CARBON FOOTPRINT AND MEETING THE ENVIRONMENTAL AND FOOD CHALLENGES OF THE FUTURE

Lazányi János*

* University of Debrecen CAAES

Abstract

According to IPCC estimates, agriculture is the second largest driver of climate change and 17% of the total GHG emissions of the EU-27 originate from agriculture. The EU has agreed to reduce GHG emissions by 8% compared to 1990 levels. This target is unlikely to be met by 2012, as in 2006 emissions were only 3% below the baseline year. Thus, EU member states need to make a greater effort. The land surface of the EU-27 is a CO_2-carbon sink and it mitigates about 11% of fossil fuel emissions. Arable land and livestock emit large amounts of N_2O and CH_4. Including these greenhouse gases, the agriculture of the EU countries becomes a source for climate change. Per capita greenhouse gas emissions of different sectors of economy were studied to help the very ambitious climate target of reducing national emissions by 20 %, proposed in the Commission's communication for post 2013 period. IPCC research suggests that there is no single straightforward policy instrument to reduce GHG emissions. A mix of taxation and emissions capping policies could lead to significant reductions in greenhouse gases.

Key words: greenhouse gas emissions, GHG, EU, RDP.

INTRODUCTION

The Rural Development Programme (RDP) for EU 27 countries was launched in 2007 and provides financial support for a wide range of activities in rural areas including environmental stewardship, skills development, farming and forestry diversification, resource management, renewable energy supply chains and community-led development. The RDP is a seven-year programme (2007-2013), which is jointly funded by the EU and the national Government. It is the part of the Common Agricultural Policy. It aims to support and promote sustainable farming, forestry and food sectors, and also to bring wider benefits for the economy, the environment and rural communities.

The EU regulation of RDP divides its aims into three main areas. Axis 1 is for improving the competitiveness of the farming and forestry sectors. Axis 2 is for improving the environment and countryside and owns more then 50% of the total budget. It is mostly invested in existing national schemes such as environmental stewardship. Axis 3 is for improving the quality of life in rural areas and promoting diversification of the rural economy. RDP increases the attractiveness of the countryside, improves conditions for economic growth by the realisation of measures aimed at the diversification of economy, it improves quality of life in the countryside and also by increasing the awareness of natural and cultural values.

In the RDP climate change adaptation is mainly addressed through the forestry as well as by some measures for adaptation in agriculture. Under Axis 1 farmers can receive support for farm modernisation that will help them adapt to climate change. The food industry is able to use the available measures for capital expenditure on buildings and new equipment. In Axis 2, the agri-environmental measures aim to support production methods which protect and improve water and soil quality and help adaptation to climate change. Measures of Axis 3, such as village renewal and development, provide local communities the opportunity to identify actions that can be undertaken to deal with the effects of climate change. Due to the rapid growth of forest trees, the abandoned agricultural areas have a high potential for this purpose.

MATERIAL AND METHOD

Carbon footprint has historically been defined as a measure of the total amount of GHG emissions of a defined population within the spatial boundary of a country. It is calculated as carbon dioxide equivalent. Data are from Eurostat, which is the statistical office of the European Union situated in Luxembourg. Its task is to provide the European Union with data and statistics that enable comparisons between countries and regions.

RESULTS AND DISSCUSIONS

Demand for goods and services are expected to increase over the next decades, as the world's population grows and climate change confronts society with a range of uncertainties (IPCC 1996, 1997, 2000, 2003). At the same time, agriculture is likely to undergo changes resulting from climate change impacts, which vary significantly within EU countries. Farming is a core policy sector for the EU. The Commission's White Paper on adapting to climate change contains proposals for a co-ordinated EU approach and deals with the challenge for agriculture and rural areas. The debate is underway to shape the CAP after 2013. The extent of support for EU agriculture to mitigate climate change and to adapt to it is a key consideration (Lazányi 2005a, 2005b, 2008). Central and East European countries see these climate change responses as part of a sustainable intensification of agriculture which should be the defining characteristics of the future CAP. It is necessary to reduce economic impacts of land use differences and ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture, which is more actual in these countries than ever before. It is also important to stabilise markets; to assure the availability of supplies and to ensure that supplies reach consumers at reasonable prices.

