

Performant agriculture in The Big Island of Braila in the context of European strategies

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Abstract

The Big Island of Braila, known as the biggest farm in Europe, with the most fertile soil in Romania, has an objective to become the most developed farm in Europe. For this to be achieved, an investment plan is undergoing implementation. The sustainable implementation of an investment plan considering the European strategies for a biological agriculture requires rigorous organisation on a structural level as well as a procedural one. Starting from this premise, the method of economical agriculture within the company will affect the domains of agriculture, economy and human resources. The research method used is applied scientific methodology with the aim of gathering new knowledge regarding ecological agriculture and how it is implemented. The final objective is the sustainable implementation of biological agriculture in the Big Island of Braila. Concerning the land shifting to ecological agriculture, there is the implementation of the system involving minimum work of the soil; for the design of biological technologies, tests have been conducted on the crops undergoing rotation; the monitorisation of plant development is done through precision agriculture which was implemented in 2018. Upon carrying out tests for the implementation of biological agriculture within the Big Island of Braila, digital platforms were assigned the task of monitoring the plants so that their gradual development can be observed.

Keywords: agriculture, sustainability, profitability, agriculture production, farm, European strategies, performance

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I. Introduction

Agriculture is an activity that is placed hierarchically in the prime sector of the economy, which deals with the extraction or harvesting of products. This domain relies on certain resources called factors of production: terrain, work, knowledge, capital, entrepreneurship. At the level of the European Union, the agricultural sector operates within the common agriculture policy and is a field that also relies on uncontrollable factors such as weather and changes in climate.

This being one of the key sectors of the economy, the way in which it is conducted must be sustainable and resistant to crisis, so that farmers can ensure food safety. How this is achieved affects the environment and other sectors such as food and livestock. At the level of the European Union, research was conducted on the manner in which terrains should be structured so that they can be used at maximal capacity. The European Union proposed a model of ecological, durable agriculture, but which clashes with the current model of intensive agriculture.

The aim of this research is to analyse the stage of implementation of ecological agriculture in conformity with the investment plan of the Aldahra company for the development of the Big Island of Braila and in line with the Common Agriculture Policies. Starting from precision farming already implemented in the company, testing was implemented for finding the optimal way of going towards vegetal agriculture. As a result of the tests it was observed that the efficacy of ecologically-certified products is 50-60%, whilst those obtained through chemical synthesis have maximum efficacy. Additionally, more rounds within a 6-7 day interval are necessary, a fact which is not sustainable from an economic point of view. Although from an economic point of view the implementation of biologic agriculture entails high economic costs, it is beneficial for the final product as there is no chemical residue on the plant, nor in the environment. Another method of implementing biological agriculture in the Big Island of Braila is through the lucerne crops which have 75% of the biological technologies. In 2021 a surface of 50-70 ha was designated to vegetal agriculture for gathering experience and, at the same time, for observing what production will be obtained. The surface of the lucerne crops has been increased every year by the company. Granting this much surface space affects the level of productivity a farm

can achieve, hence a decision was reached to merge three farms for the establishment of a prototype farm that will also meet the requirements of biological agriculture such as closed sheds that fully protect the machinery park from the effects of exposure to temperature changes, humidity and dust.

As a conclusion, reaching the objective of allocating 25% of the agricultural surface in the Big Island of Braila to ecological agriculture will be accomplished by implementing the investment plan. The reasons are: the Island's terrain is favourable for the growth of weeds and, for the production to also be realised, changes have to be made at the structural level so the plans could be observed in closer detail and from multiple perspectives. Precise agriculture offers the necessary information on the required fertiliser quantity and which crops need treatment in due time.

Review of the scientific literature

In the European Union, based on the production factors, farms are classified as: farms of semi-subsistence, small and medium farms and large agricultural enterprises. In farms of semi-subsistence, the focus is on the production of a large quantity of dietary products for the farmers and their families, three quarters of this category consumed more than they produced. 2.9% of the total number of farms had a standard production of 250000 euros/year. The farms which obtained this result belong to the agricultural enterprise category.

