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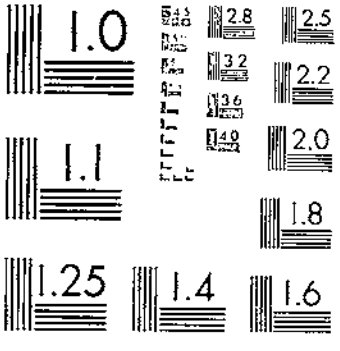

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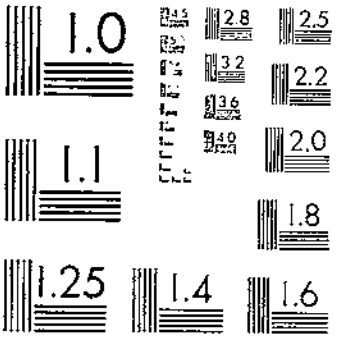

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COTTON PRODUCTION IN EGYPT

BY

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UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.

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COTTON PRODUCTION IN EGYPT[1]

By P. K. Norris, *senior marketing specialist, Foreign Agricultural Service Division, Bureau of Agricultural Economics*

CONTENTS

INTRODUCTION

Less than 100 years ago Egypt produced little cotton but was an exporter of surplus grains. Today, in order to feed a fast-increasing population, millions of bushels of cereals are imported annually. The grain exports of past years have been replaced by cotton, a comparatively new crop in the agriculture of Egypt. This shift has resulted from both internal and external influences. Local events are largely responsible but world-wide influences over which the country has little or no control have aided in this transformation.

Egypt is primarily an agricultural country. For ages the fertile soil of the narrow valley and delta of the Nile River has supported a large population. At present almost 85 percent of the 15,000,000 inhabitants depend either directly or indirectly upon agriculture.

Since cotton was introduced as a commercial crop about a century ago, it has increased in importance until today it is the leading cash crop and the chief item of export. From 80 to 90 percent of all ex-

[1] All statistics of this study have been converted as follows: 1 Egyptian pound (£.E.) equals $4.98; 1 feddan equals 1.038 acres; 1 kantar seed cotton equals 311.9 pounds; 1 kantar lint cotton equals 99.05 pounds; 1 kilometer equals 0.6214 mile; 1 centimeter equals 0.3937 inch; and 1 ardeb equals 5.444 bushels. Photographs by courtesy of the Ministry of Agriculture, Egyptian Government. The data for this study were collected by the author while stationed at Cairo, Egypt, from 1930 to 1933.

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ports are raw cotton, cottonseed, or cottonseed products. The average annual cotton crop amounts to about 1,500,000 bales of 478 pounds net which ranks Egypt as one of the leading cotton-producing countries of the world. Approximately one-third of the average crop is of a staple length of 1⅛ inches and over, and the staple of the remainder of the crop, known as Uppers, ranges from 1 1/16 to 1 3/16 inches.[2] Egypt is, therefore, the world's chief source of long-staple cotton. In addition to its length, Egyptian cotton is noted for its strength, luster, and silky appearance. These characteristics make it of special value in yarn and fabric when strength and durability are of primary importance. The premiums paid for Egyptian cotton as compared with those paid for other growths indicate the position it holds in the textile world.

Not only is American cotton forced to meet the general competition of all foreign growths, but the districts of the United States that produce the longer staples are, in a special sense, thrown into direct competition with Egyptian staples. Cotton growers of Mississippi, Louisiana, Arkansas, South Carolina, and other States which produce a staple comparable with that of Egyptian Uppers must sell their crops in direct competition with Egyptian growers. The growers of the irrigated valleys of Arizona who produce American-Egyptian cotton, which has a staple comparable in length with the cotton of the Egyptian Delta, are faced with the competition of Sakellaridis, Maarad, and other long-staple Egyptian varieties. It is recognized that the staple premiums paid American long-staple cotton growers are influenced by the size of the Egyptian crop, but the degree of influence does not lend itself readily to statistical demonstration.

The conditions under which the Egyptian crop is produced and the influences that are likely to bring about changes either in the size of the crop or in the length of its staple have a direct influence upon the production, the improvement, and the marketing of staple cotton of the United States and are therefore of importance to American cotton growers and other economic groups in the South.

AREA OF EGYPT

The independent kingdom of Egypt occupies an area of 383,000 square miles located in northeast Africa and the Sinai Peninsula of Asia. Approximately 97 percent of this vast area is desert and is of no agricultural value. The remaining area, located in the narrow valley and delta of the Nile River, supports 98 percent of the population. From an agricultural point of view, this is Egypt, and will thus be referred to hereafter (fig. 1).

At a point near Aswan the Nile Valley widens and the cultivated area begins. From this point to Cairo, over 500 miles north, the valley varies in width from 7 to 20 miles. In many places, the low desert hills are very near, whereas at other points the valley is wide and level. About 12 miles north of Cairo the river divides into two branches. This is the apex of the delta. The western branch reaches the sea at Rosetta and the eastern branch at Damietta. The Fayoum,

[2] A more accurate classification according to staple length should include (1) long staple (1⅜ inches and over) varieties as Sakellaridis, Maarad, Sakha 4, Giza 7, Casuli, and Nahda; (2) medium staple (1¼ to 1 5/16 inches) varieties as Foundi, Pilion, and Giza 3; and (3) short staple (1 1/16 inch and less) as Ashmouni and Zagora. At present but a small percentage of the crop is less than 1⅛ inch in staple length, but it is the general opinion that the shorter staples are increasing in commercial importance.

which is in fact a large desert oasis, is located about 50 miles southwest of Cairo. It is watered by a canal from the main river.

Egypt is divided into 2 or 3 main divisions. The valley south of Cairo is usually referred to as Upper Egypt, and the delta north of the city as Lower Egypt. The valley is sometimes divided at Asyut; the district south of this point is called Upper Egypt and the area between Asyut and Cairo is called Middle Egypt. The term Lower Egypt always refers to the delta. This area, in turn, is sometimes subdivided into the lower and upper delta. There are 8 provinces in the valley and 6 in the delta.

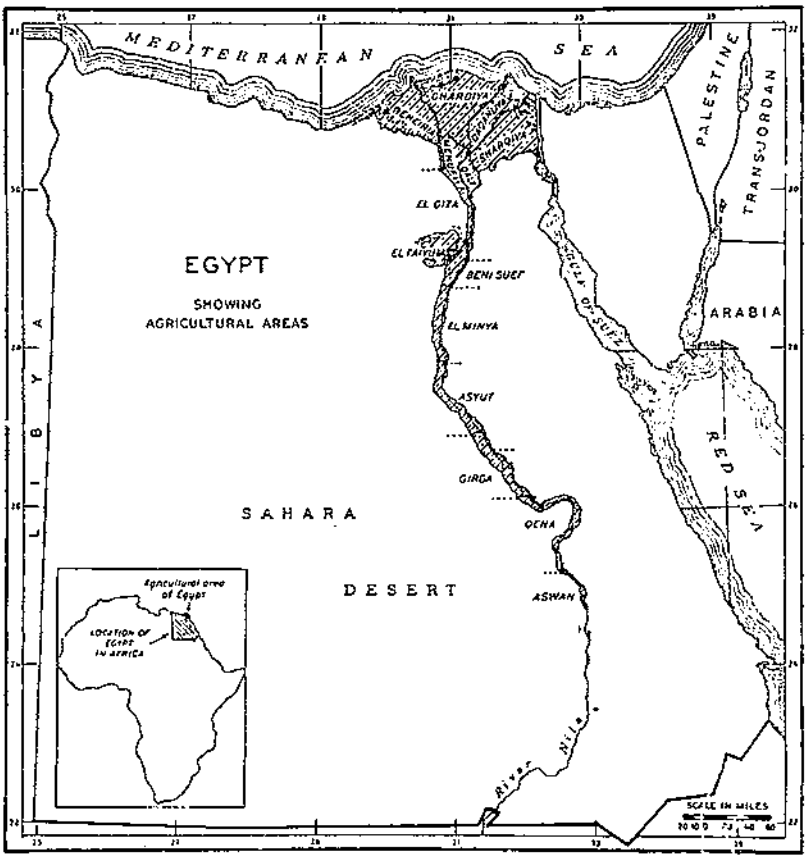

FIGURE 1.—Approximately 97 percent of the area of Egypt is desert waste, of no agricultural value. The production area is confined to the valley and the delta of the Nile River. The delta is referred to as Lower Egypt and the valley is known as Upper Egypt. This same division was used by the ancient Egyptians.

CLASSIFICATION OF AGRICULTURAL AREA

The productive area of Egypt is confined to the lands of the valley and delta upon which the Nile water can be flooded or lifted. This includes an area of about 8,451,669 acres, of which 2,953,040 acres are in Upper Egypt and 5,498,629 acres in Lower Egypt. All the area capable of being flooded is not under crops. In Lower Egypt the cultivated area is approximately 3,251,779 acres and in Upper and

Middle Egypt it is 2,391,529 acres, or a total of 5,643,308 acres for the entire country. The classification of the agricultural area is given in table 1.

TABLE 1.—*Classification of the agricultural area of Egypt, 1931–32* [1]

Area	Lower Egypt	Middle Egypt	Upper Egypt	Total
	Acres	*Acres*	*Acres*	*Acres*
Cultivated area	3,251,779	1,161,909	1,229,620	5,643,308
Waste land [2]	1,751,632	186,410	183,127	2,121,169
Public works [3]	495,218	100,788	91,186	687,192
Total	5,498,629	1,449,107	1,503,933	8,451,669

[1] Refers to the year Sept. 1 to Aug. 31.
[2] Includes low, marshy, and swamp lands within the valley and Delta.
[3] Includes area in canals, highways, railroads, cities, and towns.

Compiled from annual statistics of crop areas, 1931–32, Statistical Department of Ministry of Finance, Egyptian Government, Cairo.

The waste land includes the low marshy areas of the delta and the swamps along the river in Upper Egypt. Since much of the waste area of Lower Egypt is below sea level, to reclaim it would involve a considerable engineering problem and much time and expense. The reclaiming of most of the waste area of Upper Egypt is a simpler matter, as it is largely a problem of surface drainage. Any increase in the cultivated area of the country will have to come through reclamation of the waste lands, as the desert is too high and its soil too poor to make the lifting of water from the Nile a profitable undertaking.

CLIMATE OF AGRICULTURAL AREA

With the exception of insufficient rainfall, the climatic conditions may be said to be very favorable for the production of cotton. The summers are so long and hot that most Europeans leave the country or gather at the seashore town of Alexandria. Winters are mild in all parts of the delta and valley. The cotton crop is grown during the summer season. Planting takes place in February–April, a period of rising temperatures, with the harvest coming in August–October, a period of falling temperatures.

TEMPERATURE

A study of the normal monthly average temperature as recorded at stations in typical cotton-growing areas discloses but a slight variation of temperature between the various stations. During the growing months (April to October) the average monthly temperature fluctuations are slight and for the 2 months prior to picking, these fluctuations are very narrow (table 2).

TABLE 2.—*Normal average temperature by months, at stations in the cotton-growing area of Egypt*

Month	Kerashia	Giza	Asyut	Esna	Month	Kerashia	Giza	Asyut	Esna
	° *F.*	° *F.*	° *F.*	° *F.*		° *F.*	° *F.*	° *F.*	° *F.*
January	50.7	51.6	52.9	55.6	August	78.8	79.3	84.4	86.2
February	52.9	54.1	58.0	57.9	September	74.5	75.0	79.3	82.2
March	58.1	59.4	63.0	65.3	October	70.0	70.9	74.3	75.6
April	64.4	66.2	71.8	73.9	November	62.4	63.1	64.8	66.4
May	71.1	72.7	78.8	81.7	December	54.3	54.9	56.3	58.3
June	76.8	77.7	83.8	85.5					
July	79.3	79.9	84.9	86.2	Average	66.1	67.1	70.8	72.9

From meteorological data of the Physical Service, Ministry of Public Works, Egyptian Government, Cairo.

A more accurate interpretation of temperature and its relation to cotton production may be obtained by reviewing the normal average maximum and minimum data (table 3). The lowest average minimum temperature known was 24.8° F. recorded at Giza in December. At no time during the cotton-growing season (April to October) in any part of the cotton area does the temperature drop to a point at which the crop would be in danger of frost. The low temperatures occurring during the winter season have no relation to cotton production except to indicate the conditions under which cotton pests and insects may survive from year to year.

The highest average maximum temperature recorded is 120.2° F. in June at Asyut, while at each of the other stations it exceeded 114°. These temperatures, occurring in June, have a direct influence on cotton growing. Although no month has an average maximum temperature of over 120° F., there are from 4 to 5 months during the growing and early harvest season in which the average maximum temperature exceeds 100° F.

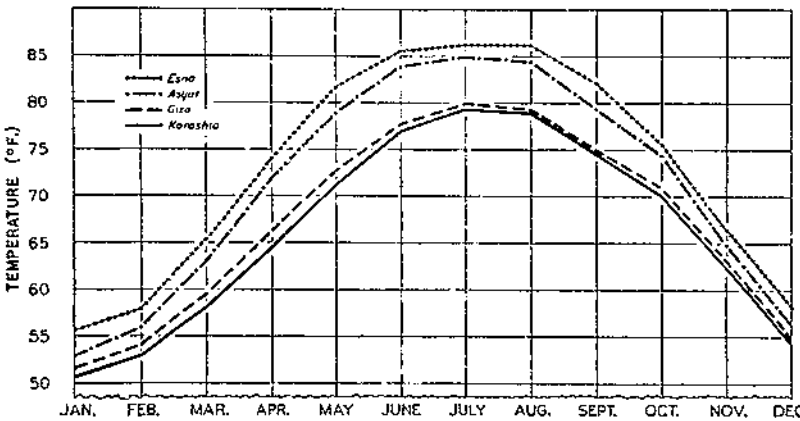

FIGURE 2.—NORMAL AVERAGE TEMPERATURE BY MONTHS, AT STATIONS IN THE COTTON-GROWING AREA OF EGYPT.

The Egyptian cotton crop is planted during a season of rising temperature and is harvested during a season of falling temperature. At no time is the crop in danger of frost.

