Capitulo 4
Biofuel production and its impact on international agricultural prices

Julieta Sánchez, Yeni Rodríguez **y** Leticia Moreno

J. Sánchez, Y. Rodríguez **y** L. Moreno
Universidad Juárez del Estado de Durango, Negrete 800, Centro, 34000 Durango
julieta.san2009@hotmail.com

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Abstract

In this paper we analyze a series of time showing the volatility of prices of basic foods and explores their correlation with the production of biofuels. Therefore, it is necessary to analyze the production chain, from the evolution of oil prices and the way in which the high prices of this resource becomes an incentive to increase the production of biofuels, which in turn affects increased demand for agricultural commodities as inputs for the production of energy, with parallel effects to increased international agricultural prices, generating strong impacts on food markets and trade balance of many countries.

Key words: biofuels, oil, price index, food markets, energy imputs

4 Introduction

Oil is a nonrenewable resource and its extraction costs are increasingly high, and its production and consumption cause excessive environmental damage. Given this scenario, many countries are investing in renewable energy, among which are biofuels. The production of ethanol for blending with gasoline or to replace it, has led this to absorb excess production of basic grains in some countries, which was destined before to the international food market. According to the UN, the boom in biofuels could create food security impacts strongly rising food prices worldwide and generating strong social and economic impact, to this end, this paper develops an analysis whose information shows the current repercussions of such events.

4.1 Materials and Methods

Since 2008, the basic food market and the oil market showed high historical prices and an upward trend that could not be reversed. Therefore, in this paper we analyze the behaviour of the oil and food market prices, we compare both price indices generated by FAO and IMF and show how both markets are strongly correlated, we analyzed the increments of prices over several years and observed impacts, because when oil prices rise there are some factors that cause market impact for basic food, affecting both the demand and supply of these products.

In addition, high oil prices tend to be an incentive for the production of renewable energies such as biofuels, generating increased demand for agricultural products for the production of this type of energy.

This analysis highlights that there are two significant effects with the increase in oil prices, on the one hand it encourages the production of biofuels also consistent with the increased demand food supplies that are used to produce them, and on the other hand generates a strong impact on the supply of food to the rising price of oil used for both production and transportation thereof.

On the other hand, high oil prices also cause an increase in the price of derivatives such as, gasoline and fertilizer, generating costs that increase food production causing supply reduction and up food prices.These issues generate a greater effort for the supply of energy and food, which generates negative effects on the trade balance of many countries.

4.2 Discussion and results

Oil is a commodity whose use has spread worldwide, and has become essential part of productive development of economies. Currently about 90% of the energy consumed worldwide is from non-renewable fossil resources whose extraction costs are getting higher, which generates that energy supply is a concern for every country.This situation has meant that several countries are dabbling in the search for alternative sources of energy in order to diversify its energy (Sánchez J., 2012, p. 1).Oil is a resource whose availability is not uniform, because there are economies that have achieved large reserves and exceed the requirements of its domestic market and other economies with more productive development experience, and therefore have higher energy demand than they produce in order to continue growing. Other countries are net importers of oil, and this brings them strong impacts on trade balance with the rising price of energy.

The energetics, have great importance for the development of any society. As a country progresses in development, increases its energy needs. This generates energy that this increase at the same development, therefore, the power supply is considered a national security strategy for many countries. In response, energy security is currently one of the central issues globally, since it can greatly affect the economies and the security of the states.However, at the same time energy security has been one of the central issues in the world, food security has also been important, because the high prices that showed basic food in recent years generated the concern of many countries to feed its population.

Oil is a resource whose use generates the existence of negative externalities on the natural environment, mainly emissions of greenhouse gases that come from the production and use of this type of energy are included, which encourages renewable energy generation including biofuels.

Oil as basic product, is subject to the possible volatility of growth of the world economy as well as to various geopolitical events that relate to geographic location and level of existing reserves, with the characteristics of the countries that possess or require more quantity, with the cost and access to sources of exploitation, as well as to the characteristics of the routes and international traffic type to be performed to extract the resource and to meet the demand.

Therefore, variations in the price of this product significantly impact predictions on the behavior of the world economy.

