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Mutual Dependence between Sustainable Energy- and Sustainable Agriculture Policies-from the Global and European Perspective

Abstract

The aim of the paper is to present the interrelationship between the sustainable energy, especially renewable energy sector and sustainable agriculture policy from both: the European and the global perspectives.

In the world and European economy the role of Renewable Energy Technologies is still increasing. Energy efficiency; sustainable agriculture; renewable energies for rural development belong to main poles of sustainable development in the world economy and its regions.

Agriculture is one of the economic sectors to which the EU commitment to reduce emissions of greenhouse gases applies. Like any other economic sector, agriculture produces greenhouse gases and is a major source of the non-CO₂ greenhouse gases methane and nitrous oxide. It is also the strong relationship between the sustainable agriculture sector and the renewable energy development possibilities. The sustainable agriculture can be seen as a source of renewable energy.

1. Introduction

The current financial and economic crisis should not delay cost-effective investments or programmed energy projects that would create jobs, enhance energy security and help limit greenhouse gas emissions in the short and

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medium term. Innovation and knowledge are key factors for supporting the recovery and putting the world economy on a more sustainable growth path. It is needed to accelerate innovation in relation to long-term challenges and to encourage the development of new industries, companies and services that will be decisive to create new sources of growth. The interlinked challenges of climate change, energy security and the sustainable and efficient use of natural resources are amongst the most important issues to be tackled in the strategic perspective of ensuring global sustainability. A shift towards green growth will provide an important contribution to the economic and financial crisis recovery.

Stable and secure energy availability is indispensable for social and economic development; it is essential to ensure global energy security and energy access in developing countries. The emergency response to the economic crisis should not overlook the opportunity to facilitate a global green recovery putting our economies on a path towards more sustainable and resilient growth. Our fiscal stimulus packages are increasingly investing in measures encouraging the creation of green jobs and low-carbon, energy efficient and sustainable growth. These include energy efficiency measures, investment in public transportation infrastructure, incentives for recycling and for fuel-efficient vehicles, research in alternative sources of energy, support for renewable energy technologies, as well as in enhanced CO₂ reduction.

The emergency response to the recent economic crisis should not overlook the opportunity to facilitate a global green recovery putting our economies on a path towards more sustainable and resilient growth. Our fiscal stimulus packages are increasingly investing in measures encouraging the creation of green jobs and low-carbon, energy efficient and sustainable growth. These include energy efficiency measures, investment in public transportation infrastructure, incentives for fuel-efficient vehicles, research in alternative sources of energy, support for renewable energy technologies, as well as in enhanced CO₂ reduction. Energy is central to our lives. We rely on it for transport, for heating and cooling our homes, and running our factories, farms and offices. However, fossil fuel is a finite resource and is a major cause of global warming. So we can no longer take energy from fossil fuels for granted. We must create an integrated energy and environment policy based on clear targets and timetables for moving to a low-carbon economy and saving energy. Driving the policy is the EU's bid to achieve a 20% reduction in its greenhouse gas emissions by 2020 (compared with 1990 levels), mainly by boosting the use of renewable energy and curbing energy consumption. The measures will also reduce dependence on imports of gas and oil and help shelter the economy from volatile energy prices and uncertain supplies.

The EU policy focuses on creating a competitive internal energy market offering quality service at low prices, on developing renewable energy sources, on reducing dependence on imported fuels, and on doing more with a lower consumption of energy.

2. Sustainable energy- strategy and policy issues

*The Green Paper A European Strategy for Sustainable, Competitive and Secure Energy*¹ was an important milestone in developing an energy policy for the European Union (EU). If Europe is to achieve its economic, social and environmental objectives, it has to address major energy-related issues such as a growing dependence on energy imports, volatile oil and gas prices, climate change, increasing demand, and obstacles to a fully competitive internal energy market. The EU must exploit its position as the world's second largest energy market and as world leader in demand management and the promotion of renewable energy sources².

