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Territorial Analysis of the European Rural Development Funds (ERDF) as a Driving Factor of Ecological Agricultural Production

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Abstract: The Europe 2030 project identified the need to create a growth model that is based on a dynamic balance between economic, social, and environmental dimensions. This involves, among other objectives, redirecting the resources that are allocated to the Common Agricultural Plan (CAP) toward more ecological agriculture and livestock. In recent decades, two packages of the European Agricultural Fund for Rural Development (EAFRD) approved funds for projects related to agriculture. This study carried out a regional evaluation of the effects on production and employment that were generated in the Spanish organic farming sector. For this, a methodology that is frequently used by researchers to analyze territorial differences was used, namely, the shift-share analysis. The main results showed important differences at the regional level in the production of crops. Likewise, constant shift and constant share analyses were used to forecast the evolution of the sector from the recent data. Pending the approval of the new EAFRD 2021–2030, the results obtained in this research allowed for the identification of the regions that showed a favorable evolution to change the agricultural model and to identify the projects that generated employment and ecological production in the sector.

Keywords: organic farming; shift-share analysis; production; employment; prediction models; European funds

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1. Introduction

In 2015, the United Nations 2030 Agenda was approved by world leaders. It established 17 Sustainable Development Goals (SDGs) targeting the eradication of poverty and achieving sustainable development around the world by 2030 [1]. For this, it was necessary to propose a sustainable growth model that considered the economic, social, and environmental dimensions [2]. To achieve the SDGs, organic agriculture is considered to be key for any designed policy framework [3].

Previously, Europe had approved, for the decade 2010–2020, a growth strategy based on three pillars: smart, sustainable, and inclusive growth [4]. Currently, and following the model of the 2030 Agenda and the Europe 2020 project, the so-called Europe 2030 project was presented to the European Council [5]. It showed the need to create a common policy that was aimed at renewing the social and economic European model. This new model must make it possible to establish a desired and dynamic balance between the economic, social, and environmental dimensions of development [2].

From an environmental perspective, the aforementioned document considered that the agricultural sector was responsible for almost 14% of global greenhouse gas emissions. Consequently, the European Union (EU) should redirect the resources of the Common Agricultural Policy (CAP) toward greener agriculture and livestock farming. The CAP is currently in the reconversion phase. Its Post-2020 Strategic Plan [6] is aimed at achieving concrete results that are related to the following three objectives:

a. Promotion of a smart, resilient, and diversified agricultural sector that guarantees food security.
b. Intensification of care for the environment and action for the climate, helping to achieve the climate and environmental objectives of the EU.
c. Strengthening the socio-economic sector of rural areas.

The CAP is basically financed by the European Agricultural Fund for Rural Development (EAFRD). In recent decades, two packages of funds were approved, one for the period 2007 to 2013 and another for 2014 to 2020. The first was regulated by Council Regulation (EC) No. 1698/2005 of 20 September 2005 and the second by Regulation (EU) 1305/2013 of the European Parliament and Council of 17 December 2013.

Among the objectives of such packages are the financing of projects that are related to the sustainable development of rural areas. Thus, it was contemplated that at least 30% of the funds must be dedicated to programs that are related to the protection of the environment and the fight against climate change. It was also established that 30% of direct aid must be linked to projects that are related to the diversification of crops, the maintenance of permanent pastures, and the conservation of 5% of areas of ecological interest.

In Spain, Law 45/2007 of 13 December was approved to regulate the Sustainable Rural Development Program (*Programa de Desarrollo Rural Sostenible*—PDRS (https://www.mapa.gob.es/es/desarrollo-rural/planes-y-estrategias/ley-para-el-desarrollo-sostenible-del-medio-rural/prog-desarrollo-rural-sostenible/, accessed on 10 April 2021)). It established a series of general and specific objectives and lines of action that are related to sustainable development for the Spanish rural environment. However, in its development, the need to adapt it to the different territorial specificities and realities was considered. For this reason, a model of actions that were tailored to each area was implemented, allowing for different and exclusive actions to be programmed in each one of them, which are adapted to their situations, needs, and potentials. The aid that these projects offer is limited by a maximum percentage that is established in Annex I of the EAFRD Regulation (€600 per hectare and year for annual crops, €900 per hectare and year for specialized perennial crops, and €450 per hectare and year in the case of other land uses) [7].

At the organizational level, Spain is a territorially decentralized state that is divided into autonomous communities (regions), all of them with autonomous powers regarding their agriculture. For this reason, this research has as its main objective to determine the level of development of organic farming in each Spanish region during the period 2007 to 2020. An exhaustive bibliographic search was carried out on organic farming, including the territorial dimension. The retrieved papers revealed that the theme was scarcely addressed in the literature. In addition, it was also found that there was little use by researchers in this sector of a methodology that was widely accepted, where this so-called shift-share analysis was used to study many sectors other than agriculture. This present study contributes to the existing body of literature via practical application since the results of this research can allow for determining which CCAA are below the average values. In this way, compensation mechanisms could be articulated to promote organic farming in those territories where this type of environmentally friendly cultivation is underrepresented.

The analysis model used was shift-share analysis. Likewise, constant shift and constant share analyses were used to forecast the territorial evolution of the sector from data that has been made available in recent years.

