

Impact of Utilizing FOOD Crops in Biofuel Production on Arab Food Security

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ABSTRACT

Recent years have witnessed unprecedented soars in international prices of food commodities. Wheat prices sharply increased by 200% between 2005 and mid-2008, whereas corn prices increased by 60%. Such soaring prices, which concurrently occurred with the tendency towards utilizing grain crops in biofuel production, resulted in shortages in the world supply of food crops. Taking into consideration the growing demand on food crops, further rises in food crop prices occurred.

The study investigates world fuel production from various sources during the period 2000-2007, with a special reference to biofuel production, and the various impacts of utilizing agricultural crops in biofuel production on the several variables in the Arab region, these are the state of food security relevant to food prices; size and value of the food gap; self-sufficiency in major food commodities; food commodity stocks; and average per capita share of food commodities. Based on the findings the study offered some recommendations regarding the measures that can be applied to limit the negative impacts on food security in the Arab region.

KEY WORDS: biofuel, ethanol, Arab food gap, Arab food security.

INTRODUCTION

Recent years have witnessed unprecedented soars in international prices of food commodities. Wheat prices sharply increased by 200% between 2005 and mid-2008, whereas corn prices increased by 60%. Such soaring prices led to sharp increases in the costs of producing red meat, poultry, eggs, and milk. As a result, the import bill of food commodities in developing countries that suffer shortages in food commodities production sharply increased. Such soaring prices, which concurrently occurred with the tendency towards utilizing grain crops in processing biofuel, resulted in higher expenditure on food commodities thus deteriorating standards of living in developing countries. Moreover, the rises in world oil prices led countries with surplus food production to devoting part of their agricultural lands to biofuel crops production, thus larger quantities of their grain crops, oil crops, and sugar crops are allocated to ethanol production. Such actions led to more declines in the world supply of food crops thus higher prices, especially with the growing demand in the world markets of those crops.

Study problem

Reviewing the state of food security and self-sufficiency in Arab countries revealed declines in self-sufficiency rates which reached 50% in grain crops, 38% in vegetable oils, and 29% in sugar. The value of food gap in grains, oils, and sugar increased to reached US\$ 12, US\$ 2, and US\$ 2.9 billion in 2007. The growing dependency of developed countries on food crops for biofuel production foretells that the value of Arab food imports bill shall continuously rise.

Study objectives

The study aims to assess the impact of utilizing food crops in biofuel production on Arab food security, and to explore the appropriate policies to combat the probable negative impacts such of such trend.

Methodology and Sources of Data

The study applied descriptive data analysis, and depended on data published by the Arab Organization for Agricultural Development (AOAD), in addition to reports related to the study subjects.

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1. Energy Sources

a. Non-Renewable Energy

Non-renewable energy is extracted from fossils such as coal, natural gas, and oil. It is characterized by high energy content, and ease of transfer and storage. It is usually used for operating airplanes and ship engines. However, it causes air pollution and global warming.

b. Renewable Energy

Renewable energy is obtained from natural resources such as wind, water, sun, in addition to oil crops and trees. Biofuel is therefore considered one of the renewable energy sources. It is the biological substitute for crude oil. It is clean fuel that is widely used in many countries, mainly the USA, Brazil, Germany, Sweden, Canada, China, and India. It is worth noting that Brazil and the USA are the two main producers of biofuel.

Global Trends in Biofuel Production

Biofuel is either produced in the form of ethanol extracted from sugar or grains, and can be added to gasoline, or in the form of bio-diesel that is extracted from oil crops or palm oil, and can be added to diesel. It is clear from table (1) that world production of ethanol reached about 56.87 billion liters in 2007. The USA is considered the major producer of ethanol, with a production capacity estimated at 20.95 billion liters of ethanol extracted from corn. Brazil ranks second with a production capacity estimated at 19.2 billion liters of ethanol extracted from sugarcane. Ethanol produced by the USA, Brazil, the EU countries, China, and India represents 37%, 34%, 8%, 7%, and 4% of the world production of ethanol, respectively. Ethanol produced by the rest of the world represents 11% of the world production of ethanol.

