

ROMANIA'S AGRICULTURE AND ITS CHALLENGES IN THE CONTEXT OF A  
NEW TECHNOLOGICAL REVOLUTION

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**Abstract:** *At the European level, Romania is recognized as agricultural and predominantly rural where practising traditional agriculture and the culture of the Romanian village are defining elements of our national identity. The basic occupation of the Romanian rural communities was and still is agriculture. As a member of the EU, Romania must comply with the new CAP provisions, which are currently emphasizing the use of the latest and most modern technologies and innovations in agriculture. The agricultural policy of the future encourages knowledge and innovation to develop an intelligent, sustainable agricultural sector. This article presents the challenges for agriculture and Romanian farmers who need to produce enough quantities of agri-food products to cover domestic demand and limit or even eliminate the import of basic products for Romania. Following the study and the analyses carried out, the authors of this article concluded that, in the current development of society, the existence and functioning of viable agricultural farms and the gradual transition to digitized farms will be the future of agriculture in Romania.*

**Key words:** *agriculture, changes, challenges, digitization*

**INTRODUCTION**

In the current context facing society (pandemic, digitization and war between Russia and Ukraine), the Common Agricultural Policy (CAP) of the European Union must be able to meet the challenges. The main elements of the current CAP refer to the following: A simplified and modernized policy; A better rebalancing of responsibilities between the EU Member States and Brussels; Orientation of performance and outcome support; A fairer distribution of direct payments; Better results in climate and environmental change [1].

In this respect, we find that the new provisions of the CAP encourage and support the use of current most modern technologies and innovations in *agriculture*. More emphasis is placed on the environment and the climate and, in this respect, several controls to ensure that both farmers and EU member states meet the obligations assumed are needed.

For the period 2021-2027, the EU Commission proposed an amount of 365 billion EURO in current prices, of which 28.5% of the EU's total budget for the multiannual financial framework is reserved for the CAP of the EU, which places greater emphasis on the support given to small- and medium-sized family farms and, in particular, to stimulate young farmers to work in agriculture[2,3].

**Table 1.**

**Advantages of integration in the EU for agriculture**

<b>Village reinvigoration</b>	New employment opportunities through the diversification of activities in the rural area Increase the standard of living in the rural area
<b>Increase of consumers' protection</b>	Increase of product quality through re-technologization of units in the food industry
<b>Modernisation</b>	Increase in production and competitiveness through the use of new technologies Increase in access to information

*Rural development* is the second pillar of the Common Agricultural Policy, whose objective is to support rural areas to meet multiple economic, social and environmental challenges. This policy meets the system of direct payments to farmers and agricultural market management measures (first pillar) [12].

EU rural development policy is funded through the European Agricultural Fund for Rural Development (EAFRD). Each Member State receives a financial package for this period of seven years[8].

It is important to point out that the Member States and regions are developing their rural development programs according to the needs of the territory through NRDPs. *They must, at the same time, aim for at least four of the next six priorities of the EU:*

1. Encourage knowledge transfer and innovation in agriculture, forestry and rural areas;
2. Enhance the viability and competitiveness of all branches of agriculture and promote innovative agricultural technologies and sustainable management of the forest fund;
3. Promote the organisation of the supply chain, animal welfare and risk management in agriculture;
4. Restore, preserve and develop ecosystems that are related to agriculture and forestry;
5. Promote efficient use of resources and support the transition to low carbon and climate-resistant economy in the agricultural, food and forestry sectors;
6. Promote social inclusion, poverty reduction and economic development in rural areas.

Farmers already play a particularly important role in protecting the environment and preserving landscapes, combating climate change, and in protecting biodiversity.

Farmers will receive support to overcome mandatory requirements for agri-environment and/or climate commitments assumed. The granting of direct payments is fully conditional on improving the environment and climate[13,14,15].

## MATERIALS AND METHODS

The methodology used in the research consists of collecting statistical data, processing them, interpreting them graphically, and analysing and synthesising information on the evolution of agriculture from the literature in the field.

## RESEARCH RESULTS

Knowledge and innovation for an intelligent and sustainable agricultural sector are of paramount importance. In this respect, the agricultural policy of the future encourages both. Thus, a specific budget of 10 billion EUROS of the “*Horizon Europe*” Program is reserved for research and innovation in the field of food, agriculture, bio-economy and rural development.

*Encouraging the digitization of rural life* on agricultural farms (for example, through precision agriculture techniques) and in broader communities (through improving connectivity) are ambitious goals for the near future. In this respect, they are acting for the implementation of an EU-level platform for risk management to help farmers operate their businesses.

