PhD THESIS

Dynamics of the implementation and the environmental impact of the Common Agricultural Policy in Maramureș County

(SUMMARY OF Ph. D. THESIS)

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INTRODUCTION

In view of climate change, food-related health problems and global food insecurity as a result of the COVID-19 pandemic and numerous wars, the implementation of agricultural practices in line with the principles of sustainable development is an obligation for mankind.

Over-dosing of chemical fertilisers and pesticides, improper tillage or uncontrolled storage of animal manure are the main sources of environmental degradation, as supported by research by DIAZ et al. (2019). According to SOLAZZO et al. (2016) agriculture contributes 11.7% of total greenhouse gas (GHG) emissions in the European Union (EU). WOLFSON et al. (2021) estimates that agriculture, together with the food industry, generates 30% of total EU GHGs. It's not just the atmosphere that suffers from intensive farming practices. Soil and water pollution and erosion of biodiversity are also caused by environmentally unfriendly farming practices (MAXIM, 2023).

The benefits of the greening scheme or environmental measures have been demonstrated in studies by SOLAZZO et al. (2016) but are insufficient in relation to the intensity of agricultural pollution. A radical change in agricultural environmental policy is needed to improve this ratio.

Modest results in terms of benefits provided to the environment as a result of the implementation of greening measures under the Common Agricultural Policy at EU level, call for a detailed analysis of these at local level. Identifying the needs, constraints and ecological potential of an area is the starting point for the design of climate and environment and rural development measures. Informing the public about the Common Agricultural Policy is also essential to increase the frequency of application of the measures implemented through it and compliance with its requirements.

The modest or minimum requirements of some measures considered beneficial for the environment are the main obstacle to achieving the objectives. In addition, the low share of farms and agricultural areas covered by the greening scheme, introduced by the 2013 reform, is a major contributor to the modest results. Even before its introduction, WESTHOEK et al. (2012) argued that the greening scheme proposed by the European Union's Common Agricultural Policy will not deliver the expected results.

Keywords: Common Agricultural Policy, greening measures, Maramureş county, cost-benefit, development directions.

RESEARCH AIMS AND OBJECTIVES

The modest results obtained after implementing the “go green” measures in EU lie at the very root of establishing the main aim of researches - protecting the environment and the consumers’ health through the use of sustainable and durable agricultural systems and the so-called “environmentally-friendly” politics.

In order to achieve the aim of this paper, we have set the following general objective: *evaluate the National Rural Development Programme and to elaborate a sustainable development strategy for Maramureş County*. In fulfilment of the general research objective, the paper **Dynamics of the implementation and environmental**

impact of the Common Agricultural Policy in Maramureş County has the following specific objectives:

- to determine the contribution of agriculture to the county's economy and to determine the share of the three farming systems in the area, i.e. intensive, traditional and organic farming;
- to identify the ecological potential through a review of existing literature and dialogue with representatives of sustainable development institutions;
- to define the particularities for the four historical-ethnographic areas of the county (Ţara Maramureşului, Ţara Lăpuşului, Ţara Chioarului and Ţara Codrului);
- to highlight the environmental and rural development progress achieved as a result of the implementation of the National Rural Development Programme, tracked through the physical application of a questionnaire to 350 people;
- to determine the physical-chemical water quality parameters by own analyses carried out both in the field and in the laboratory on 45 water samples;
- develop the necessary recommendations to optimise the intervention logic for financial support in relation to the needs and constraints of the area;
- to realise a sustainable development strategy for the county in line with the available resources and the opportunities offered by the CAP.

METHODOLOGY USED IN THE RESEARCH

(I) On the basis of specialised literature and reports drawn up by the European institutions, the effectiveness of the greening scheme and of the measures beneficial for the environment at European Union level included in the Common Agricultural Policy has been evaluated. The results were presented in the form of figures, diagrams, graphs or tables, accompanied by related comments and comparisons. The data obtained are reliable and provided a solid basis for the evaluation of greening measures in Maramureş.

(II) The evaluation of greening and rural development measures in Maramureş County was carried out by means of a questionnaire, which was applied physically to 350 people. This method is well established in obtaining quantitative data. The questionnaire includes questions about the frequency of direct payments and measures applied, the costs incurred for the implementation of environmental measures or the farming practices on farms. Natural and area-specific constraints or direct payments and measures prioritised for the National Strategic Plan 2021-2027 completed the question box. The results of the research were statistically processed using MedCalc® statistical software version 22.021 (MedCalc Software Ltd, Ostend, Belgium, 2024).