After this introduction, the literature review presents the results of the search procedures to identify the main studies that were carried out by the different authors on this matter, and to identify a methodology that allowed for analyzing the effects at the regional level. Subsequently, the evolution by Spanish regions regarding organic production during the period was analyzed. In the fourth section, the methodology is presented, and in the fifth section, the results of the analysis are given. Finally, a debate proposal is given, followed by the consulted references.

2. Organic Farming and Shift-Share Analysis

Organic farming has received attention in recent years due to the interest in assessing the impacts of the CAP reform and how organic farming would contribute toward transforming EU agriculture so that it becomes more sustainable [8]. Among the reasons for the emergence of organic farming is the unsustainable society, where the farming system should target certain self-sufficiency and self-reliance levels [9]. Organic farming was the solution for a world that was passing two World Wars, where chemical use increased at the same time and, as such, soil degradation resulted in decreased food quality [10].

The positive results of organic farming were already noticed not only in soil preservation but also in helping to conserve agriculture through preserving the soil organisms that are needed to balance life at the nematofauna and macrofauna levels [11]. Moreover, organic farming is distinguished for not using mineral fertilizers or pesticides, which also improves soil quality in the long term [12]. Then, the agricultural sciences are biologically and ecologically centered when considering organic farming. This approach resulted in changes to farming practices, especially those related to soil cultivation, organic fertilization, composting, crop rotation, and green manuring [13].

Despite organic farming having its relevance already being noticed in countries such as Poland, Brazil, United Arab Emirates, and Italy [14–16], it is in the developing countries that organic farming seems to be even more important. A study on organic farming in India pointed out that the premium price provided by organic products is between 20 and 40%, providing circa 22% more profits to farmers. On the other hand, the costs for cultivating organic products decreased by 11.7%. Thus, organic agriculture represents an important source of added value in farmers' revenues [17]. Still, in Indian agriculture, the northeastern region is one that showed the lowest productivity level and represents a promising area for implementing organic agriculture [18].

Among the numerous studies in the field of organic farming, there are some dedicated to assessing the agricultural performance, especially related to shift-share analysis. Among this subgroup of studies, the agricultural employment of Kentucky was compared with the entire United States over the period 1970–1989. The findings revealed that Kentucky possessed a comparative advantage, showing that in the United States, as in many other industrialized countries, the agriculture sector lost employees to other industries (like manufacturing or services sectors). The conclusions were reached after using shift-share analysis [19].

A study conducted with shift-share analysis was carried out by Felipe and Maximiano [20], who analyzed the agriculture dynamics in Sao Paulo (Brazil) during 1990–2005. The reported findings allowed for an explanation of production evolution, changes in cultivated land, and why cassava was the culture that showed the highest growth for the period between 1990 and 1995. In the subperiod of 1995 to 2000, bananas showed greater results and in the last period (2001–2005), wheat stood out.

Another Brazilian study, conducted by Teixeira and Mendes [21], used shift-share analysis to investigate the agriculture characterization of microregions in the State of Goias for the period 1990–2009. The calculations evidenced that, among the 18 studied microregions, changes in the total cultivated area were noticed and the disparity between microregions were identified according to obtained revenues. There was a polarization in productivity activities due to the value of the produced culture being more concentrated in the southern regions compared with the northern regions. The surplus of extensive agriculture, such as soybeans and other grains, promoted this value unbalance.

Underlining the importance of agriculture for Brazilian economic development, Garcia and Buainain [22] studied the implementation of agriculture based on modern production methods in the territory known as '*Cerrado nordestino*' (tropical savanna ecoregion) in Northeastern Brazil. Using shift-share analysis for the period between 1990 and 2012, the authors identified that the observed extensive agriculture was led by soybeans and corn.

The Dhaka district was analyzed according to regional economy and employment by using the shift-share methodology [23]. The study identified that, after 2001, the Dhaka district became specialized in fields other than agriculture, such as manufacturing and services sectors. A decrease in agriculture activities was also noted due to the opportunities offered by the called 'mega-city effect.'

In the same line of employment analysis using the shift-share method, the study of Fernández, Menéndez, and Pérez Suárez [24] proposed previsions for Asturias. Beyond underlining that shift-share analysis is a rarely used technique, the authors identified that employment in Asturias is a consequence of the dynamicity of the services sector, also evidencing that agriculture showed a decrease in employability during the analyzed period.

The study of Knudson [25] assessed Michigan's agriculture by applying shift-share analysis for the period of 1980–1995. This state showed a decline compared to other states in the United States related to agriculture, except for the cultivation of winter wheat, while corn production declined. The results also evidenced that, despite the decrease in the agricultural sector, Michigan revealed itself to be a player in the US scenario concerning commodities production (like cucumbers, sugarbeets, and cherries). Michigan also stood out for its diversity of production related to crops and livestock products.

Despite the use of shift-share analysis in agriculture, it is interesting to notice that the aforementioned studies were dedicated to exploring extensive agriculture activities, while organic farming remained absent from the literature. As such, this research intended to contribute by filling this gap in the field.

3. Shift-Share Methodology

Shift-share analysis is a technique that is based on the decomposition by parts (shares) of the variations (shifts) experienced in a period relative to various territorial units [26]. Through this methodology, territorial characteristics are incorporated into the evolution of economic variables.