Changes in oil prices may be due to several factors, of which some may be predictable (which are related to the level of proved reserves, operational capacity and the level of expected demand, however, geopolitical events that could abruptly alter the predictions can occur.It is also important to mention that oil is subject to financial transactions, making it the object of speculation (Sánchez F., 2005, p. 14).The volatility of oil prices in the last decade has been placed in the forefront of financial affairs, fueling uncertainty in economic decision making.

In 2003, high oil prices managed to be a warning about the impact that would generate in the global economy, and it was not until this year when prices showed an upward trend, achieving that in August 2005, surpassed the mark of $ 60 per barrel (Sánchez F., 2005, p. 9).

It should be mentioned that this trend continued in later years, as in 2008, oil prices started close to $ 100, generating it in July of the same year was a peak of more than $ 147 (see Figure 4.1), causing panic and uncertainty in international financial markets, as well as reflecting a greater increase in the prices of the derivatives of this product, as in the case of gasoline, jet fuel, petrochemicals, plastics, fertilizers, among others.Among the causes behind this increase are the following:

- The strong energy demand from emerging markets like China and India, to continue with a strong increase in industrialization and production, so that the emerging countries continue to be used as an essential part as current global growth axis.In the case of C hina is necessary to mention that in 2004 this country accounted for 32% of the increase in global oil demand.

- World demand for oil continues to rise year on year and increased from 83 million barrels per day (mdb) in 2003 to 86.2 for 2008 mdb (Reyes, 2013, p. 83).

- The strong speculative pressure on oil futures markets.

The recent increase in oil prices is the result of a more dynamic demand and lower responsiveness by the oil supply, in addition to geopolitical tensions and the events in the main producing countries (ECLAC, 2009, p. 6).Among the main events are the following:

a) At the end of the first quarter of 1999 were production cuts in many of the States of the Organization of Petroleum Exporting Countries (OPEC) in response to low prices accentuated by the Asian economic crisis that took place in the second half of the nineties, ending decades of rapid economic growth in several countries in East and Southeast Asia.

b) The terrorist attacks of September 11, 2001 in New York.

c) The war in Iraq in March 2003.

d) In 2006, a substantial cut in production in Nigeria, after terrorist attacks and public protests against the oil industry was shown.

e) Unfavorable weather conditions, as in the case of tropical hurricanes in the Atlantic, in the American Continent, which affect particularly the Gulf market.

The history of oil has an explanation of the urgent need of supply at the lowest cost possible and the perception that those with resources are victims of unfair sharing of trading profits. Since 1982 and for over 20 years, the price of this hydrocarbon did not exceed 22.9 a barrel, characterizing this stage as the stage in which the United States exercised control over oil subtracting forces to the Middle Eastern oil countries and organizations as OPEC. However, at the beginning of the century, it became apparent declining U.S. oil reserves, leading it to try to seize Middle Eastern oil, thereby generating the Iraq war and rising hydrocarbon prices (Rubio, 2011, pg. 65).

As discussed previously in 2008, oil prices peaked, positioning in the month of July at over $ 147 a barrel.

However, crude subsequently collapsed and December of the same year the price was below $ 40 per barrel caused by the sharp slowdown in the global economy that caused the reduction in demand for this hydrocarbon. It is important to mention that OPEC sold t to 35.58 dollars a barrel on December 31st, 2008, however, throughout the year the average price was U.S. $ 94.45, representing the highest average on record and surpassing by 25 % to the average of 2007, which was of 69.08 dollars a barrel. The high oil prices are the result of a phenomenon that originates mainly in developed countries, at the end of 2008, these countries entered a deep economic recession and substantially reduced its growth rate relative to the levels observed in the period 2002 - 2007. These unfavorable conditions also contributed to the global financial collapse, causing one of the largest financial crises in history.

All of this can be seen in Figure 4.1, It shows from 2003 the sharp increase in oil prices, generating an upward trend, a trend that continued and even accelerated to mid 2008.The speculative nature of prices generated a peak in 2008 of short duration, because at the end of that year showed a significant decline in the price. however, prices did not keep that downward trend, since early 2009 are beginning to see a new uptrend and volatile.

It should be noted that during the decade of the 90's nominal average prices below 20 dollars per barrel were registered, however, during the year 2000 an increase of 57% compared to 1999 was shown, then followed two years of reduction and stabilization of prices, to return in 2003 with an uptrend.