As a result of the statistics carried out by Eurostat in 2018, it was noticed that the largest standard production in the agricultural sector of the European Union was recorded in 2016. 16,8% of the production was made by farms in France. 14,2% was the contribution of Italy, 13,5% Germany and 10,5% Spain. Despite the fact that Romania owns a third of the total number of farms in the European Union, they contributed with only 3,3%. In Romania 91,8% of farms own surfaces smaller than 5 hectares, whilst in France the majority of farms are at least 50 hectares large, and moreover, a significant number of farms are not domestic.

In 1960 France implemented, through the law of agricultural orientation, companies for the development of lands and rural settlement, known under the name of SAFER. Their duty is to buy agricultural land, forestry and agricultural holdings, their primary function being the development and re-organisation of holdings with dimensions and improvements, by increasing their surface and equipping the fields, with the aim of creating new profitable agricultural holdings. After development and re-organisation, the agricultural holdings are sold, prioritising young farmers, and ensuring the transparency of the rural land market. The involvement of the French government in agriculture benefits the high percentage of contributions in the agriculture sector.

One strategy on the behalf of the European Committee is to have 25% of the agricultural land implement vegetal agriculture. This type of agriculture represents an alternative production system that avoids the usage of pesticides and synthetic fertilisers, is based on pest control and the rotation of crops, green manure, compost and other recycled waste for maintaining the fertility of the soil. Haas and collaborators defined in 2010 biological agriculture: a holistic system for production management which promotes and improves the health of agroecosystems, including biodiversity, biological cycles and the biological activity of the soil.

There is an emphasis on using the management practices in place of using synthetic inputs from outside the farm, considering the fact that regional conditions require locally adapted systems. This is done by the usage, where possible, of agronomical, biological and mechanical methods, in contrast with the usage of synthetic materials for fulfilling any specific function in the system.(FAO,1999)

It relies on certain principles, as Lynch and Truro (2009) stated:

- Environmental protection, reduction to a minimum of the deterioration and erosion of land, reduction of pollution and optimisation of biological activity and health,
- The maintenance of soil fertility through the optimisation of conditions for biological activity within the soil,
- Maintenance of biological diversity within the system,
- Recycling of materials and resources to the largest extent possible,
- Relying on renewable resources in organic food systems produced locally.

The impact of organic agriculture is observable in:

- The quality of the food, nutrition and safety
- Environment (soil, water, air)
- Climate changes and the impact of global warming
- Reduction of energy consumption

The biggest challenge of ecological agriculture is efficiency. The productivity in ecological agriculture is limited by the lack of nutrients, as well as the large populations of weeds. The progress in the development of organic agriculture was slow due to barriers: lack of information and support from the expansion agents, global tendencies in organic agriculture, negative perception of some cultivators, inappropriate management of weeds and pests, a decrease of efficiency, insufficient research and development, weak infrastructure, complications in

organic standards, lack of awareness regarding existent certified standards, inefficient organic markets, inadequate information regarding ecological products from the consumers, problems in deciding the prices and the availability of crops cultivated and selected for ecologic production.

Research methodology

The research is carried out through a study on The Big Island of Braila regarding the implementation of European strategies. Important in the conducted research is the analysis of the results obtained by implementing the investment plan for sustainable development of the company Al Dahra Agricost and for reaching maximum potential in the Big Island of Braila. To understand the progress obtained, an overall image of the Island's history will be provided.

Targeting primarily the review of specialised literature in the domain of reference, the deductive method was deployed presenting general notions. The main instrument of research is direct observation, informal and formal discussions. Obtaining official data from the company is as well an objective for conducting research on the field. The method used is applied scientific research as it is an activity of original investigation with the aim of gathering new knowledge regarding ecological agriculture and how it was implemented, more exactly the analysis of the conducted tests and their results. The final objective is the sustainable implementation of biological agriculture in the Big Island of Braila.

The research is qualitative and quantitative, the method of content analysis is deployed, statistics and mathematical models are presented following the premise of researchers suggesting that a study in the field of accountancy is strongly tied to other fields, in this case the agricultural domain and the domain of human resources. Research methods are constantly used in agriculture as it is a method of ensuring the constant development of the operational department.

