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The Sudan occupies one of the first places among African and Arab countries in area of land suitable for agriculture, and in area actually used--one of the last. Of 164 million feddans of potentially productive agricultural land in 1956 only 12 million feddans were cultivated or a little over 7%, and some part was used periodically by nomads. By 1970 the area of cultivated land had grown by 6.4 million feddans but approximately 54% of the fund of agricultural land was, as in the past, virgin soil and disused land (not counting meadows and pastures).

The major reason for the slow development of virgin and disused land was the absence or insufficiency of peasant and state resources, on the one hand, and a lack of interest by the Sudanese feudalists (and, in part, also by the bourgeoisie) on the other. The problem is that these lands are predominantly in regions of insufficient or overabundant moisture, and their development is accompanied by definite capital expenses. Significant appropriations are demanded, for example, by the expansion of the area of irrigated lands in the Nile Valley to 7-8 million feddans in accordance with the quota envisioned in the Sudanese-Egyptian agreement of 1959 on the Nile waters, and also by the development of lands in other regions on the basis of the use of underground waters and the drainage of wet and swampy soils. In these circumstances the characteristic trait of the Sudanese agrarian economy was maintained: land hunger in some regions with a huge fund of potentially productive but undeveloped land in others.

The lands brought into use were used nonintensively which was expressed first of all in the non-optimal structure of agricultural areas and the prevalence of extensive forms of farming and animal husbandry. Table 16 characterizes the structure of agricultural areas in the Sudan.

Table 16

Structure of Agricultural Areas in the Sudan 1956-1970
(area, millions of feddans)*

Year	Cultivated Lands			Meadows and Pastures **	Virgin and Disused Lands	
	Sown Area		Fallow			
	Irrigated	Dry				
1956	0.7	4.6	6.8	12.1	57.0	94.9
1957	1.0	4.8	7.4	13.2	57.0	93.8
1958	0.8	4.6	6.9	12.3	57.0	94.7

1959	1.1	5.4	8.2	14.7	57.0	92.3
1960	1.2	5.3	8.2	14.7	57.0	92.3
1961	1.3	5.0	7.7	14.0	57.0	93.0
1962	1.5	5.6	8.6	15.7	57.0	91.3
1963	1.4	6.0	9.1	16.5	57.0	90.5
1964	1.5	6.5	9.8	17.8	57.0	89.2
1965	1.6	6.2	9.5	17.3	57.0	89.7
1966	1.5	6.3	9.3	17.1	57.0	89.9
1967	1.7	6.1	9.1	16.9	57.0	90.1
1968	1.9	7.8	9.4	19.1	57.0	87.9
1969	1.9	5.9	8.1	15.9	57.0	91.8
1970	2.2	7.9	8.4	18.5	57.0	88.5

*Computed from [25, p. 15, 55-68; 26, p. 1-2; 32, p. 3, 25; 39, p. 7].

**Area of meadows and pastures is set at an unvarying size inasmuch as some of its contraction as a result of erosion and plowing is compensated for by use by nomads of virgin and disused lands for pasture for a growing stock of cattle.

The data of Table 16 on the area under tillage, meadows and pastures, and virgin and disused lands is conditional to a certain extent since it was calculated by us with the aid of indicators of sown area for the corresponding years and of differential coefficients for land use (for irrigated: 1956-1960--50%, 1961-1965--55% and 1966-1970--60%; for dry farming: 1956-1965--43% and 1966-1970--48%). The necessity for such computations arose because of the fact that in various Sudanese and international statistical and reference publications average annual area for 1956-1967 is determined to be 16.9 feddans. However, this figure bears the character of an estimate and includes, evidently, a part of the disused and [perelezhykh?] lands. Moreover, if one proceeds from this figure the growth of sown area in this period proceeded exclusively on account of a contraction of area under fallow, i.e. more intensively used lands, and this, as is well known, does not correspond to reality. In our view the information in Table 16 more truly reflects, although also to some degree conditionally and approximately, the real picture: growth of sown area not only and not so much on account of intensification of crop rotation as on account of a drawing into production of a part of the lands which have been in long disuse and have been included in the statistics in the category of meadows and pastures and virgin lands.