Table (1): World Production of Ethanol during the Period 2000-2007

Country	(in billion liters)								Relative Importance (%)
	2000	2001	2002	2003	2004	2005	2006	2007	
USA	7.6	8.12	9.59	12.06	14.31	16.21	19.85	20.95	36.83
Brazil	10.61	11.5	12.61	14.73	14.66	16.06	17.82	19.20	33.76
EU	2.42	2.58	2.51	2.47	2.45	2.79	3.44	4.60	8.10
China	2.97	3.05	3.15	3.4	3.5	3.5	3.55	3.80	6.68
India	1.72	1.78	1.8	1.77	1.23	1.1	1.65	2.10	3.69
Rest of the World	4.09	4.29	4.41	4.58	4.56	4.63	5.01	6.22	10.94
World Total	29.41	31.32	34.07	39.01	40.71	44.29	51.32	56.87	100

Source: A Review of the Current State of bio Energy Development in G8+5- Countries, FAO, 2008

Bio-diesel is produced by blending animal fats or vegetable oils with alcohol at a rate of 80% oil to 20% alcohol. Vegetable oil is extracted from oil crops such as soybeans, oil palms, and Jatropha. Bio-diesel can also be blended with mineral diesel. Moreover, recycled vegetable oils and animal fats together with plant residues can be used as bio-diesel. In 2006, world production of bio-diesel reached a total of 6 billion liters, of which the EU produced 3.6 million tons, mainly from turnip, sunflower oil, and palm oil. The USA followed with a production quantity estimated at 1.8 million tons during the same year.

- Biofuel Production in the Arab Region

1. All Arab countries do not utilize food crops in processing biofuel, rather, they use plant and animal residues, estimated at 300 thousand tons in Jordan, about 4 million tons in Iraq, about 15 million in Sudan, and about 30 million tons in Egypt.
2. Non-food oil crops are used in biofuel production, such as jatropha (planted in Jordan, Tunisia, Iraq, Egypt, and morocco); Jojoba (planted in Jordan and Egypt); flax, bardi, and rapeseed planted in Iraq; and sugar turnip planted in Tunis.
3. Industrial wastes are also used, such as molasses in Sudan, Syria, and Egypt; and the by-products of olives and grapes in Syria.
4. Most Arab Countries plan to develop their current biofuel production plants, and establishing new plants for future production.
5. Countries with initiatives for biofuel production include Jordan, Egypt, UAE, Algeria, Sudan, and Oman.

Impacts of Utilizing Food Crops In Biofuel Production On Arab Food Security

The global food crisis that concurrently occurred with utilizing food crops in biofuel production resulted in several negative impacts on Arab food security, the most important of which include:

1. Higher food imports bill
2. Increased deficit in food trade balance
3. Higher prices of food commodities
4. Higher food inflation rates
5. Shortages in food supplies

6. Lower real income
7. Lower food commodity stocks
8. Lower per capita share of food

Despite the increased production of food crops in the Arab region, the food gap in most food commodities still exists, which resulted in higher imports. Food imports bill sharply increased due to the soaring prices of food crops, which led to negative impacts on the state of food security and the strategic stocks of food crops in the Arab Region.

I. Impacts of Using Food Crops in Biofuel Production on Food Prices

Figures in Table (2) indicate the percent of increase in the prices of food commodities in the Arab Region during 2006/2007 and 2007/2008. It ranged between a minimum of 11% and a maximum of 21.4%, which can be explained by the higher prices of wheat, vegetable oils, rice, sugar, and milk by 16.3%, 21.4%, 12.8%, 10.8%, and 12.4%, respectively. Arab food price index increased during the same period, where it reached 132.2 for wheat; 134 for rice, 142.2 for sugar, 131.6 for vegetable oils, and 137.7 for milk in 2007. Such rising food prices led to lower food expenditure among limited and middle-income households, higher poverty levels, and lower health levels thus the spread of malnutrition diseases.

