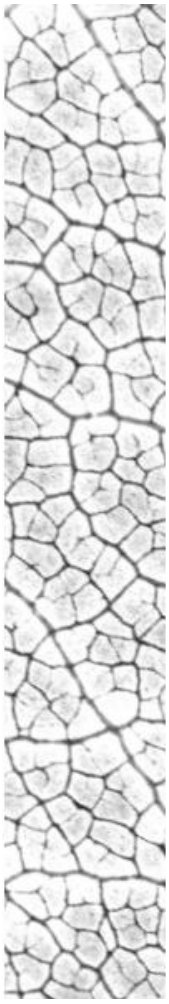

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The effect of biofuel crops cultivation on food prices stability and food security-A Review

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Abstract
Biofuel is the subject of increasing attention in most area of the world especially in the developed countries and some newly developed countries. It has become a controversial issue for the following reasons, rising commodity prices, a negative impact on food security and finally the issue of climate change. An increase in the uses of agricultural land in countries exporting food crops such as wheat, barley and rice and focus to grow oilseeds to produce biofuel, this change leads to food shortages, and rising prices due to a decline in production of basic crops and increasing demand for this type of crops, which is mainly used for food. Obviously high crop prices in this way could lead to an increase in the proportion of famine in the world and adversely affect food security. The cultivation of biofuel crops have many positive aspects including the use of agricultural land, which was left without cultivation and use for long periods of time, as well as providing employment opportunities and thus improve the living conditions of the farmers.

Keywords: biofuel, energy, crops cultivation, food security, food prices stability

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INTRODUCTION

The productions of biofuels coming from renewable resources (plants, organic waste, etc.) and can be used as an alternative to fossil fuels (oil and gas). Also currently being used in some countries in the world an alternative to oil. Ethanol and biodiesel are the main fuels used widely today, but there are other types, such as Bio-butanol, which is in the level of research and development (Tiziano Gomiero 2015). Renewable energy sources represent about 13% of the total primary energy supply, taking into consideration the region because it varies so much from one location to another, regardless of the developing countries may in some cases to 90% of the total energy consumption, The use of bio-energy is not new to humans, by thousands of years the humans have based on biomass for heating and cooking, and developing countries in some parts of Africa and Asia continue to depend heavily on bio-energy (FAO 2008). The energy issue is critical and sensitive issue because of the uneven distribution of sources of fossil fuels among the countries in the world, almost two-thirds of the world's oil assets are in the Middle East as shown in **Fig. 1**, mostly in the Gulf region (the Islamic Republic of Iran, Iraq, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates). Although these six countries now account for only 27% percent of global crude oil supplies, they expected to double their part to 53% percent by 2010 (Suani Teixeira Coelho 2005). Forecasts and current trends that the world will continue to rely on fossil fuels for several decades to come, with a greater share of the world's oil resources concentrated in a few regions in the world, especially in the Middle East (Stephen 2005). Dependence on fossil fuels imported from energy exporting countries has left many countries vulnerable to any potential disruptions in supply and, if it leads to economic disaster, especially in countries that are totally dependent on fossil fuel imports from other countries prices in international markets for conventional sources of energy especially oil, is a fluctuating Mulberry is constantly changing (FAO 2008). This constitutes a serious threat to world stability of economic and political aspects, and sometimes lead to dramatic effects on energy imports from developing countries. In this case, fuels can be all kinds of renewable energies, including biofuels, should help to diversify energy supplies and reduce dependence on oil and increase energy security. Most of countries in the world trying to reduce dependence on imported energy, particularly developing countries import fossil energy, which often spend a large proportion of its reserves of foreign exchange for oil imports. It is well known that the oil reserves in the whole world limited, therefore, we

