

ORIGINAL ARTICLES

The Impact of the climate changes on the Egyptian Agriculture

Nagwa El Agroudy, Soheir Mokhtar, Monia Bahaa Al Deen Hassan, and Mahmoud El Gebaly

Department of Agriculture Economic, National Research Centre, Cairo

ABSTRACT

Hemisphere is now under what is known as the greenhouse phenomenon causing to raise the temperature of the earth which increases the volatility in agricultural production. Egypt is not far from those changes, where climate changes will lead to raise the average sea level which threatens about 30% of the city of Alexandria and about 25% of the territory of the Delta drowning. Besides affected the productivity of many of the strategic crops such as wheat, maize and rice, negatively. The study aims to see how familiarity Egyptian farmer that climate changes and its impact on crops and take measures to address them.

Key words: climate changes - Egyptian Agriculture - the green house phenomenon - Ozone layer.

Introduction

The world recently faces several dangerous and important environmental changes that can affect the economical and social situations for many of the world's population, the most important of these changes is the climate changes and the attending rise in Earth's temperature that refer to mounting substrates amounts of global-warming gases that have the property to prevent thermal radiation from starting of the atmosphere to the surrounding space, that is known as the green house phenomenon which cause raising the temperature of the earth and melting ice the Arctic and Antarctic poles, that lead to the raise of the sea- surface and oceans and flood many of the world's deltas, one of them is the delta of the River Nile that is endangered with sinking about 1.4 million feddan that present about 25% of the total agricultural lands by the year 2050.

The climate changes world increase the volatility of the agricultural production, the poorest areas will come to the highest degree of instability of the production.

Many of the researchers as Dr.Khaled Ouda hoot declared that Egypt is not spared of these changes that will affect the available natural resources in Egypt, and that lead to the direct effect on the sector of agriculture and then the Egyptian Food Security where Egypt is considered a pure importer of food. These climate changes on the world food supply which lead to raise the world food prices that will lead to increase Egyptian food bill.

Problem of the study:

The problem of the study lies in the risks resulting from the climatic changes; this phenomenon led to unprecedented rise in the temperatures around the world, and warmed the atmosphere at a rate between two to three degrees in the last five years.

The Global warming led to the melting of the ice which affects the production of various crops especially of the strategic grains.

It is expected that the previous changes can lead to the increasing of the climatic events such as floods, droughts and hurricanes etc., the natural changes can be accommodated and overcome by the humans but the climatic changes that are induced by them like bulldozing forests and polluting water, soil and air that lead to severe results and disasters.

The aim of the study:

The study aims basically to find the impact of the climatic changes on the strategic crops; wheat, rice and maize and if the farmers can identify this changes and its impact on the crops and the measures to face them.

Research method and data sources:

The study depended on the two methods, quantitative and qualitative ones, where the simple statistic methods as percentages and some economic indicators. The secondary information were used, are issued by the

central agency of mobilization and statistics, the ministry of Agriculture, the food and agriculture Association, the Arabic Association for Agricultural development etc... references, also the studies and researches published in this area, also designing a questionnaire to identify the extent of knowledge of the Egyptian of the climate changes and what is followed methods to face them.

Discussion of the result:

The climate changes in Egypt:

Egypt can be divided into three areas [(the North Coast)-(Lower Egypt and Cairo)- (Upper Egypt)] aiming to measure the development of degrees of temperature in these areas. Table No (1) shows the development of temperature's degrees during the period (1978-2007), where it shows a slight rise in maximum and minimum degrees of temperature during winter and summer on all parts of the republic and has been rising significantly in the recent years comparing with the first years, that prove the climate changes and its impact on all sectors.

Table 1: The development of the monthly maximum and minimum temperature degrees in Egypt during the period (1978 -2007).