TABLE 3.—*Normal average maximum and minimum temperatures by months, at stations in cotton-growing areas of Egypt*

Month	Korashin		Giza		Asyut		Esna	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.
January	82.8	32.0	85.6	27.5	86.9	32.0	89.4	32.9
February	84.2	32.0	92.5	32.7	93.2	32.0	92.7	33.4
March	100.0	35.2	100.6	33.8	108.5	35.6	100.4	36.5
April	103.3	40.6	109.0	39.2	120.2	44.6	107.2	44.4
May	113.5	44.6	112.5	46.0	114.8	50.0	114.4	50.0
June	117.3	48.9	114.4	54.0	120.2	59.0	114.8	58.1
July	107.2	57.2	105.8	59.0	113.0	59.9	112.6	53.6
August	105.3	58.1	107.1	61.0	108.5	66.2	110.8	55.4
September	103.3	54.0	104.7	51.5	106.7	61.7	108.9	54.5
October	100.2	49.3	100.7	50.4	103.1	59.9	99.9	44.4
November	98.6	38.8	95.6	40.1	95.9	40.1	94.1	35.6
December	82.6	32.4	82.6	24.8	86.0	32.0	88.7	34.7

From meteorological data of the Physical Service, Ministry of Public Works, Egyptian Government, Cairo.

RAINFALL

With the exception of a small area farmed by nomads of the desert, all crops depend entirely upon irrigation. The average annual rainfall of the delta varies from about 8.5 inches at Alexandria to about 1.5 inches at Cairo. In Middle Egypt a light shower may fall occasionally during the winter months but in Upper Egypt rain is practically unknown. The light rains of the delta fall during the winter and therefore have little or no influence on the cotton crop.

RELATIVE HUMIDITY

Next to temperature, relative humidity is perhaps the most important climatic factor affecting the Egyptian cotton crop. The humidity has seasonal aspects. From a minimum in the early growing months, it increases throughout the growing season to a maximum in the fall months. This seasonal character, however, is not constant and often in the delta a high relative humidity during the early stages of the crop accompanied by low temperature is responsible for a retarded and stunted crop. It is the common belief that the increasing relative humidity and the high temperature during the growing season have much to do with the quality of the staple of Egyptian cotton. During this period the atmosphere of the delta is very moist and the soil is damp which, accompanied by the normal high temperatures, bring about a condition said to be very favorable to the growing crop.[3]

The dampest area is the district along the coast and the driest is Upper Egypt. During the growing season the average relative humidity ranges from 64 to about 85 near the seacoast and in Upper Egypt it ranges from about 25 to about 50. The dampest period occurs during the picking and winter season (table 4).

TABLE 4.—*Normal average daily relative humidity, by months, at stations in cotton-growing area of Egypt*

Month	Kerashia	Giza	Asyut	Esna	Month	Kerashia	Giza	Asyut	Esna
	Percent	*Percent*	*Percent*	*Percent*		*Percent*	*Percent*	*Percent*	*Percent*
January	86	80	70	61	August	75	67	47	31
February	83	73	64	54	September	77	73	57	42
March	79	69	55	41	October	82	75	63	49
April	71	61	44	32	November	85	78	67	52
May	64	55	38	27	December	87	81	68	59
June	64	56	38	25					
July	69	61	42	27	Average	77	69	54	42

From meteorological data of the Physical Service, Ministry of Public Works, Egyptian Government, Cairo.

MINOR FACTORS

Wind is of little importance, as a rule, but at times hot blasts from the deserts are destructive, especially if the crop is young. The prevailing winds are from the north. One of the most noticeable features of the climate is the consecutive days of continuous sunshine. Even in the winter months the days of sunshine predominate. Throughout the whole of spring, summer, and fall there are many days in which there is not a cloud in the sky. Under such conditions

[3] FOADEN, G. F. COTTON CULTURE IN EGYPT. U.S. Dept. Agr., Off. Expt. Stas. Bull. 42, 28 pp., illus. 1897.

and with an ample supply of irrigation water, cotton-growing conditions are ideal.

SOIL OF THE AGRICULTURAL AREA

The cultivated area is confined to the narrow valley and the fan-shaped delta of the Nile River. It is one of the most productive and fertile areas of the world. For thousands of years it has supported a population at times exceeding that of the present. The fame of the soil fertility of Egypt is world-wide.

The soils of the valley and delta are of alluvial origin. For countless ages the Nile River has annually flooded its banks and deposited a layer of mud over the floor of the valley and has gradually built up a delta. The best soils resemble Nile mud in chemical composition but they are not uniform, especially with reference to their physical properties. The origin of the Nile mud is found in the steep hill lands of Abyssinia.

The reason for the lack of uniformity of the soils is obvious. As the annual floods spread over the valley, the heavy soil particles carried in suspense were deposited first while the finer and lighter particles were carried to the farther sides of the valley. This accounts for the light soils often found near the river and the clay soils found along the outer edges of the valley.

The subsoil is also far from uniform. At present the Nile River is under control, but prior to the introduction of canal irrigation the river reached the sea through many branches or channels. As the delta was built up, these channels changed and in changing they shifted the area of deposits. Today these shifts are often traceable by the type of subsoil. The delta is spotted with areas of heavy clay and sandy subsoils. In many sections this clay subsoil retards drainage while a nearby field with a lighter subsoil may have excellent drainage.

No soil survey of the country has been made but from a broad mechanical classification the soils of the valley and delta appear to fall into four general groups. They range from a coarse sandy or gravelly soil to a stiff black soil containing as much as 60 percent of clay. In fertility they range from the poorest to the most productive. Generally speaking, the soils are rich in potash, less rich in phosphoric acid, and deficient in nitrogen.

The most typical is a heavy black soil containing around 50 percent of clay. This soil is from 20 to 25 feet deep and is very fertile. It is stiff and hard to work, especially when wet. It appears to stand overirrigation well, but once it becomes saturated with salts it is very hard to drain and reclaim. Overirrigation is a common practice among the farmers. Much of the delta is of this class of soil.

A second group, differing from the heavy clays of the delta in depth and subsoil only, is found in Upper Egypt. This soil is from 4 to 12 feet deep but has a light sandy subsoil. Drainage is not a problem in regard to this soil except where the irrigation canals are allowed to run at a high level throughout the year. Most of the basin lands of Upper Egypt are of this class. Both these black clay soils are known as "soda" or "cotton soils" and are by far the most productive soils of the country.

A third group of lighter loams is found in the Sharqiya Province and other parts of the delta. Because of the location much of this soil

has become salty and is in need of drainage. In areas where it is free from salts it grows fair crops of corn and cotton.

At certain places along the edge of the desert a much lighter sandy loam of the fourth group is found. These soils are the result of mixing, by winds, the desert lands with the clay soils of the valley. They are not so fertile as the clay soils but have excellent drainage and produce fair crops.

IRRIGATION

Without the waters of the Nile River, the valley and delta would be as worthless as the surrounding desert. Not only has the use of the waters of the Nile made Egypt one of the most productive countries of the world, but the type of irrigation used has influenced and will continue to influence the agriculture of the country probably more than any other one factor.

BASIN OR FLOOD IRRIGATION

The oldest form of irrigation known in Egypt is the basin or flood type. For ages the Nile, during the flood season, has covered the land, leaving a layer of fine silt and thoroughly saturating the soil to a depth of several feet. Each year after the flood passed, crops have been planted and harvested before the next flood season. As the ancient Egyptian cultivated his fields, he found that on the part of his land where the water had stood for only a short time, his crop suffered from lack of moisture. This led to the building of dikes and dams to hold the flood on a given area for a fixed time. The present system of basin irrigation is the outgrowth of this ancient practice.

As the floods arrive in Upper Egypt, the water is turned into large basins. As soon as the basins are filled, the water is allowed to pass and basins further downstream are filled. The entire valley is thus flooded. The basins are so built that after the land has been thoroughly soaked, any remaining water is drained back into the river. Land under basin irrigation receives from the flood not only its annual water supply but, in addition, a supply of silt washed down from the hills of Abyssinia. This annual renewing of the soil is a very important factor in Egyptian agriculture. The fact that basin-irrigated lands can store only enough moisture to produce one crop a year and, without pumping through the summer months, must undergo an enforced fallow period during a part of each year, is also an important factor in their fertility.

CANAL IRRIGATION

Under canal irrigation a constant supply of water is held under control at all times. The advantage of this system over the basin irrigation is the elimination of the flood; this permits the watering of the land as required during the growth of the crop. After one crop has been harvested, the land may be watered again and made to produce a second, and in some cases, a third crop. This system has advantages, but it also has its disadvantages, among which are the loss of a large part of the silt deposit and the depletion of the soil brought about by constant cropping.

The present canal irrigation system of Lower and Middle Egypt consists of six large dams on the Nile, and hundreds of miles of canals. The first dam of this system, built in 1835, is located about 12 miles north of Cairo. It is not a storage reservoir in the true meaning of

the word but is rather a diversion dam. The level of the Nile is raised sufficiently to fill the canals that supply much of the delta. Other dams of this type are located at points on the main river between Cairo and Aswan, and on the Damietta branch of the Nile in the lower Delta.

The only storage reservoir of the irrigation system is at Aswan, approximately 675 miles upstream. This dam is used to supplement the normal river supply during the summer. At present, the Aswan Dam (fig. 3) is being heightened and its present storage capacity will be doubled. The three smaller dams between Aswan and Cairo are used to raise the level of the river in order to fill the take-off canals that supply water to Middle Egypt and the upper part of the delta. During the summer the Nile is often so low that it is necessary to

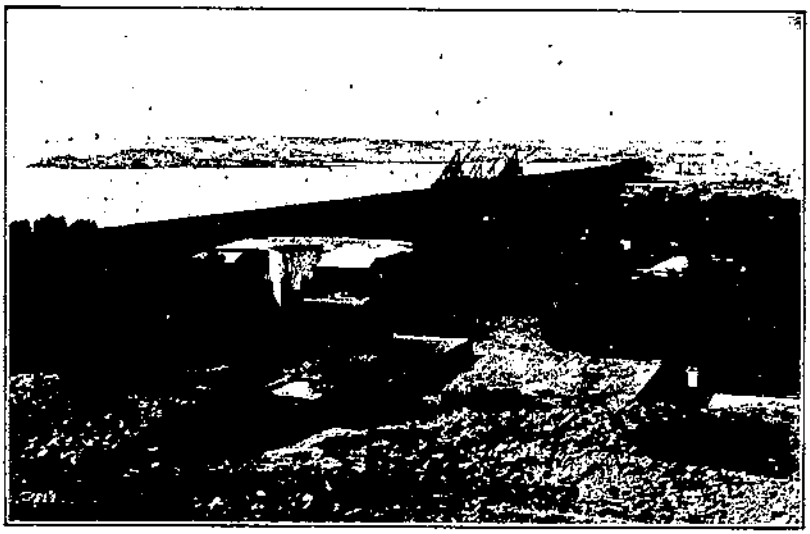

FIGURE 3.—The Aswan Dam is the largest of the six irrigation dams in Egypt.

build a temporary dam across its mouth to prevent the sea from flowing back into the delta. This gives some idea of the low, flat nature of the delta, and the difficulties involved in draining such an area.

POPULATION AND THE LABOR SUPPLY

From the classification of the population as recorded in the last (1927) Government census it appears that 85 percent or about 12,750,000 people depend directly or indirectly upon agriculture for a livelihood. Industry and commerce, although increasing in importance, hold but a limited attraction for the average Egyptian. The love of land is common to both the peasant and the upper or educated class. The peasant seems to enjoy the fact that his contact with the outside world is limited, and is willing to go on working the land year after year. To the educated Egyptian land ownership often means wealth and social and political influence.

It is estimated that the present population of 14,218,000 is increasing at the rate of from 200,000 to 275,000 each year. In 1882 it was 6,804,000; in 1897, 9,714,000; in 1907, 11,287,000; and by 1917 it was 12,751,000. Assuming that the rate of increase remains steady, it is estimated that the population by 1955 will be between 17,000,000 and 20,000,000.

The problem of the rapidly increasing population is closely related to the program of the Government for expansion of irrigation and land reclamation. In spite of the increase in population, it is not probable that the demand for land will be sufficient within the next 50 years to bring about migration. The density of the population on the lower, canal-irrigated lands is much greater than on the basin-irrigated lands of Upper Egypt. In the delta, where two or more crops are produced each year, the population in 1927 ranged between 567 and 1,777 persons per square mile. Three of the provinces have a population of more than 1,036 persons per square mile and in many of the districts (counties) of these provinces there are between 1,684 and 2,072 persons per square mile. In Middle and Upper Egypt, the population per square mile is less because a part of the land produces only one crop a year and therefore cannot support so great a number. The average for the inhabited part of the country is about 1,000 persons per square mile (table 5).

TABLE 5.—*Population per square mile of agricultural area of Egypt, census years 1882 to 1927*

Province	1882	1897	1907	1917	1927
Lower Egypt:	*Number*	*Number*	*Number*	*Number*	*Number*
Beheira	231	365	445	518	567
Gharbiya	326	461	526	588	635
Dagahliya	528	725	857	993	1,057
Menufiya	1,052	1,386	1,559	1,725	1,777
Qalyubiya	736	1,077	1,243	1,435	1,518
Sharqiya	231	376	443	495	526
Middle Egypt:					
Beni-Suef	510	730	881	1,070	1,199
Fayum	326	554	658	756	826
Giza	648	925	1,067	1,282	1,445
Minya	388	666	834	976	1,072
Upper Egypt:					
Aswan	391	567	642	699	738
Asyut	684	935	1,080	1,210	1,320
Girga	850	1,121	1,303	1,419	1,590
Qena	671	997	1,093	1,180	1,279
Total	495	710	824	938	1,044

From official census of Egypt, 1927.

The agricultural labor supply appears to be sufficient in all sections of the country at all times, the only exception being the cotton-picking season on the basin lands of Upper Egypt. During years of early flood it is often necessary to pick the crop in a few weeks. Under the present cropping system there are but two real rush periods of farm labor. The first comes in May and June when the wheat and barley must be harvested and the second from July to October during the cotton-picking season.

