Economics and Business
ISSN 2256-0394 (online)
2025, *39*, 69–81
https://doi.org/10.7250/eb-2025-0006
Published by RTU Press

FARMERS' PERSPECTIVES ON THE ADOPTION OF AGRI-ENVIRONMENTAL SCHEMES IN SOUTH MORAVIA

Kateřina MAZANCOVÁ*

University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

**Corresponding author's e-mail: mazank01@jcu.cz*

Received 20.10.2024; accepted 14.03.2025

Abstract. Human society depends on agriculture for a living, and the health of this industry is a key sign of a nation's development. Currently, protecting soil resources with ecologically friendly practices and practicing responsible land management are prioritized. The so-called agri-environmental measures of the Common Agricultural Policy of the European Union are one method for accomplishing this. Notwithstanding, these methods encounter obstacles such as inadequate adoption by farmers and restricted environmental impact. They require an analysis of environmental features and an assessment of farmer comments in order to be more effective. This study's objective is to evaluate the opinions of farmers in the Czech Republic's South Moravian region. The situation in the interest area was surveyed using a questionnaire (201 respondents). The impact of different elements (farm features, individual opinions, and socioeconomic factors) on farmers' adoption of agri-environmental schemes (AES) is investigated by statistical analysis. In general, farmers participate in AES primarily because the program offers enticing financial assistance that fits with their business plan. The likelihood of penalties, undue complexity, red tape, and stringent restrictions are the most prevalent deterrents. Working together with farmers to improve AES and making advisory services available are essential. These creative strategies will undoubtedly increase AECM's efficacy both domestically in the Czech Republic and globally.

Keywords*: Agriculture, argi-environmental schemes, Common Agricultural Policy, sustainable practices.*

JEL Classification: Q18 Agricultural Policy • Food Policy • Animal Welfare Policy

INTRODUCTION

The European Union (EU) focused on the issue and responded to the post-war food shortage through the Common Agricultural Policy (CAP), which aimed to ensure stable production and the market (Cíbik et al., 2022). The main task was to ensure a continuous food supply and develop a common approach to agriculture (Zámečník, 2018). The Treaty of Rome of 1957 defined five basic objectives: increasing productivity through technical progress and the efficient use of labour, ensuring a fair standard of living, a stable supply of agricultural products, reasonable prices for consumers and market (Mostova & Hutorov, 2023). Over

time, however, these goals have changed depending on new challenges and changes in societal priorities. In 1987, agri-environmental measures (AEM) were introduced as part of the second pillar of the CAP, with the aim of promoting organic farming, improving the environment, preserving the landscape and promoting biodiversity. Since 1992, AEM has become a mandatory part of the legislative framework (Ministerstvo zemědělství České republiky, 2019).

Currently, however, the effectiveness of the implementation of these measures in various EU countries is insufficient (Bartkowski et al., 2023), and their limited impact on the environment is also criticized (Pe'er et al., 2020). Indeed, the AEM rules are designed to rely on the voluntary participation of farmers without sufficiently motivating them (Wittstock et al., 2022). In addition, they are criticized for pitting ecological and production interests against each other (De Krom, 2017). Thus, reforms are constantly underway with the aim of improving the efficiency of AEMs and adapting them to a wider range of users. One of the methods to achieve this is the analysis of factors influencing the implementation of these measures, which includes not only the examination of natural conditions (Pavlis et al., 2016a), but also the collection of feedback from farmers through questionnaires and surveys (Bartkowski et al., 2023). This analysis is key to improving and innovating EU CAP instruments.

1. LITERATURE REVIEW

The Czech Republic, which until 1989 faced the effects of the consolidation of land blocks, habitat fragmentation and soil degradation (Šarapatka & Urs, 2008), partially joined agri-environmental measures in 2002 with the hope of improvement. As part of the SAPARD program (Special Accession Program for Agriculture and Rural Development), five protected landscape areas were involved in the preparation of measures focused on grasslands and arable land according to the specific needs of these areas. After joining the EU in 2004, these measures could be extended to the entire republic, with the key step being the introduction of land blocks into the LPIS (Land Parcel Information System). AEM goals included reducing soil erosion, retaining water in the landscape, and promoting biodiversity on cultivated land. Among the achievements can be included the maintenance of agriculture in mountain and foothill areas and the strengthening of the stability of the local landscape, as well as the protection of the nesting ground of the field warbler (Zámečník, 2018).

