

# Analyzes regarding possible effects of electromagnetic waves emitted on agricultural productions

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**Abstract:** This paper aims to highlight in a unique way the effects on sustainable agricultural systems due to the global growth of the development of the communications system. From the very beginning, we discussed the disruptions of climate change and, in particular, the risk of disaster, which causes long academic debates, electromagnetic radiation. During the study we conducted empirical research using the wide range of receptors and detailed dermination bridge, we used quantitative methods to collect the processes and analyze the data and information incorporated to formulate observations and conclusions. The aim of this paper is to highlight an assessment for obtaining an answer to the possible causes of climate disturbances in agriculture, given the episodic uncertainty. Mainly, we will reflect the effects that interfere with the level of electromagnetic radiation produced by antennas. Opening advanced technologies with new satellite capabilities is expensive, so now the density of high power data transmissions useful in digital agriculture is the technical solution of operators empirical research experimentally analyzes the data we collect in the statistical monitoring of electromagnetic waves, to what extent these electromagnetic radiation affect agricultural systems concerned with trying to sequester C from the soil and reduce greenhouse effects. The paper defines and presents the evolution of the impact of new technologies developed in order to facilitate the implementation of intelligent agricultural solutions, admitting that the opening of new technologies facilitates the creation of the economically and socially interconnected global community (Mc Luchan, 1973). Taking into account the intensification of the use of digital agriculture, the analysis proposed for research is a topic of updating and in this sense it is necessary that this research be analyzed from environmental perspectives

**Keywords:** electromagnetic waves, agricultural, land-atmosphere interactions

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## 1. Introduction

As highlighted in specialized studies according to Leal Filho et al., (2017); Rodrigo-Comino et al., (2018) the most recent being Anderson & Mammides, (2020), the abandonment of agricultural land creates cause-effect effects on ecosystem services, in this case an increased carbon storage, sustainability. [1,2,3 ]

The agri-environment system must be included in the set of sustainability targets, we believe, this being possible with the help of the technique in a global interconnection as claimed by S.D. Neill (1973). [ 4 ]

Therefore, the correlation of economic interests in terms of adaptation to new trends in the digitalization of agricultural systems as a field, in general it would be desirable to agree with these systems of sustainability not only of the environment that is now at the forefront but as a whole or as a major challenge the effects of sustainability in the environment including technique. When we talk about technology we look back decades before 1997 when we did not have whireless global telephony and so the systematization of

the integration of this service would not predict the effects and benefits of digitization but at what cost, how electromagnetic waves are felt and if I can strike the environment to some extent.

Of course, the benefits brought in the agricultural systems cannot suppress the exigency of analyzing the variations of the electromagnetic waves in relation to the environment, the analysis of the disasters being a topic of interest especially chosen from the perspective of the more aggressive atmospheric and climatic changes.

Starting from the need to digitize agriculture, today we have an intrinsic need to use digital technology and not just the Internet. More and more intelligent applications help us to receive real-time information about the weather, when to apply fertilizers, where to get them and especially what quantities and how to apply them with drones.

All these concerns that indicate a foreshadowed risk in digitalized agriculture help us to program an effective approach to develop the digitalization system in agriculture as a major challenge. From the adoption and digitalization of the agricultural economy to the quantification of progress is not much but we must emphasize in our opinion some effects on electromagnetic waves and radiation emitted by digitization and why not some effects of decarbonization of agriculture as a continuing concern.

However, a higher level of use of the digitalization of agriculture and the economy should outline a strategy to address the risks of new technologies, and here we discuss the electromagnetic waves and their influences on agricultural production without omitting atmospheric changes.

## 2. Evolutions regarding greenhouse gas emissions in agriculture

Romania, like the rest of the world, is facing the problem of climate change and environmental degradation. The present analysis derives from the growing concern to integrate the digitalization of agriculture among the new concepts more widely in all areas of Romania facing serious socio-economic challenges posed by the transition to a climate-neutral Union economy until in 2050. [ 5 ]

These dual challenges require a closer look at the related risks that we need to know about integrating the digitalization of agriculture and how we can avoid some programming effects. There is more and more talk about pressure in electrical systems, how exposure to electromagnetic waves actually works and why we need high-performance systems, this question brings us an answer to how much we will achieve a programmed digitization the more we will be able to use these systems for the benefit of the community in which we use them to ensure a sustainable development in the agri-environment system.

The high frequency of climatic phenomena has caused more and more damage lately. In the last two decades, Romania has faced floods on the one hand, but also droughts, which are in response to climate change, the wind being again a frequent atmospheric phenomenon.

In addition, the territory of our country presents a risk of 13% of the total flood area, being qualified as exposed to this phenomenon among EU countries as revealed by the OECD 2020 [ 6 ]

In view of these evidences, a concern to increase sustainability includes the need for production models aimed at digitizing agriculture, so as to avoid that, against the background of economic growth, the effects do not lead to maintaining or even increasing the level of emissions GHG not only in agriculture but in general.