On the canal-irrigated lands the labor distribution is uniform. Land is prepared for cotton in January and February and is planted in March and April. Wheat harvest follows in May and June, after which the land is prepared and planted to corn. Cotton picking

begins in September and continues through October and November, when the berseem [4] (*Trifolium alexandrinum*) and wheat must be sown. The uniform climatic conditions and water supply make it possible to plant the same crops and perform the same labor operations at practically the same time each year. Under such conditions a system of uniform labor distribution has developed. There are very few days during the year when the Egyptian farmer is not toiling in his fields.

The supply of hired labor is usually large, relative to the demand, and farm wages are exceedingly low. An adult farm laborer receives from 7 to 25 cents per day and a child may receive as low as 2.5 cents per day. In addition to this wage, living quarters in the village are included, but not food. This seems a very low wage, but it must be

FIGURE 4.—Preparing land for cotton. The tools of the present farmer are similar to those used by the ancient Egyptian.

stated that an adult can live on 10 cents a day under such conditions. The average farm laborer has a small plot of land upon which he or his family can grow a certain quantity of such food crops as corn, wheat, beans, and vegetables.

Often all members of the family work as day laborers and the total income of a family might thus be as much as 50 cents per day. With an income of this amount and the living quarters furnished free, a peasant family can live well, according to their standards.[5] The efficiency of the average laborer or the wages he receives cannot be judged by the standards applied to American farmers. He is by nature a hard worker but his tools and methods are primitive.

[4] Egyptian clover grown as a winter crop and used for fodder.

[5] It was estimated by United Kingdom Trade Mission to Egypt, March 1931, that "taking five as the average in a family, about 10,000,000 of Egypt's population live on a family income of from P.T. 120 to P.T. 250 (1/4/7½d. to 2/11/4d.) a month or 9¾d. to 1s.8½d. per day." This is about $5.93 to $12.35 per month in United States money.

THE CROP YEAR[6]

Because of the mild winters the Egyptian farmer is able to cultivate crops during the entire year. On the canal-irrigated lands of Middle and Lower Egypt water is available for a crop 12 months of the year, but on the basin lands of Upper Egypt it is necessary to pump water from wells if this area is to produce a crop during the summer months. Without pumping, this land undergoes an enforced summer-fallow period.

The crop year is divided into three seasons corresponding with the growing period of the three leading crops—corn, cotton, and wheat. Corn is planted in July and harvested in December. The crops occupying the land during the fall months are known as fall crops. A small acreage of corn is planted in the spring and is therefore known as a summer crop, and a small area of rice is grown as a fall crop. Wheat and berseem are the principal crops which are planted in the winter following corn and other crops. Berseem occupies the land until about the end of February while wheat is not harvested until about May. Cotton is planted in the spring and occupies the land during the summer months and is therefore called a summer crop (fig. 5). Only the three seasons—summer, fall, and winter—are used in classifying Egyptian crops.[7] The planting and harvest dates of the leading crops are shown in table 6.

FIGURE 5.—Replanting cotton. Great care is taken to see that a perfect stand is obtained.

[6] For statistical purposes the Egyptian Government uses the period from Sept. 1 to Aug. 31 as the agricultural year. The acreage planted to crops during this period is reported in Egyptian official statistics under a hyphenated year. If the calendar year is used, it is necessary to convert the hyphenated or agricultural year. Because of the date of planting, the areas of the summer and fall crops are the same for both the agricultural year (sometimes called the statistical year) and the calendar year, but the area of winter crops reported under the hyphenated year is the area of the previous calendar year. For example, the summer crops of the agricultural year 1930–31 for all of Egypt were 2,240,866 acres, the fall crops 2,317,550 acres, and winter crops 4,271,501 acres. In converting these data to the calendar year the area in summer and fall crops for the year 1931 would be 2,240,866 acres and 2,317,550 acres, respectively, while the 4,271,501 acres of winter crops reported must be considered as a part of the area of the 1930 crops. This is because winter crops are planted in the first or winter part of the hyphenated year, whereas the summer and fall crops are planted during the last part of the hyphenated year.

[7] For a description of farming practices in Egypt in 1904 reference is made to the following publication: FOADEN, G. B. NOTES ON EGYPTIAN AGRICULTURE. U.S. Dept. Agr., Bur. Plant Indus. Bull. 62, 61 pp. 1904.

TABLE 6.—*Planting and harvesting periods of leading crops of Egypt*

Crop	Lower Egypt		Upper Egypt	
	Planting	Harvesting	Planting	Harvesting
Cotton	Feb.–Apr.	Sept.–Oct.	Feb.–Apr.	Aug.–Oct.
Corn	July–Aug.	Oct.–Dec.	July–Aug.	Oct.–Dec.
Wheat	Oct.–Dec.	May–June	Oct.–Dec.	Apr.–June.
Barley	do.	do.	do.	Do.
Grain sorghum	Apr.–May	Aug.–Sept.	Apr.–May	Aug.–Sept.
Rice	Apr.–June	Sept.–Nov.	July–Aug.	Dec.–Jan.
Beans	Oct.–Nov.	Apr.	Sept.–Nov.	Mar.–Apr.
Berseem	Sept.–Nov.	Dec.–May	do.	May–June.
Onions	Mar.	May–June	Nov.–Dec.	Mar.–Apr.

Compiled from data supplied by Ministry of Agriculture, Egyptian Government.

The total crop area of any year may exceed the area under cultivation by several million acres. This is made possible by the extensive system of double cropping followed by the farmers (table 7).

FIGURE 6.—Cultivating cotton. All operations from planting to harvesting of the Egyptian crop are performed by human labor.

Cotton is the leading crop in summer and wheat leads in winter; corn is grown as both a fall and a summer crop, but the summer area is small. During the year ended August 31, 1932, these three crops occupied 4,929,845 acres, which is almost equal to the total cultivated area of the country. In 1929–30 the acreage in these three crops represented about 62 percent of the total crop acreage (table 7).

TABLE 7.—*Distribution of agricultural area of Egypt, 1931–32* [1]

Crop	Lower Egypt	Middle Egypt	Upper Egypt	Total
Summer crops:	*Acres*	*Acres*	*Acres*	*Acres*
Cotton	822,371	227,469	85,421	1,135,261
Rice	469,265	12		469,277
Dura	941	50,101	208,928	259,970
Sugarcane	5,127	13,381	54,177	72,685
Peanuts	31,308	875	73	32,256
Melons	11,897	8,479	609	20,985
Sesame	14,399	474	2,781	17,654
Vegetables	14,342	2,294	355	16,991
Corn	9,361	10	4	9,375
Henna	1,223		228	1,451
All others	3,904	4,671	5,152	13,727
Total	1,384,138	307,766	357,728	2,049,632
Fall crops:				
Corn	1,422,346	523,993	86,330	2,032,669
Dura	4,800	70,901	23,914	99,681
Rice		20,140		20,140
All others	16,298	18,676	7,093	42,067
Total	1,443,450	633,710	117,337	2,194,497
Winter crops:				
Wheat	992,154	382,580	387,181	1,761,915
Berseem	1,165,683	322,349	214,059	1,702,091
Beans	228,393	175,174	211,170	614,737
Barley	214,471	32,416	118,858	365,745
Onions	6,104	14,933	22,586	43,623
All others	50,031	70,574	168,655	289,260
Total	2,656,836	998,026	1,122,539	4,777,401
Orchards	20,200	9,332	5,386	43,924
Total	5,513,630	1,948,834	1,602,990	9,065,454
Cultivated area	3,251,779	1,161,909	1,229,620	5,643,308
Double-cropped area	2,261,851	786,925	373,370	3,422,146

[1] Refers to the year Sept. 1 to Aug. 31.

Compiled from annual statistics of crop areas, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

Corn, although one of the leading crops of the country, is not grown to any great extent on the basin lands of Upper Egypt but is replaced there by the grain sorghum called dura. In Lower and Middle Egypt on the canal-irrigated lands, corn is the leading crop from the standpoint of acreage. Rice is cultivated on the lowlands of the northern delta and the Fayoum. Berseem is one of the most important crops and, being a legume, is the chief soil-building crop. Onions are produced in both Upper and Middle Egypt with a limited area in the delta. Fruits and vegetables are grown in all sections (table 8).

TABLE 8.—*Percentage of total acreage in leading crops in Egypt, 1926–27 to 1931–32* [1]

Crop	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cotton [2]	17.50	20.11	21.35	24.12	19.60	12.52
Corn	24.02	23.82	21.41	21.15	24.73	22.53
Dura	2.04	2.68	2.96	3.02	3.86	3.97
Rice	4.85	2.04	3.65	4.00	.76	5.40
Wheat	18.41	17.72	16.04	10.98	18.59	19.44
Beans	5.18	5.91	5.82	4.91	4.95	6.78
Barley	4.18	4.08	4.48	3.85	3.45	4.03
Sugarcane	.55	.66	.64	.62	.70	.80
Orchards	.39	.41	.43	.38	.47	.48
Gardens and other crops	21.38	21.67	21.22	26.97	22.74	24.05
Total	100.00	100.00	100.00	100.00	100.00	100.00

[1] Ministry of Agriculture. Agricultural year Sept. 1 to Aug. 31.
[2] Area limited by law, seasons 1927–28 to 1929–30 and 1931–32.

LAND TENURE

Farm labor is of two general types (1) labor hired by the landowner at a fixed wage and (2) labor performed by the owner or tenant. The first type includes the large estates and farms of 100 acres or more. Owners of such estates may employ the population of an entire village. All machinery, work animals, and other equipment are supplied by the landowner. The wages paid may be in cash or a part of the crop. Living quarters in the village, but not food, are always provided in addition to any wages paid. The second type includes the owners of small farms who with their families work their own land. Many of these farms are so small that their owners are unable to make a living without renting additional land or working as part-time laborers on the large estates. Such a farmer might be classed as more renter than owner.

A form of share rent known as "partnership" is now becoming common. Under this system, the landlord receives a fixed percentage of all crops grown, plus a part of the estimated rent in cash. For example, land that would rent under the cash system for $40 per acre might rent under the partnership system for one-half of all crops, plus one-half of the cash rent ($20 per acre). Under such a partnership the landlord might furnish an ox, the seeds, the tools, and the commercial fertilizers. The tenant furnishes an ox, the barnyard manure, and all labor. Another form of partnership, used when the tenant has no work animals of any kind, allows the tenant to keep one-sixth of the crop after a quantity equal to the original seed has been returned to the landlord.

The terms of the partnership depends upon the type of land, the equipment of the renter, and the demand for land. The partnership system is common on the canal-irrigated lands, and on the basin lands the cash system is favored. Landlords who live in the towns prefer to rent for cash while owners who live on or near the land, as a rule, use some form of the partnership system.

SIZE OF FARMS

Egypt is a land of intensive agriculture. The average farm, according to the latest Government statistics, is 2.47 acres. About 39 percent of the total area of the country, however, is occupied by farms of 52 acres or larger. But farms of this size represent only 0.5 percent of the total number of farms. It is estimated that 90 percent of the landowners' holdings are so small that their owners are compelled, in order to supplement their income, to rent from 1 to 5 acres from the owners of larger farms (table 9).

TABLE 9.—*Number of landowners and distribution of land by size of holdings, Egypt, 1931*

Size of holdings (acres)	Owners		Area [1]		Average holdings per owner [1]
	Number	*Percent*	*Acres*	*Percent*	*Acres*
Less than 1	1,529,644	68.2	605,707	10.1	0.4
1 to 5	554,550	24.7	1,218,521	20.3	2.2
5.1 to 10	84,351	3.8	593,049	9.9	7.0
10.1 to 21	40,377	1.8	529,530	8.8	13.1
21.1 to 31	12,093	.5	303,180	5.0	25.1
31.1 to 52	9,404	.4	371,813	6.2	39.9
Over 52	12,708	.6	2,393,418	39.7	188.1
Total	2,243,127	100.0	6,015,521	100.0	2.7

[1] Excluding lands exempt from taxation.

Compiled from annual statistics, 1931–32, Department of Statistics, Ministry of Finance, Egyptian Government.

The organization of the average small farm is simple. The dates of planting, cultivating, and harvesting, vary but slightly from year to year. The capital invested in farm equipment is small. Farm animals usually consist of a buffalo, a cow or two, a donkey, a few sheep or goats, and some poultry. The farm machinery is in keeping with the simple type of organization and consists mainly of home-made plows and small hand tools.

CROP ROTATION

The Egyptian farmer may not understand the reasons but experience has taught him that better yields are obtained when a system of crop rotation is followed. No uniform rotation is in general use, but it is the universal practice to include cotton and a leguminous crop in all rotations. Few, if any, farmers grow the same crop 2 years in succession upon the same land.

Most rotations are based upon the peculiar condition of the farm and district, but all are built around cotton and berseem and may include corn, wheat, barley, grain sorghum, rice, onions, beans, and vegetables. On the canal-irrigated lands a 2-year rotation, consisting of cotton followed by wheat the first year and corn and berseem the second year, is perhaps the most common. When such a rotation is used, the land is occupied by cotton from March to October and in November or early December wheat is sown and is harvested in May or June the following year. In July the land is planted to corn and is thus occupied until the end of the year. Berseem is sown in the standing corn in November of the second year and is carried over into the following year when the land is again planted to cotton, completing the rotation. Such a rotation may be changed by substituting barley for wheat, grain sorghum for corn, and replacing a part of the berseem area with beans or other leguminous crop. Onions, rice, and vegetables may also find a place in the rotation. The demand for food compels the farmers of the delta to take advantage of the abundance of labor and of the canal irrigation and the mild winters, to grow a crop in winter as well as summer. The result is that little or no cultivable land of the delta is allowed to lie idle very long at any season.

On basin-irrigated lands, if summer water is not supplied by pumping, the characteristic feature of the rotation is a fallow period from about May to the flood season. Under this system wheat is sown in the fall after the flood and is harvested in May or June. Berseem and beans are sown about the same time as wheat, but are harvested in the spring. The land is therefore fallow from about May to the fall flood. This rotation, like that of the delta, is subject to changes within fixed limits to fit special circumstances.

The chief difference in the cropping system of the delta and the upper valley is due to the type of irrigation employed.

