

WORKSHOP: “THE SUSTAINABILITY OF A LARGE –SCALE INTERNATIONAL TRADE IN ENERGY FROM BIOMASS- POTENTIAL, OPTIONS, CRITERIA AND IMPLEMENTATION”

HOW FEASIBLE IS A GLOBAL TRADE IN BIOENERGY? A GLANCE AT FUEL ETHANOL TRADE

Frank Rosillo-Calle

Research Fellow

Biomass Users Network/

ICCEPT, Room 4.02 RSM Building

Imperial College London

Kensington Campus

London SW7 2BP

E-mail: f.rosillo-calle@ic.ac.uk; frank@rosillo-calle.freeserve.co.uk

1. INTRODUCTION

As a modern energy carrier, bioenergy could supply a far greater amount of energy than is the case for fossil fuels. Bioenergy is already the main source of energy in many developing countries, mostly for domestic uses and many cottage industries. In this sense, biomass is widely traded, primarily at local and regional levels, but hardly for exports. The large-scale international bioenergy trade is a new concept whose foundations are still very shaky. This is a complex issue, given the diverse nature of biomass energy, its many applications, and end users. For example, traders dealing with woodchips for heat and power, would not necessarily be interested in dealing with fuel ethanol, given the different characteristics of both fuels, and end users. Therefore, it is important to differentiate what is being traded, under the umbrella of “bio-trade”. This paper pays special attention to ethanol fuel, as it is one of the most promising areas for international trade.

2. THE POTENTIAL ROLE OF BIOENERGY

Faaij et al¹ have shown the complexities of a possible large-scale international trade in bioenergy. The potential for international trade is large indeed, considering that biomass could contribute to about 1000 EJ, at least in theory, compared to about 56 EJ today, and a current global energy consumption of just over 400 EJ. Given the right market conditions, bioenergy offers a large range of possible applications e.g. Lauer² has investigated 347 applications of biomass energy in Austria alone.

Due to the large range of potential applications and diverse nature of biomass energy, it makes good sense to identify what type of bioenergy can be part of an international trade. International trade only makes sense in the case of large-scale modern industrial applications e.g. heat and power generation, fuel ethanol, etc.

¹ Faaij A PC, Schlamadniger B, Solamantausta Y., Wagener M., (2002) Large Scale International Bio-Energy Trade, 12th European Biomass Conf. & Technology Exhibition on Biomass for Energy, Industry and Climate Protection, 17-21 June 2000, Amsterdam, James & James, London (in press).

² Lauer M., (2002) Market Potential for Bioenergy Applications in Austria, 12th Biomass Conf. Op.cit.

It is important to bear in mind that a considerable amount of bioenergy forms already an integral part of domestic trade, both for small-scale domestic and industrial uses, in comparison to international trade.

Currently the most promising areas for international trading are: i) woodchips for heat and power, ii) ethanol fuel (confined mostly to bilateral agreements), and iii) charcoal (i.e. in 2000 Brazil exported about 8,000 ton of charcoal, worth US\$1.4 million) and briquettes, traded in value added markets (i.e. restaurants).

Biomass energy is a complex issue, with many social, economic, technological, environmental, and policy ramifications. Bioenergy, both in its traditional and modern forms, has primarily been aimed at providing local energy needs, not export. For international trade in bioenergy to succeed, it must address a number of important issues including:

i) The imperative to modernise, so that bioenergy can be utilized in as modern energy carrier. This modernization process is in itself a complex one because it depends on the modernization of agriculture, advances in biomass conversion technology; changes in the energy market, advances in fossil fuel technology (i.e. coal clean technology), etc

ii) It needs to address the problem of low biomass productivity, and how to increase long-term sustainable high yields, particularly in the case of dedicated energy crops. A large number of studies have been carried out to assess the energy potential from large-scale dedicated forestry/crops plantations. This potential ranges from about 100 Mha to over 1000 Mha; however, most studies have assumed that energy plantations will be using primarily degraded and poorer lands, unsuitable for agricultural crops. However, recent studies indicate that this is an unlikely prospect due to a combination of factors, including³:

- Degraded land is less attractive than good quality land due to higher costs and lower productivity. This is a major factor in economic costs of energy plantations, and this cannot be ignored
- Capital and financial constrains, particularly in developing countries; energy plantations are not necessarily cheap
- Cultural practices, mismanagement, perceived and potential conflict with food production, population growth, etc
- Productivity will have to increase far beyond what may realistically be possible
- Increasing desertification, and potential impacts of climate change in agriculture, could also have major impacts.