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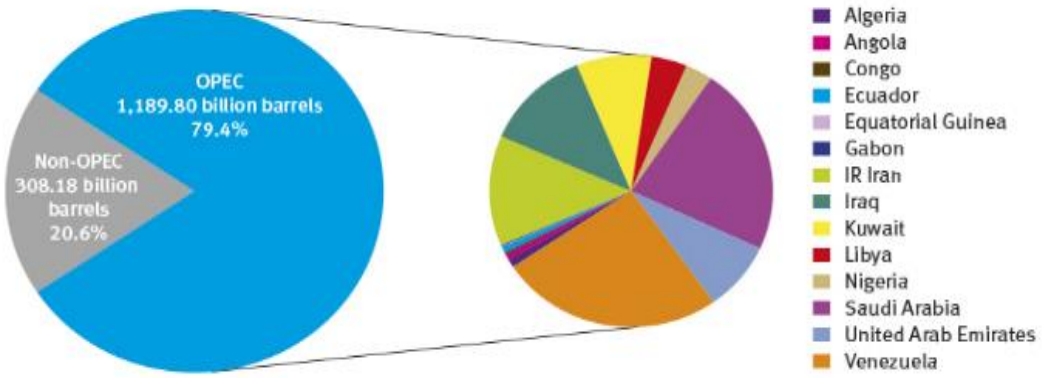

OPEC proven crude oil reserves, at end 2018 (billion barrels, OPEC share)

Venezuela	302.81 25.5%	Kuwait	101.50 8.5%	Algeria	12.20 1.0%	Gabon	2.00 0.2%
Saudi Arabia	267.03 22.4%	UAE	97.80 8.2%	Ecuador	8.27 0.7%	Equatorial Guinea	1.10 0.1%
IR Iran	155.60 13.1%	Libya	48.36 4.1%	Angola	8.16 0.7%		
Iraq	145.02 12.2%	Nigeria	36.97 3.1%	Congo	2.98 0.3%		

Source: OPEC Annual Statistical Bulletin 2019.

Fig. 1. World crude oil reserves 2018
Source: OPEC Annual Statistical Bulletin 2019

must look for an alternative to oil from now consideration of many countries of the world Biofuel from the most suitable alternatives to fossil energy (Saunders Harry 2008). Although the purpose of human cultivation and plant breeding to be used for food but in the last few years, part of which used for bio-energy, this is to reduce pollution and also to reduce dependence on fossil fuels because the amount of oil is limited in addition to the continuous fluctuations in prices (Durrett et al. 2008). Using of agricultural products as Biofuel, one of the main reasons that led to double in price of major agricultural commodities such as grains and oilseed, which the world witnessed in the period between 2002 and the end of 2006, there are other factors such as high price of energy worldwide and the change in trade policies of some countries (Mitchell 2008).

Energy derived from natural resources. Renewable energy sources are fundamentally different from fossil fuels oil, coal, natural gas and nuclear fuel used in nuclear reactors. Would not arise from renewable energy in the waste mostly carbon dioxide or greenhouse gases or global warming occurs when the combustion of fossil fuels or nuclear waste from nuclear reactors, effects of nuclear energy (Debrayan 2018). Renewable energy from wind have been produce via water and sun by progressing of waves and tides or the earth's temperature as well as the complex agricultural crops and trees producing oils. However, these last remnants of this work to increases global warming (Sharma and Sharma 2019). Currently, more production of renewable energy produced in power plants by hydroelectric dams wherever there are appropriate places to build on the rivers, watersheds and used methods that depend on wind and solar energy methods on a large scale in developed countries and some developing countries, but the means of production of electricity using renewable energy sources have become familiar in recent times, and there are many countries have developed plans to increase the proportion of production of renewable energy to cover its energy needs by 20% of consumption in 2020. At the Kyoto Conference, Japan, most heads of state agreed to reduce the production of carbon dioxide in the coming years so as to avoid serious threats of climate change due to pollution and depletion of fossil fuels (Debrayan 2018). In addition to the social and political risks of fossil fuels and nuclear energy, recently on the rise known as the renewable energy business, which is the kind of work that interfere with the conversion to renewable energy sources of income and promotion, which, although there are many obstacles but allatguenip to prevent the proliferation of renewable energies is as broad as high investment costs, and other primitive however, roughly 65 countries plan to invest in renewable energies, and worked to develop the necessary policies to develop and encourage investment in renewable energies. Types of renewable energy sources:

a. Bio-energy
b. Biomass
c. Geothermal Energy
d. Hydropower
e. Solar energy
f. Tidal energy
g. Wave power
h. Wind power (Edenhofer et al. 2013).