The variable used in this article was the area dedicated to organic farming. This information is provided by the General Subdirectorate for Differentiated Quality and Ecological Production of the Ministry of Agriculture, Fisheries and Food of Spain. This ministry prepares a set of analyses at the level of provinces and autonomous communities (regions) on an annual basis according to the type of crop or use. The information provided was grouped into three groups:

- First group: cereals, legumes, tubers, and others;
- Second group: citrus, fruit trees, vines, and olive groves; and
- Third group: nuts.

Calculations were based on the following equation:

$$CIJ = n_{ij} + p_{ij} + d_{ij} \quad (1)$$

where CIJ represents the variations in the use of the surface dedicated to organic farming (hectares) during a defined period that referred to a type of crop i (cereals, legumes, tubers, and others; citrus, fruit trees, vines, and olive groves; and nuts) in region j. n_{ij} is the territorial component at the level of Spain for the area dedicated to organic farming (hectares) (cereals, legumes, tubers, and others; citrus, fruit trees, vines, and olive groves; nuts) in the region. p_{ij} is the structural displacement, while d_{ij} is the differential displacement.

The variations experienced between periods 1 and 2 are defined using the following variation rates: r is the variation rate in the cultivated area in ecological agriculture (hectares) corresponding to the crop species (cereals, legumes, tubers, and others; citrus, fruit trees, vines, and olive groves; nuts) at the regional level. r_i is the rate of variation of the area in hectares devoted to organic farming (hectares) in its different i^{th} variants. r_{ij} is the variation rate of the area in hectares that are devoted to organic farming (hectares) in the Spanish regions of a specific type of crop relative to the region j.

The expression (1) becomes:

$$C_{ij} = V_{ij} \cdot r_{ij} \quad (2)$$

Adding the different sectors of activity:

$$\sum C_{ij} = \sum V_{ij} \cdot r + \sum V_{ij} (r_i - r) + \sum V_{ij} (r_{ij} - r_i) \quad (3)$$

and

$$r_j - r = \sum (S_{ij} - S_i) r_i + \sum S_{ij} (r_{ij} - r) \quad (4)$$

where $r_j - r$ is the net change.

The net change indicates the variation of each region relative to that experienced in Spain overall. If the sector, at the regional level, experiences growth above that which developed at the national level, the net change obtained offers positive values. This was decomposed into two changes.

First, $\sum (S_{ij} - S_i) r_i$ is the structural change. This structural change shows the effects of the regional productive structure as the difference between each of its sectors and the regional analog. If r_i is greater than r, this indicates a positive evolution at the regional level. In the opposite case, the evolution of the region is lower than the state's evolution.

Second, $\sum S_{ij} (r_{ij} - r)$ is the differential change. The differential change indicates the sectoral differences of each region relative to the variation experienced at the country level. If r_{ij} is greater than r_i, it indicates a faster growth at the regional level than at the state level.

The reference period was the years 2007 to 2019. In this way, both the starting year of the first period of the EAFRD analyzed (2007–2013) and the last available year of the second period of application of the EAFRD (2014–2020), which is the year 2019, were considered.

Prediction Models

In general, and as has been evidenced in the analyzed bibliography, this technique is generally used for descriptive purposes. However, other complementary techniques have recently been developed to adapt this methodology and use it as a predictive method. Among the different techniques used are the so-called constant shift and constant share models. In this research, these prediction models were used and applied to the development of the organic agricultural sector in Spain.

The constant share prediction model proposed by Hewings [27] is based on the application to the different regional sectors of the variations predicted at the national level [28,29]. In this way, a homogeneous territorial treatment is given to growth, without any type of regional differentiation.

This study analyzed the variation in production in the ecological economy sector i experienced by region j. This was calculated as a result of applying the equation:

$$E_{ij}^{(t+1)} = (1 + r_i) E_{ij}^{t} \quad (5)$$

where $E_{ij}^{(t+1)}$ is the production forecast for year t + 1 in sector i for region j.

In this research, the data provided by the General Subdirectorate for Differentiated Quality and Ecological Production of the Ministry of Agriculture, Fisheries and Food covering the period 2007 to 2019 were used. Therefore, the forecasts were made for the years 2020 to 2023. r_i is the expected national growth rate for year i.

Finally, there are the data of hectares of organic farming for year t.E_{ij}^{t}.

The constant shift model considers that the production differential remains over time. Thus, its predicted number for the period t + 1 is calculated using the expression:

$$E_{ij}^{(t+1)} = (1 + r_i^{(t+1)} + s_i^{(t+1)}) E_{ij}^{t} \quad (6)$$

where

$$s_i^{(t+1)} = r_{ij}^{(t+1)} - r_j^{(t+1)} \quad (7)$$

For the growth estimates, the predictions made by the Bank of Spain regarding the evolution of the Spanish economy were taken into account.

4. Evolution of Organic Farming by Spanish Regions

In recent decades, two packages of European agricultural funds were approved, one for the period 2007 to 2013 and another for the period 2014 to 2020. The following Figures 1 and 2 show the percentage distribution between the different Spanish regions.

Figure 1 shows the total amount received by each region in a disaggregated manner. The distribution was made according to the criteria adopted by the Sectorial Conference, held on 21 January 2014. Among them are economic, environmental, and territorial indicators related to the three objectives of the rural development policy: competitiveness of agriculture, managing sustainable natural resources and climate action, and balanced territorial development. As can be seen, the Spanish region that received the greatest amount of resources was Andalusia, which received 23.50% of the total allocated funds.