The combination of all these factors will severely limit large-scale development of dedicated energy forestry/crop plantations⁴.

iii) It also needs to address problems of land tenure and land rights issues, big versus small, and bulk versus value-added products, etc

iv) Current methods of food production and consumption patterns cannot be ignored. Energy production should not be seen in isolation from the food production system, on the contrary, it should be complementary. However, there will be

³ See Economics of plantation-grown fuels for power generation (<http://bioenergy.ornl.gov/reports/fuelwood/chap5.html>)

⁴ See for example Rosillo-Calle F (2003) Biomass Energy, Landolf-Bornstein-Handbook, Chapter 5, (in press).

situations in which bioenergy production will be at the expense of food production, which in some specific circumstances may be justified

v) Considers realistically what can, or cannot be, traded, regionally or internationally.

vi) Considers the potential implications for rural development if bioenergy is traded internationally e.g. if distributed generation (DG) takes off in large scale. For example, if exports provide greater value to the farmer, then it will become more attractive to trade bioenergy internationally than meeting local needs. At the very least there will be an increase in the price of biofuels.

The creation of a large international bioenergy trade will depend thus of many and varying factors and will probably take a long time to create the right market conditions; and will, most probably, be based on regional rather than on a global market, except for some specific cases (e.g. ethanol fuel, and some other value-added products).

Faaij et al⁵ have identified a set of criteria for biomass trade systems. The question is whether such stringent criteria is realistic or too restrictive; should biomass energy be considered something special, or should bio-trade be just another commodity like any other agricultural product, and thus leave it to forces of demand and supply?

Perhaps, bio-trade should be better compared with the current food chain- it is unjust, wasteful, and politically driven. We have the capacity to produce food for all, yet a billion people today are undernourished. For example, many local farmers produce cash crops, in detriment of the local food production, for export because they are more profitable. Indeed, the farmer's survival may depend on selling cash crops. Can we blame the farmer? At present we have a lot of questions, but very few answers to a complex issue, which can mostly be answered as this chain is being developed

It is also important to bear in mind the constant advances in other fuels that will compete directly with biomass and international trade. Take, for example, the changes in the automotive industry which is investigating a large range of possible alternatives, including ethanol fuel. Bio-trade will develop in any meaningful way only if the market conditions are there, even with some initial policy and financial support

3. ETHANOL FUEL

Ethanol seems to be one of the most realistic options for setting up a truly global bioenergy trade, at least within the present decade. Ethanol fuel is growing rapidly as it has a considerable potential for substituting oil in the transportation sector, given the right conditions; ethanol could also become a major feedstock for the chemical industry. Ethanol fuel currently enjoys considerable political support in many countries due to a combination of environmental, technological, energy security, and social considerations. This places ethanol at a considerable advantage but there are still some serious problems to overcome.

World ethanol production in 2002 is estimated to be about 33-37 billion litres, of which about 23 billion litres correspond to fuel ethanol⁶. Ethanol is mostly used

⁵ See footnote 1

⁶ Exact figures are difficult because the many uses of ethanol. In addition, ethanol production is often underreported in some countries because commercial sensitivity and high taxation.

blended with gasoline in various proportions. Future predictions vary significantly depending when cellulose, the most abundant raw material, can be used to produce ethanol commercially, but such potential is large indeed (i.e. some experts have put this potential to over a billion/toe annually), at least in theory.

Currently, one could hardly say that there is an international ethanol fuel market, since most of the transactions take place among a few countries (i.e. Brazil, USA, and EU), and based on bilateral agreements. There has been a clear lack of consensus in international negotiations on fuel ethanol trade, mostly because it is still regarded more as a domestic than an international trade issue. Brazil has brought up ethanol fuel trade to the World Trade Organization (WTO), but has failed for a variety of reasons. However, this could change in the near future as more and more countries set up new ethanol fuel programmes. For this to happen, a clear agenda and leadership is required, particularly among the largest producers such as Brazil and the USA.

Currently, about 3 billion litres of fuel ethanol is traded annually, with Brazil and the USA being the main exporters, and Japan and EU the main importers⁷, but it is more “one-off” bilateral agreements between countries, and hence cannot strictly be considered as international free trade.

The main advantages of international trade on fuel ethanol include:

- Ethanol is already traded internationally
- Ethanol fuel has a considerable potential for expanding, and as many new programs are being set up (or planned) in many countries. Present trends indicate that it would be possible to create sizeable production and consumption centres outside the USA and Brazil e.g. EU, China, India, Japan, Thailand, and Southern Africa, etc.
- It is relatively easy and cheap to transport ethanol to long distances, although storage of large quantities, and for long periods, could increase costs significantly

If ethanol fuel market becomes large enough, it could create sufficient liquidity to attract many ethanol fuel players. A large ethanol market will be able to guarantee the possibility of any shortfall in any one country or region, as is the case of oil or gas. If ethanol is produced in large quantities, the burden can be shared by a large number of producers and reduce risks. Market stability is important if ethanol is to become a truly global energy commodity.

The creation of a sustainable international ethanol fuel market could bring enormous economic, social, environmental, and political benefits for society, including the stakeholders. There is no doubt that the current prevailing conditions among the largest producers and consumers distort international trade, preventing free market competition. If a freer international market was to be set up, this will encourage the emergence of new producing centres.

