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Towards a rural sustainable development? Contributions of the EAFRD 2007-2013 in Low Demographic Density Territories. The case of Extremadura (SW Spain)

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Abstract: The European Commission has been striving to achieve sustainable development in its rural areas for more than 25 years through funds aimed at modernizing the agricultural and forestry sectors, protecting the environment and improving the quality of life. But is sustainable rural development really being accomplished? This study sets out to answer this question in the case of Extremadura, a Spanish territory with Low Demographic Density and a Gross Domestic Product still below 75 % of the European average. Both qualitative and quantitative methodology have been employed, using a Principal Component Analysis the result of which has provided us with a model which shows how various behaviors coexist in the region in view of the distribution of current funding from the EAFRD. The most dynamic areas have received the largest amounts of funding and these are linked to the agricultural sector and to the protection of the environment, leaving aside the more depressed areas and the implementation of the LEADER Approach as well. Therefore, we have come to the conclusion that the current rural development in Extremadura is not sustainable enough.

Keywords: Sustainable rural development; EAFRD; LEADER Approach; GIS; Principal Component Analysis

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1. Introduction

The social, economic and demographic problems that European rural areas experienced for decades, such as the existence of large agricultural surpluses, unemployment, high rates of aging and emigration, low income levels and weak production systems [1] are well-known and taking into account that more than half of the population of the EU (European Union) member countries is located in rural areas which occupy 90 % of the Community territory, it seems obvious and logical that rural development should be one of the most important political concerns [2]. Thus, for the EU, rural development policy has become one of its priorities. It has evolved from being a complement of the Common Agricultural Policy [3] focused on achieving the multifunctionality of agricultural activities[1] [4] as well as on the use of such activities as rural tourism, crafts, services to the population, and heritage conservation, etc. At the beginning of the EU in the 1950s, its efforts focused on the development of the agricultural sector. But since the 1990s, rural development has been included as a policy with its own specific character supported by sustainable development [5] since the economic and territorial transformations had been revealing new relationships between the city and its

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[1] The interest in the multifunctionality of agriculture is that it is considered as a differentiator of the most disadvantaged rural areas that guarantees different and innovative services to customers, not only food, but also the enjoyment of landscapes, biodiversity or water quality, that is, social values.

inhabitants, the countryside and the environment and natural areas [6,7] and since a productive system can only be truly sustainable not only if it guarantees the preservation of natural resources, but also ensures the profitability of agricultural activity and provides adequate living conditions [8].

The CAP aid was proving to be insufficient for economic growth and maintenance of the rural population. For this reason, in the early 1990s, specific funding for sustainable rural development was created with the LEADER (*Liaisons entre activités de Developement de L'Economie Rural*) Initiative and Integrated Operational Programs. Then, in the 2000-2006 Programming Period with Agenda 2000, the Rural Development Policy was established as the second pillar of the CAP. Subsequently, in 2005, the foundations of the rural development policy for the 2007-2013 Programming Period – recently finalised- were laid. These foundations reflect the conclusions of the Salzburg Conference and the strategic orientations of the Lisbon and Goteborg European Councils, which emphasise the three facets of sustainable rural development: economic, environmental and social [2]. Therefore, for the European Commission and its Regulation (EC) 1698/2005, the main objective is to strive for the achievement of sustainable rural development by implementing a policy to ensure greater coherence between rural development and market and price policy in the agricultural sector. This is through a single legal instrument: the European Agricultural Fund for Rural Development (EAFRD).

As Armesto [9] shows, the premises for economic growth, protection and conservation of the environment and improvement in social conditions emerge from the concept of sustainable rural development. These premises are based on the use of the endogenous resources of the territory from the vantage point of the local population as the protagonist and benefactor of these changes, which have become the priority objectives of the European rural development policy.

The study region, Extremadura, presents different territorial realities that are conditioning the perception and distribution of rural development aid, because, according to the results put forth in previous studies [10] in which the LEADER Approach and axes 3 and 4 were analysed, it is possible to observe how the most developed areas of the region receive the greater share of the funding, leaving aside the more disadvantaged ones. Therefore, the objective defended by the EAFRD isn't achieved.

Thus, taking into account the hypothesis stated, the purpose of this paper is to present a Territorial Model of Extremadura (based on Principal Component Analysis (PCA)) in which representative variables of economic, social, demographic and environmental realities of Extremadura are combined and correlated to rural development aid. The final aim is to verify whether sustainable rural development is indeed a reality in this region which has a low demographic density, whose aging and depopulated towns are at risk of disappearing, and not just a mere proposal. We further need to ascertain whether or not there exists a fair distribution of said aid and if the same thing is occurring as with the LEADER Approach. Therefore, the final goal is to determine whether there is compensation between economic, environmental and social development and if he social justice that rural population needs exists [11].

As already explained at the beginning of this paper, a large part of Europe's population lives in rural areas, which occupy 90 % of the territory. Therefore, from an obvious adaptation of the variables, the resulting model could be applied to those territories with characteristics similar to those of Extremadura.

Bearing in mind the previous considerations, this study will unfold by explaining a series of sections. First, the methodology used is described such as the study of the procedures of the rural development policy in the period 2007-2013 in Extremadura with the EAFRD as a promoter of progress, as well as the building up of databases and statistical analysis. Subsequently, the results and conclusions learned will be displayed.

2. Materials and Methods

In order to understand the phenomenon under study, it is necessary to agree on a conceptual and methodological framework to highlight the problem, as well as to have the necessary data to deal with it and process the data into useful information. At the same time, it is important to have the tools

to manage and update the data in the relevant time and space [12]. For this, as will be seen below, an analysis was carried out of the study area and the theoretical framework of the EAFRD and its relation to one of the fund's objectives, sustainable development. Then, an extensive compilation was made of physical, demographic and socioeconomic variables (including those relating to rural development) on a municipal level, to be correlated through PCA using the SPSS statistical software. For a better graphic visualization of the results in this territory GIS (Geographical Information System) has been used, which is one of the most appropriate information management tools, associating alphanumeric information to a set of cartographic information, and a perfect tool to analyze the spatial location, distribution, association, interaction and evolution [13] of EAFRD funding in the selected study area.

