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THE AGRICULTURAL ECONOMY OF THE Sudan

ECONOMIC RESEARCH SERVICE U. S. DEPARTMENT OF AGRICULTURE

NOTES ON THE SUDAN

Government

The Sudan became a fully independent nation on January 1, 1956. It is governed under a provisional constitution which provides for a prime minister and a cabinet responsible to parliament.

Area

The Sudan is 2-1/2 times the size of Egypt or 967,500 square miles. Less than 3 percent of the total land area of 619 million acres is under cultivation. Close to 2.5 million acres are now irrigated. Extensive plans for construction of dams for additional irrigation are now under consideration.

Physical Features

The Sudan, much of it a basin less than 3,000 feet above sea level, is drained by the Nile River and its tributaries, the rivers White Nile, Blue Nile, Sobat, and Atabara. Climatically, the country shows a marked transition from the hot desert of the north to the tropical rain lands of the south. Everywhere average monthly temperatures are high.

Population

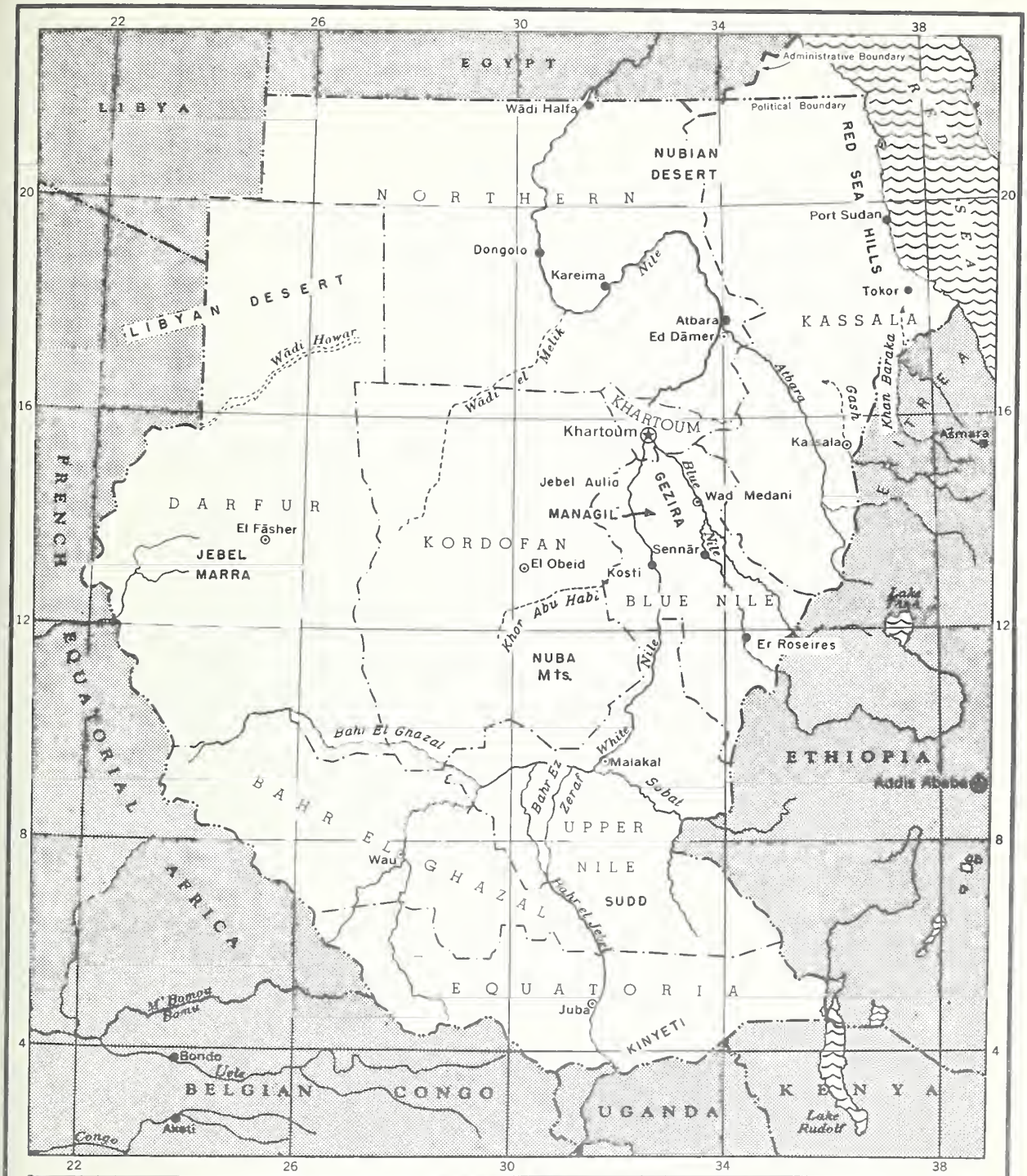
A 1955 census listed the population of the Sudan at 10.3 million, indicating a density of 11 persons per square mile. The distribution is densest along river banks. More than 90 percent of the population is engaged in agricultural or pastoral pursuits. The rate of annual increase is more than 2.3 percent.

Foreign Trade

Exports.--Cotton lint and cottonseed accounted for 70 percent of total exports in 1956. Other exports of lesser value are gum arabic, peanuts, sesame, livestock, and hides and skins.

Imports.--Cotton piece goods rank high as an import. Sugar, coffee, tea, wheat flour, and tobacco are other major imports.

Effective April 3, 1961, the responsibility for the work in the Regional Analysis Division was transferred from the Foreign Agricultural Service to the Economic Research Service. This report, originally issued as FAS M-45, is now reissued, without change in text, by the new agency.



SUDAN

—·—·— International boundary

— · — Province boundary

⊛ National capital

⊙ Province capital

Scale 1:12,500,000

0 250 Miles

0 250 Kilometers

U.S. DEPARTMENT OF AGRICULTURE NEG. 1613 FOREIGN AGRICULTURAL SERVICE

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THE AGRICULTURAL ECONOMY OF THE SUDAN

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SUMMARY

The Sudan is almost exclusively an agricultural country. At least 90 percent of its 10.3 million inhabitants derive their livelihood from agriculture or animal husbandry. Also 90 to 95 percent of the value of external trade is from agricultural products, chiefly cotton. Production of some food crops--peanuts, sesame, durra, dates--also exceeds the country's consumption requirements, leaving a sizable surplus for export. The principal imported foodstuffs are sugar, tea, and coffee. These three items account for about 20 to 25 percent of total imports.

Not only is the Sudan's economy an agricultural one, but it is heavily dependent on one cash crop--cotton. In most years, cotton and cottonseed account for 70 percent or more of the Sudan's foreign earnings and supply the government with the largest share of its revenues. Both long and short staple types of cotton are grown. However, the greater portion of total production is made up of long staple varieties grown almost entirely on large irrigation schemes. The short staple is grown chiefly in areas of rain cultivation.

Other important cash crops include sesame and peanuts. Gum arabic is the only forest product exported extensively. Next to cotton, the most important place in the Sudanese economy is held by livestock, now numbering about 22 million head.

Irrigation is of vital importance to the Republic of Sudan. In parts of the central zone and practically all of the northern zone, agricultural activities depend almost entirely upon irrigation, as rainfall is inadequate or totally lacking. Basin irrigation exists in a few places. However, most of the irrigation process employs gravity flow or lift techniques ranging in size and efficiency from the traditional shaduf (counterbalanced dipper) and saqiya (Persian water wheel) to large-bore, diesel-powered pumps. A gross area of about 2.5 million acres is now irrigated, close to one-half of which is under gravity irrigation in the well-publicized Gezira Scheme.

Communication and transportation have not kept pace with increased agricultural production. The country has an extremely poor network of roads, so almost all goods must be transported by the Sudan Railways Company. Many agricultural products which can be produced economically in the south cannot now be marketed because of inadequate marketing and transportation facilities. Programs are under way, however, which will extend railway lines to this area and others of considerable economic potential.

There is no land hunger in the Republic of the Sudan. Population density is less than 11 persons per square mile. An estimated one-third of the total acreage is suitable for either cultivation or grazing, but only a small percentage of this plentiful supply of good land has been developed. Thus, an impressive potential in agricultural resources remains to be exploited. The effective use of much of this land is limited by lack of water. However, the government is pushing the development of water resources, and progress is being made.

From 1945 through 1957, exports from the Sudan to the United States averaged about $4 million annually. Gum arabic accounted for the largest percentage of U. S. imports from the Sudan. The greater part of U. S. total sales to the Republic of the Sudan was made up of machinery, but small quantities of dairy products, wheat flour, tallow, and canned fruit have been sold in recent years.

POPULATION AND PHYSIOGRAPHY

The Republic of the Sudan, located in the northeast quarter of the African Continent, joined the free nations of the world on January 1, 1956. The country is a vast one, occupying 967,500 square miles. It is nearly a third the size of the continental United States and 2-1/2 times the size of Egypt.

Administratively, the Sudan is divided into 9 Provinces: Northern, Kassala, Khartoum, Darfur, Kordofan, Blue Nile, Upper Nile, Bahr El Ghazal, and Equatoria. The first 6 of these are known as the Northern Provinces and the other 3 as the Southern Provinces.

Population

A census completed early in 1956 showed the population of the Sudan at 10,264,000. It has been increasing at a rapid rate of 2.3 percent annually. Culturally as well as geographically the Sudan shares in both Middle East and African civilizations. The people of the north, constituting the largest portion of the total, are of Arab stock and speak Arabic. The southern inhabitants are racially Negroid and have close affinity with the natives of Uganda, Kenya, and Ethiopia.

It is believed that 90 percent or more of the people follow agricultural pursuits, largely subsistence farming. That portion pursuing a nomadic life is declining; it is now estimated at 14 percent of the total.

The largest concentration of population is in the developed areas along the Nile and its tributaries. For the country as a whole, there are 11 persons per square mile, but the population is very unevenly distributed, with approximately 40 persons per square mile in the Blue Nile Province and less than 5 in the Northern Province.

Table 1.--Population distribution, by Province, 1956

Province	Area (in square miles)	Population
Northern	184,200	871,152
Kassala	129,132	941,150
Khartoum	10,493	505,157
Darfur	191,650	1,329,202
Kordofan	146,930	1,762,681
Blue Nile	53,800	2,069,614
Upper Nile	148,200	889,700
Bahr El Ghazal	82,530	991,022
Equatoria	76,495	903,964
Total	976,500	10,263,642

Source: Sudan Almanac, 1958. Information Office, The Republic of the Sudan, Khartoum, 1958.

Topography

The Sudan consists mainly of a plain, with a general altitude of 1,100 to 1,200 feet above sea level. The effect of topography on vegetation is minor.

The most important physical feature which influences the agricultural economy of the Sudan is the Nile River and its tributaries. It is along the banks of this river system that some of the country's most productive agricultural areas are found and that the most intensive agricultural development is taking place. The Nile flows the entire length of the country, not only providing water for agriculture, but serving as a link between the people of the north and south.

Physical factors affecting agriculture can best be described by dividing the country into three broad zones running from north to south, although it is not suggested that the lines of demarcation between these zones are always clear.