THE PLACE OF COTTON IN THE CROPPING SYSTEM

Maintenance of the soil fertility is one of the outstanding problems of Egyptian farmers and one in which the Government is equally interested.[8] But the average farmer, in addition to the maintenance of the soil fertility, must consider other factors when outlining a cropping program. Years of experience have shown that in general, rotations that include corn and wheat as food crops, cotton as a cash crop, and berseem and beans as soil-building crops are the most profitable.

In addition to maintenance of the soil fertility, a farmer must consider seasonal distribution of crops, labor, rent, and water supply. If cotton has a high cash return per acre and the soil is fertile, a 2-year rotation is generally followed. If the land is not of the best cotton soil a 3-year rotation may be followed. In the choice of crops, under normal conditions cotton receives first consideration and all other crops are made subordinate to it. By using an increased quantity of barnyard manure, land that would otherwise be planted to cotton only once in the 3 years can be so planted every other year and a 2-year instead of a 3-year rotation might be followed.

It is important, from the standpoint of yields, to keep up soil fertility but the variety of cotton planted and the quality of the staple produced are also intimately related to soil fertility (fig. 7). The income from cotton depends upon quality as well as quantity and a loss in quality may be just as much a factor in crop income as in a drop in yields. This point is well understood by native growers. No matter what the income per acre or the demand for food may be, it is seldom that the same crop is planted on the same land 2 years in succession. The farmers feel that the productive powers of the soil must be maintained and they have found that a system of rotation in which cotton utilizes one-third or less of the land each year will do this best.

Prices and the returns per acre either in cash, food, or feed have a direct influence upon the choice of crops. Gross returns per acre from corn, cotton, and wheat in 1927 and 1932 are included in table 12. Government decrees restricted the acreage in many years but in half the years since 1913 there were no acreage restrictions and the substantial changes which took place are attributable to other factors among which the price of cotton relative to other crops was probably the most important. The high cotton acreages in 1920, 1924, and

[8] By royal decrees dated Nov. 14, 1932, the acreage that a farmer might plant to cotton in any 1 year was limited to 50 percent of his cultivated land. In a note the Government explained that this action was in the interest of soil fertility and crop rotation and was not designed to increase prices. Recently these decrees were rescinded.

1925 and the low acreage in 1919 were associated with relatively high and low cotton prices, respectively, prior to planting. Likewise the more usual acreages in 1916 and 1917 followed approximately average prices of cotton in relation to prices of corn and wheat.

Labor is not a problem, the farm population is large, wages are low, and intensive crops, such as cotton, may be grown. The labor supply is especially large in the delta (fig. 8).

Rent as such may not be so much a factor in the choice of crops as is the system under which it is collected. With about 70 percent of the area of the country in farms larger than one man can cultivate, it is plain that the collection of rent affects a large percentage of the farmers. Because of convenience, landlords demand that rents be paid in cash. To the small farmer cash means cotton. Therefore cotton is grown and sold in order to pay rents. The system of cash

FIGURE 7.—Without irrigation for watering cotton the fertile soil of Egypt would be unproductive.

rent has a direct influence on the place cotton occupies in the cropping system. It also tends to restrict the extent to which farmers respond to changes in cotton prices, both actual and in relation to other crops.

On the canal-irrigated lands of the delta the summer water supply is often limited, and may influence the crop acreage. The shortage of water at times restricts the quantity of rice grown as a summer crop. In years of low water, farmers of the lower delta may be forced to plant cotton in place of rice. The average Egyptian farmer grows a large proportion of his food and feed requirements. The beans and clover for the animals, the corn and wheat for human food, fit into his crop rotation, and the area of each is governed largely by the fertility of the soil, the home requirements, and the demand for cash.

The extensive double-cropping practices of the farmers are largely responsible for the involved and overlapping cropping system of the country. Under the common rotation, crops are classed according to

their growing seasons into summer, fall, and winter crops. Although this general classification fits into the rotation, certain crops overlap, thus often limiting a farmer in his choice of crops, particularly with respect to the time at which the choice may be made. Cotton, corn, and wheat dominate the total crop area of the season in which they are grown. The annual fluctiations in the acreages of cotton, corn, and wheat, therefore, have a direct relation to the fluctuations in the total area of summer, fall, and winter crops and explain in part the acreage shifts of the three growing seasons. The extent to which these crops

FIGURE 8.—The labor for picking cotton is supplied largely by women and children. Great care is used to keep the lint free from trash and other foreign matter.

overlap and to which a shift in one involves a shift in one or both of the others is due to the double-cropping system.

In September 1914, the Egyptian Government issued a decree restricting the cotton acreage for the year 1915. Before the planting of the 1915 crop, however, cotton prices fell sharply. The Egyptian acreage was cut in compliance with the law, but in all probability the fall in prices alone would have resulted in a reduced acreage. The decline in the cotton acreage of 1915 was absorbed by an increase in the 1914 winter-crop area. The fact that the decree was issued in September 1914, prior to the planting of winter crops, explains in part the heavy increase in the acreage of winter crops planted in 1914 (table 10).

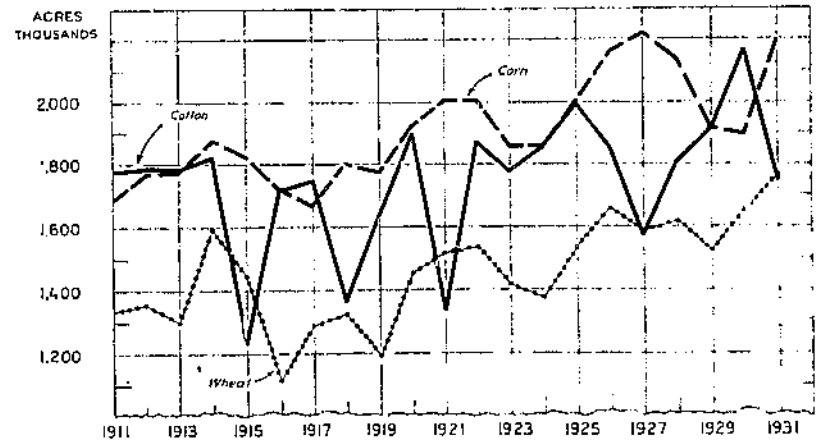

FIGURE 9.—ACREAGE OF COTTON, CORN, AND WHEAT OF EGYPT, 1911–31.

These three crops form the chief rotation. Cotton is grown as a summer crop, corn as a fall crop, and wheat as a winter crop.

TABLE 10.—*Acreage of summer, fall, and winter crops of Egypt, 1911–31*

Year	Summer crops	Fall crops	Winter crops	Total	Year	Summer crops	Fall crops	Winter crops	Total
	Acres	*Acres*	*Acres*	*Acres*		*Acres*	*Acres*	*Acres*	*Acres*
1911	2,248,643	1,800,795	3,879,337	7,928,775	1922	2,210,455	2,157,407	4,138,915	8,515,777
1912	2,263,856	1,816,037	3,870,454	7,950,347	1923	2,262,461	1,980,061	3,955,762	8,197,284
1913	2,289,785	1,841,365	3,632,022	7,763,772	1924	2,399,318	1,990,310	3,887,656	8,277,284
1914	2,180,744	2,016,324	4,249,108	8,446,266	1925	2,407,530	2,197,533	4,029,900	8,634,963
1915	1,896,062	1,948,180	3,852,057	7,697,100	1926	2,391,503	2,321,777	4,306,729	9,020,009
1916	2,178,406	1,848,090	3,806,494	7,833,050	1927	2,296,588	2,351,745	4,320,859	8,975,192
1917	2,337,485	1,805,225	4,031,341	8,174,051	1928	2,350,310	2,260,105	4,329,750	8,940,225
1918	2,105,491	1,950,248	3,942,306	7,998,045	1929	2,578,731	2,003,713	4,074,159	8,656,603
1919	2,101,873	1,909,590	3,658,388	7,669,851	1930	2,802,054	1,991,913	4,271,591	9,125,558
1920	2,308,204	2,047,427	4,150,042	8,505,673	1931	2,240,866	2,317,550	4,877,400	9,435,816
1921	1,990,392	2,194,334	4,108,188	8,292,914					

Compiled from annual statistics of crops areas, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

A second factor in the changes in the wheat acreage is the ease with which crop acreages of the winter season can be shifted as compared with those of other seasons. Although wheat is the chief winter crop, on an average it does not occupy so large a part of the total winter-crop area as cotton and corn do of the total summer- and fall-crop areas. Since 1911, cotton has occupied an average of about 76 percent of the total summer-crop area, corn almost 94 percent of the total fall-crop area, and wheat only about 35 percent of the winter-crop area. About one-third of the total winter-crop area is occupied by berseem grown as a forage crop. It is a simple matter, therefore, to increase the wheat acreage by shifting the acreage of berseem. A shift in the acreage of berseem or wheat often requires no change in the total winter-crop area, whereas, because of the high percentage of the total area they occupy, a shift in the acreage of cotton or corn is almost certain to affect the total crop area of the summer or fall seasons (fig. 9 and table 11).

TABLE 11.—*Acreage of cotton, corn, and wheat of Egypt, 1911–31*

Year	Cotton	Corn	Wheat	Total	Year	Cotton	Corn	Wheat	Total
	Acres	*Acres*	*Acres*	*Acres*		*Acres*	*Acres*	*Acres*	*Acres*
1911	1,776,268	[1] 1,688,732	1,331,087	4,796,087	1922	[2] 1,869,275	2,026,840	1,536,881	5,432,996
1912	1,787,244	[1] 1,761,829	1,355,189	4,904,262	1923	[2] 1,780,926	1,853,584	1,415,883	5,049,793
1913	1,788,572	[1] 1,771,466	1,300,843	4,860,881	1924	1,855,781	1,859,935	1,379,620	5,095,342
1914	1,821,970	1,876,151	1,592,085	5,290,206	1925	1,997,509	2,091,148	1,531,523	5,590,180
1915	[2] 1,231,072	1,823,710	1,447,163	4,501,945	1926	[2] 1,853,559	2,158,723	1,654,787	5,667,049
1916	1,718,421	1,719,397	1,116,529	4,554,347	1927	[2] 1,573,815	2,214,282	1,589,874	5,377,971
1917	1,741,048	1,669,844	1,286,214	4,697,106	1928	[2] 1,804,534	2,127,627	1,614,481	5,556,642
1918	1,365,504	1,800,214	1,323,376	4,489,154	1929	[2] 1,911,454	1,916,777	1,521,560	5,349,791
1919	1,633,461	1,778,610	1,190,290	4,602,361	1930	2,161,552	1,896,277	1,649,368	5,707,195
1920	1,897,329	1,924,286	1,458,180	5,279,795	1931	[2] 1,748,616	2,193,706	1,761,915	5,702,297
1921	[2] 1,340,981	2,069,318	1,517,785	4,928,084					

[1] Includes a small acreage of grain sorghum.
[2] Acreage limited by law.

Compiled from annual statistics of crop areas, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

The extent to which minor crops of the three growing seasons are shifted when a major crop is involved is also noticeable, but because of the low acreage of these crops these shifts are not very important. During the summer growing season of 1914 the area planted in rice was 23,307 acres; with a restriction on the acreage of cotton in 1915, the acreage of rice increased to 310,064 acres [9] while the acreage of sugarcane increased but 4,000 acres over 1914. The importance of cotton as a summer crop is shown, however, in that, in the face of an increase in other summer crops, the total summer crops declined 284,682 acres.

With the acreage restriction removed in 1916, the acreage of cotton (and the total summer-crop area) increased while the fall and winter-crop areas (as well as wheat and corn acreage) declined. The fact that this increase was absorbed by both fall and winter crops may be explained by the circumstances under which the farmers exercised their choice of crops. The coming removal of acreage restriction was known early enough in 1915 to enable farmers to hold land out of wheat and thus have it available for cotton in the spring of 1916. The acreage of the 1916 summer rice crop was again near the average.

The low cotton acreage of 1918 followed an increased acreage of winter crops (planted in 1917) the chief of which was wheat. Farmers, knowing in late 1917 that they would decrease their 1918 cotton acreage, prepared for it by increasing the area of winter crops (wheat) in 1917. This increased acreage harvested in 1918 was naturally followed by an increase in the acreage of fall crops planted in 1918. Under the normal rotation, land upon which a winter grain crop is harvested is planted to fall (corn) crops. The choice of summer crops other than cotton appears to have little influence upon the total summer-crop area.

The increase of the 1920 cotton area to 1,897,329 acres was the result of a decrease of both fall (corn) and winter (wheat) acreage in 1919. Here again the growers were free during the fall and winter season of 1919 to exercise their choice of crops, and the result was an

[9] The acreage of summer rice depends to a large extent upon the summer water supply. Under normal conditions the average area is about 150,000 acres. The low acreage of 1914 was probably due to water shortage and for this reason the increase of almost 300,000 acres in 1915 cannot all be charged to the cotton reduction.

increase in the 1920 cotton area and a decrease in the winter-crop area of 1919. The high cotton acreage of 1925 in like manner accounts for the low acreage of winter crops of 1924. Knowing in late 1924 that the conditions were favorable for an increase of cotton acreage in 1925, farmers planted less wheat in 1924. The 1924 fall-crop area was about equal to that of the previous year. The decline in cotton acreage from 1925 to 1927 was followed by an increase in wheat acreage.

Apparently, to increase cotton acreage under the present rotation, Egyptian farmers must make the decision prior to the date of planting winter crops of the previous year. The choice of a substitute crop for cotton, wheat, or corn appears to have little influence upon the area of these crops or upon the totals of the seasonal areas. Apparently the important factor is the crop-rotation system and the position of a crop in that rotation at the time conditions warrant a shift in its area.

It therefore follows that when the farmer elects to increase cotton acreage he plants less wheat the preceding year which in turn makes available less area for fall (corn) crops; likewise when wheat acreage is increased, the area of summer (cotton) crops the following year is less, and a larger area for fall crops is available. Cotton acreage can therefore be increased but little without a corresponding shift in food (corn and wheat) crops. This shift the farmer is prepared to make when conditions warrant.

