Developing Energy Plants for Biofuels Production may Comply to Organic Principles

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Abstract

Biofuels are the only source of renewable environmentally friendly fuel currently suitable for road transport without any negative traits associated with traditional biodiesel or other green energy alternatives. The combustion of petrol and diesel produces many different types of local air pollutants, but the use of biofuels may result in the reductions in emissions of greenhouse gas carbon dioxide up to 70%.

Impacts on land use require careful planning to maximise the gains and minimise the losses. The role of biofuels in organic farming will solve three significant problems: 1) waste will become valuable resources; 2) low quality forage products can be utilized for biofuels and thus get value-added; and 3) the trafficable damage on soil fertilities will be reduced by the minimized recirculation rate of bulky watery waste products.

Introduction

The use of energy has been increasing steadily since the industrial revolution and it has not shown any sign of slowing down within the next decades. With the current oil production decline in many countries, biofuel use for motor vehicles could help bring oil market into balance and reduce it prices. However, Governments and university researchers have designed several research proposals to evaluate and improve biofuels producing plants as a bioenergy crop over the past years. Despite this effort, there are still a lot of criticisms regarding developing energy producing plants from a lot of scholars. Developing biofuels plant could help provide food for man, fodder for livestock feed and fuels for motor vehicles. Biofuels will benefit both developed and developing countries if researchers focus on the development of analytical assays that will give information to farmers, advisors and biofuel producers about the value of the product (that would enable researchers and farmers decide on the optimal use of the product) either as cattle feed, as biofuel feed, or as soil fertility enhancer. Research geared towards the evaluation of various typified scenarios as to the consequence on soil fertility and environment of the changes in land use will contribute to soil fertility and reduce the rate of environmental pollution. Recently, the EU has proposed a directive on protecting soils and their fertilities as compaction is identified as a major treat to soil fertility.

The European Commission has proposed that at least 10% of petrol and diesel volume EU will use by 2020 should come from biomass rather than fossil sources (European Federation for Transport and Environment, 2007). South African current policy is that by 2013, 4.5% of motor fuel sold in the country should contain either 8% ethanol blend or 2% biodiesel blend.

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There have been several debates regarding biofuels use for motor vehicles. The main arguments put forward in most of the debates are that fossil fuels stocks are finite and are not renewable but biological sources of energy are renewable, biodegradable, produce fewer emissions and do not contribute to the increase in carbon dioxide in the atmosphere (Cook and Beyea, 2000).

To promote evidence-based decision-making and good practice approaches in biofuel production, it is paramount to conduct comprehensive analyses for major projects and to share data and experiences through appropriate means for efficient improvement.

Materials and methods

This paper is based upon relevant literature within organic farming and biofuels, a review of the applicability of biofuels within the organic principles.

Energy crop for biofuels

The utilization of energy crops produced as a source of renewable fuels is a concept with great relevance to current ecological and economic issues at both national and international levels. Energy crops and various wastes have the potential to reduce and stabilise the price of oil, which could be very beneficial to poor countries. About 17 countries in the world have currently committed themselves to growing various energy crops on a large scale. Energy production from perennial cropping systems, some cereals and leguminous crops which are compatible with conventional farming practices, will help reduce degradation of agricultural soils, lower national dependence on foreign oil supplies, and reduce emissions of greenhouse gases and toxic pollutants to the atmosphere. Developing significant national capacity to utilize the above mentioned for biofuels production will benefit agricultural economy by providing an important new source of income for farmers

Previous research on bioethanol production from lignocellulosic waste materials have included crop residues (Kim and Dale, 2004; Zayed and Meyer, 1996), municipal solid waste (Mtui and Nakamura, 2005; Green et al., 1988), forest products industry wastes (Champagne, 2006), leaf and yard waste (Lissens et al., 2004) and dairy and cattle manures (Chen et al., 2004). The use of corn, wheat, peas, soybeans, sugar cane, grasses and other plant materials have shown significant improvements in the recent years.