The northern zone, from the Egyptian frontier as far south as Khartoum, is mainly desert, broken only by the Nile Valley, and semidesert.

The central zone, between 16° and 11° N. Most of the land under cultivation is located here, although the northern half of the zone may be classified as semidesert, and a principal feature of the zone west of the Nile is the sand-dune area. One other outstanding physical feature is the Nuba Mountains in the Kordofan Province. The fertility of the soils and the availability

of water make this an important agricultural area. The Red Sea Hills are in the northeastern portion of this zone and to the southeast is the fertile plain between the Blue Nile and the highlands along the Ethiopian border.

The southern zone, south of 11° N. contains the upper Nile and its tributaries. The terrain varies from vast swamps to a range of mountains lying near the Belgian Congo border. Tracts of land, but generally on a smaller scale than those of the central Sudan, are cultivated. Areas of rather dense grass woodland are found throughout this region.

Rainfall

In the country's economy, rain is vital, since a major portion of the Sudanese are dryland farmers. A large part of the country gets summer rainfall; the amount and the duration increase from north to south. The northern zone is practically rainless, but farther south--across southern Kassala, Blue Nile, and Kordofan Provinces--rainfall is adequate over most of the growing season, and agricultural productivity is high. Here the principal wet season may start as early as May or as late as July, and continue after mid-September. The rainfall of 7 to 8 inches received just south of Khartoum is considered the minimum necessary for regular agricultural production under the prevailing temperatures. Here the farmers grow grain crops that mature quickly.

The southern Sudan lies just outside the equatorial region, where rains are almost continuous. Along the southern border the greatest rainfall occurs in May and August, although rainfall is adequate throughout this belt for virtually all tropical plants. The south adds little to the total economy of the Sudan because of the remoteness of the area and the limited transportation facilities.

For the country as a whole, from 50 to 75 percent of the rainfall occurs in June, July, and August. An exception to the general pattern, however, is the climate in the Red Sea littoral, which shows maritime characteristics and has a winter rainfall too small to be of agricultural value.

Table 2.--Rainfall for selected stations

Station	Annual rainfall	Months with more than 1 inch	Months of greatest rainfall
	Inches	*Number*	
Atbara	2.8	1	August
Tokar	3.5	1	November
Khartoum	6.5	3	August
Kassala	12.7	4	August
Wad Medani	15.3	4	August
El Obeid	15.0	4	August
Malakal	32.1	6	August
Juba	38.6	9	May and August

Source: H. Ferguson. The Food Crops of The Sudan and Their Relation to Environment, Khartoum 1954, and Sudan Almanac 1953, Civil Secretary's Office, Khartoum, 1953.

Temperature

Marked differences are found in summer and winter temperatures in northern Sudan, the summer being very hot and the winter relatively cool, at least for a period of 3 months or more. The mean temperature for the north is lowest in January and usually is at its highest in mid-May or early June; a high of 115° F. is not uncommon at Wadi Halfa. The effect of the sun's rays is reduced for a large part of the summer by the prevalence of clouds. A weather feature common to the northern and central zones is the haboob, a violent dust-laden wind that can give rise to moving walls of sand that are several thousand feet in height. These winds alter and rebuild sand dunes.

To the south the seasonal variation and the daily range in temperature become less. A maximum temperature usually does not exceed 108° F. in March or April and a minimum of 68° to 85° F. is registered in July or August under the influence of the southerly monsoon prevailing throughout the south at this time.

Table 3.--Mean monthly and annual, annual absolute maximum and minimum temperatures, selected stations

Month	Atbara	Tokar	Khartoum	Kassala	Wad Medani	Malakal	Juba
	°F	°F	°F	°F	°F	°F	°F
January	61	48	74	77	75	81	84
February	63	49	77	79	77	83	85
March	65	50	83	84	83	87	85
April	66	53	89	89	88	88	84
May	62	59	92	92	90	85	81
June	61	63	92	90	87	81	80
July	57	59	89	84	82	79	78
August	57	56	87	82	80	79	78
September	59	58	90	85	82	82	80
October	60	52	90	88	85	82	81
November	60	50	83	85	83	82	82
December	61	48	77	79	80	81	83
Mean annual	61	54	85	85	83	82	82
Absolute max	118	123	118	117	118	110	111
Absolute min	40	48	41	43	42	52	56

Source: Sudan Almanac, 1958, Information Office, The Republic of the Sudan, Khartoum, 1958.

Soil

The significant agricultural soils throughout northern Sudan are the alluvial soils laid down by the Nile. These soils are small in total area and scattered. The other soils are predominantly sandy without organic matter.

The river bank soils vary from pure river silt of recent deposit to those of high clay content deposited by slowly running or stationary water. They are extremely fertile and produce good crop yields. Due to low level terrain, however, these areas are subject to flooding with the slightest rise of the river. In the basins and depressions farther back from the Nile are soils which are locally known as saqiya and karu. These are also river laid and may be classed as rich, free-working alluvial loam. Under irrigation they produce heavy yields of cotton and cereals.

Most soils of the central zone are heavy alkaline clays. Usually brown or gray to a considerable depth, they are of low nitrogen content. To the west of the Nile limited areas of agriculturally rich volcanic deposits are found in the vicinity of the Nuba and Marra Mountains. Soils near these hills produce fair crops but are liable to suffer from drought as they do not readily absorb rain. The remainder of the western side of the intermediate zone is covered by fixed dunes of brown sand. These brown sandy soils are not as fertile as the volcanic deposits, but they preserve enough of the rain so that cereal and oilseed crops can be grown, though yields are low.

A heavy clay soil known locally as the gezira soil is found along the Nile and in the area lying between the White and Blue Niles from their junction southward. This soil has the unique quality of being an alkaline cracking clay of great depth. The clay fraction varies up to 60 percent and, as there is a high sodium content, the soil is quite impermeable. Under continuous irrigation it will collect enough salt to affect the growth and yield of crops, even though the salt content of the Nile and its tributaries is quite low. On this soil cotton is given first consideration; approximately half the acreage lies fallow each year because of the system and methods of farming.

The eastern portion of this belt has alternating areas of sand and silt, each of which is potentially cultivable. The more productive soils are located in the Takar and Gash deltas. Here an alluvial deposit has been laid down by the flood waters of the Baraka and Gash Rivers. This flooded land retains moisture to a marked degree and thus even during years of scanty rainfall produces a cotton crop.

The southern clay plains and swamps are made up of the ferruginous (deep red) soils. Erosion has caused local sorting of these soils. As a group they are less uniform than the clays and sands of the north. They are readily cultivable but relatively poor soil; their fertility is quickly depleted unless the humus content is repeatedly replenished. Better soils for agricultural purposes throughout the southern region are found in the narrow valleys in the highlands along the southern border. These areas are of deep fertile clay soils suitable for coffee or other tropical crops.[1]

ORGANIZATION OF AGRICULTURAL RESOURCES

Land Utilization

Slightly less than 3 percent of the Sudan's total land area of 619 million acres is under cultivation; an additional 16 percent is believed to be potentially productive. Forest lands represent more than one-third of the total.

Table 4.--Land use

Use	Area	Percent of total
	1,000 acres	*Percent*
Cultivated land	17,500	2.8
Potentially productive land	98,800	16.0
Forests	226,000	36.5
Pastures and meadow	59,300	9.6
Waste land and other	217,400	35.1
Total land area	619,000	100.0

Source: Yearbook of Food and Agricultural Statistics, 1956, vol. X, part I, Rome, 1957, and other sources.

Only a small percentage of the land suited to rain-grown crops has been developed, and there are also large areas, in the central region, which may be brought under irrigation.

Irrigation

To the Sudan the economic importance of the Nile and its tributaries is inestimable. By providing irrigation water these rivers become great natural resources of the country. However, the Nile Waters Agreement of 1929 between Egypt and the United Kingdom limits the total amount of the Nile waters available to the Sudan. The Agreement restricts the Sudan's water supply for irrigation each year to 4 milliards of cubic meters; Egypt's share is 48 milliards of cubic meters. This leaves 32 milliards of the annual average flow of 84 milliards for future division. Since 1955 conferences have been held by the Sudan and Egypt as to how the remaining water can best be shared, as there are increasing demands for irrigation in each country. As of mid-1958 no agreement had been reached.

The irrigated area in the Sudan having increased greatly in recent years includes a total area of nearly 2.4 million acres, of which approximately half is planted to crops each year. Various methods of irrigation farming are practiced. The simplest form consists of sowing the river banks (gerf lands) behind the receding river. Various crops are grown in this manner; in years when the Nile is especially high, the area so cultivated is considerable.

The more primitive water-lifting devices used in the Sudan are the saqiya, or Persian water wheel, worked by cows, water buffaloes, or other animals and the shaduf (counterbalanced dipper) worked by men. These devices are still widely used in the Northern Province but they are gradually being replaced by mechanically driven pumps. Over 1.2 million acres are irrigated annually by government and private pump projects. The Guneid Pump Project, located

[1] This section is based mainly on references (4) and (6).

on the Blue Nile, is believed to be the largest of its kind in Africa. It provides irrigation water for 30,000 acres each year.

All pumps operating from the Nile or its tributaries are licensed by a control board, which sees that the limited water supply is used efficiently. Over 2,000 such projects were licensed in 1956. There are two classes of private pump projects. By the Nile Waters Agreement one group is not entitled to use water during the restricted low water period from January to July, but the other has permission to draw water throughout the entire year.

Most irrigated cotton is grown on land which receives regular water supplies by gravity flow. The Gezira plantation is the best known of the free flow projects in the Sudan. Here water from the Sennar Dam on the Blue Nile enters the main canal by gravity flow and is distributed over the project by a system of canals.

Flush irrigation is also practiced. Areas get a thorough soaking by the seasonal overflow or endspill of rivers before the crops are sown. The success of this method depends on the capacity of the soil to absorb water and later yield it to the roots of the crop as needed. West of the Nile, flush irrigation is practiced in areas watered by the Khor Abu Habl River. This type of irrigation is found at Tokar, where floods from the Baraka River spread out over a wide plain, and in the area flooded by the Gash River. In some cases the flow of the water is controlled by locks.

Table 5.--Irrigated area, 1957

Type of system	Area	Percent of total
	1,000 acres	*Percent*
Gravity	1,040	43.3
Gezira Scheme	1,040	
Pump	1,200	50.0
Government schemes	85	
Private schemes	1,115	
Flood basins	95	4.0
Shendi basins	53	
Dongala basins	42	
Flush irrigation	[1] 65	2.7
Gash delta	40-130	
Tokar delta	0-155	
Total (including average flush)	2,400	100.0

Source: Sudan Irrigation. The Ministry of Irrigation and Hydro-Electric Power, Khartoum, 1957.

[1] The area effectively watered by flush irrigation in any given year varies considerably according to the magnitude of the flood.

Land Tenure

In the Sudan there is no land hunger, nor has there been preemption of large landholdings by influential people or exploitation by landlords. While much of the land is farmed by tenants, the government ensures a fairly equitable system of sharing the output by landowners and tenants. Standards for such division have been set in the government-managed schemes and have been adopted throughout the country.

