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COTTON PRODUCTION

in the

ANGLO-EGYPTIAN SUDAN

by

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Production of cotton in the Anglo-Egyptian Suday has not exceeded 206,000 bales (478 pounds). This quantity of cotton is a relatively small factor in the total world supplies of cotton but the production in the Anglo-Egyptian Sudan is of interest because it represents the results of organized vigorous efforts to develop cotton growing in a vast region of scant rainfall. The success or failure of such efforts is of considerable interest to American cotton producers from the standpoint of foreign competition.

The desire of English spinners to develop a larger supply of cotton within the British Empire and to reduce thereby their dependence upon American supplies stimulated Government interest and investment in cotton-growing projects in the Sudan. Then, too, English spinners became apprehensive of the future prospects of cotton growing in the United States as a result of the injury inflicted on the American crop during the early years of the boll-weevil invasion. The Sudan Government has done everything within its power to make the country a factor in the world's cotton supply but in no year has the crop exceeded 10 percent of the early estimates of potential production in the Sudan.

The entire cotton production of the Sudan may be said to be a Government project. The Government supervises the production in several areas and maintains the major irrigation works in the largest producing area.

Cotton is grown by several methods of water supply. Rain-grown cotton is relatively unimportant.

Fully half of the Sudan cotton crop is grown in the Gezira irrigation district. Problems of diseases and of accumulation of salts in the soil as a result of poor drainage have not been solved. Drainage is made difficult, if not impossible, by the flatness of the area and by high costs.

Yields fluctuate greatly. The construction of new irrigation works rests with the Government which at present is not in a position to finance further expansion. The financial returns during the last few years have fallen far short of the original estimates upon which the present irrigation works were based.

Cotton growing in the Tokar and Kassala areas depends upon flood water from local rivers. The extent of the areas flooded is determined by the annual flood, and expansion of the cotton acreage in these districts is improbable.

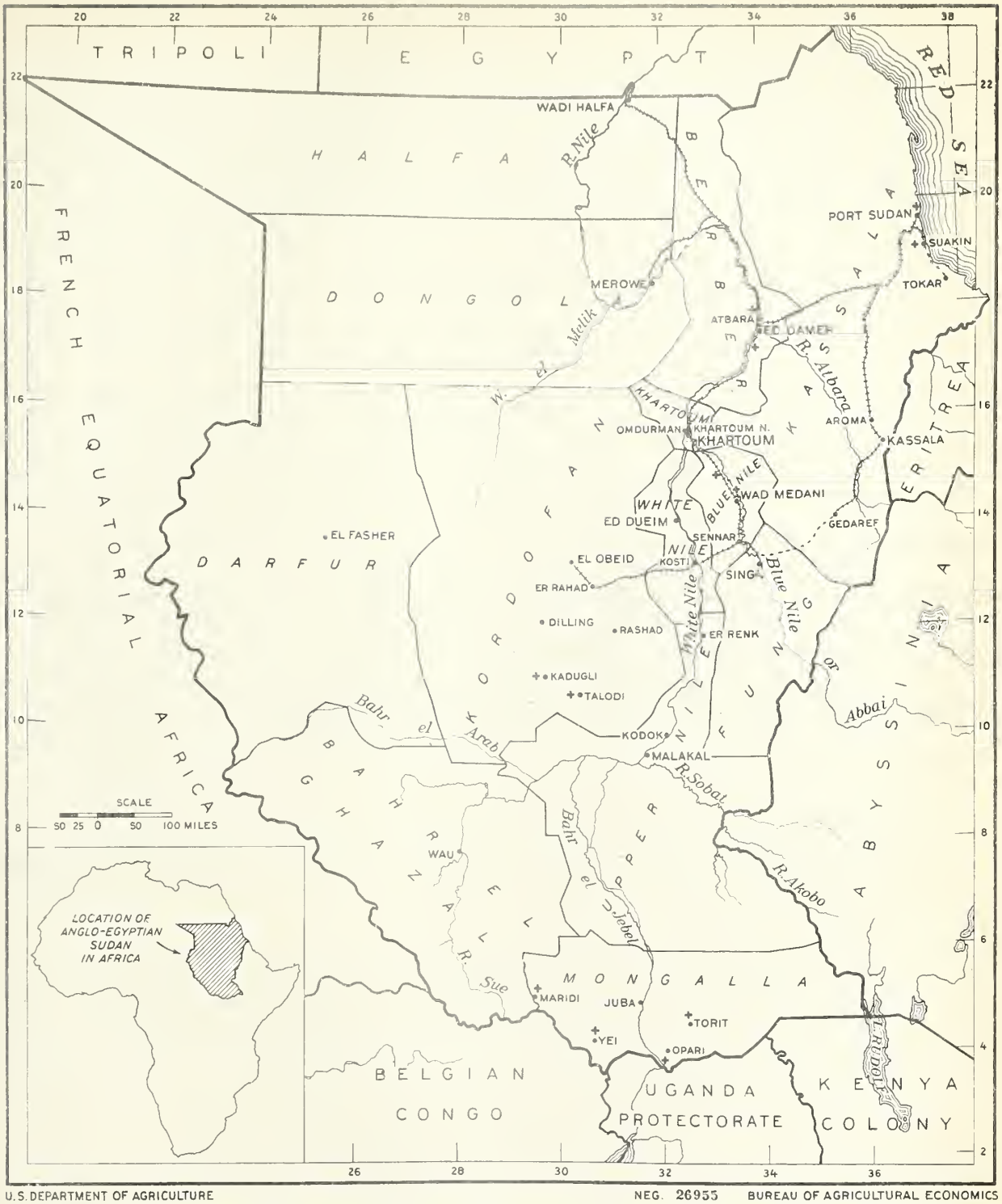
Expansion of cotton growing in rain-grown districts depends to a considerable extent upon changes in the living standards of the natives. The desires of these primitive tribes are meager and they are little disposed to exert themselves to produce cotton with which to buy other products. In the rain-grown districts transportation is slow and expensive.