2.1. Study area

Extremadura (Figure 1) is a predominantly rural region [14] with a GDP (Gross Domestic Product) below 75 % of the European average and with serious demographic and economic problems. Due to this, the region has benefited from rural development aid since the beginning of the 90s through LEADER and PRODER (*Programa Operativo de Desarrollo Rural*) on a national level with 89 % of the territory under its protection. Thus, the LAGs (Local Action Groups) of Extremadura have been managing this aid for 25 years, and this is the reason why LEADER is considered to be a good example in the management of this type of aid by various international organisations such as the OECD and various authors [15]. Furthermore, studying the application of the rural development policy in this region is worthwhile because there are a great variety of territories depending upon the physical, economic, social and demographic characteristics of each. On the one hand, there are areas with an adequate level of development and with enough equipment and services, as well as an articulated, modern and competitive agro-industrial sector. These areas are located in irrigated areas (the Guadiana, Tiétar, Alagón and Árrago Rivers) and in productive dry land with vineyards and olive groves (Tierra de Barros). On the other hand, there are areas farther from the main urban centres with a very elderly population and with important infrastructural deficiencies, in which the primary sector is unable to provide the necessary income for the population. These more disadvantaged areas are located in mountain and peneplain areas in the province of Cáceres (North) and in the border areas of the province of Badajoz (South). Finally, there are intermediate ones with a good rural/urban interaction, whose population complements their agrarian incomes with others from the tertiary sector due to the fact that the main regional county seats and cities (Cáceres, Badajoz, Mérida and Plasencia, all of which house more than 40,000 inhabitants) are located there.
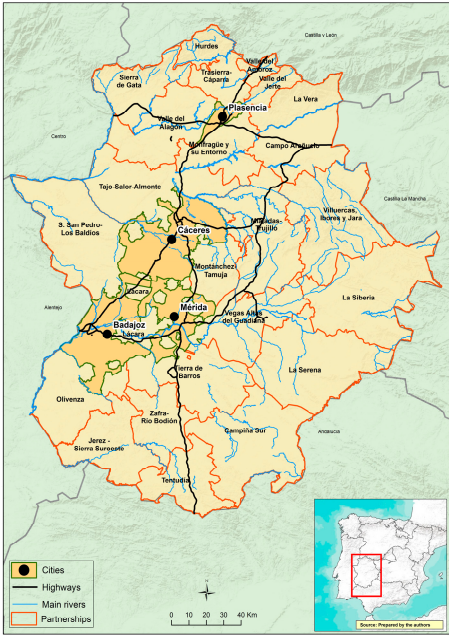
Figure 1. Study region, Extremadura. Source: authors.

2.2 Studing the European Agricultural Fund for Rural Development

As could be read in the introductory paragraph, Council Regulation (EC) No 1698/2005 lays the foundation for the new European rural development policy which finances aid under a single Fund, the EAFRD (Figure 2).

In line with the Community Strategic Guidelines, each Member State chooses a series of measures with which to carry out its rural development strategy on a national level, with the National Rural Development Plan, which is the guide for Rural Development Programs (RDPs) of each Autonomous Community, in the specific case of Spain. In these RDPs the strategic content and sustainable development of rural areas are reinforced through three fundamental objectives: increasing the competitiveness of the agricultural sector, enhancement of the rural environment and landscape and support for land management and improvement of quality of life in rural areas through economic diversification.

The RDPs are implemented through three thematic axes and a methodological one dedicated to the LEADER Approach. Each axis has a minimum funding (Figure 2) in order to ensure a balanced strategy and presents a series of measures from which each Member State chooses the most appropriate one for the development of their own territories.
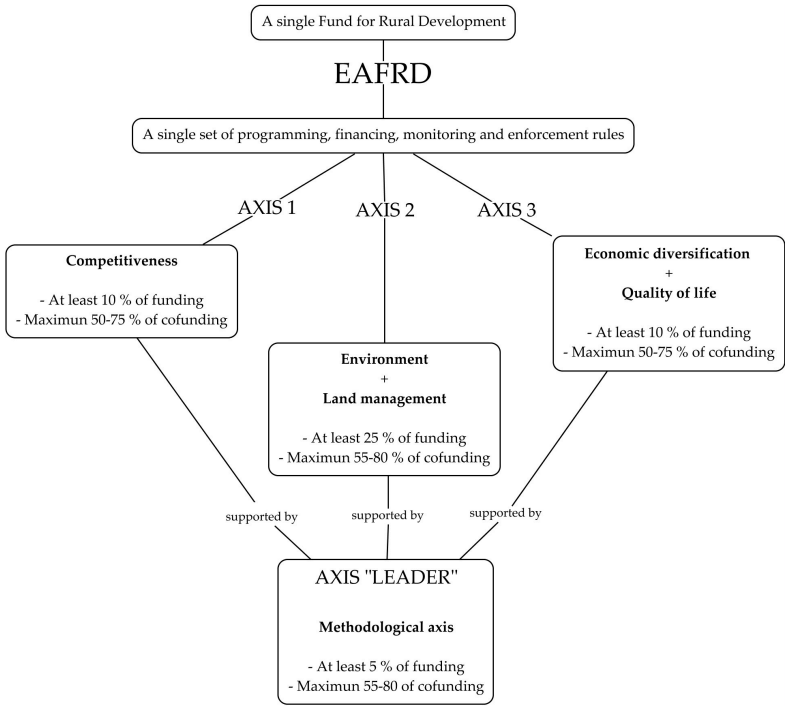
Figure 2. Operation of the EAFRD. Authors from [2]

Each axis of action is dedicated to:

Axis 1. Improving the competitiveness of the agricultural and forestry sector. With measures to promote knowledge and the improvement of human potential, the restructuring and development of physical potential, the promotion of innovation and the improvement of the quality of agricultural and food production.

Axis 2. Improving the environment and the countryside. It includes measures that contribute to sustainable rural development, encouraging farmers and foresters to maintain the management of their land in order to preserve and improve the rural environment.

Axis 3. Quality of life in rural areas and diversification in the rural economy. With measures aimed at the development of local infrastructures and human capital in rural areas, in order to improve conditions for growth and job creation in all sectors, i.e. measures aimed at achieving a "living rural environment" from diversification of their economic activities.

Axis 4. The LEADER Approach. Axis with which the so-called LEADER Approach or Method is applied in terms of local development strategy by zones, through partnerships[2] between the public and private sectors that are in charge of managing Axis 3 measures.

In the case of Extremadura, the measures and sub-measures selected in each thematic axis with which to carry out the sustainable rural development strategy in its territories are (Table 1):

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[2] These partnerships are the Local Action Groups (LAGs) and they are non-profit associations constituted by representatives of public entities and economic and social actors in each area of action, as well as being responsible for the management of projects to be funded through the LEADER Approach. In this way, the LAGs integrate the business, social and institutional sectors of each area into its organisation in order to defend a common set of interests for the application and management of EAFRD aid and to achieve a social, political, economic and entrepreneurship mass that allows the optimisation of RDP resources.

