RELATIVE COMPARATIVE ASSESSMENT OF EU-28 FARM SUSTAINABILITY

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СРАВНИТЕЛНА ОТНОСИТЕЛНА ОЦЕНКА НА УСТОЙЧИВОСТТА НА СТОПАНСТВАТА В ЕС-28

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Abstract

The main sustainability aspects are defined in a broader definition regarding to which the agriculture should be economically efficient, environmentally compatible and socially responsible.

The EU is transforming the holdings and this reflects on the farm economic size and furthermore its sustainability. This paper aims to find out the connection between the farm economic size and the sustainability.

The relative comparative approach applies an assessment by normalizing the FADN data (representing an average statistical farm performance from each MS sample) and determines the scope of the Member States according to pre-defined criteria used as a sustainability score.

Key words: Agricultural Holdings, Sustainability, Economic Size, Relative Comparative Assessment, EU-28

JEL Codes: D04, Q12, Q56

Introduction

Measuring sustainability involves complex indicators which often do not support each other and there appears the necessity of building a Composite Sustainability Index where the Relative Comparative Assessment approach facilitates the evaluation of influence of a set of variables on farm sustainability. Also provides some clues for policy-makers (Mortimer et al, 2008) that intend to design sustainability-increasing and green agricultural policies. The most papers dedicated to farm sustainability are focused on eco-environmental component. In this paper, we evaluate sustainability through the estimated main detrimental production factors, intensification level and the wellbeing of holdings based on their costs.

One pays attention on the sustainable intensification of the small farms operating in the highlands. The Ethiopian researcher Mutyasira (2017) tried to find out where is the limit of that intensity when a farm is exploiting the land, animals and environment extraordinarily. Longhitano et al (2012) applied a methodology of sustainability assessment to the regional FADN sample of Veneto based on the Italian database (as we used on a MS holding level), keeping into consideration that dataset

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has "to be a valuable source of information to monitor the environmental and social farm assets, beside the economic one". Katona et al. (2005) presented a comparative sustainability approach to the EU-15 and found Hungary farms had lowered the inputs relative to the reference values and during its pre-accession period had even went under the EU-15 input levels. In term of such a goals, while aiming to fulfil the EU framework, a national administration should define effectively institutional checkpoints especially to ensure policy implications for environmental management (Mitov, 2019). Ivanov et al. (2009) concluded that there is a need of continuous monitoring to assess and modify sustainability strategies. That is the reason we created a long-term observation on the average synthetic farm holdings, representing the Member States of EU-28 by an official data.

Methodology

Aiming to build a Composite Sustainability Index includes 15 complex variables. The FADN provided 37 variables used to create complex farm indicators, which form an estimation ranking for every pillar and afterward to form the Composite Sustainability Index:

Economic indicators:

1. Labour Productivity = Total Output / Total Labour Input;
2. Diversification Level* = 1- (Max Output (FADN~SE140÷SE245)/ Total Output);
3. Profitability = Farm Net Income / (Total Inputs – Farm Usage);
4. Capital Productivity = Total Output / Average Farm Capital;
5. Economic Resilience (Bachev et al., 2017) = (Total Output – Total Subsidies excluding on Investments – Subsidies on Investments) / (Other Direct Inputs + Depreciations + Total External Factors);

* The Diversification Level is expressed by the reciprocal value of a Specialization Level

Social indicators:

6. Family Farm Income per Family Working Unit;
7. Internal Consumption per Family Member = Farmhouse Consumption / Unpaid Labour Input;
8. Farm Salaries = Wages Paid / Paid Labour Input;
9. Farm Made Factors of Production = [Farm use – Feed for Grazing Livestock Home-Grown/ (Arable Land + Permanent Crops)];
10. Share of Own Land = 1 – (Rented U.A.A./ Total Agricultural Area)

Ecological indicators:

11. Stocking Density;
12. Fertilizer Usage per Unit Area = Fertilizers / Input Intensified Area*;
13. Pesticide Usage per Unit Area= Crop Protection / Input Intensified Area*;