In 2014, the name of the AEM was changed to Agri-Environmental-Climate Measures (AECM), and since that year, it has included eight different measures that set the conditions for applicants for financial support. Within the framework of the Rural Development Program (RDP) for the period 2014–2020, which is the focus of this study, the AECMs were as follows:

- Integrated fruit production;
- Integrated production of vegetables and strawberries;
- Integrated vine production;
- Grassing the paths of the concentrated runoff;
- Treatment of grasslands (TG);

- Weeding of arable land;
- Bio-belts;
- Protection of the crested lapwing.

Applicants were required to farm in accordance with European and national rules, including compliance with limits on fertilizers and protective agents, for a minimum of five years on all plots that were part of their commitment (Ministerstvo zemědělství České republiky, 2016).

As already stated, the current AECMs do not meet the expectations of the EU, which were set in its strategic plans, and do not fully achieve the stated goals (Brown et al., 2021). Despite certain positive changes, there remains room for improvement and reversal of negative trends (Pe'er et al., 2020). AECMs, therefore, undergo regular innovations and adjustments based on the evaluation of previous experiences, including their effect on plants, animals, habitat, landscape stability and production. In addition to natural factors, it is also necessary to take into account socio-economic aspects that influence farmers' decisions (Micha et al., 2015). Working with qualitative data obtained through questionnaires is more difficult because they are difficult to quantify (Brown et al., 2019). However, this feedback fundamentally affects the effectiveness of AECMs and their acceptance among farmers (Brown et al., 2021). The analysed variables include, for example, farm characteristics (area of arable land, specialization and type of farm) or landscape characteristics (fertility and altitude) (Paulus et al., 2022). The social context also plays an important role (De Krom, 2017), which includes the position of the farmer in society and public perception. Farmers' views, which are obtained through questionnaires and interviews, are often taken into account in these studies. Many works compare foreign studies with areas of interest (Brown et al., 2019), and some follow the entire decision-making process of farmers (Wittstock et al., 2022). Using statistical analyses, the relationships between various factors and the implementation of AECM are investigated in these studies. According to most studies, the reason for insufficient application of AECM is not a lack of awareness about the negative impacts of certain practices or about protection methods (Brown et al., 2019). The main factors that influence farmers are the size and focus of their farm, the amount of administration and the conditions of subsidies (Wittstock et al., 2022). The influence of socio-economic factors varies depending on the specific area, farmers' attitudes and their previous experiences (Bartkowski & Bartke, 2018).

In the Czech Republic, unfortunately, feedback from farmers is still insufficiently mapped. There are few studies (Cudlínová et al., 1999; Karásek et al., 2014; Zavadil & Jančák, 2021) that examine the views of farmers and look for connections between their decisions and the factors that influence them.

2. METHODS AND PROCEDURES

This article is devoted to the analysis of a questionnaire that was developed as part of the BESTMAP (Behavioural, Ecological and Socio-economic Tools for Modeling Agricultural Policy) project, which is financed by the European Commission as part of the Horizon 2020 program. The aim of the project was to

develop a methodology that, through an individual approach and cooperation of various interested parties, contributed to a more effective functioning of the Common Agricultural Policy (CAP). The project focuses on investigating the impact of agricultural policies on the environment, the climate system and the socio-economic sphere.