TABLE 12.—*Gross returns per acre from the three leading crops of Egypt, 1927 and 1932* [1]

Crop	1927			1932		
	Lower Egypt	Middle Egypt	Upper Egypt	Lower Egypt	Middle Egypt	Upper Egypt
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Cotton	48.31	49.26	57.54	25.22	26.50	30.79
Corn	28.84	27.08	29.80	28.75	28.22	28.65
Wheat	30.98	31.32	30.55	25.70	25.75	25.58

[1] These figures were obtained by multiplying the average acre yield by the price of the crop at Alexandria. The yield figures were supplied by the Cotton Bureau of the Ministry of Finance and the prices by the Statistical Department of the same Ministry. All prices are averages for the month of August. Cotton prices of Lower Egypt are for Fully Good Fair Sakellarids spot; for Middle and Upper Egypt they are for Fully Good Fair Uppers spot.

COST ITEMS IN THE PRODUCTION OF COTTON

The cost of producing cotton varies widely from farm to farm as well as from year to year. In common with farmers the world over, few Egyptians know definitely their cost of production. A large percentage of farmers are unable to read or write and therefore make no attempt to keep accounts. The few figures available are perhaps chiefly from larger estates on which, because of the form of management, the costs are perhaps relatively higher than on the lands of the small farmer. According to the best available estimates, the costs of growing an acre of cotton range between $26.70 and $60.20.[10]

[10] WAHBAH, A. A. MEMORANDUM ON THE BASIS OF A STAPLE COTTON POLICY, 55 pp. Cairo, Ministry of Finance, 1930.

LABOR

Labor cost is not high, but it is the chief item in cost of growing. The average grower can cultivate from 1 to about 4 acres of cotton. With average yields this means that the average grower and his family produces from less than 1 to about 3 bales of cotton annually, depending upon the size of his family.

FERTILIZER

Fertilizer is an item of increasing expense. In spite of the fertile soil, the use of commercial fertilizer has increased in Egypt from about 55,000 tons in 1919 to more than 330,000 tons in 1930. This increase is due to the use of fertilizer on lands that formerly did not require it, as well as to the use of increasing quantities per unit of land. The commercial fertilizers most used are nitrate of soda, sulphate of ammonia, cyanamid of calcium, and superphosphates. The value of barnyard (baladi) manure is well known, and great care is taken to return it to the soil. Most landowners require the renter to return to the land a fixed quantity of baladi manure per acre each year. Little crop residue as such is returned to the soil. All fodder is fed or burned as fuel.

Use of commercial fertilizer is more common in Lower Egypt than in the upper valley where little fertilizer aside from the baladi manure is used. The average cost of fertilizer, when used, ranges from $2.38 to $7.14 per acre. The fact that commercial fertilizer is not used on all cotton land reduces the average cost per acre below this figure.

RENT

Rent of agricultural land has always been high, but since cotton has become the leading cash crop, a system of excessive rents has developed. The price has fluctuated with the fluctuations in the price of cotton. Rent per acre in designated years 1912 to 1929, averaged as follows:[11]

1912	$29.94	1927	$39.07
1913	31.03	1928	38.95
1914	31.55	1929	36.95

Rents have decreased since 1929 but at present they range from $15 to $40 per acre. The decrease is due to reduced cotton prices and not to a decline in yields. It is well known that rents are greatly out of harmony with cotton income. Until the system of renting is changed or rents per acre are reduced, the growers will receive very little for their labor.

TAXES AND INTEREST RATES

Taxes are high. Land taxes, collected by the central Government, range from $3.33 to $7.61 per acre. The land tax includes the fee for water rights. The grower is required to buy a supply of cottonseed each year. This has its advantage in that the Government is able to control the seed supply and can dictate the quantity and variety to be planted, but it often works a hardship on the grower who is short of cash.

The average farmer, like most farmers of other countries, operates to a large extent on borrowed money. In the case of the small farmer

[11] WAHBAH, A. A. See footnote 10.

this borrowed capital is supplied by a banker or money lender who lives in the village, but in the case of the large landowner the larger banks and the cotton-export firms make the loans. Cotton is the basis of all such loans. Interest rates are high, often as much as 15 to 20 percent, and are a considerable item in the cost of growing cotton since most of the land is rented for cash which is often paid with borrowed money. Thus in addition to a high rent, such a farmer is required to pay interest upon the money borrowed and paid as rent.

Egypt is now passing through an adjustment period in which both land prices and rents are declining. This reduction has its reaction on the cost of producing cotton. A great many farmers will probably lose their holdings through foreclosures, but in general it is not expected that this fact will cause a shift to crops other than cotton. It will have a tendency to increase the cotton acreage on the large estates on which farmers who have lost their holdings will be employed.

ACREAGE AND PRODUCTION

Cotton was probably known and grown to a limited extent by the ancient Egyptians, but only in the last 100 years has it become a commercial crop. A little more than 100 years ago a French engineer called the attention of the Turkish viceroy, Mohamed Aly Pasha, who was in need of more revenue, to the possibilities of cotton as a commercial crop. The Pasha was quick to recognize its value and to order it planted on a scale large enough to insure a quantity for export. The early crops were grown under order of the viceroy but in a short time individuals became interested in its production and forced planting was no longer necessary. It is estimated that the crop in 1820 was about 200 bales of 478 pounds net, but by 1861 it had reached 150,000 bales. The increase during this period was largely due to the encouragement given by the State.

The Civil War in the United States stimulated Egyptian cotton production sharply. It is probable that, lacking that stimulus, cotton culture in Egypt would not be as far advanced as it is today. At the outbreak of the war, European spinning centers were cut off from American cotton and were forced to look for other supplies. This gave Egyptian cotton an opportunity to enter the spinning centers of the Old World. Growers were quick to take advantage of the situation and to increase their acreages. By 1864 the crop had reached 414,000 bales.

After the close of the war the Egyptian crop not only held this place but continued to increase. In 1879 the crop was larger than 622,000 bales. Without the encouragement of the State in the early years and the opportunity brought about by the American Civil War, it is doubtful if cotton production in Egypt would have gained the place it holds today in the economic life of the country.

During the period between the American Civil War and the outbreak of the World War, in 1914, cotton production continued to increase. As new irrigation works were constructed new areas were brought under production. The Aswan Dam on the Nile River in Upper Egypt, completed in 1903, increased the much-needed summer water supply and enabled large areas in the delta to be brought under irrigation. In 1912 this summer water supply was again increased by the heightening of the dam. New developments continued until in 1914 the area planted to cotton was 1,822,000 acres, with a crop of

1,334,078 bales. By this time Egyptian cotton had become so widely and so favorably known in the spinning centers of the world that Egypt's place as a producer of long-staple cotton seemed assured.

The end of a period of almost uninterrupted acreage increases and the beginning of a period of wide fluctuations in both acreage and production occurred in 1914 (table 13). Annual fluctuations in acreage, in some instances as much as 25 percent, have been due in many cases to Government action in the form of laws restricting cotton planting. At the beginning of the World War, in fear of a food shortage, the Government limited the acreage planted to cotton; the 1915 area was reduced to 1,231,000 acres, or more than 32 percent under that of 1914. Production declined 345,000 bales. The following year the restrictions were removed and the cotton acreage increased approximately 500,000 acres but the crop outturn was only slightly larger than that of 1915.

TABLE 13.—*Acreage, production, and yield of cotton in Egypt, 1911–31*

Year	Acreage	Production	Yield per acre	Year	Acreage	Production	Yield per acre
	Acres	*Bales* [1]	*Pounds*		*Acres*	*Bales* [1]	*Pounds*
1911	1,776,208	1,531,009	412	1922	[2] 1,869,275	1,302,180	356
1912	1,787,244	1,551,087	415	1923	[2] 1,780,326	1,355,720	364
1913	1,788,572	1,586,516	424	1924	1,855,781	1,506,300	388
1914	1,821,970	1,334,078	350	1925	1,907,990	1,650,661	395
1915	[2] 1,231,072	988,078	381	1926	[2] 1,853,550	1,585,095	409
1916	1,718,421	1,049,747	292	1927	[2] 1,573,815	1,201,028	383
1917	1,741,018	1,303,905	358	1928	[2] 1,804,534	1,672,403	443
1918	1,305,561	907,033	340	1929	[2] 1,911,451	1,767,495	442
1919	1,633,461	1,155,011	338	1930	2,161,552	1,713,867	379
1920	1,897,320	1,250,332	315	1931	[2] 1,746,640	1,317,256	360
1921	[2] 1,340,981	993,339	322				

[1] Bales of 478 pounds net.
[2] Acreage limited by law.

Compiled from annual statistics and monthly agricultural and economic statistics, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

After the restriction of 1915 no Government action regarding acreage was taken until December 7, 1920. By decree of this date the area of 1921 was reduced by more than 500,000 acres under that of 1920. Production dropped about 340,000 bales. Government action again undertook to limit the acreages of 1922 and 1923, but from the area planted it appears that the decree was not well enforced. The action of the Government in limiting acreage in 1926 and again in 1927, 1928, and 1929 accounts in part for the declines during these years, but, apparently, after 1926 the further laws regarding acreage reduction during this period were not very well enforced. The all-record high acreage in 1930 of 2,162,000 acres brought about Government intervention the following year. Since 1930 some form of acreage restriction has affected every cotton crop.

With the exception of the interventions at the beginning of the World War, all Government action has had for its real object the increase of the price or premium of Egyptian cotton over cotton from other countries. There is a close relationship between the decline in price or premium and Government action. The Government attempted to keep the price near the war-time level not only by limiting the acreage but by entering the market and purchasing large quantities of cotton. Prior to the World War, the demand for Egyp-

tian cotton was an important factor in stimulating acreage expansion. During the war and immediately thereafter the influence of rising prices appears to have increased acreage, but just what influence declining prices, without the accompanying Government restriction, would have had cannot be definitely determined. It is doubtful if declining prices alone would have brought about such sharp reductions. The influence of price upon cotton acreage since the war, except as it influenced Government intervention, cannot be definitely appraised. Since the degree of enforcement of these laws is not known, it is difficult to measure their influence or to estimate the acreage that growers would have planted had their choice of crops been influenced solely by prices.[12]

COTTON-PRODUCING DISTRICTS AND YIELDS

The acreage under cotton in the delta is almost twice as great as that of Upper Egypt, but because of the yield the production is fairly evenly divided between the two sections of the country. The average annual acre yield of the six delta provinces for the 5-year period from 1927 to 1931 ranged between 300 and 360 pounds, while for Upper and Middle Egypt it was as high as 700 pounds per acre and seldom below 400 pounds per acre (table 14). On many of the estates of Upper Egypt the yield is often as much as 750 to 1,000 pounds per acre.

TABLE 14.—*Acreage, production, and yield of cotton by Provinces of Egypt, 1927–31*

ACREAGE

Province	1927	1928	1929	1930	1931
Lower Egypt:	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Behera	205,802	226,770	286,610	283,420	247,642
Gharbiya	360,009	401,230	427,547	403,559	434,267
Daqahliya	177,060	199,632	218,168	254,044	218,691
Menufiya	108,007	111,471	116,026	124,124	93,068
Qalyubiya	57,598	62,080	64,126	69,862	50,488
Sharqiya	170,041	185,651	191,965	215,065	187,702
Total	1,078,727	1,186,849	1,204,442	1,440,083	1,237,858
Middle Egypt:					
Beni-Suef	72,825	84,995	90,350	99,517	77,641
Faiyum	93,008	102,445	105,629	107,850	96,272
Giza	35,334	47,311	47,486	50,249	36,080
Minya	134,510	155,324	161,803	180,777	148,631
Total	337,737	390,075	405,268	438,373	358,624
Upper Egypt:					
Aswan	2,364	2,608	4,033	3,085	1,428
Asyut	117,352	150,293	101,636	186,324	112,633
Girga	30,718	61,807	58,069	73,704	20,709
Qena	6,917	12,902	18,006	19,983	6,394
Total	157,351	227,610	241,744	283,096	150,164
Grand total	1,573,815	1,804,534	1,911,454	2,161,552	1,746,646

[12] An effort has been made to determine by graphic correlation the relationship of relative cotton prices to cotton acreages in years when no Government restrictions existed. As indicated in fig. 9, an upward trend is evident in the acreage of cotton, corn, and wheat and in view of this trend, relative cotton prices were associated with deviations from the trend in acreage. The variables used included prices of Ashmouni cotton at Alexandria during the period from January to March, deflated by indexes of wholesale prices of farm products in Egypt, indexes of cotton prices for the same period expressed as percentages of: (1) Combined indexes of wheat and corn prices during September, October, and November preceding the planting of cotton; (2) indexes of corn prices from January to March; (3) indexes of rice prices from January to March; and (4) combined indexes of corn and rice prices from January to March. Of the above and other correlations the best results were obtained from the use of indexes of cotton prices in the 3-month period from January to March expressed as percentages of indexes of corn prices for the same months, but a close coincidence or high degree of correlation was not obtained.