14. Energy Intensity = Energy / Total Utilized Agricultural Area;
15. Protein Crops Share in the Crop Rotation = Protein crops / Cereals + Energy crops + Potatoes + Sugar beet + Oil seed crops + Industrial crops.
* Input Intensified Area = Arable Land + Permanent crops;

Assessment method:
In order to focus on the majority of results, to normalize the data and to form a score, the following ranking formula was applied to design the values to fit between 0 and 1:

$$\text{Indicator Score} = \text{FADN Value} * \frac{(0.5 + 0.5\ \text{Var. Coeff}^{2})}{\text{St Dev} + \text{AVG}}$$

Where: Variation Coefficient = Standard Deviation / Average

As a consequence, to remove the spikes the following restrictions to values needed to be applied:

a. value <0 = 0;
b. value >1 = 1.

The assessment of each MS Composite Sustainability Index will be presented as an arithmetic **average of the results by pillars**, which in turn will be formed also by the average of each indicator group. What is distinctive about the measurements of the pillars is that they are represented by the assessment on sustainability principles, which represent a common denominator of the indicators that make them up.

Economic Pillar Assessment:
1. Economic Efficiency= (Capital Productivity + Labor Productivity) / 2
2. Risk Management = Diversification Level
3. Financial Stability = (Capital Productivity + Profitability) / 2
4. Economic Viability = Economic Resilience

Social Pillar Assessment:
5. Welfare of Employed in Agriculture = {[(Family Farm Income per Family Member + Internal Consumption per Family Member) / 2] + Farm Wage} / 2
6. Agricultural Preservation and Conservation = (Share of Own Land + Farm Made Factors of Production) / 2

Ecological Pillar Assessment:
7. Animal welfare* = 1 – Animal density
8. Water quality* = 1 – [(Fertilizers per Unit Area + Pesticides per Unit Area)/2]
9. Air quality* = 1 – (Energy intensity of production)

10. Land quality = Share of protein crops in the crop rotation

*inverted values where indicator type is "less is better"

Results

The top **Economic Pillar** score belongs to Belgium after a 3.5 % increase during the last program period – 0.655 on an average basis (Figure 1), while the EU level increases by nearly 3% and reaches 0.435.

The second place among the rising economies is taken by the Netherlands with a growth of 3.7% and a level of 0.61.

The leading role of these countries is supported by stable levels in terms of the productivity (labor and capital), as well as a high level of economic conjuncture where the enterprises operate (Economic Resilience). In fact – Italy ranks third with an increase of 10% reaching a result of 0.60, the basis of which hang on the profitability and the production diversification.

The EU founding group is rounded out by Germany, which shares the fourth place with Denmark at 0.55. France and Luxembourg are also progressing as a consequence of above EU values. In chronological order follow the island countries – Malta (0.54), United Kingdom (0.52) and Ireland (0.51) and Mediterranean countries – Spain (0.51) and Portugal (0.48) with values above France. They include Sweden, whose farms reach 0.48 of the economic pillar. In the case of Portugal and Spain, this is due to the diversification of production, and thanks to the high values of its profitability and economic environment suitability. Malta – small-mid scale farmers are also performing top economic result due to the high intensity of their production.