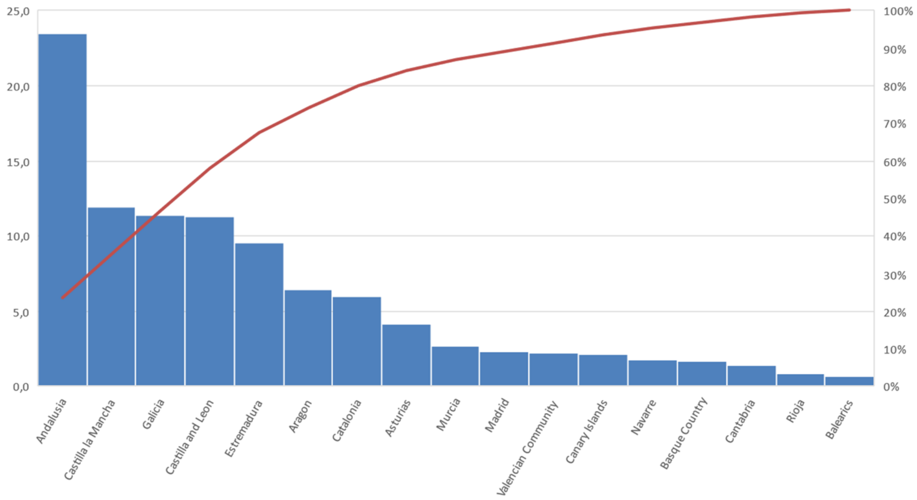

Figure 1. Amount received by the Spanish regions from the EAFRD. Period 2007–2020. Units: EUR. Source: Own elaboration from the data published by the National Institute of Statistics.

Figure 2 displays the amount of resources received relative to the distribution of the territory that each Spanish region dedicates to agriculture. It shows how the Canary Islands received almost 32% of the funds on a funds-per-area basis. Above the Spanish average were Galicia, Asturias, and the Basque Country.

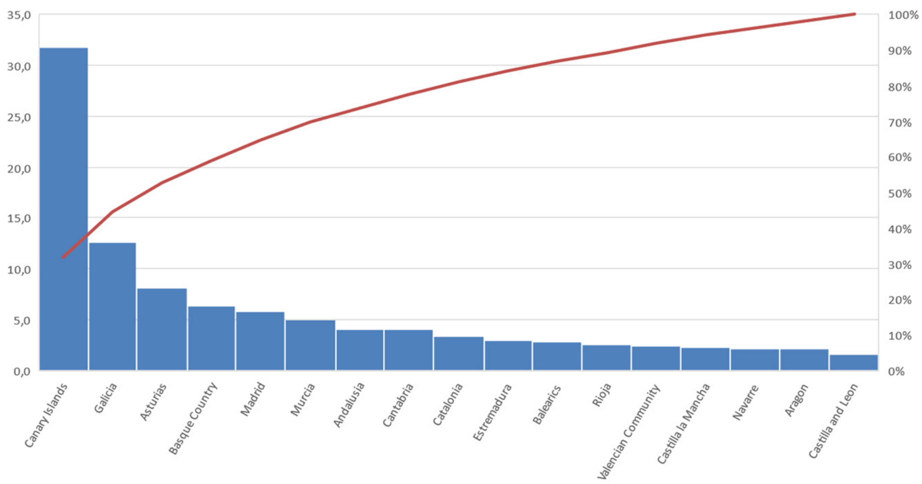

Figure 2. Territorial distribution, by region, of the EAFRD in relation to the extension of cultivated land. Period 2007–2020. Units: EUR. Source: Own elaboration from the data published by the National Institute of Statistics.

The EAFRD funding was distributed among different concepts, as shown in Table 1.

Table 1. Conceptual distribution of the EAFRD.

Distributions of the EAFRD	
M01 Knowledge transfer	M11 Organic farming
M02 Advisory services	M12 Natura 2000 and the Framework Directive Water
M03 Quality regimes	M13 Areas with natural limitations
M04 Investments in physical assets	M14 Animal welfare
M05 Potential restoration	M15 Silvo-environmental measures
M06 Development of farms	M16 Cooperation
M07 Services to the population	M17 Agricultural insurance
M08 Forestry investments	M19 LEADER
M09 Producer groups	M20 Technical Assistance
M10 Agro-environment and climate	M113 Early termination

Source: General Directorate of Rural Development, Innovation and Forest Policy of the Ministry of Agriculture, Fisheries and Food.

The item M11 (organic agriculture) was distributed among different regions, as shown in Figure 3. It can be seen how the regions of Castilla La Mancha and Andalusia received almost 60% of the total of these funds.