TABLE 14.—*Acreage, production, and yield of cotton by Provinces of Egypt, 1927–31*—Continued

PRODUCTION

Province	1927	1928	1929	1930	1931
Lower Egypt:	*Bales* [1]	*Bales* [1]	*Bales* [1]	*Bales* [1]	*Bales* [1]
Beheira	126, 760	159, 405	165, 287	142, 393	132, 262
Gharbiya	249, 012	283, 648	316, 370	293, 405	271, 952
Daqahliya	124, 607	141, 613	155, 815	164, 192	153, 031
Menufiya	88, 886	102, 178	100, 875	94, 030	82, 436
Qalyubiya	52, 468	63, 938	71, 168	69, 727	59, 208
Sharqiya	121, 490	134, 507	141, 972	138, 790	112, 531
Total	754, 202	876, 289	951, 467	903, 137	791, 420
Middle Egypt:					
Beni-Suef	72, 218	106, 330	117, 930	101, 836	71, 196
Faiyum	64, 560	80, 285	91, 173	77, 294	62, 024
Giza	34, 875	48, 421	49, 107	47, 689	30, 102
Minya	156, 595	216, 619	228, 269	238, 081	179, 281
Total	328, 248	457, 656	486, 479	464, 902	342, 603
Upper Egypt:					
Aswan	1, 308	2, 517	2, 797	1, 813	730
Asyut	136, 874	237, 529	236, 914	240, 584	145, 337
Girga	35, 096	84, 052	71, 489	85, 610	34, 585
Qena	5, 551	13, 743	18, 627	18, 799	5, 281
Total	178, 829	337, 841	329, 827	346, 806	186, 233
Grand total	1, 261, 369	1, 671, 786	1, 767, 773	1, 714, 845	1, 320, 256

YIELD PER ACRE

	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lower Egypt:					
Beheira	295	317	321	266	253
Gharbiya	319	335	354	284	300
Daqahliya	337	330	342	309	335
Menufiya	303	438	416	365	321
Qalyubiya	435	402	531	477	472
Sharqiya	342	346	353	308	286
Average	334	353	360	309	304
Middle Egypt:					
Beni-Suef	474	598	624	490	438
Faiyum	324	403	412	343	308
Giza	471	490	494	453	399
Minya	556	667	675	630	576
Average	495	561	573	507	457
Upper Egypt:					
Aswan	204	461	331	281	244
Asyut	557	756	700	617	616
Girga	546	659	589	555	561
Qena	384	510	494	449	381
Average	543	710	652	586	592
Grand average	383	448	442	379	361

[1] Bales of 478 pounds net.

Compiled from annual statistics of crop areas, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

The yield of roughly twice as much per acre in Upper Egypt as in the delta has offset, to a large degree, the disadvantage of the one-crop-per-year system on the basin lands of this upper section. At present, the national requirement for winter crops, in order to meet the growing demand for food, is threatening the cotton crop of the basin lands. With the introduction of canal irrigation in Upper Egypt, and the continuous cropping that follows such a system, the

total yield, if no change in varieties is made, may be expected to decline, but probably for several years will remain above that of the delta.

FACTORS INFLUENCING ACRE YIELDS

A study of the total acreage planted to cotton and the total production, by years since 1910, reveals the influence of the yield per acre upon the size of the crop. It also reveals a decline in yields during a part of this period. Because of a small area, the intensive system of cultivation, and the uniform growing season, it is possible to point out numerous reasons for these fluctuations and to estimate to a considerable extent their influence on future yields.

INFLUENCE OF TYPE OF IRRIGATION ON YIELDS

Perhaps the most important factor influencing acre yield in the delta is the rise of the subsoil water level. In Lower Egypt, where canal irrigation is general, the underground water level in many places is often less than 3 feet below the surface. This is especially true of a large part of the northern delta where the canals run at a high level. With the coming of the annual flood the normal level of the water table of the country is raised. In the northern delta, where the water table is normally high, the feeding area of the crop is reduced at just the time the crop is most in need of plant food. The influence of the high-water table upon yields is shown in part by a comparison of delta yields with those of basin lands of Upper Egypt (table 14). Fully two-thirds of the delta is in need of improved drainage.

The Delta lands drain into open ditches which become large streams before they reach the sea. Each large drain is emptied into the sea by means of pumps operated by the Government. The present drainage system is inadequate to a noticeable degree but it is estimated that a large part of the delta would become unproductive in a short time without the present system of artificial drainage. With the impounding of more irrigation water the drainage problem becomes increasingly important and its influence on yields becomes more pronounced.

The increased supply of summer water has become a factor in the drainage problem of the delta. Farmers on canal-irrigated lands recall past years in which the summer supply was very low. They therefore often overwater the land when the water supply is abundant in the hope that this will carry the crop through a possible period of low water.

Canal irrigation has made it possible for the farmers to utilize their land during the winter as well as the summer. All available land is therefore kept in some crop 12 months a year. Under the old system of basin irrigation the land had a fallow or rest period each year, but with the change in irrigation, this rest period has been replaced by a growing crop. The value of the loss of this fallow period has perhaps been overestimated, although it has an important influence on yields.[13] Regardless of the value of the fallow period, the

[13] TAYLOR, E. MCK. THE EFFECT OF THE SHARÂQI PERIOD UPON THE YIELD OF COTTON IN EGYPT. Egypt Min. Agr. Tech. and Sci. Serv. Bull. 57, 22 pp. 1926. Dr. Taylor makes the following statement: "The theory that the decline in yield of Egyptian cotton is directly attributable to the fact that the *Sharaqi* [fallow] period has been almost entirely eliminated is confirmed."

supply of summer water has enabled each farmer to follow a system of constant cropping that increases his total crop output.

Prior to the introduction of canal irrigation in the delta the land was flooded yearly in a manner similar to the flooding of the basin lands of Upper Egypt. During this flood the fields were covered with a layer of mud. This "new" soil was very beneficial and was considered the source of the soil fertility of the country. The value of this Nile mud may be appreciated when it is recalled that for thousands of years land thus renewed has been producing annual crops. Under canal irrigation this annual supply of silt is largely lost to the delta.

Regardless of its advantages over the old basin-irrigation system the introduction of canal irrigation has brought about conditions that have contributed to the decline of the yield of cotton in the delta.

INSECTS AND DISEASES

The attacks of insects and diseases are also important factors in reducing yields. The most common and destructive insect is the pink bollworm (*Pectinophora gossypiella* Saund.). This insect made its appearance in 1913 and since that time has spread over the entire country. As a measure of control, a law now requires that all seed be treated by heat at the gin. If properly performed, this heating gives a fair degree of protection.

Other insects common to the country are the spring cotton bollworm (*Earias insulana* Boifd.) and the Egyptian cotton worm (*Prodenia litura* Fab.). Although these insects are destructive and often do a great deal of damage, they are not general over the entire country. It is commercially estimated that the average annual damage by all insects varies between 15 and 50 percent of the crop (table 15).

TABLE 15.—*Percentage of green balls in Lower Egypt, attacked by pink bollworm between July 12 and Sept. 13, 1917–19*

Date	1917	1918	1919	Date	1917	1918	1919
	Percent	*Percent*	*Percent*		*Percent*	*Percent*	*Percent*
July 12	5	4	2	Aug. 23	51	39	13
July 19	18	3	3	Aug. 30	86	58	37
July 26	11	7	6	Sept. 6	92	52	50
Aug. 2	20	6	10	Sept. 13	92	82	87
Aug. 9	26	15	7				
Aug. 16	27	27	6	Average	43	29	22

From STOREY, G. THE PRESENT SITUATION WITH REGARD TO THE CONTROL OF THE PINK BOLL WORM IN EGYPT. Egypt Min. Agr., Tech. and Sci. Serv. (Ent. Sect.) Bull. 16, 16 pp. 1921

Cotton wilt (*Fusarium*) is the principal plant disease of the country. Rotation is the only known method of control. Attempts to develop a wilt-resisting variety have met with some degree of success. The short-staple varieties appear to be somewhat resistant. The principal districts suffering from wilt are in Lower Egypt where drainage is poor and other soil conditions are unfavorable. Otherwise the country is remarkably free of cotton diseases.

SUMMER WATER SHORTAGE

An ample supply of summer water is always a question of concern to the farmers. The yield per acre, especially along the lower reaches of the canals in the delta, is often reduced because of a limited water supply during the growing season. Because of its salt content, the subsoil water of the lower delta cannot be pumped during seasons of short summer supply as is done in Upper Egypt. Not only does the lack of water interfere with the yield, but it often reduces the quality of the staple as well. The question of an increased water supply for summer use is now receiving the attention of the Government.

VARIETIES AND YIELDS

The quality of its staple is largely responsible for the popularity of Egyptian cotton among the mills. Until recent years it was the general opinion that because of this quality Egyptian cotton was indispensable in the manufacture of certain goods and it enjoyed a monopoly in this field.

Little is known of the early Egyptian varieties. After Mohammed Aly became interested in cotton production the seed of sea-island, Brazilian, Peruvian, and American upland cottons were introduced; the early Egyptian varieties were the results of selection and natural crossing. They received little or no attention from the plant breeders. These varieties apparently rose to general favor by the spinners only to break down biologically and disappear from the market in a few years. The single exception is the variety known as Ashmouni which appeared about 1860 and is still one of the leading varieties of the country.

Egyptian cotton varieties are classed as a rule, according to their staple length and the area of production, into two general groups or divisions known as "lower" and "upper", or "long" and "short" staples. During recent years, in commercial classification, three groups have developed: (1) Long-staple varieties, (2) medium-staple varieties, and (3) short-staple varieties. This classification is now used by the Egyptian Ministry of Agriculture in its official reports and estimates.

Of the long-staple group Sakellaridis is by far the most common variety (table 16). The several strains of this variety are often referred to as "Sakellaridis type." The fiber of the Sakellaridis-type varieties is a light cream in color, is very fine and silky, with a staple 1⅛ inch and longer. All the strains are relatively late-maturing and low-yielding cottons. They are best suited to low land and therefore are largely grown on the high-water-table lands of the northern Delta. Their adaptability to this low section and their long silky staple are largely responsible for their popularity.

TABLE 16.—*Acreage of leading varieties of Egyptian cotton, 1911-31*

Year	Sakellaridis	Ashmouni and Zagora	All other varieties	Total	Year	Sakellaridis	Ashmouni and Zagora	All other varieties	Total
1911	124,182	342,377	1,309,709	1,776,268	1922	1,409,780	418,053	41,482	[1] 1,869,275
1912	204,959	357,347	1,224,938	1,787,244	1923	1,302,090	428,217	49,419	[1] 1,780,326
1913	256,689	370,031	1,161,852	1,788,572	1924	905,784	826,624	123,373	1,855,781
1914	409,390	367,340	1,045,250	1,821,970	1925	1,171,846	684,478	141,185	1,997,509
1915	508,744	240,441	421,887	[1] 1,231,072	1926	1,019,091	692,838	141,630	[1] 1,853,559
1916	1,071,361	356,045	290,415	1,718,421	1927	825,978	621,017	126,920	[1] 1,573,815
1917	1,176,241	375,625	189,182	1,741,048	1928	829,905	797,611	177,018	[1] 1,804,534
1918	988,075	284,346	92,543	1,365,564	1929	880,172	838,776	192,500	[1] 1,911,454
1919	1,190,008	346,858	96,595	1,633,461	1930	869,163	971,707	320,682	2,161,552
1920	1,318,758	294,694	283,876	1,897,328	1931	496,705	787,471	462,410	[1] 1,746,646
1921	1,033,262	271,201	36,428	[1] 1,340,981					

[1] Acreage limited by law.

Compiled from annual statistics of crop area, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

The variety known as Maarad is a selection from the American-Egyptian (Pima) cotton, and has a somewhat longer but a weaker and more irregular staple than Sakellaridis but the yield and gin turnout are higher. It is also adapted to a larger section of the

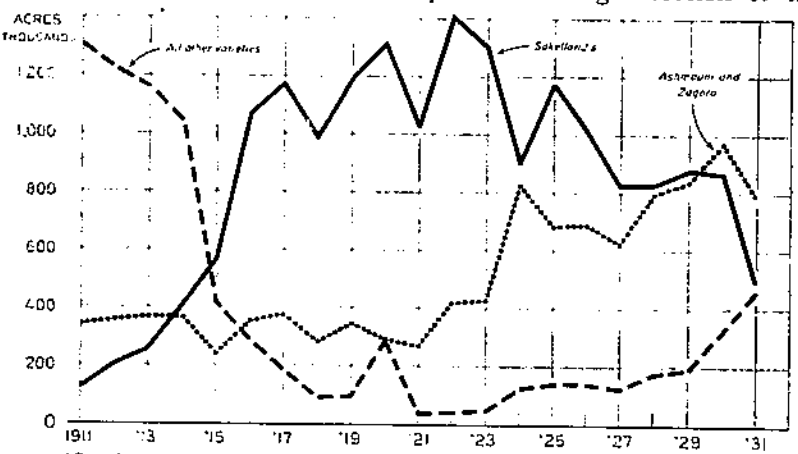

FIGURE 10.—ACREAGE OF LEADING VARIETIES OF EGYPTIAN COTTON, 1911-31.

The long-staple varieties have declined in area whereas the shorter and medium varieties have increased during recent years

country which gives it an advantage over Sakellaridis. In recent years Maarad has increased in popularity in the delta.

Other varieties of the long-staple group are Nahda and Giza 7. These cottons are somewhat shorter than Sakellaridis but are better yielders and are adapted to a larger area of the country. Of late years the better yielding varieties of this group have increased in area very rapidly whereas the acreage of Sakellaridis has declined (fig. 10).

The leading varieties of the medium-staple group are Pilion and Fouadi. These cottons, although slightly shorter than the long-staple varieties, were classed as long staples until recent years, forming the minimum staples of this group. They are often mixed or blended with varieties of the long-staple group and sold under a long-staple

variety name. They are best suited to the delta where they outyield many of the long-staple varieties. The staple ranges between 1¼ and 1⅝ inches in length. The acreages of these varieties have been increasing at the expense of Sakellaridis-type varieties.

The bulk of the Egyptian cotton is classified as "Uppers" or short-staple varieties, the chief varieties of which are Ashmouni and Zagora. These two cottons are very similar, about the only real difference being the location of their production. Ashmouni is largely grown in Upper Egypt and Zagora is grown in the delta. The lint is a dark cream color and is rougher than is found in the varieties of the longer staple groups. It ranges from 1⅛ to 1⅜ inches in staple length, most of which is 1⅛ inches and longer. Until recent years the percentage of staple shorter than 1⅛ inches was considered to be very small but today several of the large cotton-export companies

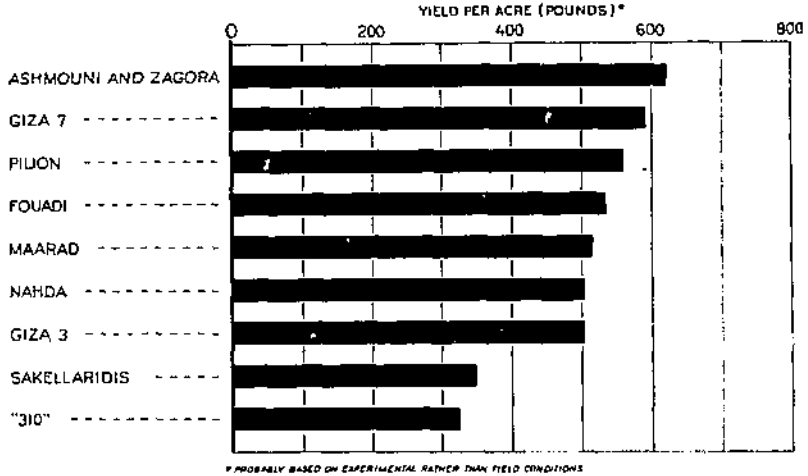

FIGURE 11.—AVERAGE YIELD OF LEADING VARIETIES OF EGYPTIAN COTTON, 1929 AND 1930.

