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THE IMPACT OF IMPLEMENTING THE FARM TO FORK STRATEGY REGARDING THE USE OF FERTILIZERS AND PESTICIDES IN THE EU

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Abstract

This paper analyzes the existing situation in Romania, Germany, France, Poland, Hungary and the United Kingdom, European countries cultivating cereals, technical plants and oleaginous plants, in the period 2010-2019, regarding the quantities of fertilizers and plant protection substances This analysis has responded to the requests from farmers' associations regarding the effect of the FARM TO FORK strategy, as a essential element of the European Green Pact, has serious implications within the agricultural sector. Agricultural producers question the survival of the agricultural sector as the implementation of the Farm to Fork strategy will lead to a significant decrease in agricultural production in the EU and an increase in food prices. In the present study, a descriptive research was performed on the situation existing in each studied country, using the bibliographic method but also the processing of statistical data, using the correlational method, this aspect directing the study to a predictive research, thus establishing how the quantities of fertilizers and pesticides used in different crops in the EU member states will be allocated, if the Farm to Fork strategy is applied in the current form, the conclusion being that their reduction should be applied to the European average of consumption in the EU member states.

Key words**:** *Farm to Fork Strategy, cultivated surface, chemical fertilizers, pesticides*

INTRODUCTION

In October 2021**,** the European Parliament debated the report on the *"Farm to Fork Strategy - for a Fair, Healthy and Ecological Food System 2020-2060"* [6, 10].
This strategy sets the global standard for safe and high-quality food based on the outcome of previous years of EU policy making, combined with the efforts of all actors in the entire food chain.
There is a discussion of safe, sustainable food for the planet, people, farmers, fishermen and processing factories, but the question is how and when the new strategy will be applied [7].
The transition to resilient and nature-friendly food systems is a well-known EU initiative, but integral change lacks perseverance, commitment, ambition and the courage to change.

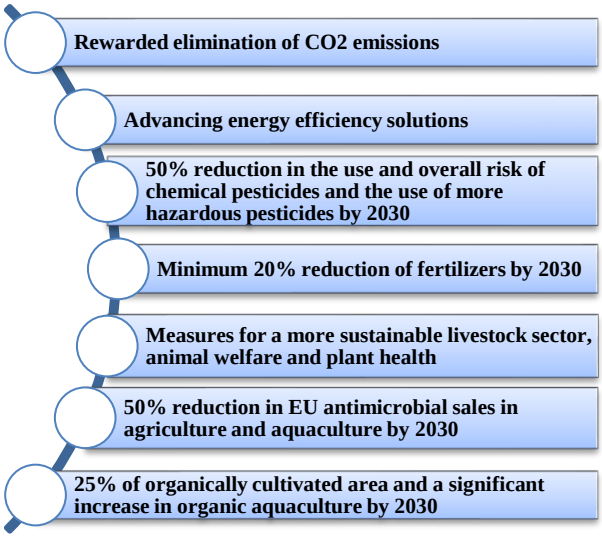

Fig. 1 Farm to Fork strategy
Source: Our figure based on Farm to Fork strategy [6, 10].

The Farm to Fork strategy establishes ambitious EU-wide targets for the use of pesticide, chemical fertilizers, antimicrobials and the enlargement of organic farming, all

based on the latest available evidence, the agreed targets becoming legally binding [9].
Thus, the Joint Research Centre (JRC) study and other recent studies present arguments for improving existing models, without being able to guess the changes in demand or the production losses that will be caused by climate change and the loss of biodiversity. [8, 17]. Fertilizers are an important factor in modern day agriculture [4] The established targets set the direction and send a strong signal, not only in Europe, but also globally. Under the Common Agricultural Policy, Member States are invited to establish explicit national values that contribute to the implementation of EU objectives, taking into account the specific situations in each country, in order to allow the assessment of the contribution of national strategic plans to EU environmental and climate legislation and commitments. This transition can turn the challenge into a real opportunity. In order to bring about change, the EU needs the support of other global players, through trade and partnership agreements, development policy, international standard-setting bodies and green alliances.

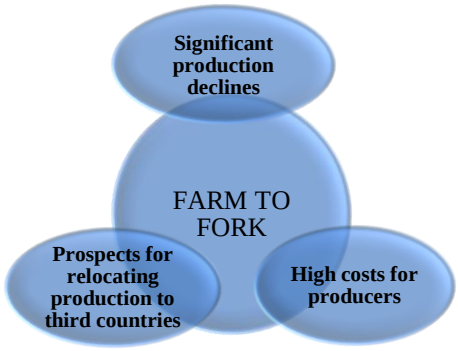

Fig. 2. Position of COPA and COGEGA member farmers regarding the FARM to FORK Strategy
Source: [3].