The BESTMAP project questionnaire was prepared by authorized workers and then distributed among farmers online, first through organizations such as the Private Agriculture Association and the Agricultural Union. It was later expanded through the State Agricultural Intervention Fund and its databases. A total of 201 respondents took part in the questionnaire; after discarding incorrect or inaccurate answers, 140 relevant answers remained. These participants answered most of the general questions, with 72 of them addressing questions related to AECM. The questionnaire was divided into several thematic areas: the first part included general information about the farm, the second part allowed the selection of customized measures with follow-up questions explaining these decisions, the third part focused on previous experiences with AECM, and the fourth block included farmers' opinions. The final part of the questionnaire was devoted to socio-economic data such as age, education and experience.

South Moravia was chosen for its high fertility, which is due to favourable soil and climate conditions (Rožnovský et al., 2010). In this region, there is a diverse landscape mosaic and different approaches to agricultural management. The area includes both large farms and smaller holdings, which makes it comprehensive enough for the research issue (Ziv et al., 2020).

The site of interest is located in the Zlín and South Moravian Regions, while its central part lies in the valleys of the Morava and Dyje rivers, where a flat fertile area stretches (Rožnovský et al., 2010). The area is characterized by brown soils and black soils in fields, meadows and vineyards, and in some places, good alluvial soils are also present. The altitude in this study area mostly does not exceed 300 m a.s.l., which means that the region is not very fragmented. It reaches its highest altitude near the Slovak border, where it exceeds 700 m above sea level.

According to Chyba (2010), this area is characterized by great climate dynamics, with Pannonian and continental climates prevailing. This causes more frequent occurrences of drought than in other parts of the Czech Republic. Most of the regions of South Moravia fall into very warm to hot climate zones, with annual average air temperatures of 8–10 °C. The marginal areas have a mildly warm climate with average temperatures of 7–8 °C. Annual rainfall varies between 350–600 mm, which contributes to the dry to moderately dry character of the region (Meitner et al., 2023).

The average farm size in South Moravia is 94 ha. Of this, 24 % of the land is privately owned, and 76 % is leased. About 16 % of farms are engaged in organic production, and 47 % participate in AECM (Bartkowski et al., 2023). The dominant crops in the region are wheat, rapeseed and maize grown on arable land. Permanent grasslands are mainly found in the higher elevations of the White Carpathians (Roilo et al., 2024).

In general, this area is densely populated and heavily agriculturally used (Herber, 2015). In recent years, however, the region, like the rest of the Czech

Republic, has faced the negative consequences of agricultural intensification and climate change. The number of dry periods is increasing, as the soil has been steadily losing moisture over the past 60 years (Frantová et al., 2024). This area ranks among those that are extremely prone to drought periods within Europe and the Czech Republic (Meitner et al., 2023). In addition to climatic factors, land reclamation is also a cause of these changes. The region is expected to shift towards a Mediterranean climate. An increase in dry and warm periods is also anticipated in Central Europe (Potopová et al., 2022).

The study focuses on four sets of questions from the questionnaire, which include previous experience with AECM and three other aspects: farm characteristics, personal opinions and socio-economic background. The aim is to explore the connections between these groups. First, general data is summarized, followed by a statistical analysis of the influence of factors on the implementation of AECM. Only respondents who answered both general and AECM questions were included in the analysis.

The questionnaire contained questions on categorical variables (type of farm, management method) and continuous variables (age, area of arable land, area of AECM). AECM was examined in both categorical (yes/no) and continuous (ha) form, resulting in the use of two statistical methods. To compare continuous and categorical variables, a t-test for two categories (e.g., average age at implementation/non-implementation of AECM) and a one-way ANOVA for multiple categories (e.g., average acreage of TG measures on different types of farms) were chosen. Spearman's correlation coefficient was applied to compare two continuous variables, which was suitable due to the non-normal distribution of the data (e.g., dependence of AECM acreage on soil fertility).

The independent variables included the factors influencing the implementation of AECM, while the dependent variable was the measures themselves. Of the number of categorical and continuous variables, those that showed potentially significant results were compared. In the first circuit, focused on the characteristics of the farm, the type of farm, the method of management, the area of individual soil crops and fertility were investigated. First, ANOVA was used to compare the average area of different soil cultures according to different management methods. Subsequently, the average area of AECM between individual types of farms was examined in the same way. To illustrate the interdependencies, Spearman's correlation analysis was performed for the AECM area and soil culture area, as well as for the AECM area and soil fertility rate.