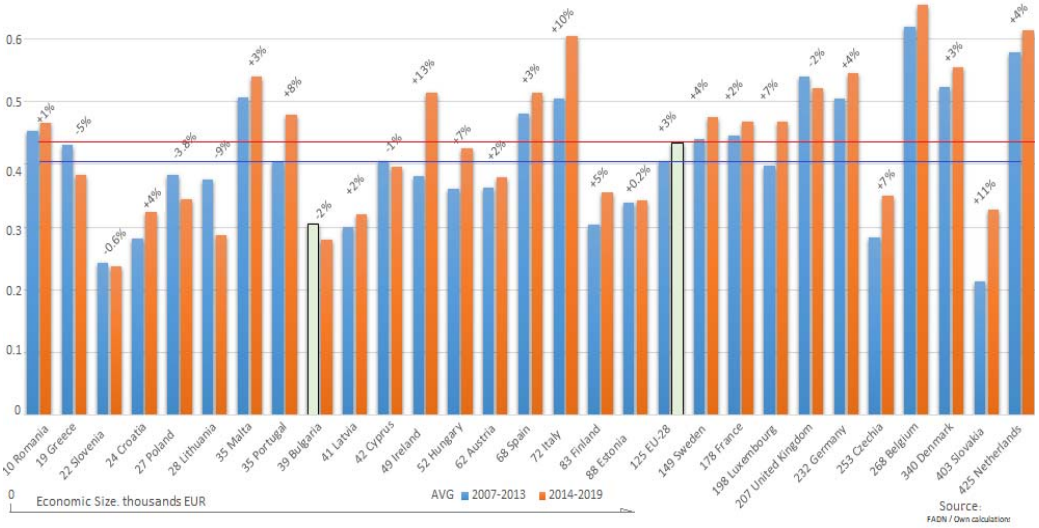

Figure 1. Economic Pillar Estimation Scores

The MS average farm holdings might be separated by the red line received during the second program period as being updated according to the pre-covid situation. The intensification farm level could be easily seen in each economic size class according to the EU typology (average economic size 2007 – 2019 is presented at the bottom of these figures). That level is declining in Greece – minus 5%. United Kingdom is presenting minus 2% performance as the only one decreasing large-scale farm.

Such a trend could be expressed as reducing the intensification level which in turn might be understood as integration of a more environmentally friendly production technologies in both (animal husbandry and land cultivation) production directions. It is also observed in the small (up to 25 th. EUR) – Slovenian farms (-0.6%) and the small-mid ES group (up to 50) – Poland (-3.8%), Lithuania (-9%) and Bulgaria (-2%).

In summary – 10 out of 11 new MS farms have score below the EU – average. The smallest Romanian holdings make the exception, Hungary passed through the 2007 – 2013 blue EU line after that period.

7 out of 11 old MS have score above the EU-average – Greece and Cyprus fall down the EU curve after 2013, Finland and Austria are still below the both references.

Top 3 economically sustainable are the farms from the founding MS and the rest stay above the reference.

Within the small farm size class, **the Social Pillar** values are reciprocal to these compared to the economic one which sum stands on the essential farm wealth. That occurs in the small-mid group – Portugal and Malta, where again are observed bellow the EU results. The big exception is Ireland (again above the average). Poland, Lithuania and Greece have the only farms performing a social decline. Despite of its increase, Bulgaria seems to have the holdings on the most vulnerable socio-economic position. Latvia and Cyprus are close behind, and together with Hungary and the Czech Republic they form the members of the "may be poor" group. All the other MS have a sufficient sum of the selected indicators. Belgium stays bellow the reference but the reason stays on the low share of own cultivated lend, farm made factors of production and farmhouse consumption (which is declining by 45%).