(III) The characterisation of the environmental quality status was carried out by determining the physico-chemical parameters for 45 water samples, both in the field, using certified and accepted apparatus for such studies, and in the laboratory using Spectroquant test kits and photocolorimeter type photoLab S12 (WTW Germany). Sampling, preservation and handling of water samples or parameter determinations were carried out in accordance with the standards laid down in the national legislation in force. The indicators used to assess agricultural pollution on water bodies in the

county are nitrates, nitrites, ammonium and phosphates, dissolved oxygen and chemical oxygen consumption. The statistical analysis was carried out using the XLSTAT programme.

(IV) The identification of the ecological potential of the area and the elaboration of a sustainable development strategy involved the use of various research methods commonly used in the specialised literature. These include analysing, summarising or comparing, as well as being physically present in each administrative-territorial unit to visually check the results obtained. The development guidelines were drawn up on the basis of the county's potential, following development models established at national or international level, in accordance with the opportunities offered by the Common Agricultural Policy of the European Union.

STRUCTURE OF THE PAPER

The PhD thesis entitled *Dynamics of implementation and environmental impact of the Common Agricultural Policy in Maramureş County* is divided into two distinct parts. The first part of the research covers information on the current state of knowledge and is composed of the first five chapters of the thesis.

Chapters I-V present the impact of the different farming systems on the environment and the composition of the Common Agricultural Policy, both at EU level and in Romania, from its inception to the present.

The second part of the thesis is for personal contribution and consists of nine chapters. The first chapters cover the purpose of the own research, the description of the study area and the material and method of work. The next four chapters are devoted to personal studies, and the last two chapters are dedicated to the conclusions drawn from the research and innovative contributions of the thesis. For the realisation of this thesis a total of 156 bibliographical sources were consulted, of which 144 from the specialised scientific literature.

Chapter VI, deals with the geographical and socio-economic framework of Maramureş County, providing data about the research area. This chapter presents geographical, economic and demographic information. It also provides a description of natural resources and the agricultural sector.

Chapter VII, entitled Aim and objectives of the own research, presents the arguments that underpinned the establishment of the main aim of the thesis and the seven specific objectives. Translating them into practice was done by elaborating a strategy consisting of a bibliographical study, identification of the state of the art, needs analysis and the directions to be followed in order to achieve the targets proposed in the research.

Chapter VIII entitled ,,Material and working method'' deals with the particularities of the four areas that make up the county of Maramureş (Ţara Maramureşului, Ţara Lăpuşului, Ţara Chioarului and Ţara Codrului). The interview method was used to assess the dynamics of implementation of the Common Agricultural Policy in each area and to determine their ecological potential. The assessment of the environmental quality status was carried out by determining physical-chemical parameters for 45 water samples, both in the field and in the laboratory. The indicators needed to characterise the water quality status and the

contribution of agriculture to environmental pollution were thus obtained. Based on the results, the main directions for the sustainable development of the county have been outlined.

RESULTS AND DISCUSSIONS

Chapter IX deals with the „Effectiveness of greening measures under the Common Agricultural Policy on the environment at EU level''**.** On the basis of literature and reports produced by the European institutions, the number of farms under the greening scheme and the effectiveness of environmental measures were analysed. Of the 10.2 million agricultural holdings in the EU, around 6.8 million (66.7%) are subject to the CAP and only 2.4 million (23.5%) are subject to the greening scheme (EUROPEAN COURT OF AUDITORS, 2017). According to the same institution, the scheme has identified changes in farming practices on up to 4.5% of the EU's agricultural area. What's more, some greening requirements were met even before greening was introduced. ARFINI et al. (2013) identified a large number of farms that are exempt from greening requirements.

A slight reduction in GHG emissions is observed in northern Italy, averaging 0.2 per cent (GOCHT et al., 2017). This is also confirmed by SOLAZZO et al. (2016) which showed a decrease of 2% for CO_2, 2.1% for NO_2 and 0.4% for CH_4. PELIKAN et al. (2015) showed a 1.8% reduction in EU GHG emissions from greening. Contributions of the scheme have also been identified in improving soil structure (WALKER et al., 2018). However, PE'ER et al. (2019) argue that the cost-benefit ratio is unfair because the subsidies are higher in relation to the costs of implementing greening measures or the benefits provided.