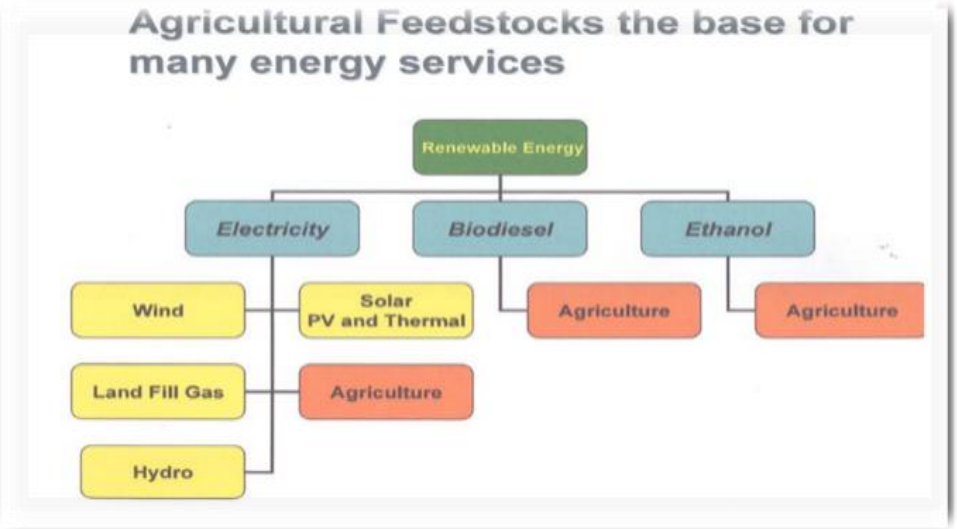

Fig. 2. Agricultural Feedstock's the base for many energy services
Source: (Ugarte 2006)

During this study, we cannot mention all things related to energy, rather, what concerns us now crop cultivated a wide range in order to obtain biofuels, and therefore impact on prices and global food security. It is obvious that the agricultural feedstock is the base for many of the energy services (**Fig. 2**) (Ugarte 2006).

Biofuel Production: What, How and Where?

In the last century specifically in the mid 1970's, several scientific researchers conducted which focused to increase the sources of biomass resources to produce bio- energy. Biomass resources are like perennials, including short-rotation woody crops (e.g., willow, sugar-cane, palm oil, and switch grass), as well as annual crops (rapeseed, beet, corn, maize) (Shahzad 2015). Energy crop species have been more successful in penetrating the energy markets, where governments encourage and applied subsidies and tax incentives. Rapid increase in the rate of economic growth of China and India will continue to grow in the demand for fossil energy. At the same time, prospecting for oil and coal to meet a worldwide shortage of new fields will face more restrictions for instance, increase in costs, ongoing geopolitical tensions and the structure of environment (Almodares and Hadi 2009). As a result, the demand for biofuels will increase in the in the next few years due to fluctuations in the prices of fossil energy and increase the search costs of exploration in newer fields and also policies to reduce emissions of the CO_2. Multi-Technologies, which are commonly used to convert plant material into biofuels available and totally dependent on the type of raw materials used to make biofuels (Shahzad 2015).