Table (2): Relative Change and Food Commodity Price Index in the Arab Region during the Period 2005-2007

Commodity	Relative Change Between 2006 and 2007	Index Number 2005	Index Number 2006	Index Number 2007
Wheat	16.3	115.3	122.3	132.4
Rice	12.8	122.1	124.2	134.00
Sugar	10.8	124.4	134.6	142.2
Vegetable Oils	21.4	102.7	123.2	131.6
Milk	13.4	125.7	129.9	137.7

Source: Arab Organization for Agricultural Development, Annual Report on Arab Food Security, 2007.

II. Impacts of Using Food Crops in Biofuel Production on Arab Food Gap

Figures in table (3) show that the value of total trade gap in major food commodity crops highly increased between 2006 and 2007 as a result of lower production and higher imports of grains and legumes in the Arab region. The value of gap increased from US\$ 18.2 billion in 2006 to US\$ 22.5 billion in 2007 then slightly declined to US\$ 22.5 in 2008. Grains have been the most affected food group, where the value of trade gap in grains increased from US\$ 9.5 billion in 2006 to US\$ 12.5 billion in 2007 then slightly declined to US\$ 12 billion in 2008.

Table (3): Relative Change and Value of Food Trade Gap for Major Food Commodities in the Arab Region during the Period 2006-2008

Commodity Group	2006	2007	2008	Relative Change Between 2006 and 2007	Relative Change Between 2007 and 2008
Grains & Flour	9.5	12.5	12	31.58	4
Rice	1.4	1.5	1.6	7.1	6.7
Sugar	2.8	2.9	2.9	3.6	-
Vegetable Oils	1.7	2.00	2.6	17.6	30
Milk	3.3	3.9	4	18.2	2.6
Total	18.2	23.2	22.4	27.5	3.4

Source: Arab Organization for Agricultural Development, Annual Report on Arab Food Security, 2008.

Figures in table (4) indicate that grains and flour account for 46.6% of the total food gap value for major food commodity groups in the Arab Region. Milk and dairy products group ranked second with a gap value accounting for 15.53% of the total. Sugar, vegetable oils, and rice followed with gap values accounting for 11.24%, 10%, and 6.27 of the total food gap value, respectively.

Table (4): Major Food Commodity Groups' Share in the Total Value of Trade Gap in the Arab Region during the Period 2006-2008

Commodity Group	2006	2007	2008*
Grains & Flour	45.16	48.87	46.63
Rice	6.86	5.69	6.27
Sugar	13.45	11.54	11.24
Vegetable Oils	8.26	7.89	10.00
Milk & Dairy Products	15.81	15.46	15.53

* AOAD Estimates

Source: Arab Organization for Agricultural Development, Annual Report on Arab Food Security, 2008.

As regards self-sufficiency rates, figures in table (5) show that grains, oil seeds, and sugar groups are amongst the groups in which Arab countries realize low self-sufficiency rates. In 2008 self-sufficiency of grains, vegetable oils, and sugar have been estimated at 52.3%, 30.32%, and 30.3%, respectively.

Table (5): Self-Sufficiency Rates of Major Food Commodity Groups in the Arab Region during the Period 2006-2008

Commodity Group	2006	2007	2008*
Grains & Flour	54.9	49	52.3
Rice	74.1	75.6	75.7
Sugar	30.6	29.3	30.2
Vegetable Oils	28.6	37.9	30.3
Milk & Dairy Products	69.8	69.8	69.1

* AOAD Estimates

Source: Arab Organization for Agricultural Development, Annual Report on Arab Food Security, 2008.

