of CO₂ released. Reducing the consumption of nitrogen fertilizers reduces the formation of another greenhouse gas - N₂O, the emission of which from UR in 2017-2018 amounted to an average of 52.4 thousand tonnes. Implementation of the above DRCW packages enforces the use of appropriate doses of nitrogen fertilizers affecting greenhouse gas emissions from agriculture. The value of this ratio remains

at a constant level and only increased slightly in 2016 to 1,040.09 thousand tones, and in 2017, it decreased by 11.56% compared to the previous year.

An especially important evaluation of Agri-Environmental-Climate policy is to find out reasons for the relatively low share of beneficiaries compared to the population of farms and other authorized entities in Poland as a whole as well as the above-mentioned poor effects of the policy in the sense of the actual realization of its goals. Farmers receiving direct support, except for farmers participating in the small farmers scheme, are subject to cross-compliance checks. Beneficiaries receiving direct payments are required to maintain all agricultural land, including land that is no longer used for production purposes, in good agricultural condition.

In evaluation of the negative effects of the investigated policy can help analysis of the most common observed irregularities in the performance of carried out actions. The findings will enable irregularities to surface related to the implementation of the Agri-Environmental-Climate commitments. In terms of the surface control of agricultural plots, the following were most often stated: increasing or reducing the scope of the field of development, differences between the area declared by the beneficiary and the area found during the control, identification of the boundaries of an agricultural parcel based on GIS data, the values of the external circuit were used to calculate the measurement tolerance, extending the boundaries of crops beyond the boundaries of the reference plot(s) declared in the application.

As part of the Agri-Environmental-Climate requirements, it was stated that:

- farmers possessed incomplete / inconsistent details regarding the lack of products and attachments of agri-environmental production in terms of plots located on specific registration plots and sets or packages implemented on them,
- a) in the case of package 4 and 5 with marked signs of individual plots on which packages or variants are to be set, and elements of agricultural landscape not used for agriculture, forming nature refuges, occurring in the field, b) with an indication of the places on the agricultural plot where individual trees of the varieties listed in Annex 4 to the Regulation or of varieties traditionally grown in the territory of the Republic of Poland before 1950 are planted - in the case of package 3, c) with a marked part of the agricultural parcel to be left unmown in individual years,
- not leaving the area unmown on the agricultural plot,
- not sowing catch crops by September 15,
- conversion of economically occurring permanent grasslands and permanent pastures in Art. 4 lit. h of Regulation No 1307/2013,
- the farmer's possession of an incomplete / non-compliant agri-environmental activity plan, our products, and appendices regarding the list of courses under which the farmer or the manager meets Agri-Environmental-Climate conditions,

— not sowing as a catch crop a mixture of at least 3 plants (ARMA 2018, 2019 reports).

In evaluating the reasons for the relatively low effectiveness of analysed policies, one can find several risks such as organizational, financial, human resources, technical, legal, and dependent on the beneficiaries. In the area of organizational risks, one can underline such problems as employment level in implementation and payment institutions not adjusted to the needs, delays in preparing implementation procedures, too much bureaucracy and complexity of implementation and payment procedures, and poor coordination and low effectiveness of cooperation between institutions involved in the RDP implementation system.

Among financial risks, one can mention such problems as difficulties with ensuring the required public contribution, difficulties with ensuring the required own contribution by farmers, difficulties in ensuring the required contribution by local governments, and insufficient level of financing of implementation institutions and paying agencies. If talking about risks caused by human resources, one can highlight the bad impact of inadequate and insufficient human resources to perform tasks in the periods of their accumulation and insufficient preparation of human resources to perform new tasks. Technical risks are caused by not adjusting IT system to new tasks. On the other hand, delays in the implementation of EU legislation, and hence national regulations, are also part of the area of legal risk. The lack of enough interest of potential beneficiaries in certain activities and the lack of creditworthiness to take loans to ensure their participation in certain activities also creates the risk of low effectiveness of the policy being pursued.

