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European Union Agri-Environmental Support and Agricultural Competitiveness: an Empirical Approach

SUMMARY

The study examines the farmers' perception of the financial incentive role of the Agro-Ecological Program (AEP) in the context of the Common Agricultural Policy of the European Union, in comparison with the Agricultural-Environmental Management Program (AEM). The empirical analysis is based on a questionnaire survey among farmers in Szabolcs-Szatmár-Bereg county (N = 80). Due to the ordinal measurement level variables, non-parametric statistical methods – Spearman's rank correlation and chi-square tests – were used. The results do not show a significant relationship between the assessment of the financial incentive nature of the AEP and the perceived improvement in competitiveness, and the characteristics of the plant do not significantly influence the evaluation of the incentive effect. According to the findings, the AEP appears primarily as a compliance and environmental protection tool and is less integrated into the financial planning and decision support processes of farms. The study points to the importance of the perceived role of financial incentives and provides useful guidelines for policy makers on the need for a controller-based approach.

Keywords: agricultural supports, agro-ecological program, agri-environmental management, financial incentives, farm competitiveness

JEL-codes: Q001, Q14,

INTRODUCTION

Agricultural support systems are one of the most important institutional pillars of the operation of modern agricultural farms, especially in the member states of the European Union, where the interventions implemented within the framework of the Common Agricultural Policy (CAP) serve not only income support, but also structural, environmental and competitiveness goals (Miklós, 2023). The peculiarities of the agricultural sector – the exposure to natural risks and the challenges associated with environmental and climate change – justify the use of subsidies at the state and EU level, but at the same time, the

question of the effectiveness and incentive nature of the subsidies arises more and more strongly (Hargita, 2005).

The new support tools introduced in the 2023-2027 CAP period, including the Agro-Ecology Program, place more emphasis than before on sustainability, improving environmental performance and integrating ecological aspects into agricultural production (Magyarné, 2024). The purpose of the Program is to encourage farmers to use practices that contribute, for example, to preserving soil quality, increasing biodiversity and strengthening the ability to adapt to climate change. However, the realization of these goals requires additional expenses, adaptation costs, and changes on the part of the farmers, which can only be undertaken in the long term if the financial incentive of the Program can be properly perceived (Takácsné, 2020).

From the point of view of the evaluation of the support programs, it is therefore a key question whether they not only formally compensate the costs arising from environmental protection regulations, but whether they are actually integrated into the economic decisions of the farmers. Subsidies can be considered an effective incentive tool if they contribute to the efficiency of the economy, improve the income-cost ratio, and support the maintenance or increase of competitiveness in a measurable way (Mizik, 2004). If the financial impact of a support scheme does not appear clearly in the judgment of farmers, the incentive function may weaken, which may lead to a decrease in willingness to participate and partial realization of the program's goals.

In domestic farming practice, the basis of comparison of the Agro-Ecological Program is the Agricultural-Environmental Management program, which has a longer history and whose role as a financial incentive is relatively well known among farmers. The differences between the AEP and the AEM – both in terms of the support logic, obligations and compensation mechanisms – justify the comparison of the two programs at the level of farmer opinions. A particularly relevant question is how far the producers perceive the AEP as an independent, financially motivating tool, and how far they see it as an additional or alternative program of the AEM.

LITERATURE REVIEW

The examination of the economic role, incentive effect and competitiveness consequences of agricultural subsidies is one of the priority areas of the agrarian economics and agrarian

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policy literature. Numerous studies emphasize that support systems cannot be interpreted merely as a means of supplementing income, but influence the decisions of farmers and the long-term performance of farms through complex economic and behavioral impact mechanisms.

Agricultural subsidies and economic incentives

One of the basic goals of the Common Agricultural Policy (CAP) is to stabilize the income of agricultural producers and mitigate market risks. On the other hand, the incentive role of subsidies has long been the subject of debate in the literature. According to the OECD (2011) analysis, subsidies can moderate income fluctuations, but they can distort production decisions if they are not properly targeted. Matthews (2018) emphasizes that the economic impact of subsidies depends to a large extent on their construction, especially on the extent to which farmers perceive them as a real, net financial advantage.

Several empirical studies have concluded that the incentive power of subsidies depends not only on the size of the payments, but also on how well they fit the cost and income structure of the economy (Zhang et al., 2018). This finding is in line with the basic principle that external sources contribute to competitiveness if they can be planned, measured and integrated into the decision support system of the economy.

