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Impact assessment of the Agri-Environment-Climate Measure (M10) of RDP 2014-2020 on environmental and climatic policies implementation according to the perception of Polish farmers**

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Abstract. This paper presents the results of a survey conducted electronically in the years 2020-2022 within the framework of the AGRICORE Horizon project. It concerned the Agri-Environment-Climate Measure M10 within the Rural Development Programme 2014-2020 and aimed to quantify the impact of its effects on environmental and climatic policy implementation at a national level according to the perceptions of Polish farmers. The representativeness of the scrutinized population was checked using general data from the Polish Statistics Office. The results of our study show a positive perception of M10 by the participating farmers. The majority of them observed the income progress of their activities despite the increased workload connected with programme implementation and the increased costs associated with some of the declared activities. The innovation activities of the M10 participants were directed mainly at sustainable agriculture and protecting the environment. The respondents who did not decide to participate in M10 most frequently explained themselves by noting a lack of information about the programme, bureaucratic limitations, or doubts concerning the profitability of participation. The results of the study suggest that during the implementation of future EU agri-environmental measures, more attention should be paid to administrative and legal activities at the national level which may improve the perception of the programme.

Keywords: Common Agricultural Policy CAP, EU Agri-Environment Programmes, Agri-Environment-Climate Measure M10, environmental and climatic policies, assessment of farmer innovativeness

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INTRODUCTION

Rural areas are important for the EU's ecological transformation. The Common Agricultural Policy (CAP) represents a significant portion of the overall EU budget. However, despite this there is still an imbalance between farming and the environment, this has led to compulsory EU regulations for implementing advanced environmental standards in agricultural production processes (ECA, 2022). Agri-environmental programmes encourage farmers to adopt positive environmental practices on their farmland (Bignal and McCracken, 2000). These programmes are based on the scientific knowledge and experiences gathered from past EU activities designed to improve subsidy systems and avoid policy failures (Pe'er *et al.*, 2020; Pinto-Correia *et al.*, 2014). They follow the principles of sustainability, multi-functionality, and public payments for public goods.

Protecting biodiversity and addressing climate change are crucial for the EU's Green Deal goals (Gradziuk *et al.*, 2021; EC, 2019) and the Farm-to-Fork Strategy (EC, 2020). The agricultural-environmental activities of the EU are focused on reducing the environmental and climate footprint of the food system, and increasing the resilience of the system to climate change and biodiversity loss (Scherr and McNeely, 2008; ECA, 2020). The CAP implements the protection of the natural environment and the promotion of agricultural-environmental activities through the Rural Development Programme (RDP), funded by the European Agricultural Fund for Rural Development (EAFRD) and national contributions (EU Regulation, 2013; Będźmirowska, 2013; Pe'er *et al.*, 2019; EC, 2021). These programmes involve specific measures in all EU Member States (Batáry *et al.*, 2015), including payments to compensate farmers for adopting environmentally friendly production methods (Armsworth *et al.*, 2012; Kleijn *et al.*, 2001). They support climate change mitigation (Walker *et al.*, 2018; Fonseca *et al.*, 2019), biodiversity protection (Scherr and McNeely, 2008), and ecosystems preservation (Pe'er *et al.*, 2014).

The effective implementation of agri-environmental policies requires targeted measures, reliable data, and regular monitoring and evaluation (Piorr, 2003). Empirical information and stakeholder engagement are essential for evaluating the formulation and execution of agri-environmental programmes at the EU and national levels. Understanding the cause-and-effect relationships between policy implementation and environmental outcomes is crucial for decision-making.

In Poland, the agri-environment-climate measure (M10) under the Rural Development Programme (RDP) for 2014-2020 was to a large extent a continuation of the previous Agri-environmental programme from 2007-2013. The implementation rules were defined by European Union legislation and further specified at the national level. The Act of 20th February 2015 formed the basis for this measure (Act, 2015), while the detailed conditions and procedures were outlined in the Polish Ministry of Agriculture and Rural Development's regulation of 18th March 2015 (Regulation, 2015). Additionally, a transitional period regulation was published on 10th March 2021 (Regulation, 2021). The RDP 2014-2020 received funding primarily from the state budget, and the Agency for the Restructuring and Modernization of Agriculture (ARMA) played a key role as a funding organization.

The M10 measure had the aim of promoting sustainable land management practices, protecting natural habitats and endangered species, preserving landscape diversity, and safeguarding the genetic resources of crops and farm animals. It was divided into nine packages that cover various aspects such as sustainable agriculture, soil and water protection, orchard preservation, habitats, genetic resources, and water retention. M10 was aligned with strategic environmental goals at both the EU and national levels, taking into account the economic and social significance of agriculture, including employment and territorial development. It considered both traditional extensive farming and production intensification in favourable agricultural areas. The measure was designed to support biodiversity, High Nature Value farming, landscape conservation, water and soil management and improvement, and also soil erosion prevention. It also contributed to the implementation of the Nitrates Directive, the Water Framework Directive, and the requirement for extensification.

Several M10 packages required farmers to develop agri-environmental and fertilizer plans, these were based on a nitrogen balance and chemical soil analyses (Watros *et al.*, 2019). Activities supporting a positive organic matter balance included crop rotation, catch crops, and the incorporation of straw or manure. However, there are no specific requirements for soil cultivation methods regarding water retention. Other commitments include maintaining permanent grasslands and landscape elements, mowing or grazing on grasslands, and avoiding the use of sewage sludge.

The largest payments within M10 were allocated to packages related to habitats and endangered bird species in Natura 2000 areas, valuable habitats outside Natura 2000 areas, and sustainable agriculture. These packages received significant funding, totalling 1 685.9 million PLN (32.0%), 1 433.8 million PLN (27.2%), and 1 091.7 million PLN (20.7%), respectively. Additionally, 31 873 agricultural producers who had not previously received support under the agri-environmental RDP 2007-2013 programme participated in the M10 implementation (ARMA Report, 2022).