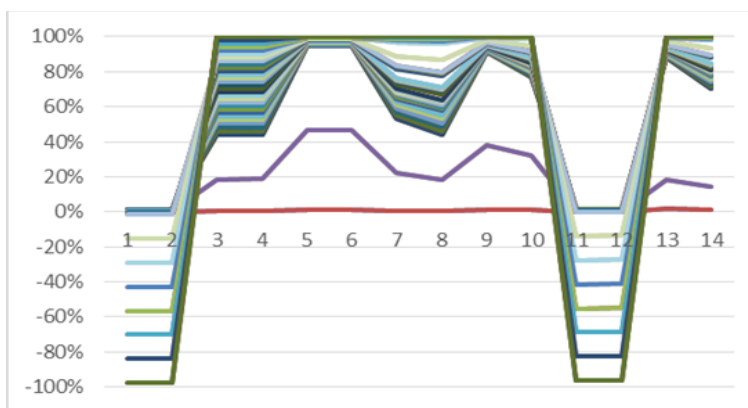
This fragment provides an overview of the growing global trend in terms of the effects of electromagnetic waves emitted by telephony systems and gsm antenna transmission capsules. The first part describes the impact of carbon emissions in Romania in the agricultural sector. It also presents the key elements of the disaster risk management framework for agriculture, which include, among others, the identification of these risks, control and awareness.

Most of the increasingly common natural disasters have caused hazards and have been linked to weather and climate. But there are other disasters that cannot be quantified and are often ignored by ignorance, electromagnetic waves and their effects on the environment.

Despite the good quality natural soil resources, agriculture in Romania is characterized by a source of 17.4% of total greenhouse gas emissions in the country, but is ranked last in the ranking of intensity of emissions from agriculture at EU level, due to the low productivity of the sustainable agriculture sector. Girardin, P., (2012) [ 7 ]

The reorientation of the agricultural design mechanisms determined by the rise of the use of agricultural digitization leads to rapid counterbalancing of the current situation as soon as the efficiency of agriculture will increase. Thus, both the reduction of GHG emissions in agriculture and the adaptation through agricultural processes to climate change are both important factors, maintaining their balance being a concern.

As we highlight in Figure 1, greenhouse gas emissions show long-term evolutions, the resulting diagram deciphering only forecasts on the reference field of agriculture.



**Figure 1. Evolution of greenhouse gas emissions**  
Source Owner recherché from data CEE Eurostat (2020)

These emissions are expected to be a response to climate change in relation to favorable critical interdependencies, including agriculture, as shown in Table 1.

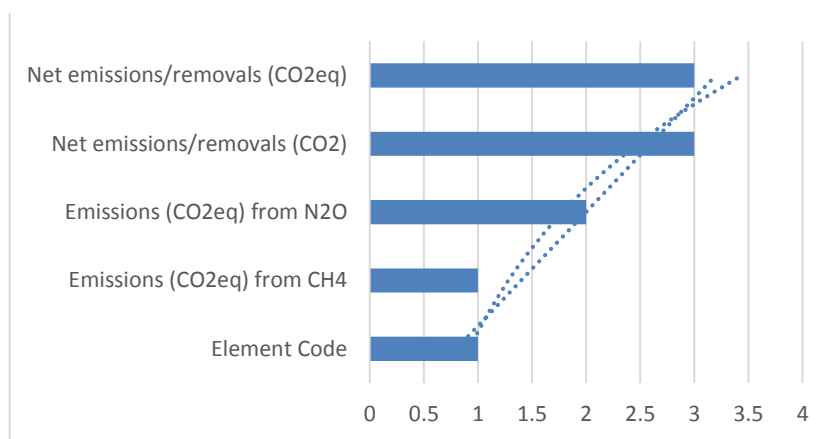
**Table 1.** Greenhouse gases (CO<sub>2</sub>, N<sub>2</sub>O in CO<sub>2</sub> equivalent, CH<sub>4</sub> in CO<sub>2</sub> equivalent, HFC in CO<sub>2</sub>)

| AIRPOL   | 2015            | 2016            | 2017            | 2018            | 2019            | of EU27_2020 |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|--------------|
| UNIT   | Thousand tonnes | Thousand tonnes | Thousand tonnes | Thousand tonnes | Thousand tonnes |              |
| Agriculture  | 432006.72       | 432829.39       | 435960.82       | 431462.42       | 427601.91       | in EU27_2020 |
| Biomass - CO <sub>2</sub> emissions (memo item)      | 546476.8        | 554469.91       | 566450.28       | 573491.71       | 584523.58       | in EU27_2020 |
| Land use, land use change, and forestry (LULUCF)     | -292346.11      | -291305.09      | -291305.09      | -291305.09      | -233948.9       | in EU27_2020 |
| Fuel combustion in agriculture, forestry and fishing | 79133.57        | 79751.06        | 80490.11        | 81557.74        | 81822.57        | in EU27_2020 |
| Other electronics industry                           | -               | -               | 1.09            | -               | 1.1             | in EU27_2020 |

Sources: European Commission, Eurostat and Directorate General for Agriculture and Rural Development

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As can be seen in Table 1, there is no concrete evidence of pollution in the electronics industry, although the greenhouse gas emissions produced by this electronics industry are obvious, this being another reason to create some premises for research into the effects of electromagnetic waves emitted. in the atmosphere.