Years	North Coast				Cairo& Lower Egypt				Upper-Egypt			
	Winter		Summer		Winter		Summer		Winter		Summer	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1978	18.3	9.1	29.1	21.4	18.6	7.7	32.5	19.1	21.0	7.0	37.5	22.6
1985	18.2	9.1	29.1	21.4	18.6	7.7	32.5	19.1	21.0	7.0	37.5	22.5
1990	18.2	9.1	29.1	21.4	18.6	7.7	32.5	19.1	21.1	7.0	37.5	22.5
1996	18.3	9.1	29.6	21.6	19.0	7.7	33.9	21.1	22.4	7.2	38.8	24.0
2000	19.3	9.7	29.6	22.6	19.8	8.3	33.7	20.3	22.9	8.3	39.0	23.8
2007	19.3	11.2	29.6	22.2	19.6	8.4	33.7	20.5	22.9	8.4	39.1	23.9

Source: Central Agency for Public Mobilization and Statistics.

Carbon dioxide's emission in Egypt and source world's countries:

Table No. (2) shows the quantity of emissions of carbon dioxide in Egypt and the rest of the world's countries during the period (1990-2004) where it occurred that Egypt are of the countries that share significantly in raising the rate of carbon dioxide, and it is significantly responsible for the green house phenomenon where it occur from the table that the rate of change in the quantity of the carbon emissions that is caused by Egypt reached the highest rates of the world, and that can be attributed to the quality of the existing industries in Egypt, where the Egyptian industry depend basically on the environment pollution of industries of fertilizers, iron and steel, cement, petrochemicals etc..., while the other industries that not pollute the environment as the electronics and the computers industries that depend on the advanced technology, so the Egyptian industry doesn't depend on it significantly.

In spite Egypt's emissions of the greenhouse gases only represent about 0.57% from the total emissions of the world in the year 2005/2006 table no. (3),but Egypt was affected the most of the climate changes, also Egypt is considered one of the greatest countries of the world in the rate of carbon emissions, as mentioned before.

Table 2: The quantity of dioxide emissions in Egypt and some world countries during the period (1990-2004).

Countries	1990	1995	2000	2004	Rate of change (1990-2004)
America U.S.A	4821.2	5209.1	5961.9	6049.4	25.5
England	579.7	509.6	580.1	587.3	1.3
Indonesia	214.0	303.0	365.6	378.3	76.8
France	364.0	351.1	357.7	373.7	2.7
Australia	278.6	312.4	337.7	336.8	17.3
Egypt	75.5	95.1	138.7	158.2	109.5
Morocco	23.5	30.3	34.4	41.2	75.3
Jordon	10.2	13.6	15.5	16.5	61.8

Source: The earth centre for Human Rights- Series of land and the farmer no. 53.

Table 3: Emission ratio in Egypt for the world.

Years	Emission quantity in Egypt million equivalent ton of carbon dioxide	Emission rate for the world
1990/1999	107	0.40%
2004/2005	150	0.55%
2005/2006	152	0.57%

Source: Egypt and the climate changes, climate damage Unit, Ministry of State for environmental affairs, Egypt Arab republic 2008.

The impact of climate changes on Egypt:

The climate changes phenomenon is considered a global one but its effects are local, where it differ from one place to another on the Earth surface due to the nature and sensitivity of the environmental systems in each area, so, it is necessary to estimate the vulnerability of Egypt especially agriculture production by these changes. The coastal areas are most affected and that by the sea –level rise, also the impact on water resources and agriculture.

The impact on agriculture and food sources:

The agriculture in Egypt in the mainstay of the national wealth where it covers about 6 million feddan cultivated with two crops or more over the year. The agricultural wealth represents about 20% of the national income.

It was settled on the quality of some involved crops in certain areas of the Delta during hundreds of years. Because of the increase of population, so, the agricultural production of some crops, isn't almost enough for the local consumption, thus Egypt is considered from the import countries of some strategic crops as wheat and corn. The Egyptian agriculture have a special sensitivity for the climate changes where the raise of temperature and the changes of frequencies and times of the host and cold waves will lead to the lack of the agricultural productivity of some crop where these are more affected than the others, also the changes of temperature will lead to the increase in each of the evaporation and electricity consumption, in addition to the rise of the sea-level and the sinking of a part of the Delta.

The results of a number of computer models that were used to estimate the impact of climate change on agriculture Has indicated changes in productivity per feddan for several crops due to increased concentration of carbon dioxide .

A research team in Egypt had analyzed the expected impact of the climate change on the productivity of wheat, rice and corn, the result proved that the climate change will have a negative impacts on these crops.