Axis 1	Axis 2	Axis 3	Axis 4
111. Information provision and professional training	211. Natural handicap payments to farmers in mountain areas	311. Diversification into non-agricultural activities	411. (123. Adding value to agricultural and forestry products)
112. Installation of young farmers	212. Natural handicap payments to farmers in areas apart from mountain areas	312. Support for the creation and development of microenterprises	413. Improving the quality of life and economy of rural areas
113. Early retirement of farmers and agriculture workers	214. Agro-food aid	313. Encouragement of tourist activities	421. Transnational and inter-regional cooperation
114. Use of advisory services	215. Animal welfare aid	321. Basic services for the economy and rural population	431. Operation of Local Action Group, acquisition of capacities and territorial promotion
115. Implementation of services, management, relief and advisory	216. Support for non-productive investments	322. Village renewal and development	
121. Modernisation of agricultural holdings	221. First afforestation on agricultural lands	323. Conservation and upgrading of the rural heritage	
122. Improving the economic value of forests	226.Restoring forestry potential and introducing prevention actions	331. Training and information for economic agents conducting their activities in the fields covered by Axis 3	
123. Adding value to agricultural and forestry products	227. Support for non-productive investments in forest lands	341. Acquisition of capacities and promotion with a view to the processing and application of a local strategy	
125. Improving and developing infrastructure related to the development and adaptation of agriculture and forestry			
131. Helping farmers to adapt to demanding standards based on Community legislation			
132. Participation of farmers in food quality assurance and certification schemes			
133. Information and advocacy interventions			
144. Holdings undergoing restructuring due to a reform of a common market organisation			

Table1. Measures and sub-measures with which to execute the RDP Extremadura (2007-2013). Source: Authors from RDP Extremadura 2007-2013.

2.3. Sustainable development in the EAFRD

The thematic axes 1, 2 and 3 are identified with the fundamental objectives proposed by the European Council and these in turn relate to the three dimensions of sustainable development. However, in this paper, the LEADER methodological axis, 4, is also a protagonist, whose costs, which are managed by the LAGs, are applied in Axis 4 itself, in a sub-measure of Axis 1 and in most of the areas belonging to Axis 3, in the case of Extremadura. In addition, the importance of the LEADER Approach is due to the fact that it is the approach with which European rural development aid has been put into action since 1991 with the LEADER Initiative. Therefore, this method has a 25

year trajectory of implementing an integrated, endogenous and innovative development model that significantly implicates the local population in decision making, to the point of becoming an Axis of the current Funding. On the other hand, although the quantitative results in Extremadura are not adequate [10], it cannot be denied that without this methodology and without the LAGs, a large part of the rural population would not be involved in the developmental processes, as well as population losses in the more rural areas could have been more worrying.

In this way, the following relation between the EAFRD axes, its action fields and the dimensions of sustainable development is proposed (Figure 3):
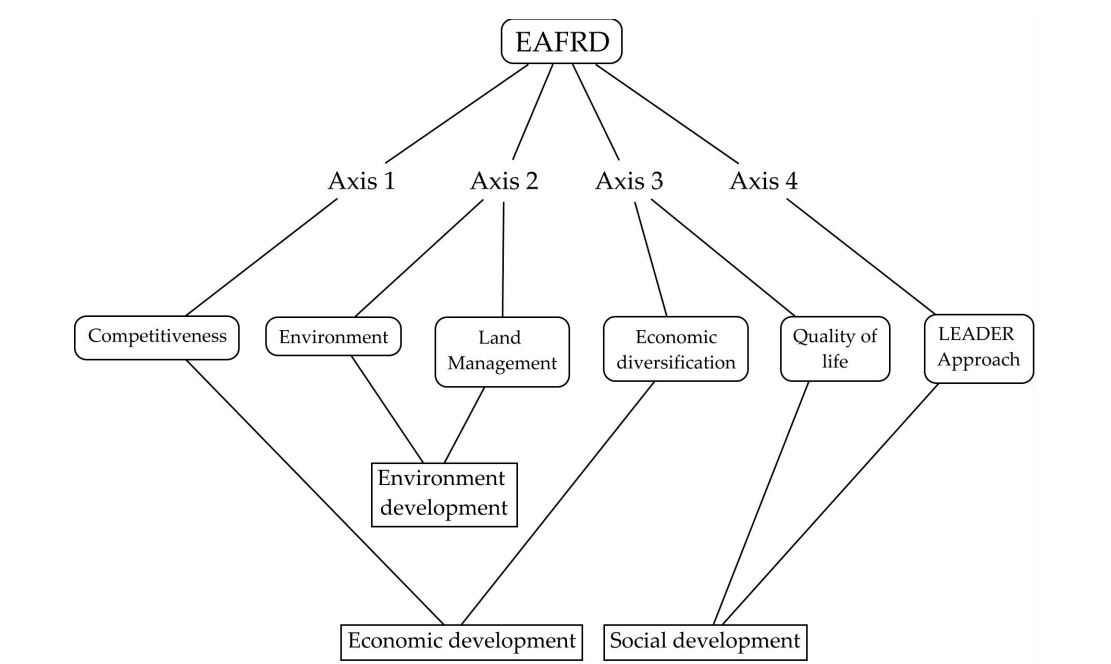

Figure 3.Reflection of the dimensions of sustainable rural development in the EAFRD. Source: Authors.

2.4. Homogenisation of the EAFRD

As can be seen in Table 2, the EAFRD subsidises rural development aid with 32 measures and sub-measures. In order to achieve a better comprehension and analysis of them, a homogenisation of 10 actions has been established, 6 actions are managed directly by the EAFRD (actions followed by E) and 4 by LAGs through LEADER (actions followed by L), according to the theme and objectives.

ACTIONS	SUBMEASURES				
Action 1 E. Human potential	111. Information provision and professional training	112. Installation of young farmers	113. Early retirement of farmers and agriculture workers	114. Use of advisory services	115. Implementation of services, management, relief and advisory
Action 2 E. Agricultural structures	121. Modernisation of agricultural holdings	122. Improving the economic value of forests	123. Adding value to agricultural and forestry products	125. Improving and developing infrastructure related to the development and adaptation of agriculture and forestry	

Action 3 E. Quality of agricultural products	131. Helping farmers to adapt to demanding standards based on Community legislation	132. Participation of farmers in food quality assurance and certification schemes	133. Information and advocacy interventions	144. Holdings undergoing restructuring due to a reform of a common market organisation	
Action 4 E. Sustainability of agricultural areas	211. Natural handicap payments to farmers in mountain areas	212. Natural handicap payments to farmers in areas apart from mountain areas	214. Agro-food aid	215. Animal welfare aid	216. Support for non-productive investments
Action 5 E. Sustainability of forest areas	221. First afforestation on agricultural lands	226.Restoring forestry potential and introducing prevention actions	227. Support for non-productive investments in forest lands		
Action 6 E. Improving the quality of life	413 (313, 321, 322, 323)				
Action 1 L. Acquiring skills and training and employment	331. Training and information for economic agents conducting their activities in the fields covered by Axis 3	341. Acquisition of capacities and promotion with a view to the processing and application of a local strategy	431. Operation of Local Action Group, acquisition of capacities and territorial promotion		
Action 2L. Tourism and Heritage	313. Encouragement of tourist activities	321. Basic services for the economy and rural population	322. Village renewal and development	323. Conservation and upgrading of the rural heritage	
Action 3L. SMESs and Valorisation of agricultural and forestry production	411 (123. Adding value to agricultural and forestry products)	311. Diversification into non-agricultural activities	312. Support for the creation and development of microenterprises		
Action 4L. Cooperation	421. Transnational and inter-regional cooperation				

Table 2. Homogenisation measures and sub-measures of the EAFRD 2007-2013. Source: Authors from RDP Extremadura 2007-2013.