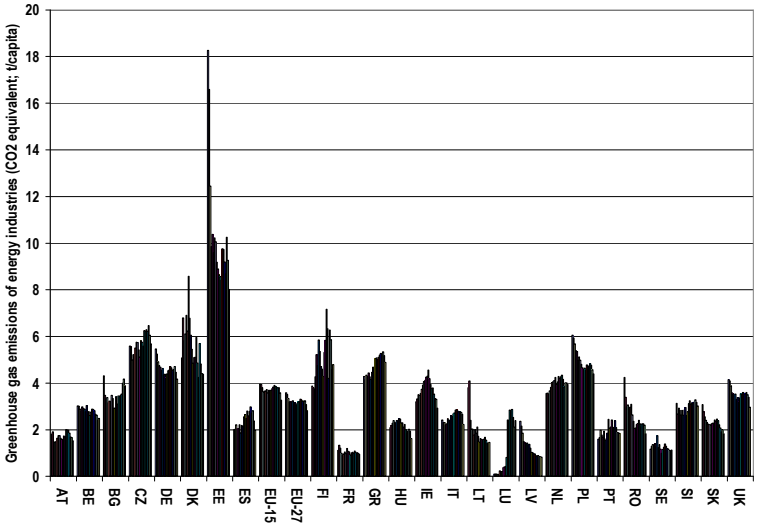

Fig. 1. GHG emissions of energy industries (1990-2009) (CO_2 equivalent; t/capita)

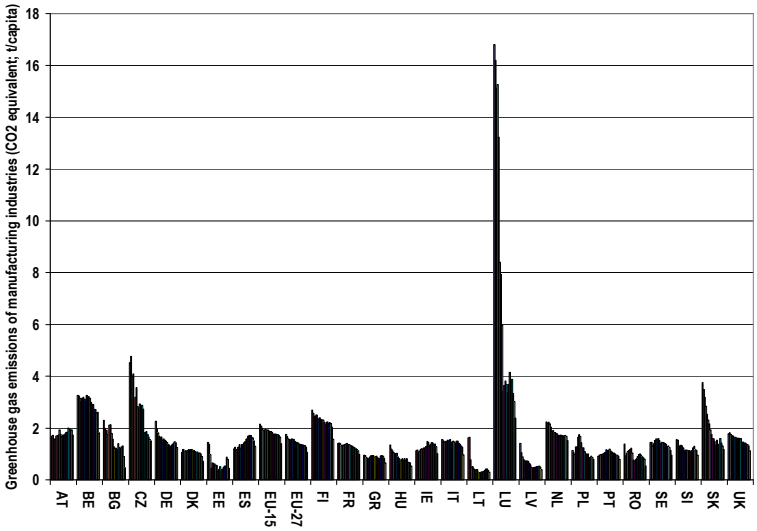

Fig. 2. GHG emissions of manufacturing industries (CO_2 equivalent; t/capita)

Greenhouse gas emissions of energy industries were highest in Estonia (10.3 t/capita) and lowest in France (1.0 t/capita). Between 1990 and 2009, emissions increased more in Luxembourg, Finland, Greece, while it decreased more in Latvia, Denmark and Estonia (Figure 1). Greenhouse gas emissions of manufacturing industries were highest in Luxembourg and lowest in Latvia. Between 1990 and 2009, emissions increased in Spain, Austria and Ireland, while it decreased more in Slovakia, Czech Republic and Luxembourg (Figure 2).