For understanding the research method on the implementation of European strategies in ecological agriculture in a sustainable way, it is necessary to identify some objectives which entail:

- Identifying the way in which it will affect the production of crops;
- Determining more alternative ways of research from which to be selected the one most suited for solving the particular problem of research;
- Maintaining the constraints at a national level concerning ecological agriculture.

Four levels of research can be identified in this activity: description, classification, explanation, prediction. The description represents the collection and centralization of information and parallelisms. The classification is used within the process of centralization underlining the similarities and differences between certain criteria. The explanation outlines the meaning of the observations, emphasises the observations made and sets the relation between causality and theory. The prediction presents opinions on a possible evolution.

Throughout the implementation of theory in practice, one will notice the necessity of starting from specific observations and data for achieving a new strategy. The premise on which the basis of this type of research relies is that the combination of deduction with induction implies a constant interaction between theory and practice.

II. Results and analysis

• Testingsystems on the crops

The Big Island of Braila, also called The Swamp of Braila, constitutes in fact an area of 7 islands, drained and dammed in the years 1950-1960 to be devoted to agriculture because in that time there was this prevailing idea that "swamps are useless and unhealthy". The terrain proved to be a fertile one and, in this way, the Big Island of Braila was proclaimed "a success of Romanian communism" with a history dating back to 1965 and currently the biggest compact farm in Europe covering 56 thousand hectares. The large surface increases the difficulty of implementing ecological agriculture. The vision of the leading committee is for biological agriculture to be implemented without the need for mechanical hoeing, a reason being: the roots layer of wheat and barley is within the interval of 0-15cm, if a breeder of 7 cm would be used 50% of the roots would be destroyed. After the harvesting of wheat and barley until entering winter, the terrains get filled with weeds. Mechanical prevention entails fuel consumption, emissions and water losses. A solution for preventing this situation would be using covering crops which will bring carbon to the soil and will decay over winter.

As an adaptation of the lands to the transition to ecological agriculture, there is the implementation of the system of minimum soil work. At the moment The Big Island of Braila has the chance to implement biological agriculture for the lucerne crops because 75% of the technologies are bio. An objective for the year 2022 is for the lucerne to have in rotation 12000ha. For the implementation of biological agriculture, testing systems were established with various products ecologically certifies on the crops of:

- Lucerne. For fertilisation. Two fertilizer products had been tested obtained from vegetal waste which has in its composition nitrogen, phosphorus, potassium, foliar remains rich in fluvic and humic acids. These are used for nourishing the soil and the plant. For the phytosanitary treatment: biological insecticide
- Soy. A bio fungicide was tested which contained: copper, gluconic acid destined for tackling mildew. This test had high results.
- Wheat and barley. In 2021 a biologic fungicide was implemented for the prevention of diseases.
- Wheat+ Barley+Sunflower+Corn. Ecologically certified biostimulators were used which contain fluvic acid, humics and natural ingredients.

Lucerne and Corn

- Biologic insecticide based on plants which are being tested this year for controlling pests
- Biologic insecticide which has in its composition tulips of *Bacillus Turingies* for controlling the *Ericoverbe Emirgare* pests (this is present in the corn crops)

As a result of the conducted tests so far with the ecologically certified products in an ecological system it has been observed:

- They have a reduced efficacy compared to those obtained by chemical synthesis, their efficacy being 50-60%.
- More rounds are necessary in shorter time intervals between applications, the time interval is 6-7 days.
- There are no residues of chemical nature in the obtained products, nor in the environment (soil, water, air).

• **The implementation of a farm model prototype**

Until October 2020 The Big Island of Braila was divided into 29 farms, but the designation of a larger surface for lucerne crops, namely 25% of the surface of a farm, supported the idea of merging three farms. The motives they had for increasing the surface allocated to lucerne crops are: lucerne as a field plant can resist an excess of humidity and drought, it is an excellent prequel which increases the quantity of nitrogen in the soil and is a plant which stays for 4-6 years in rotation, time in which the land is protected from erosion, additionally it is a necessary plant in the feeding of animals reason why there is high market demand. The effect that lucerne, also called “the queen of fodder plants”, brings in zootechnics brought in the past years a bigger and bigger demand and on the basis of the demand it was taken into consideration to expand the processing sector, currently the Agricost society owning a number of 3 farms which are designated for its exploitation and processing.