In northern Sudan the right to individual ownership of land is recognized in Islamic law and the native farmer is accustomed to it. Ownership derives from a right conferred by first clearing of land, followed by continuity of occupation and regularity of cultivation. The validity of a claim to individual ownership also depends on whether custom requires that land should be inherited, sold, or purchased according to Islamic law. The government has accepted the position that absolute individual ownership of land can be established according to native custom. However, in order to check speculation and to prevent the creation of a landless class by accumulation of large blocks of land in one man's possession, the consent of the government must be obtained before land can be sold.

To a large extent in the central belt (other than in the Nuba Hills and in some areas along the river) land is held communally; where the inhabitants are sedentary, the unit is the village. Each villager has the right to cultivate within the village lands. He also has the right to tap the gum trees on the plot of ground he occupies. The area allotted to each man is no more than he and his family can work by hand, locally known as Kifayat yed. If he should leave the village, the land occupied by him is allotted to someone else.

Members of a nomadic or seminomadic tribe have the right to graze animals at will over tribal lands. All standing water or wells are considered the property of the group normally living or grazing livestock in their vicinity. Owing to the impossibility of maintaining fences, the responsibility of keeping animals out of gum gardens and off cultivated crops is left to the herdsman.

In the rich delta lands of the Kassala Province the government has refused to recognize rights, but has admitted that certain people should be treated in a preferential manner. At the turn of the century land in these areas was allotted to tribes, not to individuals. These allotments were abused by powerful men for their own gain. As a result, the government found it necessary to declare these areas government land. Now these rich agricultural lands are allotted annually by a board representing the government. Allotments are made on a tribal basis with preference given to members of tribes who had exercised cultivation rights before the land was placed under government control.

Settlement rights in agricultural land, followed by registration, have not been extended to the southern provinces. This may be because land is plentiful and held in common by a tribe or group, an individual having no right except as a member of such tribe or group. Also, it may be because the inhabitants here are not Mohammadens, and so are unaffected by the recognition given to individual ownership of land by Islamic law. Thus, there is general acceptance of the idea that land in the southern Sudan is held by the government in trust for the people who habitually exercise rights over it.

Farming Practices

Farming methods used in the Sudan vary greatly. Rather primitive methods are still used by most Sudanese farmers. It is only on the various government-sponsored projects and the irrigated private estates that intensive cultivation is practiced, or that animal or tractor-drawn implements are used to any extent; here the methods used compare favorably with those in highly developed countries.

The immediate discussion is limited to farming practices used by most individual farmers, those who are not associated with the various governmental projects. A general description of the farming methods employed on the plantations is given later in the discussion of the Gezira plantation.

Farmers cultivate one area until the fertility of the soil is depleted and then move to new ground to continue the harvest of good crops. Inherent in this system of shifting agriculture is the practice of burning the dry vegetation on new ground. This practice is destructive of forests in the area.

The main farm tools used by the Sudanese farmer are: (1) Digging hoe, a small tool with a thin arching blade of European manufacture and a handle cut from some local tree or shrub of strong wood. (2) Weeding hoe, an implement having a blade with the edge curved outward. (3) Wooden sowing stick, with a slight curve and a flattened end point. (4) Ax, made from a wedge-shaped piece of soft iron, and used to clear scrub. (5) Sickle, a short saw-edged blade, fitted to a short wooden handle and used for cutting grass, grains, and forage crops. (6) Wooden plow with a flat iron point.

Oxen supply most of the field power. Horses or donkeys are used to draw carts, and camels are the pack animals.

Farmers live in small villages along a river or near wells in the neighborhood of cultivable land. In parts of the western Sudan, the family water supply is obtained during the dry season from rainwater stored in the hollowed trunks of the haobab trees. On nonirrigated land, a family can farm from 7 to 10 acres. If cotton is grown, outside help is often required at picking time.

The division of labor between the members of the family follows a definite plan. In the north, most of the heavy field work is done by men; women assist in the lighter harvesting operations. In the south, however, women take a more active part in crop production. They assist with the sowing and are almost entirely responsible for the complete harvesting of the grain crops. It is usual at harvesttime to see women carrying unthreshed grain in baskets on their heads from the fields to the village.

Preparation of the land is more thorough where there is a shortage of land suitable for cultivation. Before sowing, the seedbed may be manured, and subsequent weeding is carefully carried out. Where land is more abundant, it is cleared of bush and trees by burning, the soil is broken by a mere scratching of the surface, and the seed is sown. Once the seed has been scattered it may be lightly covered by brushing with a branch or by raking with a forked stick.

Certain crops (chiefly irrigated cotton) are sown on ridges, made with a wooden, steel-pointed plow. In ridge planting, a man makes the holes with a digging hoe (torea) and is closely followed by a woman or child who drops seeds and scrapes earth over them with a foot.

Grain crops must be protected from the many varieties of birds in the Sudan. For this purpose a 10 to 15-foot high scaffold is built with a platform on top. Children are placed on these stands to scare the birds away. From dawn to dusk someone is on duty slinging mud pellets, shouting and cracking whips, or pulling a rope to which are attached jangling cans. For the most part, this method of protecting a crop is very effective.

Grains are harvested in the Sudan by cutting the stalks near the head; later the straw is cut and stacked in the field for use as fodder. The heads are then carried to the threshing area and beaten with a blunt stick. Chaff is separated by pouring the grain from a basket held head high and allowing the wind to do the winnowing. It is then stored in pits in the ground or in special containers made of reeds and mud.[2]

Gezira Scheme

Agricultural practices in the Gezira and other schemes in the Sudan are unique in the Middle East and Africa.

The Gezira (Arabic word for island) lies between the Blue and White Niles from their juncture southward. This region is a flat plain of approximately 5 million acres, of which 3 million are irrigable; over 1 million acres are under gravity irrigation. It is here that most of the Sudan's cotton is produced.

In 1904 a British official advocated the building of a dam or barrage at Sennar on the Blue Nile to provide water for irrigation of the Gezira. It was not until 1925 that construction of such a dam was completed. The government rented the land and established a triple partnership for the operation of the scheme. It involved the Sudan Government, the tenant farmers, and a concession company in charge of management. More recently, the management has been vested in the Sudan Gezira Board.

Operation.--The government, in addition to providing the land, maintains the Sennar Dam and the system of canals. In return it receives 44 percent of the net profit from the cotton produced. The tenant is provided with free land, free water, selected and treated cottonseed, and credit. In return for his 44 percent of the cotton profits, he has to do the work and bear expense involved in growing his crops. The tenant receives two-thirds of his share of the profits in 3 installments. One is paid in July, the second in September, and the third in November. The balance is paid in another 3 installments during the following January, March, and May. The tenant is also given all grain and fodder crops grown in the rotation with cotton.

The Gezira Board receives 10 percent of the returns. The remaining 2 percent is placed in a welfare fund to provide better medical, educational, and social facilities for the cotton tenants. The Board has responsibility for subsidiary canalization, allocation of tenancies, land preparation, provision of cottonseed and fertilizers, pest control, farm supervision and accounting, the advance financing of the tenants, and the transport, ginning, baling, and marketing of cotton.

[2] This section is based mainly on reference (6).

The original profit-sharing basis of the Scheme provided that the government was to receive 40 percent, the tenants, 40 percent, and the Managing company, 20 percent. Early in 1957 the percentages of the division previously discussed were changed.

Cropping pattern:--The area was originally laid out in lots of 30 feddans (about 31 acres) but has since been changed to 40 feddans per tenant. Cotton is grown in rotation with durra (grain sorghum), the staple cereal consumed by the tenants, and lubia, a forage legume. As a result of experimentation, a crop rotation including these three crops and fallow has been developed. It is an 8-course rotation providing for the cultivation of cotton once every 4 years.

Culture operations.--Cultural operations are largely standardized throughout the project. Normally the soil is plowed and ridged in one operation, usually by tractors.

During the dry season there is no loss of moisture by leaching and little loss of gaseous ammonia in the Gezira so that fertilizer can be applied months before the crop is sown. In recent years nitrate of ammonia has been used, but sulfate of ammonia and nitrate of lime have both given highly satisfactory results.

In mid-August the farmers start planting cotton and usually finish by the end of the month. Planting is done with the traditional native sowing stick, or seluka. After thinning and weeding, the crop is re-ridged. Apart from watering and spraying for insects, no other operation is necessary until harvest time in late December or early January.

During the annual dry period (April to July), all cotton debris and plants within and around the Scheme are destroyed, to help control diseases and insects that attack cotton.

Little or no preparatory cultivation is done for durra or lubia. Durra is sown on flat land but lubia is usually ridged. Durra is sown in July and except for weeding and watering receives little attention until it matures about 3 months later. Most lubia is sown in September. Its foliage is cut once or twice for fodder or grazed. Before the final grazing, a crop of beans is harvested. The lubia crop is often used to attract cotton pickers to the project, being offered as grazing for their animals.

Except during rainy weather, water is applied to cotton about every 2 weeks. Some 450 cubic meters of water per acre are used. Per watering this is equivalent to about 4 inches of rainfall. Normally cotton receives up to 15 such waterings, durra 3 or 4, and lubia 4 to 8.

Long staple cotton is grown. Yields in the past have varied substantially, owing in part to rainfall variability, but mainly to losses caused by disease. The fight waged against these and other enemies of cotton is one of the successful phases of the Gezira operation.

Tenants.--There are over 31,000 tenants in the Gezira plantation. They live in over 950 villages. As former owners of land in this area were given first rights as tenants, some of them find themselves in the unique position of being tenants on their own land.

The tenants' work is closely controlled and supervised and must be carried out in accordance with a timetable. The tenancy is an annual one, no tenant being evicted unless he fails in his obligations as a partner in the project. The standard set for agricultural efficiency has been high. Less than 1 percent have been evicted each year for negligence or inefficient farming. The tenants are cooperative and show much interest and initiative in the economic and social development of this agricultural enterprise.

All tenants are members of the Gezira Tenants Union, which is recognized by the Board as representing the views of the tenants. The union is completely independent, annually electing its own representative from among the tenants. Representatives of the Gezira Board Management hold monthly meetings with the Executive Committee of the Tenants Union. In the case of unresolved differences between management and union, the union has the right to strike after giving 15 days notice, as required by law.[8]

Other Schemes

Pump projects.--Pump irrigation has increased enormously in recent years. Prior to 1930 most group projects were located north of Khartoum, but they have since spread southward

[8] This section is based mainly on reference (4).

along the White and Blue Niles. Most government projects are managed by the Gezira Board, the Ministry of Agriculture, and the White Nile Scheme Board. There are 10 White Nile projects that irrigate an area of 61,000 acres each year. Egypt bore the original cost of these schemes in order to compensate for land lost through the construction of the Jebel Aulia Dam in 1937, which also supplies water to Egypt. Here the tenants, the Board, and the government share the proceeds in the proportion of 40-20-40. The numerous other government and private schemes are following similar policies to those of the Gezira, although the proportionate division of the proceeds among the partners varies in accordance with the circumstances.