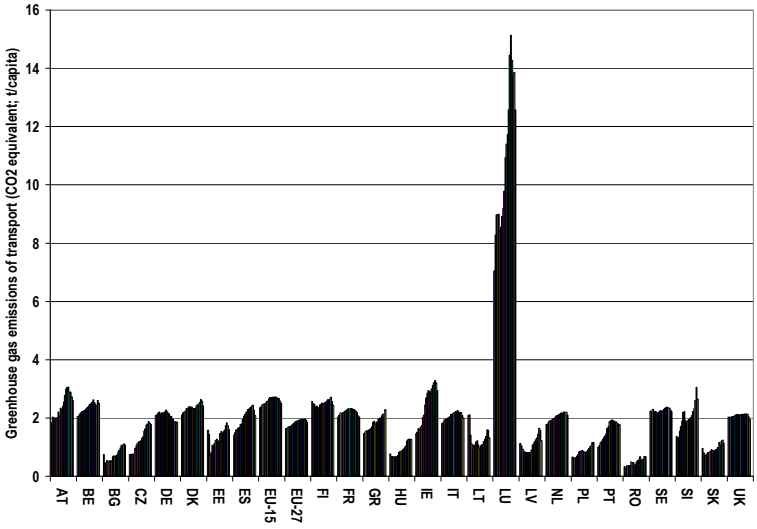

Fig. 3. GHG emissions of transport (1990-2009) (CO_2 equivalent; t/capita)

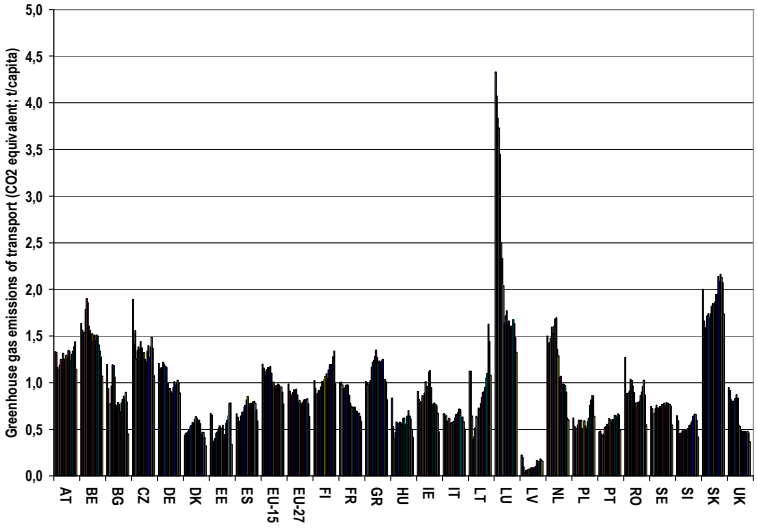

Fig. 4. GHG emissions of industrial processes (1990-2009) (CO_2 equivalent; t/capita)

Greenhouse gas emissions of transport were highest in Luxembourg (10.9 t/capita) and lowest in Romania (0.5 t/capita). Between 1990 and 2009, emissions increased more in Luxembourg, Ireland and Czech Republic, while it decreased in Latvia and Germany (Figure 3). Greenhouse gas emissions of industrial processes were highest in Luxembourg (2.3 t/capita) and lowest in Latvia (0.1 t/capita). Between 1990 and 2009, emissions increased more in Latvia, Slovakia and Finland, while it

decreased more in United Kingdom, Netherlands and Luxembourg (Figure 4).

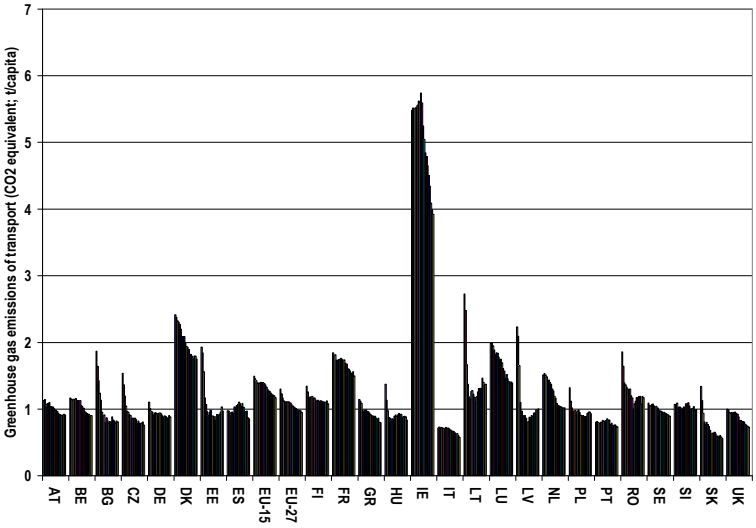

Fig. 5. GHG emissions of agriculture (1990-2009) (CO_2 equivalent; t/capita)

