Towards Sustainability in European Agricultural Firms

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Abstract. European agricultural activity plays an important role in European and world food security through the agricultural production, supply and international trade. The main aim of this paper was analyses the agricultural sustainability of the twenty-nine Member States of the European Union in terms of economics, environmental, social and political activity. Information and data comes from FADN database from the European Commission. The methodology includes the min-max approach and multivariate methods, namely, Component Principal Analysis and Cluster analysis. The results confirm three groups of European countries, namely, the North and Central countries; the New Member States and the Mediterranean counties. The results also confirm that European agriculture firms and respective countries had a medium sustainability. The main conclusion highlines confirms the importance of the sustainability as a tool to better adjust agricultural policies among the European Member States.

Keywords: European Member States… economics; environmental… political…social… sustainability

1 Introduction

Agricultural activity plays an important role in the 29 Member States of the European Union (EU) in terms of economics, environmental, social and political activity. This sector provides not only agricultural goods and services to feed the local population but have direct and indirect impacts on European and world economic sector by the exports and imports, as well as, in other sectors by the multiplier effect, namely, on the agroindustry's. But the agricultural activity has, at the same time, impacts at the social level for the local population on European countries and at a worldwide level, namely, by the creation of direct and indirect jobs and the maintenance of population living in rural areas. At the environmental level the contribute of the agriculture cannot be neglected in preservation of the habitats and biodiversity that allow the development of of-farms activities with add values for livehoods and the creation of jobs.
More specifically, this paper aims to:

a) To analyze the total sustainability of the farms from European Member States as a way to promote innovation and social change among all the European agricultural firms;
b) To analyze the competitiveness of EU MS farms;
c) To analyze the social sustainability of EU MS farms;
d) To analyze the environmental sustainability of EU MS farms;
e) To analyze the political sustainability of EU MS farms
f) To compare the results of total sustainability of farms among countries in order to better define CAP policies and support from EU.

This paper making a threefold contribution in the literature:

1) This paper gives insights to stakeholders and to public decision-makers about the way forward in the promotion of the rural development and also promoting the agricultural sustainability.
2) Introduce at the first time another new and very increasing, important and innovator indicator of sustainability, namely, the political dimension, as a new concept of sustainability in the literature.
3) Gives insights to the scientific community to more accurate measures for sustainability of farms and for sectorial activities with the necessary adjust in order to promote the agricultural and sectorial sustainability.

2 Literature Review

The economic indicators from firms in general and agricultural firms are common since the neoclassical theory. On the other hand, sustainability indicators are also common in life sciences and environmental sciences [2]. But evaluation of European sustainability firms was never analyzed. The seminar work from [1] assessing the farm relative sustainability on Lithuanian agricultural firms. Based on that work economic, social and environmental indicators was constructed. But the political indicators of firms wasn't never used. According to Dos Santos (2013) agricultural European firms are high subsidized.

Based on FADN database [[3] data and [1] we construct the social, economic, social and introduce a new political indicator of sustainability according to the tables 1; 2; 3 and 4.

Table 1. Economic indicators of the agricultural activity

Variable	Indicator
X_1	Labour productivity: farm gross value added per 1 annual work unit (EUR/AWU)
X_2	Capital productivity: Cash-flow (at constant prices) to capital
X_3	Land productivity: farm gross value added (at constant price) per 1 ha of UAA (EUR/ha)
X_4	Solvency: ratio farm total assets to total liabilities
X_5	Farm income: family Farm income per 1 family work unit (EUR/FWU)

X_6	Fixed capital formation: investment in long term assets per 1 ha of UAA (EUR/ha)
X_7	Farm diversification: ratio of revenue forms the other gainful activities to total revenue (%)

Note: ha- hectare; AWU – Annual work unit; UAA – Utilized agricultural area; % - per cent.
Source: Vitunskiene & Dabkiene, (2016) adjusted.