Gash.--The Gash Delta Scheme, located in the Kassala Province, covers roughly 75,000 acres, approximately one-seventh of which is under flush irrigation. In an average year, 30,000 to 40,000 acres are planted to cotton.

The Scheme is managed by the Gash Board, established by the government. Land is government-owned and allotted rent free for the period of 1 year. The average tendency is between 5 and 10 acres, but capable cultivators may have much larger holdings. Allocation varies from year to year, in accordance with the magnitude of the flood. All tenants are encouraged to grow a durra crop, free of any charge, equal to one-fifth of their cotton area. The profits from the cotton crop are shared as follows: the tenants get 50 percent, the Gash Board, 28 percent, and the government, 22 percent.

The cotton produced in the delta is of high quality; it is used to multiply improved seed for other schemes.

Tokar.--The Tokar Delta lies on the Red Sea Coast, about 100 miles south of Port Sudan. It is a flat alluvial plain deposited by the seasonal Baraka River and covers an area of some 405,000 acres. The cultivable area varies from year to year, but roughly 40,000 acres of cotton are a normal expectation. The land is government-owned and leased on an annual basis by a land board before the advent of the flood in mid-July. Holdings vary in size from about 10 to 40 acres though subletting by tenants often further reduces the individual holdings. The tendency in recent years has been to reallocate the land in smaller holdings to insure a more equitable distribution.

Cotton planting begins as soon as possible after the flush. Owing to late flushes, however, the crop is frequently washed out. Since there are greater hazards to crops in the Tokar Delta than in the Gezira or Gash projects, the tenants are assured 70 percent of all cotton profits.

Zande.--The Zande Scheme, located in the southwestern part of the Equatoria Province, is an experimental project initiated by the government in 1946 in order to promote the social and economic emergence of the people in this remote and underdeveloped region. It is hoped that eventually the Scheme will make Zandeland self-sufficient so that it can be used as a model throughout other parts of the south. The Zande Scheme is unlike others in that economic development is not the primary aim.

By 1950 the scattered population had been resettled in villages, each containing about 50 families. Each family is allotted 25 to 30 acres for cultivation. As far as possible the tribal structure was maintained with authority vested in the tribal leaders.

The Scheme is managed by the Equatoria Projects Board with the Governor of the Equatoria Province at its head. The Board has a trading section which has endeavored to establish a sense of money values in this community that was not familiar with a money economy. This section markets the products of the Scheme.

During the 1954-55 season over 4,000 metric tons of American-type cotton were produced on some 24,000 acres within the Scheme. Robusta coffee is grown satisfactorily and experimental plantations have been established to grow seedlings. Oil palms are issued to individual farmers for planting. Tobacco is grown and the possibilities of sugarcane, jute, hemp, and sisal are being investigated. Durra, peanuts, and sesame are grown as food crops.

The successful operation of a spinning and weaving mill has been the greatest industrial accomplishment of the Scheme. The mill began operation in 1951 and has a capacity of 10,000 bales of lint per year producing 1,600 tons of cloth. Small oil extracting plants also are in operation.[4]

[4] This section is based mainly on reference (5).

Transportation

The Sudan Railways System provides virtually the only means of transportation for agricultural commodities in the country, for there are practically no highways. It includes the Nile River streams and Port Sudan.

The Sudan Airways, linking Khartoum with the principal provincial centers, is of great importance to the country.

The Sudan System is owned by the government but operates as an independent commercial corporation. The 2,300 miles of single-track raillines, while not extensive, do serve the main agricultural areas along the rivers. A line extends northward from Er Roseires through Khartoum and Atbara to Wadi Halfa. The line connecting Atbara and Port Sudan has a loop line running through Kassala to the Sennar Junction. From the Sennar Junction, a branch line crosses the White Nile at Kosti and extends westward into the Kordofan Province for approximately 400 miles.

As the major areas of production are remote from the seaport, much long-distance hauling is needed. Cotton, durra, oilseeds, cement, flour, and sugar are the major commodities requiring transport. Freight rates are fixed for 17 classes of goods. The rates decline progressively per unit with the lengthening of the haul. Despite highly seasonal traffic, the average cost of moving freight is rather low. Traffic requirements rise to a peak in November and December when durra, peanuts, and sesame have to be moved, and in February through July when cotton is normally transported.

The rail system is operated in an efficient manner and is each year moving an increasingly larger volume of freight. Passenger traffic is also growing. To handle areas now without transport services, the Sudan Railways are currently engaged in a development program extending over the 5-year period, mid-1957 to mid-1962.

Few countries are so lacking in roads. There are less than 1,000 miles of all-weather gravel roads throughout the entire country. Roads are impassable over wide areas during the rainy season. As the railways are confined mostly to the northeastern quarter of the country, greater efforts have been made to build roads in the southern Provinces.

The south's only transport facilities are the river steamer services which form an extension to the railway system. The principal services operate on the White Nile between Khartoum, Kosti, and Juba. Great difficulties are encountered in marketing agricultural products grown in the south as they are brought by boat to the river port at Kosti, and here transferred to rail cars bound for Port Sudan. Small seasonal branch services operate on the Blue Nile, Sobat, and Bahr El Ghazal Rivers.

Storage

Both government and private facilities are available for the storage of cotton, oilseeds, and durra, but cotton and grains often have to be stored outside, as the expansion of storage facilities has not kept pace with increased agricultural production. Most of the warehouses are in Port Sudan.

Port Sudan

Nearly all imports and exports go through Port Sudan, which is situated on the Red Sea about 850 miles south of Suez. The port has a good natural, well-protected harbor requiring little or no dredging. There are 5 berths, each 456 feet long, lighted by electricity and well equipped with cranes; 2 general cargo berths without machinery. All berths are served by rail with lines running the full length of the quays. In 1955-56, over 1,150 vessels entered the port. The volume of goods handled has risen from 500,000 tons in 1946 to over 1.3 million tons during 1955-56.

Processing

Industrial development in the Sudan is extremely limited. Most of the industrial plants are engaged in the ginning of cotton and the processing of oilseeds. Although most of the oil output

is in the form of crude oil, a beginning on refining and deodorizing has been made in some of the country's 25 plants. The country has a cement factory and a brewery, and a meat canning and processing factory was recently built at Kosti; a beginning has been made with the spinning and weaving of cloth on a government scheme in the Equatoria Province. Hides and skins are cured and tanned. Other agricultural processing industries are: About 15 grain cleaning plants, one sugar factory, one plant for the manufacture of tobacco, one tea packing plant, 12 food processing plants, and 2 tanneries.

With the exception of the Sudan Railways, the cotton ginning industry totaling about 26 plants is the largest employer of nonfarm labor in the country.

AGRICULTURAL INSTITUTIONS

Education and Research

While there are over 1,800 schools in the country, few Sudanese farmers have ever had any formal education. At least 90 percent of the male population over 15 years of age is illiterate, but about 17 percent of the school-age children are now in school, with the proportion in elementary school notably higher.

Education of the nomadic tribes is one of the biggest problems facing the educational authorities. Recent expansion in agricultural schemes has helped in making a greater proportion of these nomads settle permanently.

In the agricultural field, training is provided at one school on the secondary level and at two farm-training centers in the Gezira. The Agricultural Institute of the Ministry of Agriculture, in addition to the University of Khartoum, offers higher education in various agricultural subjects. The university graduates only 10 to 12 agricultural students each year and the Agricultural Institute about 30. The government hopes to increase this total to 60 per year by 1960. While the government is expanding academic educational facilities, the greatest efforts are being directed toward increasing vocational and technical centers.

The government maintains three research stations, and a fourth is contemplated. The principal one at Wad Medani in the Gezira is the headquarters of the Research Division of the Ministry of Agriculture. Here research is undertaken on improved crop production in the Gezira as well as other parts of the Sudan.

The station at Tozi, located in the Kordofan Province, is well-staffed and equipped. It is doing work on nonirrigated crops and has demonstrated the possibility of growing a wider range of crops including hybrid corn, castor beans, and sunflowerseeds.

The third station is located near the southern border of Equatoria Province and is doing research and experimentation on tropical crops.

Cooperatives

Sudanese farmers have taken an interest in the development of cooperative agricultural societies. In 1956 there were 350 cooperatives in the country, over one-half of which were established to assist farmers in the production and marketing of their goods:

Types	Number	Number of members
Marketing and credit	100	3,921
Agricultural pump schemes	73	18,509
Flour mills	6	924
Transportation	4	1,139
Cotton unions	5	60
Consumer unions	150	26,247
General purpose societies	11	23,861
Others	5	2,123

Source: This is Our Way to Build a Strong Nation - Co-operative Movement. Ministry of Social Affairs, Khartoum (date not given).

The government has guided and encouraged this movement, in addition to providing it with financial assistance. The Cooperative Societies Ordinance enacted in 1948 assures that they will be established and operated according to recognized international cooperative principles.

Credit

A formal agricultural credit institution does not exist in the Sudan. However, legislation has been enacted to establish an agricultural bank with capital of LS 5 million ($14.4 million). Credit for current agricultural operations presents no serious problem to tenants on cotton schemes managed by the government or private owners, as it is usually advanced on reasonable terms. On the other hand, little or no credit facilities are available to farmers not connected with these schemes. It is partly for this reason that an agriculture bank is being established. Also, credit for investment is extremely short and available only to a limited extent through the commercial banks.

PRODUCTION

Most of the country's agricultural crops are grown for local consumption and not for trade. A wide variety of crops is grown but statistical data do not exist for many of them. Crop production has increased rapidly as is shown by the following production index:

1935-39	1952-54	1955	1956	1957
58	100	126	156	149

Cereals

Durra.--Durra, a grain sorghum, is the main food crop of the Sudan. It is grown in all Provinces under both rain and irrigation cultivation, and is highly resistant to drought and heat.

The crop is sown by the last of July or earlier if rain permits, and matures within 70 to 90 days. The yield varies, but for the country as a whole, it is little more than one-third of a ton per acre.

Durra is the only grain crop that is stored for any length of time. Reserves may be held 2 years or more in ground pits (Matmura). In much of the south, ground storage cannot be used because water seeps into the pit, so grain is stored in basketlike containers made of mud and dried grass.

Most durra is made into flour from which is made flat loaves of unleavened bread. Much of the production of durra in the south is used for making a mild brew (marisa), which is consumed daily. Durra is usually considered a good livestock feed but most Sudanese farmers find it uneconomical for this purpose due to its high market value.

Each year some durra is exported. However, the amount varies greatly from year to year. In 1954 some 73,000 metric tons were exported compared with only 8,000 during 1955.

Dukhn.--Dukhn (bulrush millet) ranks second as a food crop, and is grown principally in Darfur, Kordofan, and Equatoria Provinces. The cultivation of dukhn closely resembles that of durra. It has lower water requirements, and its vigorous root system makes it the most suitable crop for areas with predominant sandy soils. The crop matures in less than 3 months and has to be very dry before it can be easily threshed. Yields probably average between one-fifth and one-fourth ton per acre.