Measure 413, which belongs to Axis 4, is intended for the management and financing of sub-measures 311, 312, 313, 321, 322, 323, 331 and 341 of Axis 3 in order to increase the quality of life and diversification of the rural economy and appears as such in homogenisation, under Action 6E managed by the EAFRD and not by the LAGs. This is because a considerable volume of the amounts destined to these sub-measures has gone to Cáceres, Badajoz, Mérida and Plasencia due to the fact that they are very large towns with a great agricultural vocation and include smaller local entities that also receive financing.

Furthermore, sub-measure 123 (Adding value to agricultural and forestry products) appears on a dual basis, managed by both the EAFRD and the LAGs. This is because, since mid-2012, the LAGs have been able to incorporate projects[3] which led to the creation, expansion and/or improvement of agro-food SMEs in areas where agro-food processing and marketing are linked to the local economies

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[3] Projects with a funding lower than 200,000 euros.

in their strategies. Thus, the total amount for sub-measure 123 comes from two sources, Axis 1 and measure 411 of Axis 4.

2.5. The data

Taking into account the geographical variability that Extremadura presents, the collection, election and classification of variables that represent it physically, demographically and socioeconomically is essential, not forgetting variables related to rural development.

All the collected variables have been codified at the municipal level through a common identifier, the INE code[4]. The demographic and socioeconomic variables were already established with the INE code, so those referring to physical and rural development information were adapted.

In this sense, the variables chosen as representative of the geographical reality of Extremadura are:

-   Physical variables: altitude and slope, which were obtained from the National Topographic Base on a 1:100,000 scale from the National Geographic Institute (the slope was calculated from a Digital Terrain Model); typology of geological materials from a National Geological Map on a 1:200,000 scale from the Geological and Mining Institute of Spain; climate data such as total precipitation and average monthly temperatures in 2015 State Meteorological Agency).
-   Demographic variables: average rates of birth, mortality, natural growth and migratory balance and youth and old-age indexes, from 2010 to 2014, (National Institute of Statistics).
-   Socioeconomic variables: the *Atlas Socioeconómico de Extremadura 2014*, which includes a selection of statistical data at the municipal level, is the source of variables such as the Economic Activity Index, Industrial Activity Index, Commercial Activity Index, Index of Restaurants and Bars and the Productivity Index. Further, data regarding unemployment were collected from the State Public Employment Service. Finally, information about the area occupied by irrigation, vineyards and olive groves was extracted from Corine Land Cover (2012).
-   Variables related to EAFRD aid: This information was generated from data provided by the Council on Environment and Rural Agricultural Policies and Territory of the Government of Extremadura in Excel (.xls) format. All this information was transferred to new .xls files to be worked on later, calculating variables such as EAFRD total funding, funding by axis, measures and actions, as well as the number of projects, both at the municipal level and by LAG. Moreover, due to the diversity of territories in terms of population size and area covered, a series of indicators that express the relation between EAFRD funding and population and area were created in order to analyse the efficiency of the management of economic resources. The latest data available are dated 31 January 2015, at the close of the 2007-2013 Program.

As a result, more than 100 variables were considered as clear exponents of the territorial reality of Extremadura.

The study on a municipal basis was chosen because the region presents different territorial realities with significant differences between some areas and others as mentioned above, but also among the towns themselves, especially those of which are categorised as "county seats" in which most of the population and economic activity are concentrated.

2.6. Principal Component Analysis

In this paper, PCA is used in order to obtain a Territorial Model of Extremadura in which its physical, demographic and socioeconomic substructures are represented and related to the rural development aid. It is a multivariate analysis which offers the possibility of explaining cause-effect relationships between the variables chosen as representative of Extremadura reality, in this case.

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[4] The INE Code is established by INE (National Institute of Statistics of Spain) from the union of codes assigned by the same agency to Spanish provinces and towns.

Moreover, PCA is a causal and explanatory method of variables that involves external factors [16]. In addition, it allows for the identification of latent dimensions of a set of variables and the reduction of the vector space, which is defined by a broad set of original variables, to a smaller number of factors independent of each other which are ordered by explanatory power [17-20]. It is a technique based on the early works of Pearson [21], although it was later adapted to factor analysis by Hotelling [22] in order to obtain new sets of variables, the principal components, as a result of the combination of interrelated variables for reasons of causality [16,23]. These components represent homogeneous behaviours in different entities or elements (towns of Extremadura in this case) which allow the territorial substructures of the region to be defined.

In essence, the objective to be pursued with PCA and Factor Analysis is to extract from a set of p variables, another reduced set of variables of m components or underlying factors that explain most of the variance in these p variables [24]. The underlying factors are obtained through correlation between the variables and are calculated as a weighted sum of them. Factor i would be

$$F_i = W_{i1}X_1 + W_{i2}X_2 + \ldots + W_{ip}X_p$$

In this sense, PCA and its application in social and human sciences research is an appropriate method to study complex structures, due to the reduction of a large amount of information [25,26]. Pallarès, Tulla, Badia, Vera and Serra [20] explain an essential advantage over other methods of data reduction, such as the fact that deciding in advance which variables are important to study the phenomenon is not necessary, but all the variables that are considered most appropriate can be introduced in a first analysis, since the results show then which are the ones that really influence the phenomenon and which ones provide little information. This is the premise followed in this research, that is, many variables have been compiled to later obtain the most significant and the correlation between them through PCA. Moreover, from this statistical method, initial effective indexes of selected variables and then several comprehensive indexes [27] that allow us to know which variables are really significant are obtained.

As explained previously, more than 100 variables have been chosen in this study. However, to perform PCA, the variables had to be objective and neutral, so the variables were relativized in rates or percentages, collinearities or reductions were avoided and all necessary prospective analyses were carried out until reaching an initial matrix considered optimal. Thus, variables with a coefficient less than 0.3 were eliminated because they were not statistically explanatory in the set.

In this case, the final variables used were 19 (Table 3):

Percentage of population of all of Extremadura, 2010-2014
Gross Birth Rate, 2010-2014
Natural Growth Rate, 2010-2014
Old-Age Index, 2010-2014
Economic Activity Index, 2011
Productivity Index, 2012
Index of restaurants and bars, 2011
Percentage of unemployment, 2014
Percentage of irrigation areas in relation to the municipal total, 2012
Percentage of vineyard areas in relation to the municipal total, 2012
Percentage of olive grove areas in relation to the municipal total, 2012
Percentage of investment in Action 1E per 1,000 inhabitants
Percentage of investment in Action 2E per 1,000 inhabitants
Percentage of investment in Action 3E per 1,000 inhabitants
Percentage of investment in Action 4E per 1,000 inhabitants
Percentage of investment in Action 5E per 1,000 inhabitants
Percentage of investment in Action 2L per 1,000 inhabitants
Percentage of investment in Action 3L per 1,000 inhabitants
Percentage of total investment of the EAFRD (2007-2013) over the regional total

Table 3. Variables used in the PCA.