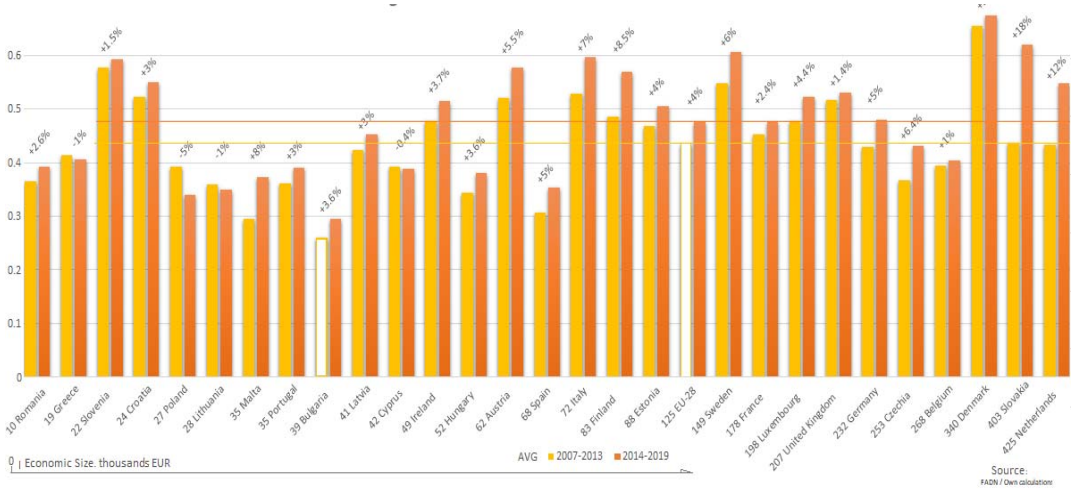

Figure 2. Social Pillar Estimation Scores

In total – 7 out of 11 new MS are below the EU-average. The farms in Slovenia and Croatia from the smallest Economic size class compensate the economical weaknesses (the opposite of Romania). Estonia and Slovakia gain from the larger production scale, while Czech Republic almost reach the 2013 – 2019 EU reference.

6 out of 11 old MS stay above the EU reference – Greece and Cyprus, Malta, Portugal and Spain are not presented as big farm holdings but they represent the south part of EU which seems poor compared to the northern regions like Scandinavian for example.

5 out of 6 founding MS have leading socially sustainable score, except Belgium. Only the German farmers joined the group after a raise in the salaries of the paid labour – 22.4%.

The **Ecological Pillar** estimation reveals what is the price of the intensive agricultural production that Malta, Belgium and the Netherlands pay – quantitatively catastrophic ecological values. Very close to that disaster are Cyprus and Luxemburg with their limited land recourses while Germany and Denmark are well known for their significant large scale units where the ecological purposes are not highly prioritized. Slovenia and Croatia are about 10% far below the border too. A satisfactory impression come from Greece and the new MS – Romania (small) including small-mid farms from Poland, Lithuania, Latvia (together with the large entities in the Czech Republic and Slovakia), also Portugal and Ireland (small-mid). Hungary places in-between the average lines (like Bulgaria and France), with the mid-big group overhead. Sweden and UK have a very little increase demonstrating solid traditions in the usage of the ecologically good agricultural practices.

The eco winners are the Baltic countries where the major increase is boosted by a huge implication of nitro-fixing crop rotation supported by each indicator constructing the pillar.

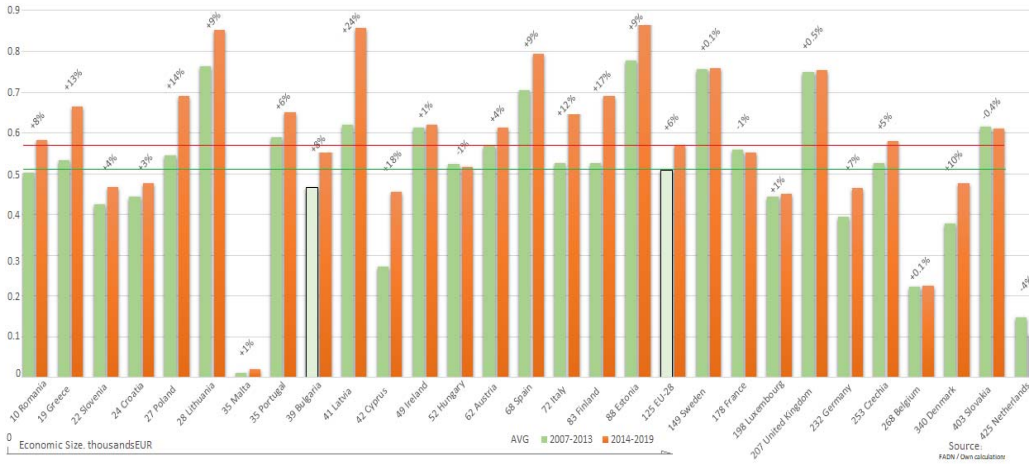

Figure 3. Ecological Pillar Estimation Scores

The huge economic size productions units involve issues concerning the environmental aspects of the sustainable development.

In general – 7 out of 11 new MS perform ecologically better than EU after 2013. Slovenian and Croatian farmers cannot reach the EU level, while Bulgaria reached the 2007 – 2013 level in consequence, while Hungary (-1%) still stays there and could not follow the EU increase.

8 out of 11 old MS have strike above the average. Malta and Cyprus have strongly limited amount of cultivated area while Denmark has intensive animal breeding where the animals could not experience a sufficient amount of outdoor free grazing area. Compared to the other MS – these conditions are represented only in Malta, Cyprus, the Netherlands and Belgium.