Of all the grains grown in the Sudan, dukhn is the favorite of the birds. After heading starts and until the crop is harvested, fields must be well guarded.

Corn.--Corn is grown in various parts of the Sudan, most of it mixed dent varieties. It is grown under irrigation and flood along the Nile in the north, but as a main crop in parts of the central belt and throughout the south. Under flood conditions it is often intersown with lubia, which makes use of the residual water after corn has been harvested. Some of the varieties mature in 60 days, others take about 120 days.

Table 6.--Area and production of principal crops, averages 1934-38 and 1952-54, annual 1955-57

Commodity	Area					Production				
	1934-38 average	1952-54 average	1955	1956	1957	1934-38 average	1952-54 average	1955	1956	1957
	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.
Cotton[1]	427	652	599	762	728	56	84	93	130	48
Durra (sorghum)	(2)	1,860	3,163	2,587	2,606	414	544	1,202	1,067	1,097
Dukhn (millet)	(2)	1,200	1,679	1,721	1,765	25	277	340	194	142
Sesame	235	375	661	823	526	30	89	150	153	131
Peanuts	35	67	309	477	466	6	80	65	146	129
Lubia (forage)	(2)	70	92	100	115	9	(2)	49	54	60
Wheat	22	27	30	25	32	7	17	18	14	20
Corn	11	30	(2)	42	35	12	16	14	20	11
Barley	(2)	(2)	2	2	2	(2)	2	1	1	1
Pulses	(2)	15	(2)	114	130	6	58	63	61	70
Gum arabic	-	-	-	-	-	(2)	40	49	46	45
Dates	-	-	-	-	-	(2)	27	25	30	30
Cottonseed	-	-	-	-	-	173	175	195	272	195

Source: Partly based on official sources and partly estimated.

[1] Cotton harvest begins in December of year given.
[2] Not available.

As a result of drought, poor yields of corn are common. An average crop is reported at about 20 bushels per acre. It is stored on the cob by hanging on racks or on trees.

When an export market is available, cultivators sell their corn. It is used as a food only when durra is scarce. Then, it is ground with other grains or boiled or roasted before fully matured and eaten from the cob.

Wheat.--The climate of most of the Sudan is unsuitable for wheat, and most of the crop is grown under irrigation. It is the basic cereal of only a very small number of rural dwellers, being grown mostly as a cash crop to meet the increasing demands of the urban population.

The yield averages about one-half ton per acre. The amount of straw associated with this amount of grain may range from one to three times the grain weight.

Small quantities of wheat are sometimes exported to Egypt, while most of the demands within the Sudan are met from imported wheat flour, amounting to over 50,000 metric tons in some years.

Barley.--Barley has never assumed much importance in the Sudan. It is grown mainly for livestock feed. When there is a shortage of other cereals, barley is sometimes ground with other grains for human consumption, but it is not popular as a food.

Rice.--Rice can be grown in many areas of the Sudan. However, only in recent years have measures been taken to investigate the possibilities of rice production. Preliminary experiments have shown that rice can be grown economically on much of the swamp lands which are covered by water from 4 to 6 months of the year. The greatest success has been obtained with Indian varieties.

A small amount of rice is produced in the southwest part of Equatoria Province but it is eaten locally. Up to 5,000 tons have been imported, for the most part coming from Egypt.

Cotton

Cotton is the Sudan's leading export and its chief source of foreign exchange. Almost all the crop is available for export, as less than 1 percent of the total raw cotton produced is consumed within the country.

Two types of cotton are grown--G. Hirsutum, or American upland, and G. Barbadense, or Egyptian, commonly called Sakel. The former is cultivated under irrigation in the Northern Province and in Kordofan, Equatoria, Kassala, and Upper Nile Provinces as a rain crop. Egyptian-type cotton is confined mostly to the Gezira area, the White Nile irrigation projects, and the Gash and Tokar deltas.

Close to four-fifths of the total production is made up of Sakel-type cotton, over three-fifths of which is produced in the Gezira. The largest portion of the rain crop is grown in the Nuba Mountains.

Methods of cultivation for Sakel cotton were given in the discussion of the Gezira Scheme. The American-type cotton is produced without the use of machinery. Since most of the crop is grown under rain conditions, yields fluctuate widely. Land is prepared for seeding by plowing with a wooden steel-pointed plow or by digging with a small hoe after the dry vegetation has been burned. The usual sowing date is from mid-June through July. Both spacing and seeding rate are extremely variable and thinning to 2 plants per hole is ideal, though rarely accomplished. The crop is hoed 2 or 3 times. Picking starts in October and goes on until January or February. The rotation is usually cotton for 2 or 3 seasons, then durra or some other food crop.

For the 12-year period from 1946-58, yields of lint cotton for Sakel varieties varied from 144 pounds to 451 pounds per acre. The average has been about 360 pounds. During the same period, yields for American upland cottons averaged 125 pounds per acre and covered a range from 99 pounds to 171 pounds.

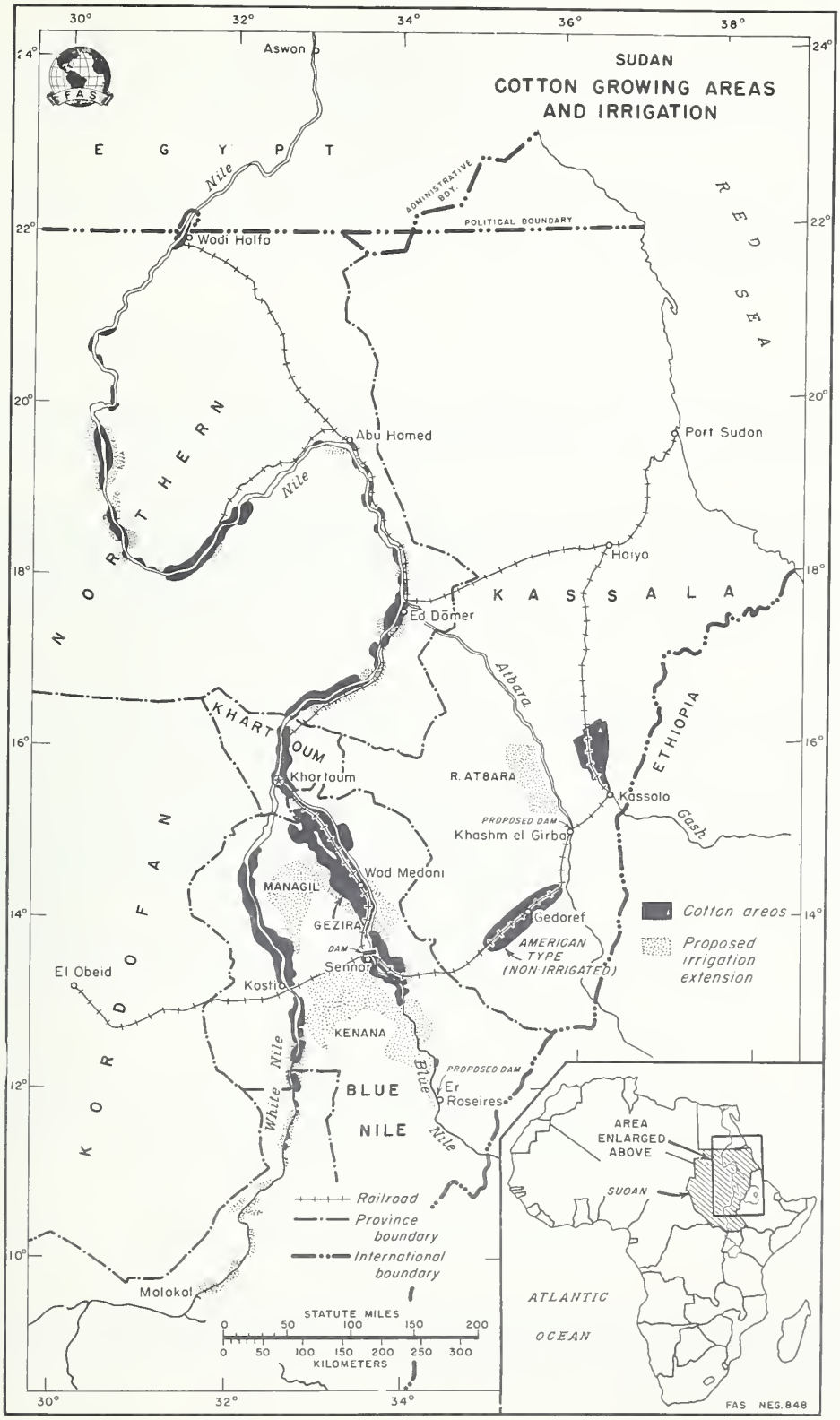
The Gezira Board handles the ginning and marketing of all cotton, with the exception of that grown on private estates. After the seeds have been removed, the crop is pressed into bales ranging between 410 and 440 pounds. Cotton is sold at auction. However, when difficulties

Table 7.--Area and production of cotton, 1946-57

Year[1]	Grand total		Sakel type						American type			
			Gravity irrigation		Pump irrigation		Flood irrigation		Irrigated		Rain grown	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
	1,000 acres	*1,000 m.t.*	*1,000 acres*	*1,000 m.t.*	*1,000 acres*	*1,000 m.t.*	*1,000 acres*	*1,000 m.t.*	*1,000 acres*	*1,000 m.t.*	*1,000 acres*	*1,000 m.t.*
1946	335	48.1	222	37.8	21	3.0	83	6.6	3	.4	6	.3
1947	328	46.7	224	33.2	23	3.4	44	8.0	5	.6	32	1.5
1948	402	56.2	225	41.7	24	4.5	70	5.8	5	.8	78	3.4
1949	430	60.4	225	45.0	29	5.0	77	6.2	7	.6	92	3.6
1950	538	90.0	226	65.4	32	8.8	133	9.2	7	1.1	140	5.5
1951	571	54.9	242	32.3	45	5.5	72	4.0	17	1.7	197	11.4
1952	619	80.9	253	52.1	61	11.2	101	6.2	10	1.5	194	9.9
1953	651	84.2	254	51.8	67	12.8	130	7.5	6	1.0	194	11.1
1954	685	85.1	254	47.7	104	19.3	57	3.1	7	1.3	263	13.7
1955	599	93.3	258	54.1	118	24.4	37	3.6	9	.9	177	10.3
1956	762	129.9	265	77.8	157	36.4	174	7.8	11	1.3	155	6.6
1957	728	47.6	265	17.2	187	13.2	62	4.0	11	1.2	203	12.0

Source: Various Cotton Progress Reports issued by the Ministry of Agriculture, Khartoum, Sudan.

[1] Cotton harvest begins in December of year given.