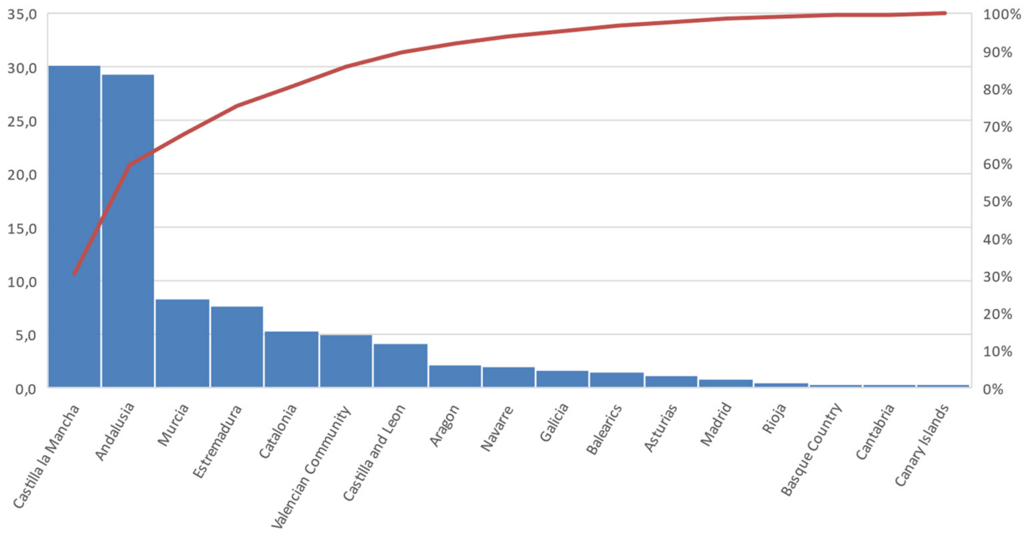

Figure 3. Percentage distribution of EAFRD destined to finance ecological agriculture projects. Period 2007–2020. Source: Own elaboration based on data from the General Directorate of Rural Development, Innovation and Forest Policy of the Ministry of Agriculture, Fisheries and Food.

Figure 4 shows the distribution of the funds received for organic farming in relation to the cultivated land. It shows how Murcia, Castilla and Leon, and Castilla La Mancha received 46% of the total funds on a funds-per-area basis.

Figures 5 and 6 show the evolution during the period 2007 to 2019. Both figures show a positive global effect in the organic farming sector in Spain, both in terms of growth in the number of hectares dedicated to its production and in the number of operators.

After the high level of growth in the number of hectares and employment generated in the organic farming sector was identified, it was necessary to determine whether this growth occurred homogeneously among the regions and in which specific crops it was produced.

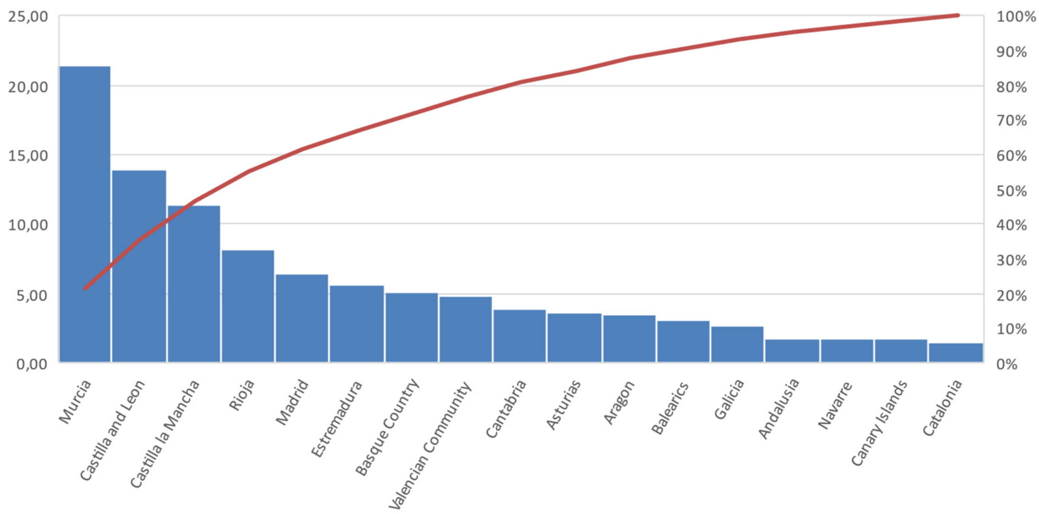

Figure 4. Territorial distribution, by regions, of the funds allocated to organic farming in relation to the extension of cultivated organic land. Period 2007–2020. Units: EUR. Source: Own elaboration from the data of the General Subdirectorate of Differentiated Quality and Ecological Production and the General Directorate of Rural Development, Innovation and Forestry Policy of the Ministry of Agriculture, Fisheries and Food.