**Figure 2.** Count of Net emissions/removals (CO2eq)  
 Source: Owner recherché from data CEE Eurostat (2015)

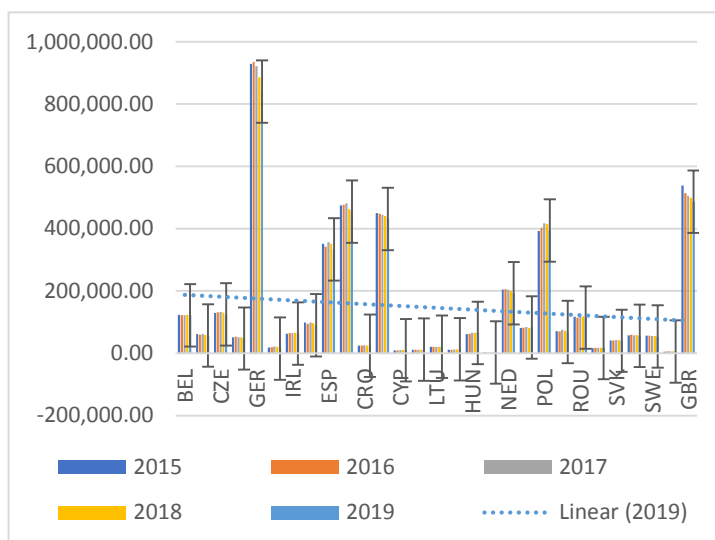
Another cause of the reduction of the agricultural land area is represented by the effects of Rainwater management, arrangements of protection areas. (Aznar-Sánchez, J. A., at al. (2019). [ 8 ]

Thus, on the whole, the climate and the changing weather phenomena that have become more and more aggressive by their extent show the weight that farmers face on large commercial agricultural holdings but also the differences between farms that practice subsistence agriculture, small. Scenarios are being made worldwide regarding the effects of climate change here and the Green Deal approach, in order to prevent the effects on farmers in general and individually. [ 9]

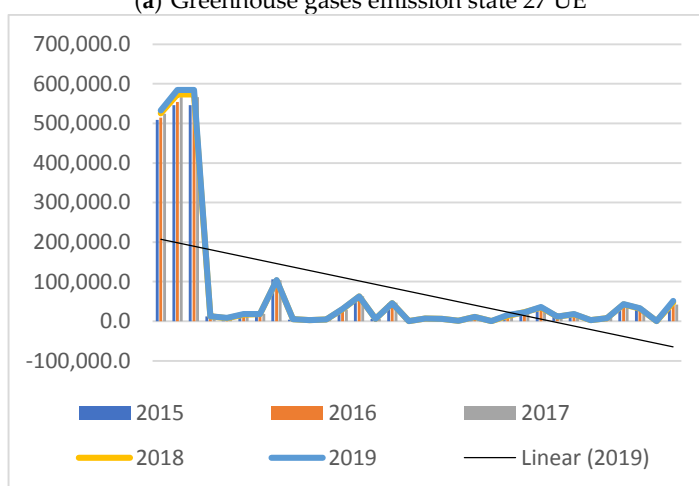
Given that large farms usually have a highly specialized production, such as cereals and oilseeds, they are particularly vulnerable to the impact of frequent and long-term droughts, which affect their production and profit.

The creation of agribusiness and forestry systems with strong incentives for soil carbon growth could be at the center of climate stabilization. "As indicated by (Mazza, 2007). [ 10 ]

Therefore the integration of digital systems and agricultural ecosystems can be seen as a lever for counting electromagnetic waves from mobile data sources, the data presented in Figure 2 .



(a) Greenhouse gases emission state 27 UE



(b) Greenhouse gas emissions by agricultural

**Figure 3** Greenhouse gas emissions by source sector (source: EEA) [env\_air\_gge]  
 Source: Owner recherché from data Eurostat (2015-2019)

The soil can degrade depending on many objects. (Andrei A\_S, Robeson MS, Barics A et al (2015). [ 11 ]

In fact, there is an accumulation of characteristics that can create the premises of agricultural systems designed as ecosystems included in the forecast environment with future orientations, resistant and adaptable to progress.