At the inauguration of the new farm model the general director Al Dahra Agricost, Mihai Solomei stated: “Functionality-wise, the new farm model affects the efficiency of the fuel consumption and worktime of combines by 20%, as well as the utilised machinery in the process of harvesting. At the same time, the process of softening and purification of water reduces the usage of pesticides by 20-25%, which means a significantly reduced residual pollution of the environment and of the vegetal production. The locked hangars protect in an integral manner the machinery park from the effect of exposure to variations of temperature, humidity and dust in an open environment. To this we add the technology already considered traditional of the minimum work of the land, which occupies 92% of the Island, the forestry curtains, the total digitalization of operations and monitorisation, as well as the rotation system of the crops with a duration of 5 years and we have the portrait of a Swiss clock of 56 000ha, which shows the exact time as precise in terms of production levels, profitability and sustainability, as any other of the most performant holdings existent on a global level. And in some places even more precise.”

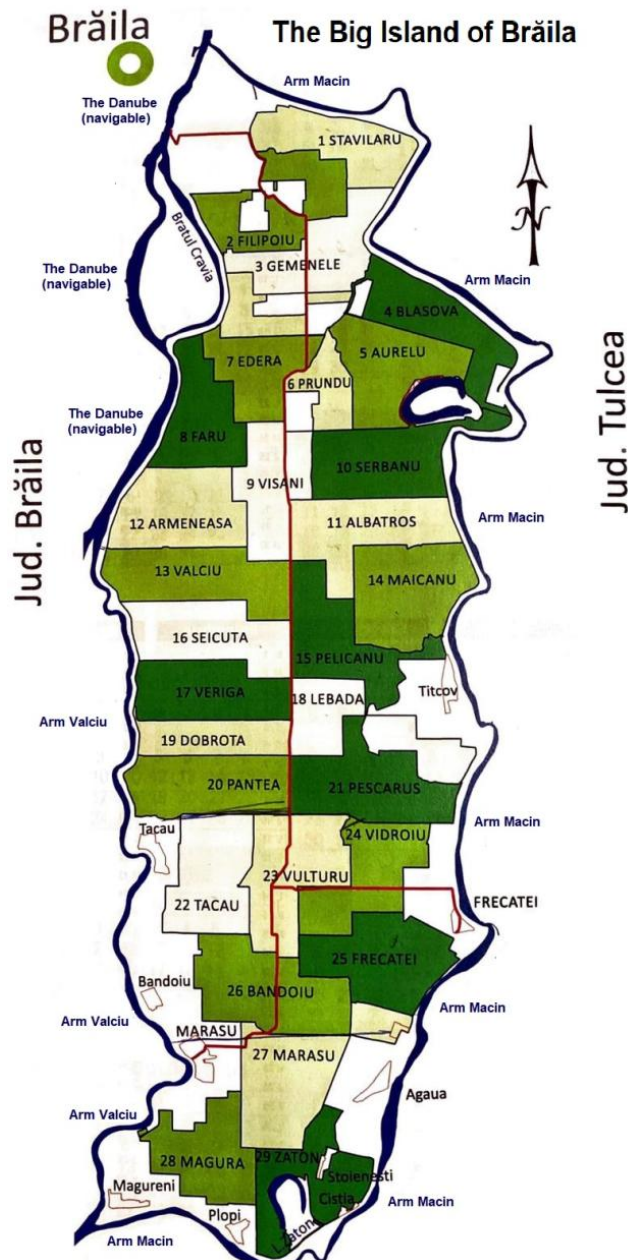


Figure 1. The farm's structure on the Island before merger

The prototype farm was formed through the union of farm Mărașu with farm Măgura and farm Zăton. A decision was taken to return to the structure of complexes because after the beginning of the rotations of lucerne the farm's staff would only have to deal with sowing and irrigating the lucerne for the plant to reach maturity, the operations of mowing and transport are the responsibility of the processing sector. Apart from the modification on the surface rented to the farm, there was also a change in the organigram of staff delegated to the farm.

