SUSTAINABLE AGRICULTURE IN EU. A METHOD FOR A SYNTHETIC CLASSIFICATION OF THE NUTS2 AREAS

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Abstract

The measure of the sustainability in agriculture is a complex task because of various approaches existing and different quantitative and qualitative parameters available in function of the national contests.

In this study it has been chosen a multi-dimension approach of the phenomenon including environmental, economic and social dimensions.

The objective of the work is to build up 30 simple indicators of the three dimensions using the only sources of EU FSS and SAPM 2010 with the aim to cluster the NUTS2 areas of EU in four level of sustainability: High, Medium-High, Medium-Low and Low. Results are shown in the synthetic map.

Key word: Sustainable agriculture, FSS and SAPM 2010, indicators of sustainability.

1. Introduction

The development of sustainable agriculture in the European Union is one of the most important strategic objectives of the actual and future Common Agriculture Policy (CAP). So much so that the three broad objectives of the future CAP are "viable food production", "sustainable management of natural resources" and " balanced territorial development", which respond directly to the economic, environmental and territorial balance challenges identified in the Communication and which guide the changes to the CAP instruments (European Commission, 2010).

The objective of this study is to cluster the Nomenclature of Territorial Units for Statistics (NUTS) 2 areas[1] in Europe in four level of sustainability through the building up of simple indicators coming all from the same statistical source: EU Farm Structure Survey (FSS) and Survey on Agricultural Production Methods (SAPM) 2010 (EC Reg. 1166/2008).

A crucial aspect to consider for building up sustainability's indicators is the adoption of a specific concept of sustainability. Among the different approaches existing it has been adopted in this study a multidimensional concept including three dimensions: environmental, economic and social. This approach hark back to the Brundtland Report (Our common future) of the World Commission on Environment and Development of United Nations (UN, 1987) based on the principle of the conservation of the production capability in function of the factors availability.

2. Methodology

The territorial areas considered have been 266 parted in 28 EU Members States plus Iceland, Norway, Switzerland and Montenegro.

Four levels of sustainability have been considered: High, Medium-High, Medium-Low and Low.

Most of the indicators proposed are included in the European Commission communication entitled 'Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy'(Council of the European Union, 2006). Further indicators have been selected from national sources (Trisorio, 2004).

The indicators chosen are 30 split by the three dimensions (Table 1).

All the phenomena summarized through the indicators have a positive impact on sustainable agriculture except for those related to the indicators 4, 6, 11, 16 of Environmental dimension and 7 of Economic dimension.

[1] Except for Germany where NUTS1 area have been utilized.

Environmental dimension			
1.	Tillage practices	10.	Sources of irrigation water
2.	Soil cover	11.	Volume of water used for irrigation per year
3.	Crop rotation	12.	Manure storage
4.	Livestock patterns	13.	Area under organic farming
5.	Specialization	14.	Agriculture propensity
6.	Animal housing	15.	Farm wooded area
7.	Manure application	16.	Intensive agriculture
8.	Renewable energy production	17.	Farm concentration
9.	Irrigation methods	18.	Landscape features
Economic dimension			
1.	Work productivity (AWU)	5.	Diversification of the holder work
2.	Work productivity (employees)	6.	Diversification of production
3.	Soil productivity	7.	Propensity to market
4.	Economic Capacity		
Social dimension			
1.	Job stability	4.	Femininity work
2.	Generational replacement	5.	Female entrepreneurship
3.	Agricultural specialization		

Table 1. The sustainable dimensions chosen.

This has been taken into account for the attribution of the score of each indicator. That is, for indicators associated with positive impact on sustainable agriculture higher values of the ratio correspond to higher level of sustainability and the other way round for the indicators with negative impact on sustainable agriculture.

The indicators chosen are simple from the point of view of the elaboration and of the numbers of parameters of which they are composed. Simple indicators guarantee better transparency and more immediacy of the information.

All parameters (except one - the Total Area in indicator number 14 of Environmental dimension) used for building up the indicators come from the same statistical source: the FSS&SAPM 2010. The choice of a single source of data is one of the strength point of this study since it evoids the problems of using multiple sources: different methods of collecting or estimating the information, of frames adopted, of reference times and of definitions of the parameters. Moreover, an high level of comparability among the Member States is guarantee by the adoption of a common legal framework to carry out the survey (European Parliament, 2008). But, at the same time, the use of a unique statistical source could limit the availability of a bigger number of variables to be analyzed (weakness point).

To clusters the NUTS2 area in 4 level of sustainability (High, Medium-High, Medium-Low and Low) it was used a Ranking-additive method[2].