On the other hand, the data referring to the four Extremadura cities with more than 4,000 inhabitants were excluded in the analysis. Although these towns also receive EAFRD aid, this paper focuses on the study of towns considered rural by the European Commission (all with less than 40,000 inhabitants) which are those really in need of being beneficiaries of the development that aid generates. In addition, during the study of the results of the different prospective analyses it was observed that the data from the four cities distorted the sample, especially those that correspond to Mérida, which is the autonomous capital and where the Council on Environment and Rural Agricultural Policies and Territory is located. This is because they are towns with great demographic and economic differences with respect to the rest that concentrate the majority of the population and activity, and important amounts from the EAFRD in the case of Mérida, from whence they are distributed for all the territory for training aid, promotion campaigns, etc.

It is necessary to consider whether the variables finally chosen to perform PCA are correlated with each other and in order to solve this question the so-called "constructs" exist, such as the Sample Adequacy Measure proposed by Kaiser-Meyer-Olkin (KMO) [28] which allows us to compare the magnitude of the observed correlation coefficients with the magnitude of the partial correlation coefficients, so that the smaller the resulting value the less suitable it is to perform Factor Analysis. The KMO statistic varies between 0 and 1, so that if the result is ≥ 0.75 the idea of performing the analysis with the chosen variables is good, if it is ≥ 0.5 the idea is acceptable and if KMO is < 0.5 it is unacceptable. In this case, the result is 0.630, thus the decision to perform PCA with 19 variables (Table 4) is acceptable. However, practical experience suggests that taking into account the KMO index as the only measure of adequacy of the model is precipitous, especially when the number of variables is small. Therefore, it is necessary to take into account other sources in order to decide which variables should be eliminated and which maintained, such as the communalities of each variable or interpretation of the factors.

Finally, the technical characteristics of the PCA are (Table 4):

Number of variables	24
Number of elements	379
Factor procedure	Principal Component Analysis
Extraction rule	Roots greater than 1
Number of factors	5

Table 4. PCA Technical characteristics.

3. Results

3.1. Distribution o the EAFRD aid in Extremadura

Hereunder, in Table 5 data calculated from EAFRD funding and Population (2010-2014) variables following INE methodology for the categorization of towns according to population are recorded. These are data with which the funding that rural towns receive is quantitatively analyzed in relation to their number and population.

As can be seen, data on the four urban cities do not appear in Table 5 because they have not been used for PCA. These towns have received 25 % of the funds, leaving 75 % for the remaining 379, although they house 31.3 % of the regional population. On the contrary, 74.4 % of the towns (all with less than 2,000 inhabitants) only house 28.68 % of the total population, which have received little more than 34 % of the EAFRD funding. The largest amount, 46.82 %, is concentrated in intermediate rural towns (from 2,000 to 10,000 inhabitants) and the remaining 19.11 %, in only 10, which are considered to be regional county seats. These data show that the most ruralized and less developed towns are where fewer projects have been managed and that the amount destined to only 10 already developed towns is very high.

	No. towns	% of towns	Total population	% of population	EAFRD total investment	% of EAFRD investment
Less than 2,000 inhabitants	284	74.74	217,461	28.63	203,31,235.85	34.07
from 2,000 to 10,000 inhabitants	86	22.63	345,785	45.53	279,374,811.76	46.82
More than 10,000 inhabitants	10	2.63	196,217	25.84	114,015,150.65	19.11
Total	380	100	759,464	100	596,707,198.26	100

Table 5.EAFRD funding related to the number of towns and the population that they house according to the population range. Source: Authors from INE (2016).

In Table 6 it can be seen that 83.78 % of the total EAFRD funding (more than 596 million euros) has been managed by the Fund itself in actions aimed at the areas of competitiveness, environment and land maintenance of axes 1 and 2 and part of 3 (environmental and economic developments), while only 16.22 % have been under the LEADER Method with actions encompassed within axes 3 and 4 aimed at economic diversification, quality of rural areas and the application of the Method itself (economic and social developments) although this shows an increase in the management capacity of LAGs, which was initially set around 10 % by Regulation 1698/2005.

Action 4E.*Sustainability of agricultural areas* receives the largest amounts, with almost 34 % of the total EAFRD funding and with measures to subsidize projects for farmers whose crops are located in areas with natural limitations, activities related to the agro-food sector, animal welfare and aid to non-productive investments linked to the fulfilments of environmental commitments required of farmers. The largest quantities of this action are in Tierra de Barros, which is linked to rainfed crops, Vegas Altas del Guadiana, with irrigated lands, and La Siberia, a traditional cattle-raising region. Action 2E.*Agrarian structures* follows, with measures dedicated to the modernization of agricultural holdings through new technologies and innovation, ecological production and to improving the economic value of forests and agricultural and forestry products, with the aim of improving the efficiency of the processing and marketing sector by increasing occupational safety, hygiene and animal welfare. Likewise, the largest quantities are concentrated in Tierra de Barros and Vegas Altas del Guadiana, which are the most developed regions in Extremadura due to their agro-industrial activity.

The other actions have received fewer funds and those are managed through the LEADER Approach. Action 2L.*Tourism and Heritage* and 3L.*SMEs and Assessment of agricultural and forestry production* have subsidized a greater number of projects, with 7.31 % and 5.03 % of the funding, respectively. The first, Action 2L, represents measures dedicated to the promotion of tourism activities, especially non-productive ones such as the creation of museums, interpretation centres or the exploitation of cultural resources, and to provide services and equipment for the rural population, such as Culture Centers, public lighting and street and trail conditioning. These projects are mostly located in Las Hurdes, La Vera and Sierra de Gata, in the northern mountains of the region. Secondly, Action 3L combines measures aimed at projects with which to launch SMEs and activities focused mainly on the service and craft sectors, as well as agro-industrial activities such as cooperatives.

Finally, Action 4L.*Transnational and interregional cooperation* has received only 0.11 % of the EAFRD funding in only 22 towns, which are the county seats where the teams of the LAGs are located.

	Action1 E	Action 2E	Action3 E	Action 4E	Action5 E	Action6 E	Action1 L	Action2 L	Action3 L	Action 4L	Total investment
€	79,126,6 59.23	126,471,9 40.59	9,446,51 7.40	220,624,5 53.26	57,519,3 62.93	6,717,66 0.67	22,522,1 21.39	43,606,4 26.19	30,044,2 01.92	627,75 4.68	596,707,198 .26
%	13.26	21.19	1.58	36.97	9.64	1.13	3.77	7.31	5.03	0.11	
	83.78						16.22				

Table 6. EAFRD Funding per Action.