GENERAL CONDITIONS IN THE SUDAN

Area and Location.-The Anglo-Egyptian Sudan comprises an area of approximately 1,000,000 square miles south of Egypt and north of the Uganda Protectorate and the Belgian Congo (Fig. 1). It is bounded on the west by French Equatorial Africa and on the east by Abyssinia, Eritrea, and the Red Sea. More than three fourths of this vast area is a rocky desert or a worthless swamp. Practically all the northern, eastern, and western areas are waste lands receiving little or no rainfall. Large sections of the southern area are swamps or are otherwise unfit for agriculture.

The Nile River flows north the full length of the country. The only tributary of any note is the Blue Nile. The land between these two rivers is by far the most important area of the Sudan. Not only is the Nile the chief source of irrigation water but it forms the only natural transportation system in the country.

Historical.-About 1820, Mohammed Aly, the Viceroy of Egypt, established trade routes into the Upper Nile country and thus held the country until about 1881, when the Egyptians were overthrown by a local religious leader, called the "Mahdi". For about 17 years, the Sudan was in the hands of the "Mahdi" and his followers. Early in 1898, Kitchener, with an army of about 8,000



U.S. DEPARTMENT OF AGRICULTURE NEG. 26955 BUREAU OF AGRICULTURAL ECONOMICS

FIGURE 1 - THE LEADING COTTON GROWING DISTRICTS OF THE ANGLO-EGYPTIAN SUDAN CONSIST OF THE GEZIRA, - LOCATED BETWEEN KHARTOUM AND SENNAR - THE TOKAR AND THE KASSALA AREAS.

British and 17,000 Egyptian troops defeated the followers of the "Mahdi" and established a joint Egyptian and British Government.

Prior to the revolt in 1881, the Egyptian control was vested in a Governor-General who at that time was General Gordon, an Englishman in the employ of the Egyptian Government. Early in the revolt, Gordon was killed. This had considerable influence upon British public opinion and was partially responsible for the British taking part in the campaign which resulted in the reconquest. The question of ownership of the Sudan has not been settled, but in theory the country is governed by a joint authority and the British and Egyptian flags fly side by side.

Population.-The Sudan is a sparsely populated country. According to the official estimate of 1932, the total population was about 5,500,000 people of which less than 6,000 were classed as Europeans.

The natives are of three general types: (1) The Arabs, living in the desert and semidesert areas - the most numerous of the types; (2) The Nubians, who are more or less mixed with the Arabs and the Negro tribes; and (3) numerous Negro tribes living in the southern section under most primitive conditions and taking very little interest in outside affairs.