The oil era and the global economy as we know it is based on the production of hydrocarbons, which has a high dependency on trying to reverse many of the countries of the world who seek to diversify its energy. The increase in oil prices makes biofuel production more competitive.

The period 2003/2008, is the longest period of sustained growth in oil prices, with an annual growth average of 25%.A monthly review shows sharp increases during the first seven months of 2008, with annual variations of 95% in May and June compared with the same months in 2007 (ECLAC, 2009, p. 5). Besides, it should be noted that this oil is still the main source of energy worldwide. If we consider only the commercial energy, oil and its derivatives accounted for 36% of final consumption of primary energy in 2006.

However, biofuels that are considered in non-conventional energy, accounted for only 2% of final consumption of commercial energy, in 2006. Despite the great dynamism that have biofuels and other renewables, they still constitute a small faction of commercial energies (ECLAC, 2009, p. 10).

So it is necessary to point out that the oil supply problem is the energy barrier with greater concern in many countries, among them the Central American Isthmus (Guatemala, Belize, Honduras, El Salvador, Nicaragua, Costa Rica and Panama), where there are no proven oil reserves. In these countries the rise in the price of this Hidroca rburo generated negative effects on economic development.

United States is a country, where the rise in oil prices worldwide, also generated negative effects, because for many years this country has been the largest importer of crude oil worldwide, generating its trade balance showed an important deficit at the beginning of the century.

This increase has had impacts not only in USA but throughout the world, since this results in a direct increase in transport costs of goods traded internationally, however the impacts vary depending on type of country as this can export more than it imports and can benefit from such an increase or be a net importer, so these countries can present a deficit in its trade balance.

Furthermore, a review of production and consumption of commercial energy produced by ECLAC (2009) must be seen deeper. It shows a deficit in three regions: Europe, Asia-Pacific and Latin (See Table 4.1).

In the case of America the deficit has been caused in large part by the United States negative balance (balance currently being modified), as without the participation of this country, the continent would present a favorable balance of production by 13% against 10% of world consumption, being due to the surplus of Venezuela, Canada and other producing countries.However, for the American continent there are other countries like Chile, and almost all of the Caribbean that are characterized by deficits, with little or no reserves.

So, they almost import all the oil and oil products they consume, what constitutes a high dependence on foreign energy for these countries, such dependence has led to the increase in the price of oil, importing countries make greater financial effort to afford to pay the oil bill, subtracting possibilities to use resources in new investments in increasing consumption, etc. (ECLAC, 2009, p. 11-15).

Torres (2010), says that the American continent has more than 95% of world production of bioethanol, while biodiesel production comes mainly from the European Union (EU).From 2000 to 2009 biodiesel production was multiplied by 10, reaching 15 billion liters by 2009, while bioethanol production has also increased significantly, from less than 20 billion liters a year 2000 to 90 million in 2009.It should be noted that most of this growth has been mainly in the United States, Brazil and Germany, which account for more than half of the production of biodiesel and more than three quarters of bioethanol (see chart 2).Experts say that in future years the biofuel sector will continue to grow and forsee for the bioethanol market will double due to the rapid expansion of biofuels in the United States (p. 4).

In 2009, the biodiesel market was led by Europe, whose share of production was 49.8%, while the second place went to the Americas with a share of about 33%.

The main producing countries worldwide during the same year were: Germany, USA, France, Argentina and Brazil, together producing 68.4% of total global biodiesel. However, by 2010, the United States led in the production of bioethanol and biodiesel (see Table 4.2).

Also the consumption of this type of energy has grown considerably, as in the case of the European Union, where consumption rose from 2.4 million tons in 2004 to 12 million in 2009.

The European Union has set targets for the next decade (2011-2020) on promoting the use of biofuels in road transport, in order to reduce the emission of greenhouse gases in this sector.The objective is that by the end of 2010, 10% of the energy consumed in the transport sector come from renewable sources in all member countries of the European Union.

However, it is necessary to mention that this goal will not necessarily be achieved only by biofuels, but other clean sources such as, electricity, hydrogen, etc. can be used The European countries that make the greatest use of biofuels are: Germany, France, Italy, Spain and the UK, countries which together account for 71.1% of the entire European Union. However, it should be mentioned that the growth of biofuel consumption in these countries has lost weight in the whole EU, since in 2005 they accounted for 89.5% of the total, that is 18 points higher than in 2009 (Torres, 2010, p. 8).