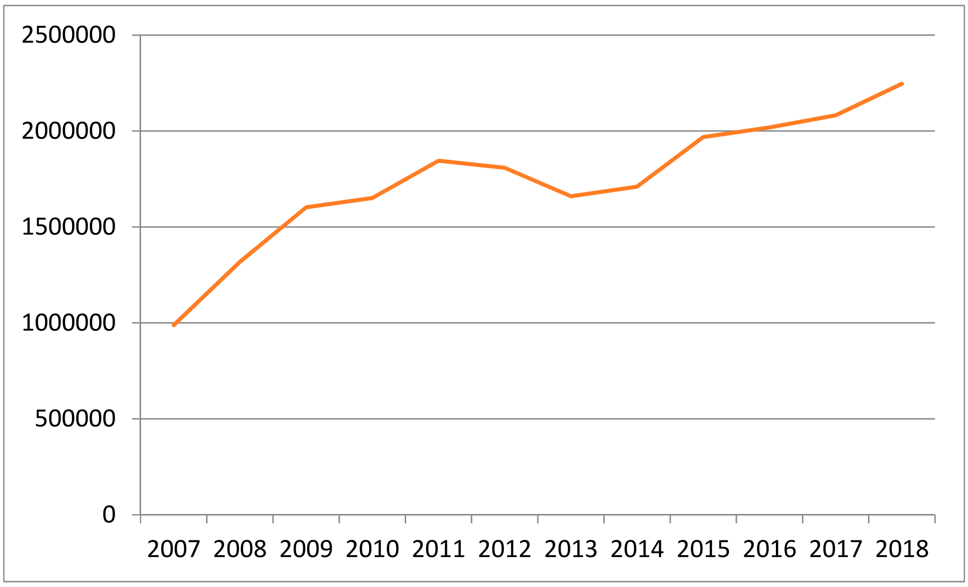

Figure 5. Evolution of the number of hectares in Spain devoted to organic farming. Period 2007–2019. Source: Own elaboration from the data of the General Subdirectorate of Differentiated Quality and Ecological Production and the General Directorate of Rural Development, Innovation and Forestry Policy of the Ministry of Agriculture, Fisheries and Food.

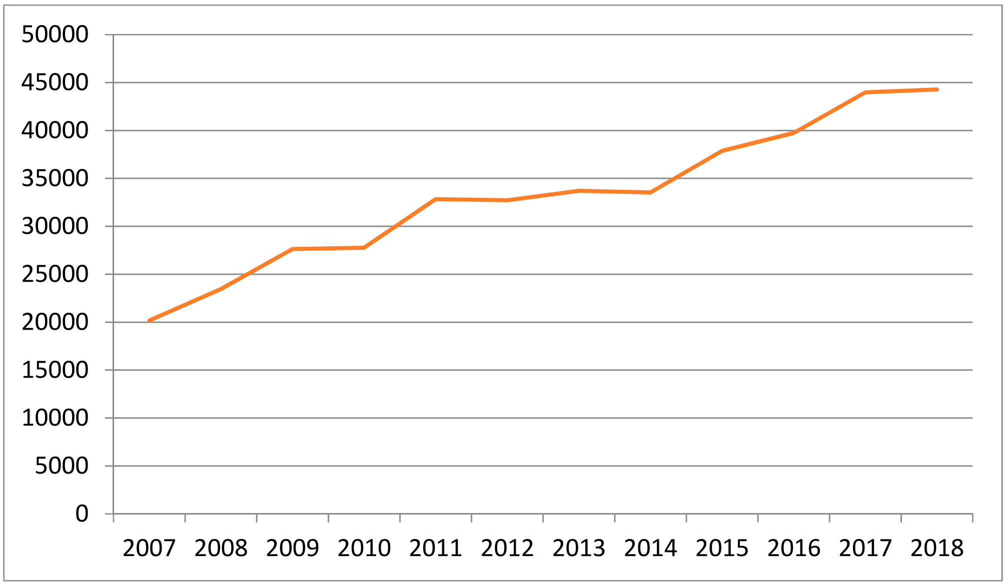

Figure 6. Evolution of the number of operators in Spain that operated in the organic farming sector. Period 2007–2019. Source: Own elaboration from the data of the General Subdirectorate of Differentiated Quality and Ecological Production and the General Directorate of Rural Development, Innovation and Forestry Policy of the Ministry of Agriculture, Fisheries and Food.

4.1. Shift-Share Model Results

Table 2 shows the results of the application of the shift-share methodology. The years that were compared were 2007 and 2019. The differences in the surface area that were dedicated to organic farming during the periods of application of the EAFRD from 2007 to 2013 and 2014 to 2019 were evaluated.

Table 2. Results of the shift-share analysis.

Regions	**Sikh (%)**			**Rates of Variation R_{ij} (%)**			**Regional Variation Rates (%) R_{ij}**
	Cereals, Legumes, Tubercules, and Others	**Citrus, Fruit, Vines, and Olive Groves**	**Nuts**	**Cereals, Legumes, Tubercules, and Others**	**Citrus, Fruit, Vines, and Olive Groves**	**Nuts**	
Andalusia	37.72	37.27	25.02	59.62	84.62	79.54	73.92
Aragon	82.39	11.85	5.76	−9.68	61.78	58.85	2.73
Asturias	31.89	64.32	3.78	−33.56	68.30	639.71	57.44
Balearics	53.43	10.86	35.71	14.82	88.11	29.11	27.88
Canary Islands	26.13	66.56	7.31	−74.52	21.91	−58.55	−9.17
Cantabria	3.45	24.14	75.86	1299.00	75.57	−17.09	53.52
Castilla and Leon	88.82	11.05	0.13	60.18	315.75	43,229.25	144.42
Castilla la Mancha	44.56	41.25	14.18	215.48	346.92	268.69	277.25
Catalonia	32.76	57.33	9.90	95.18	355.71	180.64	253.02
Valencian Community	20.32	49.00	30.68	20.52	144.10	78.68	98.92
Estremadura	16.17	80.62	3.21	−62.00	−14.62	−10.95	−22.16
Galicia	31.40	68.60	0.19	10.97	34.81	312,953.00	634.01
Madrid	23.91	75.41	0.69	43.54	164.05	152.57	135.16
Murcia	18.08	26.02	55.90	152.34	133.07	68.43	100.43
Navarre	83.41	13.95	2.64	−44.11	51.09	4.02	−29.56
Basque Country	56.17	43.83	0.21	97.39	264.95	1710.00	174.68
Rioja	13.38	50.52	36.10	−55.36	76.02	1.16	31.42
Spain	39.62	40.37	20.01	71.18	126.60	109.78	101.28

Source: Own elaboration.