SUDAN
COTTON GROWING AREAS AND IRRIGATION
FAS
30°
32°
34°
36°
38°
24°
22°
20°
18°
16°
14°
12°
10°
Aswon
E G Y P T
Nile
ADMINISTRATIVE BDY.
POLITICAL BOUNDARY
Wadi Halfa
RED SEA
NORTHERN
Abu Homed
Port Sudon
Nile
Hoiyo
KASSALA
Ed Dömer
Atbara
ETHIOPIA
KHARTOUM
Khortoum
R. ATBARA
Kassolo
PROPOSED DAM
Khashm el Girba
Gash
KORDOFAN
Wod Medoni
MANAGIL
GEZIRA
Gedoref
AMERICAN TYPE (NON IRRIGATED)
DAM
Sennar
El Obeid
Kosti
KENANA
White Nile
Blue Nile
PROPOSED DAM
Er Roseires
BLUE NILE
Cotton areas
Proposed irrigation extension
Railroad
Province boundary
International boundary
Molokol
STATUTE MILES
0 50 100 150 200
0 50 100 150 200 250 300
KILOMETERS
AREA ENLARGED ABOVE
SUDAN
ATLANTIC OCEAN
FAS NEG. 848

were encountered with marketing the 1956-57 crop, a method of selling by tender was used for a short period. Auctions are held at Khartoum, but the cotton is stored at Port Sudan until it is shipped abroad.

Pests such as flea beetles, thrips, jassids, and white flies often contribute to low cotton yields. With the exception of white flies, these insects are controlled by the use of insecticides. DDT has been used extensively in recent years. Control of the white fly is difficult and is currently the subject of study and experiment by research stations within the country. In some years cotton has also suffered considerable damage from 3 diseases: Wilt, leaf curl, and blackarm. Planting of resistant varieties in fields that have been thoroughly cleaned of debris has been effective in controlling blackarm and leaf curl. But, as yet no controls have been found for wilt. By heating the seed to be sown to approximately 140° F. for 2 hours, damage by bollworms is held to a minimum. At this temperature bollworm larvae are killed, but germination is not impaired.

Oilseeds

Sesame.--In the Sudan the cultivation and use of sesame are widespread. Small patches are grown under irrigation along the Nile north of Khartoum, but the major producing areas lie west of the White Nile across the sand dunes of Kordofan and Darfur Provinces. The best results are obtained from sandy soils where the rainfall averages 15 to 20 inches annually. Sesame will thrive under heavier rainfall providing the soils are well drained; so it is extremely grown in the Nuba Mountains and the hilly regions throughout the south.

A number of varieties of sesame is grown, but white and red types predominate. As soon as the rains are assured, the seed is normally broadcast over the surface and lightly hoed. Some types mature within 80 days, while others take from 100 to 120 days. The plants are cut, tied into small bundles, and stacked for several days, during which they ripen. The seeds are then shaken from the capsule by inverting the plants and tapping the sheaves gently. Losses resulting from shattering are so great with mechanical harvesters that their use is considered uneconomical.

Yields are in the neighborhood of 350 pounds per acre. The oil content of the seed varies from 45 to 58 percent, and the extraction rate in the Sudan is believed to average about 47 percent.

Sesame provides the staple consumption oil. Few mechanical presses exist in the Sudan but there are hundreds of wooden oil-mills operated by camel or ox. While most of the crop is pressed for oil, some is available for export. In 1957 over 36,000 metric tons were shipped to other countries. Sesame cake, the residue after oil has been extracted, is also available for export. In recent years more and more foreign exchange has come from sesame and sesame cake. In fact the crop is fast becoming one of the important cash crops in the country.

Peanuts.--Peanuts may well be considered a twin product with sesame in the Sudan, for whenever sesame is grown peanuts are also grown. The bunch type is preferred in the wetter parts of the south but the creeping (runner) type is generally grown elsewhere.

Peanuts are sown so that vegetative growth is completed during the rainy season, and ripening takes place in the early part of the dry season. A period of 3-1/2 months is needed for the nuts to reach maturity. On heavy soils digging is necessary, but on loose soils the plants are pulled up by the roots and stacked to dry for 3 weeks or more. The nuts are then shaken off. Yields of a ton per acre have been obtained on experimental plots, but the average is between one-fourth to one-half ton per acre.

Production has increased so in recent years that close to one-half of the crop was exported in 1957. The crop is much less of a staple oil seed than sesame and most of it is eaten raw.

Melonseed.--Watermelons are grown everywhere in the Sudan. Along the river banks in the north they are grown as a summer delicacy, but throughout most of the country watermelons serve as an assured water supply during the summer. The melonseeds are of economic importance as an export crop. Shipments have gone mostly to Egypt, where they are pressed for oil. The oil content ranges from 17 to 25 percent.

Cottonseed.--Cottonseed is an important byproduct of the cotton industry in the Sudan. By far, the greatest quantity is exported, though some is pressed for oil. In parts of the Sudan, the oil is used for cooking and for the manufacture of soap.

Other.--Other crops of the Sudan producing edible oilseeds are Sunflower, pumpkin, niger, safflower, castor, and gourd. Safflower and sunflower grow well and are possible crops for the commercial production of oilseeds. Soybeans have been tried in various parts of the Sudan but with little success and are nowhere established as a crop.

Pulses

Various pulse crops are grown in the Sudan, but they are relatively unimportant for food. Principal ones are lubia, lupin, cowpea, field pea, chick pea, horesbeans and haricotbeans. Total production was reported at 61,000 metric tons in 1956, of which 32 percent was exported.

Pulses are grown everywhere but are major crops only in local areas in the north, where they are grown principally for export or for fodder. In the Gezira, pulse crops occupy an important place in the rotation system.

Other Food Crops

Production of root crops is of importance only in the southern Sudan, where climatic conditions suit them best. Here they follow grains in importance as food crops. Various types are grown but sweetpotatoes and cassave are preferred.

Many varieties of fruits and garden vegetables are grown; plus, the leaves and sometimes the flowers of many wild plants are used as vegetables. Apart from the many wild fruits, dates are the only established tree fruit of economic importance. Date trees are found along the Nile banks in the Northern Province.

Gum Arabic

Gum arabic, a semiwild forest product, is the Sudan's second big money crop. It is surpassed only by cotton and cottonseed. Each year 40,000 to 50,000 metric tons are exported.

The gum arabic is obtained from the grey-barked acacia senegal tree, known as the hashab tree, which grows over wide areas throughout the central zone. After collection, the gum is carried to local markets and auctioned under government supervision.

Gum arabic is not used locally but is shipped to many countries. Important buyers are the United Kingdom, United States, and Italy. It is used in the manufacture of confections, glues, pastes, inks, polishes, and medicines, among other things.

Royalties and export duties on gum arabic have become an important source of revenue for the government. Measures have been taken to prevent burning forests in clearing land near areas with a heavy growth of hashab trees. No attempts to produce the gum under cultivation have been reported.

Other Crops

Coffee.--Climatic conditions in parts of Equatoria and Darfur Provinces are well suited to the growing of robusta coffee, but little is grown. Experimental farms and nurseries have been established to encourage the production of coffee as a cash crop. On some experimental plots a yield of one-half ton of clean coffee per acre has been obtained.

Tea.--Some tea is grown in the highlands along the Belgian Congo border. Most of the country's tea needs are met by imports. The little tea that is grown is produced on experimental farms.

Tobacco.--Small patches of tobacco are grown for local use in several Provinces. Results from trials conducted in the southern part of the country indicate tobacco fits well into the cropping patterns. That produced is of the Virginia type. The leaf compares favorably with that grown in East Africa.

In 1957 a cigarette factory, operated by an affiliate of a British tobacco firm, was opened at Wad Medani. The company also operates tobacco plantations in the south to grow needed tobacco. However, production has not expanded sufficiently to meet local requirements.

Livestock

Many types of cattle, camels, sheep, goats, and donkeys, as well as poultry, are raised in the Sudan. Much of southern Sudan is infested with the tsetse fly and large areas in the north are waterless most of the year. As a result, livestock is restricted to rather limited areas, and most of it is owned by nomadic and seminomadic tribes. Some tribes consider cattle as a form of wealth and are loathe to part with them. Few hogs are grown since Islam forbids the raising as well as the consumption of pork.

Table 8.--Livestock population for selected years

	1944	1949	1953	1954	1955	1956
	Million head	*Million head*	*Million head*	*Million head*	*Million head*	*Million head*
Cattle	3.1	3.5	4.8	5.3	5.5	6.9
Sheep	4.8	5.5	6.0	6.1	6.3	7.0
Goats	3.4	4.3	5.0	5.2	5.7	5.8
Camels	1.1	1.5	1.2	1.2	1.3	1.5
Donkeys	.4	.5	.5	.5	.5	.6

Source: This is Our Way to Build a Strong Nation - Animal Resources, Ministry of Social Affairs, Khartoum. (date not given)

Cattle.--Cattle are first in economic importance among livestock. Most of them are owned by the Nilotic tribes of the Upper Nile and Bahr El Ghazal Provinces and by the Baggara Arab tribes of Kordofan and Darfur. In addition to providing essential food, some tens of thousands are used for draft animals throughout the northern and central zones. And in 1957, close to 60,000 head, valued at $3.8 million, were exported.

Native cattle are the Zebu type and resemble those found in Asia. The physical characteristics of the cattle kept by the Arabs to the north differ from those owned by the Nilotic tribes. Nilotic cattle grow noticeably larger and have long massive horns and a relatively smaller hump. Neither type thrives well in the other's environment. In spite of better grazing land, the cows in the south are poorer milkers than the northern cows. The government has only recently begun to experiment with selective breeding as a means of upgrading livestock.

Livestock in the Sudan are affected by many insects and diseases, mainly bovine trypanosomiasis, rinderpest, and infectious pleuropneumonia. The program to eradicate animal diseases and parasites has been impeded by the acute shortage of trained personnel. Also, progress has been hampered by the disinterest of many owners in having their stock vaccinated and by the reluctance of others to slaughter infected animals.

Sheep.--Sheep are bred principally for mutton and milk, as climatic conditions are not suitable for wool; the Sudan sheepskins are noted for their high quality on the world market. Several breeds of sheep are raised, but they all have hairy coats, pendulous ears, long legs and fleshy tails. Sheep are kept together in small flocks, though it is not uncommon to see them grazing with goats or cattle. The most hardy breeds are herded by nomad Arabs in the nonriverain areas east of the main Nile. The ewes are good milkers, yielding as much as 5 or 6 pounds daily.

Other.--Goats are found throughout the country and in many parts where other domestic animals cannot survive. They are triple-purpose animals, providing meat, milk, and hair.

All camels in the Sudan are of the one-humped, or Arabian, species. They live in the semidesert areas north of Khartoum and are used both for riding and pack carrying. Camels are produced by some tribes solely for Egypt.

The donkey is the choice transport animal. It is small but often carries up to 300 pounds for miles.

Horses are not popular and the few found in the country are limited to a small area along the Nile north of Khartoum and in small areas of Darfur and Kordofan Province.

The few chickens kept by most families along the river banks run freely about the village and eat what they can pick up for themselves. As a result, their meat is stringy and tough and their eggs small. Egg production is low, averaging about 110 eggs per year per hen. There are no pure breeds of chickens and small flocks are made up of several different colors and sizes. The number of all types is estimated at about 6 million birds. In an attempt to develop the industry, the Department of Animal Production recently started pilot schemes for poultry improvement.