Energy Crops

Gateway (energy crops) is used for specific types of agricultural crops or grass grown for the purpose of producing biofuels energy such as oil crops, sugar and

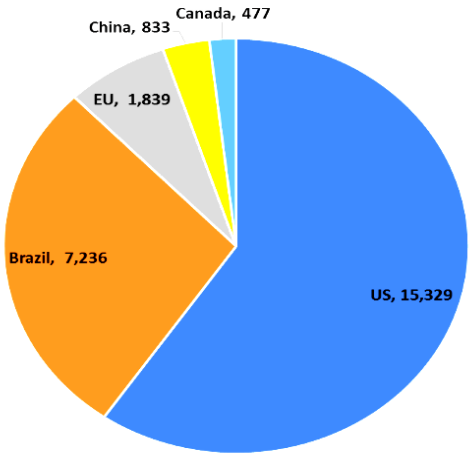

Fig. 3. Fuel Ethanol Production 2016 by major countries (million Gallons)
Source: USDA-FAS, 2017

grain crops for the production of energy. In some areas, there has been extensive cultivation of certain types of these crops, specifically for inclusion in the areas of biofuels, including corn, soybeans in the United States and sugar in Brazil to produce ethanol, which are ranked first and second respectively in the world to produce ethanol in 2005 (**Fig. 3**), as well as turnips, in Europe especially Germany (**Table 1**), which stood the first in the world for the production of diesel fuel in 2005, palm oil in South-East Asia. The crop producing biofuels are divided into three groups:

- Crops used for ethanol production: such as corn and sugar cane, in addition to the possibility of preparation of ethanol from any vessel membership.
- Crops used to produce ethanol or biodiesel: such as soybeans, rapeseed, and drew Alcamelina. Crops used to provide thermal energy by burning: Examples of these

Table 1. World Biodiesel Production by Country 2005

Country	Production (million liters)
Germany	1.921
France	557
United states	284
Italy	227
Czech republic	136
Austria	85
Spania	84
Denmark	80
Poland	80
United kingdom	74
Brazil	70
Australia	57
Sweden	7
Other countries	102
World	3.762

Source: F.O. Licht, "Ethanol: World Production, by country," table, World Ethanol and Biofuels Report, vol. 4, no. 16 (2006), p. 365.

plants millet bacillary and the man's beard and hashish silver (Almodares and Hadi 2009).

The Effect of Biofuel Crop Cultivation on Food Prices Stability

There are many factors those contribute to rising food prices. Like increase in energy prices and related increases in the prices of fertilizers and chemicals, agricultural pesticides, herbicide, increasing the wages of agricultural land and increase in the price of seeds for the purpose of agriculture, which are either producing energy or energy consumers in the process of production. Therefore, all factors together lead to a significant increase in crop prices (**Table 2**) (Ugarte 2006). Higher energy prices in the few years ago and the rapid rise in transport costs and increase incentives for biofuel production by most governments encouraged the policy of support for biofuel production (Baier et al. 2009, Mitchell 2008). The increase in the production of biofuels may inflict the increasing demand for food, and also results in broad land use changes reduce wheat supplies of food crops that compete with foodstuffs used for production of biofuels. Import staple crops, especially oil crops by the government of China to feed its population and a large proportion of the world population as well as the livestock industry and poultry have contributed to rising prices of seeds. There are other factors, including the depreciation of the dollar in the past few years against most world currencies. Higher energy prices contributed to an increase by approximately 15-20 percent of the value of agricultural commodities and transportation costs. Cost of production per acre in the United States, for corn, soybeans and wheat has risen 32.3, 25.6 and 31.4 percent respectively, during the past five years from 2002 to 2007 (Mitchell 2008). Increase in demand for biofuel crops in the world for the production of biofuels widely, has a strong impact on agriculture at the world level. Trends (long-term) of declining agricultural products prices in order to reverse the raw materials used in biofuels. Incentive to increase agricultural production will tend to increase land prices, agricultural

Table 2. Price Impacts of 25*25 in the US

Crop and Seenario	2007	2010	2015	2020	2025
Corn: bioenergy goals	77.3	100.2	95.1	96.9	115.1
Corn: baseline	79.9	94.4	94.4	91.1	89.3
Wheat: bioenergy goals	115.6	118.3	125.4	144.7	148.9
Wheat: baseline	117.1	122.8	134.1	132.2	130.7
Soybeans: bioenergy goals	206.1	233.9	248.6	257.3	271.6
Soybeans: baseline	203.4	224.1	229.8	220.4	214.3
Cotton: bioenergy goals	1143.4	1143.4	1390.0	1412.5	1412.5
Cotton: baseline	1143.4	1143.4	1227.9	1227.9	1300.4
Energy Dedicated Crops: bioenergy goals	0.0	0.0	46.85	60.9	81.85
Energy Dedicated Crops: baseline	0	0	0	0	0

