OPTIMAL MANAGEMENT APPROACHES FOR KEY FACTORS IN SUSTAINABLE AGRICULTURE

George UNGUREANU[1], Elena LEONTE [1], Eduard BOGHITA, Bianca Antonela UNGUREANU[1]

e-mail: ungurgeo@uaiasi.ro, ungurbia96@yahoo.com

Abstract

The importance of sustainable agricultural development has started to be acknowledged in Romania as well, following the identification of various pollution sources and the restrictions affecting industrial and agricultural pollution, from both economic and ecological perspectives. Sustainable development signifies the necessity of raising awareness about environmental protection and educating the population, and this aspect is mirrored in the evolution of communal policies in recent years. These policies have transitioned from an approach based on constraints and sanctions to a higher level of flexibility, grounded in incentives. The purpose of this paper is to provide recommendations for enhancing the existing policy by evaluating economic incentives aimed at encouraging farmers to adopt sustainable farming systems. These systems should support a viable, sustainable agriculture capable of employing the latest technologies, leading to profitability, efficiency, and economic and organizational consolidation. In recent times, Romania has come to appreciate the critical role that sustainable agricultural practices play in safeguarding both the environment and the economy. The acknowledgment of various pollution sources, encompassing both industrial and agricultural sectors, has prompted a reevaluation of traditional practices in favor of more environmentally conscious approaches. Sustainable agriculture is essential to meet the world's growing food demand while mitigating environmental challenges. To achieve this balance, efficient management of key factors in agriculture is imperative. This paper explores optimal management approaches for several critical factors in sustainable agriculture, including soil health, water resources, biodiversity, and pest control. The integration of innovative techniques, precision agriculture, and policy support is vital for achieving sustainability goals.

Key words: sustainable, development, environmental economics, indicators, strategy

Sustainable agriculture is a holistic approach to farming that aims to meet the present needs for food, fiber, and other plant-derived products without compromising the ability of future generations to meet their needs. Achieving sustainability in agriculture requires optimal management of various key factors, including soil health, water resources, biodiversity, and pest control. This paper delves into the best practices for managing these factors to ensure the longevity of agricultural systems. Maintaining soil health is fundamental to sustainable agriculture. Optimal soil management involves practices such as cover cropping, crop rotation, and organic matter incorporation. Implementing conservation tillage and agroforestry techniques contributes to soil conservation and minimizes erosion, promoting long-term productivity.

The national financial aids for agriculture support were reduced and directed towards the prices control for the basic products and for supporting the consumption, or towards subventions granted for inputs purchase. The use of some inadequate mechanisms of agricultural policy, lacking the performance objectives, determined the maintenance of the agriculture's subsistence character and has not allowed the formation of the sector of the middle commercial farms. In such conditions, it was aggravated the dual character of the Romanian agriculture, being developed a subsistence agriculture and large agricultural enterprises, which could not compete on the European market, and this leaded to the increase of self-consumption and to calling the food imports (Dona I. *et al*,2015).

In other respects, the paper aims to highlight a number of such impact assessment tools in the form of a set of indicators able to provide an overview of the direct and indirect measures stemming from the integration process on agriculture, as well as on the influence of CAP mechanisms on agricultural performance at regional level. Sustainable agriculture is contingent on effective management approaches for key

[1] Iasi University of Life Sciences, Romania

factors. This paper has highlighted optimal strategies for managing soil health, water resources, biodiversity, and precision farming techniques. Implementing these approaches requires collaboration among farmers, researchers, policymakers, and other stakeholders to create a holistic and sustainable agricultural landscape. Adopting optimal management practices will not only ensure food security but also contribute to environmental conservation and the well-being of future generations.

MATERIAL AND METHOD

The methodological and scientific support in this paper was based on a series of direct and indirect documentation such as: observation, analysis (qualitative, quantitative, and historical), synthesis, comparison, systemic, monographic, statistical, figures and tables in the full and complex exposure and rendering of phenomena and economic processes studied.

The theoretical support of the research focused on the study of important scientific papers in the field of economy and management, with reference to the fiscal administration and the current problems in the public finances.

RESULTS AND DISCUSSIONS

Thus, Romania adhered to the European Union, with profound structural issues at the level of the agricultural sector. In our country, the number of subsistent and semi-subsistent farms is very high, predominating the agricultural exploitations leaded by the elder farmers, and the food industry is insufficiently developed in order to assure an outlet market for the basic agricultural products.