The chief centers of population are Khartoum, the capital; Omdurman, the largest native town in the Sudan; Wad Medane, located in the center of the Gezira; Port Sudan, the chief seaport town; Atbara, a railroad center on the Nile and El Obeid, the terminus of the western branch of the railroad. Other towns and trading posts include Wadi Halfa, on the Egyptian frontier; Kassala; Gedaref, Tokar, and Suakin, all east of the Blue Nile. On the Upper Nile, Malakal, Kodak, Wau, and Juba are important trade centers. El Fasher, located in the extreme western part of the country, is one of the leading gum markets of the Sudan.

The 1932 Annual Report of the Secretary for Economic Development, Sudan Government, gives a total population of 5,507,925 consisting of the following: Natives 5,446,532, Egyptians 11,787, Europeans 5,947, all others 43,659.

In addition to the native population, there are a number of West African tribesmen in the country. These people cross the Sudan on their way to and from Mecca and often spend several years in the country. They are much better workers than the native Arabs and for that reason are in demand on the cotton plantations. Much of the cotton development in the irrigated areas is the result of the labor of these West Africans. It is very unlikely that the rapid expansion of the cotton-growing areas would have taken place without the labor of these people.

Climate.-Over more than three fourths of the Sudan the annual rainfall is so light that no cultivated crops are grown. Much of the country supports no life. About one fourth of the 1,000,000 square miles receives appreciable amounts of rain but much of the rain is extremely seasonal. A considerable part of this area is therefore desert or semidesert during a part of each year.

As the Sudan lies entirely within the torrid zone, the climate is hot and a given amount of rainfall is less effective than the same rainfall in cooler countries. During the summer months, most British officers leave the country. It is strongly recommended by health authorities that no white person remain in the Sudan for more than two full years at one time.

The desert and semidesert areas are subject to severe sand storms at certain seasons of the year and during these periods living conditions are almost unbearable. The hotest months are May and June when the average monthly temperature is often more than 90° F.

Agriculture and Commerce.-With the exception of cotton growing, there is little real agriculture in the Sudan. The Arab tribes keep herds of sheep, goats, and camels and graze them on the desert shrubs and plants along the banks of the Nile River and in the areas of light rainfall. In the districts where the rainfall is sufficient, the desert tribes grow crops of grain sorghum. This type of agriculture is carried on with considerable uncertainty and hazard. Thousands of natives are constantly faced with crop failure. In years of short crops, the Government takes the supply of grain sorghum (which is the chief food crop) and supervises its distribution. Formerly famine was common but with the introduction of irrigation and the construction of railroads famines have been averted.

In years of good rains, large quantities of wild or semicultivated crops, as gum and dom nuts (vegetable ivory) are exported. Cattle and sheep are also exported, chiefly to Egypt. Until the expansion of cotton production the chief revenue of the country was from its livestock trade and from exports of gum and ivory.

There is little or no manufacturing in the Sudan. The wants of the natives are few and are either supplied by local efforts or obtained from the trading centers. Most of the small traders are natives or Greeks. Most of the imports are from the United Kingdom.

The transportation of the Sudan is served by a system of Government-owned railroads of approximately 2,000 miles in length which connects the chief towns with the seaport of Port Sudan. Steamship service on the White Nile is also an important means of transportation and is likewise owned and operated by the Government. Native sailboats are common on both the Blue and White Nile.

The motor trucks are used to some extent during the dry season in the central and southern areas but the cost of gasoline and the poor roads make this method of transportation expensive. Over most of the western and northern areas the camel caravan is the only means of transportation.

An English "Cape to Cairo" air service passes through the Sudan. Landing fields are maintained at Wadi Halfa, Atbara, Khartoum, Malakal, and Juba.

COTTON PRODUCTION IN THE SUDAN

Cotton is said to be indigenous to the Sudan but it is only since the World War that production has attracted world attention. As early as 1911, the Department of Agriculture and Forests of the Sudan Government estimated a crop of 7,394 bales (478 lbs.) from an area of 30,052 acres. This was a yield of about 158 pounds per acre. As indicated in table 1 the cotton acreage increased steadily and in 1924-25 was 89,009 acres. The production in that year was 30,908 bales. With the completion of a dam in the Gezira in 1924 the cotton acreage in 1925-1926 gained almost 60,000 acres. The acreage continued to expand and in 1930-1931 reached 387,000 acres. The largest production recorded was in the 1931-32 season when the production reached 206,000 bales. The yields have fluctuated widely, ranging from 130 pounds per acre in 1930-31 to 317 pounds in 1925-26.