The quantitative estimation for the greenhouse gases in Egypt:

An inventory had been worked of greenhouse gases in EGYPT, where they reached about (106.608 Giga grams) of the equivalent of carbon dioxide of the sectors of energy 71.2 agriculture 15%, industry 9% and waste 5% where it will lead to the reduction of productivity of wheat by about 18%, rice by about 17% and maize by about 19%.

In the light of population growth and the non-increase of area of the agricultural land by the same ratio, the per capita of the agricultural lands declined to reach about 0.1 feddan, and in the light of these modest resources the Egyptian agriculture face a major challenge, it is the providing the enough food to face the growing consumer needs as well as contributing to the economic growth, and providing, the raw materials needed for the food and agricultural industries, and in the light of that seen in the world prices of food of violent fluctuations and increases at unprecedented rates they modest resources for residents, in the light of the global developments in the field of bio-fuel production using the staple food crops, also in light of the adverse effects of the climate changes, that make an increasing reliance on imports to fill the food gap.

Selecting the sample of study:

A random sample was selected, it size was 150 farmers, where selected two villages of Balakos and Moghнем from the center of Koam Hamada in Beheyera governorate and the two village of kellin al Balad and kafr abo naem from the center of kellin in Kafr el Sheikh governorate, also the village of Al Ormaan from the center Al-Senbellawin and the village of Nowasa al Gheit from the center of Aga in the Dakahlia governorate in the size of random sample of 50 farmers for each governorate, that is for the crops of wheat, rice and maize.

Reviewing the results of the study:

The number of holders in the three governorates reached 105 holders owning about 101 feddan, 30 holders hire about 120 feddan and 15 holders participating in cultivating about 90 feddan the area cultivated with rice was about 249 feddan by a percentage of 80% from the total area of the sample, also, the area cultivated with wheat was about 218 feddan by a percentage of 70% from the total possession of the farmers of the sample in the three governorates, and it was occurred that the summer crop that is preferred to be cultivated by the farmers, also the summer crop that was preferred to be cultivated by the farmer of the rice on the account of the maize owing to the increase of its feddanic productivity.

Table 4: The extension of knowledge of farmers about the climate changes.

Statement	No. of farmers	% of total sample
No. of who heard about climate changes	60	40
No. of who did not hear	9	60
No. of who felt increase of heat	150	100

Source: Collected and calculated from the questionnaire from the field of the study sample.

The table No. (4), that about 40% from the individuals of the sample heard about the term of climate changes and know its meaning, and that about 60% of the sample didn't hear about it, but the total individuals of the sample, i.e., 150 farmers agreed on their sense of the changes in temperature degrees and its rising by 100%.

Table 5: The impact of the raising temperature on the crop.

Statement	No. of farmers	% of total sample
Have a bad impact	135	90
Don't have a bad impact	15	10

Source: Collected and calculated from the field questionnaire of the sample of study.

90% of the sample's individuals had consent on that the raise in temperatures affect the cultivated crop badly, while 10% of the sample's individuals didn't feel this bad effect, table No. (5).

About 30% of who felt the bad effect of the high temperature had defined that this bad effect was in the early maturity of the crop and thus it doesn't take a sufficient time in the ground for the full maturity, and about 53% consent on the lack of fullness of grains, thus, a poor harvest and a decline degree and productivity, table No. (6), while the samples individuals had consent on the spread of pests and various diseases as a result of the raising of the temperatures.

Table 6: The Impact of the rising temperatures of the crop.

Statement	No. of farmers	% of total sample
Early maturity of the crop	45	30
Lack of fullness of grains and poor lowest	80	53
Spread of pests and ruinous disease	150	100

Source: Collected and calculated from the field questionnaire of the sample of study.

30% of the s showed that the early maturity of the wheat crop will be about 15 days, the rice about 20 days and the maize from 15-20 days.

Table 7: The effect of raising of temperature on the spread of the pests and diseases.

Statement	No. of farmers	% of total sample
Whitefly	60	40
Green worm	75	50
Butterfly	15	10
Manna	45	30
Smut	30	20
Trip	15	10

Source: Collected and calculated from the field questionnaire of the sample of study.