The results obtained at the European Union level were the starting point for setting the objectives for the research carried out in Maramureş County, but also a benchmark for comparing the results obtained in our research.

Chapter X follows **„**The dynamics of the application of the Common Agricultural Policy in Maramureş County and the impact of this policy on the environment''. The results were obtained by physically administering a questionnaire to 350 people. Thus, the frequency of direct payments and the applicability for voluntary environmental and climate as well as sustainable development measures have been established. The costs incurred by farmers for the implementation of the measures were also determined in relation to the subsidies received, establishing the cost-benefit ratio.

The main direct payments received are: area payment, transitional national aid, payment for greening scheme and redistributive payment. Among the voluntary measures, the highest applicability was found for measure M 13 - payments to administrative territorial units designated as less-favoured areas due to natural or specific constraints and for the component envelopes of measure M 10 - agri-environment and climate. Farmers' behaviour shows that they want more or less the same measures in the future programme, as they already fulfil the conditions.

Only 14.2 per cent of farmers fell under the greening scheme for the crop diversification condition and 7.7 per cent for the inclusion of ecological focus areas. The requirement to maintain permanent grassland was met by 88.6% of farmers, but most of them had met this requirement before. In terms of implementation costs,

96.6% of farmers reported spending less than 30% of the amount of grants received for implementation. Moreover, only 6.3% of farmers claim that they have changed their farming practices as a result of greening or environmental measures. It follows that the majority of farmers fulfilled these requirements before. Essentially, the greening measures still remain a direct payment to farmers. The results demonstrate that much stricter requirements for voluntary measures and a much lower incidence limit for the greening scheme conditions are needed to address a larger number of farms.

In the process of agricultural development, farmers face the following constraints: fragmentation of plots, outdated machinery, lack of integrated supply chains for agricultural products or uncompetitive prices due to imports. In designing the future CAP, particular attention should be paid to constraints and continued subsidisation of farm development measures.

Chapter XI assesses **„**The impact of diffuse pollution due to agricultural activities on groundwater and surface water quality'' in Maramureş County. At this stage, determinations for physical-chemical parameters of water were carried out, both in the field and in the laboratory, for a number of 45 samples, taken from farms or rivers in the county. Nitrate, nitrite, phosphate and ammonium concentrations were determined for these samples. Additionally, dissolved oxygen and chemical oxygen consumption were determined for the 15 main rivers in the county. The purpose of these surveys is to verify compliance with the requirements of greening measures.

Water quality in terms of pH is suitable for human consumption in the case of groundwater, and surface waters are generally in good condition and meet water quality standards. In both cases, all samples are within the maximum permitted limits (6.5-9.5).

As regards the indicator of electrical conductivity, all average values for groundwater are below the maximum permissible limit of 2500 μS/cm, indicating generally good water quality. Slightly higher values were measured in surface waters, but without indicating major pollution problems.

The Ammonium indicator for groundwater shows the highest ammonium values for samples from intensive farms, reflecting the influence of agricultural practices on water quality. Seven of the 26 samples exceeded this limit. For surface waters, out of the 19 samples analysed, only four did not meet the objective of the Water Framework Directive, failing to reach 'Good status'.

The average values of nitrite concentration in groundwater vary between 0.003 mg/l in the Budeşti sample and 0.018 mg/l in the Bârsana sample, all well below the maximum permissible limit of 0.5 mg/l. For surface waters, most of the nitrite concentrations in the analysed samples are around 0.01 mg N/l, indicating a relatively low nitrite concentration in these waters.

The nitrate content in groundwater samples taken from the 26 ATUs ranged from 0.05 mg/l to 3.50 mg/l, all values being below the maximum admissible limit of 50 mg/l. The surface water quality classification shows that the water at most sampling points falls into Class I (concentrations ≤ 1 mg N/l) or Class II quality, indicating good water quality.

Phosphate concentrations in groundwater range from 0.2 mg P/l (Remeți TAU sample) to 2.5 mg P/l (Târgu Lăpuş TAU sample). The samples with higher phosphate values come mainly from intensive farms or from rivers within the radius of the TAUs

characterised by a high proportion of intensive farms. In terms of surface water quality, only site 2 (intensive farm - Seini TAU) complies with the standards of the Water Framework Directive, achieving "Good status" of water quality.

