



An Economic Study of Water Scarcity in Egypt and How to confront it

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ABSTRACT

A drop of water equals life. Therefore, the problem of the study lies in the low water share of Egypt, which in turn affects the Egyptian agricultural sector. This is in addition to the decrease in the per capita share of water, which reached the level of water poverty amounted to about 500 m³. The study conspicuously aims to identify the size of the Egyptian agricultural sector's contribution to the gross domestic product and foreign trade, and its role in food security and the provision of raw materials for various industries. This is in addition to studying the factors that lead to the growth of the phenomenon of water poverty, as well as trying to address the most important proposed solutions to confront it and study the potential repercussions of building the Renaissance Dam Egypt's share of the water. The study showed that during the sixties, agricultural foreign trade constituted most of Egypt's trade. Then, its role began to decline with the increase in exports from other industrial sectors until Egypt became an importing country for most of the main food commodities, especially wheat, which led to a deficit in the Egyptian agricultural balance that amounted to about 9700 million pounds in 2000. Besides, it rose to about 30131 million pounds in 2010 and then to 89260 million pounds in 2018. The percentage of agricultural exports in relation to the total exports in 2014/2015 was about 22.8%, declining to about 18.7% in 2017/2018. The study concluded some of the factors that lead to the growth of water poverty in Egypt and the most important solutions to confront it. The most important of these factors is the increasing population growth and the high demand for food, dependence on water-consuming crops such as rice and sugar cane, "climate change and global warming, which leads to reducing the amount of water coming into Lake Nasser, decreasing rainfall in northern Egypt, the Renaissance Dam and its repercussions, the deterioration of water quality due to factory waste, fertilizer and pesticide residues, which make it difficult to reuse the water because it contains a high level of pollution. The study recommends decreasing the dependence on water-consuming crops and the cultivation of export crops that have the highest economic value and the least consumption of water. Replacing traditional methods with modern irrigation methods that save water and use it in horizontal expansion and line canals and drains, as well as renewing drinking water networks to eliminate the quantities of wasted water and maximize the use of groundwater, rain and reduce the risk of floods, adopting the concept of virtual water when developing the future strategy for the agricultural sector, in order to adopt water-saving agricultural production systems.

Keywords: Water Scarcity, water poverty, The Renaissance Dam.

1. Introduction

The agricultural sector in Egypt conspicuously plays a strategic role in the process of economic development, as it constitutes one of the main activities in the Egyptian national economy, and an essential pillar of its components. It has also played a distinguished role in achieving comprehensive economic and social development. Besides, it is still the main contributor to providing the necessary food and clothing needs for the Egyptians. Also, it is the primary responsibility for achieving national food security for Egypt. It also contributes to supplying many industries with the raw materials needed

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for them. Moreover, it contributes to providing job opportunities for a large segment of Egyptians, as well as providing the necessary capital to finance economic development work in general and industrial development in Egypt in particular, by transferring the agricultural sector revenues and tax revenues imposed on it to finance non-agricultural (industrial and service) activities. Despite the importance of this sector, it faces many challenges, most notably water poverty as a result of high rates of water demand resulting from many factors, the most important of which are (population increase, irrational management of water resources, high rates of demand for food, and the strongest challenge represented by The Ethiopian Renaissance Dam and its impact on Egypt's share of the Nile water.

Problem of the Study

The problem of the study is conspicuously represented in the low water share of Egypt, which in turn affects the Egyptian agricultural sector. This is in addition to the decrease in the per capita share of water, which reached the level of water poverty amounted to about 500 m³.

Objectives of the Study

The study aims to identify the size of the Egyptian agricultural sector's contribution to the gross domestic product and foreign trade, and its role in food security and the provision of raw materials for various industries. This is in addition to studying the factors that lead to the growth of the phenomenon of water poverty, as well as trying to address the most important proposed solutions to confront it and study the potential repercussions of building the Renaissance Dam on Egypt's share of the water.

Results of the Study

The cultivated area in Egypt reached about 9.333 feddan in 2004 instead of 5.766 million feddan in 1970. It means an increase in the cultivated area by about 3.567 million feddan Table (1).