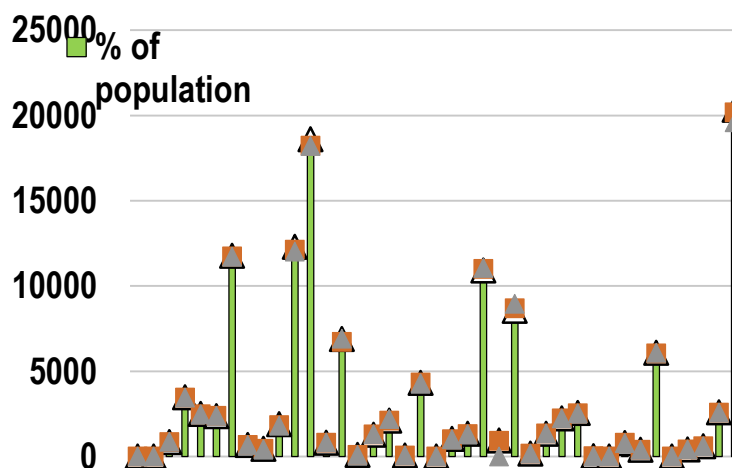
The paper brings as a novelty some characteristics of agricultural ecosystems by highlighting the monitoring and ash design of electromagnetic wave sources in the cells of mobile data antennas.

### 2.1. Soil and electromagnetic waves

Impact forecasts are expected, with climate change, weather and climate disasters to continue to increase in frequency and severity (IPCC, 2012 [ 12 ]). Due to this exposure there is a general climate sensitivity in agriculture, (FAO, 2016 [13 ]).

There are also premises for pests and diseases of plants and animals to increase due to climate change, atmospheric phenomena meaning that the design of digitized agricultural processes takes precedence to prevent disasters. FAO, (2005). [14 ]

The highlighting in Figure 3 of the variation of agricultural producers at EU level shows a progressive increase although this increase has no cause in increasing production but rather related agricultural services, agricultural systems being closely related to the evolution of digitalization of non-agricultural services, such as distribution, transport and the sale of agricultural products and fertilizers used in agriculture.



**Figure 4.** Highlighting the population in EU agricultural systems  
 Source: Owner recherché from data CEE Eurostat (2020)

However, the reduced productivity is attributed to the large proportion of subsistence farms without including another important factor, namely the risk of disasters, what would be the reduction of this risk if these fortuitous or force majeure disasters, natural or accidental and reduce this gap.

At this time, there is no global study on the impact of different types of disasters on agriculture. However, scientific research must continue to bring to the surface on each economic and agricultural system some effects of customs related to the adaptation of digitization the effects of electromagnetic waves and whether they can have impact effects such as radiography disasters, being a kind of reverse effects of greenhouse effects.

### 2.2. Disasters and air pollution

Generic so-called natural disasters are a major cause of food insecurity as reported (FAO – WFP 2020). [ 15 ]

The impact of these disasters extends beyond the economic sphere - by reducing the availability of sustainable food; limiting the reduction and / or loss of agricultural land and, as the case may be, affecting the nutritional qualities of plants, vegetables, fruits by exposure to radiation or electromagnetic waves.

Thus, another type of disaster can lead to imbalances in food stability at any time, as stated by L. Popescu (2021) [ 16 ].

Air pollution highlighted in Table 2 by air pollutants (AIRPOL) are considered: SO<sub>x</sub>, NO<sub>x</sub>, NH<sub>3</sub>, NMVOC, PM<sub>10</sub>, PM<sub>2.5</sub>, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Pb, while through the source sector for air emissions the classifications are under the LRTAP Convention. The Convention on Long-range Transboundary Air Pollution was the first legally binding international instrument to address air pollution

issues on a broad regional basis. It was signed in 1979 and entered into force in 1983. Since then it has been extended by eight specific protocols. [17]

**Table 2.** Air pollutants by source sector (source: EEA) European Union - 28 countries (2013-2020) and Iceland under the Kyoto Protocol [env\_air\_emis]

| AIRPOL                                  | 2014    | 2015    | 2016    | 2017    | 2018    |
|---|---------|---------|---------|---------|---------|
| UNIT                                    | Tonne   | Tonne   | Tonne   | Tonne   | Tonne   |
| Non-methane volatile organic compounds* | 7175978 | 7131236 | 7090428 | 7156077 | 7014421 |
| Particulates < 10µm                     | 2039964 | 2050731 | 2024952 | 2030918 | 1988686 |
| Particulates < 2.5µm                    | 1310984 | 1321946 | 1303169 | 1304387 | 1254688 |
| Nitrogen oxides                         | 8226311 | 8047481 | 7749410 | 7596656 | 7286691 |
| Sulphur oxides                          | 2851109 | 2677623 | 2233997 | 2189893 | 2043268 |
| Ammonia                                 | 3839232 | 3887048 | 3900696 | 3919805 | 3858921 |

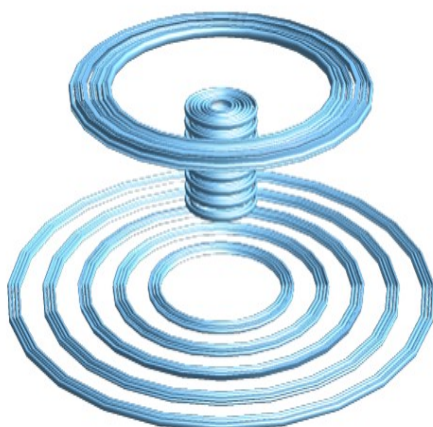
Source \* European Environment Agency (EEA)