*Unfortunately, the CAP is adapted to the situation in the agriculture of EU countries and does not meet the needs of Romania's agriculture that has other objectives, such as:* Restructuring and consolidating farms; Supporting production to increase financially; Balancing agri-food balance; Increasing export and reducing imports of agri-food products.

Low productivity, the high share of self-consumption, the advanced age of most owners, as well as their lack of training in the field explain the practice of subsistence strategies and the lack of concern for the development of the current agricultural households in Romania[4,5,6].

It is worth noting that, even after three decades of changes in Romania's agriculture, they do not cultivate the areas cultivated in 1990, and the largest area, over 62%, is cultivated with cereals according to published statistics. Among cereals, the largest share is that of maize – 46.26%[9,10].

Romanian agriculture, due to its resources, can produce sufficient quantities of agri-food products for domestic consumption, thus limiting imports for basic products [7].

Romania's agriculture is currently facing the following issues:

a) *Reduced degree of use of the ecological potential of agricultural land* (about 39-40%) in the period 1990-2019 [11], compared to the normal average use of agricultural land in France (80%);

b) *Technological performance gaps*;

c) *Non-performance of annual agricultural production generated by the too-high dependence on annual weather conditions*;

d) Use of obsolete agricultural technologies, particularly on small- and medium-sized farms;

e) From the point of view of agricultural performance and rural development, the current state of Romanian agriculture is (mostly) similar to the agriculture of EU-6 countries in the years 1965-1970.

The non-performance of Romanian farmers has caused *an increase in the share of food imports* of the total food consumption (20-25%, the average of the years 2007-2019) and a decrease of the share (15.4%) of exports of total agri-food production.

Romanian **export** consists mainly of raw materials (cereals, oil plants, live animals) and **import** consists of animal products and processed products (meat, milk, vegetables, fruits, biological material, including frozen dough, etc.).

The existence and functioning of viable agricultural farms and the gradual transition to the **digitized farm**, the farm of the future, will lead to increased farm revenues, revitalised rural economic life, and increased living conditions in Romanian villages.

#### **Challenges of society in the current period**

We are living, now (beginning of the 21<sup>st</sup> century and the 3<sup>rd</sup> Millennium), in a society that changes at a stunning speed.

Besides, we are all contemporaries of these changes, we live and we must overcome the challenges of *the fourth industrial revolution* also called Industry 4.0, which originates at the beginning of the 3<sup>rd</sup> Millennium *with the emergence of the Internet*.

It is the only industrial revolution that is not based on the discovery of a new form of energy as it has happened in the past: it is based on the latest technology phenomenon – digitisation.

#### **a) The First Industrial Revolution – Industry 1.0**

It took place in 1765 when James Watt invented *the first steam engine*; it had a main technical impact on **the mechanisation of production processes**, a process that gradually replaced agriculture with industry as a basis for the economic structure of society. Subsequently, the railway lines were created that led to the acceleration of economic exchanges

#### **b) The Second Industrial Revolution – Industry 2.0**

It took place at the end of the 19<sup>th</sup> century and culminated with **a new source of energy: electricity**. Thus, *the first internal combustion engines* have resulted: the steel processing industry developed, and new chemical synthesis methods emerged that have given rise to *the first synthetic fibres, paints and soil fertilization* have emerged. *The means of communication have also been revolutionized as a result of the appearance of the telegraph and the phone*.

Then, towards the beginning of the 20<sup>th</sup> century, the first *cars* and the first *planes* appeared (Romanian inventors Traian Vuia, Aurel Vlaicu and Henri Coandă played a special role in aviation).

*c) The Third Industrial Revolution – Industry 3.0*

It started, practically, in the second half of the 20<sup>th</sup> century and it intertwined, to some extent, with the fourth, which is unfolding today.

This third revolutionary wave culminated with the discovery of a new source of energy, namely **nuclear energy**. Electronic *products* appeared, with *the invention of the transistors and, then, the microprocessors* (1970) and, last but not least, *the development of the telecommunication industry and the computers industry* (also ICTs).

The development of new technologies has given rise to new areas of research, especially in space and biotechnology. *A new era of automation of production processes was born and the emergence of industrial robots occurred.*

*d) The Fourth Industrial Revolution – Industry 4.0*

It is characterized by *a high level of automation of processes* and by *a close interconnection of the physical – real world* with the digital world.

The phenomena have greatly increased during the pandemic period and we do not know when it will end. Information and communication technology have emerged everywhere. In all areas of activity, robots appeared – they talk to us on the phone, clean the house, operate in production phases up to the final product, drive cars, can keep us company and examples can continue. We are already surrounded by artificial intelligence, from *autonomous vehicles* and *drones* to *virtual assistants*.