Seven application campaigns for M10 took place between 2015 and 2021, with the last campaign ending on 12th July 2021. A total of 502 330 applications were submitted, resulting in 450 937 approval decisions and

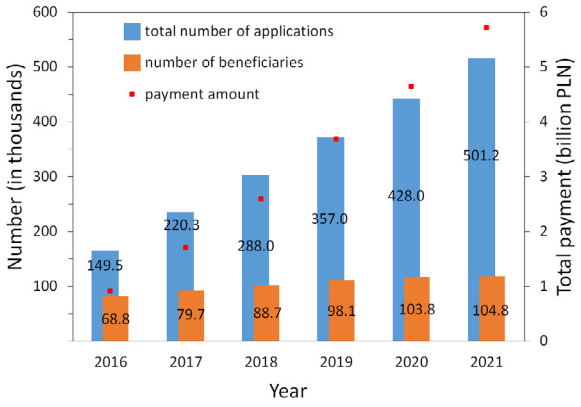

Fig. 1. Changes in the total number of applications, number of beneficiaries, and the total M10 payments in Polish zloty in the period 2015-2021 (own elaboration based on ARMA reports (ARMA Report, 2016, 2017, 2018, 2019, 2020, 2021, 2022).

payments amounting to 5 327.8 million PLN by the end of 2021. The dynamics of applications, beneficiaries, and payment amounts are presented in Fig. 1.

Considerable regional variations in the participation of Polish farmers in M10 have been observed. Figure 2 presents changes in the number of beneficiaries of M10 for 16 Polish voivodeships (I tier units) during the period 2017-2021. Lubelskie and Podkarpackie had the highest number of beneficiaries, while Śląskie and Opolskie had the lowest. The largest payment amounts were made in the Zachodniopomorskie, Warmińsko-Mazurskie, Lubelskie, Pomorskie, and Wielkopolskie regions, while the lowest payments were made in Śląskie, Opolskie, Łódzkie, and Świętokrzyskie (ARMA Report, 2022). These differences may be attributed to variations in natural, economic, and social conditions, as well as agricultural technologies (Bojar and Żarski, 2020).

Limited analyses of the effects of M10 implementation in Poland exist, mainly focusing on short-term statistics and offering limited stakeholder feedback (Report, 2017; Michalek *et al.*, 2020; ARMA Report, 2022). Bojar and Żarski (2020) emphasized the need for optimization and stakeholder involvement in agri-climate-environmental policies, thereby highlighting the irregularities in fund distribution (Bojar and Żarski, 2020). Jezierska-Thöle *et al.* (2021) identified the areas where pro-environmental management has been widely adopted based on socio-economic, technological, and natural conditions. Czyżewski *et al.* (2020) found that CAP measures were more cost-effective than local spending on environmental protection. Prandecki and Wrzaszcz (2023) used the available results of RPD 2005-2020 and other statistical data, including the results of the Agricultural Census 2020 (GUS, 2022), and noted that the fragmented structure of Polish farms supports biodiversity preservation, landscape elements, and reduced mineral fertilization through organic farming, given that 80% of farms have an area of up to 15 ha.

Matyka *et al.* (2019) evaluated the RDP in Poland from 2013 to 2018, including the activities related to M10. They used a participatory and mixed evaluation model involving stakeholders and various data sources. The positive impacts of M10 were observed in surface and groundwater quality, reduced gaseous emissions, and threats to semi-natural habitats. Additionally, Matyka *et al.* (2019) found that improvements to wetland habitats and the farmland bird index (FBI) were still insufficient. No clear trends were found in soil organic matter content or water uptake by the agricultural sector.

To date, no studies have been conducted which focus on the factors that determine the willingness of Polish farmers to participate in activities such as the agri-environment-climate measures, which covered the whole 2014-2020 period of the M10 implementation. Therefore, the objective of this study was to recognize and assess the influence of the Agri-Environment-Climate Measure (M10) which was implemented under the Rural Development Programme 2014-2020, it was based on the perceptions of Polish farmers and its impact on the implementation of environmental and climatic policies at a national level. By examining the effects of M10, this research aimed to gain insights into how this measure has shaped the understanding and attitudes of farmers towards the environmental and climatic policies of Poland. It was based on results originating from an electronic questionnaire collected in the years 2020-2022, which covered such areas as the assessment of environmental and socio-economic factors, the innovativeness of farmers, and their willingness to take risks.

MATERIALS AND METHODS

The study was performed within the framework of the AGRICORE Horizon 2020 project (https://agricore-project.eu/). The AGRICORE project proposes a novel tool for improving the current capacity to model policies dealing with agriculture by taking advantage of the latest progress in modelling approaches as well as Information and Communication Technologies. The agent-based approach