The diagnose concerning the situation in the European energy sector was based on the most important factors of the following evidence:

- A need for investments to meet expected energy demand and to replace ageing infrastructure.
- The European import dependency is rising. Unless we can make domestic energy more competitive, in the next 20 to 30 years around 70 % of the Union's energy requirements, compared to 50% today, will be met by imported products – some from regions threatened by insecurity.
- Reserves are concentrated in a few countries. Today, roughly half of the EU's gas consumption comes from only three countries (Russia, Norway, Algeria). On current trends, gas imports would increase to 80 % over the next 25 years. The EU currently imports 82% of its oil and 57% of its gas making it the world's leading importer of these fuels.
- Global demand for energy is increasing. World energy demand – and CO2 emissions – is expected to rise by some 60% by 2030. Global

¹ GREEN PAPER, A European Strategy for Sustainable, Competitive and Secure Energy, Brussels, 8.3.2006; COM(2006) 105 final.

² http://europa.eu/legislation_summaries/energy/european_energy_policy/l27062_en.htm

oil consumption has increased by 20% since 1994, and global oil demand is projected to grow by 1.6% per year³.

The European Commission oriented a European energy policy on three core objectives:

- sustainability - to actively combat climate change by promoting renewable energy sources and energy efficiency;
- competitiveness - to improve the efficiency of the European energy grid by creating a truly competitive internal energy market;
- security of supply - to better coordinate the EU's supply of and demand for energy within an international context⁴.

The United States and Japan have a comparative advantage in biotechnology and nanotechnology patenting and in the relevant scientific fields, while the EU is the world leader in environment-related technologies and services with special reference to recycling. Recycling: proper and effective waste management and Renewable energy-two of Leads markets of the EU. Japan is second to the EU in all three environmental technology fields⁵.

Since 1990, the EU has been engaged in an ambitious and successful plan to become world leader in renewable energy. To take one example, the EU has now installed wind energy capacity equivalent to 50 coal fired power stations, with costs halved in the past 15 years. The EU's renewable energy market has an annual turnover of € 15 billion (half the world market), employs some 300,000 people, and is a major exporter. Renewable energy is now starting to compete on price with fossil fuels⁶.

In the year 2010 Commission proposed new economic strategy for Europe: *Europe 2020*⁷. This Strategy presented three key drivers for growth, to be implemented through concrete actions at EU and national levels:

- smart growth (fostering knowledge, R+D, innovation, education and digital society),

³ GREEN PAPER, A European Strategy for Sustainable, Competitive and Secure Energy, Brussels, 8.3.2006; COM(2006) 105 final, p.3; comp. also: Summary report on the analysis of the debate on the green paper "A European Strategy for Sustainable, Competitive and Secure Energy" COMMISSION STAFF WORKING DOCUMENT; Brussels, 16.11.2006 , SEC(2006) 1500

⁴ As above.

⁵ OECD SCIENCE, TECHNOLOGY AND INDUSTRY SCOREBOARD 16 2007 – ISBN 978-92-64-03788-5 – © OECD 2007, p.p.9-16.

⁶ GREEN PAPER, A European Strategy for Sustainable, Competitive and Secure Energy, op.cit. p.11.

⁷ COM(2010) 2020; Brussels, 3.3.2010.

- sustainable growth (making our production more resource efficient while boosting R+D and competitiveness);
- inclusive growth (raising participation in the labor market, the acquisition of skills and the fight against poverty).

On the 10th November 2010, the European Commission has adopted the Communication "Energy 2020 - A strategy for competitive, sustainable and secure energy" The Communication defines the energy priorities for the next ten years and sets the actions to be taken in order to tackle the challenges of saving energy, achieving a market with competitive prizes and secure supplies, boosting technological leadership, and effectively negotiate with our international partners⁸.

The three most important objectives in the energy economy to be met in the EU by 2020, known as the "20-20-20" targets are as follows:

- 20% of EU energy consumption to come from renewable resources
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency
- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels⁹.

The EU has even offered to reduce its emissions by 30% if other major economies commit to comparable emission reductions or adequate contributions. Negotiations on this are ongoing within the framework of the United Nations. In "A roadmap for moving to a competitive low-carbon economy in 2050", the European Commission also looked at new ways of reducing greenhouse gas emissions by 80 to 95% by the middle of the century.

The "Energy 2020 Strategy" provides also a solid and ambitious European framework for energy policy, defines the energy priorities for the next ten years and sets out the action to be taken.

1. Free movement of energy

Electricity and gas are transported in grids and pipelines that often cross national borders. The energy policy decisions made by one country inevitably have an impact on other countries.