Technology has made possible new products and services designed to ease our personal and professional lives. *This is the time to ask ourselves where we are heading to.* Integration of robots, artificial intelligence, the Internet and advanced communications provides transformations and radical changes in the production of goods, with a major technological, economic and social impact.

***The 21<sup>st</sup> century is the Century of Connectivity and Automatic Systems. The current industrial revolution involves optimizing production, resource efficiency, flexibility and rapid adaptability to consumer requirements, machine cooperation, and cooperation between human operators and machines.***

***What will the impact on society be?***

- Increased incomes and improved quality of life: first of all, new products and services will emerge that will increase population efficiency;
- Digitisation in all areas of activity;
- Impact on people – new jobs, new occupations and advanced professional training because we will live in a digital economy.

Specialists in the field discuss new development directions that are heading for a new industrial revolution, ***the Fifth Industrial Revolution which is based on humans' collaboration with robots.***

If we think that they are talking more and more about *artificial intelligence, robotics, the Internet of things, autonomous motor vehicles, 3D printing systems*, (meat or houses obtained using a 3D printer), *virtual reality, and nanotechnology*, then, we can talk about the beginnings of the Fifth Industrial Revolution 5.0.

In other words, ***Industry 5.0 is about the relationship between man and machine*** and about how Smart our world will become.

*At the heart of this concept, the bioeconomy plays a crucial role, as it contributes to a sustainable economy that ensures a balance between ecology, industry and economy.*

The new industrial revolution focuses on technology, life and a man-centred economy.

It is intended to integrate smart devices, intelligent systems and intelligent automation with physical objects in cooperation with human intelligence.

Follows spreading in all areas of activity, i.e., the implementation of classes of autonomous process management systems.

Autonomous systems with real self-organization capabilities impose new ways of training for future specialists with another type of knowledge.

In this situation, the emergence of new professions and trades based on the technologies of the future can generate a social impact through *the vulnerability of the labour force and the disappearance of traditional jobs*.

## CONCLUSIONS

Under the current conditions of the economy, it is necessary to find *an optimal ratio between cultivated technologies, productions obtained and ecology*, to ensure the economic and social development of rural communities by:

- Satisfying food and social requirements;
- Improving the quality of the environment and the basis of the natural resources;
- Using with maximum efficiency the limited resources and the non-renewable resources;
- Improving the quality of life so that citizens are no longer tempted to leave rural areas and migrate to other areas.

### ***Increasing welfare of rural areas can be achieved by:***

- Stopping migration and rural population by creating economic alternatives to motivate them to remain in villages and stimulate their action initiatives for the economic growth of communities and ensure the simple bare necessities for living within the limits of the normality of the century in which we live;
- Combating extreme poverty in rural areas;
- Stimulating and diversifying all economic activities and all services, in particular;
- Ensuring decent living conditions for rural inhabitants, compared to the conditions of the urban population;
- Ensuring everybody's right to a better life, health care, education, social protection, etc.

Since agriculture is the basic field of rural areas, *the practice of sustainable agriculture* must pursue: maintaining soil quality and an optimal correlation between the quantity and quality of food necessary for the population and the animals, focusing on people's health and maintaining the quality of the environment within normal parameters.

The achievement of these balance correlations can be provided by practising alternative agriculture whose objective function is determined by environmental and production restrictions.

### **As action directions, the following activities are required:**

- Ensuring proper crop rotation;
- Recycling crop residues and manure;
- Using chemical fertilizers, pesticides and other chemicals in restricted dosage;
- Extending of soil protection and improvement cultures, including hemp cultures that leave the soil free of weeds, as well as nitrogen-fixing legumes (soy, peas, lucerne, etc.) that leave the soil rich in nitrogen;
- Controlling diseases and pests in an integrated way;
- Expanding organic farming to larger areas and obtaining **considerable organic product** yields.

Today, people have to cope with a society exposed to profound, continuous changes globally and locally. In this context, the academic environment has a primary role

in both the training of graduates as well-trained specialists and the shaping of people able to cope with the current challenges:

a) *Robots in agriculture* -In agriculture, some robots harvest such fruits as strawberries, cherries, oranges, grapes, etc.

Shortly, replacing people with robots in actions that demand repetitiveness, physical effort, and particular precision will be almost total.

b) *Autonomous tractors and combines* - Autonomous (no driver) tractors and combines have been introduced supervised by a single operator who coordinates, from a computer, dozens of agricultural machines in the field. Such tractors are used in agriculture in Banat, Bucovina or Insula Mare a Brăilei.

c) *Agricultural drones* that perform various fertilization, surveillance or pesticide treatments.

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