Agro-environmental subsidies

The Agri-Environmental Management and Agro-Ecology Program subsidies occupy a special place among agricultural support systems, as they serve both environmental and economic purposes. Research emphasizes that the success of the programs depends to a large extent on the ratio of the compensation level and the additional burdens perceived by the farmers (Mettepenningen et al., 2013).

Barnes et al. (2015) empirical analysis, joining agri-environmental protection programs often does not result in a demonstrable improvement in economic performance in the short term, since the costs arising from environmental protection regulations are not always fully offset. At the same time, in the longer term, the preservation of environmental resources and the reduction of production risks can have a positive effect on the stability of the economy (Rockström et al., 2017).

Business opinions and decision-making

International literature discusses the role of economic insights more and more prominently, especially in research based on the results of behavioral economics. Kuhfuss et al. (2016) showed that the simplicity, transparency and predictability of information related to support programs significantly influence the willingness to participate. Dessart et al. (2019), in many cases, farmers do not make decisions solely on the basis of a rational cost-benefit calculation, but on the basis of the perceived financial and administrative burdens of the subsidies.

This approach is particularly relevant for agri-environmental programs, where farmers often have to make short-term economic sacrifices for longer-term environmental benefits with uncertain returns. If the financial incentives are unclear or insufficiently communicated, this can unfortunately lead to a reduction in the incentive power of the programs (OECD, 2017).

Competitiveness and support systems

Studies examining the relationship between subsidies and competitiveness show different results. In their research, Latruffe et al., (2018) found a moderate positive relationship between agri-environment payments and productivity, while other authors reported neutral or contradictory effects (Barnes et al., 2015). The differences can be explained, on the one hand, by the examined time period and, on the other hand, by the different national application of support systems. Norton (1996) emphasizes the issue of competitiveness by saying that external sources make a meaningful contribution to economic performance if their impact is measurable in profitability and efficiency indicators. If subsidies are not integrated into the financial planning processes of the economy, their incentive role remains limited (Kutasi, 2008). It can be concluded that the financial incentive role of subsidies is a complex phenomenon, which is shaped by the subsidy scheme, the farmer's experience and the structural characteristics of the economy. The majority of international research emphasizes the importance of the perceived nature of incentives, but at the same time, fewer empirical studies deal specifically with the relationship between economic perception and competitiveness at the regional level.

METHOD

The research was carried out as a quantitative, descriptive and exploratory empirical investigation, the purpose of which was the statistical analysis of farmers' opinions regarding the financial incentive role of the Agro-Ecological Program. During the methodological design, it was a priority that the applied statistical procedures fit the measurement levels and the characteristics of the sample. The basis of the empirical analysis is a questionnaire survey conducted as part of primary data collection. During the data collection, a total of 80 evaluable questionnaires were processed (N = 80). Only agricultural producers operating in the County of Szabolcs-Szatmár-Bereg were included in the study, who recently came into contact with agricultural support programs aimed at environmental protection, with special regard to the Agro-Ecological Program and the Agricultural-Environmental Management Program.

The territorial delimitation is justified, as the agrarian structure of Szabolcs-Szatmár-Bereg Vármegye provides a suitable field for examining the practical implementation of agro-ecological measures. The Vármegye plays a significant role in domestic agricultural production, especially in the field of field crops and horticultural crops, which makes the analysis of the financial incentive role of the Agro-Ecology Program relevant in this area.

The sample cannot be considered representative of the entire Hungarian agricultural sector, but at the same time it is suitable for exploratory examination of the farmers' perception of the financial incentive role of the Program, as well as the related relationships. The composition of the sample is heterogeneous in terms of management profile, farm size and professional experience, which enabled comparisons between different groups.

The questionnaire was divided into several thematic blocks. The first block concerned the participation of farmers in various support programs for environmental protection (AEP, AEM, ECO, Natura 2000). The second block focused on measuring attitudes related to the Agro-Ecology Program, while

the third block included demographic and economic background variables.

The central variable of the research was the assessment of the financial incentive role of the Agro-Ecological Program, which was operationalized with a statement measured on a five-point Likert scale (1 = I do not agree at all; 5 = I completely agree). The perception of the impact of the Agro-Ecology Program on competitiveness was included as an additional analysis variable, also on a five-point ordinal scale.

The explanatory variables included:

- farming profile (plant cultivation, mixed, horticulture),
- professional experience, which was transformed into a dummy variable (0 = below average experience, 1 = above average experience),
- age,
- sales revenue,
- plant size.

