Biofuels, a Chance For Energy Self-Sufficiency In Mexico's Countryside

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Biofuels, part of the renewable energy sector, are combustible liquids such as ethanol and biodiesel produced from biomass, that is, from organic matter. Among their advantages are their ability to reduce energy dependence on fossil fuels, which helps reduce CO_2 emissions and other greenhouse gases, and the creation of high value-added subproducts for various industries, while representing a revolution in the energy, productive, commercial, and rural sectors.

A wide variety of raw materials are used in their preparation, such as agricultural crops, wood, or cane and seeds. They can also be produced from beets, fruit, rice, and even from used oil and solid fats, as well as from lingo-cellulosic material and pyrolysis oil used in more advanced processes.[1] Biofuel production should also be accompanied by the cultivation of high energy-yielding crops, and at the same time require fewer inputs.

Renewable resource such as biomass, however, are put at risk by improper use; therefore caution should be exercised in the production of this type of energy on a large scale, since production cycles may have harmful effects on the environment due to deforestation and encroachment on nature reserves. Thus, biofuel production should be carried out in a sustainable, controlled, local way on a small and medium scale, so that the insertion of small and medium producers into the biofuel production energy chain contributes to revitalizing and promoting self-sufficiency in rural areas. Mexico

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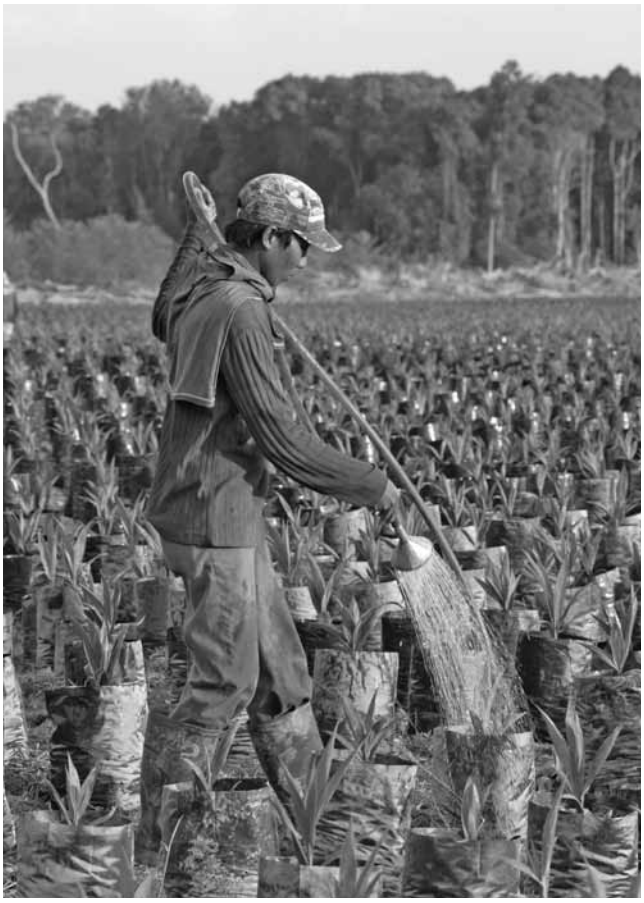

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needs public policies to foster both the production of food products and energy crops sustainably, without neglecting the balance of the two.

This article aims to address the importance of the agricultural sector in improving the production and use of crops and their waste products to the advantage of both food production and energy, ensuring that the countryside is self-sufficient in food and energy.[2]

Public Policies and Regional Strategies

Since each region has different characteristics in terms of production as well as variations in weather, geographic, social, and cultural conditions, public policy in Mexico should encourage the establishment of regional strategies to promote a particular rural profile as well as promoting food and energy self-sufficiency in each region, suitable for its special features and needs. Their successful operation should not depend on fixed development models brought in from outside.[3]

It is important to recognize the contribution of small and medium-sized producers to food security, their participation in job creation, and environmental conservation, as well as the role they play in social stability. Whether small and medium-sized producers' output is on a subsistence or small or medium scale, they should represent the social equality goals; their contribution should thus be reconsidered. At the same time, public policies must be reoriented to improving their conditions since these people are a key part of the Mexican population, embodying characteristics compatible with the notion of a sustainable community in terms of local development, care for the environment, and regional identity, besides having a great capacity for overcoming adversity and regenerating themselves.[4]

The Environmental and Socioeconomic Effects of Biofuels

The effects of the large-scale processing of biofuels and associated products are highly controversial. However, controlled production on a small and medium scale can have social benefits: it can be linked to improvements in production and quality of life in rural areas as well as representing an opportunity to generate higher-value-added products, achieving food self-sufficiency, and meeting the energy needs of these areas. Among the advantages for farmers participating in this production are:

1) helping to reduce pollutants harmful to human health;
2) creating more employment and self-employment opportunities;
3) fostering social cohesion;
4) learning about the specialized production of biofuels and the management of inputs used in their production; and
5) energy self-sufficiency on a small and medium scale.

