



Reorientation of Methods Applied to Plant Protection as an Effect of Climate Change [†]

Lavinia Popescu and Adela Sorinela Safta *

Economic school, Bucharest University of Economic Studies, 010374 Bucharest, Romania;

popesculavinia14@stud.ase.ro

* Correspondence: saftaadela19@stud.ase.ro

[†] Presented at the 1st International Electronic Conference on Plant Science, 1–15 December 2020; Available online:

<https://iecps2020.sciforum.net/>.

Abstract: The paper provides an overview of the agricultural economy in terms of agricultural development, especially in the area of plant protection, taking into account the effects of climate change. Environmental protection and sustainable management of natural resources, prioritizing an action behavior regarding vulnerabilities regarding the types of fertilizers used, favors the re-orientation of methods applied to plant protection in order to protect the biosphere are part of the soil-plant-air-water equation. Climate change involves the reduction of greenhouse gas emissions and adaptation of agricultural systems. There also are risks in using excessive fungicides in plant protection. Plant-soil interdependence in agricultural practice is highlighted in the paper. One of the main objectives in the field of agriculture is to maintain a low level of greenhouse gas emissions. Research has a major role to play in reducing the carbon footprint per tonne of food produced from organic farming, compared to conventional farming, mainly due to the abandonment of chemical fertilizers and pesticides. The aim of the following research is to collect data and information on the most efficient management models that will create the premises for the production of production models that will respond in the future to the challenges of climate change, especially from the perspective of reducing greenhouse gases, depending on the application of a plant protection system in response to climate change and the pressure of diseases and pests. During the research, we tried to highlight aspects that, in our opinion, are important for the development of the agricultural sector as part of the economy.

Keywords: waters; pollution; nitrates; plant



Citation: Popescu, L.; Safta, A.S. Reorientation of Methods Applied to Plant Protection as an Effect of Climate Change. *Biol. Life Sci. Forum* **2021**, *4*, 48. <https://doi.org/10.3390/IECPS2020-08650>

Academic Editor: Yoselin Benitez-Alfonso

Published: 1 December 2020

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The Farm to Fork strategy—for a fair, healthy and environmentally friendly food system adopted by the European Commission at the end of May 2020 tends to position the role of consumption in the virtual spectrum affected by climate change with tendencies to reorient factors in the shift to sustainable consumption in a sustainable agricultural economy [1].

Pending the successful achievement of the targets in the strategy, the Commission will initiate a call for action to be taken in accordance with the principles of better regulation, one of which is to propose a revision of the Regulation on pesticide statistics to overcome data gaps and to strengthen the development of evidence-based policies by 2023. This is more than an invitation to the research community empowered to contribute to this investigation through its expertise, an invitation to which we have responded through this paper to provide a small but not only symbolic scriptum in the glossary of sustainable development researching the patches of reducing pesticides in sustainable agriculture. Eurostat pursues the “Strategy for Agricultural Statistics for 2020 and beyond” in close collaboration with key data users and producers of agricultural statistics. Pesticide statistics are included as part of this paper [2,3].

1.1. Literature Review

The application of pesticides has been strictly controlled by community legislation since 1991 (by national legislation prior to 1991), due to their potential toxicity, often even at very low levels. Policy control measures in the EU are driven by the objectives of protecting human health and the environment (consumers, operator safety, protection of water quality, and biodiversity). Only a limited number of pesticide active substances are permitted to be used in organic farming—those listed in Annex II of Commission Regulation (EC) No. 889/2008 on organic production [4].

In 2009, the Sustainable Use Directive (Directive 2009/128/EC), the so-called ‘SUD’, established a framework to achieve the sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of integrated pest management and of alternative approaches or techniques, such as non-chemical alternatives to pesticides [5].

This Directive establishes a framework for the sustainable use of pesticides by reducing risks and their effects on human health and the environment and by promoting the use of integrated pest management and alternative techniques or approaches, such as non-chemical alternatives to pesticides. “Pesticides” means: (a) plant protection products as defined in Regulation (EC) No. 1234/2007; 1107/2009; (b) biocidal products as defined in Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market [6–8].

Instructions to adopt national action plans, develop obligatory systems for training and education, set up a framework for equipment inspections, examine alternative pest management methods, secure water protection, and apply harmonised risk indicators are fundamental [9].