However, the position of EU farmers and agricultural cooperatives, members ***Copa and Cogeca*** [3] on the strategy ***Farm to Fork,*** as a fundamental element of the ***European Green Pact***, with significant implications for the agricultural sector, aims at the survival of the agricultural sector and calls for further consultations arise, as the measures included in this strategy will lead to a significant decrease in agricultural production in the EU and an increase in food prices. Crop fertilization with adequate fertilizer application rates for obtaining maximum and economically optimum yields, the best use of nutrients and gaining high quality harvests [1, 16].
A research conducted by the Institute of Agricultural Economics of the University of Kiel, Germany [12] regarding cereals, oilseeds and beef, highlighted that the impact of applying a "farm to fork" strategy would diminish production by about 20%, which would increase EU's agricultural products prices (10-20% of fruits and vegetables, oilseeds and cereals), and if all Farm to Fork procedures were implemented simultaneously, grain exports would fall sharply and become reliant on imports. The EU's agricultural cooperatives (Copa and Cogeca) have called on the European Commission to conduct an impact assessment on the agricultural sector.
Each EU Member State has incorporated country-specific aspects in its ***National Strategic Plan*** and has interventions, targets and phase-related outcomes and indicators for each intervention, as well as the planned annual productions and unit amounts per intervention [7].
Nevertheless, at EU level, all actors of the food chain agree on the general principles contained in the Farm to Fork strategy being fully conscious of the need for constant and generous major improvements to assure the sustainability of the agri-food systems.
However, certain recently published researches on the "farm to fork" strategy suggest that the present targets will impose significant costs on the EU.
In this context, the purpose of the paper is to analyze the quantities of fertilizers and plant protection products used in Romania, Germany, France, Poland, Hungary and the United Kingdom and the expected impact of reducing these quantities in agriculture.
In Table 1, it is presented a synthesis in the authors' vision regarding the key studies conducted on the Farm to Fork strategy.

Table 1. Studies conducted on the Farm to Fork strategy

Crt. no.	Study	Results
1.	**JRC Study** [8]	The reduction in greenhouse gas emissions of 40-60% of European agriculture resulting from the implementation of the objectives of the FARM to Fork strategy will lead to the outsourcing of European agricultural production, including its emissions, to third countries.
2.	**Study of the University of Kiel** [12]	Europe could become a net importer of food, in direct contradiction with the open strategic autonomy promoted by the European Commission during the COVID crisis.
3.	**USDA Study** [18]	The objectives established in the FARM to Fork strategy could lead to food insecurity for 22 million people.
4.	**Study from Wageningen** [2]	It addresses different scenarios, and clearly highlights that the assessment has been isolated in terms of the effects of the FARM to Fork Strategy and provides a partial picture of the cumulative reality faced by farmers and agri-food actors on the field. The cumulative impact of the targets will lead to an average decrease in production of 10-20%, with a reduction of up to 30% for certain crops. Also, a decrease in beef, pork and dairy products production, an increase in prices for consumers and unforeseen effects on livestock farmers' incomes.

Source: Own conception based on [8, 12, 18, 2].

MATERIALS AND METHODS

The paperwork is elaborated on a vast documentary basis, by using the bibliometric method, bringing to the foreground the results of extensive researches carried out regarding the implications of the application of the Farm to Fork Strategy on agricultural production, farmers' incomes and food security. The statistical analysis of the data extracted from FAO (www.fao.org) regarding the cultivated agricultural areas and the obtained productions, as well as their correlation with the quantities of chemical fertilizers and pesticides used in the countries included in the study, highlighted aspects that justify the recommendations made, namely that the reduction of the fertilizers and plant protection products should be made taking into account the European average of the quantities used.

RESULTS AND DISCUSSIONS

In order to highlight aspects related to the use of chemical fertilizers and pesticides in the agriculture of Romania, France, Germany, Italy, Spain, Poland, Hungary and the United Kingdom, in the period 2010-2019, the main groups of chemical fertilizers and pesticides used in the period 2010-2019 in these countries were analyzed. The need to apply chemical fertilizers resides from the increase in water retention in soil [19]. Likewise, the application of pesticides is also intended to repel, destroy or control any pest or to regulate the growth of plants. There are obvious differences in the application of chemical fertilizer and pesticides in the agriculture of the European countries surveyed, differences demonstrated by the analysis of the existing statistical data on www.fao.org. To this purpose, account has been taken of the areas under cultivation in these countries, as well as of the total quantities of fertilizers and pesticides consumed in agriculture, and in addition the division by types and destinations. The land resource in our time is limited and, thus, the attention has been directed towards technological intensification, in order to significantly increase the agricultural yield, but not enough as to ensure a decent food supply for the entire population of the Earth [13].

An analysis of the acreage of the major European countries cultivating cereals, technical plants and oleaginous plants, for the period 2010-2019, reveals that France has the widest area cultivated with a multi-year average of 19,299.38 thousand ha, pursued by Spain with 17,080.92 thousand ha, Germany with an average annual cultivated area of 12,013 thousand ha, Poland with 11,306.30 thousand ha, Italy with an average cultivated

area of 9,254.27 thousand ha, Romania with 9,234.80 thousand ha, the United Kingdom with 6,144.83 thousand ha and Hungary with an average cultivated area of 4,522.40 thousand ha (Fig. 3).