⁸ http://ec.europa.eu/energy/strategies/2010/2020_en.htm, see. also: Energy 2020A strategy for competitive, sustainable and secure energy, {SEC(2010) 1346}, Brussels, 10.11.2010; COM(2010) 639 final

⁹ The EU climate and energy package,
http://ec.europa.eu/clima/policies/package/index_en.htm

2. A technological shift

Without a technological shift, the EU will fail on its 2050 ambitions to de-carbonize the electricity and transport sectors.

3. Strong International Partnership

International energy policy must pursue the common goals of security of supply, competitiveness and sustainability.

While relations with producing and transit countries are important, relations with large energy-consuming nations and particularly emerging and developing countries are of growing significance¹⁰.

3. Powering Development with Renewable Energy Technologies (RETs)

The role of RET-s in the world economy is still increasing. According to UNCTAD, Technology and Innovation Report (2011) the total renewable power capacity (including wind-, biomass-, solar- and geo-thermal power) belong in 2/3rd to developed market economies and in 1/3rd to developing countries¹¹.

Technological progress and greater investments and deployment are lowering costs of established RET-s. Global Investments in renewable energy and related technologies during the period 2004-2010 increased from 33 to 211 \$ billion. The average annual growth rate amounted to 38,3%¹². The green economy and Rio+20 framework should promote wider use and learning of RETs.

National Policy Frameworks for Renewable Energy Technologies (according to UN and EU regulations) are mostly oriented on:

- Defining policy strategies and goals;
- Enacting policy incentives for R&D, innovation and production of RETs;
- Enacting policy incentives for developing greater technology absorptive capacity, which is needed for adaptation and use of available RETs;
- Promoting domestic resource mobilization for RETs in national contexts;
- **Exploring newer means of improving innovation capacity in RETs, including North-South and South-South collaboration.**

¹⁰ http://europa.eu/pol/ener/index_en.htm

¹¹ Technology and Innovation Report (2011), *Powering Development with Renewable Energy Technologies*, United Nations, New York, Geneva, 2011, p. 8-9.

¹² as above, p.10.

4. Liberalization of markets for energy products is also one of the most important objectives of the WTO

Much of today's energy supply — particularly fossil fuels and natural gas — is geographically concentrated, fixed in terms of location, and prominent in the production and trade of the countries that possess the resource. Thus, trade patterns on the supply side are largely pre-determined and change only slowly, in contrast to the shifting comparative advantage we associate with economies that are less resource-endowed in this way.

But compared to the geographical concentration that characterizes the supply side of energy markets, demand is very widely spread because we all need energy to run our economies. This relationship between supply and demand has important implications for the economic and political conditions under which trade takes place. We observe in the world economy some significant changes that are occurring in energy markets, and which some argue fortify the case for closer attention on the part of the WTO to the energy sector. Over time, a larger number of players have entered the field on the supply side. In no small part this is the result of technological advances and the diversification of energy sources. Fossil fuels and natural gas increasingly compete with alternative energy sources such as nuclear power and renewable energy, including bio-fuels, wind, water and solar power.

5. Detoxifying Finance and De-carbonization the Economy: Opportunities for Clean and Sustainable Growth in Developing and Transition Economies- main problems

- A transition to a low-carbon and more resource –efficient economy provides a promising avenue for economic and social development in many countries,
- Promoting sustainable agriculture, enhancing energy efficiency and harnessing renewable energy for sustainable rural development are but three illustrative poles that could yield a triple win: economic growth, job and income creation, as well as environmental sustainability.
- Despite the fact that such investments are strategic and can be lucrative, the greening of economies requires the elimination of perverse policy frameworks as well as the availability of public finance where public investment is deficient.