Globally, the production of liquid biofuels for transport whose production is based on agricultural commodities have seen a rapid growth, caused mainly by support policies on the production and consumption of the same, especially in countries belonging to the Organization for Cooperation and Development (OECD).Therefore, it is expected that the expansion of biofuels continues in subsequent years even though the contribution of biofuels to transport energy resources remains limited, noting that one of the main limitations of biofuels is lack of inputs, because they generally are also needed agricultural products for human consumption. Given this, it is necessary to consider the significant impact that biofuels have on world agricultural markets, environment and food security, as the new source of demand for agricultural commodities may provide an opportunity for developing countries to take advantage of achieving greater economic growth and rural development in this way to reduce poverty, however, this can not happen without the implementation of public policies directed toward those specific objectives.

Rising food prices caused by increased demand for biofuel inputs can have other repercussions, as it is trying to cover increased demand with the same offer, with consequent economic impact on prices.The impact of high food prices have been negative for food security of vulnerable populations in the world. In 2006, international agencies alerted the world to the scarcity of commodities, causing the increase in food prices worldwide and affecting the livelihoods of low-income people in poor countries and ways in development, which is that this population spends the highest percentage of their income on food (FAO, 2008, p.2).In the period 2005 - 2008, international prices of basic food managed to reach historic highs, creating social unrest in many countries.There are many reasons that explain this increase, among which are the following:

- The high oil prices that generated the increase in production and transport costs
- The growing demand for agricultural products for biofuel production
- Food demand from countries like China and India
- The abandonment of agricultural policies in developing countries
- Speculation in agricultural markets
- Unfavorable weather conditions have affected crop

Another cause of the increase in food prices has to do with oil prices, as the price of oil and food are highly correlated, this correlation has affected the path that has been agriculture, when such prices rise there are some factors that affect agricultural markets, for example, costs increase crop production due to increased costs of fertilizers and transport, as well as already mentioned above, the increase in the oil price encourages the production of biofuel, because in 2003 alongside the increase in the price of oil worldwide also increased demand for ethanol as fuel, increasing by 94% over the period 2002/2005.Also in 2007 U.S. corn consumption increased 40 million tons of which three quarters were absorbed by ethanol plants (Rubio, 2011, p. 65). The increase in oil prices led to a tightening of supply as increased production costs, on the other hand, also generated a greater demand to be such an incentive to increase biofuel production, which increased competitive conditions demand agricultural products that are absorbed to generate large quantities of grain for the production of ethanol.

Ethanol production from corn in the U.S. has been successful, by 2002 production in this country was 2,310 million gallons, an increase for the year 2003 to 2.800 million in the year 2004 to 3.400 million gallons. However, these numbers are small compared to fossil fuel consumption in this country. During the 2002/2005 as ethanol demand gasoline additive step 2,085,000 gallons to 4,049,000, respectively, which results in an increase of 94% (Galarza, 2012, p.110-114).Therefore, the demand for corn for ethanol production also increased significantly as in 2007 40 million tons which increased maize consumption in the country, 30 million were absorbed by ethanol plants.

Whenever renewable energy production or known as "green energy" pressure is a factor in the international food market, as it has increased the demand for corn, sugar and soybeans for the production of biofuels, so it generates that prices in such production increase (CIS, 2011).

Currently all renewables together provide about 19% of world energy, of which, only 0.6% of total energy comes from biofuels. Despite their apparent insignificance as an energy source, their tendency is to occupy important places.

For example, during the period 2004/2008, bioethanol production increased sixfold, while biodiesel production doubled (REN, 2009, p. 13).In Figure 2.2, we can see how it has increased production of bioethanol and biodiesel worldwide during the period 2000/2008, which shows the increase showed higher bioethanol production compared to the production of biodiesel.

In 2009, world production of ethanol reached 76 billion liters, representing an increase of 10% compared with 2008 production.

Much of the increase in production occurred in the United States, then in Canada, Germany and France.

Other countries such as Australia, Belgium, China, Colombia, India, Spain and Thailand also produced significant volumes of bioethanol. It should be noted that the United States is the leading producer of ethanol and subsequently found Brazil, countries which together produced 88% of the total bioethanol 2009.

