The economic effects of climate change on Egyptian food security of wheat crop

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ABSTRACT

The phenomenon of climate change is considered one of the most important challenges which face the world in the recent and coming years which are represented in high temperature as a result of the significant increase in global warming gas emissions, which make the ground like a green house. Egypt is not unaffected by climate changes which will have a huge effect on agriculture and food sector. This study aims at evaluating the impact of climate changes on the most important strategic crops in Egypt which is wheat crop. 2030 represented in the production, consumption and, the size and value of the food gap and self-sufficiency rates and acre return. The study has used various scenarios adopting the estimation of the previous economic indicators in case of the increase in carbon emissions and its effect on the reduction of feddan productivity, as many studies have proved, and lack of land and drown about 15% of the Delta. The Study has also examined determining the degree of Egyptian food security of wheat through measuring food dependency index which has demonstrated rising of the ratio of this index which means that this crop lies in food dependency, as the ratio is more than 30%. The study has recommended the necessity of taking care of the field of scientific research and the application of the applied research results, which was able to develop varieties of high-return wheat which has short stay in the ground, that bear the salinity and temperature and can be water-saving, so we can even overcome the lack of production caused by climate changes.

Key words: Wheat-climate changes-Egyptian food security.

Introduction

The phenomenon of climate changes is considered one of the most important challenges which face the world in the recent and incoming years which are represented in high temperature as a result of the significant increase in global warming and gas emissions, which make the ground like a green house which affect the productivity of the Egyptian wheat crop and lead to the increase in the food gap of wheat where this gap has reached about 55% in 2011 which affect Egyptian food security, as Egypt is considered a main importer of food. The climate changes will affect the world food supply which leads to the rising of global food prices, which leads to the increase in the Egyptian food bill.

The study problem:

The research problem lies in the risks arising from climate changes, where this phenomenon has led to an unprecedented rise in temperatures around the world, and has warmed the atmosphere at a rate ranging from a degree to three degrees in the past five years. The global warming has led to fusion of the ice, which affect the production of the various crops, especially the strategic grain crops and most importantly the wheat crop, which negatively affect the productivity and production of the wheat crop and increase wheat gap.

The study objective:

According to the expected climate changes during the incoming period and the associated expectations such as drowning of Nile Delta which will inevitably affect the total production of crops, the study aims at recognizing the most important changes and their effects on the Egyptian wheat crop in order to reduce the negative effects on this strategic crop.

The study results:

Evaluating the economic effects of climate changes on wheat in Egypt:

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The area of cultivated land in Egypt reaches about 8.4 million feddans, but it is a subject to the set-aside, dredging and neglecting area of the wasted cultivated land each year reaches about 60 thousand feddan, and if the situation continues as it is, the land area will reach about 7.6 million feddan in 2030. If there is no increase in the feddan productivity of the crop under study, and the productivity continues as it is, amounting to about 2.71 tons / feddan, the total production of this crop will drop in a significant decrease as an impact of climate changes, and under the prediction of the different studies of the productivity decrease by about 18%, and then the impact of climate changes on wheat production, if the situation continues as it is, will be studied through the study scenario.

Firstly: Evaluating the economic effects on wheat if the situation remains as it is:

Table no. 1 demonstrates that the population in 2030 will reach about 111.3 million people and the average of the annual consumption of the individual of the crop under study will rise to about 202.3 k.g which is reflected on the total consumption of the crop, which will reach about 22.5 million tons in 2030.

These effects will be studied in four scenarios:

1. The first scenario:

   Evaluating the expected total production and the ratio of self-sufficiency and the gap, if the land area and the productivity, remain as they are without the effect of climate changes on them.