- It will also require the emergence of the necessary awareness, skills, capabilities and vision to mobilize the private sector, governments, and the society as a whole¹³.
- A „new economic growth” (within the current global and financial crisis) can only emerge if inspired leadership is manifest among a critical mass of countries. Policy measures that undermine change must be reformed or eliminated, such as subsidies (e.g.) to agriculture or energy), domestic energy policy (energy pricing), as well as national investment policies¹⁴.
- Liberalization of climate –friendly technologies, goods and services would contribute not only to increasing the choices available to importing countries, but also lowering the costs of those choices, thus making it easier to mitigate climate change. However, finding a viable negotiating strategy for the liberalization of these goods has proved difficult in the WTO¹⁵.
- Agriculture accounts for 13 percent of global GHG emissions. This rises to almost 30 per cent if land clearance for farming, agrochemical production and trade in agricultural and food products are attributed to the sector¹⁶.
- Innovative management options, such as organic farming, offer promising opportunities to reconcile the objectives of feeding a rapidly growing human population with minimal adverse impacts on the environment¹⁷.
- Methane is a significant contributor to climate change, and the bulk of methane emissions, i.e. 52%, are emitted by the agricultural sector. While methane emissions in the OECD countries as well as in the CIS have declined over the past decade, methane emissions have been increasing in many developing countries and regions. With continuing growth in the demand for livestock products, methane will constitute a large proportion of future GHG emissions, particularly in developing countries¹⁸.

¹³ Trade and Environment Review 2009/2010, United Nations, New York, Geneva, 2010, p. 3.

¹⁴ As above, p. 23.

¹⁵ As above, p. 17

¹⁶ As above, p. 67

¹⁷ As above., p.112

¹⁸ As above, p. 124

6. Agriculture and environmental protection

Integrating environmental concerns into the Common Agricultural Policy aims to head off the risks of environmental degradation and enhancing the sustainability of agro-ecosystems.

Around half the EU's land is farmed. Farming is important for the EU's natural environment. Farming and nature influence each other:

- Farming has contributed over the centuries to creating and maintaining a unique countryside. Agricultural land management has been a positive force for the development of the rich variety of landscapes and habitats, including a mosaic of woodlands, wetlands, and extensive tracts of an open countryside.
- The ecological integrity and the scenic value of landscapes make rural areas attractive for the establishment of enterprises, for places to live, and for the tourist and recreation businesses.

The links between the richness of the natural environment and farming practices are complex. Many valuable habitats in Europe are maintained by extensive farming, and a wide range of wild species rely on this for their survival. But inappropriate agricultural practices and land use can also have an adverse impact on natural resources, like

- pollution of soil, water and air,
- fragmentation of habitats and
- loss of wildlife.

The Common Agricultural Policy (CAP) has identified three priority areas for action to protect and enhance the EU's rural heritage:

- Biodiversity and the preservation and development of 'natural' farming and forestry systems, and traditional agricultural landscapes;
- Water management and use;
- Dealing with climate change.

The CAP ensures that its rules are compatible with environmental requirements and that CAP measures promote the development of agricultural practices preserving the environment and safeguarding the countryside. Farmers are encouraged to continue playing a positive role in the maintenance of the countryside and the environment.

This is achieved by:

- targeting aid at rural development measures promoting environmentally sustainable farming practices, like agri-environment schemes;

- enhancing compliance with environmental laws by sanctioning the non-respect for these laws by farmers through a reduction in support payments from the CAP¹⁹.

EU farm policy – known as the common agricultural policy – ensures adequate European food production goes hand in hand with economically viable rural communities and action on environmental challenges such as climate change, water management, bioenergy and biodiversity²⁰.

Today, EU policy aims to enable producers of all forms of food – whether cereals, meat, dairy, fruit, vegetables or wine – to:

- produce sufficient quantities of safe, high-quality food for European consumers,
- make a full contribution to diversified economic development in rural areas,
- meet very high standards of environmental care and animal welfare.

With consumers becoming ever more quality-conscious about food, voluntary EU quality marks now help them make educated choices. These labels – indicating geographic origin, use of traditional ingredients or methods, including organic – also help make EU farm products competitive on world markets.

The various reforms of EU farm policy have also promoted innovation in farming and food processing – aided by EU research projects that have increased productivity and reduced environmental impacts, e.g. by using crop by-products and waste products to produce energy²¹.

With about 40 % of the EU's land area being farmed, agriculture has a very important impact on the natural environment:

- Over the centuries, farming has created and maintained a variety of valuable semi-natural habitats on which a wide range of wildlife depend for their survival.
- Farming practices can have an adverse impact on natural resources, such as pollution of soil, water and air, fragmentation of habitats, and a loss of wildlife²².