3.2. Results of Principal Components Analysis

A value known as "communality" is obtained by PCA for each variable, which expresses the explanation of them in the data set. This value is obtained by adding the squares of the correlations or loads of the retained factors with the variable for which it is calculated. Thus, it expresses the proportion of variance of the variables extracted with m factors, where m is the number of factors retained. If m is equal to the total number of variables, the communality is 1.

In this case, as can be seen in Table 7, almost all variables have values higher than 0.600, up to 0.966, which shows a high explanation of the whole. The variables that provide the greatest explanation are those that refer to the total funding of the EAFRD and the population, both of which are closely related, as well as the Index of Restaurants and Bars, funding in 4E.*Sustainability of agricultural areas, unemployment and Natural Growth Rate*. On the other hand, there are variables with values that are also revealing but not so significantly, because they are more complex. These variables have weights below 0.800, like the variables of the EAFRD, especially those managed by it, demographic ones and cultivation of olive groves, vineyards and irrigation. In addition, actions managed by LEADER have the lowest weights, which is why they are the ones with the least funding.

	INITIAL	EXTRACTION
Percentage of total investment of EAFRD (2007-2013) over the regional total	1	0.966
Percentage of population of all of Extremadura, 2010-2014	1	0.903
Index of restaurants and bars, 2011	1	0.867
Percentage of investment in Action 4E per 1,000 inhabitants	1	0.837
Percentage of unemployment, 2014	1	0.827
Natural Growth Rate, 2010-2014	1	0.816
Percentage of investment in Action 3E per 1,000 inhabitants	1	0.790
Percentage of investment in Action 2E per 1,000 inhabitants	1	0.789
Old-Age Index, 2010-2014	1	0.776
Gross Birth Rate, 2010-2014	1	0.771
Percentage of olive grove areas in relation to the municipal total, 2012	1	0.681
Percentage of vineyard areas in relation to the municipal total, 2012	1	0.663
Percentage of investment in Action 1E per 1,000 inhabitants	1	0.648
Percentage of investment in Action 5E per 1,000 inhabitants	1	0.628
Economic Activity Index, 2011	1	0.591
Percentage of investment in Action 3L per 1,000 inhabitants	1	0.572
Productivity Index, 2012	1	0.560
Percentage of irrigation areas in relation to the municipal total, 2012	1	0.507
Percentage of investment in Action 2L per 1,000 inhabitants	1	0.500

Table 7.Communalities obtained in the PCA.

Furthermore, principal components were obtained with their total variance explained, in this case, 5. But what components should be considered for extraction? This question is resolved by representing the eigenvalues related to each component in the scree plot (Figure 4). The eigenvalues associated with the initial components are usually high but decrease as they are extracted, reaching a point where they are low and similar to each other, so the slope is minimal in the plot. The point of inflection in which the slope changes from being pronounced to a minimum is taken as an indicator of the number of the components to be extracted. These are the components whose eigenvalues are greater than 1 (Table 8).

In the scree plot (Figure 4), it can be seen how the slope appears much smoother in Component 5, although a greater change is seen in the second one. Taking this and the percentage of the variance explained into account, in this study the first three components are chosen as the most representative of the sample, which represent territorial substructures of the region. The first two explain 50.28 % of the variance and together with the third one, 58.94 %, so it can be considered sufficient to explain the sample analyzed, although, at the same time, not an excessively high value because of the complexity of the territory of the region.
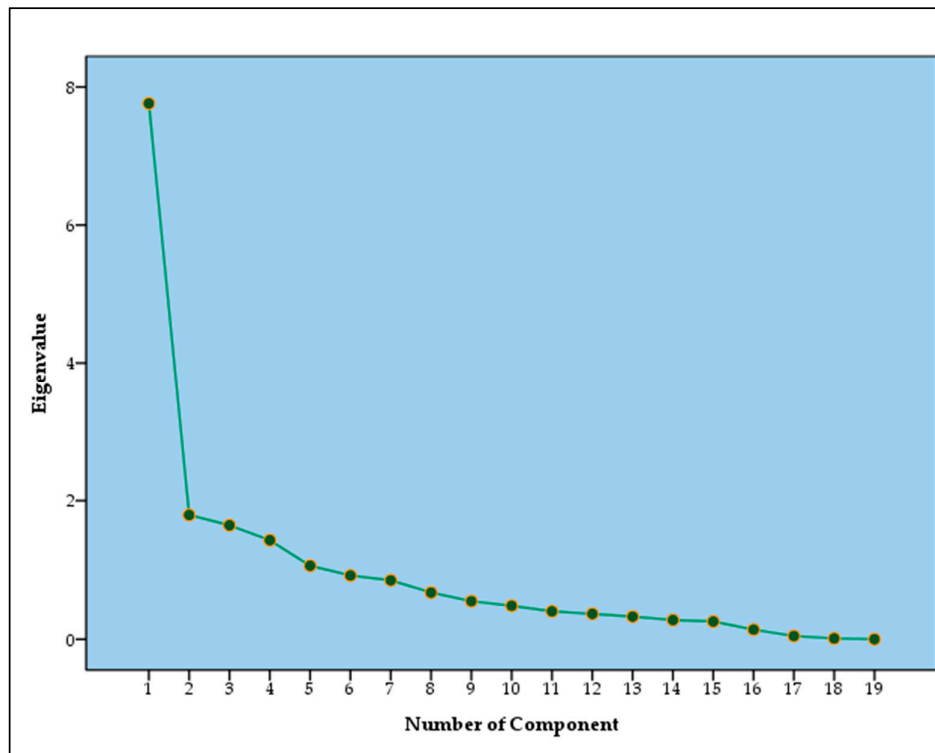

Figure 4.Scree graph.

Component	Initial eigenvalues			Sums of extraction of loads squared		
	Total	% of variance	% accumulated	Total	% of variance	% accumulated
1	7.762	40.853	40.853	7.762	40.853	40.853
2	1.793	9.435	50.288	1.793	9.435	50.288
3	1.645	8.660	58.947	1.645	8.660	58.947
4	1.429	7.524	66.471	1.429	7.524	66.471
5	1.060	5.580	72.051	1.060	5.580	72.051

Table 8.Total variance explained.

In Table 9, the variables and their explaining factors in components 1, 2 and 3 are recorded, and the towns of the region are cartographically represented with respect to them in figures 5 and 6.