The needs identified at the date of planning the funds for the period 2014-2021 were multiple, among them finding: the modernization and restructuring of the non-performing exploitations; increase of labour productivity and of the level of education and competitiveness of agriculture; support of associations and incorporation of groups of producers, the modernization and restructuring of the small enterprises from the agro-alimentary processing sector and from the forestry sector, with weak scale economies, the reduced use of the capacities and the low level of compliance with the European standards, etc El Benni N., Finger R. 2021.

In such conditions, the main objectives aimed along with the implementation of CAP 2014-2021 were the formation of the commercial sector of the middle family farms, reduction of the number of agricultural farmers and creation of jobs for non-agricultural activities. In order to reach such objectives, there were applied measures of agricultural policy concerning the market and measures for assuring the rural development.

Sustainable development, more than twenty years after the global campaign to promote the concept launched at Rio, remains a concept that is not fully scientifically documented or unified in political discourse. This is because it is not a phenomenon that can be observed, integrated into scientific formulas, and standardized. Instead, it evolves constantly based on new factors, changing interests, and institutional conditions. Sustainable development can be seen as an aspiration to integrate all aspects of development through its three dimensions (economic, social, environmental). It is currently disseminated through documents, conventions, and political programs, but with diverse and interpretable tools for implementation.

However, there is no unified vision of sustainable development. In 2014, the European Union called for the establishment of models of development strategies with specific indicators (ESDN) (ESDN, 2013), including the creation of a sustainable rural development strategy (Committee of the Regions, 2014).

Sustainable development is people-centered, aiming to improve the quality of human life, and it is conservation-based, driven by the need to respect nature's capacity to provide resources and services necessary for life. Thus, sustainable development means "improving the quality of human life while taking care of the capacity of ecosystems" (FAO). "Sustainability is a relationship between dynamic human economic systems and slower ecological systems in which (a) human life can develop indefinitely; (b) individuals can develop; (c) human culture can develop, and (d) the effects of human activities remain within limits so as not to destroy the diversity, complexity, and functionality of life-supporting ecological systems," allowing for the "simultaneous maximization of biological system objectives (genetic diversity, resilience, biological productivity), economic system objectives (satisfying basic needs, increasing useful goods and services), and social system objectives (cultural diversity, social justice, participation)" (Abrahamson K. V., 1997).

The term "sustainable development" is considered to have been introduced globally in 1980 (Kates R.W *et al*, 2001) by the International Union for the Conservation of Nature and Natural Resources (IUCN) as part of the World Conservation Strategy (WCS), although it was initially associated with the idea of ecological sustainability (IUCN, 1980). In 1987, the World

Commission on Environment and Development (WCED), also known as the Brundtland Commission, provided the following definition in its Brundtland Report: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Building on this definition, the Commission established the following operational objectives: restarting economic growth; changing the quality of economic growth; meeting essential needs for jobs, food, energy, water, and sanitation; ensuring a sustainable level of population; conserving and enhancing basic resources; redirecting technology and managing risks; integrating environment and economics in decision-making; reorienting international economic relations.

The report also emphasized that sustainable development requires political changes in various sectors and coherence among them because it must balance the economic, social, and environmental objectives of society (the three pillars of sustainable development) and integrate them through supportive practices and policies

The evaluation of the consequences arising from mechanisms of communitarian support emerges as a crucial concern in the development and promotion of effective agricultural policies. Understanding the implications of these support mechanisms is essential for crafting policies that not only address immediate needs but also contribute to the long-term sustainability and success of the agricultural sector.

By delving into the intricacies of communitarian support mechanisms, policymakers can gain valuable insights into the dynamics that influence the agricultural landscape. This assessment encompasses a comprehensive understanding of how community-based initiatives impact farmers, rural communities, and the broader agricultural economy. It involves scrutinizing the social, economic, and environmental implications to ensure that policies align with the overarching goals of fostering resilience, inclusivity, and sustainability. The high number of exploitations of small dimensions, the low level of absorption of the communitarian funds due to the weak capitalization and bureaucracy, the dependence of the economic performances on the volume of subventions, the low productivity of agriculture, especially for small and middle exploitations, etc. are only several of the issues that should be dealt by the Romanian agriculture, especially in relation with the use of the communitarian support, creating long term negative effects on the performances of the agricultural exploitations and on the development of the agricultural sector.

The 2021-2022 IMF, approved in November 2021 (Council of the European Union, 2021), reveals a reduction in agricultural policy spending over the coming period. The amount allocated to the CAP amounts to 362.8 billion euros, 37.8% of the total EU budget (less than 47.1% in 2014-2021). Thus, in 2022, the CAP budget will account for 35% of EU spending, 5% less than in 2021 (*Table 1*).