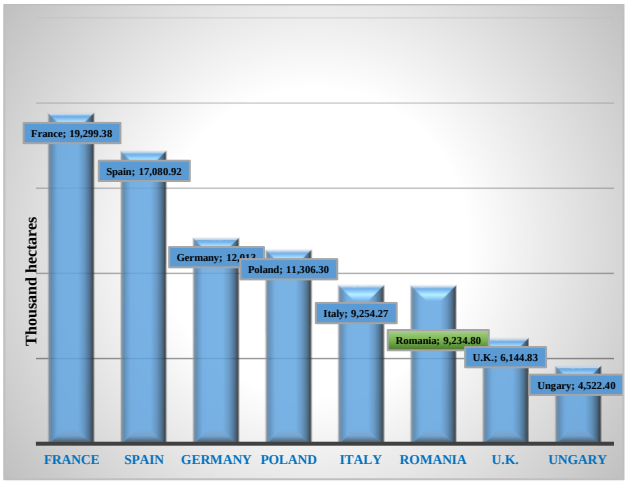

Fig. 3. Cultivated areas – multiannual average
Source: Own calculations and figure [11].

Romania occupies the 6th place in terms of average cultivated area (9,234.80 thousand ha), respectively 47.85% of the cultivated area in France, 54.06% of the average planted area in Spain, 76.87% in Germany, 81.67% in Poland and 97.78% of the area cultivated by area cultivated in Italy. On the other hand, the U.K. manages 66.54% of the area cultivated by Romania and Hungary utilises 48.97% of the area planted by Romania.

Chemical fertilizers are a crucial farm input for increasing productivity in conventional agricultural system, but with a negative impact on environment. [14] Regarding ***the consumption of chemical fertilizers with nitrogen in agriculture***, ***France*** is the largest country consuming fertilizers with nitrogen, with a multiannual average of 2,138,482.40 tons, a quantity correlated with the large cultivated area, respectively 19,299.38 thousand ha. It is noted that Romania consumes 16.67% of the quantity consumed by France. ***Germany*** is the second largest consumer of nitrogen fertilizers, with a multiannual average of 1,615,427.70 tons in the period 2010-2019, quantity correlated also with the large cultivated area, respectively 12,013 thousand ha. ***Romania*** consumes 22.06% of the quantity consumed by Germany. ***Poland***, the third consumer of nitrogen fertilizers, with a multiannual average of 1,087,981 tons in the period 2010-2019, quantity correlated also with the cultivated area, respectively 11,306.30 thousand ha. Romania consumes 32.76% of the amount of fertilizers used in Poland. ***United Kingdom***, the next country consuming nitrogen fertilizers, with a multiannual average of 1,028,400 tons in the period 2010-2019, at the average cultivated area, namely 6,144.83 thousand ha. Romania uses 34.66% of the amount used by the United Kingdom in agriculture, although the UK cultivates 66.54% of the average cultivated area in our country. In ***Spain,*** the average multiannual amount of nitrogen fertilizers used was 986,893.60 tons per cultivated area of 17,080.92 thousand ha. Romania uses in agriculture 36.12% of the quantity used in Spain. ***Italy*** used in agriculture a quantity of 578,128.30 tons of nitrogen fertilizers, on a cultivated area of 9,254.27 thousand ha, an area with 2.22% higher than the cultivated area of Romania, but in terms of consumption of nitrogen fertilizers, Italy consumes 38.34% more than Romania.

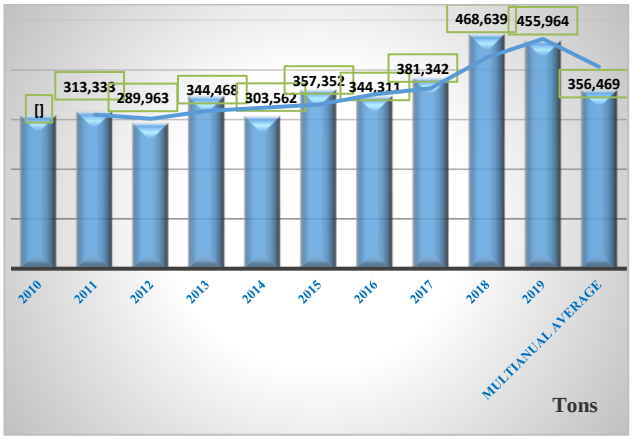

Fig. 4. Nitrogen fertilizer consumption (N) in Romania
Source: Own calculations and figure [11].

Hungary has a multiannual consumption similar to that of ***Romania***, respectively 356,606.40 tons, for an average multiannual area cultivated of 4,522.40 thousand ha, respectively 48.97% of the area cultivated in Romania. It is noted that ***Romania*** has the smallest amount of nitrogen fertilizers used in agriculture, with a multiannual average of the

quantities consumed in 2010-2019 of 356.469,10 tons.