Source: (Ugarte 2006)

production in all regions of the world that despite the differences from one country to another country. In the some European Union countries lead to reduced ability to produce enough crops for domestic energy to produce biofuels because of the lack of land, causing a deficiency in agricultural trade. Expansion of agricultural land use on a global scale, may indicate a decline in the prices of agricultural crops, all the results depend on the availability of land relative to countries all over the world (Brahim et al. 2018, James 2006).

In some regions of the world, trade balance deficit of agricultural commodities used for biofuel production will increase dramatically under the scenarios of biofuels. In central and South America because of the availability of agricultural land will expand the export of agricultural products to produce biofuels. Land availability for these countries duo to increasing production without huge of money, while this is not possible in European Union countries because of to land scarce (Amezaga et al. 2010). The reduction in prices of agricultural crops through the cultivation of crops for energy production depends on the availability of land relative to countries all over the world. In many parts of the world and there are discussions about the effect of cash crops for access to land by the poor. In many ways biofuels are not different from other cash crops in these discussions. However, it is possible that the sheer speed of the development of biofuel making will generate new pressures on land tenure arrangements. Biofuels would disrupt the expansion or improvement of poor people's access to land (Peskett et al. 2007). The impact of crops energy cultivation alone, unfortunately, do not directly contribute to reduce the prices of food crops and even non-food crops, and this for many reasons, we remember some of the reasons affecting the prices of crops in the world:

- Current production, policies and goals for the future indicate that the global annual production of bio-ethanol will increase to 120 billion liters by 2020; annual biodiesel production will increase to 12 billion liters by 2020, which leads to increased demand for agricultural products.
- Limited arable land as well as damage to the soil due to erosion, also the increase in the wages of agricultural land.

- The rapid increase in the number of the world's population, which leads to increased demand for agricultural products.
- The increase in the cost of production (fertilizers, pesticides, wages for workers, tax and transport).
- Environmental changes (drought, high water level and warming).
- Application of the old traditional methods still prevailing for the development of the agricultural system by many developing countries, which impedes the increase in production (Bringezu et al. 2009).

The Effect of Biofuel Production on Food Prices Stability

Increase in the production of biofuels in the recent years, especially using ethanol in the United States and Brazil, as well as biodiesel in Europe, caused an increased demand for food commodities. Therefore this increased demand has led to a rapid increase in the prices of essential crops food for subsistence. The higher prices for food commodities in international trade has increased sharply since the beginning of 2002 until late 2006, prices of vital foodstuffs such as grain and oilseed prices have doubled in the past three years (Brenden et al. 2017). The high prices have caused riots in many countries, this rise in prices to the power of most governments in the implementation of new policies such as a ban on exports of grain and other foodstuffs, and reduction of customs duties on imported foodstuffs in other countries. Application of new policies reflected the concern of governments about the implications of rising food prices on the poor in developing countries, on an average; spend half of their household incomes on food. There are many factors that led to the rise in prices, in particular, the contribution of these crops to produce biofuels (ethanol and biodiesel), which eventually led to a rise in food prices (Brenden et al. 2017). Agricultural rising prices caused by demand for Biofuel production in the forefront of the debate on the potential conflict between food and fuel. For example, the sports car four-wheel drive needs to be the amount of 240 kg of grain to fill the tank of ethanol (240 kg of corn to produce 100 liters of ethanol), this much amount weight of corn could be enough to feed one person for one year (World Development Report 2008). Therefore, the competition between food and fuel would be real competition. The rise in prices of staple crops can cause serious losses towards welfare of livelihood for the poor, who mostly net buyers of food staples, but the producers of the poor and others who originally were net sellers of these crops, and other will benefit from higher prices. Could be based on biofuel technology in the future, crops destined for energy production, which in turn helps to reduce the prices of crops used for human food (**Table 2**). Agricultural residues and wood instead of food crops, potentially reduces the pressure on the prices of food crops potentially and reduces the pressure on prices of food crops, but in the second generation technology of biofuels to convert to cellulose from waste products, sugars distilled to produce ethanol, or to convert biomass into a gas that is still not commercially viable-for the next several years (Darith 2009).