Table 1

CAP expenses for the period 2021-2022 (2021 constant prices)

	2015	2021	2017	2018	2019	2020	2021	2022	Total
Competitiveness for growth and jobs	18.0	15.6	16.3	16.7	17.7	18.5	19.7	21.1	125.6
Economic, social and territorial cohesion	52.4	44.7	45.4	46.0	46.5	47.0	47.5	47.9	325.1
Sustainable growth: natural resources	59.6	55.9	55.1	54.3	53.4	52.5	51.5	50.6	373.2
Security and Citizenship	2.5	2.1	2.1	2.2	2.2	2.3	2.4	2.5	15.7
Global Europe	9.1	7.9	8.1	8.3	8.4	8.6	8.8	8.8	58.7
Administration	0.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	61.6
Compensation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand total	141.6	134.3	135.3	136.1	137.1	137.9	139.1	140.2	960.0
CAP spending in the EU budget -%	40.3	40.5	39.6	38.8	37.9	37.0	35.9	35.0	37.8
EAGF - %	72.4	74.4	74.4	74.5	74.5	74.5	74.4	74.4	74.5
FEADR - %	23.3	23.0	22.9	22.8	22.7	22.7	22.6	22.6	22.8

The Commission's Multiannual Financial Framework confirms that the structure with two pillars of the CAP is retained by EUR 277.8 billion allocated for direct payments and market measures in Pillar I, while EUR 84.9 billion is earmarked for rural development expenditure under Pillar 2. The Commission proposes and another € 3.5 billion for agricultural crisis management measures to be financed outside of the multiannual financial framework. This leads to the establishment of an emergency mechanism to combat crisis situations in order to provide immediate support to farmers in an accelerated procedure. (Dona I. *et al*, 2021, based on European Commission data).

The performance of large farms increased in 2014-2021 by approx. 39-45%, but the net added value per hectare was much lower than the one recorded in small-scale firms (*Table 2*). On the other hand, labour productivity reached very high values of approx. 20000-30000 euro / AWU, respectively approx. 3-7 times higher than in 2014, while on small farms, although rising, labour productivity is approx. 2700 euro / AWU.

Table 2

Evolution of the net added value per hectare and labour productivity, on standard value categories, for the period 2014-2021

	2014		2021		2021/2014 (%)	
	VAN/ha	VAN/AWU	VAN/ha	VAN/AWU	VAN/ha	VAN/AWU
(1) 2 000 - < 8 000 EUR	672.1	1502.2	783.6	2726.1	116.6	181.5
(2) 8 000 - < 25 000 EUR	753.2	2672.3	913.5	7578.7	121.3	283.6
(3) 25 000 - < 50 000 EUR	861.6	7234.7	718.4	15524.9	83.4	214.6
(4) 50 000 - < 100 000 EUR	360.6	5589.2	523.3	22924.4	145.1	410.2
(5) 100 000 - < 500 000 EUR	358.9	10137.5	498.5	32375.3	138.9	319.4
(6) >= 500 000 EUR	365.8	9474.1	767.3	37707.6	209.8	398.0

Source: FADN processing (RICA)

The analysis of economic performances shows that in 2021, without receiving subsidies, most farms would have lost, except for small farms with lower consumption of inputs.

In 2021, the income rate varied between 54.1% and 90.7%, while without subsidies the income rate reached only 25.6-65.7%. Major increases in economic performance compared to 2014 were recorded mainly on farms with a standard value ranging from 8000 to 100000 euro / exploitation. In 2021, the most important subsidies were direct payments, followed by other grants and complementary national payments (*Table 3*) (FADN processing RICA).

On the other hand, labour productivity reached very high values in the livestock sector (about 118 thousand euro / AWU), 243.5% more than in 2014, and in field crops (about 16 thousand euro / AWU) where the increase was 515.8%.

The analysis of economic performance shows that in 2014 without receiving subsidies the farms in the field crops and granivores would have lost, while the wine sector had a negative income rate due to the unfavourable climatic conditions (*Table 3*). In 2021, the income ratio varied between 26.5% in horticulture and 85.5% in the dairy cow sector, while without subsidies the income rate reached only 22.1-62.6%. Major increases in economic performance compared to 2014 were recorded mainly in the livestock sector and in the wine sector.