Following up on the Sustainable Use Directive, member states have introduced country-specific measures setting objectives and timetables to reduce the risks and impact of pesticide use.

In the latest report of the Commission to the European Parliament and the Council on the implementation of the SUD, the progress towards full implementation of the requirements are described [10].

1.2. Analysis of Development Areas in Romania

In the analysis we have highlighted the products that contain active substances, phytoprotective agents or synergistic agents, in the form in which they are presented to the user and which are intended:

- Protection of plants or plant products against any harmful organism or prevention of these organisms;
- Exercising an action on the vital processes of plants, other than a nutritional action;
- Ensuring the preservation of vegetable products, insofar as these substances or products are not subject to other legal regulations on preservatives;
- Destruction of plant parts, stopping or preventing unwanted plant growth.

Thus, we found that the products (chemicals) that are used to control diseases in agro-agricultural crops are growing in agricultural areas, especially fungicides.

The amount of fungicides sold in solid form in 2018 increased by 5.7%, compared to the previous year. The distribution, in total fungicides, on macroregions is as follows: macroregion three (34.2%), macroregion one (26.3%), macroregion four (22.0%), macroregion two (17.5%). The largest quantities of fungicides in solid form were sold in the development regions of Centru (20.6%), Sud-Muntenia (17.6%), and Bucharest-Ilfov (16.6%). For products sold in liquid form, the amount of fungicides decreased by 3.0%, compared to 2017 as shown in Figure 1, according to the data source of the statistical institute.

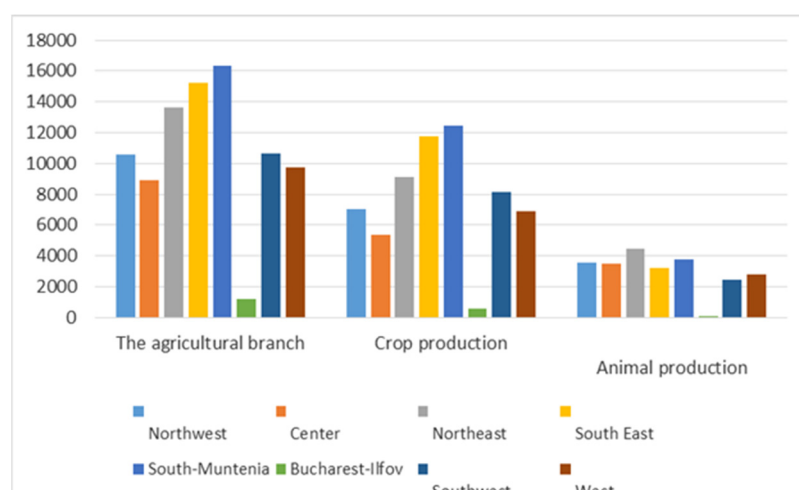


Figure 1. The value of the agricultural branch. Source owner recherché from insse—Eurostat 2018–2019.

The largest amount of fungicides was sold in macro-region three (49.2%), followed by macro-region one (26.6%), macro-region two (15.7%), and macro-region four (8.5%). By development regions, the South-Muntenia region occupies the first place (27.7%), followed by the Bucharest-Ilfov (21.5%) and Center (19.3%) regions.

Thus, in determining the increase in consumption, the different climatic conditions of the regions were analyzed as possible causes for increases in consumption and the critical level of losses by non-compliance with agricultural practices in the application of plant protection products.

Table 1 shows the positioning of agricultural farms in the development regions, observing the development of agricultural productivity of plantations compared to animal production farms, plant protection products following the same rise respectively in the South-Muntenia areas, respectively South East and Northeast while in West there is a moderate increase in livestock and a decrease in the consumption of plant protection products.

Table 1. The value of the production of the agricultural.

Item	Northwest	Center	Northeast	South East	South-Muntenia	Bucharest-Ilfov	Southwest	West
The agricultural branch	10,561	8930	13,652	15,256	16,336	1196	10,656	9762
Crop production	7015	5348	9092	11,724	12,428	606	8141	6862
Animal production	3523	3509	4475	3239	3775	110	2453	2819

Source Insse 2019.

2. Results

The use of pesticides plays an important role in agricultural production, ensuring less damage to weeds and crop pests and a consistent yield. However, their use can have negative effects on the environment, on water quality, and on terrestrial and aquatic biodiversity (persistence and toxic effects on non-target species, etc.).