Table 1: The cultivated area in thousand feddan in the period (1990-2019)

Year	Cultivated area	Year	Cultivated area
1990	6918	2005	8385
1991	7023	2006	8411
1992	7134	2007	8432
1993	7179	2008	8432
1994	7173	2009	8783
1995	7813	2010	8741
1996	7563	2011	8619
1997	7726	2012	8799
1998	7761	2013	8954
1999	7848	2014	8916
2000	7836	2015	9096
2001	7946	2016	9101
2002	8148	2017	9132
2003	8113	2018	9193
2004	8279	2019	9333

Source: https://www.capmas.gov.eg/Pages/SttattiiicPages.aspx?page_iid=5035

Land reclamation and the addition of new lands to the cultivated area have contributed to increasing the cultivated area, such as the Toshka project, which aims to add 540 thousand feddan to the agricultural area, completely irrigated by the Nile water. Besides, the East Al-Owainat project aims to increase an estimated 230 thousand feddan irrigated with groundwater, and the Salam Canal Project, the Darb Al-Arbaeen project and other projects, including the New Nubaria project, which has become an area to attract residents and create new job opportunities for young people. This is in addition to the comprehensive development plan for the reclamation and cultivation of 4 million feddan according to the sustainable development strategy, the first phase of which aims to reclaim and cultivate about 1.5

million feddan in 2030. Table (2) shows the development plan for the reclamation and cultivation of 1.5 million feddan in (2018).

Table 2: The development plan for the reclamation and cultivation of one and a half million feddan (2018)

Region	Area in thousand feddan
Almagara in the Western Desert	170
Al-Amal Village in Ismailia	3.5
Southeast Low	50
Al-tour	20
Extension south of the low	50
East Siwa	30
West Minya	628
Old Farafra	100
New Farafra	100
Almarashda	41.5
Dakhla Extension	50
West of Kom Ombo (Joufi)	25
Toshka	20

Source: The Egyptian State Information Service - Agriculture - Sectors of the Egyptian Economy - 19 July. www.sis.gov.eg2018.

This is in addition to the horizontal expansion projects, there are vertical expansion projects by increasing the acre productivity of different crops, cultivating crops in more than one loop, as well as devising new varieties of strategic crops such as rice and wheat characterized by increased production, bearing different climatic conditions and saving water.

The contribution of the Egyptian agricultural sector to the gross domestic product:

The agricultural sector contributed about 70% of the GDP during the fifties. Besides, when Egypt turned to the development of the industrial sectors in the sixties, the industrial sector grew at the expense of the agricultural sector. Moreover, the value of the contribution of the agricultural sector to the gross domestic product, which amounted to about 51,701.071 million pounds at current prices, decreased to about 15%, 14%, and 11.3% for the years 2005, 2008, 2019, respectively. Table (3) shows the total value of production and net agricultural income in all its sectors during the period 2013-2018.

Table 3: The total value of production and net agricultural income at current prices in million pounds 2013-2018

Type of Agricultural Production	2014/2013	2015/2014	2016/2015	2017/2016	2018/2017
Animal Production Value	112	119	134	169	187
Value of Plant Production	171	177	198	258	265
Total Value of Fish Production	22	23	32	44	48
The Overall Value of Agricultural Production	305	320	364	472	501
Total Value of Agricultural Production Inputs	82	95	108	142	176
Net Agricultural Income	224	225	256	329	325

Source: Central Agency for Public Mobilization and Statistics - Statistical Yearbook - Edition 111 - 2020

It is worth noting that the decline in the agricultural sector's contribution to the GDP is due to the previously mentioned challenges faced by the sector. This is in addition to the higher growth rates in other productive sectors in a faster rate than the agricultural sector.

The Egyptian agricultural sector’s contribution to foreign trade:

During the sixties, agricultural foreign trade constituted most of Egypt’s trade. Then, its role began to decline with the increase in exports from other industrial sectors until Egypt became an importing country for most of the main food commodities, especially wheat, which led to a deficit in the Egyptian agricultural balance that amounted to about 9700 million pounds in 2000. Besides, it rose to about 30131 million pounds in 2010 and then to 89260 million pounds in 2018. The percentage of agricultural exports in relation to the total exports in 2014/2015 was about 22.8%, declining to about 18.7% in 2017/2018, as shown in Table (4).