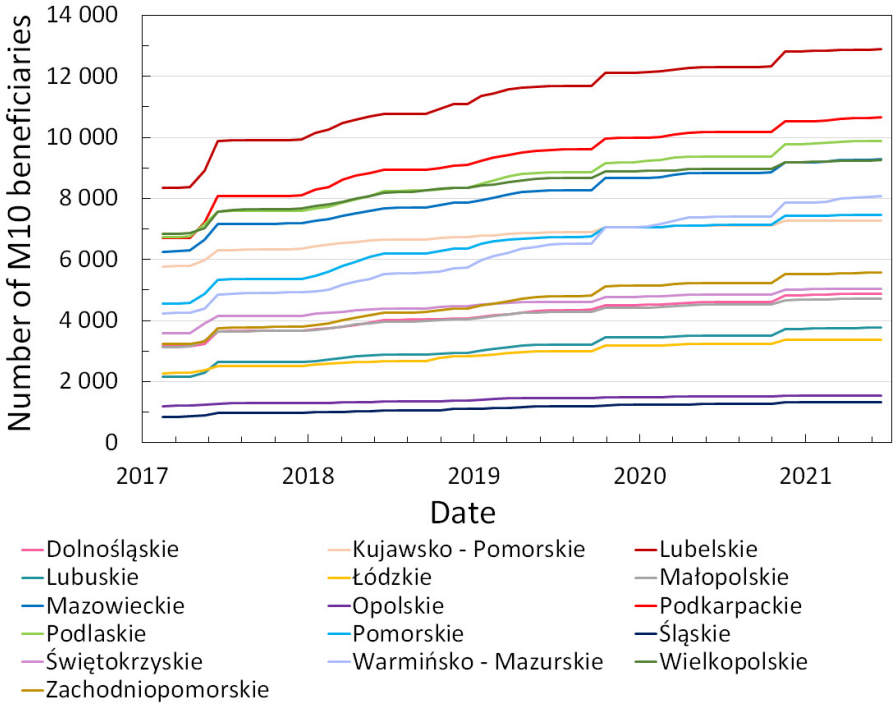

Fig. 2. Changes in the number of M10 beneficiaries (2017-2021) in 16 voivodeships (I tier units). Elaboration based on the ARMA reports (ARMA Report, 2016, 2017, 2018, 2019, 2020, 2021, 2022).

within the AGRICORE policy evaluation tool makes it possible to simulate the interaction between farms and their context (the environment, rural integration, ecosystem services, land use, and markets) at various geographic scales. An important aspect of environmental modelling is the determination of the actual status of soil-plant interactions (Walczak *et al.*, 1997). Within the AGRICORE project, three Use Cases were conducted, among them the Spanish Use Case which aimed to assess the impact of the Regional M11 "Organic Farming support measure" on the olive farming sector in Andalusia, the Greek Use Case which aimed to assess the socio-economic impact of M6.1 "Start-up aid for young farmers" on Greek agriculture (Staboulis *et al.*, 2022), and the Polish Use Case (Bojar *et al.*, 2023). The aim of the participatory research within the Polish use case of AGRICORE was to fill in the detected information gaps concerning the impact mechanisms and to extract the crucial key performance indicators (KPIs) of the prevailing agri-environmental status within the context of the realization of M10.

Within the framework of the participatory research into the Polish Use Case, a survey was performed among Polish farmers and stakeholders concerning the implementation effectiveness of the M10 activities. The data from the survey were supplemented with statistical data from the General Directorate for Environmental Protection, Statistics Poland, ARMA, and EUROSTAT databases. The survey was conducted in the form of an electronic questionnaire. The primary goal of this questionnaire was to analyse the effect of M10 on different aspects of farm management across the whole territory of Poland. Therefore, to ensure the unbiased sampling of a population of farms in Poland, a large group of Polish agricultural organizations was contacted including the Agricultural Advisory Centre in Brwinów, the Polish Pig Breeders and Producers Association "POLSUS" Northern District based in Bydgoszcz, and the Association of Employers – Land Leases and Association "Polish Club FARMER OF THE YEAR", to obtain a representative database of the e-mail addresses of the stakeholders. At the pilot stage of the survey preparation, direct contact was made with a set of farmers and agricultural advisors from various regions of Poland, this includes those with whom contact was made previously and who cooperated within the framework of previous projects when other activities took place. These stakeholders were consulted about the relevance of the proposed structure of the questionnaire and the content of the proposed questions and also the readability of the entire survey for the average farmer. In the pilot study, it was also important to adapt the structure and the content of the questionnaire according to the detected issues to make it acceptable for the participants. This pilot survey fully confirmed the validity of the initial idea of carrying out the survey campaign telemetrically due to the Covid-19 pandemic situation in Poland. This form of

survey also facilitated a time and cost reduction. Following the remarks of the pilot surveyors, some questions were modified or shortened to improve their clarity.

After the modifications made as a result of the pilot study, the content of the questionnaire included the following groups of questions: characterization of household resources, household location, natural and local ecological conditions, characterization of the production type and level of income from farming, changes to land areas, special areas, types of agrotechnical systems, the level of mechanization in the context of the possibility of protecting the environment and biodiversity, and plans for investment in machinery. In the survey, two groups of questions were provided separately, as they were dedicated either to the participants in M10 or to those who did not participate. They included a request to explain the reasons for participating/not participating in M10 and questions about the difficulties related to the fulfilment of M10 commitments. Also, questions concerning the willingness of farmers to participate in future agro-environmental measures were included in this part of the survey. The last portion of the questionnaire was intended to assess the level of innovation and risk avoidance in farming, using a multi-point scale that considered many factors such as: erosion control activities, the use of irrigation practices on water-scarce farms, treatments preventing the occurrence of air pollution by external factors, treatments preventing the occurrence of soil pollution by external factors or soil degradation as a result of improper soil management, assuring animal breeding standards by taking into account proper organic waste management and the processing of methane, disease and/or pest control through the application of plant cover and/or antagonistic fungi, innovation in terms of automatic and/or smart field operations and/or smart animal production systems, the use of integrated equipment for bunching, chopping and managing postharvest residues, the use of mobile applications, including weather forecasting or machinery monitoring as an aid to agronomic practice, the use of drones and other equipment for precision farming, the implementation of business lines that represent alternative sources of income (eco-tourism, cosmetics, *etc.*), conducting training courses for all types of personnel.