The Sustainable Use Directive promotes the use of integrated pest management and alternative approaches and techniques, such as non-chemical alternatives to pesticides. Integrated Pest Management (IPM) is a strategy that promotes safer and more sustainable pesticide management.

IPM strategies evolve due to new emerging pests and climate change and involve crop rotation, hygiene measures to prevent the spread of pests, protection, and improvement of beneficial organisms, using appropriate cultivation, cultivation, or seed techniques. Farmers need to implement IPM and give preference to non-chemical methods to ensure satisfactory pest control. The main goal is to reduce pesticide dependence in agriculture as revealed by Popescu L. et al. (2021) [11].

Environmental contamination due to pesticides can result from drift by spraying, volatilization, surface runoff, and loss of subsoil by leaching/flow.

The persistence of pesticides in the environment differs greatly and is dependent on factors such as susceptibility to attack by microorganisms and enzymes, soil temperature, and water content. In the last decade, much has been done in the agricultural sector to limit the negative effects of pesticides. Organic farming is growing year by year and now covers 7.5% of the EU AU. Four million farmers have been trained in the safe use of pesticides, and the number of EU-approved non-chemicals or low-risk substances has doubled since 2009.

The abandonment of agricultural land has far-reaching effects on ecosystem services, such as increased carbon storage, lower soil erosion, better water quality, and loss of traditional cultural landscapes as revealed by Tuomisto, H.L. et al. (2017) [12].

These effects often result in a decline in biodiversity. In addition, the lack of appropriate knowledge, as a result of problems with the farm consulting system, results in often inadequate agricultural practices, with a negative influence on biodiversity.

Even the relatively low yields of feed production, largely determined by improper pasture management, have led to erosion and loss of biodiversity.

In the context of climate change, there is the need for a new activity in the agricultural field, which means using natural resources and good practice models to provide observation systems, information management understanding, modeling, and analysis of environmental phenomena for evaluation, and exploitation and management of natural resources (water, soil, and climate).

3. Discussion

The 2013 reform of the common agricultural policy (CAP) introduced an ecological (greening) direct payment scheme. It should be noted that the aim was to further improve the sustainable management of agricultural-related natural resources through payments for climate-friendly and environmentally friendly agricultural practices [13].

In fact, the reform of the common agricultural policy (CAP) continues the prerogatives inserted in 2013 which created mechanisms for ecological direct payments diversifying the consumer market. The aim was to further improve the sustainable management of natural resources related to agriculture ecological and ecological agricultural practices, according to Andrei J.V. (2015) [14].

Therefore, in addition to crop diversification and maintenance of permanent pastures, greening requires farmers to reserve 5% of their arable land for areas of ecological interest (ZIE). Many valuable habitats and the biodiversity they maintain are based on agricultural systems. However, efforts to protect this biodiversity are not recognized, as they are not reflected in farmers' prices for their products. Although biodiversity depends on the existence of appropriate management practices, these practices have changed over time due to competitive pressures, leading to increasing specialization and intensification of production in certain areas and the abandonment of soil cultivation in certain other areas.

4. Materials and Methods

The data collection from reference year 2011 onwards is based on Regulation (EC) No. 1185/2009 concerning statistics on pesticides, which established a common framework for the systematic production of community statistics on the sales and use of pesticides that are plant protection products and data European Commission, Brussels; Directorate General Communication, COMM.A.3 Media Monitoring and Eurobarometer [15,16].

5. Conclusions

The above-discussed practices have put pressure on biodiversity; have detrimental effects on soil, water, and climate; and have also jeopardized the long-term productive potential of the agricultural sector. Thus, as a priority, during such conditions of "chaos" amplified by climate change, there is the need once again for fresh efforts in the systematization of agricultural production processes. One way to start would be through a reorientation

of the techniques of using plant protection products. In fact, this issue will not die down until good practices are intertwined with good faith in the correct use of fertilizers, self-control to avoid unwanted consequences of pollution, and destabilization of the biosphere largely affected by climate today.

Supplementary Materials: The poster presentation is available online at <https://www.mdpi.com/article/10.3390/48/s1>.