3. Results

Results are shown in the map below (Figure 1).

[2] It was calculate the value of each indicator in each NUTS2 area, then using the quartile distributions of the values it was assigned a score to each indicator in each area. Finally the scores of all indicators have been summed and the result divided by the number of indicators calculable in each area.

Areas with higher level of sustainability are 17 in total and they are all located in Centre Europe. They are listed as below:

Germany: Bayern, Brandenburg, Hamburg, Nordrhein-Westfalen, Sachsen, Schleswig-Holstein.

Luxembourg: Luxembourg.

Austria: Niederösterreich, Wien, Oberösterreich, Salzburg.

Switzerland: Région lémanique, Espace Mittelland, Nordwestschweiz, Zürich, Ostschweiz, Zentralschweiz.

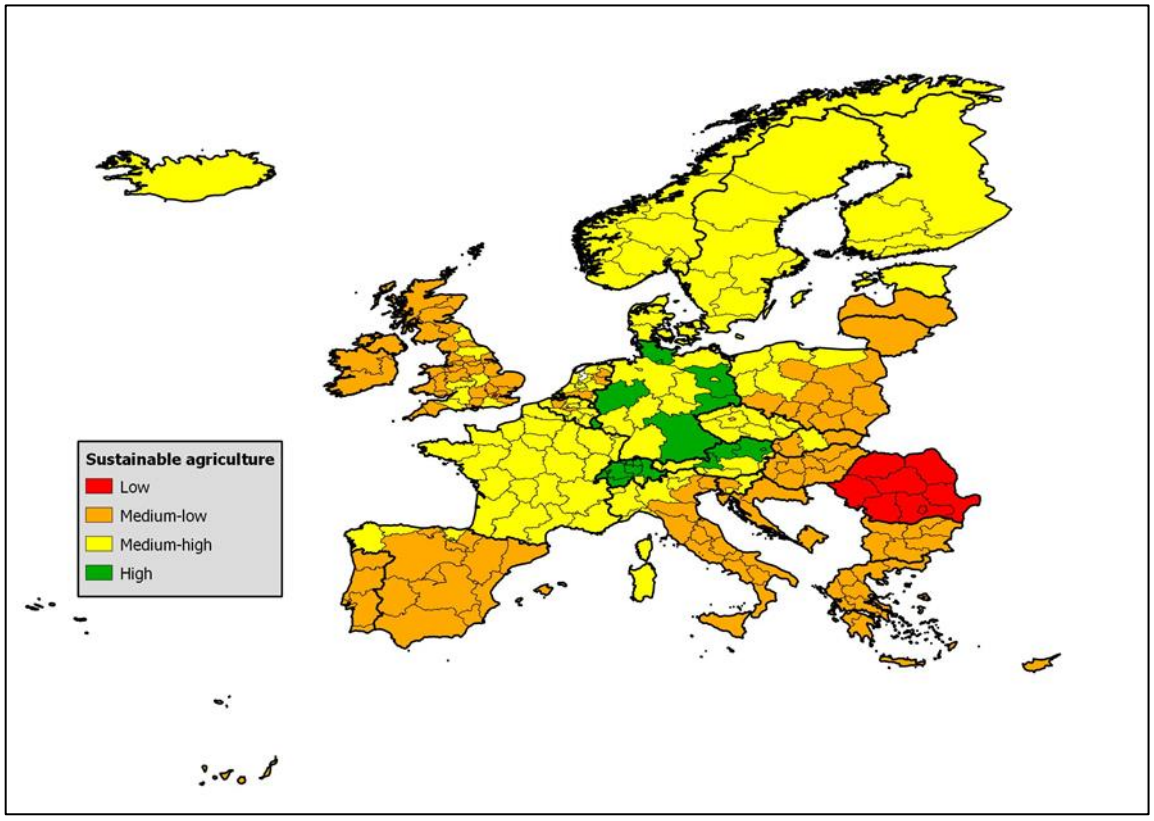

Figure 1. Level of sustainability in EU at NUTS2 level.

All these areas have obtained the high or medium-high score in the environmental and economic dimensions. Luxembourg, Austria and Switzerland (except Région lémanique) have got the high score in the social dimension, too.

Related to Germany, the general indicator for the Economic dimension is maximum for each Region. Particularly the "diversification of production" is very high in these areas. Effectively in Germany 92,130 farms have other gainful activities with an economic impact on them. These farms represent 31 % of the entire population of holdings, which is one of the highest shares reported within the EU-27 in 2010 (Eurostat, GCA 2010).