Moreover, biodiesel production increased 9% in 2009 with a total production was 16.6 billion liters, the European Union as a whole has been the leading producer of biodiesel worldwide, representing about 50% of the total production in 2009, where France led global biodiesel production with (SAGARPA, 2013).

Another cause that generated the increase in food prices worldwide is speculation in agricultural markets.

The market behavior in international financial exchanges has affected global prices of basic grains, as in the bags there was a movement of investment from the oil market to the commodities markets, which generated an uplift in the staple food prices.

Such speculations cycle began in the oil market and then step to financial markets and food markets to finish in the money market (Gomez, 2008, p. 4).In 2007 the world experienced the "real estate crisis" prompting hedge funds flee the market and concentrate in the food market, creating in 2008 one of the highest peaks in the last decades. However, this peak was short-lived, as by December of the same year there was a 50% decline of food prices.

The FAO indicates that the spike in international food prices beginning in 2006, which became a price inflation worldwide, creating problems of food security and causing protests in several countries. The price index of the FAO food increased by 7% in 2006 and 27% in 2007, both years compared with 2005. This increase was maintained and even accelerated in the first half of 2008, where the price index stood at FAO 24% above the value of 2007 and 57% above the value of 2006 (See Figure 4.4) . In 2011, the world experienced the second rise in food prices in the last five years. The index of food prices World Bank increased by 43% between June 2010 and January 2011 (World Bank, 2012, p. 3).However, in February of 2011, the price index of the FAO food was at its highest level since the beginning of the 1990s.

In February 2012, the price index of the FAO food stood at an average of 215 points, representing 1% more than recorded in January of the same year. For the month of September of the same year, the index stood at an average of 216 points, which represented a 1.4% increase recorded in August of the same year (FAO, 2012, p. 1).Currently the index of food prices stood at an average of 215.5 points for the month of April 2013, representing 1% more than the value recorded in March of that year, which was 213.2 and 1% more than the value recorded in April of 2012.It should be noted that the index is only 9% below the peak reached in February 2011 (FAO, 2013, p. 1). Figure 4.4 shows that from the year 2006, the food price index of the FAO starts with an upward trend that achieves a peak in June of 2008, however, from this date prices start short-term decline, and by 2010, cereal prices begin an upward trend that continues to grow until February of 2011, the year in which it becomes to have a historical peak in this index.

Current prices represent a significant break with the average prices of the decades of 1990 and 2000, as the international price of grain doubled between 2005 and 2010 compared with the period 1990-2005, together with cereals, other products such as sugar and rice also showed upward trends.

It is necessary to mention that in relation to cereals, the situation in 2011 was similar to 2008, this was due largely to the price of oil has made an impact on the prices of raw materials through the market biofuels (World Bank, 2012, p. 2).

However it must be recognized that although the price of oil in 2011 than it was in 2008, the price of food if it was higher (see Figure 4.5).

The figure 4.6 shows the strong correlation between the energy market and food, showing similar behavior evident that submitted both markets.

The graph shows a series of time that starts from the year 2000 to the present, where it can be seen as the slight increase in oil prices in 2003 had a significant impact in increasing food prices. Later, it can be seen how in 2008, both markets get the highest prices, where the energy market showed a higher rate. Both markets slowed in late 2008, however, did not last long this slowdown since early 2009 for both markets again show an uptrend. In June of 2008, the index of food prices peaked FAO of 224.4 points and the price of oil in July reached a maximum price higher than $ 147.

To some extent, the food market has been mostly affected the oil market, and the latter showed a peak for the year 2008, however in subsequent years until now it has not generated a peak higher than the year 2008.

While on the other hand, the food market showed a peak in 2008, followed by another peak in 2011, which, significantly exceeded the peak achieved in 2008. The increase in the price of the food s was due largely to the behavior as its oil market, in addition to some of the causes that affected oil prices also impacted the price of food on one hand, the strong demand for both oil by strong expansion of economic activities in emerging countries and newly industrialized countries, and moreover increasing food demand in countries like China and India (ECLAC, 2009, p . 5).

The increase in the supply of biofuels can be mitigated by the parallel increase in food prices. Their overall impact on commodity markets depend on the rise in biofuel prices in relation to the total cost increased agricultural production.