The survey was conducted between 2021 and 2022. The questionnaires were distributed to farmers from all of the voivodeships of Poland, and in all 4 872 farmers received an invitation to participate in the survey. To ensure that the responses were representative of the whole agricultural sector in Poland, several farm characteristics were compared to the existing statistical data. They were gender, age, the distribution of farms in the 16 voivodeships, and the percentage of the farms participating in the M10 activity from the total number of farms in Poland. It was assumed that a minimal return of 300 to the questionnaire survey would guarantee the representativeness of the selected features of the population based on farms in Poland.

The first stage of the survey distribution did not fulfil the assumed minimal return level, and therefore several activities were undertaken to gain new potential respondents. Invitations to fill in the survey were sent in the middle of October 2021, and then resent two times, at the beginning of December 2021 and February 2022. The progress in the received responses was as follows: 63 by 9th November 2021, 115 by 14th December 2021 and 260 by 11th March 2022. Because the number of responses was still below the expected value (300 responses), it was decided to take additional measures: the coordinators of Polish partners in LIFT H2020 (Krupin and Jendrzejewski, 2018) were contacted in order to obtain the e-mail addresses of the farmers who were surveyed in this project. Additionally, it was decided to survey farmers directly during the AGROTECH agricultural fair in Kielce (from 18th to 20th March 2022). Several dozen responses were then gathered. Finally, 319 filled-in questionnaires were obtained, which means that the assumed minimum number of returns was reached.

RESULTS

The collected questionnaire responses indicated that the farmer group under scrutiny was representative of the whole agricultural sector in Poland, which may be seen by making a comparison between gender, age of the survey respondents, and the distribution of their farms with the respective data from the Statistics Poland database. Data in Fig. 3 shows that the differences were only 1.2% in both gender groups between the results of the survey and the general population of Polish farmers taken from Statistics

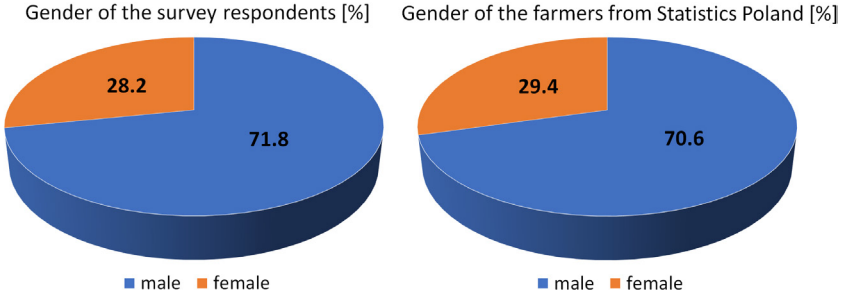

Fig. 3. Comparison of the representativeness of the gender groups in the survey with the respective Statistics Poland data.

Poland (GUS, 2017). Similarly, only a very small difference of 0.1% was noted between the representativeness of the over 60/65 year old farmers category in our study and that of the Statistics Poland data (Fig. 4). Greater differences were observed for two groups of younger farmers (those younger than 40 and between 40 and 60/65). The reason for this discrepancy could be twofold. Firstly, the percentage of the youngest farmers was overrepresented because of the telemetric method used to conduct the survey (young farmers below 40 are much better equipped with electronic devices and familiar with computer-based methods of communication, therefore they were more eager to participate in the survey). Secondly, some disagreement concerning the age percentage for the two other groups originates from the slightly differently defined upper age of the second group in these two sources (60 or 65). However, in our opinion, the age representativeness in our study was acceptable.

Also, the percentage of farms participating in the M10 activity as a proportion of the total number of farms in Poland was compared between the survey data and the Statistics Poland database (Fig. 5). The difference of 20.2% between these two sources was probably the result, once again, of the telemetric method used to conduct the survey, which implied that the survey was reaching farmers who are more aware and innovative, having a wider spectrum of information about the additional funds that may be obtained, also younger and much more prone to participation in agri-environmental activities.

A preliminary analysis of the survey indicated that the respondents represented all 16 regions of Poland. The highest percentage of them came from the Lubelskie (18%) and Wielkopolskie (11%) regions while the lowest numbers of surveys were obtained from Dolnośląskie (1%) and Opolskie (2%). The majority of all the respondents (83%) were farm owners and they represented the individual farms (89% of responses). Their farm production concentrated mainly on cereals (57.4%) while other production sectors had a smaller share (industrial plants 3.8%, vegetables 4.1%, fruits 6.9%, meat 7.5%, milk 5.6% and other sectors 14.7%). The majority of the studied farms were family farms, 62% of which do not hire any workers either permanently or seasonally. Among the respondents, 52.4% evaluated the conditions on their farm for obtaining a stable yield as moderate, 29.8% as hard, 14.1% as good, and only 3.8% as very bad. Concerning the source of income of the respondents, 36% of them declared that more than 50% of their budget comes from farming, which is similar to the results of the National Agricultural Census 2020 (GUS, 2022), in which it was found to be equal to 34%. It was also established by the survey that 22.6% of the respondents never enlarged their farm area, 24.1% did it more than 10 years ago, 27.0% between 5 to 10 years ago and 26.3% less than 2 years ago.

A very important part of the survey was intended to check the general opinion of the farmers concerning the effects and inconveniences occurring during their participation in the M10 activities. Even during the pilot study,

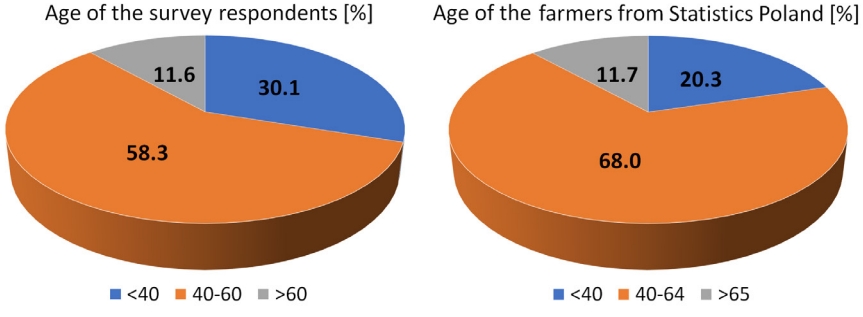

Fig. 4. Comparison of the farmers' age in the survey with the respective Statistics Poland data.