Furthermore, opinions and socio-economic factors such as age and experience were analysed, with the dependent variable relating to the implementation of AECM. The influence of the farmer's personal attitude on the implementation of AECM was investigated using a t-test. The dependence of the AECM measure on the degree of agreement with individual statements was expressed by the Spearman correlation coefficient. The effect of age and experience on the implementation of AECM was also tested, again using a t-test.

3. RESULTS

3.1. General Characteristics of Farms and Farmers

The largest proportion of farmers surveyed (36 %) worked full-time on individual or family farms. In second place were individual and part-time family farms and trading companies, which made up roughly the same percentage of the sample (25 % and 24 %, respectively). Multi-farm cooperation and cooperatives accounted for 10 % of respondents. Many farmers (63 %) practice conventional farming, while less than half of the respondents (22 %) have an organic certification. Furthermore, 18 farms participate in other certification programs (e.g., Milk QCZ, Biokont, etc.).

Wheat (40 %) and cattle (29 %) dominated the questions about cultivated crops and farmed animals. Other important crops included barley, canola, corn and alfalfa. Some farmers also mentioned permanent grassland (PG) or clover-grass mixtures. 56 % of the respondents keep livestock, the most common being dairy and beef cattle (dairy cows, fattening bulls, cows, etc.). Sheep, horses and goats followed, while other animals were mentioned only in passing.

The fertility of most farms was at the level of the average fertility in the given district. Nevertheless, more than a third of farmers rate the fertility of their land as significantly or slightly worse compared to the average in the district. Farmers usually do not use the services of advisers in this area at all or use them only in longer time intervals.

In another category of questions, farmers expressed their agreement with six different statements that related to their approach to farming, environmental protection and technology. Among these statements appeared, for example, "*Food production is the only goal of agriculture*" and "*Profit maximization is the only goal of agricultural management*", which were intended to shed light on the attitude of farmers. Other statements, such as "*It is important that agriculture is perceived by society as environmentally friendly*" and "*Protecting the environment is an important task for farmers*", explored how farmers approach nature conservation. The statements "*I always make time to contact other farmers*" and "*We like to use new technologies as soon as they become available*" showed the farmers' openness and their social sensibilities. Many farmers expressed agreeable opinions, which indicates their approach focused on innovation and environmental protection. On the issue of profit maximization, however, opinions were almost equal.

The last general section focused on socio-economic data. Most of the interviewees were men, and the most common age group ranged from 35 to 64 years old. In terms of education, many respondents have obtained a university education at the level of a master's degree or a bachelor's degree or have a high school diploma in the field. Only a few respondents have completed an apprenticeship, and almost one-third of the respondents have no education in the field of agriculture. The largest share was made up of farmers who have been working in the field for 11 to 21 years (32 %). Groups with shorter and longer work experience were also significantly represented.

3.2. Previous Experience with AECM

This specified block focused on specific measures and their implementation. The majority of the respondents had never participated in the bio-belts measures, while the answers to the questions about the TG were balanced. Negative responses also prevailed for the AECM grassing of arable land measure.

The majority of farmers who stated that they do not implement AECM are aware of its existence (74 % for bio-belts, 63 % for TG, and 80 % for grassing). However, not even half of the respondents could imagine the application of the second two measures on their fields, while for bio-belts this potential is slightly higher at 60 %. Among the main reasons for involvement in AECM, aspects such as compliance with management, benefit for the environment, and financial support appeared most often. For TG, the range of reasons was wider, including, for example, carbon sequestration and the image of the farmer in society. The reasons for non-participation in AECM were various, but among the main ones appeared excessive bureaucratic burden and inconsistency with the management style of the given company. Some farmers also mentioned concerns about high penalties, strict rules and restrictions, as well as insufficient financial support. For the bio-belts measure, there were also doubts about its effectiveness and demandingness. Farmers who could not imagine the application of AECM on their plots cited inconsistency with the management of their farm and the lack of the necessary technologies. However, all available claims were mentioned in the answers.