Yields have played an important part in the acreage decline of the long-staple varieties.

of Egypt admit they handle orders for staples shorter than 1⅛ inches.[14] It appears that the average staple length of Uppers is shorter now than it was a few years ago.

Yield per acre is an important factor in the total output of the cotton crop and is closely associated with variety. The long-staple cottons have relatively low yields and low gin turnout (table 17). The medium- and short-staple varieties are relatively higher yielders; this is the chief reason for the recent increase in the area of these varieties (figs. 11 and 12). Another factor in the situation has been a decline in the premium paid for long-staple cotton. During the 6 years 1924–25 to 1929–30, the price of Sakellaridis averaged 32 percent above Uppers. In 1932–33 the price of Sakellaridis was only 11 percent above that of Uppers.

[14] In discussing the staple length of Egyptian cotton it must be stated that Egyptian cotton exporters give but slight consideration to staple length aside from grade and variety name. Each variety carries a more or less definite staple length depending upon the grade.

TABLE 17.—*Average yield, ginning outturns, and staple length of leading varieties of Egyptian cotton, 1920 and 1930*

Variety	Yield of lint per acre [1]	Gin turn-out	Staple length	Variety	Yield of lint per acre [1]	Gin turn-out	Staple length
	Pounds	*Percent*	*Inches*		*Pounds*	*Percent*	*Inches*
Maarad	515.6	32.0	1 1/2 to 1 5/8	Pilion	558.5	34.6	1 1/4 to 1 5/16
Sakellaridis	348.3	31.4	1 3/8 to 1 1/2	Fouadi	534.4	33.0	1 5/16 to 1 3/8
"310"	325.0	31.8	1 3/8 to 1 1/2	Giza 3	502.7	34.2	1 1/4
Giza 7	500.6	33.7	1 3/8	Ashmouni and Zagora	620.7	35.3	1 1/16 to 1 1/8
Nahda	503.4	33.7	1 3/8				

[1] Probably based on experimental rather than field conditions.

Compiled from the following publication: ELA, G. A. THE EGYPTIAN COTTONS. Egypt Min. Agr., Plant Breeding Sec., Leaflet 4, 16 pp., illus. 1932.

At present there is a definite trend toward a shorter staple, higher-yielding cotton. In 1916, Sakellaridis and related long-staple varieties occupied about 62 percent of the total cotton area of the country whereas Ashmouni and Zagora or Uppers, occupied only about 20

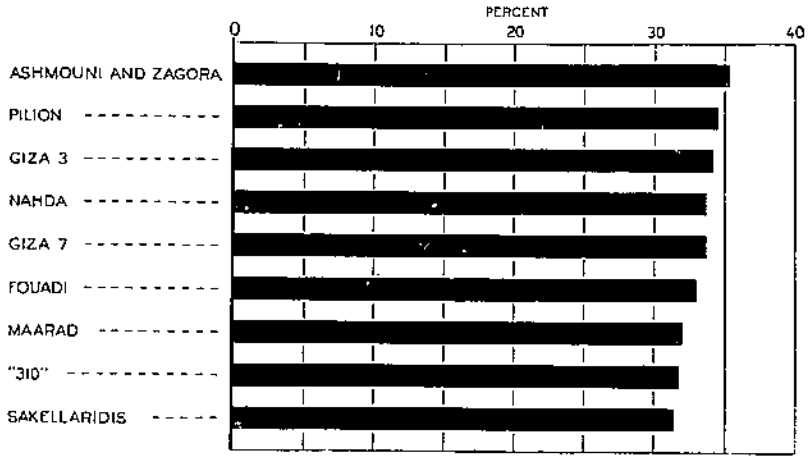

FIGURE 12.—AVERAGE GIN TURN-OUT OF LEADING VARIETIES OF EGYPTIAN COTTON, 1929 AND 1930.

High percentage of lint is also an important factor in the shift of the shorter-staple varieties.

percent. By 1922, Sakellaridis had increased to 75 percent whereas Uppers had increased to only 22.4 percent of the total cotton area. This was the high point for Sakellaridis. Following 1922 the Sakellaridis type declined to about 41 percent by 1931 while the short-staple varieties of Uppers increased to 45.5 percent of the cotton area. In addition to the increase in the area of Uppers since 1922, the medium-staple varieties have increased until they occupied about 13.8 percent of the total cotton area by 1931. The net result of this shift in variety has been a rather steady decline in the area of long-staple varieties and the substitution of the medium- and short-staple varieties. During the last years of this period the growing of Sakellaridis was restricted by law. It is, therefore, possible that the area under Sakellaridis would have been larger but for the law. Government action is a factor in the future of Egyptian cotton acreage but is one that cannot be forecast (table 18).

TABLE 18.—*Acreage and percentage of Egyptian cotton, by varieties, 1929, 1930, and 1931*

Variety	1929		1930		1931	
	Acreage	Percentage of all varieties	Acreage	Percentage of all varieties	Acreage	Percentage of all varieties
Maarad	22,367	1.2	68,615	3.2	115,174	6.6
Sakellaridis	880,172	46.0	869,163	40.2	496,765	28.4
Giza 7			5,532	.3	36,020	2.1
Nahda	46,016	2.4	26,962	1.2	55,279	3.2
Caseilli	11,830	.6	9,852	.5	6,290	.4
Pilion	90,863	4.8	128,976	6.0	163,461	9.4
Fouadi	14,036	.7	34,240	1.6	41,115	2.4
Giza 3			37,698	1.7	38,935	2.2
Ashmouni and Zagora	834,624	43.7	971,707	44.9	787,471	45.1
All others	11,547	.6	9,709	.4	6,128	.2
Total	1,911,455	100.0	2,161,552	100.0	1,746,641	100.0

Compiled from annual statistics of crop areas, Statistical Department, Ministry of Finance, Egyptian Government, Cairo.

A shift to shorter-staple varieties and improved varieties, if widespread, is certain to increase the average yield. It is estimated that the average yields of the country can be increased from 10 to 20 percent by the more general planting of Maarad, Giza 7, and Fouadi in the delta and the improved strain of Ashmouni in Upper Egypt. The chief problem in this substitution, at present, is the limited seed supply. If all factors are favorable it will require from 3 to 5 years to develop a sufficient seed supply.

DRAINAGE

Another factor that may some day tend to increase average yields in Egypt is the contemplated improvement in drainage. The program of the Government calls for an extensive system of drains in the delta and in Middle Egypt. This project, like the irrigation program of the country, is far from complete and is very expensive; in fact to a large extent the program exists on paper only. Just how long the country can go without increased drainage facilities cannot be forecast with any degree of accuracy. At present, powerful influences are being exerted upon the Government to complete its drainage program. It is probable that in the near future this problem will receive increasing Government attention. The influence of better drainage on the average per-acre yield of the country, however, will depend upon the extent of the area receiving the improvement. Without an extension and enlargement of the present drains, there appears little likelihood of an increase in acre yield in one-third or more of the delta, assuming the continued use of existing varieties of cotton.

SOIL FERTILITY

Although the system of constant cropping, made possible by canal irrigation, is a factor in the decline of cotton yields it has, on the other hand, increased the total crop returns that can be obtained from a given unit of land. Therefore, the decline in the yield of cotton is not so important as might be expected. Probably the decline is due in part to "soil exhaustion" but the loss in soil fertility is a matter that the average farmer can overcome. Most farmers

understand the practices of maintaining soil fertility and they carry out these operations with almost religious care.

The use of barnyard manure is an old and well-established practice. When renting land it is often required that the tenant apply a fixed quantity per acre each year. The maintenance of soil fertility is as much the responsibility of the tenant as of the landowner. It is not believed that the soils will be allowed to deteriorate, within the near future, sufficiently to reduce yields materially. They may not increase as a result of an improved soil fertility but they hardly seem likely to decline because of a depleted soil.

The use of barnyard manure and the growing of leguminous crops appear to form the most practicable method of maintaining soil fertility. The use of commercial fertilizers is comparatively new and their influence on cotton yields is still undetermined. Little specific information has been published although agronomists are doing experimental work designed to ascertain the facts. Such factors as drainage, water-table level, crop rotation, fallow period, and use of barnyard manure, in the opinion of most of the authorities are of far more importance.[15] In spite of this opinion the use of commercial fertilizer has increased from about 55,000 tons to over 330,000 tons during the last 12 years.

In terms of fertilizer units, Egypt apparently uses about 2½ units of nitrogen to 1 unit of the minerals. The quick growth resulting from the use of nitrogen is the chief reason for this ratio, in the opinion of many. Farmers are often led to believe that increased yields are sure to follow this rapid growth but unpublished experimental data do not support this view. Apparently where results are noticeable phosphate has been used with nitrogen.

As the knowledge of the best use of commercial fertilizer increases, such fertilizer may become a factor in cotton yields, but its use will always be limited by the competition of barnyard manure and the growing of legumes. The price of cotton will also be a factor in its use. Without an advance in cotton prices, a material increase in the use of commercial fertilizer is not to be expected, regardless of its effect. The increase of the cotton acre yield of the country as a whole through the wide use of commercial fertilizer is apparently very remote.

EFFECT OF CULTURAL METHODS ON YIELDS

The change in type of irrigation and the advent of the pink bollworm made necessary certain changes in the method of planting and cultivating cotton. Many of the old practices based on sound reasons and years of experience are now out of date. Changes in the cultural methods to fit changed conditions are not widespread but year by year they are becoming more general and in time will become the established practices. The influence of these changes on yields depends upon the extent to which they become a part of the conventional system of planting and growing the crop.

Prior to the increasing of the summer water supply, a water shortage during July and August was common. The planting, cultivation, and watering practices were intended to develop a heavy root system and thus enable the crop to withstand this dry period. After the dam at Asyut was built the danger of this shortage largely passed, but the

[15] This view was expressed in private discussion by a number of Government agronomists who have worked for years in Egypt.

spacing and watering methods of many growers have changed but little. Under the old system the plants were spaced about 18 inches apart in the drill with rows about 30 inches apart. The present experimental work indicates that the highest yields are obtained when the rows are about 24 inches apart and the plants in the drill are about 12 inches apart.

It has also been found that the old method of withholding water for a long period after planting in order to force the plant to develop a deep root system is not sound under present conditions. By early watering the crop can be forced to mature earlier and thus largely escape the damage of the pink bollworm.[16]

The introduction of practices that hasten maturity are necessary under the conditions of the pink bollworm.

Experimental data indicate that by "sand sowing" [17] yields can be increased about 50 pounds per acre. This method includes covering the seed with sand instead of the soil of the field.

INFLUENCE OF GOVERNMENTAL ACTION ON EGYPTIAN COTTON PRODUCTION

The chief concern of the Egyptian Government, after maintaining law and order, is agriculture, especially cotton production. So vital is cotton to the prosperity of Egypt that on numerous occasions the Government has intervened in its production and marketing in the hope of restoring price declines.

In the regulation of agriculture, as in other matters, the power of the Government is almost absolute. Much of the improvement in production, marketing, ginning, and handling of cotton is the result of Government decrees. Among the principal laws designed to improve conditions are the seed-control law restricting varieties to the areas to which they are best adapted, and laws preventing the mixture of unginned cottons.

All cotton is sold by the growers in unginned condition. Each grower, therefore, must buy his seed supply each year. Seed is sold only by licensed dealers who have complied with requirements regarding the treatment for pink bollworm. The seed is examined for purity by Government agencies and only approved seed may be sold for planting. Thus the Government has absolute control over the quantity and variety of seed offered for sale as well as the area in which it may be planted.

The possible action of the Government with regard to the encouragement of the planting of higher-yielding varieties can be merely contemplated, but it would be in line with its other measures to give such governmental encouragement and to restrict the low-yielding varieties to the areas in which they have proved to be most profitable. It is probable that, in view of its past experience, the Government will soon limit by law the number of varieties that may be planted. It will perhaps include 10 or 12 of the leading varieties and prohibit the planting of all other varieties except under experimental conditions.

[16] TEMPLETON, J. WATERING AND SPACING EXPERIMENTS WITH EGYPTIAN COTTON, Egypt Min. Agr., Tech. and Sci. Serv. (Bot. Sec.) Bull. 112, 7 pp., illus. 1932.

[17] ELA, G. A. SAND SOWING IN GROWING COTTON. Egypt Min Agr., Tech. and Sci. Serv. (Bot. Sec.) Bull. 122, 12 pp., illus. 1932.

FACTORS INFLUENCING FUTURE COTTON PRODUCTION

The future of cotton production in Egypt is closely associated with a national cotton policy and the expansion of the total crop area. The expansion of new area depends upon the action of the Government in increasing the water supply and in extending the irrigation and drainage works. A national policy with regard to cotton production would include the specific attitude of the Government toward the present trends and shifts in varieties and its attitude as to the place cotton is to occupy in the economic program of the country. Necessarily a cotton policy includes a long-time view but such a policy is one of the significant factors to be considered in attempting to measure the present and future production of the country.

GOVERNMENT POLICY

The present Government policy with regard to cotton production appears to be a complete reversal of the policy of a few years ago. Contrasted with the old policy of encouraging the planting of long, fine-staple varieties regardless of yields and depending upon Government action to maintain prices, is the present policy of producing the maximum yields on the maximum area at minimum costs with little Government intervention.