Author Contributions: All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Acknowledgments: European Commission, Eurostat data.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. European Commission. The Farm to Fork Strategy. Available online: https://ec.europa.eu/food/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf (accessed on 1 December 2020).
2. Communication from the Commission to The European Parliament, The Council, The European Economic and Social Committee and The Committee of The Regions. COM/2020/381 Final. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381> (accessed on 20 May 2020).
3. Eurostat. Sales of Pesticides by Type of Pesticide. 2020. Available online: <https://ec.europa.eu/eurostat/web/products-datasets/product?code=tai02> (accessed on 1 December 2020).
4. Commission Regulation (EC) No. 889/2008 of 5 September 2008 Laying Down Detailed Rules for the Implementation of Council Regulation (EC) No. 834/2007 on Organic Production and Labelling of Organic Products with Regard to Organic Production, Labelling and Control. *Off. J. Eur. Union* **2008**, *250*, 1–84. Available online: <http://data.europa.eu/eli/reg/2008/889/oj> (accessed on 1 December 2020).
5. Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 Establishing a Framework for Community Action to Achieve the Sustainable Use of Pesticides (Text with EEA Relevance). *Off. J. Eur. Union* **2009**, *309*, 71–86. Available online: <http://data.europa.eu/eli/dir/2009/128/oj> (accessed on 1 December 2020).
6. Council Regulation (EC) No. 1234/2007 of 22 October 2007 Establishing a Common Organisation of Agricultural Markets and on Specific Provisions for Certain Agricultural Products. Available online: <https://www.legislation.gov.uk/eur/2007/1234/contents> (accessed on 1 December 2020).
7. Regulation (EC) No. 1107/2009 of the European Parliament and of the Council of 21 October 2009 Concerning the Placing of Plant Protection Products on the Market and Repealing Council Directives 79/117/EEC and 91/414/EEC. *Off. J. Eur. Union* **2009**, *309*, 1–50. Available online: <http://data.europa.eu/eli/reg/2009/1107/oj> (accessed on 1 December 2020).
8. Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 Concerning the Placing of Biocidal Products on the Market. *Off. J. Eur. Communities* **1998**, *123*, 1–63. Available online: <http://data.europa.eu/eli/dir/1998/8/oj> (accessed on 1 December 2020).
9. In the Action Plan of the Strategy, the Commission Proposed a Revision of the Pesticides Statistics Regulation to Overcome Data Gaps and Reinforce Evidence-Based Policy Making. Available online: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicator_-_consumption_of_pesticides (accessed on 1 December 2020).
10. European Commission. Legal provisions of COM(2017)587—Member State National Action Plans and on Progress in the Implementation of Directive 2009/128/EC on the Sustainable Use of Pesticides. COM(2017)587. 10 October 2017. Available online: https://www.eumonitor.eu/9353000/1/j4nvhdcs8bljza_j9vvik7m1c3gyxp/vkicge6lwnwz (accessed on 20 May 2020).
11. Popescu, L.; Safta, A.S. The Causal Relationship of Agricultural Standards, Climate Change and Greenhouse Gas Recovery. *Environ. Sci. Proc.* **2021**, *4*, 21. [CrossRef]
12. Tuomisto, H.L.; Scheelbeek, P.F.; Chalabi, Z.; Green, R.; Smith, R.D.; Haines, A.; Dangour, A.D. Effects of environmental change on agriculture, nutrition and health: A framework with a focus on fruits and vegetables. *Wellcome Open Res.* **2017**, *2*, 21. [CrossRef] [PubMed]
13. Second Pillar of the CAP: Rural Development Policy, Brussels. Available online: <https://www.europarl.europa.eu/factsheets/en/sheet/110/second-pillar-of-the-cap-rural> (accessed on 1 December 2020).
14. Andrei, J.V.; Dusmanescu, D.; Mieila, M. The influences of the cultural models on agricultural production structures in Romania and some EU-28 countries—A perspective. *Econ. Agric.* **2015**, *62*, 293–307. [CrossRef]

-
15. Regulation (EC) No. 1185/2009 of the European Parliament and of the Council of 25 November 2009 Concerning Statistics on Pesticides (Text with EEA Relevance). *Off. J. Eur. Union* **2009**, *324*, 1–22. Available online: <http://data.europa.eu/eli/reg/2009/1185/oj> (accessed on 1 December 2020).
 16. European Commission, Brussels; Directorate General Communication, Media Monitoring & Eurobarometer (COMM.A.3). Available online: https://op.europa.eu/en/web/who-is-who/organization/-/organization/COMMU/COM_CRF_231900 (accessed on 1 December 2020).