Table 2. Social indicators of the agricultural activity

Variable	Indicator
W_1	Family work: ratio of hours worked by family members to total hours worked on farm (%)
W_2	Jobs on farm: total annual hours worked converted into full-time equivalents (FTE)
W_3	Innovation and cycle agricultural life: Net Investment/UAA (%)
W_4	Family Farm Income / FWU
W_5	Job creation (Total AWU/UAA) (%)

Note: ha- hectare; AWU – Annual work unit; UAA – Utilized agricultural area; % - per cent.
Source: Vitunskiene & Dabkiene, (2016) adjusted.

Table 3. Environmental indicators of the agricultural activity

Variable	Indicator
Z_1	Use of chemical fertilizers: amount of chemical fertilizers per ha of UAA (Kg/ha UAA)
Z_2	Energy intensity: ratio of cost of electricity, equipment, heating, transport fuel and oil to farm gross value added
Z_3	Meadows and pastures: share of meadows and pastures (per cent of UAA)
Z_4	Livestock density: livestock units per 1 hectare of UAA (LSUs/ha)
Z_5	Environment-friendly: Total agricultural area out of production/UAA (%)

Note: ha- hectare; AWU – Annual work unit; UAA – Utilized agricultural area; % - per cent.
Source: Vitunskiene & Dabkiene, (2016) adjusted.

Table 4. Political indicators of the agricultural activity

Variable	Indicator
P_1	Total dependency of farms from subsidies: Total subsidies/Farm net income (%)
P_2	Dependency of crops subsidies: / subsidies on crops/Farm net income (%)
P_3	Dependency on livestock subsidies: subsidies on livestock/ Farm net income (%)
P_4	Dependency on dairying subsidies: subsidies on dairying/farm net income (%)
P_5	Dependency on environmental subsidies: subsidies on environmental measures/Farm net income (%)

Source: Authors, 2017.

3. Methodology

Data comes from FADN database [2] but reporting to the year of 2013, because was the last one available. The main methods include multivariate methods, namely Component Principal Analysis was used to estimate weights for the selected indicators to construct sub-indices and then the sub-indices were aggregated into the farm relative sustainability index according to [1] but adjusted to the present goals. After, Cluster analysis was used to form homogeneous groups of European farms of countries, according to the agricultural sustainability indices by [4], [5], [6] and [7].

Based on FADN database [3], data and [1], were con-struct the social, economic, social and introduce a new political indicator of sustain-ability according to the tables 1; 2; 3 and 4.

4. Results

The main results of the cluster analysis of farms of EU MS outline confirm the existence of three clusters based on economics; social; environmental and political indicators, namely:

Table 4. Clusters of countries of farms sustainability

Cluster	Countries
I	Czech Republic; Estonia; Hungary; Italy; Poland; Portugal; Romania and Slovenia
II	Bulgaria; Cyprus; Greece; Spain; Croatia; Lithuania; Malta, Austria, and Sweden
III	Belgium; Denmark; Germany; France; Ireland; Luxembourg; Latvia; Netherlands; Finland and United Kingdom.

Source: Results of authors, 2018.

The results show the existence of three clusters that generically include, respectively: 1) Cluster I include mainly the New Member States (NMS); 2) Cluster II includes mainly the Mediterranean countries; and; (3) Cluster III includes mainly the Central European countries, which have mostly been in the genesis from European Union and are beneficiaries of the policies the from the beginning from Common Agricultural Policy (CAP).