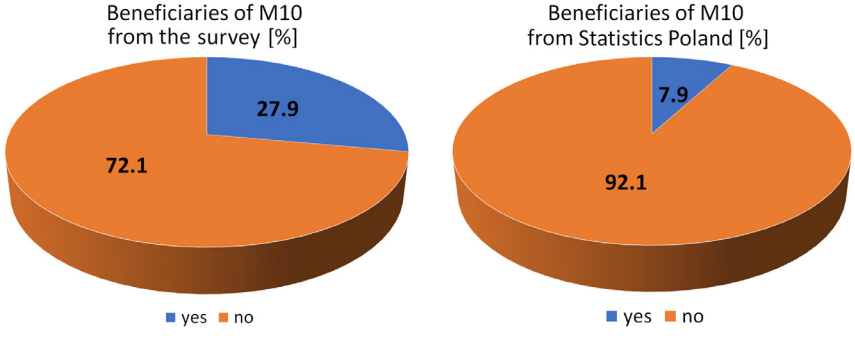

Fig. 5. Comparison of the percentage of the beneficiaries of M10 activity in relation to all farms in Poland, this was obtained from the survey and Statistics Poland.

some valuable comments from the stakeholders were obtained concerning the barriers for farmers who wished to participate in the M10 activity. They mainly referred to the problems of instruments being insufficiently suited to the varied conditions of farms in Poland, such as the type of production and specialization, the unprofitability arising from complying with certain obligations such as the cropping plan, sowing dates, catch crop use, bureaucracy and others. These opinions were gathered locally, and therefore it was not obvious that they could be generalized to a larger scale. In this context, it was not clear if the opinions of the farmers about the realization of the measure would be positive. Furthermore, the sum of knowledge concerning changes in the instruments used by farmers to fit pro-environmental goals and the relationship between the increase in their workload due to M10 obligation fulfilment and other factors affecting farmer prosperity and their perception of their natural circumstances, such as changes in income, production costs, the market values of their products, prestige, *etc*. has not been well-established to date.

The results of the survey conducted indicates (Fig. 6) a generally positive reception in terms of farmer participation in the M10 programme (96% of the respondents). Among the 3.4% of negative answers given, it was not possible to identify the regions where such negative attitudes were found to be most common because they occurred at the same rate in different voivodeships. The generally highly positive evaluation of M10 participation was tempered by changes in workload and income during its realization (Fig. 7). More than half of respondents (53.9%) noted an increase in workload, however a high share of them (40.4%) did not observe any change as compared to the period before the programme was initiated. The reason for this response may be twofold. Firstly, there were large differences in the number and intensity of the obligations involved in different Packages of M10. For example, in Package 5, which dealt with valuable habitats outside the Natura 2000 areas, the majority of these obligations were passive and intended to reduce/prohibit very laborious procedures, such as ploughing, rolling, creating/restoring drainage systems, the application of sewage sludge, the application of the mechanical destruction of soil structure and the application of plant protection products. On the other hand, in some packages (*e.g*. Package 1), several very laborious activities were expected, such as the use of a minimum of 4 crops in the main crop per year on the holding, double chemical soil analysis, developing and following a fertilizer plan, and activities designed to obtain a positive balance of organic matter. Secondly, in Polish agriculture, there are large disproportions regarding the availability of production machines, tools, material resources and production-controlling devices. This may have influenced the perception of the burdens of the programme and the possibility of being able to fulfil the individual obligations.

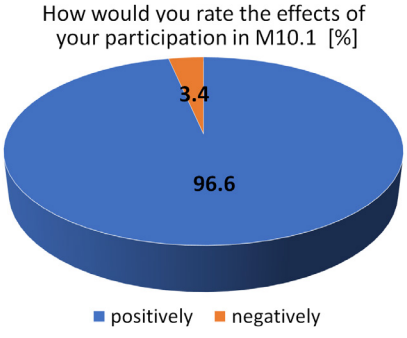

Fig. 6. General assessment of the respondent's participation in M10.

Undoubtedly, a positive assessment of the M10 effects was connected to an improvement in farmers' income (73%), which strongly suggests a higher profit despite the increased workload. Only 5.6% of respondents observed a decrease in farm income, while 21.3% did not observe any change (right panel of Fig. 7). This result confirms the possibility of reconciling the profitability of agricultural activity and the wellness of the holding owners with the objectives of environmental protection, *i.e.* restoring, protecting, and enhancing ecosystems dependent on agriculture.

The generally positive evaluation of the effects of M10 by the farmers does not coincide with the assessment of its impact on the prestige and the image and market value of their products (Fig. 8). The majority of the farmers indicated that participation in M10 did not influence their prestige and the value of their product.

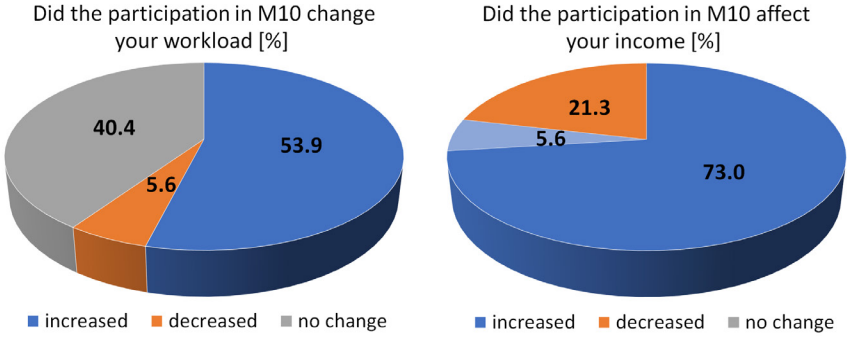

Fig. 7. Respondents' assessment of the impact of M10 on their workload and the farm's income.

