BIODIESEL: EVALUATING THE RISK OF SOYBEAN OIL SHORTAGE AND THE CONTRIBUTION OF BRAZIL TO THE GLOBAL SUPPLY

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Keywords

Biodiesel, vegetable oil, soybean, land use, energy security, Brazil.

Overview

As recently recognized by the FAO (2007), the growing demand for biodiesel around the world will provide a substantial boost to the price of vegetable oil and raise the question of fuel security over food security, as it is already happening with sugar and corn in the case of ethanol. This major new element to global demand for oils and fats is challenging the vegetable oil supply sector that was already experiencing high rates of growth just to meet the food demand.

However, the potential of higher prices to boost production is limited by structural constraints in the agricultural sector. Huge redistribution of land uses seems inevitable but will be difficult to achieve in the short term. Therefore, policies aiming to promote aggressive production of biofuels may focus on the multidimensional competition for land. But land has been required for diversified uses such as human food, animal food, paper and cellulose production, distinct energy uses such as biofuels, but also bioelectricity or charcoal production, as well as for other growing interests such as promoting biodiversity through the preservation of native forests or boosting reforestation for carbon sequestration.

High vegetable oil prices will stimulate the production of high oil content oilseeds worldwide. Yet this solution can only be developed in the medium term. Developing new crops of palm trees or jatropha takes a minimum of 3-4 years from seeding to the first harvest, and 8-10 years to achieve full maturity. Concerning rapeseed/canola and sunflower, areas in Europe are scarce (OCDE, 2006). In Argentina, the area for soybean production is already considered to be close to its realistic maximum (USB, 2006). In the USA, according to the USDA forecasts, the combined area producing corn and soybean has just a little upward potential (USB, 2006). Thus, only by speeding up major technological breakthroughs may these constraints eventually be overcome.

In this context, the only two reasonable candidates with available land and mature oilseed industry, and that have the potential to meet the short-term and skyrocketing global demand for biofuels, are Canada (rapeseed) and mainly Brazil (soybean). These countries are believed to still have large areas of available and productive land that can quickly be allocated to biofuel production. Indeed, the remaining arable lands in Brazil emerge as the planet's last agricultural frontier. The paper examines Brazil's potential role as a leading global supplier of biofuels.

Methods

The method used for the elaboration of this paper is based on the following steps:

i) The first part contextualizes all the market inter-connections that have recently emerged as a result of the biodiesel demand. It raises the question of the potential conflicts between food and energy security. These initial thoughts establish the assumptions adopted in this paper and present the main issues, which are necessarily involved in the biodiesel supply/demand relationship.

ii) Secondly, the text highlights the main results found in the literature regarding the global supply/demand perspectives for the raw materials required both for biodiesel production and other non-energy uses. The idea is to show how major imbalances may be expected in the traditional biodiesel producing areas.

iii) Finally, the paper focuses on the Brazilian soybean industry and tries to quantify the effective contribution that Brazil can reasonably provide, evaluating its chances of becoming a major producer and supplier for the world biodiesel market.

Results

The demand side: Since the arrival of high energy prices and the explosive expansion in biodiesel output, there has been acceleration in worldwide demand for vegetable oils. This acceleration must be understood by making the distinction between energy demand for biodiesel on one side, and food industry oil demand on the other side. Biodiesel demand is mainly mandated and subsidised by public policies and it is reasonable to estimate that the additional demand for biodiesel in 2012 will be between 12 and 20 Mt (million tons) on top of the 5.4

million Mt production in 2006 (OECD, 2006). Demand for vegetable oil has grown expressively, driven not only by food, but also for paints, cosmetics and pharmaceuticals. The trend increase, based on the past 10 year data, is about 4.4 millions Mt per year. The perspective for endogenous growth, without counting energy uses, appears to be at least 5% a year for the next 10 years (FAO, 2004). This represents an additional non-energy demand of between 20 and 30 Mt in the next five years.

The Brazilian supply side: There is a real agricultural potential for vegetable oil, but in the short term, even considering the maturity of the soybean agricultural sector in Brazil, it is unable to support a growth higher than 5 to 10% especially with current international prices and the question of meal commercialisation. Growing projections show clearly that Brazil alone will represent almost 70% of world growth. It will achieve half of this through cultivation of new areas and the other half through the increase of the yield due to the development of technologies and new agricultural practices (ABIOVE, 2005). These projections represent between 3 to 4 Mt of additional vegetable oil produced from Brazilian soybean, in a five year horizon, which is a very poor contribution in relation to the global demand projection that is between 32 and 50 additional Mt. It is therefore reasonable to assume that Brazil soy oil will contribute only about 10% of the world's additional need for vegetable oil and Biodiesel.

Conclusions

A great amount of analyses that refer to the demand perspectives of biodiesel are generally more optimistic than those that refer to supply perspectives. In fact, the anticipation of biodiesel demand is not always concerned with supply restrictions, as if policies aiming to promote rapid growth in the global biodiesel demand assume that the supply, particularly from Asiatic palm oil and Brazilian soy oil will always be generously elastic to any additional demand.

Indeed, a quick analysis of the Brazilian soy bean contribution shows that if the potential actually exists it is not all that relevant in the short term. Even using existing available arable land to expand soybean production, the rhythm of this expansion may not be enough to supply simultaneously the endogenous growth of the food market and the emergent demand for biodiesel.

On the other hand, soybean supplies are limited by the protein meal market of animal feed. The meal issue is one of the main limiting factors for soy oil expansion. For each ton of soy oil, four tons of meal are produced. "What will happen to all the additional soybean meal?" Soybean contribution to biodiesel is then dependent on the growth of the meat, pig, poultry and aquaculture markets and the capacity of importing countries to accept meal as meal and less as meal-in-beans (to be extracted). This kind of cultural change is very slow because it compromises the crushing industry of the importing countries.

The vegetable oil market went from a demand driven market to a supply driven market in 2006. In this context, the possibility of reducing the price of raw material for biodiesel, even increasing the production scale, and of making it competitive in relation to fossil diesel, as has already happened with Brazilian ethanol, is remote.

This imbalance is expected to be naturally adjusted by the market mechanisms with both prices and quantities shifting. One likely scenario is that high vegetable oil prices will depress the food-use demand in India and other developing countries to a level that half of the need for biodiesel could be achieved with reduction in food use.

When the objective is to avoid CO_2 emissions, there can be appointed cheaper alternatives than the mandated production of biodiesel from expensive vegetable oil. The pressure may come from media and public awareness regarding the competition among food, energy and environmental issues. Finally, soybean has a low oil content oilseed, with high water requirements. So the productivity of biodiesel per hectare is 8 to 10 times less than palm oil. The tendency in the short run is to focus on high oil content oilseeds (oil palm, jatropha, micro-algae). In the long run it is expected that production will be centred in the next generation of biofuels (lignocellulosic ethanol) that focus on the species with high photosynthetic efficiency and higher rates of biomass and cellulose per hectare and per litre of water.

References

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