The present crop is grown in six areas or sections of the country under a variety of artifical and natural moisture conditions. Fully half the total production is made possible by gravity-flow system of irrigation. A small portion of the crop is grown by pumping water for irrigation purposes. Natural flooding of river basins, called flood irrigation, accounts for 20 percent of the crop. Rain-grown cotton is relatively unimportant.

The Gezira, leading producing district, receives its water from a dam on the Blue Nile. Plantations in the Nile Valley secure water by pumping. The Tokar and Kassala areas are flood-water districts. Districts in the Nuba mountain and areas in the southern provinces are rain-grown districts. The relative importance of these areas is shown by the following production statistics reported by the Department of Agriculture and Forests for the Sudan Government for the season 1932-33: The Gezira, 77,804 bales; Tokar and Kassala, 25,412; Nile Valley, 9,611; Nuba Mountains and Southern Provinces, 7,838; Total, 120,665.

In the Gezira, Tokar, and Kassala districts, Egyptian cotton is grown. Only American upland varieties are grown in the rainfall areas. On the plantations in the Nile Valley, using a pumping system of irrigation, American upland varieties are also grown.

The Gezira

The Gezira, a triangular plain lying between the Blue and White Nile, is the most important cotton-growing area of the Anglo-Egyptian Sudan. It consists of approximately 5,000,000 acres, of which it is extimated 3,000,000 acres could be brought under irrigation if water were available. The cotton acreage has not exceeded 205,000 acres. The potential cotton production has been estimated at from 1,000,000 to 5,000,000 bales but the actual crop has never exceeded 167,000 bales and the average is far below this figure.

The possibilities of the Gezira as a cotton-producing area were pointed out to Lord Kitchener who at the time was Governor-General of the Sudan. He was quick to see the opportunities of the country if irrigation were developed but, like many engineers who have since studied the

Table 1. -- Area, yield and production of all cotton areas of the Anglo-Egyptian Sudan, 1911-12 to 1932-33

Year	Area	Yield per acre	Production
	Acres	Pounds	Bales of 478 lbs.
1911-12	30,852	115	7,394
1912-13	23,600	166	8,188
1913-14	12,218	192	4,911
1914-15	58,035	137	16,690
1915-16	37,417	138	10,817
1916-17	77,227	115	18,600
1917-18	37,943	103	8,195
1918-19	38,362	80	6,425
1919-20	44,407	170	15,788
1920-21	44,858	221	20,734
1921-22	65,887	120	16,532
1922-23	43,325	224	20,299
1923-24	81,805	189	32,278
1924-25	89,009	166	30,908
1925-26	149,680	317	99,240
1926-27	209,198	297	129,940
1927-28	237,687	220	109,439
1928-29	283,877	239	141,722
1929-30	369,236	180	139,215
1930-31	387,213	130	105,714
1931-32	335,858	293	205,982
1932-33	324,831	178	120,665

Source: The Annual Reports of the Secretary for Economic Development and the Annual Reports of the Department of Agriculture and Forests - Sudan Government.

project, he overlooked many of the underlying agricultural problems which developed later. As early as 1912 cotton was planted on a small scale and was watered by pumping from the Blue Nile. From these early experiments an interest was developed which resulted in the present project. At present approximately 200,000 acres of Egyptian cotton are grown annually in the Gezira.

The concession for this production is held by two English firms known as the Sudan Plantation Syndicate and the Kassala Cotton Company. According to the concession, the Government supplies the water and maintains the major irrigation works; the natives supply the labor and the syndicates supervise the planting, cultivation, harvesting, and marketing of the cotton. The net proceeds are divided approximately 40 percent to the Government, 40 percent to the grower, and 20 percent to the syndicates.

The area is managed somewhat as a large plantation. Authority is centered in a head officer. The growing area is divided into blocks or tracts of about 20,000 acres each under an English supervisor who has under him two or more English and several native assistants. The irrigation system is so built that each block receives its water supply at fixed intervals throughout the growing season. The headquarters of each block supervisor is connected by telephone with the administration headquarters. The whole scheme is run according to a schedule.

Each block is divided into 30-acre tracts upon which the native grows 10 acres of cotton under a rotation that utilizes about one third to one fourth of the land each year. (Figure 2) Two thirds or more of the entire area under irrigation thus lies fallow each year. It is the duty of the supervisor to see that the native farmer plants, waters, cultivates, and harvests the crop at the proper time.