Figure 2. Organigram of staff in prototype farm

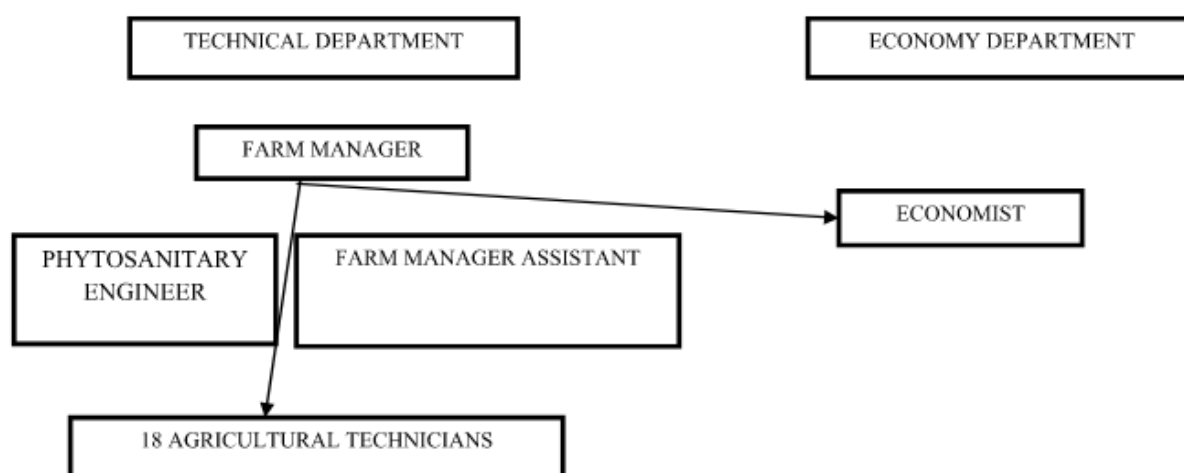
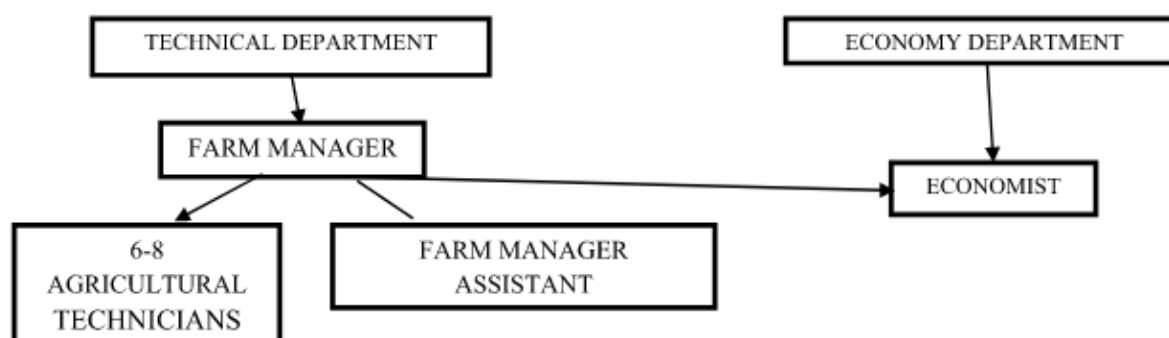


Figure 3. Organigram of staff in the vegetal farm of the Big Island of Braila



For the implementation of ecological agriculture more time needs to be allocated to the observation of plants and a better understanding of the modification in the agricultural system, therefore in the new organigram another phytosanitary engineer was included whose objective is maintaining the health of the plants and more. From a technical point of view, they will deal with the prevention of nutritional problems and the control of pests. As the Island's land is favourable for the growth of weeds, the presence of a specialist who will manage it at the right time is necessary for saving the crops and obtaining production. Additionally, the fact that the machinery and pesticides are self-managed allows for efficient usage and facilitates the process of finding the natural substances for the prevention of weeds. Currently, as only one farm has this structure, it is considered an advantage that brings a profit when the chemical methods used in farm Magura charge services to the other farms.