III. Impacts of Using Food Crops in Biofuel Production on Arab Food Commodity Stocks

Countries should keep strategic stocks to meet local consumption for a future period of 3-6 months. Stock commodities include grains, sugar, and milk. The size of commodity stock depends on the world supply of those commodities, and is considered an indicator on the state of food security. Figures in table (6) indicate the size of food commodity stocks in the Arab region during the period 2003-2007.

Table (6): Arab Food Commodity Stocks during the Period 2003-2007

Commodity	(000 tons)				
	Stock 2003/2004	Stock 2005/2006	Stock 2006/2007	Stock 2007/2008	Change in Stock between the last two years%
Wheat	1963.28	7539.4	11920.3	-6852	-42.52
Rice	536.63	301.6	307.3	316.4	2.96
Sugar	1096.33	360.4	403	437.8	8.64

Source: Arab Organization for Agricultural Development, Annual Report on Arab Food Security, 2007.

It is clear from the table that Arab wheat stock sharply declined from 11920 thousand tons in 2006/2007 to 6856 in 2007/2008, down by 42.5%, whereas rice stock slightly increased by 2.96%, while sugar stock increased by 8.64%.

IV. Impacts of Using Food Crops in Biofuel Production on Arab Per Capita Food Share

The increasing population rates, lower grain imports due to lower world supply of grains, and higher grain prices resulted in lower average per capita share of grains in the Arab region. It reached 97.1% of the average per capita world share of grains between 2006/2007 and 2007/2008, where it declined from 339.3 to 336.6 kilograms between the two years, down by 0.8%. Sugar per capita share declined from 25.4 to 13.7 kilograms between 2006 and 2007, down by 6.62%. Figures in table (7) indicate that average per capita share of rice and vegetable oils represent 31.3% and 46.3% of the average per capita world share of the two commodity groups, respectively. As regards sugar, and milk and dairy products, Arab average per capita share surpassed world per capita share of the two commodity groups by 9.1% and 7.3%, respectively.

Table (7): Average Per Capita Share of Major Food Commodity Groups Available For Consumption In The Arab Region During The Period 2005-2007

Commodity Group	(kilogram/year)						
	2005	2006	2007	Relative Change between 2005 & 2006	Relative Change between 2006 & 2007	World 2007	Arab Region To World (%)
Grains & Flour	334	339.3	336.6	1.6	-0.8	346.7	97.1
Rice	29.5	30	30.2	1.59	0.59	96.47	31.3
Sugar	22.9	25.4	23.7	10.73	-6.62	21.72	109.1
Vegetable Oils	16.4	17.4	18.2	6.48	4.15	39.21	46.3
Milk & Dairy Products	106.5	105.6	107.5	-0.86	1.78	100.2	107.3

Source: Arab Organization for Agricultural Development, Annual Report on Arab Food Security, 2007.

Recommendations to mitigate the Negative Impacts of Utilizing Food Commodities in Biofuel Production

1. Designating sustainable agricultural development plans to achieve vertical and horizontal agricultural expansions, and developing new, high yielding varieties.
2. Adopting appropriate plans to mitigate the impacts of rising prices of food commodity.
3. Subsidizing major food commodities.
4. Subsidizing farmers and promoting private sector's agricultural investments internally and externally.
5. Designating an integrated policy to raise wheat, sugar, and oil seeds production.
6. Promoting the agro-industries.
7. Building up strategic stocks of major food commodities.
8. Lowering custom tariffs on imported food commodities.
9. Lowering losses and wastes of agricultural products during post-harvesting and marketing stages.
10. Signing trade agreements with countries of production to ensure the application of food safety and quality assurance measures.
11. Arab countries should adopt policies to produce biofuel from plant and animal wastes and by-products, which have no negative impacts on food security.
12. Activating inter-Arab agricultural trade.
13. Achieving agricultural integration based on the comparative advantage of agricultural production.
14. Support and development of scientific research in Arab countries, especially those suffering shortages in water resources.

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