Cotton is planted at the end of the short rainy season which is usually during the first days of August. The Gezira receives about 8 to 12 inches of rain annually during the summer months but the crop does not depend upon rainfall. The native farmer tends the crop with a hoe. (Figure 3) Aside from plowing, which is done by the Syndicate, no power machinery is used in growing the Gezira crop. Picking starts in December or January and is over by the last of April or the first of May. The cotton is packed in large bags in the field and transported by camels to the railway where it is loaded on cars and shipped to gins. Each bag is numbered and a record is made before it starts for the gin. There are only two ginning centers, both owned and operated by the Syndicate. At the gin, the seed cotton is classed into three or four grades, according to a system of standards developed in the country. Each class or grade is ginned separately. The bales are all uniform in size and shape each weighing about 400 pounds; they are pressed to a high density and are never cut for samples. The system of handling and ginning produces a very neat and attractive bale of cotton. The cotton is shipped by rail to Port Sudan.

In 1912-13, the crop of the Gezira as reported by the Sudan Government was 634 bales from an area of 633 acres or a bale (478 pounds net) per

acre. The early yields encouraged the promoters to such an extent that, by 1914-15, 3,075 acres were planted, a crop of 3,247 bales was produced. From 1914-15 to 1920-21 the yield averaged about 320 pounds per acre.

In 1921-22 a program of expansion was undertaken that resulted in 1924-25 in an area of more than 20,000 acres. The Sennar Dam on the Blue Nile was completed in 1924-25, and the 1925-26 acreage was increased to more than 80,000 acres, with an average yield of 457 pounds per acre. During the period from 1912 to 1924 the acreage increased and the yields showed a downward trend especially in the older cultivated areas. The addition of about 60,000 acres of new land in 1925-26 explains, no doubt, the average yield of 457 pounds in that year as compared with 211 pounds in the previous year.

After 1925-26 the area continued to expand very rapidly until at present it is about 200,000 acres. These changes are indicated in table 2. During the period since the completion of the dam, the yields have undergone a marked decline. The average yield in 1926-27 was 455 pounds, in 1927-28 314 pounds, and in 1930-31 only 128 pounds per acre. The high yield of 390 pounds in 1931-32 was attributed to exceptionally small injury from diseases. The significance of the decline in yields was minimized because new lands were being brought under water and the total production thus increased each year. Rising prices also increased the total income and enabled higher dividends to be paid the stockholders of the Syndicate.

The reasons for the decline in yield are not fully known but are largely traceable to the origin of the scheme. After the first enthusiasm had passed it become apparent that a knowledge of the agricultural as well as of the engineering problems was necessary. It was realized that an understanding beyond the construction of irrigation ditches and the application of water was required to produce cotton in the Gezira. To supply this understanding, an experiment station was located in the area. In the short period since its establishment, this station has done remarkable work on the agricultural problems.

The soil of the Gezira plain is a heavy clay ranging from a few to several feet deep with a subsoil that is almost impervious to water. This soil condition makes subsoil-drainage impossible and because of the flat nature of the area, surface drainage is limited. Drainage in the Gezira, therefore, depends upon evaporation to a large extent. This method of drainage eliminates any excess water but salts contained in the irrigation water remain in the soil. The problem resulting from the collection of these salts is a serious one. Large areas are now showing the effects of accumulated salts and with continuous irrigation the problem will increase in intensity.

Yields have also declined because of diseases that have developed. For several years the area has suffered from "Black Arm" (Pseudomonona Malvacearum). To date no real control has been developed. It appears that Black Arm is closely associated with excess water during the early growth of the plants. The crop is planted at the end of the short rainy

FIGURE 2 - A NATIVE TENANT OF THE GEZIRA. EACH TENANT CULTIVATES ABOUT 10 ACRES OF COTTON. THE GOVERNMENT RECEIVES 40 PERCENT, THE SYNDICATE 20 PERCENT AND THE TENANT 40 PERCENT OF THE NET PROCEEDS.

FIGURE 3 - COTTON GROWING IN THE GEZIRA. MANY OF THE LABORERS ARE WESTERN AFRICANS WHO STOP OVER FOR A FEW YEARS AS THEY CROSS THE SUDAN TO AND FROM MECCA.