<table>
<thead>
<tr>
<th>Variable</th>
<th>2007</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>The average of the individual consumption k.g/capita</td>
<td>158.400</td>
<td>202.300</td>
</tr>
<tr>
<td>The total consumption in million tons</td>
<td>11.406</td>
<td>22.510</td>
</tr>
<tr>
<td>Population growth rate</td>
<td>1.900</td>
<td>1.900</td>
</tr>
<tr>
<td>Population in million people</td>
<td>72.009</td>
<td>111.295</td>
</tr>
</tbody>
</table>

Source: - Central Agency for Public Mobilization and Statistics – the research of family budget, spending and income 2004/2005
- The Ministry of Agriculture and Land Reclamation - the central administration of the agricultural economy 2007.

2. The second scenario:

   The second scenario supposes that the Delta of Egypt will not drown and the cultivated land will be the same as it is, but the feddan productivity of the crop under study will fall by the ratio predicted by many researches as a result of the impact of climate changes.

3. The third scenario:

   The third scenario adopts the possibility of drowning of 15% of the Delta as a result of climate changes, also rising of sea water and remaining of the productivity as it is.

4. The fourth scenario:

   The fourth scenario adopts the negative impact of global warming phenomenon with regard to drowning of 15% of the Delta in addition to the negative impact of the increase in carbon emissions which will lead to the decline of the feddan productivity of the crop under study.

The results of the scenarios in 2030:

Table no. 2 demonstrates that in the scenario no. 1 which supposes that the land area and the productivity of wheat will remain the same as it was in 2007, the production will be fixed and will reach about 7.37 million tons while the consumption will reach about 22.51 million tons in 2030 as a result of population increase and increasing the average of the individual share of wheat as shown in table no. (2), which reflects its impact on wheat gap reaching about 15.14 million tons and the decline of self-sufficiency ratio to about 32.7% and rising the value of the wheat gap to about 19594 million pounds in comparison with 2007 prices, while the value of the gap must be times as that, because the prices are in a continuous increase and the return per feddan will be fixed on what it is in comparison with 2007 prices, which will further discourage farmers to cultivate this strategic crop.
Table no. (2) demonstrates that scenario no.(4) is the most pessimistic scenario as it supposes drowning of 15% of Delta area and the increase in carbon emissions which reflect its impact on the production which reaches about 5.27 million tons and which also reflect its negative impact on the productivity which reaches 2.28 ton per feddan with assuming constant consumption at 22.51 million tons, so the gap becomes about 17.24 and its value is about 22312 million pounds in comparison with 2007 prices and the expected feddan return and the total return will fall by about 2629 pound/feddan and about 6073 million pounds in 2007 prices.

Table 2: The economic effects of climate changes on wheat crop in the current situation in 2030

<table>
<thead>
<tr>
<th>Variable</th>
<th>Base year 2007</th>
<th>In case of 15% of Delta drown</th>
<th>In case of No drowning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Scenario 1: carbon emissions remain as they are</td>
<td>Scenario 2: fall of the productivity by 18%</td>
</tr>
<tr>
<td>Land (million feddan)</td>
<td>2.72</td>
<td>2.72</td>
<td>2.72</td>
</tr>
<tr>
<td>Productivity (ton)</td>
<td>2.71</td>
<td>2.71</td>
<td>2.28</td>
</tr>
<tr>
<td>Production (million ton)</td>
<td>7.37</td>
<td>7.37</td>
<td>6.20</td>
</tr>
<tr>
<td>Consumption (million ton)</td>
<td>11.406</td>
<td>22.51</td>
<td>22.51</td>
</tr>
<tr>
<td>Self-sufficiency %</td>
<td>64.62</td>
<td>32.74</td>
<td>27.5</td>
</tr>
<tr>
<td>Gap value (million pound)</td>
<td>(5228.6)</td>
<td>(19594)</td>
<td>(21108)</td>
</tr>
<tr>
<td>feddan return (pound)</td>
<td>3125</td>
<td>3125</td>
<td>2629</td>
</tr>
<tr>
<td>Expected total Return (million Pound)</td>
<td>8500</td>
<td>8500</td>
<td>7150</td>
</tr>
</tbody>
</table>

Source: collected and counted from references (2, 7)