The Environmental indicators have a different distribution in the areas. The Regions with higher score are Bayern and Sachsen. The first one get a maximum score for "tillage practices", "agriculture aptitude", "area under organic farming". It's important to underline that the agricultural land dedicated to this last practice is relevant in Germany that records the highest value (852,670 ha) among the EU Member States (Eurostat, GCA 2010).

In Sachsen the maximum score is for "manure application", "irrigation methods, "agriculture propensity" and "renewable energy production". Concerning this last point it is interesting to notice that 41% with other gainful activities in Germany produce renewable energy (41%).

Luxemburg has the maximum score for the synthetic index thanks to Social and Economic dimensions: The higher scores have been got by *"job stability*" (Social) and *"work productivity* (number of employees)", *"soil productivity"*, and *"economic capacity"*, (Economic). The Environmental dimension has a medium-high score. For this dimension higher values are recorded for *"renewable energy production", "irrigation methods"* and *"agriculture propensity"*.

Concerning Austria is interesting notice that all four Regions of Niederösterreich, Wien, Oberösterreich, Salzburg have high score for the following indicators:

- Environmental dimension: "*tillage practices", "crop rotation", "agriculture propensity"* and *"landscape features"* showing a particular attention to protection of lands.
- Economic dimension: *"diversification of production"* leading to an extra source of income for the agricultural holdings.
- Social dimension: "*job stability*" and "*femininity work*".

About the last dimension, Regions of Oberösterreich and Salzburg reach the maximum score for both indicators.

In Switzerland each Region has high score both for Economic and Social dimension (except for Région lémanique).

Related to Environmental indicators, high score are for "*renewable energy production", "irrigation methods", "landscape features*" and *"agriculture propensity*". The last outcome is influenced by the fact that agricultural and alpine grazing areas together make up more than one third of the total area of Switzerland (FSO, 2013).

In this area, the indicators with higher values for Economic dimension are *"diversification of the holder work", "propensity to market", "economic capacity"* and *"diversification of production"*. In fact, in 2010, 45% of farms had family members with other gainful activities, mainly forestry, direct sale of farm production or agricultural work for other farms (FSO, 2013).

About Social dimension, higher score are recorder for *"generational replacement"* (medium-high for Nordwestschweiz), although between 2000 and 2011 the age pyramid of farmers shifted to the right (FSO, 2013) and *"agricultural specialization"* (medium-low for Région lémanique). The number of people completing an apprenticeship in farming fell significantly until 2005. Since then, interest in this apprenticeship has grown again (FSO, 2013).

A medium-high level of sustainability is observed in Norway, Sweden, Denmark, Iceland, France (except Guadeloupe medium-low), Finland (except Åland medium-low), Czech Republic (except Praha medium-low) Estonia and in some areas of Spain, Italy, United Kingdom, Belgium, Germany, Slovakia, Netherlands, Austria, Poland, Slovenia, Switzerland (Ticino).

A medium-low level of sustainability is noticed in Greece, Ireland, Portugal, Hungary, Bulgaria, Cyprus, Latvia, Lithuania, Malta, Montenegro, and in some areas of Italy, Spain, United Kingdom, Belgium, Netherlands, Poland, Slovakia, Slovenia.

All Romanian regions result with the lower level of sustainability together with Inner London (UK). These area have obtained a low or medium-low score in the environmental and economic dimensions. For Romania, all economic indicators have minimum value. The only high values are observed for the Environmental dimension of *"specialization"* and "*volume of water used for irrigation per year*" and for Social dimension of *"femininity work*" and "*female entrepreneurship*". It should be noted that this is one of the Countries together with Poland with a greater employment rate of women in the workforce. Most Member States like this also face severe demographic ageing and the main potential for labour supply lies with women (Eurostat, LFS 2012). In many Countries (i.e. Hungary, Bulgaria, Greece, Ireland,

Portugal, Norway, Sweden, Denmark) the level of sustainability is homogenous among all the regions composing the whole Country.

4. Discussion

This study proposes a synthetic Sustainable Agriculture Index to make available to Policy Makers and researches. Its main peculiarity is to use a single statistical source for feeding the indicators selected (EU 2010 FSS&SAPM). This strategy implies a strong advantage in building up homogeneous indicators in terms of methods of collecting/estimating and definitions of the parameters, frames adopted and reference times, among the Countries, but limit the choice of the indicators at those in which FSS&SAPM make available the parameters.

Further developments of the work could be oriented to strengthen the methodological aspects:

- Implement and compare different methods for calculating the synthetic indicator.
- Study more complex formulas for feeding the single indicators.
- Weight each indicator according to their impact on the sustainability
- Enhance the study of each dimension.

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