Table 3

Evolution of income rates, per sectors, for the period 2014-2021

	2014		2021		2021/2014 (+/-) Percentage points	
	Income rate (%)	Income rate without subsidies (%)	Income rate (%)	Income rate without subsidies (%)	Income rate	Income rate without subsidies
Field crops	19.0	-5.6	56.7	28.1	37.7	33.7
Horticulture	55.1	49.1	26.5	22.1	-28.6	-26.9
Wine	-9.2	-12.7	40.5	26.9	49.7	39.7
Other permanent crops	45.7	38.8	73.0	62.6	27.3	23.8
Milk	85.5	65.6	85.5	60.8	0.0	-4.8
Other grazing livestock	55.8	40.2	81.3	60.6	25.6	20.5
Other granivorous animals	7.8	-12.5	64.8	44.7	56.9	57.3
Mixed	42.9	30.8	69.1	52.1	26.1	21.3

Source: FADN processing (RICA)

The analysis of the subsidy structure in 2021 highlights that the most important subsidies were direct payments for the plant and livestock sector, followed by support for rural development and other subsidies, while in the livestock sector other subsidies were important, complementary national payments and support for rural development.

CONCLUSIONS

Sustainable agriculture is a pressing need in today's world. The urgency for sustainable agriculture in the contemporary world is undeniable, driven by a complex web of interconnected challenges that span environmental, economic, and social dimensions. The imperative for sustainable agricultural practices arises from the recognition that conventional methods, characterized by intensive resource use and environmental impact, are no longer tenable in the face of global population growth, climate change, and dwindling natural resources.

At the heart of this pressing need is the imperative to balance the demands of food production with the preservation of ecosystems. Traditional agricultural practices, marked by extensive use of chemical inputs and monoculture, have resulted in soil degradation, loss of biodiversity, and water pollution. The consequences of these practices not only compromise the long-term fertility of the land but also pose threats to global food security and the resilience of rural communities.

Sustainable agriculture offers a transformative paradigm that seeks harmony between productivity and environmental stewardship. It entails the adoption of practices that conserve soil health, promote biodiversity, and optimize resource use. Crop rotation, agroforestry, and organic farming are among the approaches that prioritize ecological balance, fostering resilience in the face of changing climatic conditions.

The economic dimension of sustainability is equally critical. Sustainable agriculture is an investment in the longevity of farming enterprises. By promoting diversified and resilient farming systems, it mitigates risks associated with climate variability and market fluctuations. Additionally, it opens avenues for small-scale farmers to access niche markets that value environmentally friendly and ethically produced goods.

On the social front, sustainable agriculture contributes to the well-being of farming communities. It encourages local empowerment, fosters knowledge-sharing among farmers, and promotes equitable access to resources. Moreover, sustainable practices often prioritize fair labor practices, recognizing the vital role played by agricultural workers in the food production chain.

In conclusion, the call for sustainable agriculture reverberates as an imperative response to the complex challenges facing our planet. It represents a collective commitment to redefine the way we produce, consume, and think about food. By embracing sustainability in agriculture, we not only safeguard the health of our ecosystems but also pave the way for a resilient, equitable, and food-secure future for generations to come.

The analysis per types of production of the separation per sources of incomes, revealed us that the support through Pillar I – subventions for the vegetal and animal production – was more equally distributed among farms. The contribution of the income sources to forming the total income emphasized that the value of the agricultural production leads to around 67.1% of inequity, the remaining being under the influence of subventions. Among these, the most important contribution was determined by the free payments (21,3%), these being followed by subventions for intermediary consumption and other subventions. The assessment of the effect of the modification of the income sources on the total income:

Incomes from the agricultural production and other subventions lead to the increase of inequity among farms that obtain different products (grains, wine, horticultural products, etc.); increase with 1% of the incomes from the agricultural production leads to the inequity increase with 5.76%;

The subventions lead, generally, to the decrease of inequity between them, especially subventions for the animal production (decrease of 3,33%) and direct payments (with 2,17%);

The analysis per types of specialized farms concerning the discomposure on income sources showed us that the value of the agricultural production leads to 68.8% of inequity, the remaining ones being under the influence of subventions. Among these, the most important contribution was of the free payments (20,8%) and the subventions for the intermediary consumes. The assessment of the effect generated by the modification of the income sources on the total income:

- incomes from the agricultural production, other subventions and subventions for breeding, lead to the increase of the inequity between the specialized farms; the increase with 1% of the incomes from the agricultural production leads to the increase of inequity with 6,85%;
- the subventions generally lead to the decrease of the inequity between them, especially in regard to the subventions for breeding (decrease of 4,1%) and direct payments (with 3,04%).