To achieve the 2020 objectives set out by EU and USA, research and development on renewable energy sources that are vital to achieve widespread use of liquid and gaseous biofuels within the next decade is highly needed.

Growth in Biofuels

Growth in biofuels production may have unexpected economic benefits for farmers and researchers. Biofuels produced in the world in 2006 was about 44 billion litres. The amount of fuel ethanol was up to 22% and biodiesel account for 80%. Biofuels production is still very low and was accounted for less than 1% of the total global liquid fuel supplied. To continuously improve biofuels production, farming practices need to be re-examined if agriculture is to provide enough biofuels as well as food for a rapidly growing global population that is hungry for both. Further advancement in biofuels production will help countries that depends on the development of domestic biofuels industries be able to purchase fuels from their own farmers rather than spending

scarce foreign exchange on imported oil. Beside, purchasing fuels from the farmers will increase the farmers' income therefore contributing to the economies development and creating new jobs for the citizens.

World energy production matrix indicates that biofuels production is very low as it accounts for just 1.7% in 2006 records. Considering the environmental effects of both fossil fuels and biofuels, there is urgent need to conduct more research on the further advancement of the most promising ethanol producing plants. To date, conventional fuels have a higher percent of fuels used in the world (Fig. 1). However, the 2. generation technology will practically change all waste sources into valuable resources with significant consequences for value-addition, environmental losses, transport costs associated with waste treatment, soil fertilities and land uses. Furthermore, environmental friendly crops like grasses from extensive areas or even grass-clover mixtures from intensive areas will hold great potentials.

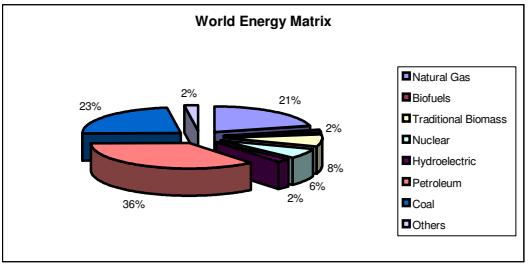

Figure 1. World energy matrix 2006 (modified after European Union, 2006).

Ethanol Consumption

The world consumption of ethanol is expected to grow with 2% - 3% yearly. In 2005, the market value has been estimated to exceed US$16 billion.

The total world production of biodiesel in 2004 was more than 2 billion litres, of which more than 90% was produced in the EU25 countries and in particular in Germany (EU 2006). The production of liquid biofuels in the former EU 25 in 2006 was about 2 million tons of oil equivalents (MTOE), which is less than 1% of the total fuel market. There have been marked increases in production and use in the recent years and the market share is at risk of failing the EU policy target for 2010 of 18 MTOE used in the transport sector. Reaching the vision set means considerably increasing of domestic biofuel production, this will not only require substantial investment in biomass production, harvesting, distribution and processing but will need an agreed biofuel and biofuel-blend standards within the union.

The expected growth of the biofuels market and the development of new transformation pathways require time to investigate new integrated refining schemes. The mechanism to improve biofuels requires further development of energy plants and investment of huge capital as bioethanol is growing quite slowly (Figure 2).

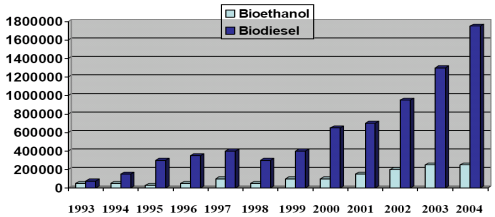

Figure 2. Biofuel production (0000 MTOE) in the EU since 1993 (International Energy Outlook, 2006).

Conclusions

The role of biofuels in organic farming will solve three significant problems: 1) waste will become valuable resources, 2) low quality forage products can be utilized for biofuels and thus get value added, and 3) the trafficable damage on soil fertilities will be reduced by the minimized recirculation rate of bulky watery waste products. Thus, the development of biofuels in organic farming may comply both to the organic principles and the EU directive on soil protection.

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