Table 5. Results of Cluster of farms sustainability indicators

Variable	Economic Indicators/ Cluster		
Cluster	I	II	III
X_1	117560	111061	398211
X_2	0,5	0,5	0,3
X_3	8207	13076	17092
X_4	321	440	77
X_5	109780	81794	328271
X_6	223682	51930	393520
X_7	8717	13921	14534
Variable	Social Indicators/ Cluster I	Social Indicators/ Cluster II	Social Indicators/ Cluster III
W_1	537	611	675
W_2	1574	665	468
W_3	22554	-61989	216707
W_4	109781	81795	328272
W_5	59	106	29
Variable	Environmental indicators/ Cluster I	Environmental indicators/ Cluster II	Environmental indicators/ Cluster III

Z_1	93232	115492	146775
Z_2	2,8	2,2	3
Z_3	45,6	37,5	22,1
Z_4	0	0	0,2
Z_5	0,7	0,4	0,5

Variable	Political indicators Cluster I	Political indicators/ Cluster II	Political indicators/ Cluster III
P_1	591	384	582
P_2	9	14	11
P_3	25	18	52
P_4	22	0,5	6,2
P_5	0,8	2,9	7,5

Source: Results of authors, 2018.

The results of economic indicators highline confirm that Central European countries (Cluster III) presents a high value of productivity of labour; capital; financial indicators; income and investment in fixed capital. On the opposite way the farm diversification id high in the Mediterranean countries due the climatic and soil conditions that allows different and unique agricultural systems, namely as occurs with “montado” or cork production with pastures and animal production [4].

About the social indicators of the agricultural activity among the Clusters, the results confirm the important social impacts of all these tree clusters on this indicator, mainly with the high contribute of the agricultural firms from cluster I and cluster III, from the NMS and Central European agricultural firms on jobs creation on farm; innovation and rural development. These results confirm the important contribute of family farms for

the preservation of the rural development and sustainability and are according to [8]and [9].

About the environmental indicators the results mainly confirm that the Mediterranean agricultural systems are, in general, more environmental friendly with low inputs in fertilizers chemicals; low energy intensity consumption; highest areas on pastures and more extensive livestock systems. These results highline confirm the need of financial support from CAP policies to conduct the maintenance of the environmental European systems and farms and your preservation.

The results of political indicators from the firms of the all the clusters confirm that the dependency of farms from subsidies presents the highest value for the Central European countries, namely the total dependency of farms from subsidies, dairying and environmental financial support measures from CAP.

5. Conclusion

The main results confirm that farms from European Central countries are more competitive with more economic efficiency and have high financial support from CAP measures. On the opposite way, Mediterranean agricultural firms have the highest value and contribute on environmental and rural development and preservation. In general all the European agricultural firms from EU the family farms represent an important contribute for jobs creation and the maintenance of the rural live.

With the exception of crop subsidies, Mediterranean agricultural firms present the lowest values of support from CAP policies. That means the need of more attention from public decision makers about the Mediterranean agricultural farms and countries.