Egyptian officials and agricultural leaders now recognize that the advantages enjoyed by Egyptian cotton because of its staple are being modified somewhat through the competition of other long-staple-producing countries and shifts in the world demand for long-staple cottons. Egypt is still the leading long-staple-producing country but must recognize the increasing production of long staples in the Anglo-Egyptian Sudan and in Uganda, Brazil, Peru, and in the United States. Recent improvement in spinning machinery has made possible the substitution of short staples for the longer ones. With a somewhat reduced demand and an increasing supply of the longer staples in foreign countries Egyptian cotton producers are faced with reduced premiums for their longer staples. In other words, it appears likely that the somewhat limited outlet for long-staple cotton will be more than supplied and that this cotton will have to be sold in competition with the shorter staples for the manufacture of the coarser types of goods.

In this event staple premiums will probably decline to a point at which they merely represent the superior spinning utility of long-staple cotton over the shorter staple lengths in the manufacture of the same kind of goods. Thus, the Egyptian growers faced with this possibility have chosen to produce the shorter staple and higher yielding varieties rather than the lower yielding long staples that formerly commanded a substantial premium in a rather limited market. The present Government policy favors a shift in the type of cotton grown rather than a reduction in acreage.

The present policy includes the completion of the irrigation and drainage works, the reclaiming of the waste lands, and the increase of yields by a more extensive planting of higher yielding varieties and the use of improved cultural methods. This policy of quantity rather than quality is based on the theory that an increased yield will not only increase the returns to growers but will add to the total national income.

It is the general opinion that the days of high-staple premiums are past and that a strong hard-bodied cotton, slightly longer in staple than is found in the bulk of the American crop, with a good yield and gin turnout, will best accomplish this purpose. The extension of the cotton area to a degree that would reduce the area of food crops is possible and is justified on the grounds that Egypt is better fitted to produce cotton than cereals and that an increase in area and acre returns of cotton will make the importation of wheat desirable. Shifts of this nature must, of course, take into consideration "relative prices" of the several crops adaptable to Egypt. Associated with the increased production policy is the campaign of the Government for the increased use of Egyptian cotton abroad. The present leaders now realize the disadvantages of catering to the demands of a small percentage of the spinning industry and are giving their attention to wider markets for Egyptian cotton. In keeping with that policy, all restrictions on cotton acreage in Egypt have been removed.

The early influence on cotton production of this new program will depend upon the extent to which it is carried out and the speed. It appears that the shifts to higher yielding varieties are well under way, and that within a few years as much as 75 to 80 percent of the total crop will be of a staple length about equal to that of the present Uppers. It is claimed that as yields increase costs of production will decline to a point at which the crop can be sold in the world market at a price slightly above that of American cotton of comparable staple length. It is the hope of Egyptian growers that the spinning utility of their cotton will enable it to meet the competition of cottons of comparable staple lengths and to sell at a slight premium over most growths.

Such a policy, if successful in all of its phases, might increase that portion of the world's supply of cotton measuring $1\frac{1}{16}$ to $1\frac{3}{16}$ inches by 1,000,000 bales or more annually. This in turn would tend to increase the competition that American cotton of relatively long staple would meet in the world market and would thus tend to reduce the premiums to American growers for this type of cotton.

EXPANSION OF CROP AREA

The agricultural land of Egypt, definitely limited to the Nile Valley and to the delta of the Nile, includes 8,451,669 acres, of which 5,643,308 acres are cultivated, 687,192 acres are occupied by railroads, canals, highways, cities, and towns, and the remaining 2,121,169 acres are waste areas (table 1).

Increase in the population of the country will eventually bring about the reclaiming of the waste areas. In addition to the crop area added by such reclamation projects the area now occupied by the basins of Upper Egypt will some day be converted to canal irrigation and made to produce two or more crops annually. How soon this will be brought about is a highly speculative question and is dependent, to a large extent, upon the action of the Government.

Many problems are involved in the expansion of area. The Council of Ministers, in 1929, approved a plan, submitted by the Ministry of Public Works, for reclaiming the waste areas of the country and changing the present basin areas to canal irrigation. If this plan is accepted as a program of expansion, it is said that by

1955 (when, it is estimated, the population will be about 18,500,000) the total cultivated land will have been increased to about 8,500,000 acres, or to the limit of agricultural possibility in the country.

The first step as outlined in this program is the heightening of the Aswan Dam, which is now under way and is to be completed in 1934, at a cost of $22,230,000. Other projects include the construction of a storage dam on the White Nile at a point about 30 miles south of Khartoum in the Anglo-Egyptian Sudan (the cost of this dam is estimated at $18,770,000), impounding the waters of Lake Tsana (cost estimated at $12,350,000), construction of a dam at Lake Albert and other works in the Sudd region of the White Nile (estimated cost $83,860,000), and the strengthening of the dams at Esna, Asyut, and Cairo (costing $17,290,000). It is estimated that the building of canals and other expenses involved in converting the basin lands of Upper Egypt to perennial irrigation will cost $22,230,000 and that the work required to reclaim the lowlands of the delta and supply the drainage needed in Lower Egypt will cost $38,800,000. To this should be added $4,200,000 for unexpected and emergency works, which brings the estimated expense of the total Government irrigation expansion program to an estimated $197,500,000.

The cost of such a program is enormous and is almost prohibitive for a country like Egypt, but it is only one of the difficulties. It is the claims of the Government that increased yields on the poorly drained lands, the value of the double cropping on the present basin lands, and the reclaiming of the swamp areas or the lower delta, will more than pay the cost of the improvements. A major difficulty, in addition to the cost of such a program, is the local political objection which so far has prevented putting a large part of it into effect.

The irrigation water supply is so essential to the welfare of the country that any policy regarding its development at once becomes a political issue. It was claimed by the Government that the additional water supply as a result of the heightening of the Aswan Dam would permit the conversion of a large part of the basin lands of Upper Egypt to canal irrigation. This is now questioned by some of the best engineers of the country. Many of the landowners of the basin areas are anxious to have their holdings converted to canal irrigation, whereas the landowners of Lower Egypt, who fear that the increased water supply will not be sufficient to do this and at the same time supply enough water to enable them to grow rice and other summer crops, are just as anxious that no change be made in Upper Egypt. It is easy to see how such a question becomes a political issue. It is now expected that the increased water supply from the Aswan Dam will be used in the delta, and that few or no basins will be converted as a result of the present work at Aswan.

If proper storage facilities are provided, the Nile River will supply all the water required by Egypt, but such a storage system involves the construction of dams outside the country. As stated above, it is the announced policy of the present Government, as the next step in its program, to build a large storage dam on the White Nile in the Anglo-Egyptian Sudan.

It is estimated that this dam will supply the water required to bring all the country under canal irrigation and reclaim the lowlands of the north delta. The construction of the dam has the approval of the present Government, but it is meeting with bitter political

opposition. In addition to the local political controversy there is an international aspect.

That the building of a dam outside of the country, even though in the Anglo-Egyptian Sudan, involves an international question is well understood in Egypt. It is true that Egypt claims the waters of the Nile even though they rise in central Africa, but an agreement with the jointly owned, but British-controlled, Sudan must be made before the dam can be built. It is held by the opposition that the Sudan question should be settled before any construction works are begun. The speed at which the announced program for the expansion of irrigation works will be carried out depends upon the settlement of the many local political and financial matters.

With the water supply increased by the present work on the Aswan Dam, it is estimated that the more or less regular summer water shortage in the delta will be overcome. The increase of area by the reclaiming of the waste lands or making the now basin lands produce more than one crop a year, without additional storage dams, appears to be out of the question. It is estimated that if the Government were to undertake at once, and were to complete without interference, the storage dams outside of the country, and the canals, drains, and all other improvements within the country necessary to the completion of the Government program of bringing the crop area to the maximum, the time required would exceed 15 years. If the storage dams outside of the country were begun in 1934 they could not be completed prior to 1940. Other needed improvements, such as strengthening the Esna, Asyut, and Cairo Dams and building the necessary canals and drains, would require more than 10 years. If this entire program is carried out within 20 years, it will far exceed the speed at which any public work heretofore undertaken in Egypt has been completed.

If all the waste lands of the country are reclaimed and the present basin lands are converted to canal irrigation, the cotton acreage can be materially increased. Of the 2,200,000 acres of waste land, it is estimated that from 400,000 to 650,000 acres can be used for cotton production. On the basin lands the present ratio of cotton to other crops would probably change. It is estimated, therefore, that this section would grow from 300,000 to 350,000 additional acres of cotton. With the completion of the reclamation program—provided other factors influencing the cotton crop remain normal—the cotton area of Egypt may range between 2,700,000 and 3,000,000 acres.

From an area of this size, and with increased yields resulting from a more extensive planting of higher yielding varieties, the total annual production might range between 2,000,000 and 3,000,000 bales. Without the expansion of area or increased yields, production may be expected to remain near the average of the last few years. The acreage will probably fluctuate from year to year in the future as in the past, but a slight upward trend may be expected even without the improvement and enlargement of the irrigation and drainage systems.

SUMMARY

Egypt is primarily an agricultural country. Of the more than 15,000,000 inhabitants, 12,750,000 depend directly or indirectly upon the agriculture of the delta and the narrow valley of the Nile River.

This area, although one of the most fertile and productive areas of the world, would be as worthless as the surrounding desert were it not for the waters of the Nile. All crops are grown by irrigation. The rainfall at the seacoast is about 8.5 inches, and in parts of Upper Egypt rain is practically unknown.

The productive area is limited to the valley and delta of the Nile River and this includes 8,451,669 acres, of which a little more than 2,808,361 acres are given over to low marshy swamps, canals, highways, railroads, cities, and towns. This leaves 5,643,308 acres of farming land. In many of the districts of the delta the population is more than 2,000 per square mile and it averages more than 1,000 per square mile for the entire inhabited area of the country. It is estimated that the population of Egypt is increasing at the rate of 200,000 to 275,000 per year. This increase will eventually require all the available land. The swamp areas will be reclaimed and the areas that are now basin-irrigated will be converted to canal irrigation and will thus produce two or more crops annually.

The oldest type of irrigation known in the country is the flood or basin type. It is still common in Upper Egypt but much of Middle and all of Lower Egypt is now under canal irrigation. With basin irrigation, waters of the Nile, during its annual flood, are diverted into large basins. After saturating the soil for a depth of several feet the water is drained back into the river. Under this system the land not only receives its annual water supply but a supply of silt is deposited over the flooded area. This annual renewing of the soil is an important factor in Egyptian agriculture. Crops are planted after the flood has passed, and unless water is pumped from wells during the summer months, the fields receive no additional water. Basin-irrigated land, therefore, grows only one crop a year unless there is this summer pumping.

Under canal irrigation a supply of water is kept under control and can be used as needed throughout the year. After one crop is harvested the land is again watered and made to produce a second, and in some cases a third. This system has its advantages over the basin type in that a crop can be growing on the land at all times, but it has its disadvantages, among which is the loss of a large part of the silt deposits resulting from the flood.

Cotton as a commercial crop in Egypt is a little more than 100 years old. The early crops were grown by order of the State but in a few years production gained a foothold, and cotton is today the chief export crop. In fact it forms about 90 percent of the total exports of the country.

As early as 1820 the crop was estimated at 200 bales; by 1861 it had reached 150,000 bales. The American Civil War was largely responsible for the early increase in Egyptian cotton production. At the outbreak of that war European spinners were cut off from American supplies and were forced to look for other cotton. This gave Egyptian cotton its opportunity and Egyptian growers were quick to take advantage of the situation. By 1864 the crop had reached 414,000 bales, an increase of more than 260,000 bales in 3 years. After the close of the war the Egyptian crop not only held its place but continued to increase. By 1879 the crop was more than 622,000 bales. During the period between the close of the Civil War and the outbreak of the World War cotton production continued to expand.

New lands were brought under irrigation. New irrigation works were constructed. Every effort was made to increase the cotton area until in 1914 a crop of 1,334,000 bales was harvested from an area of 1,822,000 acres.

The year 1914 marks the end of a period of uninterrupted increases in the cotton acreage of Egypt, and the beginning of a period of wide acreage fluctuation. At the outbreak of the World War 1,822,000 acres in Egypt were planted to cotton but the following year, because of a governmental decree, the area was reduced to 1,231,000 acres. The record planting of 1930 reached 2,162,000 acres.

During the last 5 years the annual acreage has fluctuated between 2,162,000 acres and 1,135,000 acres, or by more than 1,000,000 acres. In 1932 the acreage was 1,135,000 and the 1933 acreage of 1,873,000 represented a 65-percent increase above the 1932 area. These fluctuations indicate that the Egyptian farmer can and will shift his cotton acreage when conditions justify. With the present system of rotation and the most favorable conditions, the past cotton acreage has exceeded 2,000,000 acres only once.

The transportation system of Egypt is very good and other conditions for the importation of food are favorable, but the country depends almost entirely upon domestic grain production for its food supply. In view of this dependence, it is doubtful whether the present relationship of the cotton acreage to the grain acreage will be materially altered.

A substantial permanent expansion of the cotton acreage will involve reclaiming a part of the waste land. This will require the extension of the irrigation and drainage systems of the country. The first step in a program of this kind would be the construction of storage dams on the White Nile in the Anglo-Egyptian Sudan. Other improvements would include a dam in Abyssinia and other work in the Sudd region of the upper Nile. The work within the country would include the construction of canals and drains in the lower delta. To put through the whole program of reclaiming the entire agricultural area would cost about $197,500,000—a very large sum for a country the size of Egypt. The cost is not the only problem involved. It is estimated that if this program were started at once it could not be completed in less than 20 years.

A change in cotton production has been taking place in Egypt that is probably of far more importance to American cotton growers than is the expansion in acreage. This is the shift to the higher yielding but shorter staple varieties of cotton. Egyptian cotton is referred to as the longest staple commercial cotton grown. This is not true to the same degree as a few years ago. The present trend is toward a shorter staple. In 1922, Sakellaridis and other long-staple varieties occupied about 75 percent of the total cotton area, and Ashmouni and Zagora and other shorter staple varieties occupied about 25 percent. By 1932, Sakellaridis had decreased to 43 percent whereas the shorter varieties had increased to about 50 percent of the total cotton area.

It is possible that in the future as much as 80 percent of the Egyptian crop will range between 1⅛ and 1⅜-inch staple. With an average crop, this would mean from 1,000,000 to 1,500,000 bales of a staple length comparable with the best American staples.

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