\* National total for the entire territory (based on fuel sold)

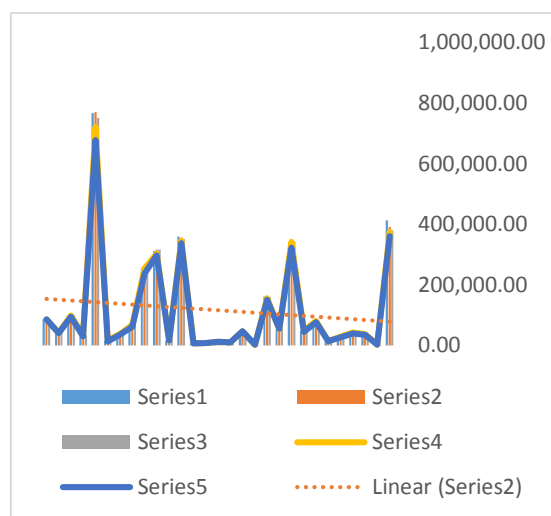
Directive 2001/81 / EC of the European Parliament and of the Council on national emission ceilings for certain pollutants (NEC Directive) sets upper limits for each Member State for certain pollutants responsible for acidification, eutrophication and ground-level ozone pollution. [18 ]

Under the EU inventory system, the European Environment Agency and the European Center for Air Pollution and Climate Change Mitigation are responsible for compiling the annual EU inventory.

By way of example, we have highlighted in the statistical figures by countries considering the annual inventory of pollution in the area covered by its member states. Regarding pollutants to Non-methane volatile organic compounds \* led by Germany 1196457 Italy 940101 Poland 708249 France 662961 Spain 572369, Romania 241860, another example of Particulates <10µm pollutant, Gr 1202279, Pol 761712, Fr 749007, Sp 698483, Italy 669157, Romania having 225378.



(a) Virtual



(b) global

**Figure 5.** Evidentierea poluantilor (a) si (b) din sistemele agricole UE

Source: Owner recherché from data \* European Environment Agency (EEA)

### 3. Results

#### 3.1. Agricultural ecosystems and electromagnetic waves

The aim of the paper points to the progress of digitalization of agriculture with increased risks of rising electromagnetic waves in large areas of development and presents a collection of data to obtain an answer to possible causes for climate disturbances in agriculture, given the epistemic uncertainty. Several properly identified statistical distributions allow the acceptable approximation of the frequent values of electromagnetic waves but do not make a direct connection with the effects on agricultural ecosystems whether we are talking about animal farms or plantations. The scattering of gsm cells as well as radiation verification can be the subject of a more careful analysis by exploring the data as a consequence of the epistemic uncertainty, by defining an area of uncertainty both for the recorded data and for the extrapolated values. Considering some upper and lower values of the uncertainty intervals as limits for achieving a compatible interdependence between data on a given area

Due to the epistemic uncertainty, the statistical estimates thus belong to a range of uncertainty, which will depend on the spread of the analyzed statistical distributions.

For the present paper, instead of looking for the best distribution function, the uncertainty interval was used to define the reasonable limits of these limits, however, not having enough data, the monitored points being random.

The best solution to match the empirical data is the spatial variability and duration of a series of monitoring of available electromagnetic waves. Moreover, the recorded data are subject to epistemic uncertainty due to incomplete knowledge of the system of electromagnetic wave effects. Before any statistical analysis, the data must be verified for mutual independence and identical distribution, homogeneity and lack of trend data of the sample used on a frequency of 1 to three months and one year, but also to three days the electromagnetic variations extracted from the general data system. Figure 6,7,8,9.

The stationary nature of the data, although in most cases, implicitly assumed, is questionable due to land cover and land use changes or climate change. Depending on the purpose and the available data, the analysis is supported by the way in which it would be good to distribute the radars for checking the electromagnetic fields compared to the proximity of agricultural systems for a proper management of the risk of high electromagnetic field pressure or why not with values exceeding the allowed limits, really known, as well as proper planning and design in the future so as not to affect agricultural systems, this being in fact a different kind of pollution.

