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Abstract of diploma thesis

Economic and selected environmental impact analysis of farming practices in the EU

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Abstract

The main purpose of this thesis was to evaluate the impact of several economic and environmental indicators on greenhouse gas emissions resulting from farming practices in all the EU-28 Member States. The recent and increasing concerns about food security and climate change were the main reasons for the execution of this paper, the gist of the thesis will be to provide a better understanding about the main drivers of such concerns. The theoretical part provides an insight on environmental economics, on the history of environmental awareness, and an overview of other source sectors` specificities concerning the selected environmental impact. The analytic section will rely on secondary data to provide future trends and find cause effect relationships between the chosen indicators over the past. The main methodological tools used in this paper include sector analysis, regression analysis, forecasts and comparisons between different indicators regarding both greenhouse gas emissions and agriculture's economy. The sector analysis was used in the theoretical chapter to provide information regarding other source sectors of emissions in the EU-28, and with more detail in the practical part about the agricultural sector. The forecasts are based on data from the period from 1991 to 2013 and predicted until the year 2050. The regression analysis was used to measure the significance of each of the chosen independent variables on agricultural emissions over the selected period.

Keywords: GHG emissions, farming practices, environmental economics, kuznets curve, CAP, regression analysis, forecast

Introduction

Every being has either a positive or negative impact on the environment quality, however, the anthropogenic causes of pollution are by far the most significant negative impact. Many efforts have been done in the past, especially during the last 2 decades, to revert the increasing environmental degradation. As it will be explained in this paper, economic agents do not always make the best decisions regarding its impact on environment due to various factors. The increasing population size has been one of the main drivers of most environmental concerns, mainly those linked to the agricultural sector. Although the environmental degradation caused by farming practices is not the most significant among all the anthropogenic causes of the selected environmental impact (greenhouse gas – GHG – emissions), it deserves special attention due to its importance in terms of sustainable development and the need to solve worldwide disparities in food supply. The EU has put in place many efforts to develop towards a sustainable agriculture.

It is of the author`s opinion that it is of extreme importance to analyse both the economic and environmental characteristics of the agricultural sector in order to improve and evaluate political action. An overview of other anthropogenic causes of the selected environmental impact is crucial to allow both a comparison regarding the sectors` significance and to compare the different targets expected to be achieved by all the EU-28 Member States for each sector.

This paper will start by stating the research questions and aims in order to clarify its desired outcome and value added. It will be followed by a specification of the methodological tools needed throughout the paper. The next chapter begins with an overview of historical events which proved environmental awareness. The following subchapter includes definitions of environmental economics and the problems associated with balancing economic growth and environmental degradation. The third subchapter provides an overview of the various sources of greenhouse gas emissions besides those resulting from farming practices in the EU-28. The practical part`s main outcome will result from a regression model including economic and environmental data related with the agricultural sector in the EU-28 between 1991 and 2013 as well as from

forecasts for each of the chosen indicators. The two types of analysis aim to draw conclusions regarding the significance and trends of each agricultural related indicators.

Research questions

- How has the EU`s economy and agricultural sector been correlated to the selected environmental impact (GHG emissions) between 1991 and 2013?
  - How has the EU´s economic situation and GHG emissions increasing control driven farming practices in the EU when comparing to other source sectors?
  - What are the main causes of GHG emissions emitted by farming practices in the EU?
  - Why should farming practices be studied through both environmental and economic perspectives?

Objectives

The gist of this diploma thesis will be to find the main restrictions and difficulties existent when attempting to achieve sustainability between environment and economy. The main aim is to provide an added value for decision-makers involved in issues regarding the agricultural sector and the environment. In order to do so, the research plan will follow different stages. The theoretical part of the thesis has as its main goal to explore existent theories and literature regarding economics and the environment. The same chapter will also provide information about other source sectors in order to allow a comparison with the agricultural sector in an economic and environmental perspective. The main thesis´ outcome is expected to arise from analysing the farming practices´ selected environmental impact (GHG emissions), attempt to build a relation between economic and environmental characteristics of the agricultural sector, point the main weaknesses of the EU´s agricultural sector, as well as analysing the feasibility of actual EU´s goals for the future. The outcome of this paper is expected to clarify what types of farming practices or economic characteristics do significantly affect the emissions level from agriculture, as well as how each of the chosen indicators is expected to develop in the future for measuring the feasibility of the targets established for the EU-28.