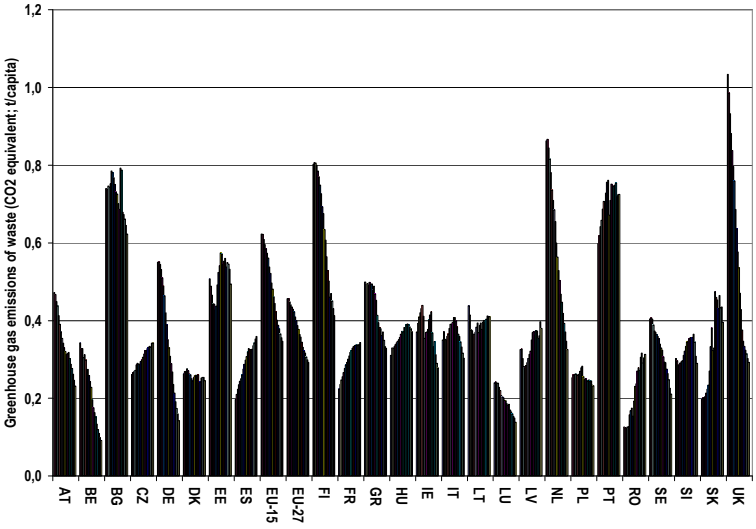

Fig. 6. Greenhouse gas emissions of waste (CO_2 equivalent; t/capita)

Greenhouse gas emissions of agriculture were highest in Ireland (5.1 t/capita) and lowest in Italy (0.7 t/capita). Between 1990 and 2009, emissions decreased less in Spain, Slovenia and Portugal, while it decreased more in Bulgaria, Latvia and Ireland (Figure 5). Greenhouse gas emissions of waste were highest in Bulgaria (0.7 t/capita) and lowest in Luxembourg (0.2 t/capita). Between 1990 and 2009, emissions increased more in

Slovakia, Romania and Spain, while it decreased more in Germany, Netherlands and United Kingdom (Figure 6).

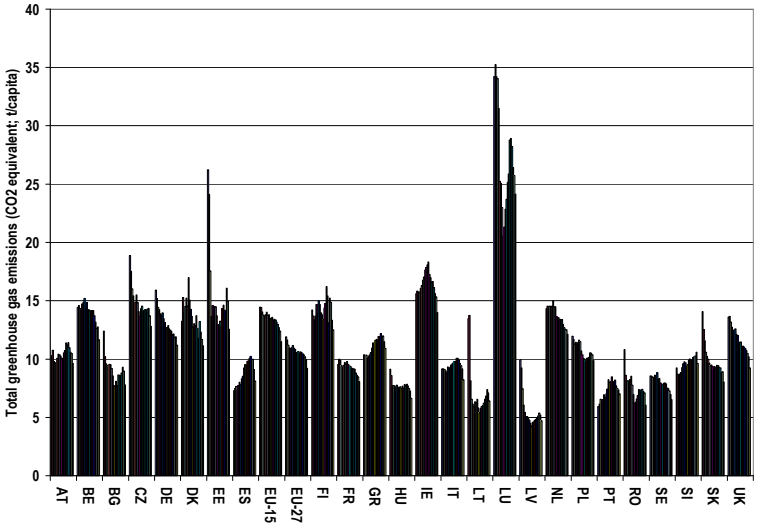

Fig. 7. Total GHG emissions between 1990 and 2009 (CO_2 equivalent; t/capita)

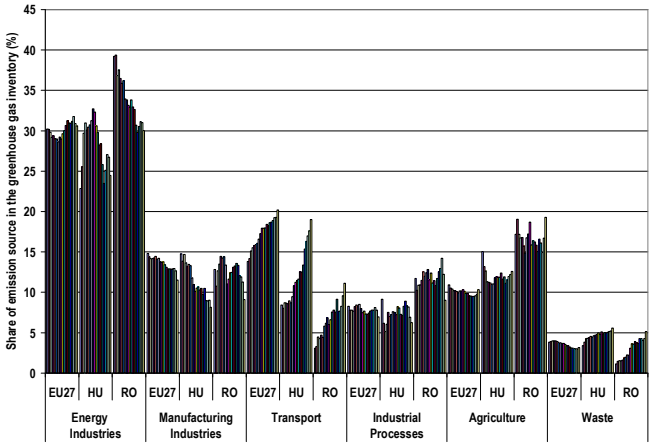

Fig. 8. Share of emission sources in the greenhouse gas inventory (%)