- **The sustainability of precision agriculture**

Digital platforms are working tools that enable the making of correct and fast decisions concerning the achievement of crops in the farm and company and their economic efficiency. In 2018 digital platforms were implemented for increasing efficiency per hectare and reducing costs. The program of monitoring crops via satellite Geoscan was implemented. Initially, there were 6 digital platforms for implementing precision farming. In the year 2021 4 platforms were united and formed one still called Geoscan. This platform enables monitoring the crops and analysing the vegetation index.

Geoscan has the purpose of monitoring all the agricultural activities: sowing, phytosanitary treatment, fertilizing, transports that are carried out, monitoring the pivots and informing in real-time. The monitoring of the pivots entails: if they work or not, the moisture norm, what surface was irrigated and working pressure. The real-time information about the environmental parameters are given by means of 30 weather stations which identify: air temperature, precipitations, soil temperature every 10 cm deep and three stations that provide the prediction of disease on the plants.

The programme Geoscan provides precise high-quality images from the surface of every crop and gives hints regarding the evolution of vegetation indexes. It can be observed throughout if the crops are evolving uniformly or if interventions are needed in a certain area to ensure the optimal development of the plants. The

program also offers information concerning agrochemical mapping, therefore being able to make the correlation between the situation in a region regarding the supply of fertility elements and the situation of the crops at a certain time, because the groundwater table is at a shallow depth one can determine the emergence of some water buildup. If maps will be created to show exactly where these water “lenses” appear and, more importantly, what is the closest channel for ensuring the drainage. Also, in this programme agrochemical data is introduced to see the degree of supply of the soil with the main macroelements: nitrogen, phosphorus, potassium and, as well, the rainfall situation, their evolution and that of the temperature. With the help of digital maps, the variable fertilizer doses are determined, a very important element that can represent in the future an environmental condition. The company has their own laboratory for analysing the soil. For every hectare, laboratory determinations are conducted and a map of the degree of supply is obtained. In the first phase, the nutrient composition of the soil is recorded in a table, the specific consumption for every crop, the consumption formula and then the variable norms from this data. The application of variable doses of fertilisers is implemented with the help of another programme, provided by John Deere, on the platform myjohndeere.com, because the society has a machine for administrating chemical fertilisers from this provider. All the necessary details regarding the variable application of fertiliser norms are introduced in the computer of the agricultural machine and it knows exactly the necessary quantities which will be utilised. By applying precise agriculture, by modifying the distance between rows to increase the nutrition surface used by plants, localised application of fertilisers, the usage of satellite programs and that of intelligent agricultural machines, the productivity in the Big Island of Braila in the agricultural crops increased. In the corn crops, the mean harvest recorded over the 10 000ha reaches up to 12 t/ha. In the Big Island of Braila new technologies are constantly being implemented and the management of agricultural exploitation is being improved. Agricultural exploitation is known to be a true research resort as there is a series of agricultural techniques, varieties and hybrids of different genetics being tested.

- **Incorporation of the investment plan for the development of the Big Island of Braila**

In 2019 Agricost was integrated in the investment fund Al Dahra Holding, with the aim of making the Big Island of Braila reach maximum levels of productivity. In autumn of 2019 it was announced that the multinational has an investment plan for the following 5 years. In an interview for Financial Intelligence, the Sheik Hamdan Bin Zayed Al Nahyan declared: “The project in the Big Island of Braila is huge. We are talking about an investment of around 500 million dollars. Romanian workers and companies will be working there, inclusively for irrigations. The United Arab Emirates will export grains from Romania towards countries in Europe and others. We want to make there the largest agricultural area in Europe.”

The plan is based on the principles of the company Al Dahra, apart from the desire to have a profitable business it is desired to make an impact which will be felt in the development of the community, hence why there are already plans for building a new factory for the processing of lucerne, and through the unification of these three farms a new farm model was reached which offers a more pleasant work environment that can lead to maximum efficiency.