Regarding the ***consumption of chemical phosphorus fertilizers in agriculture***, the use of these fertilizers has contributed [5] ***Spain'***s leader position and multiannual consumption of phosphorus fertilizers used during 2010-2019, respectively 407,646.89 tons on a cultivated area of 17,080.92 thousand ha. ***Romania*** uses in agriculture 34.06% of the quantity used in ***Spain***, and the area cultivated in ***Romania*** represents 54.06% of that of Spain. ***France*** consumed an average multiannual quantity of phosphorus fertilizers in the period 2010-2019, of 402,884.28 tons, a quantity correlated also with the cultivated area, respectively 19,299.38 thousand ha. It is highlighted that ***Romania*** utilizes 34.46% of the quantity consumed by ***France***, and the area ***of Romania*** represents 47.85% of that of ***France***. ***Poland***, used a multiannual average quantity of phosphorus fertilizers, of 349,539.90 tons in the period 2010-2019, at an average multiannual cultivated area, respectively 11,306.30 thousand ha. ***Romania*** consumes 39.72% of the amount of phosphorus fertilizers used in ***Poland,*** and the multiannual cultivated area of ***Romania*** represents 81.67% of the area of ***Poland***. ***Germany*** consumed in the period 2010-2019 a multiannual average amount of phosphorus fertilizers, of 257,907 tons, on a multiannual average cultivated area, namely 12,013 thousand ha. ***Romania*** utilizes 53.83% of the quantity consumed by ***Germany,*** and the multiannual cultivated area of ***Romania*** represents 76.87% of the area of Germany. ***United Kingdom***, the next country included in the analysis, used an average multiannual quantity of phosphorus fertilizers, of 192,100 tons during 2010-2019, on the average cultivated area, namely 6,144.83 thousand ha. ***Romania*** uses in agriculture 72.28% of the amount used by the ***United Kingdom***, although it cultivates 66.54% of the average cultivated area in our country. ***Italy*** used in agriculture a quantity of 172,278.70 tons of phosphorus fertilizers, on a cultivated area of 9,254.27 thousand ha, 2.22% larger than the cultivated area of ***Romania***, but in terms of phosphorus fertilizer consumption, Italy consumes 19.41% more than Romania. ***Romania*** is on the penultimate place in terms of quantities of phosphorus fertilizers used in agriculture, with a multiannual average during 2010-2019 of 138,846.70 tons, followed by ***Hungary*** with 83,369.50 tons.

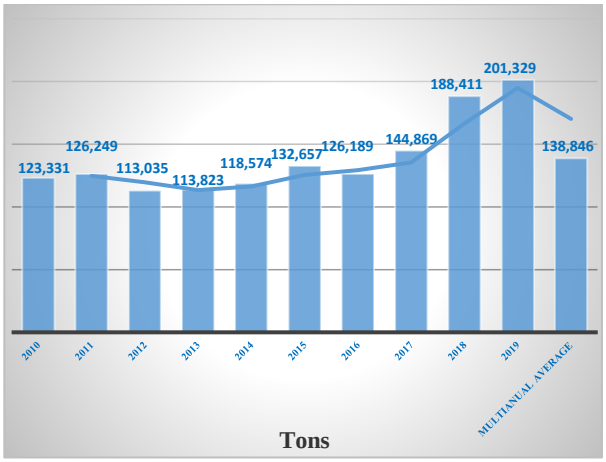

Fig. 5. Consumption of phosphorus fertilizers (P_2O_5) in Romania
Source: Own calculations and figure [11].

Regarding ***the consumption of chemical potassium fertilizers in agriculture***, ***Poland*** is the first country consuming potassium fertilizers, with a multiannual average quantity of 502,200.90 tonnes in the period 2010-2019, on a multiannual average cultivated area, namely 11,306.30 thousand ha. ***Romania*** consumes 9.89% of the amount of potassium fertilizers used in ***Poland,*** and the area cultivated by Romania on a multiannual basis represents 81.67% of Poland's area. ***France*** consumed in the period 2010-2019 a multiannual average amount of potassium fertilizers of 448,942 tons, a quantity correlated also with the cultivated area, respectively 19,299.38 thousand ha. It is highlighted that ***Romania*** consumes 11.07% of the quantity consumed by ***France***, and the area of ***Romania*** represents 47.85% of that of France. ***Germany*** consumed in the period 2010-2019 a multiannual average amount of potassium fertilizers of 420,675.30 tons, on a multiannual average cultivated area, namely 12,013 thousand ha. ***Romania*** consumes 11.81% of the quantity consumed by ***Germany***, and the multiannual cultivated area of ***Romania*** represents 76.87% of the area of

Germany. ***Spain*** had a multiannual consumption of potassium fertilizers, in the period 2010-2019, of 364,002.60 tons on a cultivated area of 17,080.92 thousand ha. Romania uses in agriculture 13.65% of the amount used in Spain, and the area cultivated in Romania represents 54.06% of that of Spain. ***United Kingdom*** consumed in the period 2010-2019 a multiannual average amount of potassium fertilizers, of 269,100 tons, on the average cultivated area, namely 6,144.83 thousand ha. ***Romania*** uses in agriculture 18.46% of the amount used by the United Kingdom, although the latter cultivates 66.54% of the average cultivated area in our country. ***Italy*** used in agriculture a quantity of 127,185.6 tons of potassium fertilizers, on a cultivated area of 9,254.27 thousand ha, an area 2.22% higher than the area cultivated in ***Romania***, but in terms of potassium fertilizer consumption, ***Italy*** consumed 60.93% more than Romania. ***Hungary*** has a multiannual consumption of potassium fertilizers of 82,805.5 tons, respectively 39.98% more than in ***Romania***, on an average multiannual cultivated area of 4,522.40 thousand ha, respectively 48.97% of the cultivated area in ***Romania.***

Romania is on the last place in terms of quantities of potassium fertilizers used in agriculture, with a multiannual average between 2010 and 2019 of 49.695 tons.