3.3. The Influence of Factors on the Implementation of AECM

3.3.1. Influence of General Characteristics

At the beginning, an analysis of the differences in the relative area of arable land across different types of farms was carried out. As expected, the highest mean values were for cooperatives and trading companies, both for arable land and permanent grassland (ANOVA, $p = 1.16E{-}08$; ANOVA, $p = 0.00333$). Also, the average area of rented land turned out to be the highest among these two groups (ANOVA, $p = 5.72E{-}10$).

As a percentage of the ratio of leased land to the total area of the farm, the highest average values were recorded for farm associations, which reach almost 75 %. They were followed by individual full-time farms with 50 % of leased land. The influence of management on the representation of different soil cultures was also investigated. Conventional farms show the highest percentage of arable land among all farm types, while organic farms dominate the proportion of permanent grassland and leased land.

Another focus of the research was to assess whether the type of farm affects the size of the plot on which specific AECM measures are applied. A significant result was recorded only for the grassland treatment measure, where commercial and joint-stock companies showed the highest average values (ANOVA, $p = 0.0919$). No significant results were found in the other statistical analyses, which related to the comparison of management and AECM acreage (ANOVA, $p = 0.3$).

Evidence-based results were obtained using Spearman's correlation coefficient, which examined the influence of the area of soil culture on the area of the TG

measure. In the case of TG, a weak positive correlation was found (ρ = 0.3459714, $p = 0.04311$), which indicates that the larger the area of arable land the farm manages, the larger the area AECM implements. The correlation between TG and PG measurements showed a strongly positive value (ρ = 0.9956125, $p < 2.2E{-}16$). A positive correlation was also found between the area of leased land and the area of TG (ρ = 0.6894343, $p = 1.068E{-}05$). When comparing the proportional representation of leased land, the correlation was weaker (ρ = 0.402519, $p = 0.01152$).

The correlation between the soil fertility rate and the application of the TG measure showed a weakly negative value, indicating that decreasing soil fertility is associated with a higher application of this measure (ρ = −0.4132802, $p = 0.02232$) (Fig. 1).

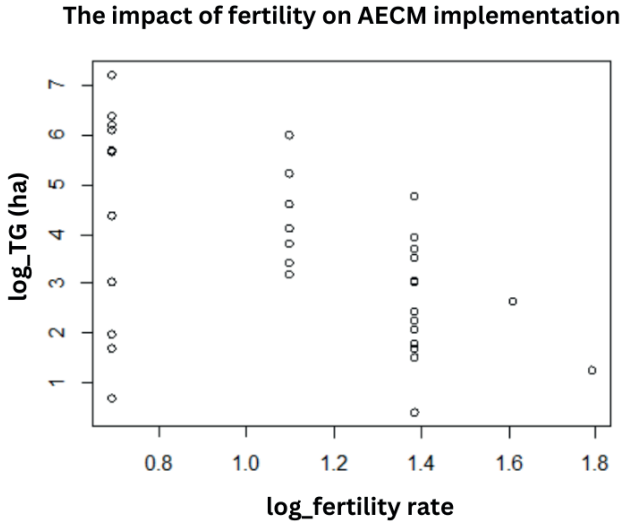

Fig. 1. Spearman's correlation coefficient of TG area and soil fertility rate in the region of interest area of South Moravia.