Table 2. -- Area, yield and production of cotton in the Gezira area of the Anglo-Egyptian Sudan, 1912-13 to 1932-33

Year	Area	Yield per acre	Production
	Acres	Pounds	Bales of 478 lbs.
1912-13	633	479	634
1913-14	714	363	542
1914-15	3,075	505	3,247
1915-16	3,489	317	2,312
1916-17	4,464	316	2,950
1917-18	4,003	314	2,629
1918-19	4,115	318	2,735
1919-20	3,909	502	4,105
1920-21	3,852	312	2,515
1921-22	10,191	374	7,975
1922-23	10,781	349	7,877
1923-24	23,337	273	13,324
1924-25	22,437	211	9,899
1925-26	83,072	457	79,435
1926-27	103,859	455	98,897
1927-28	109,601	314	71,983
1928-29	136,346	339	96,663
1929-30	180,750	222	84,073
1930-31	203,472	128	54,429
1931-32	201,350	396	166,809
1932-33	202,384	184	77,804

Source: The Annual Reports of the Secretary for Economic Development and Annual Reports of the Department of Agriculture and Forests - Sudan Government.

season near the first of August, and is watered shortly after planting. It often happens that a heavy rain, sometimes as much as an inch, falls after the first watering. Because of the lack of both subsoil and surface drainage this excess water may stand on the fields for several days, making a condition favorable to the development of Black Arm, especially if there is a drop in temperature. A disease called "Leaf Curl" has done great harm to the crop from time to time, but is kept under control to some extent by a system of rotation in which cotton land is allowed to lie fallow from 2 to 3 years.

The Egyptian Sokellarides variety is grown and is not by nature a heavy yielder but yields have been far below the early estimates.

At one time labor was a problem in the Gezira but high prices attracted West Africans who were willing to work a few years in the Sudan on their pilgrimage to Mecca. These tribesmen did the actual labor so long as the native received enough from his 40 percent of the crop to employ them, but since 1929 the native growers have not been able to hire all their labor. It became necessary for the Arab growers to go to work or to give up their holdings and return to the nomad life of the desert. Many of them chose the latter. Others who remained on the land have received little or nothing for their labor and are more or less discouraged.

From an administration standpoint, the Gezira has presented many problems for both the Syndicate and the Government. The whole scheme is based on an estimated annual income much above that of the last few years. The yields were estimated at from 300 to 400 pounds per acre and the price at from 20 cents to 30 cents per pound, which would have made an income of more than $50 to $100 per acre. On this basis the Sudan Government spent something like $65,000,000 to develop the irrigation works. From an estimated annual return of $5,000,000 to $10,000,000 the original capital investment was to be retired in 20 years. For a few years, 1926-27 to 1928-29, this plan was realized but since 1929-1930 both prices and yields have declined and the Government and Syndicate, as well as the native growers, have been unable to make expenses. In 1928-29 the Government received about $5,040,000 from its share of the crop while the 1930-31 crop brought the government less than $150,000. Because of increased yields the 1931-32 income showed a slight increase. The income since 1928-29 has been far below that which was anticipated when the project was financed, and the Syndicate has passed several dividends. The recognition that the original estimated income cannot be realized has resulted in reduced expenditures by both the Government and the Syndicate and every effort is being made to adjust expenditures to income.

Nile Valley

The first commercial cotton production in the Sudan was in the valley of the Nile north of Khartoum and was the result of private effort. At the present time, in addition to these private interests, the Government is engaged in cotton growing at seven or eight stations along the river north of Khartoum. These stations were originally planned to grow

grain sorghum in years of a general crop failure. At present they are farmed by natives who follow a rotation including cotton and grain sorghum. The returns from cotton on these stations are not large but the Government feels that the stations should be maintained to insure a local food supply. As indicated in table 3, production of cotton has not exceeded 13,000 bales.

The largest privately owned plantation in this section is located near the town of Zeidab, in the Dongola Province. It grows from five to six thousand acres of cotton annually. This plantation is probably the most successful cotton-growing enterprise in the Sudan.

Under a system of licensing pumps the Government limits the amount of water that can be drawn from the river. As a rule something like 140 plantations ranging in size from a few acres up to more than 5,000 acres pump water from the river. Some have what are known as "seasonal licenses" and are allowed to take water from the river only during a fixed season whereas others have "all-year licenses".