Given that the investigated attitude variables are of ordinal measurement level, and the number of elements in the sample is relatively limited, we used non-parametric statistical methods during the research. As a first step in the analysis, descriptive statistics were prepared to present the basic characteristics of the sample. Spearman's rank correlation coefficient was used to examine the correlations, which is suitable for revealing monotonic relationships between ordinal variables. The statistical significance of the correlations was evaluated with a two-sided test at a significance level of 5%. Cross-tab analysis and chi-square test were used to analyze the differences between the different groups. This method made it possible to examine whether, based on the farmer's profile and experience, significant differences can be demonstrated in the assessment of the financial incentive role of the Agro-Ecological Program.

RESULTS

During the presentation of the results, in line with the objectives of the research, we first describe the main characteristics of the sample, and then analyze in detail the relationships related to the financial incentive role of the Agro-Ecological Program. During the analysis, we pay special attention to the interpretation of individual statistical results from the point of view of economic decision-making.

Descriptive statistical characteristics of the sample

The 80 farmers involved in the study are engaged in agricultural activities in the County of Szabolcs-Szatmár-Bereg. The composition of the sample is heterogeneous in terms of farmer profile, farm size and professional experience, which enabled a comparative analysis of different farm types. Among the respondents, the largest proportion of farms involved in crop cultivation were present, followed by farms with a mixed profile, while horticultural farms were present in a smaller proportion. The distribution of professional experience can be considered balanced, as the sample includes farmers starting their careers as well as producers with decades of experience. There is also a significant deviation in terms of plant size and sales revenue,

Table 1: Main structural characteristics of the sample (N=80)

Examined feature	Finding
Business profile	Plant growing dominance, significant mixed proportion
Professional experience	Scattered on a wide scale
Plant size	Predominance of small and medium-sized farms

Source: own editing

Table 2: The relationship between the financial incentive role of AEP and competitiveness

Correlation Matrix			
		AEP is not financially stimulating, AEM is	AEP improved the competitiveness of its economy
AEP is not financially stimulating, AEM is	Spearman's rho	—	
	df	—	
	p-value	—	
AEP improved the competitiveness of its economy	Spearman's rho	0.023	—
	df	78	—
	p-value	0.838	—

Source: own editing

which supports the diversity of the sample. I. táblázat: A minta főbb strukturális jellemzői (N=80)

Examination of the financial incentive role of the AEP and the relationship between competitiveness

One of the central questions of the research was whether a statistically interpretable relationship could be demonstrated between the assessment of the financial incentive role of the Agro-Ecology Program and the improvement in competitiveness perceived by farmers. Spearman's rank correlation analysis was used to examine this.

Based on the results of the analysis, an extremely weak positive relationship can be observed between the two variables ($\rho = 0.023$), which, however, is not statistically significant ($p = 0.838$). This means that a monotonic relationship cannot be verified in the examined sample, according to which a stronger perception of the financial incentive nature of the AEP would go hand in hand with an improvement in the competitiveness of the economy.

There is no significant correlation, no statistically verifiable relationship between the two variables. The result indicates that farmers do not necessarily perceive the financial elements of the AEP as a factor that directly improves competitiveness, and the impact of the Program is not clearly reflected in perceptions linked to economic performance.

The role of the economic profile in assessing the incentive effect

In the next analysis step, we investigated whether the farmer profile (plant cultivation, mixed, horticulture) influences the assessment of the financial incentive role of the AEP. Cross-tab analysis and chi-square test were used to explore the relationship.

Based on the results, no statistically significant difference can be detected between the farmer profiles in the perception of the financial incentive nature of the AEP ($\chi^2 = 4.36$; $df =$

8; $p = 0.824$). This suggests that economies with different production orientations evaluate the financial incentive of the Program in a similar way.

The effect of professional experience on the assessment of the financial incentive role of the AEP

During the examination of the role of professional experience, we divided the farmers into two groups. We used a dummy variable: 0=below average farming experience, 1=above average experience.

According to the results of the chi-square test, no significant relationship can be detected between the level of experience and the perception of the financial incentive role of the AEP ($\chi^2 = 5.42$; $df = 4$; $p = 0.247$).

The result indicates that neither farmers at the beginning of their career nor those with longer experience evaluate the financial incentive effect of the AEP differently.

Role of demographic and economic background variables

The investigation also covered how age, sales revenue and company size relate to the perception of the financial incentive nature of the AEP.

Based on Spearman's rank correlation analyses, no statistically significant correlation was detected for any of the background variables. This result suggests that the assessment of the financial incentive role of AEP is relatively uniform among farmers with different demographic and economic characteristics, and cannot be clearly linked to either farm size or economic performance.