	Component 1	Component 2	Component 3
Percentage of population of all of Extremadura, 2010-2014	0.923	0.114	0.014
Gross Birth Rate, 2010-2014	0.573	-0.613	-0.208
Natural Growth Rate, 2010-2014	0.516	-0.645	-0.261
Old-Age Index, 2010-2014	-0.545	0.588	0.290
Economic Activity Index, 2011	0.505	0.215	-0.365
Productivity Index, 2012	0.281	-0.519	0.388
Index of restaurants and bars, 2011	0.371	-0.270	0.403
Percentage of unemployment, 2014	0.512	0.148	-0.342
Percentage of irrigation areas in relation to the municipal total, 2012	0.884	0.214	0.009

Percentage of vineyard areas in relation to the municipal total, 2012	-0.018	-0.040	-0.226
Percentage of olive grove areas in relation to the municipal total, 2012	0.877	0.092	0.036
Percentage of investment in Action 1E per 1,000 inhabitants	0.759	0.021	0.221
Percentage of investment in Action 2E per 1,000 inhabitants	0.803	0.137	0.314
Percentage of investment in Action 3E per 1,000 inhabitants	0.330	0.138	0.303
Percentage of investment in Action 4E per 1,000 inhabitants	0.791	0.110	0.339
Percentage of investment in Action 5E per 1,000 inhabitants	0.396	0.198	-0.471
Percentage of investment in Action 2L per 1,000 inhabitants	0.482	0.195	-0.445
Percentage of investment in Action 3L per 1,000 inhabitants	0.724	0.144	-0.153
Percentage of total investment of EAFRD (2007-2013) over the regional total	0.929	0.167	0.194

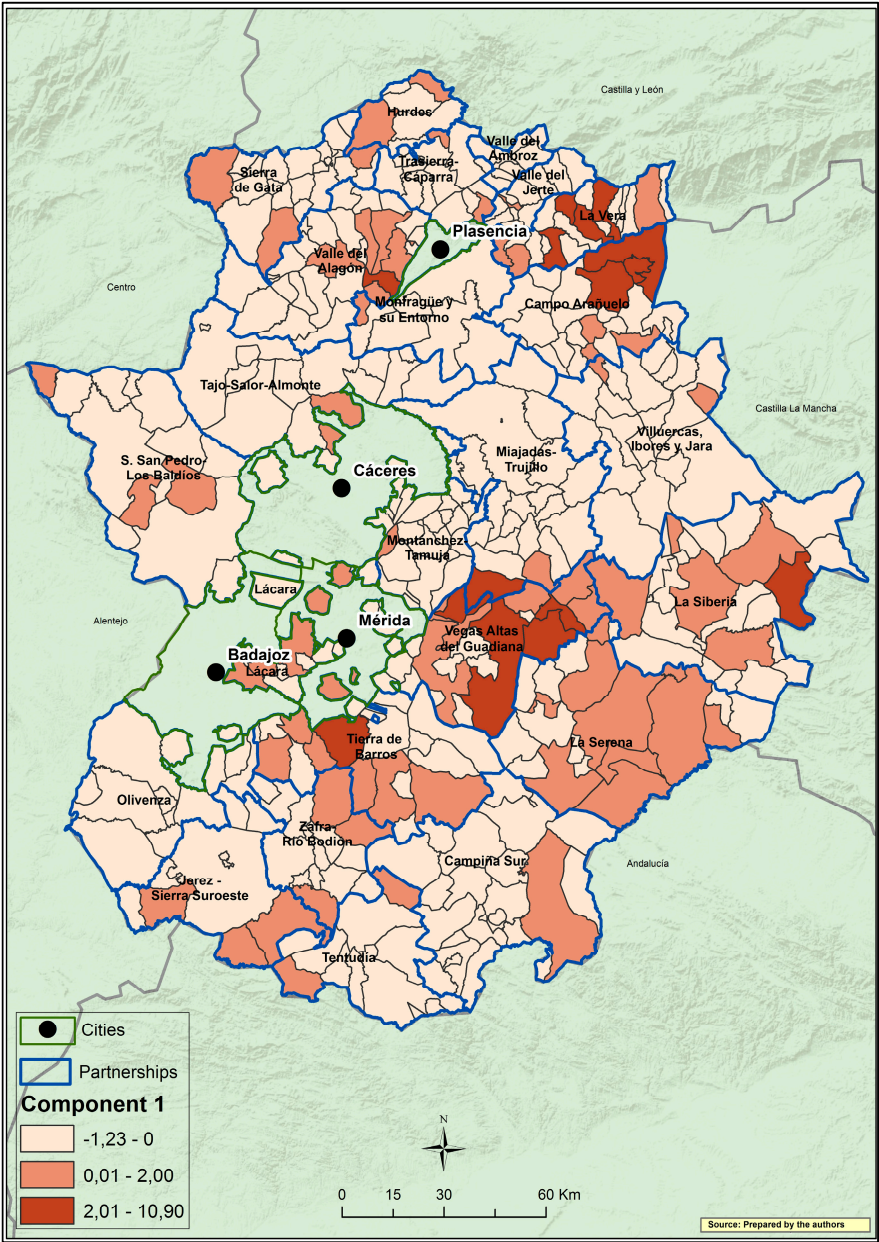Table 9. Factor weights of the variables in the first three components of PCA.

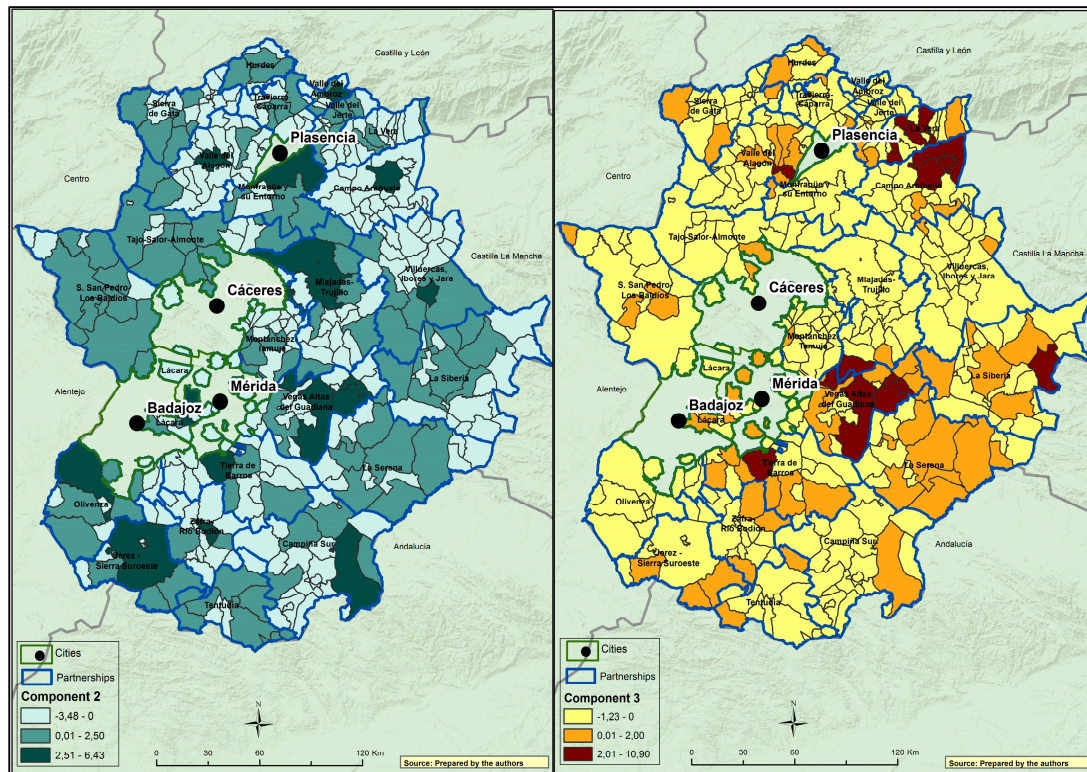Figure 5. Towns of Extremadura with respect to Component 1. Source: Authors.