The Effect of Biofuel Crop Cultivation on Food Security

Poverty in rural areas and the lack of government programs for rural development is the most notable causes of food insecurity, conflict, terrorism, corruption, environmental degradation, as well as the use of a large amount of food in bio-fuel, leading to the creation of humanitarian problems (FAO 1996). Also using a large area of arable land for the purpose of biofuel crops cultivation, this area is increasing annually, for instance in 2004 were 13.6 Mha of cropland, after three years increased to cover about 26.6 Mha. Food production in the world has increased substantially. As a result of the use of new technology and the utilization of most of the arable land, however, households and the inadequacy of national income, as well as natural disasters or man-made all of these reasons prevented the population from food to meet basic needs. We should not obscure the vision, the effect of directing significant part of the agricultural crops to biofuels production, especially in developing countries (Ravindranath et al. 2009). During the period between 2002 and 2007, coinciding with increased production of the first generation of biofuels, prices of some types of agricultural crops hit record high unreasonable prices unimaginably human beings, this rise is due to several factors. Most notably the trend towards the use of some types of crops such as corn and sugar cane, grain and oilseed crops to produce biofuels, resulting in adverse economic consequences for poor countries. Out of this tragic reality, it has a political orientation to the production of biofuels from food crops, raising concerns and questions fundamentally to most people about the adverse effects on global food security, in light of suffering some developing and poor countries, environmental challenges of the real by the lack of water scarcity, drought, and floods, and reflected directly on food security. Having given the rapid growth of world population in the twenty-first century expected to reach about 10 billion people by 2050 (**Fig. 4**), and the problems of hunger and nutrition insecurity will continue, or even increase dramatically in some regions, unless urgent measures taken (United Nations 2007). Before we discuss the UN Data on food security, it required to see what does that mean malnutrition or food insecurity, definition of food security as defined by the World Bank is "access for all people of all ages at all times to enough food to get active and healthy life" (ATKINSON 1995). Between 2001 and 2003, the organization estimated the Food and Agriculture Organization of the United Nations had 854 million people undernourished in the world; including 820 million were in developing countries and

