

## **The effect of bio-fuel prices on agricultural products market: A review**

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### **Abstract**

The demand for a renewable source as a bio-energy has been developed strongly by market national governments support and becomes the fastest among alternative energy sources. The development of bio-fuel saves resources for many countries and has brought great opportunities to each country's economic growth. Because raw material for bio-fuel are mainly grain and oil crops, its development will bring a certain extent of effect on food security. The development of bio-fuel has attracted great attention from various countries, for it can solve the global energy crisis to some extent. However, the raw materials of bio-fuel are mainly maize, sugar cane and other crops, the development of bio-fuel industry will inevitably affect food security. This paper reviewed present studies on the effect of the development of bio-fuel from four aspects i.e., agricultural market, agricultural inputs, agricultural development and family welfare.

**Keywords:** Food security; bio-fuel; agricultural development; market

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### **Introduction**

In recent years, bio-fuel has been linked with the rising price of agricultural products, although this effect was not inconclusive at present, but the rising price caused by the bio-fuel development indeed has impact on of farmers' income, employment, family welfare and agricultural development.

Tyner and Taheripour (2008) showed that if the rise in food price can be largely transferred to energy exports for the low grain-producing country, the country's overall food consumption will not be greatly affected. However, according to FAO 2005 statistics, there are 82 low-income countries in the world which are not only import food but also energy. The rising grain price in international market would lead to pay a huge cost of import for the food consumption for a country. Therefore, the rising grain price would cause serious impact on a country's welfare. Ford Runge (2007) found that even Mexico was also affected which was oil exporter and food importer. About 80% of yellow maize in Mexico came from

import, but due to the raised international market price of yellow maize, the domestic food manufacturers tended to use domestic sweet corn, therefore, the domestic price of sweet corn rose sharply. Studies show that the real price of the world's major food crop raised at the rate of 1%, the number of global hunger people would increase 16 million.

According to estimation, by 2025 the number of hungry people around the world would reach 120 million. Aksoy and Isik- Dikmelik (2008) conducted a study from the perspective of a net seller, and they selected three main foods as research object and then computed the proportion of net sellers in the developing countries among the sample. Barrett (2008) thought that the majority of farmers or rural households did not belong to the ranks of net food sellers in sub-Saharan African countries, food price increase did not increase income of peasants. In their view, if the economic feasibility of using cassava to produce ethanol achieved commercial standards, cassava price increase could only give a big landowners much more income, and to those landless workers, the general rise

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in food price only take them fewer intake of calories, which make it difficult to get rid of the long-term malnutrition situation. FAO (2008a) study also showed that in the rural areas where agriculture and food production are the mainstay, the proportion of poor small-scale operators who at the same time were net sellers is not more than 37%, four of seven countries' proportion was even 13% or lower. Increased food prices did not play a positive role in farmers' income rise.

Compared to the above research, rural income-generating activities (RIGA) project researched from the perspective of the farmer's family status, that is, farmer was a net buyer or net seller. The study found that in both rural and urban areas, net buyers among the most of poor people (the bottom 20% of the poverty population) suffered the biggest brunt of price rise. They would suffer 2.7% net losses if price increased 10%. While the one-fifth of the poorest people face a net loss of approximately 2.0%. On the other hand, they investigated "specialized households" as a net producer of agriculture. It was found that agricultural products price increased in Bangladesh increased the welfare of agriculture specialized households by an average of 1.7%, (the welfare of 20% of the poorest the population increased by 1.3%, (the welfare of 20% of the most affluent the population increased by 1.8%). Taylor (2006) also analysis from the two perspective, he selected four countries in Central America, simulated the possible impact of food prices increased 10% in a general equilibrium framework. The results showed that all residents including agriculture specialized households would be subjected to more than 2% of the welfare losses. In addition, Ivanic and Martin (2008) quantified unit income and expenditure of family household using the expenditure and revenue functions, and simulated a variety of food products' prices increased 10% based on the envelope theorem to analyze the percentage change of one dollar poverty rate every day. The conclusions were very similar to Taylor's.

### **The impact of Bio-fuel development on the employment of the farmers**

Bio-fuel development not only has an impact on the income and welfare of the farmers, but also brings new opportunities to country's economic development, such as increasing employment. Moreira (2006) study pointed out that Brazil's bio-fuel industry provided about one million employment in 2001, basically in the rural areas, and most are low-skilled jobs, 65% of which belonged to long-term employment, 35% short-season work. Von Braun (2006) found that the development of bio-fuel can contribute to increase the planting amount of cash crops, and the impact of planting cash crops on the employment for poor

families were very significant. Statistics showed that 30% of sugar cane in Brazil was produced by 60000 farmers independently; the peasants without land can be engaged in the processing of raw materials, transportation and other labour-intensive work in the process of bio-fuel production. According to the current development of bio-fuel, he also pointed out that many developing countries have mastered the bio-fuel technologies, and would build ethanol plants in remote areas; the construction and operation of these plants could provide more jobs and economic vitality for remote areas.

### **The impact of bio-fuel development on economic development of agriculture**

Raw material costs accounts for 70 to 80% of the cost of bio-fuel, means that agricultural products are the main input factor of bio-fuel production. Therefore, increasing demand for agricultural productions caused by the development of bio-fuel plays a vital role in promoting economic development of rural areas. Moreover, Timmer (2002) considered that the amount of contribution of agricultural growth to poverty reduction depended on the level of inequality in a country and the proportion of agriculture in the economy and employment. World Bank's econometric analysis (2007) on contribution rate of national GDP growth showed that, taking into account the scale of agriculture, the efficiency of poverty reduction brought by agricultural GDP growth was at least twice than other areas. Bravo-Ortega and Lederman (2005) found that not only agriculture make the greatest contribution to poverty alleviation, but also the growth of primary industry had a significant impact on living standard of the poor.