Livestock Products

Beef and mutton are the meats eaten by the Sudanese. Meat constitutes only a small portion of the daily diet, but the total amount consumed is by no means negligible. Records are not kept at all slaughtering centers, but the number slaughtered in the 10 principal towns during 1956 totaled about 60,000 cattle, 230,000 sheep, and 41,000 goats. The meat that is not consumed fresh is cut into long strips about an inch thick and dried. There has been little demand for salted meat.

Dairy products.--Dairy products in various forms are essential to the Sudanese diet. Although the cow is looked upon as the principal milk animal, large parts of the country must depend on the camel, sheep, and goat. In general, milk production per cow is low, probably less than 4 quarts a day.

Milk that is not consumed fresh goes into making clarified butter. Many thousand tons of butter are produced annually; butter not used by pastoral nomads is sold in nonpastoral areas within the country. Little is produced in the Southern Provinces because of the low milk yields, and in the Arab areas of the north, production is mainly seasonal.

Hides and skins.--Hides and skins make a decided contribution to the Sudan's foreign exchange earnings. Total annual exports are valued $3 million. Most of this comes from the sale of hides; skins are generally used within the country. The skins that are exported bring good prices on the world markets, but hides are of poor quality.

Sheepskins destined for export are dry-salted, whereas those used internally are merely air-dried. All goatskins are air-dried, but relatively few are marketed. Some good suspension dried hides are produced by slaughterhouses. However, most of the hides are dried on the ground. Some attempts are made to keep the hides in the shade of bushes and trees, but sun spoilage is heavy.

Some hides are tanned for sole leather, but the true leather of the country is sheepskin. A portion of the skins are tanned by tanneries in the larger towns, but most leather is made by small village tanners.

TRADE

Exports

For any given year, close to 95 percent of all the Sudan foreign exchange earnings come from agricultural commodities--mainly cotton, cottonseed, gum arabic, peanuts, sesame, and livestock.

By value, cotton lint and cottonseed traditionally account for two-thirds of the Sudan's total exports. Owing to difficulties experienced in marketing the 1956-57 record crop, however, they made up less than 55 percent of the total in 1957. Gum arabic, livestock and hides and skins, and peanuts accounted for 9 percent each; sesame, 7 percent; and durra, 2 percent. While the value of cotton exports in 1957 was less than one-half that for 1951, exports of other commodities showed an increase amounting to $28 million, or 71 percent. The largest increase in exports was for peanuts and sesame.

The sterling area received 37 percent of all exports in 1957, compared with 47 percent for the previous year. The dollar area took only 4 percent of the total in 1957, while the Soviet Bloc received 5 percent. The United Kingdom, India, West Germany, and Italy have been the major

Table 9.--Principal agricultural exports, 1951, 1956, and 1957

Commodity	Quantity			Value		
	1951	1956	1957	1951	1956	1957
	1,000 m.t.	*1,000 m.t.*	*1,000 m.t.*	*Million dollars*	*Million dollars*	*Million dollars*
Cotton, raw	95.5	114.7	56.9	130.7	119.7	61.0
Cottonseed	112.1	151.9	179.8	11.0	13.4	14.3
Gum arabic	41.0	48.8	41.3	9.7	15.3	12.9
Peanuts	14.3	64.1	67.4	2.4	10.9	12.5
Sesame	n.a.	30.4	36.1	([1])	5.9	7.8
Durra	10.2	18.1	55.4	.5	1.0	3.2
Dates, dried	8.0	7.4	6.9	.8	.8	.8
Hides and skins	5.1	4.4	4.6	3.6	2.9	2.8
	1,000 head	*1,000 head*	*1,000 head*			
Camels	([1])	38.1	42.7	([1])	3.5	4.0
Cattle	28.0	59.5	57.2	1.4	2.9	3.8
Sheep	50.9	148.6	125.2	.6	1.4	1.7
Other agricultural	--	--	--	10.0	6.7	4.4
Total agricultural				170.7	184.4	129.2
Nonagricultural				4.5	7.3	8.9
Total exports				175.2	191.7	138.1
Percentage agricultural				97.4	96.2	93.6

Source: Annual Foreign Trade Reports, Ministry for Social Affairs - Department of Statistics, Khartoum, Sudan.

[1] Not available.

buyers of Sudanese long staple cotton, taking about 49 percent, 21 percent, 9 percent, and 7 percent, respectively, in 1956. But Communist China purchased 32 percent of the short staple cotton, Ethiopia took 14 percent, and France 9 percent. Egypt is the largest receiver of cottonseed and livestock, but peanuts go mostly to European countries.

Imports

Although the Sudan's total imports have greatly increased during the postwar years, on a percentage basis the agricultural proportion has showed little change. By value, agricultural commodities accounted for approximately 25 percent of the total imports and were confined chiefly to sugar, wheat flour, tea, and coffee. Except for these commodities, the country can be considered self-sufficient in foodstuffs. Close to 68,000 metric tons of wheat flour were received in 1957 compared with only 12,000 in 1951. These larger purchases of wheat flour reflect the preference of the Sudanese for bread made of wheat rather than from sorghum or millet. Rice imports are small but have increased greatly.

Virtually all requirements of manufactured consumer goods, capital equipment, fuels, and building materials are imported. Expenditures on textiles alone exceed $35 million some years. But large purchases of machinery for development purposes have contributed most to the increase of total imports in recent years.

Australia supplied a large part of all wheat flour imports prior to 1957. For that year, West Germany was the largest supplier. Sugar came from the United Kingdom, Taiwan, and Czechoslovakia; tea from Ceylon and India; coffee from several East African countries.

Table 10.--Value of exports, by destination, 1951, 1956, and 1957

Country	Value			Percentage of total exports		
	1951	1956	1957	1951	1956	1957
	Million dollars	*Million dollars*	*Million dollars*	*Percent*	*Percent*	*Percent*
United Kingdom	119.4	63.2	30.5	68.2	33.0	22.1
Egypt	10.9	21.3	22.2	6.2	11.1	16.1
India	20.2	25.3	15.2	11.5	13.2	11.0
Italy	2.7	16.5	12.4	1.5	8.6	9.0
France	4.4	9.1	10.1	2.5	4.8	7.3
West Germany	3.2	13.5	6.7	1.8	7.0	4.8
Netherlands	1.7	3.9	3.8	1.0	2.0	2.8
Saudi Arabia	.5	2.8	3.7	.3	1.5	2.7
United States	3.8	4.2	3.5	2.2	2.2	2.5
USSR	([1])	([1])	2.9	--	--	2.1
Greece	.2	.9	2.3	.1	.5	1.7
Japan	.3	5.3	2.1	.2	2.8	1.5
Venezuela	([1])	1.2	2.0	--	.6	1.4
Ethiopia	.3	1.9	2.0	.2	1.0	1.4
Belgium	.6	3.3	1.9	.3	1.7	1.4
Czechoslovakia	.8	1.1	1.9	.5	.6	1.4
Red China	([1])	2.5	1.7	--	1.3	1.2
Aden	([1])	.6	1.7	--	.3	1.2
Iraq	([1])	([1])	1.2	--	--	.9
Switzerland	1.3	1.6	1.1	.7	.8	.8
Others	4.9	13.5	9.2	2.8	7.0	6.7
Total	175.2	191.7	138.1	100.0	100.0	100.0

Source: Annual Foreign Trade Reports, Ministry for Social Affairs - Department of Statistics, Khartoum, Sudan.

[1] Less than $50,000.

Trade Balance

The Sudan's balance of trade tends to change markedly from year to year because the price and volume of cotton exports fluctuate sharply. During 4 of the 10 years from 1948 to 1957, the country had an unfavorable balance of trade. The greatest deficit occurred in 1952 and amounted to $54 million; while in 1951, a favorable balance of $60 million was registered. In 1957, imports outpaced exports by $43 million, but in 1956 the favorable trade balance reached $62 million.

Agricultural Trade With United States

Close to two-thirds of the Sudan's total dollar earnings come from trade with the United States. The country has but three commodities which have been attractive to the American market: Gum arabic, long staple cotton, and hides and skins. From 1945 through 1957, exports to the United States averaged about $4 million annually, of which less than $1 million were for agricultural commodities. Traditionally, gum arabic, a forest product, accounts for the greatest percentage of all United States imports from the Sudan.

The Sudan has only a limited number of dollars for the purchase of goods from the United States. In order to conserve this exchange, imports from the dollar area are subjected to special licenses. Most imports from the United States have been machinery. Less than 1 percent of the $4.5 million worth of goods shipped to the Sudan in 1957 came from agricultural commodities. In different years, the United States has sold the Sudan small quantities of dairy products, wheat flour, tallow, and canned fruit.

Except for the period 1940-44 and 1957, the balance of trade was in favor of the Sudan.

Table 11.--Principal agricultural imports, 1951, 1956 and 1957

Commodity	Quantity			Value		
	1951	1956	1957	1951	1956	1957
	1,000 m.t.	*1,000 m.t.*	*1,000 m.t.*	*Million dollars*	*Million dollars*	*Million dollars*
Sugar	60.1	114.3	106.2	10.7	13.3	16.6
Coffee	5.8	7.6	7.9	5.5	5.5	5.9
Tea	5.3	4.9	7.2	4.3	5.0	8.0
Wheat flour	12.1	42.9	66.9	2.8	3.8	5.9
Rice	2.2	2.1	4.8	.2	.2	.7
Oranges and mandarines	(1)	1.5	1.3	(1)	.2	.3
Other agricultural	--	--	--	5.4	4.9	4.8
Total agricultural	--	--	--	28.9	32.9	42.2
Nonagricultural	--	--	--	91.5	97.0	138.6
Total imports	--	--	--	120.4	129.9	180.8
Percentage agricultural	--	--	--	24.0	25.3	23.3

Source: Annual Foreign Trade Reports, Ministry for Social Affairs - Department of Statistics, Khartoum, Sudan.

[1] Not available.

Table 12.--Value of imports, by origin, 1951, 1956, and 1957

Country	Value			Percentage of total imports		
	1951	1956	1957	1951	1956	1957
	Million dollars	*Million dollars*	*Million dollars*	*Percent*	*Percent*	*Percent*
United Kingdom	41.9	35.8	47.9	34.8	27.6	26.5
India	19.8	15.8	21.6	16.5	12.1	11.9
Egypt	11.0	18.0	13.3	9.2	13.9	7.4
West Germany	1.6	5.0	12.9	1.3	3.8	7.2
Japan	.3	3.1	10.0	.2	2.4	5.5
Iran	n.a.	5.4	7.3	--	4.1	4.0
Italy	5.4	4.4	6.9	4.5	3.4	3.8
United States	3.4	2.8	6.0	2.8	2.2	3.3
Taiwan	1.7	1.9	4.8	1.4	1.5	2.7
Netherlands	2.0	3.5	3.9	1.7	2.7	2.3
Czechoslovakia	2.6	4.8	3.6	2.2	3.7	2.0
Uganda	1.2	3.4	3.5	1.0	2.6	1.9
Ceylon	.3	1.8	3.4	.2	1.4	1.9
France	1.9	2.6	2.9	1.6	2.0	1.6
Belgium	2.2	1.6	2.8	1.8	1.2	1.5
Australia	2.3	2.1	2.8	1.9	1.6	1.5
Sweden	.9	.9	2.4	.7	.7	1.3
Hong Kong	.2	.8	2.0	.2	.6	1.1
Belgian Congo	.7	1.0	1.8	.6	.8	1.0
Norway	.8	.2	1.7	.6	.2	.9
Others	20.2	15.0	19.3	16.8	11.5	10.7
Total	120.4	129.9	180.8	100.0	100.0	100.0

Source: Annual Foreign Trade Reports, Ministry for Social Affairs - Department of Statistics, Khartoum, Sudan.