As is evident from Table 16, in the structure of agricultural areas in the Sudan in the indicated period meadows and pastures, the area of which constituted 57 million feddans or 37% of the total land fund suitable for agriculture, predominated. A large share of pastures was economically warranted at least under the achieved level of the development of productive forces. Extremely unfavorable natural-climatic conditions in the regions in which the major part of the pastures

in the country were found predetermined the role of cattle-raising as the major means of utilizing their economic potential. Sudanese statistics do not give data on what area of meadows and pastures is in fact used for cattle grazing. However, the situation here has undoubtedly worsened considerably. Even proceeding from the constant size of 57 million feddans, which, as was already noted, has a tendency toward decreasing, one can determine that resources of natural pastures per head of cattle has decreased from 2.7 feddans in 1956 to 1.5 feddans in 1970 (computed from [17, p. 202; 32]). This conclusion is confirmed also by material from the field research of J. Lebon according to which, by the middle of the 1960s the number of cattle in [bedzha i baggara?] exceeded the resources of pastures in the regions of their nomads by 50 and 20% respectively [161, p. 162-163].

In conditions of a low and practically unchanging level of the provision of peasant farms with tillage and pastures in a majority of regions of the Sudan a strengthening of the "pressure" on the land, the elimination of the plant cover, and the exhaustion of the natural fertility and erosion of the soils has been witnessed [161, p. 166, 169-170]. The underemployment of small peasant landholders, meaning in the final account the underutilization of the labor resources of the Sudanese countryside is yet another consequence of "land hunger."

Of all agricultural areas the economically most important are cultivated lands. According to the data in Table 16, in 1956 12.1 million feddans, or 73% of the total land area suitable for agriculture, was under cultivation. By 1970 the tilled area had increased by 52% and had reached 18.5 million feddans (11.2%). However, as a result of natural population growth peasant landholdings remained practically at the former level--1.17 feddans in 1956 and 1.19 feddans in 1970.

At the same time the significance of irrigated lands, the areas of which grew from 1.4 million feddans (11.5%) of fields in 1956 to 3.54 million feddans (19.1%) in 1970, increased appreciably. This became possible thanks to the construction of a whole series of state complexes and, first of all, of el-Manaqil and Khashm-al-Girba, as well as an increase in the number of private irrigation pumping stations. However, the resources of the major water artery of the country, the Nile, were, as in the past, used far from fully: of the 18.5 billion cubic meters of Nile water which constituted its share under the already mentioned Sudano-Egyptian agreement of 1959 not more than 9-10 billion were used annually [17, p. 194-195].

In the first years of independence the growth of sown area in the Sudan barely exceeded the rate of expansion of cultivated land as a result of which the sown area per capita increased from 0.5 feddans in 1956 to 0.6 feddans in 1970. In overall area of sowings the share of irrigated lands increased: from 13.2% in 1956 to 21.7% in 1970. The structure of the sown area also

changed. The correlation of major crops in the Sudan in the period 1959-1970, according to area of sowings, is shown by the data in Table 17:

TABLE 17

Sown areas under major crops in the Sudan, 1959-1970
(thous. feddans)*

Year	Industrial Crops				Food Crops			
	Cotton	Sesame	Peanuts	Castor	Sorghum	Millet	Wheat	Corn
1959	855	747	464	--	3252	1003	33	106
1960	908	991	461	--	3251	788	39	109
1961	901	694	471	9	3067	932	39	93
1962	1132	981	472	13	3516	759	41	40
1963	1066	776	694	11	3517	1066	54	79
1964	1049	1184	847	16	3277	1410	56	74
1965	1068	1116	779	23	3158	1427	136	79
1966	1050	948	935	19	3200	1447	136	41
1967	1158	925	926	32	3182	1297	173	40
1968	1149	1234	847	33	4700	1452	213	84
1969	1118	1320	719	25	2823	1436	262	68
1970	1256	1359	1073	45	4229	1502	290	119

*Based on [25, p. 15; 26, p. 1,51].