Table 3 shows the results of the net, structural, and differential changes experienced by the different regions. The net change shown in this table indicates the variation experienced by each of the regions relative to the national average. Thus, the regions of Castilla and Leon, Castilla La Mancha, Catalonia, Galicia, Madrid, and the Basque Country had positive values. This indicates that these regions experienced a positive evolution above the overall evolution of Spain.

Table 3. Net, structural, and differential change.

Regions	Net Change	Structural Change	Differential Change
Andalusia	−0.2736	0.0021	−0.2757
Aragon	−0.9855	−0.2131	−0.7724
Asturias	−0.4384	0.0701	−0.5085
Balearics	−0.7340	−0.1029	−0.6310
Canary Islands	−1.1045	0.0961	−1.2006
Cantabria	−0.4776	0.1502	−0.6623
Castilla and Leon	0.4314	−0.2392	0.6707
Castilla la Mancha	1.7597	−0.0176	1.7773
Catalonia	1.5174	0.0550	1.4624
Valencian Community	−0.0236	0.0890	−0.1126
Estremadura	−1.2344	0.1582	−1.3926
Galicia	5.3274	0.0813	5.2441
Madrid	0.3388	0.1195	0.2193
Murcia	−0.0085	0.0590	−0.0675
Navarre	−1.3084	−0.2135	−1.0950
Basque Country	0.7340	−0.0557	0.7876
Rioja	−0.6986	0.1184	−0.8169

Source: Own elaboration.

The structural changes indicate the sectoral differences of the different types of organic farming for each region. In this case, Andalusia, Asturias, the Canary Islands, Cantabria, Catalonia, the Valencian Community, Extremadura, Galicia, Madrid, Murcia, and La Rioja presented positive values.

Likewise, the differential changes indicate the differences of the sectors relative to the national average, where Castilla La Mancha, Catalonia Galicia, Madrid, and the Basque Country displayed positive values.

The results showed how the development of organic agriculture experienced significant growth in the studied period. However, when including the territorial variable through the use of the shift-share model, it was shown that this growth was not uniform. Specifically, there were autonomous communities that had production levels below the Spanish average and others that were higher. This uneven growth can be perpetuated over time and give rise to an undesirable situation in which the territories that are currently better positioned tend to improve their situation to the detriment of those that started with smaller amounts of production. If this situation is maintained over time, the differences would tend to increase. For this reason, it is necessary to carry out this type of preliminary investigation to establish whether territorial differences are present. Then, these territorial differences must be studied in depth with specific investigations showing their origin to develop, manage, and execute specific public policies.

4.2. Constant Shift Prediction Model Results

The growth structure results presented in the previous section that were calculated using the shift-share methodology were applied to the data series of the number of hectares since 2007 and 2019.

In this section, the series that ran from the year 2000 till 2019, which is the last year for which data was available, was used. A projection was made for the years 2020 to 2023, taking into account the growth forecasts provided by the Bank of Spain for the Spanish economy. Figure 7 shows this evolution.

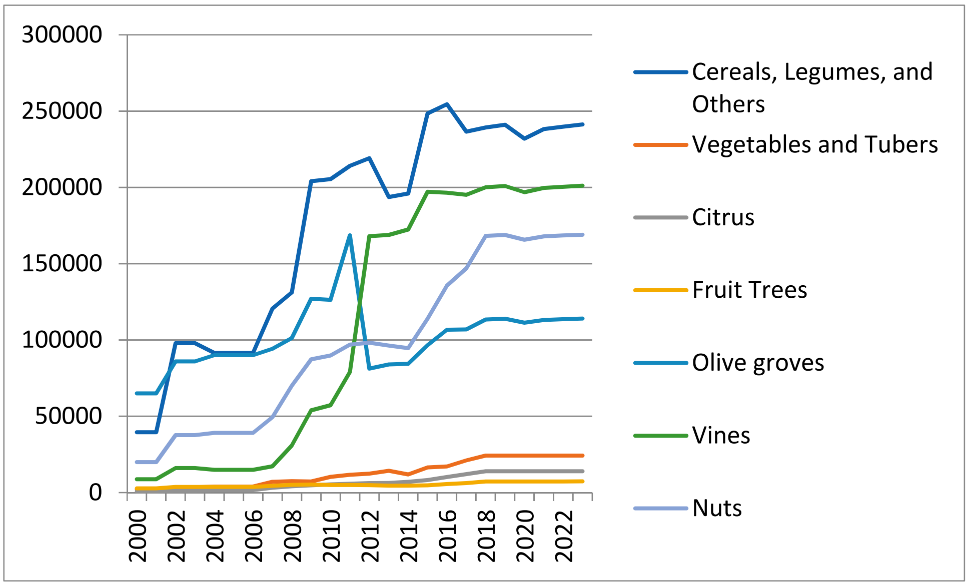

Figure 7. Evolution of the number of hectares devoted to organic farming, which was calculated using the constant shift prediction model. Source: Own elaboration.

The evolution in the number of hectares predicted by the constant shift model revealed that, for the predicted period of 2020–2023, cereals, legumes, and others presented the highest predicted evolution in total cultivated hectares, followed by vines and nuts.

4.3. Constant Share Prediction Model Results

Figure 8 shows the evolution of the number of hectares dedicated to organic farming from 2000 to 2019, and a prediction of its evolution for the years 2020 to 2023 according to the constant share methodology.