The crop is planted in July and August and is harvested in the winter. During December and January, while the plant is fruiting, the temperature often drops several degrees in a short time. This sudden change has an unfavorable effect on the growing crop and often causes the plants to shed a large part of their squares. The American Upland varieties appear to stand these sudden changes in temperatures better than do the Egyptian varieties and for that reason then are grown to the exclusion of Egyptian in the valley north of Khartoum.

The problem of extending the area under cotton along the Nile Valley is not a simple one. Although there are areas where the soil would grow cotton, the cost of lifting the water from the river (if a pumping license could be obtained) is high. The operation of a large pump requires the presence of an European as the natives know nothing of machinery and care little about learning. Oil or gas is expensive and difficult to obtain. The small native water wheel is too slow to be of use on large plantations.

Insects are common. Pinkboll worm and plant diseases take a heavy toll, often as much as 25 to 50 percent of the crop.

At present prices, there is no inducement for the expansion of cotton acreage in this area even if the water were available.

Table 3.-Area, yield and production of cotton in the Nile Valley north of Khartoum, Anglo-Egyptian Sudan, 1918-19 to 1932-33

Year	Area	Yield per acre	Production
	Acres	Pounds	Bales, 478 lbs.
1918-19	250	358	187
1919-20	620	429	557
1920-21	1,147	260	627
1921-22	1,157	305	741
1922-23	3,208	356	2,393
1923-24	3,994	384	3,124
1924-25	21,386	198	8,845
1925-26	16,940	279	9,875
1926-27	16,973	250	8,894
1927-28	14,437	282	8,507
1928-29	13,476	451	12,707
1929-30	19,701	301	12,391
1930-31	12,677	438	11,619
1931-32	-	-	11,158
1932-33	11,980	383	9,611

Source: Annual Reports of the Director of the Department of Agriculture and Forests - Sudan Development.

The Tokar and Kassala districts

In two small areas in eastern Sudan cotton is grown by what is termed flood irrigation. Annual production by this method of securing moisture has not exceeded 29,000 bales. (Table 4.) The older and more important of these areas is Tokar, located about 60 miles south of Port Sudan. Cotton has been grown there for years and at one time Tokar was considered to be one of the most promising cotton-growing areas in the country.

The Baraka River can hardly be called a river. It rises in the highlands of Abyssinia and is dry except during the flood season from July to September, when it flows out over the sandy desert plain. There its flood waters have built up deposits of fine silt on the cotton. No other moisture is received and if the soil has been thoroughly saturated none is needed.

The area covered by the flood varies, but as a rule it is less than 50,000 acres. The amount of flood the land receives is not uniform because of the shifting of the silt deposits by the flood or by the wind during the dry season. Frequently a part of the area does not receive enough water to carry the crop to maturity. As there is no way of determining the poorly watered acreage the entire area is planted in the hope that the flood has been sufficient. Often the poorly and inadequately watered area is as much as 20 percent of the total flooded area.

It has been suggested that the flood be controlled by building a dam in the hills and releasing the water as needed, but nothing has been done and it is not probable that the suggestion will be carried out. Such a plan would be expensive and impracticable, for during the dry season the fine silt of the delta is blown from one side of the area to the other in a manner almost beyond belief. Large mounds of this fine dust are built up in a few hours, houses are covered, and in a short time the whole landscape is changed. This drifting silt is largely responsible for the shifts in the flood area from year to year. A system of irrigation ditches and canals would doubtless have to be rebuilt each year at great cost and it is thought that the advantages over the present plan of uncontrolled flood would not be worth the added cost.

Tokar cotton is grown and sold under Government supervision. The land is alloted to the native growers anew each year after the flood passes. The crop is sold at auction by Government agents. It is shipped by the buyer to a gin at Port Sudan or Suakin. Transportation is one of the chief problems. A light railroad, owned and operated by the Government, carries the cotton to a small seaport on the Red Sea where it is loaded on a privately owned boat and shipped to the gin. The gin at Port Sudan is Government-owned and the one at Suakin is privately owned. It often happens that the owners of the Suakin gin, in order to have cotton to work on enter the Tokar market. The Entire crop is Egyptian Sakellaridis.

About 150 miles east of Khartoum, the Gash River spreads out over the desert sands forming a delta of silt like that at Tokar. The area is located just north of the town of Kassala in the Province of the same name. The area as a rule is not so large as Tokar. The flood arrives during the month of June and flows for several weeks.