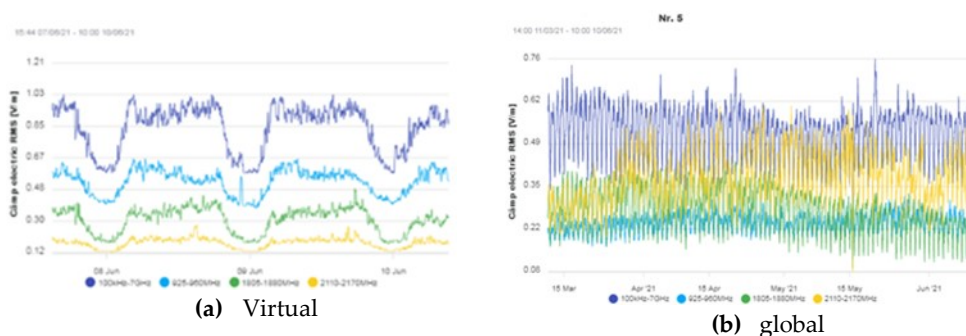
Exposure to the electromagnetic field is regulated by law, according to the practices adopted in the European Union. Thus, it is regulated according to Recommendation 1999/519 / EC on limiting the exposure of the general population to electromagnetic fields (from 0 Hz to 300 GHz), but in agriculture they are not monitored, measurements on the level of electromagnetic field emitted by antennas used in frequency bands up to 7 present for 5G technology, etc.), are important data in the case of sustainable systems.

The present research adds among the possible causes of disturbance or risk of absorption of C in the soil, due to electromagnetic causes from various sources, but the subject is not evaluated in depth because both statistical data for periods of time and measurement solutions are missing in Figure 6,7,8,9 we managed to extract the evaluation of a localized example of monitoring an electromagnetic field.

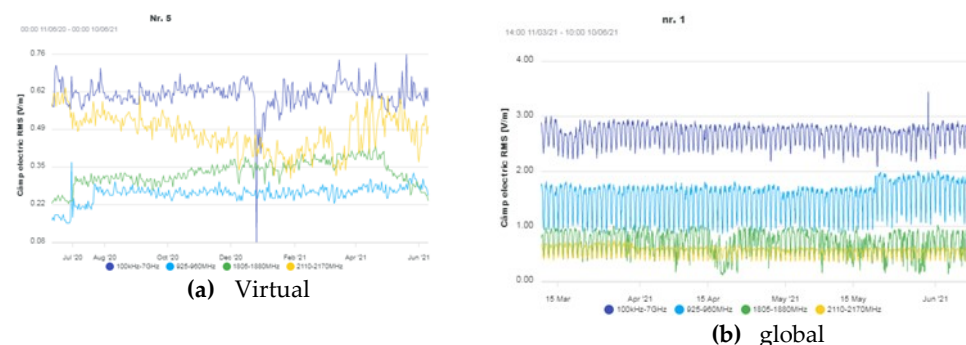
The lack of measuring stations at the level of agricultural farms is complicated by the lack of information, but the present exercise shows the need for information in order to discover with greater precision the effects of electromagnetic fields at the level of agricultural crops and plantations.



As indicated in Figure 7(a) and Figure 8 (b), there is a suspicion that there are surges or shocks as we call them, which determine much lower values in Figure 3 and much higher in Figure 8 at the level of monitored electromagnetic waves, the investigation must continue and use other levers to determine on the basis of scientific data the effects of these so-up or down electromagnetic waves and what are in fact the real causes. In the data extracted from the database we alternately evaluated information on electromagnetic waves to look for a connection between the climate zone.



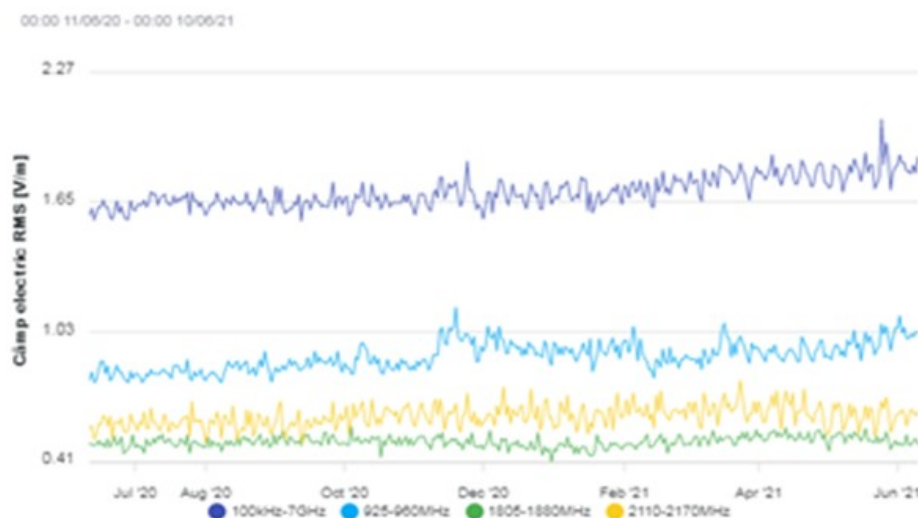
(a) Virtual  
(b) global  
**Figure 6.** Evidentierea poluantilor (a) si (b) din sistemele agricole UE  
Source: Owner recherché from data \* European Environment Agency (EEA)



(a) Virtual  
(b) global  
**Figure 7.** Evidentierea poluantilor (a) si (b) din sistemele agricole UE  
Source: Owner recherché from data \* European Environment Agency (EEA)