Climate changes and Egyptian food security:

Egyptian food security is one of the main aspects which must be concerned by the country in the incoming period especially because of the various social, economic and political changes in Egypt after the revolution of 25 January 2011 along with many internal and external factors affecting Egyptian food security. One of the most important external factors is the direction of the rich and developed countries to produce biofuel from the most important strategic crops like wheat and maize. This direction must have many negative effects on Egyptian food security because of the reduced supply of goods globally, which leads to higher import prices. This result in rising commodity deficit in the balance, and rising the domestic prices of these commodities which could result in the country tend to follow two policies, the first is the direction of the country to increase the value of Egyptian consumer-oriented support especially on bread. This trend may be difficult to implement in the incoming period due to the repercussions of 25 revolution and the accompanying deterioration of the Egyptian economy in general resulting from number of factors, most notably the large number of civil disobedience and the decline of production because of the increasing factional demonstrations after the events, and thus lower the value of GDP and national income, resulting in the direction of the country to borrow from the International Monetary Fund (IMF), and this increases the burden of the country of external and internal debts.

The second policy can be summarized in the trend of the country to cancel the support completely and the negative impact on the Egyptian consumer especially the low-income and people under the poverty line and this leads to the revolution of the hungerliness, which is feared of its consequences while the most important internal factors which threaten Egyptian food security directly is climate changes which is witnessed by the entire world. To illustrate the negative effects of climate change on Egyptian food security for that strategic crop requires measuring the indicator of food dependency, and this indicator means the possibility of Country to get its food from others or outside, and if the percentage of the indicator 30% or more, it means a dependent country in this commodity and the degree of Egyptian food security required in this commodity is not available and table (3) shows the degree of food security for wheat in Egypt.
Table 3: The indicator ratio of dependency on others in getting food.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Current Situation</th>
<th>Scenario No (1)</th>
<th>Scenario No (2)</th>
<th>Scenario No (3)</th>
<th>Scenario No (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>35.38</td>
<td>67.26</td>
<td>72.5</td>
<td>72.9</td>
<td>76.59</td>
</tr>
</tbody>
</table>

Source: collected and counted from reference no. (2).

The ratio of this indicator in the current situation has reached about 35.4% and this means that wheat lies in food dependency.

The table referred to demonstrates that the degree of Egyptian food security gets worse with the expected effects of climate changes as described by various scenarios that were expressed in the study. The first and second scenarios reveal in the case of assuming no drowning of the Delta, an increasing ratio of food dependency in wheat because of the ratio of food imports of this item which is about 67.3% in the first scenario, while amounted to about 72.5% in the second scenario, as shown in the table, that If 15% of the Delta drown, the situation of Egyptian food security will be worse as the ratio of food dependency in wheat will increase as a result of rising of import ratio reaching about 72.9% as in the third scenario while the import ratio of wheat has reached about 76.6% in the fourth scenario. It is clear from this that there is no doubt negative consequences will ensue climate changes which result in lower wheat production, thereby increasing the size of food imports, which result in increasing Egyptian food dependency to get food from outside of this strategic crop upon which the majority of the Egyptian people according to the four scenarios depend on, and the risk is limited in case of unavailability of the commodity in the exporting countries of these commodities as a result of the reduced supply. Therefore, the problem lies in the inability of the Egyptian country to meet the needs of Egyptian consumers from outside.

Recommendations:

1. Adopting agricultural policies that focus on giving as much attention to an increase in agricultural productivity, especially in the strategic crops.
2. Increasing in spending on agricultural researches related to the production and evolution of varieties that has short stay in the ground and that is salt and heat resistant, and water-saving.
3. Adopting the appropriate strategies to resist rising in sea levels to prevent the erosion of the shores of North Delta and drowning it.
4. Cultivating highly productive varieties to overcome the lack of production.
5. Spreading agricultural awareness, guidance, and training of farmers on new varieties and better farming methods.
6. Focusing on the use of methods and means which reduce climate changes.

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