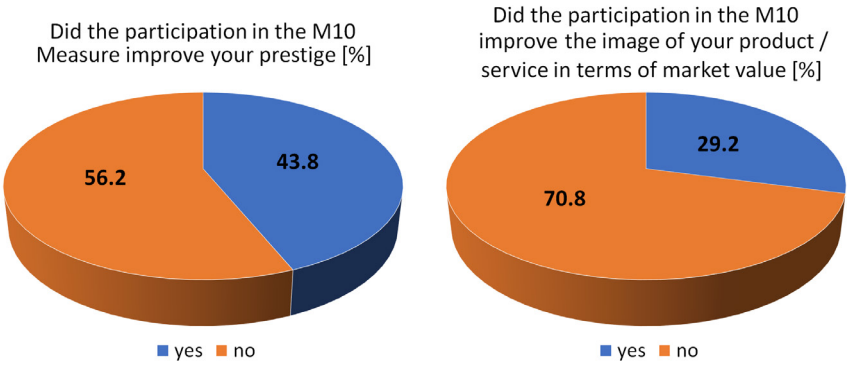

Fig. 8. Farmers' assessment of the influence of M10 on product/service value and their prestige.

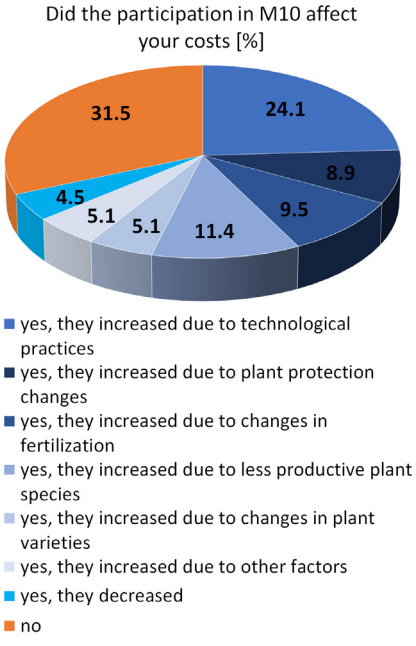

Fig. 9. Effect of M10 on farm production costs**.**

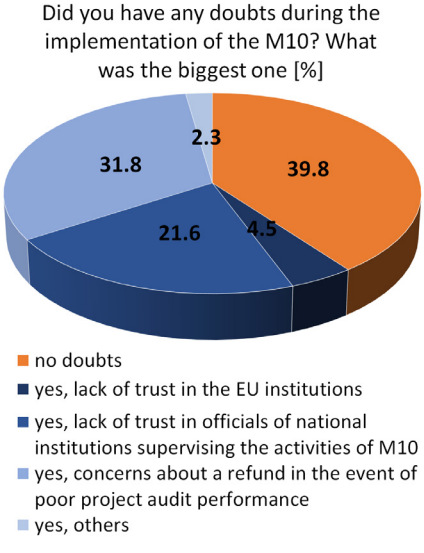

Fig. 10. Factors causing farmers' doubts during the implementation of M10.

A considerable share of the survey respondents (64%) noted increased production costs that were connected with participation in M10, while 31.5% did not note any change, and only 4.5% noted a cost decrease (Fig. 9). The most important reasons for increased costs are changes in technological practices (24.1%), the necessity of using a less productive plant species (11.4%), changes in fertilization (9.5%), plant protection changes (8.9%) and changes in plant varieties (5.1%).

When asked specific doubts during the implementation of M10, only 39.8% of respondents did not perceive any uncertainties and worries (Fig. 10). This result suggests that the previous experiences that the farmers had with the EU and national institutions implementing subsidy programmes were not always positive. It is also meaningful that their attitude towards national institutions was much worse (21.6% of respondents expressed a lack of trust towards them) than towards EU institutions (only 4.5% did not trust them), and also farmers signalled that this lack of confidence was the main reason for their doubts. This may be connected with the complicated procedures involving specific requirements to be fulfilled by the applying entities which were not always clear for the farmers. A considerably large percentage (31.8%) of respondents were concerned about paying a refund in the case of poor project audit performance.

A separate part of the survey was directed towards the farmers who did not participate in M10. First of all, we wanted to obtain a list of the main reasons for not joining the M10 activity from this group. The responses, which are presented in Fig. 11, suggest that three factors had the highest impact on the decision to refrain from participation. These were: the lack of information about the programme or incorrect/incomplete information (24.3% together), the overly bureaucratic data registration procedures (23.3%), and an anticipated lack of profitability due to high natural and business risks connected with profound changes being made on the farm to meet the obligations of M10 (20.8%). The respondents also mentioned other factors which made them refrain from participation, such as reports of bad experiences from neighbouring farmers connected with availing of subsidies (8.8%), poor support provided by