(a) Virtual  
(b) global  
**Figure 8.** Evidentierea poluantilor (a) si (b) din sistemele agricole UE  
Source: Owner recherché from data \* European Environment Agency (EEA)



**Figure 9.** Monitorizare camp electromagneticic

Source: Owner recherché from data \* European Environment Agency (EEA)

From the technical data considered in the research, GSM cells are emitting factors of electromagnetic fields at low levels. Mobile telephony operates through electromagnetic fields with frequencies between 9 kHz and 300 GHz. Co-communicé Communications Regulatory Agency (2020) Amparo Lázaro (2016) [19 ]

Antennas typically operate at much higher frequency radio frequencies than cell phones. According to wikipedia data, the level of the electromagnetic field in front of the antenna decreases very strongly as the distance from the antenna increases, being negligible behind it. We can therefore say that at 6 meters from an antenna, we are in the safe area where the level of the electromagnetic field is lower than the reference level stipulated in the norms, regardless of its power and type. [ 20 ]

In addition, research indicates that soil is a prime example of the need to think globally and act locally to better find the need to harmonize methodologies for researching the processes underlying the functions of the solution. (eg the role of soil in global CO2 accounting and biodiversity protection), - spatial and temporal changes in soil processes.

**4. Conclusions**

The big challenge, as I said before, is the impact of climate change on agricultural production systems.

Among the objectives pursued were the protection and sustainable use of digitized agricultural processes to protect as efficiently as possible the soil, biodiversity, human resources in agriculture.

Failure to protect the soil will undermine long-term sustainability and competitiveness in Europe. Since soil is related to air and water in this symbiosis it is possible to regulate soil quality and the implications arising from it. In addition, they can have a significant impact on the prediction of agricultural processes that are obviously related to digitization. This is due to the risks of disasters. Thus, in our opinion, the electro-magnetic fields can generate a fluctuation in the soil level, the action by preventing the contamination of the soil or reducing its level, are a necessary complement to the measures to ensure the safety of feed and food. The idea of approaching this research problem and conducting research from the perspective of digitizing agriculture that agricultural systems adopt

contributes to supporting the economy, research on this topic has emerged as a result of detailed study of the literature.

Concern for the good of the economy being an intrinsic component of the way processes evolve in farms and agriculture must not omit that electromagnetic waves must be further investigated in terms of atmospheric disasters that affect the agricultural field and beyond.

Stokols (1992) showed that the adoption of a healthier lifestyle can be transposed through the prism of care behavior and ecological behavior so that these benefits more precisely care for what we choose to consume, what we choose to produce creates another approach to anything is around us and on society as a whole with the benefits that flow from it. [ 21 ]

The research helps to analyze any type of atypical disasters that can attack agricultural systems. What we want to highlight is the need to investigate the effect of electromagnetic waves at ground level, the progress of sampling reports of electromagnetic waves without creating and a map of them in relation to agricultural systems leads to the need to predict this through processes, in order to give effective results.

Having these smart system options to adapt their agricultural systems to climate change through new technologies and digital systems for irrigation, pest control and detection, fertilization is a breakthrough in agriculture. All this involves a volume of data that must be properly managed prepared for data loss disasters, these data safes can generate electromagnetic radiation near the mobile systems of data cells.

As a consequence we can say that from an economic point of view, the 2019 pandemic has exponentially increased the need and dependence on the use of digitalization agriculture, and possible disturbances and shock of adverse climatic effects in agriculture add to the need for efficiency and standardization of smart agriculture monitoring all long-term process risks. The introduction of electromagnetic waves as a risk factor for disasters cannot be ruled out as long as atmospheric disturbances produce effects in agricultural ecosystems which in turn generate carefully monitored greenhouse gases.

The new goal of a more equitable, greener and more efficient CAP vision, which supports environmental measures, also aims to strengthen the European agri-food system in line with the development of a greener agricultural system. Eurostat (2020) [22 ]

Basically this vision includes increased standards of conditionality that farmers must meet in order to benefit from CAP support, including the conservation of carbon-rich soils by protecting wetlands and peatlands, as well as minimum levels of arable land for landscape features to protect biodiversity. John M. Antle (2007) [23]

In this sense, it is particularly important that the integration of these targets includes a risk analysis for other types of disasters such as electromagnetic waves to bring in the new CAP the performance flow of agricultural systems with customized development interventions to needs and strategy systems in accordance with the objectives envisaged at need.