Overall, the results show that the financial incentive role of the Agro-Ecological Program in the examined sample is not significantly differentiated according to the characteristics of the farmers and is not closely related to the perceived development of competitiveness. These findings provide an important basis for the interpretation and literature comparison presented in the next chapter.

The results are consistent with international research, according to which the financial incentive effect of agri-environmental protection programs is often not directly reflected in the perception of competitiveness. This indicates that the AEP is not clearly integrated into the decision support system of the economy.

CONCLUSIONS

The aim of the study was to empirically examine the financial incentive role of the Agro-Ecology Program among farmers in the county of Szabolcs-Szatmár-Bereg, with particular regard to the detection of the impact of the Agro-Ecology Program on competitiveness, as well as the correlations with the basic structural characteristics of the farms. The results of the research make it possible to draw several professionally relevant conclusions.

Based on the empirical analyses, it can be concluded that the financial incentive role of the Agro-Ecology Program in the examined sample does not show a statistically verifiable relationship with the improvement of competitiveness perceived by the farmers, the size of the farm, the sales revenue, nor with

Table 3: Influencing factors – profile

Contingency Tables				
	Profile			
The financial incentive role of AEP	Crop production	Miscellaneous	Horticulture	Total
5	9	9	2	20
4	10	4	3	17
3	18	9	2	29
2	6	2	1	9
1	3	2	0	5
Total	46	26	8	80

Source: own editing

Table 4: Chi-square test results based on the farmer profile

Pointer	Value
χ^2	4,36
df	8
p-value	0,824

Source: own editing

Table 5: differences between groups

Contingency Tables			
	Experience		
The financial incentive role of AEP	0	1	Total
5	9	11	20
4	5	12	17
3	8	21	29
2	1	8	9
1	3	2	5
Total	26	54	80

Source: own editing

Table 6: Chi-square test results based on farmer experience

χ^2 Tests			
	Value	df	p
χ^2	5.42	4	0.247
N	80		

Source: own editing

the demographic characteristics of the farmers. All this indicates that the financial elements of the AEP do not clearly appear in the economic decision-making as a factor that would directly contribute to increasing economic performance. The current construction of the AEP can be interpreted primarily along the lines of environmental protection and compliance logic among farmers, while the financial incentive function is relegated to the background. If the financial impact of a support program is not integrated into the economy's planning, cost-benefit analysis and decision support processes, its incentive power may remain limited, even if the program formally provides compensation.

The lack of differences according to the farmer's profile, professional experience and farm size also indicates that the perception of the AEP is relatively homogeneous among different

Table 7: Additional influencing factors: age, sales revenue, company size (ratio scale)

1. Correlation Matrix					
		Age	Sales revenue	Plant size	The financial incentive role of AEP
Age	Spearman's rho	—			
	df	—			
	p-value	—			
Sales revenue	Spearman's rho	-0.110	—		
	df	78	—		
	p-value	0.330	—		
Plant size	Spearman's rho	-0.180	0.733	—	
	df	78	78	—	
	p-value	0.109	<.001	—	
The financial incentive role of AEP	Spearman's rho	-0.077	-0.059	0.059	—
	df	78	78	78	—
	p-value	0.496	0.604	0.604	—

Source: own editing

farm types. On the one hand, this may indicate that the conditions and level of support of the Program are not sufficiently differentiated between farms with different economic conditions, and on the other hand, it raises the possibility that the communication and transparency of financial incentives is not sufficient for farmers to identify farm-specific benefits.

From a practical point of view, the research carries an important message for policy makers. The results draw attention to the fact that the effectiveness of agricultural subsidies for environmental protection does not depend solely on the size of the subsidy amounts, but also on how farmers perceive and interpret their financial incentive nature. The application of a controller-based approach – for example, through simple, economic-level cost-benefit calculations – could contribute to AEP becoming more prominent as a tool supporting conscious economic decision-making.

The results of the study also point to the need for further research. It may be justified to extend the study to a sample with a larger number of elements and covering several regions, as well as to include longitudinal data in order to evaluate the longer-term economic and competitiveness effects of the AEP. In addition, it would be worthwhile to supplement the opinion-based studies with objective financial indicators, such as profitability and cost structure data, which could further strengthen the evaluation of support programs from a controller's point of view.

It can be concluded that the Agro-Ecology Program in its current form does not clearly appear as a financially stimulating tool for farmers in the examined region. In order to increase the effectiveness of the Program, it may be advisable to design, differentiate and communicate more transparently the financial incentives, which in the long term can contribute to the simultaneous enforcement of environmental goals and economic sustainability.

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