Taking the above-described circumstances into consideration, it seems that undertaking more detailed surveys on determinants shaping the decisions of farmers in participating in Agri-Environmental-Climate actions could be justified. It would be necessary to investigate economic, social, cultural, institutional, and bureaucratic mechanisms having an impact on the involvement of farmers in these policies.

3. The Essence of the Concept of Ecosystem Service

The functions and products of ecosystems can be grouped into three inseparable categories: (a) functions for the development and proper functioning within the system, including the ability to self-organize, stability and resilience; (b) functions and structures necessary for other ecosystems and landscape features that affect the overall integrity of the landscape system; (c) products and structures useful for human society (Green *et al.*, 1994, Brenner-Guillermo, 2007). The last one mentioned category, of an anthropogenic nature, is the basis for defining the concept of "ecosystem services" (Solon, 2008). Gómez-Baggethun *et al.* (2010) suggest that the concept of ecosystem services, which first appeared in the 1980s, is becoming increasingly influential. As the MEA Report (2005) defines, ecosystem services, are 'the benefits ecosystems provide to human wellbeing'. These benefits include

ecosystem goods (e.g., food or raw materials) and functions that maintain the possibility of life (e.g., purifying functions) and improve the quality of life (e.g., cultural). They have a direct impact on human health or material prosperity.

The concept of "ecosystem services" is one of the tools for discussing society's dependence on nature. It allows for a synthetic presentation of the links between the basic ecological and economic concepts and a joint analysis of these two subsystems, which in turn leads to a unified presentation of economic and ecological assessments. It enables the assessment of various spatial development scenarios or the consequences of protective measures (Solon, 2008). It is a useful tool for informing local communities and politicians about human dependence on nature and the need for sustainable development (Costanza *et al.*, 1997; Daily 1997; De Groot *et al.*, 2002; Kremen 2005). According to Mustajokia *et al.* (2020) various classification frameworks have been developed for assessing Ecosystem Services, including the Millennium Ecosystem Assessment (MEA, 2003), The Economics of Ecosystem and Biodiversity (TEEB, 2008) and CICES (CICES, 2013). Currently, it is accepted to divide ecosystem services into four main groups (MEA, 2005), namely: provisioning services, regulatory services, supporting services and cultural services.

4. Assessment of Ecosystem Service Development in Poland in Case of M10

The M10 measure is a tool related to the implementation of RDP priorities such as (PROW 2020):

- Ecosystems management (biodiversity, water, and soils): 4A) Biodiversity restoration, preservation, and enhancement; 4B) Water management; 4C) Soil management
- Resource efficiency and climate: 5D) GHG and ammonia emissions, 5E) Carbon conservation and sequestration

Impact assessment indicators can be used to assess the impact of activities carried out under M10 on the rise of ecosystem services and on the environmental and climate impacts. Detailed indicators and measures are presented in Tables 1 and 2.

Table 1. Selected indicators of biodiversity and ecosystem services development in Poland

Indicator	2014	2015	2016	2017	2018	2019	2030 Expected value
Environmental Performance Index (EPI)	69,53	-	81,26	-	64,11	-	>70

Forest cover [%]	29,4	29,5	29,5	29,6	29,6	29,6	31
Progress towards sustainable forestry management [%]	94,3	94,8	95,5	95,9	96,3	-	99
Farmland bird index (2000=100)	83,6	85,13	87,97	81,39	75,03	-	90
Agricultural land area in good agricultural condition in thous. ha [ha]	14 424	14 398	14 406	14 490	14 540	14 550	> 14 000
Average area of agricultural land in an agricultural holding [ha]	10,3	10,32	10,31	10,4	10,27	10,42	17
Ecological areas in thous. ha [ha]	51,8	52,3	53	53,4	54,8	55,4	60