In conformity with the development plan, the other farms will also merge in this manner in the near future: farm Stăvilăru will merge with Filipoiu and The Twins, farm Blasova will fuse with Aurelu and Șerbanu, farm Edera will combine with Faru and Vișani, farm Armeneasa will join farm Vâlcu and Șeicuța, farm Veriga will merge with Dobrota and Pantea, farm Vulturul with Țăcău and Băndoiu and farm Pescăruș with Vidroiu and Frecăței.

Currently the company, apart from the vegetal farms, developed as well in animal farming. For now, it is only one farm with a zootechnic sector, but in the future, it is planned to establish a second one. The processing sector continues to develop, in 2022 the fourth factory will be founded. Presently 75% of the surface managed by Agricost in the Big Island of Braila is irrigated and in the corners, drums are being used, but because they have poor results an underground system over a 22ha area is being tested. The two systems were integrated to cover the corners of the square. It is noticed that if the irrigation is done drop by drop it allows the soil to absorb the water steadily, therefore maintaining a uniform air-water ratio.

III. Conclusions

In Romanian agriculture the farmable land is not exploited to its full potential, the reasons are variable, but the fact that Romanian farms are divided and the resources limited is a factor that determined the small rate of contribution at a European level.

The Big Island of Braila is undergoing a process of transition towards organic agriculture, but considering that the company does not have in its organigram just the vegetal sector, the transition from classical agriculture is influenced by other factors as well. There were more hectares allocated to the lucerne crops because, apart from its importance as a plant, there is also a big demand for the processed plant. Digital platforms are tools with the help of which decisions are being taken regarding the optimisation of crops in the

farm or company and their economic efficiency. For conceiving biological technologies, product tests were deployed and organic products were implemented: fungicides, even insecticides. Upon the carrying out of tests for the implementation of biological agriculture in the Big Island of Braila, the digital platforms were given the role of monitoring the plants for observing their gradual development. From the tests, it was noted that they have a capacity of 50-60% and require more rounds within short time intervals, from this follows that for the implementation of vegetal agriculture there are bigger costs. For facilitating the transition process to vegetal agriculture, there are forestry curtains being made for the retention of water in the soil, which create a favourable microclimate, stop the winds which dry the soil, retain the snow and contribute to the maintenance of humidity in the soil.

The fact that there are more hectares designated to lucerne means a larger production, the production will be processed by the exploitation sector, such that if the production increases the sector must be developed. It is a sector in the process of development, two factories dry, roll and make the concentrated granular fodder which is then given to the client. The reasons they have, from a vegetal point of view, to increase the surface designated to the crops of lucerne are: lucerne is a field plant resistant to excesses in humidity and drought, is an excellent prequel which grows the quantity of nitrogen in the ground and is a plant that stays 5 years in rotation, time in which the terrain is protected from erosions, additionally it is a plant required for the feeding of animals, reason why there is a large demand for it.

The gradual change of structure brings with it another perspective from which the crops can be analysed until the moment of harvesting. Through the implementation of the farm prototype, another organisation of human resources is observed, three agronomists who have the duty to implement strategies for the development of crops and sustainability of the farm. Another factor of ecological agriculture included in the prototype farm is the implementation of a covered shed for machinery.

Altogether the objective of the investment plan is for the Big Island of Braila to become the largest grain exporter in Europe, but for these products to be in demand, the Policies of Common Agriculture and the requirements of the European Union must be implemented. The Common Agriculture Policy supports that 40% of the European Union's Budget should be allocated to agriculture. According to analysis, it is important to present analytics with economic, social and environmental impact on each individual strategy. From the desire to align with the European demands and standards, Al DahraAgricost's target is that in 2-3 years 25% of the agricultural area would produce only vegetal agriculture. The gradual transition from classic agriculture to biological agriculture is realised by means of precise agriculture and the constant development of the research sector existent in the company's organigram. Within this sector, in 2021 a seed treatment was discovered against *Tanymecus* for the cultures of: soy, corn, flower. The values of the company Al Dahra resonated with the principles of ecological agriculture through making an impact on the development of society and by respecting the regulations. The sustainable implementation of an investment plan taking into account the European strategies for biological agriculture requires rigorous organisation on both a structural and procedural level. Starting from this premise in the study of the implementation methods of a new perspective that have an impact on the fields of agriculture, economy, human resources.

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