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Producing biofuels is more labor-intensive than producing fossil fuels. However, with suitable public policies, they could represent an opportunity, primarily to supply raw materials and to operate self-sufficient bioenergy plants. Even though this requires specialization, it could be a new source of employment for the rural population. The strategic objectives of public policy for the ideal development of the energy generating industry are:

1) to transform the energy matrix with a view to sustainability;[5]
2) to bring about the conditions for an increased share of bioenergy sources in the energy matrix;
3) to create the conditions for regional development, based on expanding agriculture for energy and optimal value-added in the production chain;
4) to generate additional job opportunities in agribusiness;
5) to open up wider business opportunities with equitable distribution among the participants;
6) to contribute to the care of the environment and the reduction of greenhouse gas emissions;
7) to contribute to a reduction in the use of petroleum; and
8) to contribute to increased energy self-sufficiency.[6]

Strategic planning and decision making are thus essential in the choice of the most suitable crop varieties to use as little additional land as possible while achieving the highest yields, in order to obtain fuel without detriment to food supplies. This should be possible given the variety of organic sources that can be used in processing biofuels. Here, government intervention to represent national interests will be crucial, rather than relying on the market, which traditionally has not taken social and environmental factors into account. However, a sustainable growth model is called for that is competitive, socially inclusive, and environmentally friendly, with a significant share of the biofuel production chain.

It is possible to fulfill these aspirations in Mexico because the factors exist that favor this scenario over the medium and long term, but several of them must be brought together in advance. In the first place, global demand for food is growing. Secondly, global demand for renewable energy (agro-energy) such as biodiesel and ethanol has increased. In addition to these, there is growing demand for non-durable consumer goods (natural fibers among others) and durable consumer goods (including bio-plastics and bio-products in general) that use agricultural and biological raw materials to replace fossil fuels.[7]

Specific goals are already being established in Mexico. The Ministry of Energy has stated, "In order to replace 5 percent of diesel oil in the country, it will be necessary to install 10 plants, each with a capacity of 100 000 tons/year, or more than 140 small plants, each with a capacity of 5 000 tons/year."[8] To optimize the supply of agricultural crops and reduce the distribution cost of biodiesel and its by-products, production plants

> should be set up close to refineries or plants producing vegetable oils. Integrated plants for the production of vegetable oils and biodiesel are the best option from a logistical standpoint.... The estimated investment to reach the 5-percent biodiesel stage is Mex$3.1 billion,[9] given that each large-scale plant costs Mex$311 million. Although the production of biodiesel would target the domestic market, fuel could also occasionally be exported to other markets such as Europe or the United States.... The production costs of biodiesel range from Mex$5.3 to Mex$12.4 per liter equivalent, depending on the raw material used to produce it.[10]

In this manner, the crops used for the production of oil, and hence biodiesel, are considered more suitable for family farms and therefore for small and medium-sized production, since there are crops like the castor oil plant and jatropha (*Jatropha curcas*) that are adapted to less favorable conditions and do not require much water or care; the latter can even be grown in poor soil and with a much lower investment. The advantages of producing these crops include, on the one hand, that they can be used alternately in multiple-crop systems, since it is possible to plant beans between the rows of castor oil plants or jatropha, to provide food, and they also fix nitrogen in the soil, improving fertility. On the other hand, the organization and cooperation of several small producers would be sufficient to acquire a small biofuel production plant that would provide for local energy needs and open new business opportunities for their products, which could be sold as raw materials and that could add value through the extraction of

the oil they contain and its conversion into biodiesel. It is also important to mention that the price of some of the crops with potential for processing into biofuels has risen, and this could increase farmers' revenues.[11] VM

Further Reading

Sánchez Cano, Julieta Evangelina, "Biocombustibles, la era de la nueva revolución agrícola," *Casa del tiempo* nos. 22-23, vol. 2 (Mexico City: Universidad Autónoma Metropolitana, August-September 2009), pp. 79-84.

Notes

[1] Wood consists of lignin, cellulose, and hemicellulose. "Ligno-cellulosic" refers to the processes that combine lignin and cellulose, for example those in which both substances are decomposed. "Pyrolysis" is the process of decomposition of organic matter by heating in an atmosphere devoid of oxygen. It is a method for converting biomass into biodiesel.

[2] J. Reichman, "Biomasa y agro-combustibles: veinte tesis," *Ecología política* no. 34 (Barcelona: Icaria, 2007).

[3] Tomas Loewy, "Indicadores sociales de las unidades productivas para el desarrollo rural en Argentina," 2006, http://www.infoagro.com/desarrollo/indicadores_sociales_desarrollo_rural_argentina.htm.

[4] Ibid.

[5] By "energy matrix" I mean the range of energy sources used by a country as a whole.

[6] Government of Brazil, *Plano nacional de agroenergia, 2006-2011* (Brasília, F.D.: Ministério da Agricultura, Pecuária e Abastecimento-Secretaria de Produção e Agroenergia, Embrapa Informação Tecnológica, 2006), 2nd revised ed.

[7] Food and Agriculture Organization, "Land resource potential and constraints at regional and country levels," based on the work of A. J. Bot, F.O. Nachtergaele, and A. Young, Rome, FAO, UN, Land and Water Development Division, 2000, ftp://ftp.fao.org/agl/agll/docs/wsr.pdf.

[8] Secretaría de Energía et al., "Potenciales y viabilidad del uso de bioetanol y biodiesel para el transporte en México (Proyectos ME-T1007–ATN/DO-9375-ME y PN 04.2148.7-001.00)," November 2006, http://www.sener.gob.mx/res/169/Biocombustibles_en_Mexixo_Estudio_Completo.pdf.

[9] At the exchange rate of Mex$10.9694, published in the *Diario oficial de la federación*, Monday, May 8, 2006, ftp://ftp2.sat.gob.mx/asistencia_servicio_ftp/publicaciones/legislacion06/tc20060508.doc.

[10] Secretaría de Energía et al., op. cit.

[11] Omar Masera, "La energía renovable como catalizador del desarrollo sustentable en México," working paper (Mexico City: UNAM, August 17, 2007), http://www.snitt.org.mx/pdfs/bioenergeticos/ Perspectivas_Bioenergia_Mexico.pdf.

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