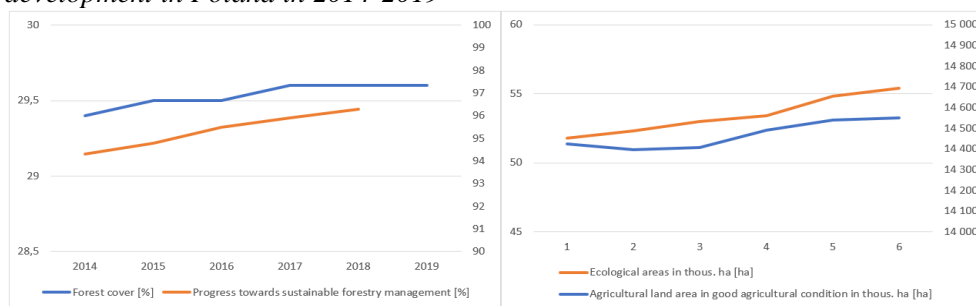
Source: Authors' elaboration on the base of Statistics Poland

<https://strateg.stat.gov.pl/#/strategie/krajowe/1003>

The examples of general indicators can be classified as follows:

- Delivery of ecosystem services: a) Provisioning (Food provision; water provision; raw materials), b) Regulating (Regulation of water), c) Supporting (Biological control; production quality);
- Environmental and climate impacts of farming (soil erosion and degradation; Pollution; Genetic erosion)

Figure 1. Values of indicators and measures characterizing ecoservices development in Poland in 2014-2019



Source: Authors' elaboration on the base of Statistics Poland

<https://strateg.stat.gov.pl/#/strategie/krajowe/1003>

The trends in changes in the values of indicators and measures characterizing ecoservices development and the impact of agriculture on the environment presented in Tables 1 and 2 and in Chart X indicate still unsatisfactory results of the

implementation of the instruments used so far. Therefore, further research into more effective tools increasing the potential for the development of eco-services and mitigating the negative effects of agricultural production on the environment is absolutely necessary.

Table 2. Selected datasets of environmental and climate impacts of agriculture

Dataset	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018
Greenhouse gas emissions by source sector - Agriculture	Thousand tonnes	30705,12	31081,04	30977,39	31594,82	31489,77	30741,63	31305,25	32734,84	33117,07
Air pollutants by source sector - Agriculture/Forestry/Fishing: stationary	Tonne	10715	10166	10379	9971	9501	8957	9594	9572	9259
Air pollutants by Agriculture/Forestry/Fishing: off-road vehicles and other machinery	Tonne	57227	57688	58119	56817	54877	54593	57820	69132	72922
Estimated soil erosion by water	Tonnes per hectare	1,4	-	-	-	-	-	1,5	-	-

Source: Authors' elaboration on the base of Statistics Poland <https://ec.europa.eu/eurostat>

5. Conclusions

Since the Common Agricultural Policy started to function, the main objectives were to ensure the security of food supplies, an adequately high income of farmers and low prices for consumers. Such a policy contributed to the excessive intensification of agriculture. Excessive use of plant protection products and fertilization, the creation of cultivated monocultures lead to environmental degradation. Environmental degradation affected, first, the deterioration of water quality, limitation of biodiversity, soil degradation and unfavorable climate changes. In order to protect the environment and natural heritage, the European Union proposed programmes under the CAP, owing to which farmers can participate in voluntary additional programmes, the so-called agri-environmental. One of the measures that supports the protection of the natural environment and its ecosystems is the agri-environment-climate measure implemented under the RDP 2014-2020.

The facts cited in the article indicate a relatively small share of beneficiaries acquiring funds as part of the activities carried out in relation to the entire population of farms in Poland, as well as their large diversification in terms of the value of obtained amounts and the number of applicants in the geographical structure of the country as well as in the structure of individual packages activities. This indicates the need to search for new methods and tools for the optimization of agri-climate-environmental policy and to conduct research in this area among stakeholders managing these measures, such as ARMA, and among farmers implementing

individual measures into practice. The analysis also shows many irregularities that create barriers to the effective implementation of the activities carried out.

On the other hand, the development of ecosystem services, illustrated by indicators and the distribution of their value over time, indicates the need to dynamize their development also by searching for precise relationships between the activities of the agri-climate and environmental policy and the target values obtained in the field of agricultural policy, including the development of ecosystem services. Only by finding such relationships will it be possible to more accurately set the directions and methods of implementation of activities that will meet the priorities of sustainable development to a greater extent.

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