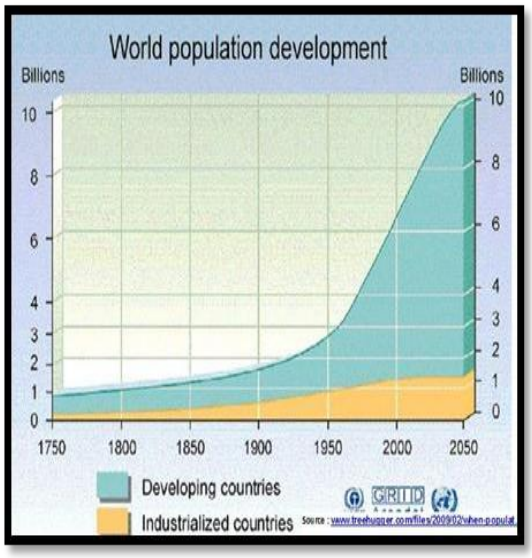

Fig. 4. World population development
Source: www.agpolicy.org

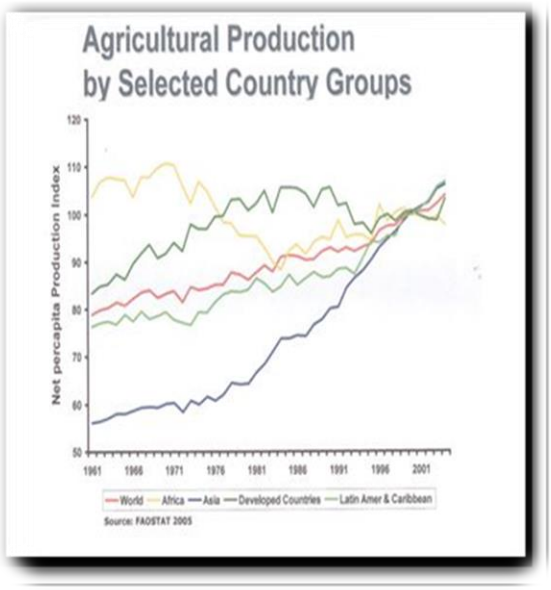

Fig. 5. Agricultural production by country group
Source: FAO STAT 2005

25 million in transition countries and 9 million in industrialized countries. Therefore, agricultural production also varies between countries depending on how the development of those countries, as is clear from **Fig. 5** (Venturini et al. 2009). It is expected to conclude that the lack of nutrition in the world, as well as food security problems in the world is critical, and their relationship to the production of biofuels must be studied from all aspects related thereto. The most serious causes of food insecurity are poverty in terms of income per capita, and access to free education, health, provision of agricultural resources and providing technology, as is evident in **Fig. 6**.

The United States alone have the capacity to export about 70% of corn in the world. More and more of the distillation unit are being built to produce ethanol. This has caused increased concern of food manufacturers that rely on these pills for oil-importing countries and food at one time, as oil prices steadily rising, and thus the production of biofuels from agricultural products is more profitable, and the use of agricultural products in the biofuel industry is huge due to higher oil prices. Certainly because an increase in crop prices due to increased demand, this will create a humanitarian disaster and increase the number of poor in the world (Brown 2006). For example in the USA, the area used for cultivation of maize has increased, and pushing of the areas of other crops such as wheat and soybeanetc. As being more cereal crops used for energy purposes, and available stocks to drop food, which causes warnings for the availability of food and high prices. In this way, the increase in the production of biofuels in the United States had a direct impact on the prices of grain and other foods products related in 2006, the price of corn and wheat reached the highest levels over the past 10 years (Grant 2007).

Evolution and the advent of biofuels in the past few years provides a new opportunity for agriculture to contribute to building a better society, and do so in a way that reduces market competition and improve energy

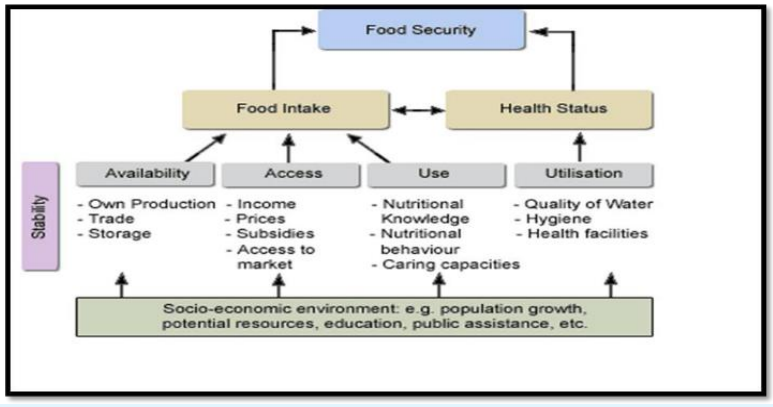

Fig. 6. Determinants of Food Security
Source: (Darith 2009)

Table 3. Employment in Biofuels Production

Country	Current (no of people)	Additional jobs in the future (no of people)
US (ethanol only)	147 – 200,000	
Brazil (ethanol)	500,000	
France		25,000 by 2010
Colombia		170,000 by approx 2010
Venezuela		1,000,000 by 2012
China		9,000,000 in the long term
Sub-Saharan Africa		700 – 1,100,000