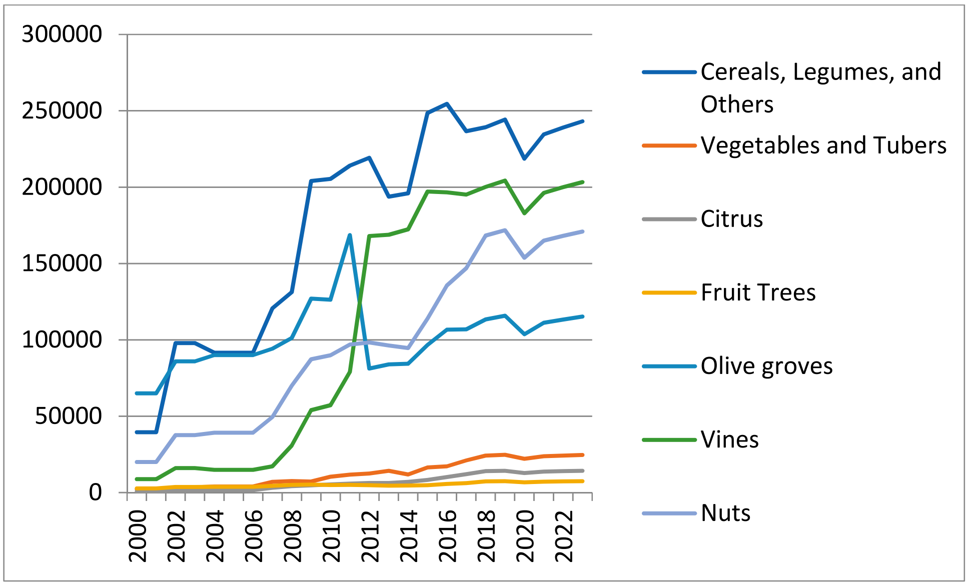

Figure 8. Evolution of the number of hectares devoted to organic farming, which was calculated using the constant share prediction model. Source: Own elaboration.

The predictions for the period 2020–2023 revealed that cereals, legumes, and others were ranked at the highest number of hectares, followed by vines and by nuts.

After the economic and social crisis created by the pandemic situation that was caused by COVID-19, it was observed in both prediction models how a prompt recovery of ecological production levels should take place. The trend of the curves showed an increase, and this situation was the result of economic and social factors. On the one hand, the Bank of Spain's forecasts showed a quick recovery of the gross domestic product (GDP) in the years immediately after the crisis. On the other hand, a culture associated with ecological movements was increasingly being imposed among consumers. This cultural change greatly affects the products to be consumed, where the trend is that, in the coming years, the acceptance of consumers toward their purchase will increase.

5. Conclusions

In recent decades, two packages of European Funds were approved to finance actions related to the development of the agricultural sector in Spain. The first covered the period from 2007 to 2013 and the second from 2014 to 2020. One of the main objectives of these was to introduce substantial changes in production models, directing them toward a more environmentally friendly economy. Special attention was devoted to the growth of the types of crops that are linked to organic farming.

The objective of this research was to determine the levels of development of this type of production among the different regions on which the Spanish state is territorially based. We considered that this type of analysis can help to redesign public actions since it can allow for specific actions to be taken in those territories in which the levels of organic production are below the Spanish average. Among them can be found the creation of a base of successful projects that could be transferred from one territory to another, or the realization of specific campaigns among farmers to reconvert their farms by introducing these types of crops.

This type of analysis may become more important, especially at this time, since the framework to develop the new Common Agricultural Policy (CAP) for the period 2023–2027 was approved. It once again considers the need to respond to environmental and climatic challenges through more sustainable production. Of the total amount approved, for Spain, 47,000 million EUR has been authorized.

To determine the level of territorial development, the shift-share methodology was used in this research. Its application showed the existence of important differences in the levels of development of organic farming in Spain. Specifically, the regions of Castilla and Leon, Castilla La Mancha, Catalonia, Galicia, Madrid, and the Basque Country experienced values above the Spanish average during the analyzed period.

Likewise, two prediction models were applied to predict the level of development of the sector in the near future, with a time horizon of 2023. These calculations were made at the national level and the data was disaggregated by the types of crops, specifically: cereals, legumes, and others; vegetables and tubers; citrus; fruit trees; olive groves; vines; and nuts.

In both prediction models, the negative effect that the recent economic and health crisis produced by COVID-19 had on production during 2020 was evidenced. However, there is an important tendency to regain the importance of the sector during the years 2021 to 2023. However, in the last projected year, there was a general tendency to keep levels unchanged. For this reason, it is important to redirect this situation and maintain the growth levels prior to the crisis caused by the COVID-19 pandemic.

Being aware of the limitations of this study, we consider it necessary to direct future research to correlate the patterns of regional economic growth with those of ecological agricultural production. This would make it possible to quantitatively determine the regions that are implementing efficient economic development and employment models in these types of crops. This type of analysis can help to define the distribution system of the European agricultural funds among the different regions. In this distribution system, public economic resources should be offered as a priority to those projects that generate employment and ecological production. We also consider it necessary to identify the regions that are lagging regarding the implementation of a sustainable growth model and to promote in them the projects that contemplate this environmental dimension. Otherwise, the environmental differences at the territorial level could increase. To this end, the recently approved European Fund can undoubtedly produce important changes in the sector.

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