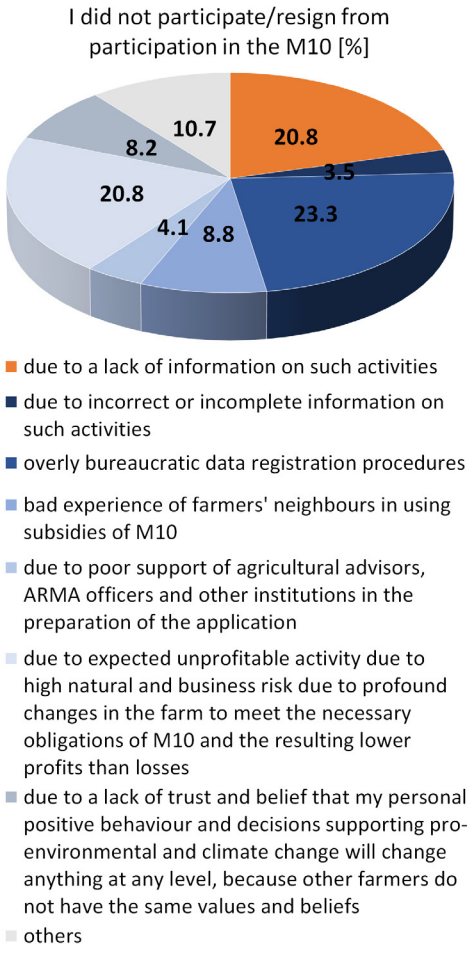

Fig. 11. Factors influencing the farmer's decision not to participate in M10.

agricultural advisors, ARMA officers and other institutions in the preparation of applications (4.1%) or a lack of trust and belief in the possible positive changes due to the negative attitude of other farmers (8.2%). These results suggest that considerable improvements are expected from farmers in order to encourage them to participate in similar RDP agri-environmental activities in the future. These improvements should be focused on diminishing the existing bureaucratic limitations and lack of information, as well as on the simplification of application procedures and raising the awareness of farmers with reference to environmental goals.

In the survey, there was also a set of questions directed both to participants and non-participants in M10, which were aimed at assessing, among other matters, the attitude of the farmers to innovative solutions on their farms and the amounts invested in such activities. The results are presented in Fig. 12, showing the average amounts invested in various activities in the period of the last 10 years, they indicate that there are considerable differences in the preferences of these groups when it comes to investing in specific innovative solutions on their farms. The M10 participants, on average, invested more money in activities that were strictly connected with sustainable agriculture, such as the use of irrigation practices on water-scarce farms, treatments preventing air pollution by external factors or treatments preventing soil pollution by external factors, or avoiding soil degradation as a result of improper soil management. For them, investments in activities connected with eco-services, such as becoming involved in lines of business that represent alternative sources of income (eco-tourism, cosmetics, *etc.*) or in precision agricultural equipment (drones

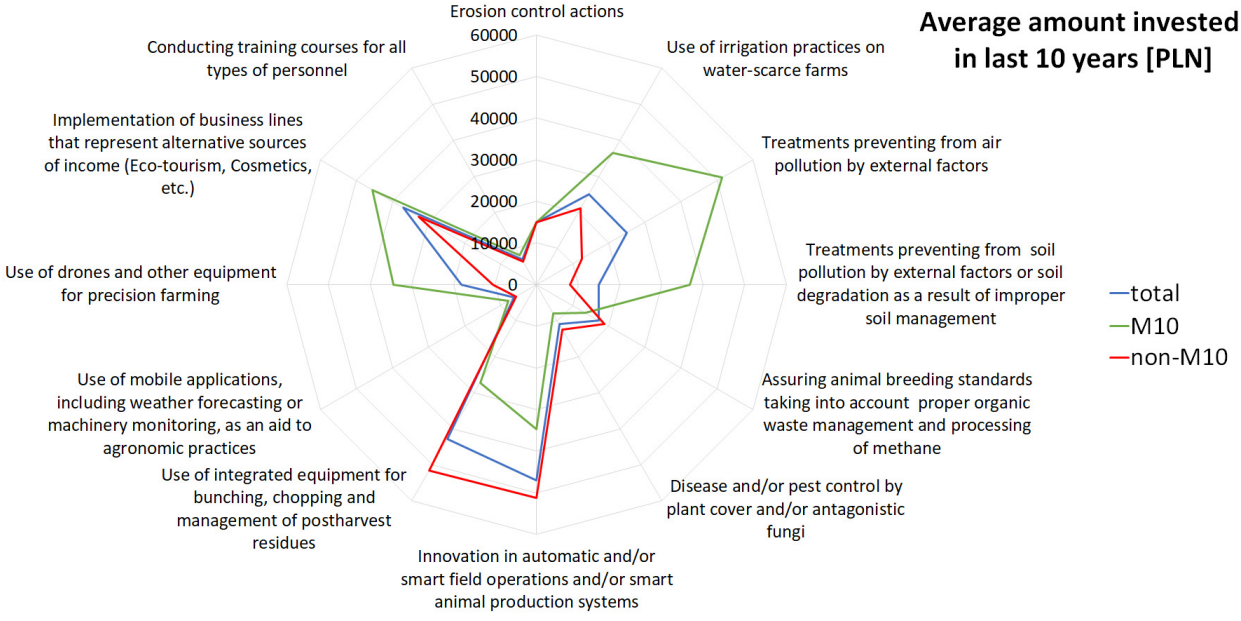

Fig. 12. Investments in innovative activities on farms managed by M10 participants (green line), non-participants (red line) and all the respondents, *i.e.* both of the studied groups of farmers together (blue line).

included), were also much more important than for the non-participants. On the other hand, non-participants in M10 invested more than the M10 participating farmers in activities connected with intensive agriculture practices, such as innovations in automatic and/or smart field operations and/or smart animal production systems, or in the use of integrated equipment for bunching, chopping and managing postharvest residues. It may be observed in Fig. 12 that the potential of some innovation investments is still being underestimated by both groups of respondents, especially those connected with knowledge improvement and monitoring systems. They include conducting training courses for all types of personnel, or the use of mobile applications, including those used for weather forecasting or machinery monitoring, as an aid to agronomic practices. There is also a notable scepticism in both groups concerning investments in disease and/or pest control through the application of plant cover and/or antagonistic fungi, this may be the result of insufficient knowledge about these methods.