In conclusion, the subventions granted based on Pillar I present the highest level of importance in obtaining the incomes and therefore influence more and directly the inequity between farms. The obtained results show us that a modification with 1% of the subventions granted through Pillar I: they have a negative effect leading to the increase

of inequalities between different size farms; they have a positive effect leading to the reduction of disparities between the farms from different sectors or specialized on certain products.

REFERENCES

Abolins J., Tupciauskas R., Veveris A., Alksnis B., Gravitis J., 2008 - *Effects of Steam Exploded Lignin on Environmentally Benign Hot-Pressed Alder Boards*, The 7th International Conference on Environmental Engineering, Selected Papers, Vol. 1, Cygas D., Froehner K.D. (Eds.), Vilnius Gediminas Technical University Press Technika, **1-7**.

Bateman I. J., Brainard J.S., Lovett A. A., 1995 - *Modelling woodland recreation demand using geographical information systems: a benefit transfer study. CSERGE*, Working Paper GEC 95-06, Centre for Social and Economic Research on the Global Environment, University College London and University of East Anglia, Norwich, UK. **2.**161–179.

Toma E., Dobre C., Dona I Roman L., 2015 - *DEA applicability in assessment of agriculture efficiency on areas with similar geographically patterns*, *p.8.*

Dona I., Dobre Carina, Gergely Silvia, 2005 - *Dezvoltare Rurală, Course notes, synthesis*, USAMV București.p.10.

El Benni N., & Finger R., 2021 - *Farm income in European agriculture: new perspectives on measurement and implications for policy evaluation*. Journal of Policy Modeling, 35(4), 638-651.

Fabio Caporali, 1999 - *The effects of apply the alternative cropping system based on the of selfreeseding annual legumes (Trifolium and Medicago spp)*, Increasing Sustainability in Research methodologies in organic farming: on-farm participatory research PROCEEDINGS, Bari, Italy 5-7 September 1999.

Fîntîneru G., Dona I., & Fîntîneru A., 2010 - *The flexible approach of the second pillar on CAP to maximize advantages for EU farmers-Romania case*. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 10(3), 143-146.

Fred Gale, 2017 - *Growth and Evolution in China`s Agricultural Support Policies*, p. 5, http://www.ers.usda.gov/media/1156829/err153.pdf, accessed on 02.06.2017.

Giurcă D., Hurduzeu Gh., Rusu M., Sălășan C., 2006 - *Agricultural Sector in the Perspective of Romania's Accession to the European Union: Implications on the Payment System*, European Institute of Romania - Impact Studies III, Study no. 6.

J**ames David E., Jansen H. M. A., Opschoor J. B., 1989** - *Economic approaches to environmental problems: Techniques and results of empirical analysis*, Amsterdam; Oxford; New York, Elsevier, NL, 5. 24-27.

Gorton M., Davidova S., 2004 - *Farm productivity and efficiency in the CEE applicant countries: a synthesis of result?*, *Agricultural Economics*, 30: 1–16.

Henke R., 2021 - *The Common Agricultural Policy after the Fisher Reform: National implementations, impact assessment, agenda of future reforms, Ashgate*, Publishing Lts., England, ISBN 978-140942-194-8.

Ungureanu G., Chiran A., Brezuleanu S., Moraru R., Boghita E., 2013 - *The optimization of agricultural exploitation size thought effect to adapt the agro-alimentary supply to the demand of trade*, *ISITES.2013 1st International Symposium on Innovative Technologies in Engineering and Science*.http://www.isites.info/PastConferences/ISITES2013/ISITES2013/papers/C8-ISITES13183.pdf

Ungureanu G., Ciurea I. V., Chiran A., Brezuleanu S., Gindu Elena, 2011 - *Tourism, social and economic balance tool and culture in rural area of Romania – 2011*, Agrár- és Vidékfejlesztési Szemle 2011. vol. 6. (1) Supplement „TRADITIONS, INNOVATION, SUSTAINABILITY" Hódmezővásárhely, 5th May 2011, Pag. 464-470, ISSN 1788-5345.

*** - COM (2005) 37 final, *Review of the EU Sustainable Development Strategy: Initial Stocktaking and Future Orientations*, accessible online at http://europa.eu/legislation_summaries/environment/sustainable_development/l28117_en.htm

*** - COM (2005) 0218 final, *Draft Declaration on Guiding Principles for Sustainable Development,* accessible online at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52005DC0218

*** - SEC (2005) 161 final, *Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development Strategy*, accessible online at http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/files/SEC%282005%29161%20SDI%20COMMUNICATION%20EN.PDF