The increase in the price of oil and its derivatives are transferred to the same product in several chains rise in agricultural products is transferred via freight, fertilizers and other agrochemicals. The high price of food and fuel in the period 2007/2008, as the financial crisis this period, finished with a time of poverty reduction in many developing countries.

The drastic changes in prices, especially upward threaten many countries where the poor are the most affected. The impact of the increase in food prices vary depending on the country. Those countries that are net food exporters could benefit from improved terms of trade, however, many of these countries have not benefited as restrictive measures have been taken to prohibit exports to protect domestic markets.

Moreover, the net food importing countries had to meet domestic demand for such products at high prices with a consequent negative effect on the trade balance.

It should be noted that most of the world's households have been affected to such an increase in food prices, which generates most have had to spend more of their income to purchase them.

However, the negative effect it were the poor, since any increase in food prices forces them to limit their consumption sacrificing nutrients, thereby affecting health in the short and long term.

4.3 Conclusions

Oil is highly consumed and generates strong negative externalities, besides being a nonrenewable resource whose extraction cost is getting higher, which many countries have opted for renewable energy such as biofuels.

The period 2003/2008, is the longest period of sustained growth in oil prices, with an average annual growth of 25%, and the increase in oil prices more competitive biofuel production. In recent years, liquid biofuels based on agricultural commodities have seen a rapid growth, so they have had a major impact on world agricultural markets and food security.

Rising food prices caused by increased demand for biofuel inputs can have other repercussions, as it is trying to cover increased demand with the same offer, with consequent economic impact on prices.

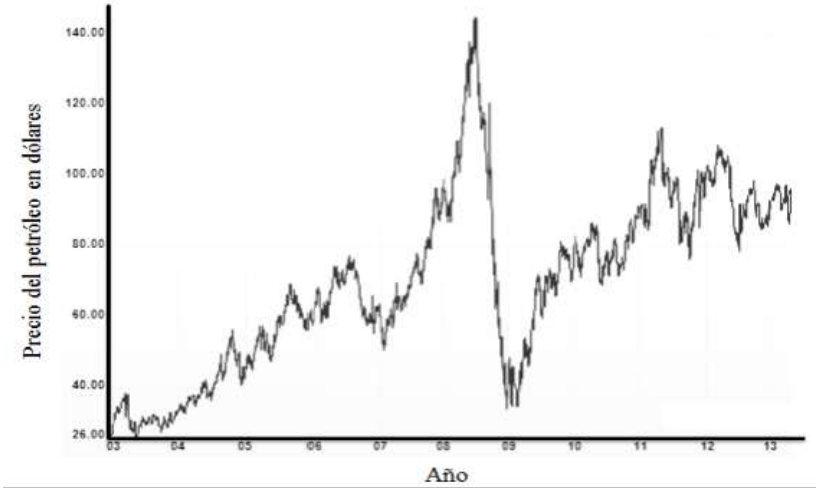
The impact of high food prices have been negative for food security of vulnerable populations in the world. In the period 2005 - 2008, international prices of basic food managed to reach historic highs, creating social unrest in many countries.

This study shows a strong correlation between the energy market and food, showing similar behavior evident that submitted both markets.

The increase in food prices has been due largely to the behavior as its oil market and increased demand for food inputs for the production of biofuels.