The table No. (7) shows the effect of the increase in temperature on infecting the crop with diseases and various pests on which 100% of the farmers had consent the occurrence of these infection, 50% of the respondents showed increasing of the green worm infection, followed by the infection of the whitefly by about 40%, then the aphids and smut by 30%, 20%, at last, the butterfly and trips by 10% for each. 90% of the respondents of sample showed that the increase of diseases and pests in faced by increasing in spraying, with what it have of bad-effect that is reflected on the human-health and the plights with different diseases, while only 10% of the sample depend on the handily-resistance, Table No. (8).

Table 8: Anti-peasant way of these pests and diseases.

Statement	No. of farmers	% of total sample
Spraying	135	90
Handy resistance	15	10

Source: Collected and calculated from the field questionnaire of the study sample.

40% of the respondents of sample answered a question on Are early agriculture leads to avoid disease and insects that help to avoid infection, while 60% of the respondents of sample had the view that it doesn't affect on avoiding infections with pests and diseases, table No. (9).

Table 9: The effect of early cultivation on the infection with diseases and pests.

Statement	No. of farmers	% of total sample
Leads to avoid infection	60	40
Doesn't lead to avoid infection	90	60

Source: Collected and calculated from the field questionnaire of the study samples.

Also, 100% of the respondents of sample, had consent the temperature increase is offset by the increase in the number of irrigations, while corresponding drop in temperature to prevent irrigation or reduce the number of irrigations, the table No. (10) shows that about 12 farmers represent 10% from the total of sample had confirmed that the member of irrigations increases by one irrigation when the temperature raises, and about 60% consent that the number of irrigations increases by 2-3 irrigations for the crop, and about 30% said that the number of irrigations increase between 3 to 4 irrigations owing to the increase in temperature, the need of crop for water and the kind of crop.

Table 10: The impact of high temperatures on increasing the frequency of irrigation.

Statement	No. of farmers	% of total sample
One irrigation	12	10
2-3 irrigations	27	60
3-4 irrigations	36	30

Source: Collected and calculated from the field questionnaire of the study sample.

To know the respond of farmers to introduce new methods to the agriculture to decrease the rise in temperature, 70% of the responders of the study sample agreed to use the new methods if found, while about 30% of the sample refused to application methods, table No. (11).

Table 11: The application of new method to decrease the raise in temperature.

Statement	No. of farmers	% of total sample
Approving the application of the new methods	105	70
Non approving the applications of the new methods	45	30

Source: Collected and calculated from the field questionnaire of the study sample.

Also, 90% of farmers of the study sample agreed to cultivate new varieties that have the ability to withstand high temperatures, while 10% of the responders of study refused this idea, table No. (12).

Table 12: Cultivating new varieties to overcome the raise of temperature.

Statement	No. of farmers	% of total sample
Approving cultivation of new varieties	513	90
Non approving	15	10

Source: Collected and calculated from the field questionnaire of the study sample.

Table 13: The increase of agriculture costs as a result of cultivating new varieties.

Statement	No. of farmers	% of total sample
Accept the idea to afford more costs	32	24
Not to accept the idea	89	66
Didn't show any opinion	14	10

Source: collected and calculated from the field questionnaire of the study sample.

About 24% of the responders of study sample who agreed to cultivate new varieties, accepted to been any increase of expenses, while about 66% of them refused and 10% didn't show their opinion, table No. (13).

Table No. (14) Shows the accepting the farmers to take the risk by cultivating new varieties or applying new methods to cultivate the studied crops, while it occurred that about 50% of the responders are ready to take the risk and about 40% are not ready to take the risk and also about 10% didn't express their opinion.

Table 14: The willingness of farmers to take the risk.

Statement	No. of farmers	% of total sample
Ready to take risk	75	50
Not ready to take risk	60	40
didn't express then opinion	15	10

Source: Collected and calculated from the field questionnaire of the study sample.

Recommendation:

- 1- The interest of educating farmers and make them aware of the dangers of climate changes and how to address them through the agricultural extension and also strengthen it role.
- 2- Increase spending on agricultural research relating to the production and developing of varieties that are short stay in the ground, salt and heat resistant and water saving.

- 3- Following the appropriate strategies to resist the rising of sea level to prevent the erosion of beaches of North Delta and its sinking.
- 4- Cultivating high- yield varieties to overcome the lack of production due to the rising temperatures.

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