Total greenhouse gas emissions were highest in Luxembourg (27.2 t/capita) and lowest in Lithuania (5.5 t/capita). Between 1990 and 2009, emissions increased more in Spain, Greece and Portugal, while it decreased more in Germany, Estonia and Luxembourg (Figure 7). Between 1990 and 2009, share of manufacturing industries in the greenhouse gas inventory was reduced in Hungary ($y = -0.3356x + 14.888$; $r^2 = 0.9197$) and in the EU ($y = -0.1291x + 14.913$; $r^2 = 0.8847$), while the share of transport increased

in EU (y = 0.2982x + 14.155; r^2 = 0.9562), in Hungary (y = 0.0303x^2 - 0.0755x + 8.3573; r^2 = 0.9863) and in Romania (y = 0.3452x + 2.9777, r^2 = 0.9107). The waste management also has increasing share (Figure 8). The difference in energy intensity of East and West economy is well established. The energy intensity of East and Central Europe has been improved but further effort is needed to improve the situation (Figure 9).

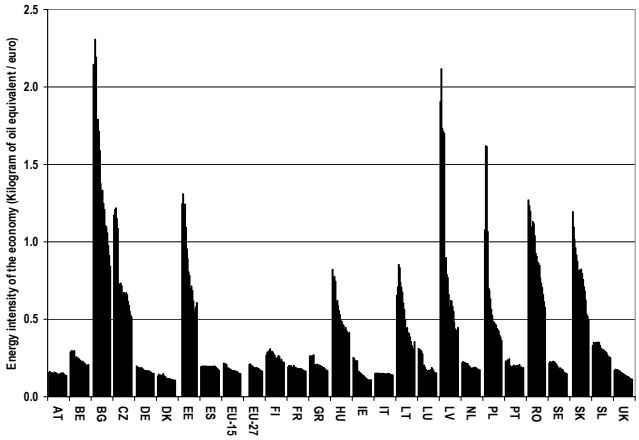

Fig. 9 Energy intensity of the economy between 1990 and 2009 (Kilogram of oil equivalent / 1000 Euro)

CONCLUSIONS

The mitigation of carbon footprints through solar or wind energy or reforestation, represents one way of reducing a carbon footprint. The role of European agriculture in climate change mitigation has also been studied in No. 1093 Commission Staff Working Document (23-7-2009). The document concentrates on greenhouse gas emissions and trends in agriculture and has concluded that there is unused potential for cost-effective mitigation activities in EU agriculture. The main influences on carbon footprints include population, economic output, moreover energy and carbon intensity of the economy. These factors are the main targets for regions in order to decrease carbon footprints. Study suggest the most effective way to decrease a carbon footprint is to either decrease the amount of energy needed for production or to decrease the dependence on carbon emitting fuels (Bouwman, 2001; Faaij, 2006).

Agriculture contributes to GHG emissions in many EU countries and there is a need to identify strategies to reduce these emissions. The EU is committed to reduce GHG emissions by 20 % until 2020 and resources in both Pillar 1 and Pillar 2 will be devoted to help agriculture to mitigate and to adapt to climate change. In terms of mitigation, the challenge for agriculture is to identify cost-effective mitigation measures which can help

the agricultural sector to contribute to challenging greenhouse gas emission reduction targets and the long-term decarbonisation of society. Trends on the per capita greenhouse gas emissions of transport end waste sectors indicate that a mix taxation and emissions capping policies could lead to significant reductions in greenhouse gases.

There is currently limited incentive for land owners to make their land a more effective GHG sink or to reduce their emissions. Most farmers do not even know their GHG balance. The situation can only be improved if sinks are rewarded and sources pay. Climate-friendly farming is very dependent on local conditions. Which crops should be grown and how much fertilizer should be used, for instance, depends on the soil and on the climatic condition. Farmers need an economic price for GHG sinks and sources that applies to all farmers then they can use their individual judgment to determine the most suitable crop and farming intensity. Grasslands sequester similar amounts of carbon in soils as forests. Afforestation or ploughing of grasslands is thus not advisable. Sustainable land use is the key to a better carbon footprint in EU countries.

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