3.3.2. The Influence of Farmers' Personal Opinion

Another area of analysis was the farmers' attitudinal statements, specifically their level of agreement with various statements. In the case of the bio-belt measure, no significant results were found. On the other hand, some tests showed significance for arable land grassing and grassland treatment measures. Farmers who participated in the TG showed a stronger agreement with the importance of the perception of the farmer in society (t-test, $p = 0.01568$) (Fig. 2, 1). Those who applied AECM grassing of arable land were more likely to agree that contact with other farmers is important (t-test, $p = 0.0651$), and their opinions were mainly positive or neutral (Fig. 2, 2). Regarding openness to new technologies, the results showed similar tendencies, with farmers using AECM showing a greater willingness to adopt these technologies (t-test, $p = 0.03258$) (Fig. 2, 3). Moreover, these farmers emphasized the importance of profit maximization (t-test, $p = 0.0351$) (Fig. 2, 4).

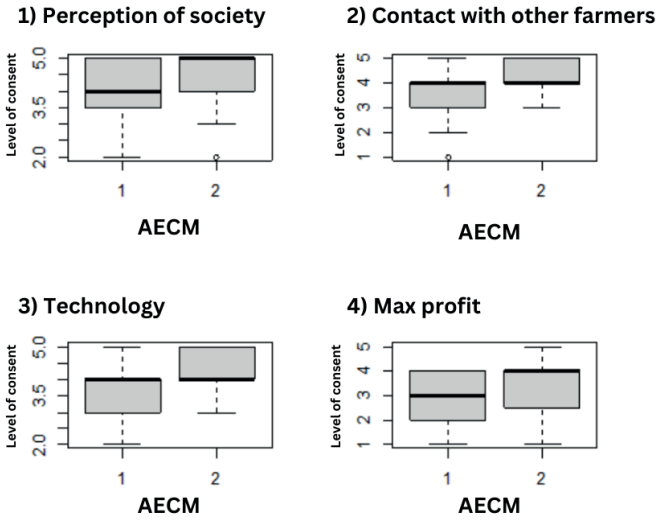

Fig. 2. Level of agreement with opinion statements from the questionnaire among farms applying (2) or not applying (1) AECM in the interest area of South Moravia.

For farmers who expressed agreement with the statement "Food production is the only goal of agriculture", a weak positive correlation was noted with the rate of application of TG measures ($\rho = 0.4025671$, $p = 0.013334$). This suggests that AECM is more often implemented by those farmers who agree with this view.

3.3.3. Influence of Socioeconomic Factors

The results of the research showed that education does not affect the implementation of AECM in the analysed area. On the contrary, respondents who implemented AECM, specifically the arable land grassing measure, had on average longer work experience in agriculture (t-test, $p = 0.1069$) (Fig. 3, 1). Also, for the TG measure, a higher average age group was observed for those who applied AECM (ANOVA, $p = 0.001291$) (Fig. 3, 2).

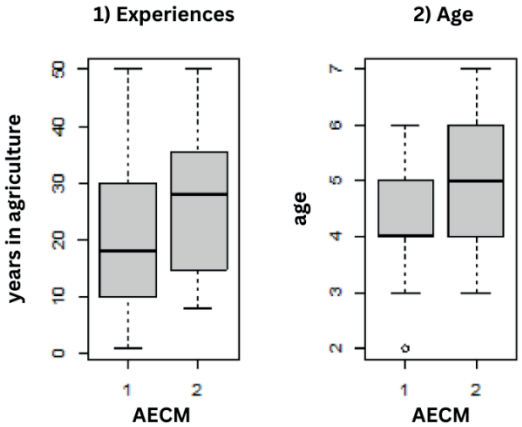

Fig. 3. The influence of experience in the field (1) and farmer age (2) on the implementation of AEKO in the area of interest of South Moravia.

4. DISCUSSION

Research in South Moravia shows that the region is home to a diverse group of farmers, with a predominance of experienced, middle-aged farmers with a high level of education. They mostly understand the importance of environmental protection and are interested in modern technologies. The fertility of the fields in the region corresponds to the average, but the certification of organic farming (bio) and the application of agroforestry and ecological measures (AECM) are at a low level. The main obstacle to the implementation of these measures is the inconsistency with economic practices on farms. In a region with fertile Blacklands farmers are production-oriented, and the choice of plots for AECM often depends on the characteristics of the farm and the landscape (Paulus et al., 2022).