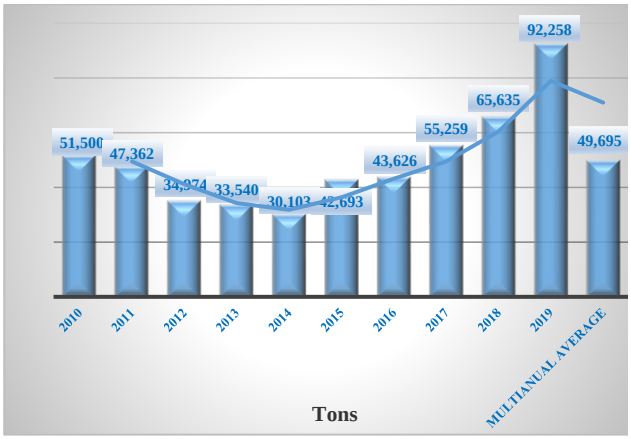

Fig. 6. Potassium fertilizer (K_2O) consumption in Romania
Source: Own calculations and figure [11].

The EU regulations regarding pesticides imposes a strict control and use of the approved pesticides for compiling with the European the Green Deal [15]. Regarding ***the consumption of pesticides in agriculture***, ***France*** consumed during 2010-2019 an average multiannual quantity of pesticides-total, of 70,882.50 tons, per cultivated area, namely 19,299.38 thousand ha. It is highlighted that ***Romania*** consumes 9.07% of the quantity consumed by ***France***, at an average area cultivated in Romania of 47.85% of that of France. ***Italy*** used in agriculture a quantity of 60,218.90 tons of pesticides-total, on a cultivated area of 9,254.27 thousand ha, an area with 2.22% higher than the area cultivated in ***Romania,*** but in terms of pesticide-total consumption, Italy consumed 89.31% more than Romania. ***Spain*** had a multiannual consumption of pesticides-total used in the period 2010-2019, namely 56,101.90 tons on a cultivated area of 17,080.92 thousand ha. ***Romania*** uses in agriculture 11.47% of the quantity used in Spain, and the area cultivated in ***Romania*** represents 54.06% of that of ***Spain***. ***Germany*** consumed during 2010-2019 an average multiannual quantity of pesticides-total, of 45,332.50 tons, at an average multiannual cultivated area of 12,013 thousand ha. ***Romania*** consumes 14.19% of the amount consumed by ***Germany***, and the multiannual cultivated area of ***Romania*** represents 76.87% of the area of ***Germany. Poland*** consumed a multiannual average quantity of 22,987.90 tons in the period 2010-2019, for a cultivated multiannual average area, namely 11,306.30 thousand ha. ***Romania*** consumes 27.99% of the pesticide-total used in ***Poland***, and the multiannual cultivated area of ***Romania*** represents 81.67% of the area of ***Poland. United Kingdom*** consumed during 2010-2019 an average multiannual quantity of pesticides-total, of 18,251.90 tons, on the average cultivated area, namely 6,144.83 thousand ha. Romania uses 35.25% of the amount used by the United Kingdom in agriculture, although the latter cultivates 66.54% of the average cultivated area in our country. ***Hungary*** has a multiannual pesticide consumption-total of 8,904.50 tons, respectively 27.74% more than in ***Romania***, at an average multiannual cultivated area of 4,522.40 thousand ha, respectively 48.97% of the cultivated area in

Romania. ***Romania*** ranks last in terms of quantities of pesticides used in agriculture, with a multiannual average over the period 2010-2019 of 6,434 tonnes.

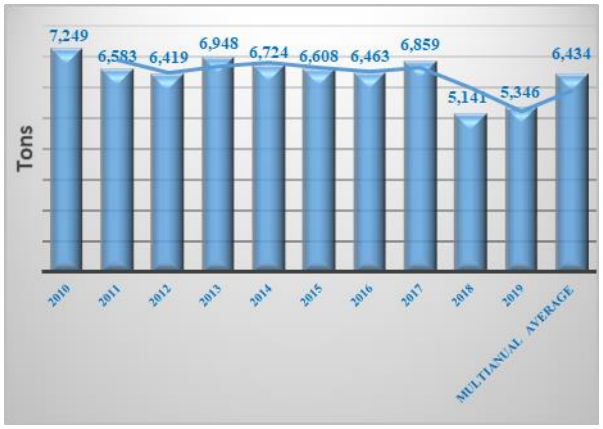

Fig. 7. Pesticide consumption in Romania
Source: Own calculations and figure [11].

Regarding the groups of pesticides, it is highlighted that Romania ranks last in the consumption of herbicides with an average multiannual consumption of 3,525.6 tons, as well as in the consumption of fungicides and bactericides, with an average multiannual consumption of 2,070.10 tons, but on the penultimate place in the consumption of insecticides, with an average multiannual consumption of 838.3 tons during 2010-2019.

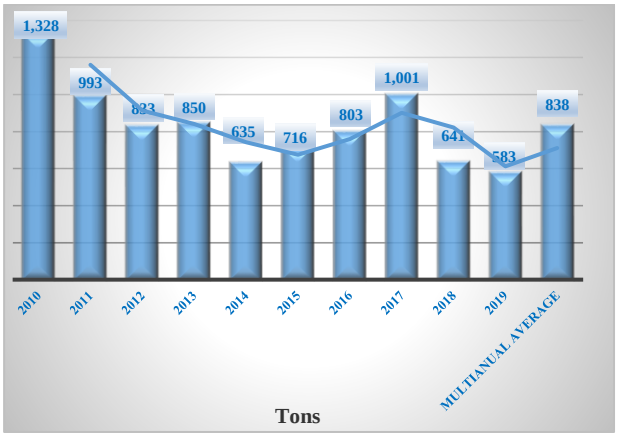

Fig. 8. Insecticide consumption in Romania
Source: Own calculations and figure [11].