Methodology

The period used for analyses in this research will include the years between 1991 and 2013. The forecasts will generate data until the year 2050. The thesis` structure will follow a sequence starting with a literature review concerning theories and definitions associated with environmental economics, followed by a historical analysis of GHG emissions by source sector. The main value added will derive from predictions of economic and environmental variables linked to the agricultural sector, as well as from the estimation of each of the indicators` significance on the sector`s emissions. This paper can be regarded as an applied research because the topic involves problems of the society and seeks to improve human condition. It will be illuminative in the sense of exploring each of the topic´s components on an economic and environmental perspective, including other sectors` analysis. According to the investigation level, it will be exploratory in order to determine the problem´s nature as well as causal research to find correlations between GHG emissions and other indicators related to the agricultural sector. The research will consist on a holistic type of analysis which means that it will firstly provide an overview of other source sectors of GHG emissions in all the EU-28 Member States and then develop into the analysis of the specific field of agriculture in an economic and environmental perspective. The type of methods concerning time will be historical (what was) and, from those values, forecasts will be provided for the most important indicators. The statistical content will consist of quantitative data. The data collection will be secondary from various online databases. Data processing will be done through machine-aided research tools including regression analysis and forecasts. The analyses will be done on a sectoral level in order to allow an understanding about agriculture`s significance on the total GHG emissions in the EU-28. Comparisons between data will be achieved through a relational analysis among the two main fields of the research.

Conclusion

This thesis achieved one of its main objectives of showing how the agricultural sector has been both developing over the chosen period (1991-2013) and how it is expected to develop until 2050 in an economic and environmental perspective. The other main goal achieved was to provide a theoretical basis concerning environmental economics together

with an overview of other GHG emission source sectors in the EU-28 (excluding those related with farming practices) in order to lay the ground for comparisons.

The author`s opinion is that this paper provided the theoretical background needed to analyse any sector`s problems to achieve both a good environmental performance and economic growth, a historical overview of the EU-28 source sectors of GHG emissions (to evaluate the significance and efforts done to cope with environmental issues), and a practical analysis concerning the environmental and economic characteristics of the agricultural sector.

The theoretical part`s main takeaways include the definitions of environmental economics, explanation about market failures which originate environmental degradation, and an analysis of the recent efforts to reduce anthropological impact on environment in the EU-28 together with its targets for the future. The main characteristic of the economic system which explains the levels of environmental degradation is associated with the inability to properly value social costs. However, the EU has shown to be one of the leading nations in tackling climate change mainly due to the instruments created for this purpose (e.g. Emissions trading scheme). The source sector which contributes the most to the total of GHG emissions is the fuel combustion and fugitive emissions from fuels (55.1%), however, the energetic sector included in fuel combustion has been reducing its emissions due to improved technologies for energy production. The transportation sector is the second most influent source of GHG emissions, however, the amount of CO_2e emitted has been decreasing from the year 2007. The agricultural sector represented 9.9% of total emissions in the EU-28 in 2014. However, despite the lower percentage, agriculture does not only impact the environment, it plays a key role in terms of food security and resource efficiency. Although the EU`s targets are ambitious, many improvements have been done in terms of more sustainable infrastructure (buildings) and technologies.

The practical part of the thesis provided historical and future analysis of indicators concerning agriculture in an environmental or economic perspective. The agricultural GHG emissions have been generally decreasing (14% from 1991 until 2013). According to the chosen variables, the decreasing tendency may be explained by increased size of forests and decreasing size of land used for agricultural purposes, as well as from the decreasing emissions associated with manure management. The economic value added in agriculture

has been influencing emissions negatively. A possible interpretation of this correlation is that the economic development of the sector contributes to the investment in new technologies or methods causing a lower impact on environment. The gross value of agricultural production was not proven to have a significant impact on GHG emissions. The assumption made was that emissions could be reduced through increasing the value of agricultural production.

This paper allowed a better understanding about the possible relations between economics and environment in a theoretical and practical perspective. The EU is on a good path in fighting climate change when comparing to other countries, however, challenges as the population size are expected to raise problems in the future mainly in the agricultural sector. The agricultural sector is expected to reduce its emissions significantly until 2050 as a result of the investment made in new technologies and more sustainable farming practices.

References

FREEMAN, A. Myrick, HAVEMAN, Robert H., KNEESE, Allen V. *Economics of environmental policy*. John Wiley & Sons. 1973. ISBN 0-471-27787-8

LERNOUD, J., WILLER, H. *Current Statistics on organic agriculture worldwide: Area, producers, markets, and selected crops*. Statistics and emerging trends, 34-116. Research Institute of Organic Agriculture (FIBL). Switzerland, 2016. ISBN 978-3-944372-15-0

PORTER, M. E., LINDE, C. Van der. *Toward a new conception of the environment-competitiveness relationship*. The Journal of Economic Perspectives,1995, Vol. 9, No. 4, pp. 97-118. DOI 10.1257

PACHAURI, R. K., Allen, M. R., Barros, V. R., Broome, J., Cramer, W., Christ, R., and Dubash, N. K. *Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change*. IPCC, Geneva, Switzerland, 2014. Available at: < https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR 5_FINAL_full_wcover.pdf>