DISCUSSION

The results of the survey indicate a positive reception for M10 in the years 2014-2020 among Polish farmers participating in this measure. Such opinions may be connected with Polish conditions and its particular economic profile, which predisposes participants to development based on agricultural and natural potential as well as on a positive income change for farmers due to subsidies. In an earlier study, Jezierska-Thöle *et al.* (2021) presented complex interactions between fund absorption and socio-economic development, as well as natural and non-natural conditions, which is in agreement with our results. Similarly, Bojar and Żarski (2020) have indicated the positive influence of M10 on farmers' prosperity and also on their awareness of environmental goals. The results of our study show that the obligations imposed during programme implementation, which were connected with the increase in workload and production costs, did not influence the generally positive evaluation of farmers' participation. However, the positive reception of the effects of M10 does not coincide with the assessment of its impact on prestige and image, and on the market value of farm products. This perception contradicts the general tendency within the EU which promotes and values agricultural products originating from eco-friendly farms. Various aspects of this problem were described by Jarczok-Guzy (2018). As the main reason for the insufficient market value attained by bio-eco products in Poland, she mentioned the poor range of organic food promotion by the media and agricultural organizations. This has resulted in only a small proportion of customers being able to recognize the current labelling system which uses a European logo to indicate the organic origin of the food. Such food is hardly available in Polish stores. It was also confirmed by this author that Polish consumers expect price reductions as the most desirable form of the promotion of organic food. In this context, our results suggest that much effort should be applied by coordinators on the Polish side in future EU pro-ecological programmes to promote and increase the prestige of the participants and the value of their products.

Our results confirm that it is possible to combine economic and social priorities with environmental objectives through the implementation of M10. In our opinion, the number of survey participants (319), their location, the structure of their farm and other features accurately reflect the population of Polish farmers which is described in detail in other studies (Kłoczko-Gajewska and Sulewski, 2019; Czyżewski *et al.*, 2020). Also, a high degree of similarity in the studied populations was observed concerning the data contained in Statistics Poland (mainly with reference to the comparison made between the gender and the age of the farmers who participated in the study, as well as the distribution of the farms in the country). Previous studies concerning the M10 results (Gradziuk *et al.*, 2021; Matyka *et al.*, 2019) based their analyses on a similar number of responses.

It should be noted that the final total of the unique beneficiaries of the agri-environment-climate measures under RDP 2014-2020 (120 417 beneficiaries till 28th February 2023) is still quite a small figure as compared to the total number of Polish farms. Mickiewicz and Mickiewicz (2015) found that even at the stage of constructing a support budget, the practices beneficial for the environment and climate were only planned to cover 19% of the country's agricultural land. Prandecki and Wrzaszcz (2023) emphasized that Poland's contribution to the achievement of the pro-environmental objectives of the European Union is significantly less than might be expected given the contribution that has been made by the entire EU, this can be explained by the lower development stage of agriculture in Poland as well as the limited possibility and legitimacy of the changes. Their analyses are in agreement with the data obtained in the part of our survey directed at farmers who did not decide to participate in M10. The respondents in our study mentioned the overly bureaucratic data registration procedures and the lack of relevant information concerning such activities, as well as the poor standard of support offered by agricultural advisors, ARMA officers and other institutions in the preparation of the application or the bad experience of the farmers' neighbours in using M10 subsidies as the main factors which prompted them to refrain from participation in M10. Another factor causing doubts to form in the minds of farmers could be delays in the implementation of certain activities and the processing of farmers' applications. According to Mickiewicz and Mickiewicz (2015), the EU planned to conduct RDP following the principles of flexibility, simplification, adaptation, fairness and equal opportunities by developing simple rules that would be understandable by beneficiaries and other participants in the agricultural markets. However, the adopted solutions

are not always simple to apply in Polish conditions, and they introduce new elements that make it difficult to submit an application and obtain support. A more general reason for farmers' doubts about national institutions could be the lack of a transparent and stable agricultural policy in the country during the considered period of RDP realization.

In the case of a larger scale and more efficient distribution of subsidies it is important to analyse and eliminate certain institutional and bureaucratic obstacles to enhance the process of pro-environmental subsidy distribution in the future. Apart from the general challenges posed by nature, Prandecki and Wrzaszcz (2023) also mentioned several specific challenges which were also indicated by our respondents as limiting factors in M10 participation (these were obstacles connected with profound changes on the farm in order to meet necessary obligations).

CONCLUSIONS

1. The results of this study confirm the positive perception of M10 by farmers participating in it. In the majority of individuals surveyed, they observed the income progress of their activities despite increasing workloads connected with programme implementation and the increased costs of some of their declared activities. The respondents who decided not to participate in M10 expressed these negative factors most frequently, they noted the lack of information provided about the programme, bureaucratic limitations or doubts about the profitability of their participation.

2. The implementation of the majority of the national strategic objectives in the agricultural sector adopted within the timeframe leading up to 2030 will involve a number of activities designed to stimulate farming activity. The results of our study suggest that in the implementation of future EU agri-environmental measures, more care should be paid to administrative and legal activity at a national level, which may improve the perception of these programmes among farmers. Special attention should be paid by the Polish coordinators of future EU pro-ecological programmes, to the prioritization of substantial efforts to promote and enhance the reputation and prestige of the participants, as well as increasing the value of their products. Additionally, programmes for the improvement of farmers' knowledge which refers to some innovative methods and equipment would seem to be worthy of inclusion in future activities.

3. Studies concerning a higher degree of spatial resolution are required in order to precisely show the specificity of the attitudes of farmers towards pro-environmental programmes. They would more precisely indicate the regional factors leading to the acceptance or rejection of participation.

Data Availability Statement: The primary data presented in this study are available on request from the corresponding author. The secondary data are not publicly available due to the data restriction policy of the provider.

Conflict of interest: The Authors do not declare any conflict of interest.

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