In order to establish the average multiannual quantity of chemical fertilizers used per hectare cultivated in the main European countries included in the study, the quantities of fertilizers consumed in agriculture and the total area cultivated each year of the analysis period, namely 2010-2019, were taken into account.

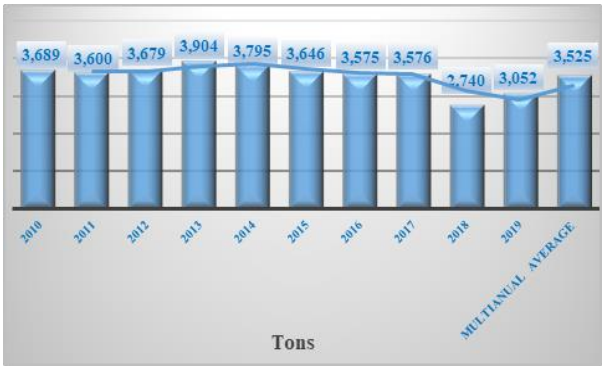

Fig. 9. Herbicide Consumption in Romania
Source*:* Own calculations and figure [11].

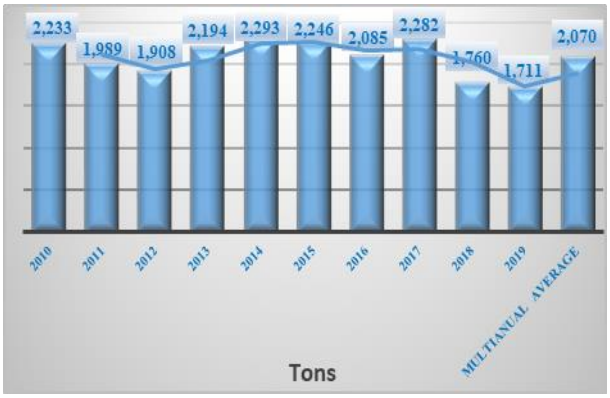

Fig. 10. Consumption of fungicides and bactericides in Romania
Source: Own calculations and figure [11].

Correlating the ***average multiannual quantity of chemical fertilizers with nitrogen*** with ***the average multiannual area,*** it is found that in the period 2010-2019, *Romania* has the lowest quantity consumed among the countries included in the study by 76.93% lower than the largest consumer of nitrogen fertilizers (N), respectively ***United Kingdom***, which recorded a consumption of an average multiannual quantity per hectare of 167.36 kg/ha. ***Germany*** has an average multiannual consumption of nitrogen (N) during the analysis period of 134.47 kg/ha, 71.29% more than the average multiannual amount per hectare used in ***Romania***. ***France*** has an average multiannual consumption of nitrogen (N) during the analysis period of 110.80 kg/ha, with 65.16% more than the average multiannual amount per hectare used in ***Romania***. ***Poland*** has an average multiannual consumption of nitrogen (N) during the analysis period of 96.23 kg/ha, with 59.88%

more than the average multiannual amount per hectare used in ***Romania. Hungary*** has an average multiannual consumption of nitrogen (N) during the analysis period of 78.85 kg/ha, 51.05% more than the average multiannual amount per hectare used in ***Romania***. ***Italy*** has an average multiannual nitrogen (N) consumption during the analysis period of 62.47 kg/ha, 38.21% more than the average multiannual amount per hectare used in ***Romania. Spain*** has an average multiannual consumption of nitrogen (N) during the analysis period of 57.78 kg/ha, 33.19% more than the average multiannual amount per hectare used in ***Romania.***

Regarding ***the multiannual consumption of chemical fertilizers with phosphorus***, it is found that in the period 2010-2019, ***Romania*** has the lowest quantity used among the countries included in the study and has 51.89% less than the largest consumer of phosphorus fertilizers (P_2O_5), respectively ***United Kingdom***, which recorded a multiannual average quantity per hectare of 31.26 kg/ha. ***Poland*** has a multiannual consumption of phosphorus (P_2O_5) during the analysis period of 30.92 kg/ha, 51.35% more than the average multiannual quantity per hectare used in ***Romania***. ***Spain*** has an average multiannual consumption of phosphorus fertilizers (P_2O_5) during the analysis period of 23.87 kg/ha, 36.99% more than the average multiannual amount per hectare used in ***Romania. Germany*** has an average multiannual consumption of phosphorus fertilizers (P_2O_5) during the analysis period of 21.47 kg/ha, 29.94% more than the average multiannual amount per hectare used in ***Romania. France*** has a multiannual consumption of phosphorus fertilizers (P_2O_5) during the analysis period of 20.88 kg/ha, 27.97% more than the average multiannual amount per hectare used in ***Romania. Italy*** has a multiannual consumption of phosphorus fertilizers (P_2O_5) during the analysis period of 18.62 kg/ha, 19.23% more than the average multiannual amount per hectare used in ***Romania.***