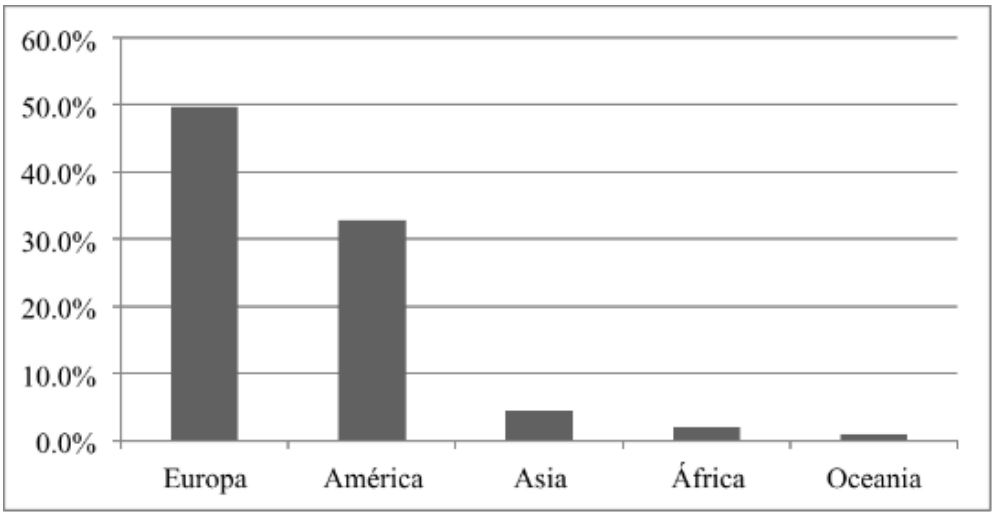
4.4 Figure Section

Figure 4.1 International oil price (dollars per barrel)



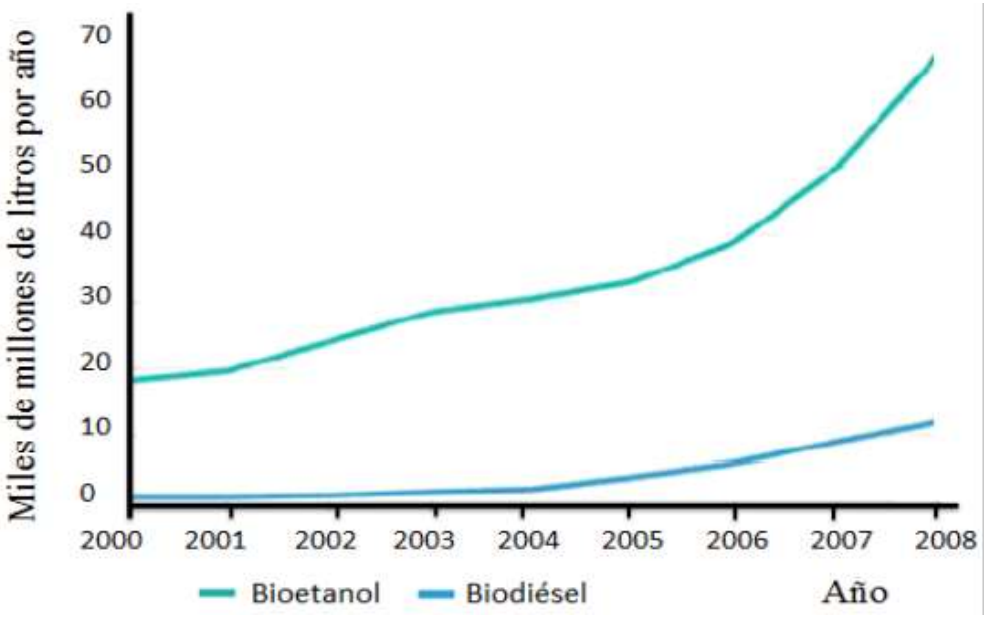
Source: Accessed online at "The price of oil today, 2013", accessed on April 19, 2013 in http://www.preciopetroleo.net/cotizacion-petroleo.html

Figure 4.2 Production of biodiesel by continent by 2010



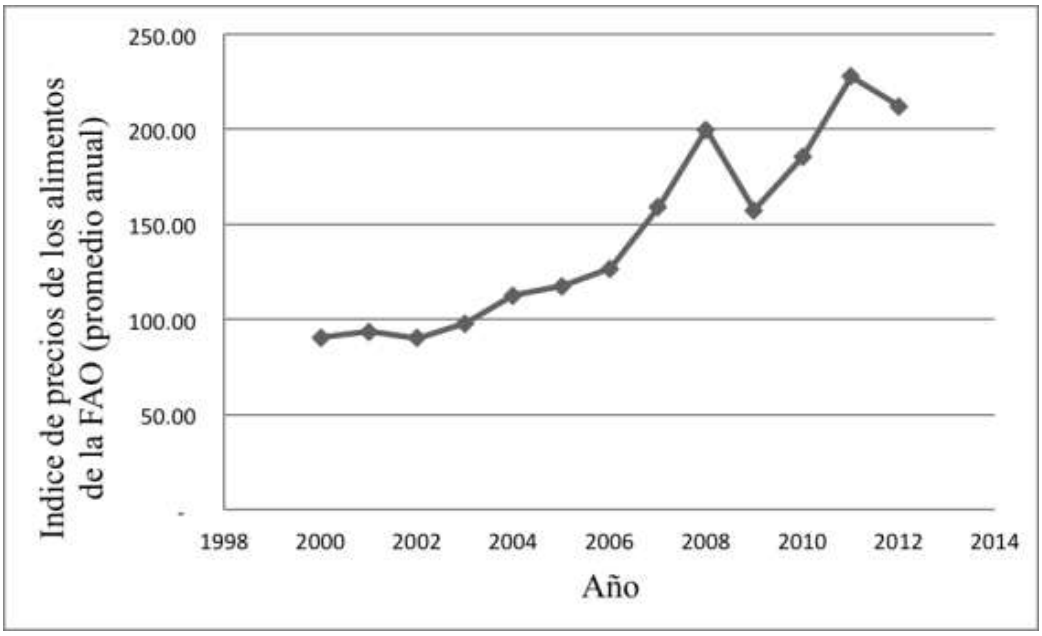
Source: Torres and Carrera (2010), obtained from Infinita Renovables: Sector Report 2010