A few years ago the Government gave a British cotton-growing firm a concession in the Kassala area but, because of the treatment of the native growers the Government cancelled the contract of the firm and at present the entire administration is in the hands of the Government. It is handled in much the same manner as at Tokar. Each native grower is alloted about 10 acres of land for cotton and a small area for food crops. About one half the cotton crop is paid to the Government as rent and charges for handling the crop. All ginning is done at Port Sudan. Cotton is transported from the area to the gin by railroad. The line from Sennar to Port Sudan by way of Gedaref and Kassala was built in the belief that this area would become a cotton-growing district of importance.

Both Tokar and Kassala are limited by the extent of the annual flood. They are far from gins and markets. The growers are Arab tribesmen whose wants are few and who are contented to continue in the future as they have in the past. If it were not for the strong hand of the Government, production would no doubt decline rapidly.

Table 4. -- Area, yield and production of cotton in Tokar and Kassala flood areas of the Anglo-Egyptian Sudan, 1911-12 to 1932-33

Year	Area	Yield per acre	Production
	Acres	Pounds	Bales of 478 lbs.
1911-12	30,852	114	7,394
1912-13	22,967	153	7,554
1913-14	11,504	170	4,369
1914-15	54,960	116	13,443
1915-16	33,928	120	8,505
1916-17	72,763	103	15,650
1917-18	33,940	78	5,566
1918-19	33,997	49	3,503
1919-20	39,878	133	11,126
1920-21	39,859	211	17,592
1921-22	54,539	68	7,816
1922-23	29,336	168	10,029
1923-24	54,474	139	15,830
1924-25	49,918	116	12,164
1925-26	26,780	123	6,902
1926-27	47,852	178	17,868
1927-28	73,532	161	24,731
1928-29	81,002	144	24,318
1929-30	104,273	131	28,519
1930-31	101,660	122	26,039
1931-32	57,609	143	17,246
1932-33	61,395	198	25,412

Source: Annual Reports of the Secretary for Economic Development and Department of Agriculture and Forests - Sudan Government.

Table 5. Area, yield, and production of cotton in the rain-grown areas of the Anglo-Egyptian Sudan, 1925-26 to 1932-33

Year	Area	Yield per acre	Production
	Acres	Pounds	Bales of 478 lbs.
1925-26	22,888	63	3,028
1926-27	40,514	50	4,281
1927-28	40,117	50	4,218
1928-29	44,925	83	7,795
1929-30	60,910	111	14,087
1930-31	62,657	100	13,109
1931-32	62,114	74	9,664
1932-33	44,868	74	6,959

Source: Annual Reports of the Secretary for Economic Development and the Annual Reports of the Department of Agriculture and Forests - Sudan Government.

Rain-grown Cotton Districts

Production of rain-grown cotton in the Anglo-Egyptian Sudan has not exceeded 14,100 bales and is therefore relatively unimportant but a description of conditions under which this cotton is grown will indicate the limitations to the production of rain-grown cotton in the Sudan. The chief areas of production are a region in the Nuba Mountains and areas known as the Southern Provinces. A few years ago an English company attempted to grow cotton along the river in the upper Nile provinces but with poor results. Some cotton is still being grown in this area on a few small private plantations. Statistics of areas, yield, and production of rain-grown cotton are included in Table 5.

The soil of the Nuba Mountains is a dark loam. The rainfall is about 30 inches and falls during the season from March to August. The crop is grown during the wet season and is harvested during the dry season.

The entire crop of the Nuba Mountains is grown under Government supervision. Agricultural agents are maintained at the points at which the cotton is collected and ginned. Seed is distributed to the tribal chiefs and each chief is held responsible for its planting and harvesting.

Prior to 1925 this area was of little importance in the total cotton crop of Sudan. After the construction of the gins at Kadugli and Talodi, production increased until in 1932-33 more than 9,000 bales were ginned. The expansion of the cotton acreage reflects the control and influence the Government agents have over the natives.

FIGURE 4 - NATIVES OF THE UPPER WHITE NILE. EXPANSION OF COTTON PRODUCTION IN THIS AREA DEPENDS UPON THE EXTENT TO WHICH NATIVES OF THIS TYPE CAN BE INDUCED TO WORK.

FIGURE 5 - A CAMEL CARAVAN LOADED WITH COTTON FROM THE NUBA MOUNTAINS. IT COSTS ABOUT $1 PER HUNDRED POUNDS TO TRANSPORT COTTON FROM THE GIN TO THE RAILWAY, A DISTANCE OF 170 MILES.