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

**Abbreviations**

|                    |   |
|--------------------|---|
| PAC                | Common Agricultural Policy                                  |
| EEA                | European Environment Agency                                 |
| Poluant atmosferic | AIRPOL  |
| ICNIRP             | Comisia internațională de protecție la radiații neionizante |
| ESS                | European Statistical System                                 |

**References**

1. Leal Filho et al., (2017) Identifying and overcoming obstacles to the implementation of sustainable development at universities Pages 93-108 | Received 15 Dec 2016, Accepted 26 Jul 2017, Published online: 18 Aug 2017 <https://doi.org/10.1080/1943815X.2017.1362007>
2. Rodrigo-Comino et al., (2018), Analysis of Weather-Type-Induced Soil Erosion in Cultivated and Poorly Managed Abandoned Sloping Vineyards in the Axarquía Region (Málaga, Spain), <https://journals.sagepub.com/doi/full/10.1177/1178622119839403> *Air, Soil and Water Research*
3. Emily Anderson & Christos Mammides (2020), Changes in land-cover within high nature value farmlands inside and outside Natura 2000 sites in Europe: A preliminary assessment <https://link.springer.com/article/10.1007/s13280-020-01330-y>
4. S. D. Neill (1973), McLuhan's media charts related to the process of communication, *AV communication review* volume 21, pages 277–297 (1973), <https://link.springer.com/article/10.1007%2FBF02768152>
5. European Commission, 2021. Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change, Brussels: COM 82. Second pillar of the CAP: rural development policy, Brussels. <https://www.europarl.europa.eu/factsheets/en/sheet/110/second-pillar-of-the-cap-rural-development-policy>.
6. Towards Sustainable Land use, OECD Publishing, Paris. OECD (2020), <https://oecd-environment-focus.blog/2020/12/23/securing-natural-capital-on-land/>
7. Girardin, P., 2012, Indicators: Tools to evaluate the environmental impacts of farming systems. *Journal of Sustainable Agriculture* 13, 5–21. doi:10.1300/J064v13n04\_03.
8. Aznar-Sánchez, J. A., Piquer-Rodríguez, M., Velasco-Muñoz, J. F., & Manzano-Agugliaro, F. (2019). Worldwide research trends on sustainable land use in agriculture. *Land Use Policy*, 87, 104069.
9. Greening the CAP. An analysis of the effects of the European Commission's proposals for the Common Agricultural Policy, 2020
10. G. Mazza, (2007) Biological Activities of Extracts from Sumac (*Rhus* spp.): A Plant Foods for Human Nutrition, *Review* volume 2, pages 165–175 (2007), <https://link.springer.com/article/10.1007/s11130-007-0058-4>
11. Andrei A. S, Robeson MS, Barics A et al (2015) Contrasting taxonomic stratification of microbial communities in two hypersaline meromictic lakes, *ISME J* 9:2642-2656, doi:10.1038/ismej.2015.60
12. The Intergovernmental Panel on Climate Change (IPCC), <https://www.epa.gov/climate-indicators/weather-climate> <https://climate.nasa.gov/effects/Climate-Change-Indicators-Weather-and-Climate>
13. Food and Agriculture Organization, 2016. Feeding the world in 2050, Rome: World Summit on Food Security. <http://www.fao.org/tempref/docrep/fao/meeting/018/k6021e.pdf>
14. Food and Agriculture Organization, 2005. Feeding the world in 2050, Rome: World Summit on Food Security. <http://www.fao.org/tempref/docrep/fao/meeting/018/k6021e.pdf>
15. FAO-WFP early warning analysis of acute food insecurity According to the 2020 Global Report on Food Crises – September 2020, <https://reliefweb.int/report/yemen/fao-wfp-early-warning-analysis-acute-food-insecurity-hotspots-october-2020>
16. Popescu L. et al (2021), "The Causal Relationship of Agricultural Standards, Climate Change and Greenhouse Gas Recovery" *Environ. Sci. Proc.* 2021, 4(1), 21; <https://doi.org/10.3390/ecas2020-08153>
17. Air pollutants by source sector (source: EEA); [https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_air\\_emis&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_air_emis&lang=en)
18. Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (NEC Directive), 32001L0081. Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants. Official Journal L 309, 27/11/2001 P. 0022 - 0030. Directive 2001/81/EC of the European Parliament and of the Council. <https://eur-lex.europa.eu/legal-content/ES/ALL/?uri=CELEX:32001L0081>.
19. Amparo Lázaro (2016) The exponential increase of mobile telephony has led to a pronounced increase in electromagnetic fields in the environment that may affect pollinator communities and threaten pollination as a key ecosystem service, <https://link.springer.com/article/10.1007/s10841-016-9868-8>
20. [https://en.wikipedia.org/wiki/List\\_of\\_WLAN\\_channels](https://en.wikipedia.org/wiki/List_of_WLAN_channels) WLAN (wireless local area network) channels are frequently accessed using IEEE 802.11 protocols, and equipment that does so is sold mostly under the trademark Wi-Fi
21. D Stokols (1992) Affiliation 1 Program in Social Ecology, University of California, Irvine 92717. PMID: 1539925 DOI: 10.1037//0003-066x.47.1.6 <https://pubmed.ncbi.nlm.nih.gov/1539925/> Jan;47(1):6-22. doi: 10.1037//0003-066x.47.1.6.
22. Eurostat (2020). Indicators Database. Accessed Online in October 2020
23. John M. Antle, Jetse J. Stoorvogel, Roberto O. Valdivia *Agriculture, Ecosystems and Environment* 122 (2007) 435–445