¹⁹ http://ec.europa.eu/agriculture/envir/index_en.htm

²⁰ http://europa.eu/pol/agr/index_en.htm

²¹ Agriculture and bioenergy, http://ec.europa.eu/agriculture/bioenergy/index_en.htm

²² http://epp.eurostat.ec.europa.eu/portal/page/portal/agri_environmental_indicators/introduction

7. Agriculture and Bioenergy

The EU is committed to combat climate change and to increase security of its energy supply. Bioenergy from forestry and agriculture plays a key role for both. The Common Agricultural Policy helps agriculture and forestry to provide biomass for energy and encourages the use of bioenergy in rural areas²³.

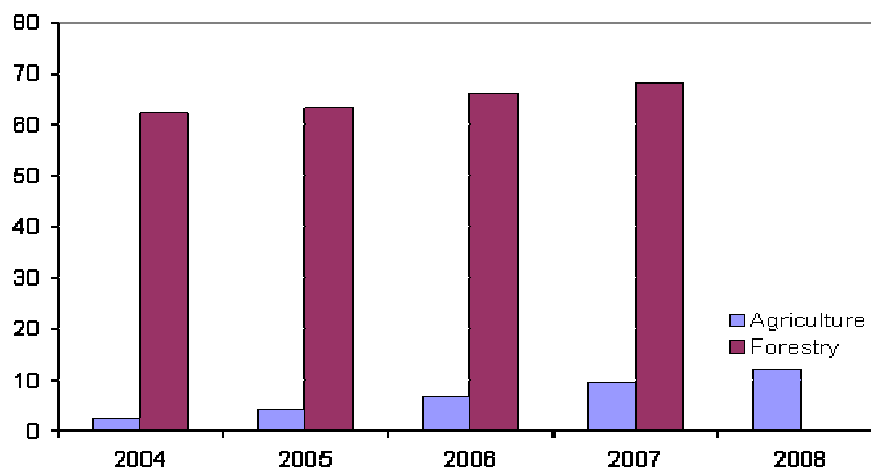
Basic issues related to the bioenergy

- Bioenergy is one form of renewable energy among many from other sources (wind, solar, hydraulic, geothermal etc).
- Bioenergy, if produced sustainably, saves greenhouse gas emissions.
- Bioenergy accounts for more than two thirds of total renewable energy in the EU.
- Biomass for energy is mainly provided by forestry (which provides half of the EU's renewable energy), agriculture and organic waste. The share of agriculture – although still modest – is growing fast.
- Feedstocks for bioenergy are storable; bioenergy can thus be produced constantly and is a reliable source of energy.
- Biomass is amply available in most parts of Europe.
- Biomass can be either in solid, liquid or gaseous form and can be used to produce electricity, direct heating, or transport fuels²⁴.

²³ Agriculture and bioenergy, http://ec.europa.eu/agriculture/bioenergy/index_en.htm

²⁴ http://epp.eurostat.ec.europa.eu/portal/page/portal/agri_environmental_indicators/introduction

Graph 1. Production of energy from EU forestry and agriculture, million tonnes oil equivalent



Sources: Forestry – Eurostat, Agriculture – EC DG Agriculture and Rural Development, based on eBio, EBB, EurObserv'ER.

8. Interrelations between the EU sustainable energy and sustainable agriculture policies

The two main objectives of EU energy policy are increasing security of energy supply and reducing greenhouse gas emissions.

Central piece of legislation is the Renewable Energy Directive 2009/28/EC. It sets ambitious binding targets for all Member States such that the EU will reach a 20% share of renewable energy by 2020. For the transport sector, it sets a specific minimum 10% target for each Member States. The Directive also establishes a comprehensive sustainability scheme for biofuels.

The Directive requires Member States to plan their development of each types of renewable energy, including bioenergy, by elaborating National Renewable Energy Action Plans. Moreover, provisions for cooperation between Member States help them to achieve their targets more cost-effectively.

Member States were obligated to transpose the Directive in their national legislation by December 2010²⁵.

The starting point, the renewable energy potential and the energy mix of each Member State vary. It is therefore necessary to translate the Community 20 % target into individual targets for each Member State, with due regard to a fair and adequate allocation taking account of Member States' different starting points and potentials, including the existing level of energy from renewable sources and the energy mix. It is appropriate to do this by sharing the required total increase in the use of energy from renewable sources between Member States on the basis of an equal increase in each Member State's share weighted by their GDP, modulated to reflect their starting points, and by accounting in terms of gross final consumption of energy, with account being taken of Member States' past efforts with regard to the use of energy from renewable sources²⁶.