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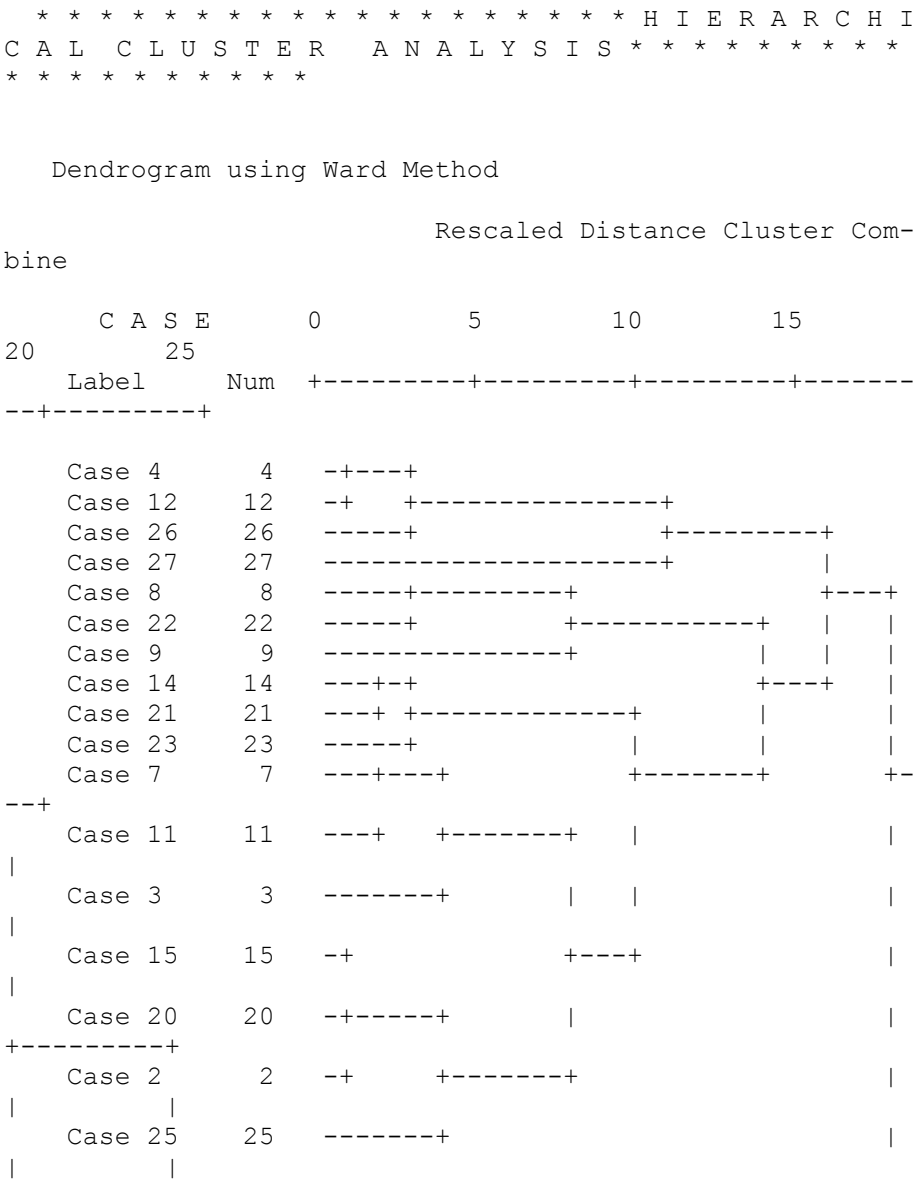
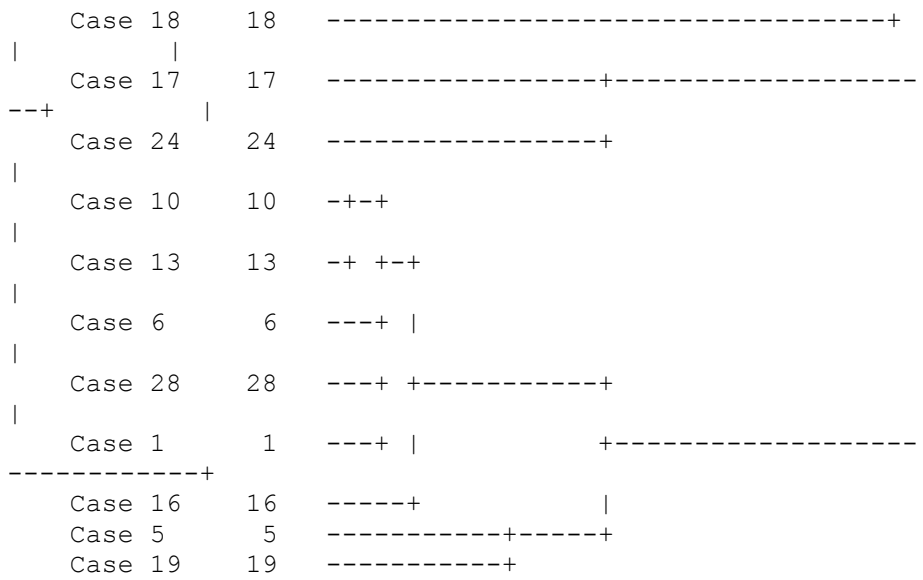
Appendix1

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