For example, imagine million of farmers producing ethanol and if hundred of billions of dollars that currently flows into the coffers of a handful of nations, were to flow into of millions of farmers, most countries would see substantial national security, economic, and environmental benefits. With so many millions involved in production of ethanol fuel, it would be impossible to create a cartel. With new drilling oil technology, we will be able to make better use of existing resources and accelerate production, but would not be able to expand oil reserves⁸.

⁷ Rosillo-Calle F., Global Overview of Fuel Ethanol, 12th Biomass Conf. Op.cit.

⁸ See Lugar R G., Woolsey J., 1999). The New Petroleum, Foreign Affairs, Vol. 78 (1): 88-102

However, the ethanol fuel market is a complex one, driven by many and diverse forces ranging from feedstock e.g. corn versus sugarcane, to fuel distribution systems, and political interference. Many of these implications go far beyond the industry itself (i.e. a large increase of ethanol fuel will have also profound implications in the world sugar markets and other by-products such as molasses).

The international trade of ethanol fuel faces some specific difficulties that need action, including:

- Trade barriers, and high storage costs e.g. the USA levy \$140 per m³ on ethanol fuel imports
- It is relatively easy to set up a domestic ethanol industry
- Most countries that have, or plan to have, ethanol fuel programs have been aimed at the domestic rather than the external market. Export/import has not a priority in most cases and this would have to change
- Need many new programs to start as soon as possible to give impetus to international trade
- New investment in infrastructure and adaptations of new program, although the know-how already exist
- Early ethanol fuel programs own a lot more to pressure from the farming community, and less to energy and the environment. As a result these programs have received subsidies and this could continue to distort the market, and would need to be addressed
- Because the nature of ethanol fuel, it is unlikely that the international market will be a typical one. Instead the most probably scenario may be that ethanol exporters/importers will concentrate on possible temporary production shortfalls, at national or regional level, rather than global, at least in the near future
- In future, there should less subsidies to ethanol fuel and greater concern with environment and climate change; support for farmers should not be the prime driving force of ethanol fuel
- Subsidies must gradually be reduced and ultimately eliminated. This could happen under pressure from the WTO. However, this would have to be an integral part of a much wider agricultural reforms. Eventually this industry must be able to stand in its own feet.

However, despite all these difficulties, the international trade in ethanol fuel looks brighter now than a few years back because:

- Devaluation of the Brazilian currency is making ethanol fuel more competitive, both in the domestic and international market
- Upturn in the USA market, and if the RFS⁹ is finally passed by the Senate, this market could increase to about 19 billion litres annually by 2012
- Increasing interest in developing countries e.g. China, India, Thailand, etc.
- Introduction in the EU of the White Paper: *European transport policy for 2010: Time to decide*, which foresees a gradual introduction of alternative fuels in the transportation systems, up to 20% by 2020.

⁹ Renewable Fuels Standard

In the longer term, after 2010, the international ethanol fuel market might be determined, among other things, by:

- Progress in climate change e.g. implementation of the KP
- USA policy towards alternative transport fuel e.g. the outcome RFS
- Emergence of other sustainable fuel ethanol programs
- Evolution of the EU fuel ethanol market
- Attitude of the automobile industry toward alternative fuels
- Emergence of other alternatives to current fossil fuels in transport
- Technological progress in ethanol fuel production, in particular cellulose-based ethanol
- The success of international trade on ethanol fuel trade requires that it becomes a truly global commodity; domestic producers must not regard ethanol as their prerogative
- MTBE banning should be encouraged, together with unleaded gasoline (i.e. many African countries still use unleaded gasoline), while emphasizing the socio-economic and environmental benefits of fuel ethanol.
- Ethanol producers must become more efficient. Ethanol production must become an integral part of a new “bio-refinery”¹⁰ concept, in which ethanol will be just another product
- Large ethanol fuel programs (E100) are highly unlikely, except for blends, mostly with gasoline; this should be a main priority
- Ethanol producers must stimulate the market e.g. by increasing competition, new uses (i.e. diesel blends, chemical feedstock), and to improve production systems.

4. CONCLUSIONS

The international trade in bioenergy is still in its infancy and confined to niche markets e.g. woodchips for heat and power in a few countries. Currently, it is also not possible to say that there is an international ethanol fuel market. For this to happen, it would be necessary some initial policy support and leadership from the leading ethanol producers. A large-scale production of ethanol, together with sustainable international trade, could bring many social, economic, environmental and political benefits.

Ethanol producers must seek new ethanol uses and new production systems. Ethanol production must be an integral part of a new “bio-refinery” concept, which can obtain food energy (liquid, gas and heat and electricity), high value-added chemicals, feed, fibre, etc. Therefore, RD&D should be channelled towards this end.

There must support for policy changes e.g. mandate the introduction of ethanol fuel, particularly in the EU; introduce greater competition and less protectionism. This industry must be able, at some stage, to stand in its own feet and compete with similar alternatives, by becoming a truly global commodity.

¹⁰ See Trindade C. S., (2002) Prospects for global trade in fuel ethanol, World Ethanol Conference 2002, London 6-7 November.