By contrast, it is appropriate for the 10 % target for energy from renewable sources in transport to be set at the same level for each Member State in order to ensure consistency in transport fuel specifications and availability. Because transport fuels are traded easily, Member States with low endowments of the relevant resources will easily be able to obtain biofuels from elsewhere. While it would technically be possible for the Community to meet its target for the use of energy from renewable sources in transport solely from domestic production, it is both likely and desirable that the target will in fact be met through a combination of domestic production and imports. To this end, the Commission should monitor the supply of the Community market for biofuels, and should, as appropriate, propose relevant measures to achieve a balanced approach between domestic production and imports, taking into account, inter alia, the development of multilateral and bilateral trade negotiations, environmental, social and economic considerations, and the security of energy supply²⁷.

The improvement of energy efficiency is a key objective of the Community, and the aim is to achieve a 20 % improvement in energy efficiency by 2020. That aim, together with existing and future legislation including Directive 2002/91/EC of the European Parliament and of the Council of 16

²⁵ DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance), Official Journal of the European Union, L 140/16 EN Official Journal of the European Union 5.6.2009.

²⁶ as above p.15.

²⁷ as above p. 16.

December 2002 on the energy performance of buildings, Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005 establishing a framework for the setting of eco-design requirements for energy-using products, and Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services, has a critical role to play in ensuring that the climate and energy objectives are being achieved at least cost, and can also provide new opportunities for the European Union's economy. Energy efficiency and energy saving policies are some of the most effective methods by which Member States can increase the percentage share of energy from renewable sources, and Member States will thus more easily achieve the overall national and transport targets for energy from renewable sources laid down by this Directive²⁸.

Emissions of methane (CH₄) and nitrous oxide (N₂O) from agriculture

Sustainable development and the integration of environmental considerations into European Commission policy instruments have been identified as long-term targets for the EU, as expressed in the 6 Environmental Action Programme and the EU Sustainable Development Strategy²⁹. Globally, the ultimate aim of the UN Framework Convention on Climate Change (UNFCCC) is to limit atmospheric concentrations of greenhouse gases to levels such that anthropogenic interference with the climate system is minimized, while ensuring sustainable levels of economic development can occur³⁰. Like any other economic sector, agriculture produces greenhouse gases and is a major source of the non-CO₂ greenhouse gases methane and nitrous oxide. Both of these gases are many times more powerful greenhouse gases than CO₂. The aim of this indicator is therefore to present the contribution of the agriculture sector to total emissions of EU-15 greenhouse gases.

- Agriculture contributed 10.1 % of the total EU emissions of greenhouse gases in 2002 Ireland (27%), France (18%) and Denmark (15%) had

²⁸ as above. p.17.

²⁹ VI Program Działań Wspólnoty Europejskiej w Dziedzinie Ochrony Środowiska-Środowisko 2010: Nasza przyszłość, Nasz wybór, Artykuł 2, propozycja decyzji Parlamentu Europejskiego i Rady ustanawiającej Program Działań Wspólnoty w Dziedzinie Ochrony Środowiska na lata -2001-2010. s. 66. cyt za: Wysokińska Z., Witkowska J., Integracja Europejska. Dostosowania w Polsce w dziedzinie polityk, PWE, Warszawa, 2004.rozdział p.t. Dostosowania w Polsce do polityki ochrony środowiska Unii Europejskiej.

³⁰United Nations Framework Convention on Climate Change,
<http://unfccc.int/resource/docs/convkp/conveng.pdf>

respective contributions of agriculture emissions to total greenhouse gas emissions significantly higher than the EU average³¹.

- In absolute amounts, the agriculture sector produced 416 413 ktonnes CO₂ equivalent of greenhouse gases in 2002, an 8.7 % reduction compared with 1990 emissions.
- Reductions in greenhouse gas emissions were mainly due to a 9.4 % reduction in methane enteric fermentation emissions because of a reduction in livestock numbers, and an 8.2 % reduction in nitrous oxide emissions from agricultural soils because of a decrease in the use of nitrogenous fertilisers³².