For dissolved oxygen, the average dissolved oxygen level varies from 5.2 mg O_2/l (Săsar river - Baia Mare TAU) to 7.8 mg O_2/l (Bârsău river - Valea Chioarului TAU). With the exception of the sample from the Bârsău river (UAT Valea Chioarului), which falls into Class II quality - "Good status", all samples fall into Class III water quality, a moderate quality, indicating potential pollution.

Results obtained for chemical oxygen consumption in surface water may indicate significant organic matter loading and potential pollution problems. None of the analysed samples are of Class I quality. Most of the samples fall into Class II, indicating moderate chemical oxygen consumption.

Chapter XII is marked by the results obtained during the whole research on Maramureș County, and these have been transposed into the main ,,Directions for the sustainable development of Maramureș County''.

The county's economy is characterised by a high diversity of activities, based on services and export-oriented industry. Secondary activities include logging and woodworking, construction, agriculture and tourism.

The physical-geographical, social, demographic, ecological and cultural criteria were the basis for drawing up the sustainable development guidelines for the county. The main pillars of sustainable development are soil, subsoil, water resources and sustainable agriculture. The potential for renewable energy production, biodiversity, cultural heritage and multiple tourism complete the list of resources the county has at its disposal. Underground resources are among the most abundant in the country.

Given the county's inestimable ecological potential, its valorisation must be achieved by investing in research, innovation and promotion, while at the same time making rational use of natural and cultural resources.

These results mark a starting point for future research on the county's ecological potential. The correct realisation and implementation of a research-based sustainable development strategy will have direct implications for the local, regional and national economy, as certain resources are found in very large quantities, and some of them only in Maramureș County.

GENERAL CONCLUSIONS

Following the results obtained in Maramureș County, we can state that the frequency of direct payments and the applicability for environmental and sustainable development measures are at a satisfactory level. However, changes in farming practices resulting from their implementation are small. Only 14.2% of farmers were covered by the greening scheme in terms of the crop diversification condition and 7.7% were obliged to allocate 5% of the arable area to ecological focus areas. 88.6% complied with the condition to keep the permanent meadows. These percentages do not represent the changes realised as a result of these obligations, as most farmers fulfilled these conditions before. Of the farmers surveyed, 14.2% were exempted from the conditions of the greening scheme. Respondents reported a 6.3 per cent change in farming practices following the implementation of environmental and climate

measures. These results are close to those obtained at EU level, where changes in farming practices of up to 4.5% have been reported. Moreover, 96.6% of farmers expect to spend less than 30% of the subsidies received to implement the measures.

The highest applicability for environment and climate measures was found for measure M 13 - payments for areas designated as less-favoured as a result of handicaps they face (60%), measure M 10 - agri-environment and climate packages (44.6%) and measure M 11 - conversion to or maintenance of organic farming (13.1%). Even if there is a high frequency for environmental measures, the conditions imposed are modest or non-existent, as in the case of measure M 13. It is restricted to certain localities and does not impose any restrictions. Organic farming is mainly represented by traditional orchards, where farmer intervention is minimal or non-existent. In essence, some measures remain a direct payment, without changing farmers' behaviour.

The environmental quality status, assessed through surface water and groundwater quality, confirms some pollutant inputs from diffuse sources such as agriculture or anthropogenic activities, but does not reveal serious pollution from agriculture.

The measured values for the pH of the water and the measured values for the electrical conductivity of the water are within the maximum permissible limit for all 45 samples.

The Ammonium indicator for groundwater shows the highest values for samples taken from intensive farms, exceeding the maximum allowable limit for 7 of the samples. In the case of surface waters, only four samples do not meet the objective of the Water Framework Directive, failing to reach 'Good status'.

Nitrite concentrations in groundwater vary between 0.003 mg/l and 0.018 mg/l, all below the maximum permitted limit of 0.5 mg/l. For surface waters, almost all concentrations are around 0.01 mg N/l, indicating a relatively low nitrite concentration without indicating significant pollutant inputs.

The nitrate content in groundwater ranges from 0.05 mg/l to 3.50 mg/l, all values falling below the maximum permitted limit of 50 mg/l. In the case of surface waters, the majority of the samples fall into Quality Class I (concentrations ≤ 1 mg N/l) and Quality Class II, indicating good water quality.