Most of the EU founding MS are performing far below the ecological standards included in the study. France step back during the second observed program period but only Italy stays on the green trend.

The Sustainability Index aims to catch the balance between the different pillars where the values are close to the average. The diapason between the average lines compiles five out of six of the smallest farm holdings MS.

Italy, Portugal and Spain are the Mediterranean examples for agricultural sustainability. Baltic and Scandinavian countries, United Kingdom and Ireland might be very good example for governance and management.

Finland and Slovakia gain a great improvement of agricultural sustainability for their holdings mainly based on a boost of the social responsibility but also preserving the nature is laid down in their traditions.

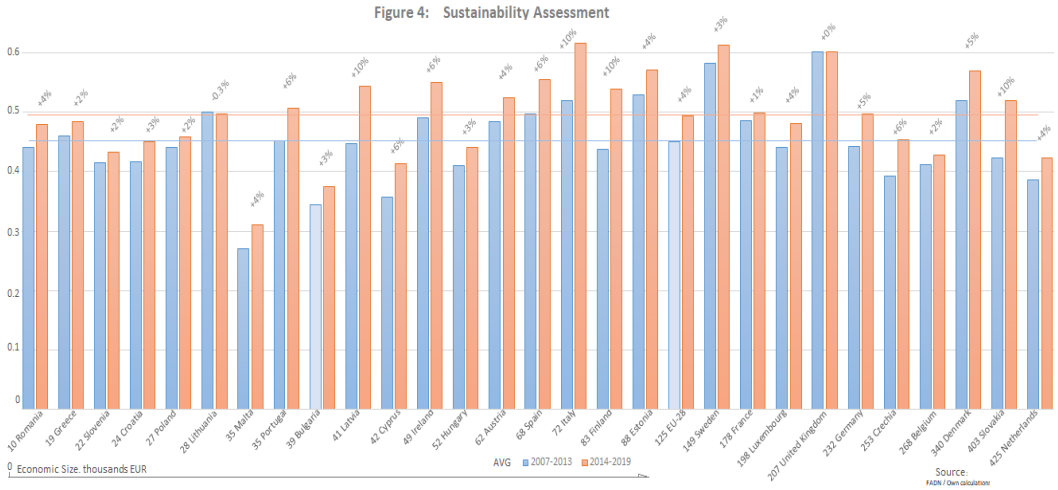

Figure 4. Sustainability Estimation Scores

On the other hand, the holdings in vulnerable position like Bulgarian excessively exploit the land and/or animals – Malta and Cyprus because of land limitations, which partly concern these MS creating some of the biggest agricultural holdings in the EU – Belgium and the Netherlands. Slovenia and Hungary need to improve CAP implementation to extend their results to meet the EU level.

Conclusions

That composite index is built based on comparative approach and the index is not classified to the degree to interpret the implication of the results as a holding is sustainable or not. It is deemed in the following studies. It is found that almost all of the MS gain an increase of the sustainability indices. The small scale farms covered in the FADN turn out not to be the most vulnerable in the EU. Keeping in mind most of them are managed by self-employed owners, they are estimated as well efficient and sustainable. All factors for sustainable development are quite depending on the structure and farm management, but on the other hand the public policy continue to play the crucial role for the implementation of the CAP. The CAP improve the economic performance of farms to a great extent but at the same time affects their resilience to be vibrant for future without subsidies.

The conflict between the ecological and the economic performance is obvious as it reveals the contest between the extensive farming and agribusiness intensive farming system. The production modesty, social and ecological merits are distinctly noted in the small scale farms. Each policy should take the choice how to preserve the land resources to the next generation and describe the sustainable development as its own challenge, opportunity and policy goal.

Bulgaria is reported in the study as one of the vulnerable MS in terms of sustainability and the main reason might be the structure of value chain which defines the country as yet to do more in added value prospect, productivity and distribution of the resources between farms.

The economic size connecting a high sustainability score could not be defined. The investigated holdings are more dependent on their agricultural (Soviet or western) legacy and management practices more then on the economic size.

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