Figure 6. Towns of Extremadura with respect to components 2 and 3. Source: Authors.

Component 1 explains 40.85 % of the sample and interrelates most of the variables related to the EAFRD with positive values, specifically the aid achieved through the Fund and particularly the Percentage of total funding of the regional funding, which is related to the population and Indexes of Restaurants and Bars and Unemployment. All of these variables have values greater than 0.7, as well as funding per 1,000 inhabitants in 2E.*Agricultural structures*, 1E.*Human Potential* and 4E.*Sustainability of agricultural areas*. Towns that share these variables are county seats, in which most of the equipment and services, population and EAFRD funding are concentrated. In contrast, the Old-Age Index appears with a negative value. It has high weight in a large number of towns located mainly in mountain areas in the north of the region, as well as in peneplain areas (centre and east) and in more border ones.

Besides that, components 2 and 3 represent 9.43 % and 8.66 %, respectively. These are very low values which demonstrate how Component 1 is the one that really contributes significance to the analyzed sample, since components 2 and 3 explain more complex structures.

The positive structure of Component 2 symbolizes aging towns (0.58 explanation factor) and an activity related to irrigation (0.215) and Tourism, Restaurants and Bars (0.214). On the other hand, the negative structure is formed by towns with optimistic demographic variables and with an economic activity linked to vineyard and olive cultivation.

In Component 3, funding for actions managed by the EAFRD (4E.*Sustainability of agricultural areas*, 3E.*Quality of agricultural products*, 2E. *Agricultural structures*) are closely related to each other through vineyards and olive groves (with values greater than 0.36) in the positive substructure, while in the negative one through funding in 5E.*Sustainability of forest areas* and 2L.*Tourism and Heritage* (with values lower than -0.36).

4. Discussion and conclusion

The main objective of the European rural development policy is the achievement of a sustainable rural development with which the problems of aging and depopulation will diminish in rural areas, as well as their differences respect to urban ones. This is through backing for the various activity sectors in rural areas under the four axes of the EAFRD, which, in this study, are identified with three areas of sustainable development: environmental, economic and social, whose balance was proposed to be analyzed.

Based on the results obtained in the previous section, our hypothesis is verified, in other words the physical, demographic and socioeconomic characteristics of Extremadura act as location and distribution factors for EAFRD aid.

In the PCA calculations, total and per-action funding have been related to the towns and population on which they operate. The result has been a very well defined first component. The positive substructure of this component directly links the total funding of the European fund with the most populated areas with the most economic activity, and in which, at the same time, the funding per 1,000 inhabitants in actions destined for agricultural structures, human potential and sustainability of the agricultural areas stand out. In the negative substructure of Component 1 the Old-Age Index is the protagonist.

Through PCA, it can be appreciated that there are different components, which group towns, which represent different territorial realities. The components do not have the same trends in terms of EAFRD funding, as there are more developed areas, which have an adequate accessibility to the main communication routes of the region and a significant volume of population and are located in the most prosperous agricultural areas, where the greater amount of funding concentrated. On the other hand, there are very old towns whose economies are based mainly on a subsistence agricultural activity and in the services sector linked to the hotel industry and rural tourism that are located in the mountain areas to the north of the region and the peneplain, in which little funding has been granted.

It can be affirmed that there is no territorial balance in the distribution of the EAFRD aid in Extremadura, since the previously developed towns monopolise the greater economic resources. On this basis and considering the European Commission's purpose, funding should be granted to the towns that need it the most, that is to say, to the least populated ones, which are elderly and have lower rates of economic activity. This imbalance means that the more disadvantaged towns and their population are condemned to ostracism and the impossibility of achieving adequate standards of living affecting the economic and social spheres.

Thus, it is currently difficult to accomplish sustainable development on an equal footing throughout the territory of Extremadura.

In this study, the rural approach to progress in heavily depressed rural areas such as the mountains and peneplain of Extremadura, established the need for a strong and dynamic economic backing in the agricultural sector, but also tied into the exploitation of the potential resources available on a local level whose mobilization could go hand in hand with the development of economic awareness, as well as the new demands for nature and leisure of an advanced urban society [29]. In others words, a fair betting for the exploitation of environmental, social and economic resources would be the right thing to achieve a true sustainable rural development in the most deprived areas.

Economically and politically, support for the most dynamic areas from businessman, entrepreneurs or associations may be convenient, but the proposal by the European Commission is not being carried out, considering that in Extremadura 284 towns (74.74 %) house only 28.63 % of the population. It is a "new way" to understand and generate development from entrepreneurs (usually private), but with this, most of the projects have been concentrated mainly in the already dynamic towns, leaving the smaller, peripheral and depressed ones aside.

A large part of the economic resources of the EAFRD are designated for actions under axes 1 and 2, that is to say, agricultural competitiveness and the environment, leaving a bit more than 16 % for axes 3 and 4 which are managed by the LAGs within the LEADER Approach, whose labour

is fundamental in the creation of social capital and, consequently, social development. LEADER has 25 years of experience, during which it has been essential in settling the rural population, strengthening culture and idiosyncrasy, improving social services, and promoting equality and social inclusion measures, etc. For this reason, the authors of this study bet on the LEADER Approach as a model for development for all aspects, that is, not only in the social arena but also in the economic and environmental one, taking into consideration the characteristics and needs of a territory in need of aid, but also its population (farmers, ranchers, innkeepers, entrepreneurs, women, young people, etc.).

In short, is it really struggling to achieve sustainable rural development in Extremadura? Theoretically yes, but in practice, according to the results, the way seems to be divided into several different branches, some of which are being more maintained than others. Therefore, there is no balance either in territorial distribution of capital or in the use of the axes of the EAFRD.

The upkeep of forests and agricultural areas is necessary, and so is taking advantage of the great activity that farmers and ranchers do by protecting and maintaining landscapes and biodiversity and ensuring animal welfare, but little can be achieved in the case of Extremadura if it is only carried out in the most progressive agricultural areas. There are areas, such as those in the mountains, which have important physical difficulties that make their agro-industrial activity impossible. This is because LAGs have decided to invest in rural tourism and in the services sector, but this does not generate benefits or enough development.

The more rural areas of Extremadura continue to grow older and lose population and the authors propose applying the LEADER Approach to all EAFRD measures, allocating more funds to axes 3 and 4, reducing the percentage of private participation in co-financing of the projects to be carried out in the poorest areas and distributing the total funds according to advance knowledge of the territory and its population and considering how the rest of the people will be affected by the activity of farmers and ranchers. In this way, a balanced sustainable development could be possible in Extremadura.

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