Phosphate concentrations in groundwater range from 0.2 mg P/l to 2.5 mg P/l. Higher phosphate values were mainly found in samples from intensive farms. In terms of surface water quality, only one sample meets the standards of the Water Framework Directive, achieving "Good status".

In terms of dissolved oxygen, the average dissolved oxygen level varies within close limits from 5.2 mg O_2/l to 7.8 mg O_2/l. With the exception of one sample, which falls into Quality Class II - "Good condition", all samples fall into Water Quality Class III, indicating potential pollutant inputs.

Values obtained for chemical oxygen consumption in surface water may indicate significant organic matter loading and potential pollution problems. None of the samples analysed falls into Class I water quality. Most of the samples are of Class II quality, indicating moderate chemical oxygen consumption and possible pollutant inputs.

Based on the state of environmental quality, in conjunction with the ecological potential, we can state that Maramureş County has all the necessary resources for

sustainable development through the Common Agricultural Policy. The county's main pillars of sustainable development are soil and subsoil resources, water resources and sustainable agriculture. The environmentally-recognised potential for renewable energy production, biodiversity, cultural heritage and multiple tourism complete the list of the county's resources.

Exploiting these pillars in a sustainable way can be achieved by developing a sustainable development strategy for the county, based on scientific results and targeting the ecological potential of each locality. This requires investment in research, innovation and promotion, through close co-operation between stakeholders.

The results obtained represent a solid basis and a starting point for future research, both in terms of evaluation of the Common Agricultural Policy, environmental quality monitoring and sustainable development guidelines. This research can be easily replicated at both national and international level, as the methodology is very simple and self-explanatory.

SELECTIVE BIBLIOGRAPHY

1. ARFINI, F., DONATI, M., & SOLAZZO, R. (2013). L'impatto della Pac Post-2013 sulla regione Emilia Romagna: un'analisi dell'accordo raggiunto in relazione alle proposte presentate al Trilogo. Agriregionieuropa, 9, 34.
2. CURTEA, E. C., (2017 12 decembrie). Înverzirea, o schemă de sprijin pe venit complexă, însă ineficace din punctul de vedere al impactului asupra mediului. Raportul special 21/2017 (Raport). doi:10.2865/158929. Disponibil la: https://op.europa.eu/webpub/eca/special-reports/greening-21-2017/ro/. Consultat: 18 septembrie 2021.
3. DÍAZ, S., SETTELE, J., BRONDÍZIO, E. S., NGO, H. T., GUÉZE, M., AGARD, J., & ZAYAS, C. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
4. GOCHT, A., CIAIAN, P., BIELZA, M., TERRES, J. M., RŐDER, N., HIMICS, M., & SALPUTRA, G. (2017). EU-wide economic and environmental impacts of CAP greening with high spatial and farm-type detail. Journal of Agricultural Economics, 68(3), 651-681.
5. MAXIM, A., 2023. *Agroecologie*. Editura AcademicPres Cluj-Napoca, 2023, eISBN 978-630-309-071-9
6. PE'ER, G., ZINNGREBE, Y., MOREIRA, F., SIRAMI, C., SCHINDLER, S., MŰLLER, R., & Lakner, S. (2019). A greener path for the EU Common Agricultural Policy. Science, 365(6452), 449-451.
7. PELIKAN, J., BRITZ, W., & HERTEL, T. W. (2015). Green light for green agricultural policies? An analysis at regional and global scales. Journal of Agricultural Economics, 66(1), 1-19
8. SOLAZZO, R. and PIERANGELI, F. (2016). How does greening affect farm behaviour? Trade-off between commitments and sanctions in the Northern Italy. Agricultural Systems.
9. WESTHOEK, H., VAN ZEIJTS, H., WITMER, M., VAN DEN BERG, M., OVERMARS, K., VAN DER ESCH, S., & VAN DER BILT, W. (2012). Greening the CAP. An analysis of the effects of the European Commission's proposals for the Common Agricultural Policy 2014-2020.
10. WOLFSON, J.A., WILLITS-SMITH, A.M., LEUNG, C.W., HELLER, M.C. and ROSE, D. (2022). Cooking at Home, Fast Food, Meat Consumption, and Dietary Carbon Footprint among US Adults. International Journal of Environmental Research and Public Health, 19(2): 853.