### **The impact of bio-fuel's development on markets for agricultural products**

The share of bio-fuel in the entire energy market is relatively small, but its development has the great impact on agricultural products market. In general, the impacts of bio-fuel development on the agricultural market are shown in the following two aspects. First affect the production and consumption structure of agricultural products; second, affect the price of agricultural products.

### **The impact of bio-fuel development on the production and consumption structure of agricultural products**

The development of bio-fuel has direct effect on the production and consumption structure of agricultural products. Birur et al. (2008) said that if we want to achieve the objectives and the rules the European Union and the United States use compulsorily, the materials onshore used for

producing bio-fuel such as grain, rapeseed, sugar cane and other agricultural products would have a substantial increase in demand and more land would be used for cultivation of these crops, which promotes the change of agricultural production structure. They estimated that coarse grains production area will increase by 11 or 12% by 2010 in Canada and the United States, and rapeseed production area will also increase by 12 or 21% in Brazil, Canada and the EU. Banse et al. (2008) also predicted that the coarse grains and sugarcane planting area would have a substantial increase (especially in Africa and Latin America) caused by the mandatory bio-fuel policy mix and as a result, reduced the planting area of other crops and changed agricultural production structure.

Other research analyzed the impact of bio-fuel development on the consumption structure of agricultural products. Cassman et al. (2006) pointed out that the energy industry's (ethanol) expansion will consume more corn. They found that 19.6% of corn was used for ethanol production in 06-07, and the rate be expected to rise to 29.6% in 2010-2011 according to the U.S. data. They considered that the industry will continue to expand, because ethanol producing has a larger profit margin in the current prices of gasoline, ethanol and corn. Xin'an Deng (2008) first proposed the concept of energy in agriculture; it was defined as the agriculture for the purpose of producing biomass energy. The development of bio-fuel industry absorbed agricultural products for the production of alternative energy which led to the change of consumption structure of agricultural products.

### **The effect of bio-fuel development on the price of agricultural products**

Bio-fuel development had an impact on the price of agricultural products in a certain extent, but scholars' points on the extent of this impact are not consistent. Mitchell (2008) submitted a report recently indicating that for the rapid expansion of the bio-fuels industry in United States and the European Union, the stocks of global wheat and rice had dropped significantly, while price of grain products had also greatly increased. According to the statistics, 65% prices increasing of grain products were caused by due to the rapid growth of bio-fuels in the demand for bio-fuel and feedstock crops. IFPRI (2008) released a report showing that the expansion of bio-fuels as an alternative energy to deal with rising oil prices not only became a major factor in rising food prices, but also had a profound impact on the world food situation. Different from the results of the above study, Bole and Londo, (2008) considered that the impact of the global bio-fuel development on global food price is relatively small currently. They used a bottom-up analysis method which considered the change of grain prices in the

market and the more realistic impact of these changes on bio-fuel production. They used the relative cost of production and Break-Even Point to assure that the amount of bio-fuel can be estimated, and then showed the bio-fuel demand for agricultural products is not in a unlimited growth trend coupled with the cyclical nature of the market so that they think that bio-fuel in the long term will not cause excessive increase in the price of agricultural products. In addition, the study also found that agricultural products and other raw material cost are lower in the current food prices. Usually grain cost account for about 10% in the retail price of food in developed countries. Thus they believe that at present the increasing price in the international agricultural products market is affected by the elasticity of food consumption and the retail cost in a very large extent. The International Federation of Agricultural Producers (IFAP) said the land for bio-fuel production accounts for a very small proportion of agricultural land in the world (Brazil 1%, Europe 1%, United States 4%), bio-fuel production is only a marginal factor in rising food price, and has little impact on the increase of real price. Some scholars also study the impact mechanism of the bio-fuel development on agricultural products price. Rosamond (2007) studies have shown that the expansion of bio-fuel production have both direct and indirect effects on agricultural products price. Schmidhuber (2006) considered that the rise in energy price and bio-fuel technologies gradually resulted in energy demand for agricultural products, thus the energy price with the price of agricultural products became synchronically.

### **The effect of bio-fuel development on food security of developing countries**

The development of bio-fuel to some extent, ease the energy crisis, but the specialties of bio-fuel sources (mainly got from processing sugar cane, corn, soybeans and other crop) changed the use of crops in traditional agriculture. Previous crops were used as food and feed grains, while feed grains gave service to people's diet. Now the production of bio-fuel uses a part of crops, so more and more scholars begin to worry about the phenomenon of "fight for food with people". Senauer and Sur (2001) predicted that the number of global undernourished people would increase to 440 million if the relative base of grain price raised by 20% in 2025 (of which 195 million in sub-Saharan Africa, 158 million in South Asia and East Asia). The International Food Policy Research Institute (IFPRI) estimated, under the existing national bio-fuel development plans, the expansion of bio-fuel would make corn, oilseeds, cassava and wheat price rise by 26, 18, 11 and 8% resulting in reduce calorie intake per capita range from 2 to 5% and the increasing child malnutrition rates at the average rate of 4% (Msangi, 2008).

## Conclusion

In order to cope with the emerging problem of bio-fuel prices, we should focus on how to increase the benefit of the poor in developing bio-fuel industry. Furthermore, we should increase technological investment and make full use of marginal land and non-food crops to serve the production of bio-fuel.

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