Figure 4.3 World production of bioethanol and biodiesel, 2000-2008



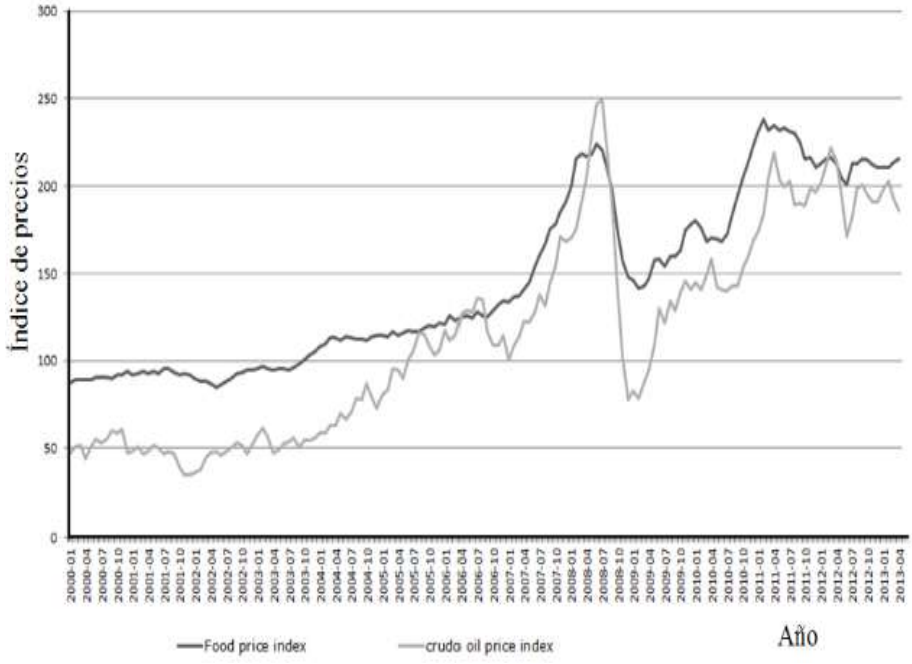
Source: Global Renewables status report, 2009 update, p. 13

Figure 4.4 Price Index of the FAO food (annual average)



Source: Based on FAO data

Figure 4.5 Correlation of the price index of food and the price index of crude oil



Source: Based on data from FAO and the International Monetary Fund

4.5 Section of tables

Table 4.1 Energy balance commercial energy by region, 2005 (in percentages)

	Production	*Consumption*
Total	100	100
Africa	8	3
America	28	31
Asia-Pacific	25	32
Euro-Asia	15	10
Europe	11	19
Middle East	14	5

Source: Obtained from ECLAC (2009). Using data from the U.S. EIA, production and global consumption in 2005

Table 4.2 Ranking of countries production capacity of ethanol and biodiesel

Ethanol			*Biodiesel*	
Country		*Millions of liters*	*Country*	*Millions of liters*
1.	U.S.	51415.97	1. - United States	5912.17
1.	Brazil	26887.52	Two. - Germany	5047.81
1.	China	2699.48	Three. – Spain	5023.19
1.	Franc e	1821.03	April. - Indonesia	4262.31
1.	Canad a	1,494.50	May. – Brazil	4160.28

Source: Torres and Carrera (2010), obtained from the Global Biofuels Center

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