9. Conclusions

The main objectives in the world- and in the European Economy:- promoting poles of clean growth to foster the transition to a more sustainable economy. Sustainable development and "green economy" are the most important objectives of economic and social development for the nearest 10 years future not only in the European but also in the world economy.

Europe as a leader in environment related technologies promotes sustainable growth and integrated environmental goods and services standards within the new industrial policy and strategy oriented on the cooperation with developing world.

The role of Renewable Energy Technologies in the world economy is still increasing. Energy efficiency; sustainable agriculture; renewable energies for rural development belong to main poles of sustainable development in the world economy and its regions.

Agriculture is one of the economic sectors to which the EU commitment to reduce emissions of greenhouse gases applies. Like any other economic sector, agriculture produces greenhouse gases and is a major source of the non-CO₂ greenhouse gases methane and nitrous oxide.

³¹IRENA 34, Share in agriculture of gas emission,
http://epp.eurostat.ec.europa.eu/portal/page/portal/agri_environmental_indicators/documents/IRENA%20IFS%2034.1%20%20Share%20of%20agriculture%20in%20GHG%20emissions_F.pdf

³² IRENA 19 - Emissions of methane (CH₄) and nitrous oxide (N₂O) from agriculture
http://epp.eurostat.ec.europa.eu/portal/page/portal/agri_environmental_indicators/documents/IRENA%20IFS%2019%20-%20GHG%20emissions_FINAL.pdf; comp. also with analysis presented on p. 9 of this paper.

It is also the strong relationship between the sustainable agriculture sector and the renewable energy development possibilities. The sustainable agriculture can be seen as a source of renewable energy. Agriculture has greatly enhanced the extraction of food energy from nature. However, if agriculture is to be a *sustainable* source of energy for food or fuel, we must first create a sustainable agriculture.

A sustainable agriculture, like all other sustainable development, must meet the needs of the present without diminishing opportunities for the future. It must be ecologically sound, because all agricultural productivity originates in the land – in the resources of nature. It must be socially responsible, because the fundamental purpose of agriculture is to meet the needs of people – not just consumers but also farmers and society in general. It must also be economically viable for farmers. All economic value originates in nature and society. The economy produces nothing; it simply facilitates our relationships with nature and society. So, an economically viable agriculture must be ecologically sound and socially responsible.

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http://epp.eurostat.ec.europa.eu/portal/page/portal/agri_environmental_indicators/documents/IRENA%20IFS%2019%20-%20GHG%20emissions_FINAL.pdf; comp. also with analysis presented on p. 9 of this paper

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VI Program Działań Wspólnoty Europejskiej w Dziedzinie Ochrony Środowiska- Środowisko 2010: Nasza przyszłość, Nasz wybór, Artykuł 2, propozycja decyzji Parlamentu Europejskiego i Rady ustanawiającej Program Działań Wspólnoty w Dziedzinie Ochrony Środowiska na lata - 2001-2010

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Z PUNKTU WIDZENIA PERSPEKTYWY
GLOBALNEJ I EUROPEJSKIEJ**

Celem artykułu jest zaprezentowanie z perspektywy globalnej i europejskiej związków między sektorem zrównoważonej gospodarki energetycznej, w tym w szczególności sektorem energii odnawialnej a sektorem rozwoju zrównoważonego rolnictwa .

W gospodarce światowej i europejskiej zaznacza się w ostatnich latach systematyczny wzrost znaczenia technologii na rzecz rozwoju energetyki odnawialnej. Głównymi dziedzinami zrównoważonego rozwoju gospodarki światowej i jej regionów będą w nadchodzących latach będą te obszary, które bazują na poprawie efektywności energetycznej, zrównoważonym rolnictwie, odnawialnych energiach ukierunkowanych na rozwój obszarów wiejskich. Rolnictwo jest jednym z wiodących obszarów, do których odnoszą się ustalenia UE dotyczące redukcji emisji gazów cieplarnianych do atmosfery. Podobnie jak i inne sektory gospodarki, rolnictwo jest źródłem emisji nie tylko gazów cieplarnianych ale jest i emitentem innych gazów takich jak metan oraz podtlenek azotu. Istnieje też silna zależność między zrównoważonym rozwojem rolnictwa i możliwościami pozyskiwania energii ze źródeł odnawialnych, ponieważ zrównoważone rolnictwo wydaje się być również istotnym źródłem energii odnawialnej.