Table 4: The evolution of the agricultural sector's contribution to total exports in Egypt during the period (2014-2018) in billion pounds

Statement	2015/2014	2017/2016	2018/2017	Period average
Total Exports	163.253	276.61	341.1	251.3
Agricultural Exports	37.221	56.13	63.76	51.63
The Ratio%	22.80	20.3	18.70	20.54

Source: Ministry of Agriculture and Land Reclamation - Egyptian State Information Service - Egyptian economic sectors 2018. www.sis.gov.eg.

Despite what has been mentioned above, agricultural exports still represent a good percentage of total Egyptian exports, amounting to about 20.54% as an average for the period 2014-2018, equivalent to about EGP 51.63 billion of total exports, which amounted to about EGP 251.3 billion as an average for the period.

The contribution of the agricultural sector to achieving food security

Egypt has achieved self-sufficiency in many food commodities such as fresh vegetables, fruits, potatoes, citrus fruits, eggs and dairy products by more than 100%. This is in addition to the rice crop, which was a source of hard currency in the past years, but with the construction of the Renaissance Dam and the diversion of water in 2019, the cultivated areas of rice decreased and reduced Production rates, as shown in Table (5), where the percentage of rice self-sufficiency decreased by about 76.2% in 2019 compared to about 102.6 in 2015.

Table 5: The self-sufficiency rate of some agricultural commodities in Egypt during the period from 2015-2019

Food Commodities	2015	2016	2017	2018	2019
Wheat	49.1	47.7	34.5	35.5	40.3
Maize	56.2	56.3	47.0	50.5	51.1
Rice	102.6	99.7	94.2	90.7	76.2
Beans	31.0	20.0	30.7	12.4	10.5
Lentil	1.6	2.1	1.8	1.1	0.5
Potatoes	110.2	105.4	116.3	111.4	117.1
Fresh Vegetables	102.6	103.4	103.0	102.7	105.5
Citrus	138.8	149.9	156.5	171.7	203.6
Fresh Fruits	96.2	98.4	99.3	100.7	99
Red Meat	57.5	64.4	55.9	48.8	45.5
Chicken Meat	93.0	93.7	91.5	96.5	97.5
Fresh Fish	89.0	89.7	85.6	79.5	77.9
Eggs	100.0	100.2	100	100.2	99.9
Milk	100.1	100.0	100.2	100.2	100.7

Source: Central Agency for Public Mobilization and Statistics - Egypt in Figures 2020 - Agriculture.
 Unit: %

It is also evident that the self-sufficiency rate of wheat, corn, beans and lentils decreased from about 49.1%, 56.2%, 31%, and 1.6% in 2015 to about 40.3%, 51.1%, 10.5%, and 0.5% in 2019,

respectively. The state resorts to imports from abroad to fill the deficit in these strategic crops. This may be due to the lack of cultivated areas of these crops and the lack of irrigation water after the construction of the Renaissance Dam. The percentage of self-sufficiency in red meat and fresh fish also decreased from about 57.5%, 89% to about 45.5%, 77.9%, respectively, during the same two years.

Challenges facing the Egyptian agricultural sector

The Sustainable Agricultural Development Strategy 2030 identifies some of the challenges facing Egyptian agriculture, the most important of which are water poverty, encroachment on agricultural lands, pollution of irrigation water as a result of various industrial activities that drain polluted water into waterways, excessive use of chemical fertilizers and others. The water crisis is considered the most important challenge in front of the Egyptian agricultural sector, because it is the main axis of any agricultural activity. Without it, agriculture is absent. Since the Nile River supplies Egypt with about 90% of its water needs, the repercussions of building the Renaissance Dam are among the most important factors that lead to the growth of the phenomenon of water poverty in Egypt.

The factors that lead to the growth of water poverty in Egypt and the most important solutions to confront them.