Regarding the ***multiannual average quantity of chemical fertilizers with potassium (K_2O),*** it is found that in the period 2010-2019, ***Romania*** has the lowest, 5.38 kg/ha consumed among the countries included in the study and has 88.89% less than the largest consumer of potassium fertilizers (K_2O), respectively ***Poland***, which recorded a multiannual average quantity per hectare of 44.42 kg/ha. ***United Kingdom*** has an average multiannual consumption of potassium fertilizers (K_2O) during the analysis period of 43.79 kg/ha, 87.71% more than the average multiannual amount per hectare used in ***Romania. Germany*** has an average multiannual consumption of potassium fertilizers (K2O) during the analysis period of 35.02 kg/ha, 84.63% more than the average multiannual amount per hectare used in ***Romania. France*** has an average multiannual consumption of potassium fertilizers (K_2O) used in the analysis period of 23.26 kg/ha, 76.87% more than the average multiannual amount per hectare used in ***Romania. Spain*** has an average multiannual consumption of potassium fertilizers (K_2O) used in the analysis period of 21.31 kg/ha, 74.75% more than the average multiannual amount per hectare used in ***Romania***.

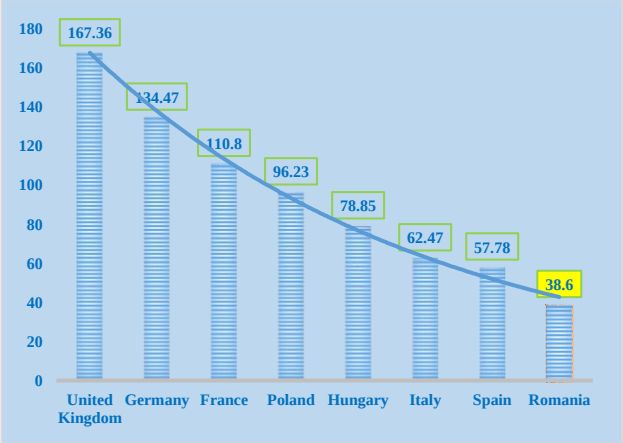

Fig. 11. Multiannual average consumption of nitrogen fertilizers (2010-2019)
Source: Own calculations and figure [11].

Soil moisture plays an important role in the mobility of potassium, with a positive impact on production [1]. ***Hungary*** has an average multiannual consumption of potassium fertilizers (K_2O) used in the analysis period of 18.31 kg/ha, 70.62% more than the average multiannual amount per hectare used in ***Romania***. ***Italy*** has an average multiannual

consumption of potassium fertilizers (K_2O) used in the analysis period of 13.74 kg/ha, 60.84% more than the average multiannual amount per hectare used in ***Romania.***

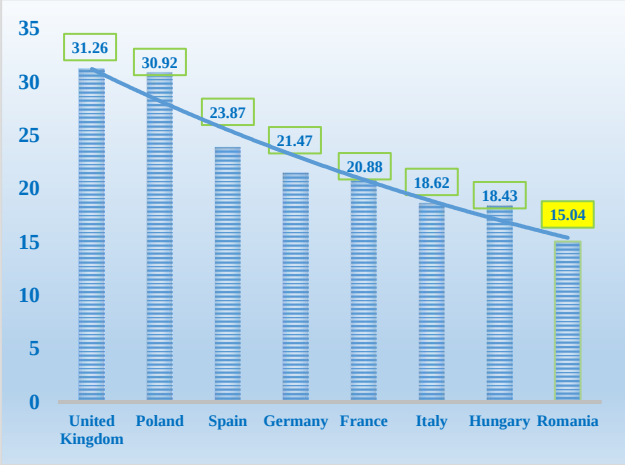

Fig. 12. Multiannual average consumption of phosphorus fertilizers (2010-2019)
Source: Own calculations and figure based on the data from [11].

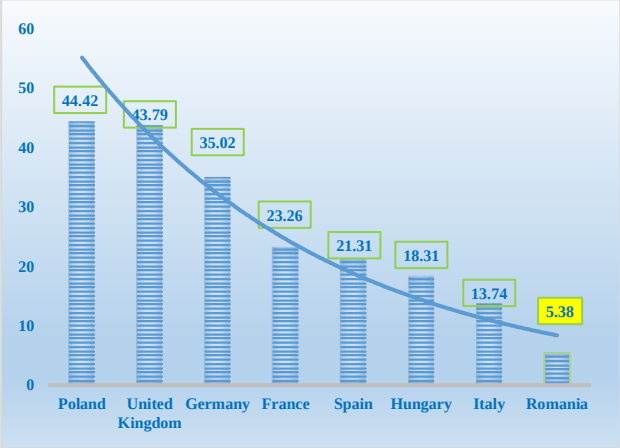

Fig. 13. Multiannual average consumption of potassium fertilizers (K_2O) (2010-2019)
Source: Own calculations and figure based on the data from [11].