Table 13.--United States agricultural exports to the Sudan, 1955-57

Commodity	Value in U.S. dollars		
	1955	1956	1957
	1,000 dollars	*1,000 dollars*	*1,000 dollars*
Fruit cocktail, canned	0	0	1.6
Dairy products	0	4	0
Wheat flour	464	0	0
Animal products, inedible	0	42	.8
Other agricultural commodities	0	4	0
Total agricultural	464	50	2.4
Nonagricultural	1,006	789	4,474.4
Total exports	1,470	839	4,476.8

Source: U.S. Bureau of the Census.

Table 14.--United States agricultural imports from the Sudan, 1955-57

Commodity	Value in U.S. dollars		
	1955	1956	1957
	1,000 dollars	*1,000 dollars*	*1,000 dollars*
Sausage casings	0	15	0
Hides and skins, raw	513	694	555
Senna	8	38	29
Sesame seed	0	0	44
Beeswax, crude	0	7	18
Cotton, unmanufactured	231	358	5
Other agricultural	2	8	21
Total agricultural	754	1,120	672
Nonagricultural	2,605	2,799	3,040
Total imports	3,359	3,919	3,712

Source: U. S. Bureau of the Census.

Competitive Aspects of Trade

The Sudan has concentrated on the production of long staple cotton, which is not directly competitive with U. S. cotton. In fact, the United States purchases small quantities of long staple cotton each year from the Sudan. On the other hand, the 8,000 to 15,000 metric tons of short staple cotton produced annually are competitive with U. S. exports on the world market. Although American-type cotton is grown chiefly as a rain crop, production has increased greatly in recent years. Most shipments of short staple cotton have gone to Communist China and Ethiopia; these shipments to Ethiopia have replaced U. S. exports of American upland cotton that were valued at more than $2 million as recently as 1954.

The Sudan is emerging as an important producer of oilseeds--cottonseed, peanuts, and sesame. Only minor quantities of oil are exported since most of the crop is exported as seeds to Egypt and Western Europe. Total shipments have risen from 126,000 metric tons in 1951 to 288,000 tons in 1957. These exports compete in the importing countries with U. S. sales of soybeans, other oilseeds and vegetable oils.

Table 15.--Trade between the United States and the Sudan: Value of exports, imports, and trade balance, averages 1940-44, 1945-49, and 1950-54, annual 1955-57

	Average					
	1940-44	1945-49	1950-54	1955	1956	1957
	1,000 dollars	*1,000 dollars*	*1,000 dollars*	*1,000 dollars*	*1,000 dollars*	*1,000 dollars*
U. S. exports to the Sudan:						
Agricultural	(1)	(1)	4	464	50	2.4
Nonagricultural	6,250	1,550	1,631	1,006	789	4,474.4
Total	6,250	1,550	1,635	1,470	839	4,476.8
Percent agricultural	0	0	.2	32	6	(3)
U. S. imports from the Sudan:						
Agricultural	700	1,100	1,130	754	1,120	672
Nonagricultural	1,424	3,442	2,550	2,605	2,799	3,040
Total	2,124	4,542	3,680	3,359	3,919	3,712
Percent agricultural	33	24	31	22	29	18
Trade balance with the United States[2]	4,126	-2,992	-2,045	-1,889	-3,080	765

Source: U. S. Bureau of the Census.

[1] None or negligible.
[2] - means U. S. imports exceed exports.
[3] Less than 0.05 percent.

AGRICULTURAL DEVELOPMENT

Progress

The Sudan has made much economic progress through a series of 5-year development plans, begun in 1946. Under the first plan, the irrigated area in the Gezira was extended; rural water supplies and soil conservation were improved; experimental projects in mechanized agriculture were introduced; cotton ginning and oil mill factories were constructed; veterinary and transport services were extended and improved; agricultural research centers were established and extension services were expanded.

At the close of the first 5-year plan, the scheduled program had been largely completed and the unfinished projects were transferred to the second 5-year plan, which began in 1951-52 and was to run until 1955-56. Later, however, this plan was extended until 1957-58. Some 312 projects were included, and most of them had been completed by 1957.

The Managil Extension adjoining the Gezira Scheme is the largest development project under way. Over one-half of the 1957-58 development budget was allocated to this project. Upon its completion, an area of 800,000 acres will be added to the country's total irrigated land. This area is to be developed in 4 installments of about 200,000 acres each, with the first phase ready for operation in 1959.

Other programs include large-scale experiments for the production of grain by mechanized farming in the Kassala Province. Experiments with farm machinery are also being made in the heavier rainfall areas to the south. The Sudanese Railways is well under way with its first 5-year development program, that was initiated in 1957, and calls for a total expenditure of about $75 million. In addition to obtaining new equipment and replacing much of the equipment now on hand, present rail lines are to be extended farther west and south.

Development Plans for the Future

In addition to the scheduled completion of the Managil Extension by 1962, the government contemplates the construction of a dam at Roseires on the Blue Nile. This dam would provide storage for 3 times the volume of water now stored by the Sennar Dam. Water held by the Roseires Dam would be available to irrigate an additional 1.3 million acres in the proposed Kenana Extension in the southern Gezira. A full supply would be available for the Managil Extension, and enough for considerable expansion in pumping projects would be made possible.

The Sudanese Government has also made a preliminary survey of the possibilities of constructing a dam on the Atbara River at Khashm El Girba. This dam would provide sufficient water to irrigate 520,000 acres along the left bank of the Atbara. If the high Aswan Dam is built in Egypt, the Wadi Halfa area in the northern Sudan would be flooded and the inhabitants relocated on the Atbara Scheme at the expense of the Egyptian Government.

One other project that would bring an estimated 520,000 acres of land under irrigation is being investigated. In the south much of the water of the White Nile is lost in the great marshes of the Sudd region. It is proposed to bypass this area by constructing a canal some 180 miles long. Then, water could be pumped to crops growing along its banks.

In addition to programs to expand irrigation and transport facilities, other projects of interest to agriculture are planned. These include pilot projects for mechanized crop production; organizing an agricultural bank; improving the Port Sudan cotton gin; reorganizing the Nuba Mountains cotton industry; expanding rice and coffee production in the south; improving research and educational institutions; and experimenting in production of alternative cash crops.

Many of these projects are included in the proposed third 5-year development plan. The government has delayed announcing the starting date until there is a reasonable assurance that the necessary funds for its implementation will be made available. The Sudan has relied almost exclusively on its own resources for development funds, but the government hopes to obtain foreign assistance from the World Bank for future development. The Sudan became a member of the World Bank in 1957. Shortly thereafter the bank's representatives visited the country to make a study on which to base recommendations for credit.

Also, at the request of the Sudan Government, the International Cooperation Administration sent a mission to the Sudan in October of 1957 to survey the possibilities of U. S. assistance with its many agricultural problems. Early in 1958 a program of U. S. economic and technical assistance to the Sudan under the Mutual Security Act was established.

Prospects for Expanding Production and Trade

The Sudan has demonstrated its capacity for economic growth. It has the economic potential and capacity to sustain a satisfactory rate of progress in the future. Both the government and the people have the will to improve their economic position and have shown their desire to develop natural resources cooperatively. The realistic approach being taken by the government and private enterprise to develop these potentials is noteworthy.

A thorough survey of land in the Sudan is yet to be made, but various estimates have placed the potentially productive land not now in cultivation at over 100 million acres. The use of some of this land, however, is limited by inadequate transport facilities and by the shortage of water for human and livestock consumption. Programs now under way to develop ponds to preserve much of the rainfall and drilled wells to tap underground water will do much to alleviate this situation.

Probably the two greatest deterrents to expansion in agricultural development in the immediate future are (1) insufficient development funds and (2) the lack of agreement with Egypt and other East African countries as to the division of the water of the Nile, presently unallocated. The World Bank or countries interested in the future progress of the Sudan may hold the answer to part of the first problem. But the second one can be solved only by the parties themselves.

The projected development of irrigation which might reasonably be expected in the next 10-15 years should increase the country's total amount of irrigated land approximately as follows:

	Million acres
1957	2.5
1960	2.7
1965	3.3
1970	5.5

Long staple cotton production may well be increased 10-15 percent by 1960, 40-50 percent by 1965, and as much as 150 percent by 1970 when present development plans are carried out. Production of American upland cotton is not expected to show much increase, for newly developed areas will be planted to long staple varieties. The production of peanuts, sesame, and pulses may be expected to be more than doubled within the next decade. Also, durra and dukhn production will more than meet domestic requirements, making increased quantities available for export. Livestock numbers, now growing at about 5 percent each year, are expected to increase at a faster rate in future years.

Some increased production is expected for sugar, tobacco, wheat, coffee, and tea, as various programs are activated in an attempt to make the country self-sufficient in these items. This increase, however, is expected to be so small that domestic requirements for the next 8-10 years will need to be met by imports. In fact, with a rising standard of living and the population expanding at a rate of 2.3 percent annually, the growing demand for these particular commodities may exceed any increase in local production; especially is this true for wheat flour and sugar.

When increased agricultural production becomes a reality, the Sudan will then have increasingly larger quantities of certain farm products to sell on the world market. At that time much of the food crops available for export could be absorbed by other Middle East countries. Egypt, with its growing population, should provide a ready market for oilseeds and livestock. Saudi Arabia, Egypt, and Aden, the principal purchasers of the Sudan's grain exports in 1956 and 1957, may take larger quantities in the future. Western Europe is also likely to take increased quantities of grains for feed and oilseeds. At any rate, the Sudan is not expected to face difficulties in disposing of its surplus food crops in the foreseeable future.

The outlook is not bright for prospective cotton markets. If the anticipated expansion of Egyptian-type cotton is realized in the Sudan, it will undoubtedly have a decided impact on the world's extra long staple situation. Substantially larger quantities would be available for export, as little development of the cotton textile industry is planned in the next few years. Increasing amounts are likely to go to the Far East and Western Europe. However, as production increases in other major producing countries, the Sudan may encounter difficulties in marketing larger quantities of cotton.

The reason for desiring to grow larger quantities of cotton is easily understood. Cotton is the country's chief economic link with the outside world; it is by far the most valuable cash crop grown in terms of both the income derived locally and the foreign exchange earned. It is easy to store and to transport, essentials for a Sudanese cash crop. However, in the light of the difficulties encountered in marketing the record crop produced in 1956, the long-run growth of the Sudanese economy might be best served if greater efforts were directed toward promoting a more balanced agricultural economy.

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