High rate of demand for water

This is due to several factors, including

1- The growing population and the high demand for food

Egypt has been suffering for many decades from a high rate of population growth, as it ranks first in the Arab world and fourteenth globally in population, as the population increased from about 23,223.124 million people in 1955 to about 102.334.404 million people in 2020, with a change rate of about 2.05%. With the increase in population growth, the rate of demand for water is increasing, whether for domestic or agricultural use, to meet the increasing demand for food.

2- Relying on water-consuming crops such as rice and sugar cane.

3- Relying on traditional irrigation methods that consume water, such as flood irrigation

Climate change and global warming, which leads to a reduction in the amount of water entering Lake Nasser, a decrease in rainfall in northern Egypt.

4- Increasing the water needs of agricultural crops

5- The Renaissance Dam and its repercussions.

6- Deterioration of water quality due to factory waste - Residues of fertilizers and pesticides, which make it difficult to reuse them because they contain a high percentage of pollution.

Suggested solutions to face the phenomenon of water poverty

- Eliminating poverty, unemployment, illiteracy and early marriage to reduce the population growth rate.
- Suspending the cultivation of crops that consume the most amount of water and the cultivation of export crops that have the highest economic value and the least water consuming.
- Adopting modern irrigation methods to replace the traditional methods of saving water and using it for horizontal expansion and lining of canals and drains.
- Renewing drinking water networks to eliminate the quantities of wasted water.
- Storing the Nile water, which is wasted in the sea, in the Qattara depression, as previously announced.
- Cultivation of crops that are resistant to climatic changes, more tolerant of temperatures and less water consuming.
- As for the repercussions of the Renaissance Dam, the period of filling the reservoir must be increased for a longer period, about seven years, so that more water reaches the lake of the High Dam, which reduces the size of the damages afflicting Egypt, and that the reservoir is filled during the years of heavy rain
- Developing new water resources such as groundwater, rainwater, torrential rain and water desalination.
- Rationalizing uses in water-consuming sectors: by reducing losses in water-using sectors by:
- Continuously improving irrigation efficiency in irrigation development projects.
- Raising the awareness of water users of the importance of water, preserving it from pollution and rationalizing its use.

- Focusing on combating pollution of water resources and improving water quality:
- Amending and activating the laws of irrigation, drainage and the environment to protect waterways and prevent pollutants from reaching them.
- Imposing fines related to pollutant loads and activating their implementation.
- Treating industrial and sewage water before dumping it into waterways.
- Reviewing the operating rules of the High Dam to adapt to high flood and drought scenarios.

The state's plan to confront water challenges

The Ministry of Water Resources and Irrigation has developed the National Water Resources Plan (2017/2037), in which (9) different ministries participated in its implementation. This is in addition to a large number of concerned bodies and authorities, with investments amounting to 50 billion dollars, with the aim of implementing a set of measures in coordination with the ministries and authorities concerned with the state, within the framework of adopting the principle of integrated management of water resources and including the procedures of each ministry. This consequently achieves its sectorial objectives and in line with the objectives of the sustainable development strategy for the state 2030 as well as the previously prepared water policies and strategies.

In light of the general trend towards decentralization, the development of plans to manage water resources has been circulated to all governorates at the level of the Republic in order to monitor the challenges facing each governorate with regard to managing water resources now and in the future. Also, plans have been made to define the actions required to be taken to meet these challenges and define the roles and responsibilities of each of the concerned authorities in the governorate. In implementing these procedures, the plan relies on 4 axes as follows:

- Improving the quality of water and preserving it from pollution
- Developing additional water resources
- Rationalization of water use
- Creating the appropriate environment for the implementation of the plan through the required legislative, institutional and coordination measures whose required investments will reach 900 billion pounds over the next twenty years (four five-year development plans 2037). This includes 200 billion pounds for sanitation in rural areas out of 600 billion for infrastructure. Therefore effective coordination of donors along with the governmental role (through integrated investment planning and effective modernization of the water sector in Egypt) is an urgent necessity in order to achieve the required goals as mentioned in the national strategies

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