In order to establish the multiannual average quantity of pesticides used per hectare cultivated in the main European countries included in the study, the quantities of pesticides consumed in agriculture and the total area cultivated each year from the analysis period, namely 2010-2019, were taken into account. In terms of the multiannual average quantity of pesticides used, it is found that, during 2010-2019, ***Romania*** recorded the lowest value, 0.70 kg/h, compared to the values recorded in the countries included in the study and has 89.24% less than the largest consumer of pesticides, namely ***Italy***, which recorded a consumed multiannual average quantity per hectare of 6.51 kg/ha. ***Germany*** has a multiannual average pesticide consumption of 3.77 kg/ha, 81.43% more than the multiannual average amount per hectare used in Romania. ***France*** has a multiannual average consumption of pesticides of 3.67 kg/ha, 80.93% more than the multiannual average amount per hectare used in Romania. ***Spain*** has an average multiannual consumption of pesticides of 3.28 kg/ha, 78.66% more than the average multiannual amount per hectare used in Romania. ***United Kingdom*** has an average multiannual pesticide consumption of 2.97 kg/ha, 76.43% more than the average multiannual amount per hectare used in Romania. ***Poland*** has an average multiannual pesticide consumption used of 2.03 kg/ha, which is 65.52% bigger than the average multiannual amount per hectare used in Romania.

Hungary has an average multiannual pesticide consumption during the analysis period of 1.97 kg/ha, 64.47% more than the average multiannual amount per hectare used in Romania.

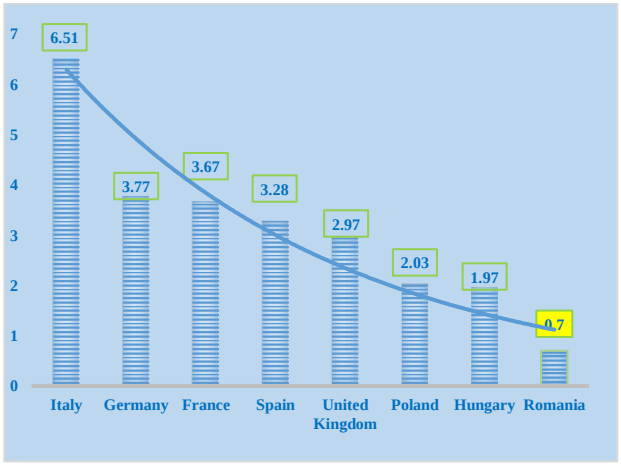

Fig. 14. Multiannual average pesticide consumption-total (2010-2019)
Source: Own calculations and figure based on the data from [11].

CONCLUSIONS

The conclusions of the study conducted by us, "The socio-economic impact of implementing

the Farm to Fork Strategy in agriculture and its transposition in Romania" highlighted the following:

-*The average cultivated area* in the period 2010-2019 in the countries under study, have positioned *Romania* on the 6th place among the countries under study (9,234.80 thousand ha).

-*The consumption of fertilizers and pesticides in Romania* is low, and this country occupies the last positions in the ranking of the countries under study, a situation that has a negative influence on the productions made in the analyzed crops.

-Correlating *the average multiannual quantity of chemical fertilizers and pesticides* with *the average multiannual area,* it is found that in the period 2010-2019 *Romania* has the lowest quantities consumed per cultivated areas amongst the countries included in the study. Reducing the amount of fertilizers and plant protection products will lead to a significant decrease in yields.

-The reduced consumption of *chemical fertilizers with nitrogen* along with other limiting factors, places Romania on the last places in terms of average yields/ha for the main crops.

-Also, the consumption of *chemical fertilizers with phosphorus* highlighted that Romania ranks 3rd in maize and potato crops, 4th in wheat and 5th in barley. For sunflower, rapeseed and soybean crops, the consumption of chemical phosphorus fertilizers placed Romania on the 6th place.

-Consumption *of chemical fertilizers with potassium,* places Romania on the last place in the hierarchy of the countries under study (8th place).

-Similarly, the average consumption of pesticides ranked Romania the last in the hierarchy of the countries studied (8th place).

Thus, the study has strengthened the existing ideas in other previous analyses, namely the use of fertilizers and pesticides in Romania is below the average of the quantities used by the countries included in the study. As a result, although the areas cultivated with cereals and technical plants in Romania are significant, the average yields/ha achieved are much lower compared to those recorded in the main producing countries mainly because Romanian farmers consume the lowest average quantities of fertilizers and pesticides per hectare, are largely dependent on climatic factors, use less advanced technologies (irrigation, modern machines, precision agriculture, performant seeds obtained by modern improvement techniques, etc.). The total yields are dependent on cultivated areas and average productions. As a result of the fluctuation of the two components, the total yields are also fluctuating, but again we note that the variability is higher in Romania for all the crops considered mainly due to the variability of the average yields per hectare. A special remark should be made for the production of maize in Spain. Spain grows the smallest area of maize in the studied countries but obtains the highest average yields per hectare. This is possible because genetically modified maize resistant to the attack of *Ostrinia nubilalis* is grown in Spain, and because maize is grown only on irrigable areas. Thus, we consider that it is necessary that the reduction of the quantities of fertilizers and pesticides used in EU agriculture and, implicitly, in Romania, as a result of the transposition into work of the Farm to Fork Strategy, to be carried out by reference to the European average, to the level of access/use of the elements of technological progress in the concerned country and to be taken into account the impact on the average yields, respectively total yields, for the main crop plants.

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