The analysis shows that farms with a larger share of leased land apply AECM more often, which contradicts international findings. The reason may be that cooperatives and joint-stock companies have more possibilities to implement AECM due to the larger area of land. Conversely, smaller farms with lower yields are more involved in AECM, although this may not have the same environmental impact as expected by the EU (Brown et al., 2021). Financial subsidies have a positive effect on participation in AECM, with farmers more likely to use simple measures to compensate for losses from barren land (Bartkowski et al., 2023).

From a socio-demographic point of view, the age and experience of the farmer play a role. More educated and longer-working farmers apply AECM more often, but in the region, there is still a significant share of respondents without higher education. Older farmers are more likely to be involved in AECM, probably due to greater experience and knowledge of subsidy mechanisms (Lastra-Bravo et al., 2015). At the same time, it is necessary to support young farmers who are promising but often insufficiently addressed within the framework of AECM.

Organic farms, which have a higher proportion of permanent grassland, show that ecological approaches to farming are key to environmental protection. In contrast, conventional farms focus more on food production. However, the application of AECM alone did not lead to sufficient changes in sustainable management (Bartkowski et al., 2023).

The introduction of AECM should be more focused on a wider spectrum of farmers, including simpler subsidy titles. Education and the availability of advisory services, which are often insufficient for farmers, are key. Indeed, many farmers are reluctant to accept external interventions in their way of farming. To improve the situation, counseling services need to be free and accessible.

Regional projects that involve farmers in the decision-making process of measures could improve the efficiency of AECM and reduce bureaucracy (De Krom, 2017). This approach would encourage greater flexibility and adaptation of the rules to the needs of farmers, which could contribute to a greater willingness to participate in AECM. Fears of financial penalties and inappropriate measures resulting from a lack of understanding of the rules are still one of the main obstacles to the application of AECM in the EU (Zinngrebe et al., 2017).

CONCLUSIONS

In this study, the opinion of farmers from South Moravia on AECM subsidies was investigated through a questionnaire survey, which included 72 respondents from different types of farms. Many respondents farmed conventionally on leased land and considered AECM a beneficial source of additional income that compensates for losses from non-productive fields. A positive impact on the environment was also mentioned, but sceptical views were based on bureaucracy, lack of financial support and little positive impact on the environment.

Farms with larger land areas were more likely to apply AECM, and a positive correlation was found between the size of the area and the adoption of these measures. Older farmers and those with longer experience were more involved in AECM. Motivating factors, such as the positive influence of financial support, are in line with international trends, while farmers' opinions differ according to the socio-economic conditions of individual countries.

Dissatisfaction with AECM is often related to bureaucracy and insufficient support. In the future, not only financial support would be effective, but also advisory services that would facilitate the implementation of measures. Regional cooperation with farmers could contribute to more efficient planning and improvement of conditions for farmers within the framework of the CAP.

ACKNOWLEDGMENT

This work has been supported by Grant 066/2023/S, funded by the Grantová Agentura Jihočeská univerzita v Českých Budějovicích.

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AUTHORS' SHORT BIOGRAPHY

Kateřina Mazancová is an academic, holding a Master's degree in Finance and Accounting from the University of South Bohemia in České Budějovice. She completed her Master's studies in Finance and Accounting and subsequently embarked on a doctoral journey. In 2022, she was admitted to the prestigious doctoral program in Economics and Management. During her academic journey, K. Mazancová has displayed a keen interest in taxation, with a particular focus on the taxation of cryptocurrencies. Her Master's thesis, titled "Cryptocurrencies in terms of tax burden for a particular entity," provided valuable insights into the tax implications of cryptocurrencies for specific entities. Mazancová is currently a PhD student at the University of South Bohemia in České Budějovice, where she continues to explore the motivational effect and importance of subsidies and payments for agricultural entrepreneurship in the Czech Republic. Her work underscores her commitment to advancing knowledge in this domain.

Email: mazank01@jcu.cz

ORCID iD: https://orcid.org/0000-0002-2677-8027