Source: Worldwatch Institute (2006)

security and reduce dependence on oil. A little while back, increased concern has arisen about the impact of increased biofuel production on food security. Warning of the use of crops for energy production, expectations of sustained high food prices high over the next decade, and it also expected an increase in the number of displaced persons as a result of Biofuel production. These effects would be detrimental and affect, in particular to developing countries, which many of these countries are net importers of food (Midmore 1993). The subject of biofuels, raising many questions and different points of view and sharp as presented, due to economics and ethical. What is the impact of this process in the event of deployment and expansion in the availability of important food crops? What is the amount of fuel that will eventually result in converting a large amount of food necessary for mankind? Is it sufficient to replace conventional gasoline? Is it feasible for the replacement of human agricultural products fuel for cars? The question always arises: Is not it more useful to rely on traditional fuels, rather than entry into the new global crisis, like the scarcity of staple crops of the people and raise their prices and then pay a quick and high inflation without the need for that? (Oliphant et al. 2018).

In addition to using more than 26 Mha (million hectares) of agricultural land to produce biofuel crops, it is possible to double this area in the next ten years because it is used to cultivate Biofuel crops instead of food crops (Ravindranath et al. 2009). Also lost a lot of exploitation of the forests to grow crops intended for fuel those contribute to curbing the effects of climate change.

Benefits of Biofuel Crops Cultivation

In general, increased cultivation of biofuel crops in the world may lead to increased production of biofuels, therefore, decline in energy prices; decline in the price of energy means the decline in the cost of agricultural production. In other words, can be used to expand the cultivation of crops for energy production to improve the living conditions of farmers and provide employment for a large number of people in rural areas (**Table 3**). In 2004, the sugar cane sector in Brazil is responsible for providing more than 700,000 jobs and 3.5 million indirect jobs. This is a great achievement at the same time lead to the growth and development of rural areas and improves their living conditions (Goldemberg 2005, Oliphant et al. 2018). To reduce greenhouse gas emissions and environmental impact of transport, these benefits can be a key to reduce urban pollution problem since emissions from the transport sector contributes to a large amount to emissions. Another important benefit of Biofuel crops cultivation is making full use of agricultural land, including land that has been left without using for a long time. More importantly, all provide a significant proportion of energy is expected to reach 10% of the total energy sources in the world, which help to diversity of energy and not total reliance on conventional oil (Oliphant et al. 2018).

CONCLUSIONS

Biofuel is the subject of increasing attention in all parts of the world, especially in the developed countries. It has become a controversial issue for the following reasons. Firstly, high commodity prices, secondly the negative impact on food security, thirdly and finally the issue of climate change. Biofuel development always associated with food security. Changes in agricultural land use in the exporting countries of wheat in response to increased cultivate of oilseeds for biofuels production, therefore this change leading to a shortage of food, at the same time leading to higher prices due to a reduction in production and increased demand for food. In 2007, crops for transport biofuels covered about 1.7% of the global cropland in the world but in 2004 were about 0.9% of global cropland in the world, which is means that after three years, which increased the area of land used for cultivation of fuel crops to about double. When we look carefully during the period of 2004-2007, food prices rose sharply and reached record rates it. Therefore increasing the number of people, who suffer from a lack of nutrition or malnutrition, certainly has been effects on food security (Bringezu et al. 2009).

Biofuel crops have many positive aspects of rural areas including providing employment opportunities and thus improve their living conditions. In addition to use of abandoned agricultural land by some farmers without cultivation of long-term. Regrettably, cultivation of biofuel crops, in most cases does not lead to a decline in crop prices at present or near future due to continued demand for those crops. At the same time due to use part of the suitable land for cultivation of biofuels crops, could lead to food shortages in the World. The cultivation of crops for long periods of time certainly may help to decrease or put an end to the high experienced by global markets for fossil energy. Reduction in fossil energy prices will greatly help the large drop in prices of food crops by reducing the cost of production and thus maintain the food security (Oliphant et al. 2018).

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