As is evident from Tables 16 and 17 the share of area under sowings of the four industrial crops increased during the indicated period from 31.8 to 36.5% and that of food crops fell from 67.6 to 60.8%. In absolute terms the area under sowing of major industrial crops grew from 2066 thousand feddans in 1959 to 3688 thousand feddans in 1970, i.e. by 78.5%, while that of food crops grew from 4394 thousand to 6140 thousand feddans or by 39.7%. Of industrial crops the largest growth is in sowing of peanuts--609 thousand feddans (131%), sesame--612 thousand (82%), cotton--401 thousand feddans (47%); of food crops: sorghum--977 thousand (30%) and millet--499 thousand feddans (50%).

However, noticeable changes in the structure of sown areas did not lead to an essential increase in the effectiveness of the use of agricultural lands. First, the expansion of sowings of industrial crops, destined in the main for export, took place on account of a contraction of sowings of grains mainly in the central regions, while in the outlying districts the structure of sowings remained virtually as before. Second, since prices on the world market on the enumerated industrial crops has a tendency to decline during the indicated period, the expansion of sown area on account of these crops did not bring a noticeable growth in the value of the volume of the gross product of farming. Moreover, because of the absence of a corresponding

additional fertilization of fields, the introduction of industrial crops was accompanied by the destruction of the natural fertility of the soils and a decrease in yield [25, p. 27, 55; 26, p. 15, 59-83].

The underutilization of agricultural lands and water resources in the Sudan in the period examined was connected also with the wide distribution of extensive forms of farming and animal husbandry based on the natural fertility of the soils, backward agrotechnical methods and archaic tools.

Animal husbandry developed on a traditional basis. Natural pastures served in the main as its fodder base [226, 1966, No. 47, p. 104]. Over 90% of the cattle were found on nomadic, semi-nomadic and pasture maintenance connects with its herding over significant distances in search of watering places and grasses-- from the north to the south and in the opposite direction of from elevations to valleys and vice-versa depending upon the season.

In the rainy period cattle do not experience a shortage of fodder and apart of the pasturelands is generally not used. However, the stockpiling of hay for future use was not practiced as it was incompatible with the nomadic way of life of the cattle herders [128, p. 683]. As a result significant resources of pastures remain unutilized since, with the onset of the dry season, the grasses quickly withered, the quantity of protein in them decreased to the minimum and they became hardly suitable for cattle fodder. On huge expanses scorching rays of the sun completely burn up the plant cover.

The lack of water (a large part of the pastures in the Sudan are in the arid zone) was a serious problem. They tried to keep the cattle on pasture close to the rare natural or artificial water sources until the vegetation was completely eaten away and only then drove them to other water holes. The concentration of many cattle on comparatively small tracts led to the trampling down of the plant cover, made difficult its reestablishment and hastened the development of erosion; some of them became completely unsuitable for use [128, p. 683]. Thus, in many regions of Kordofan, according to the evidence of J. Tinker, "then plant cover is under threat from overuse of pastures. Around wells and natural sources of water mini-deserts have formed. For 10, 20 and even 40 km to the sides of large water reservoirs and cattle-herding routes extended belts of trampled bare land which has changed into barren sand." [220, 1977, No. 76, p. 29]. Moreover, as a result of frequent herdings over significant distances in search of watering holes and pastures the cattle lose weight and often dies. This is also one of the phenomena of the unproductive use of pasture resources to which O. Snow devoted his attention [128, p. 669].

There is one more factor. For the Sudanese nomads it is not the quality but the quantity of cattle which served as the deciding factor. During 1958-1970, thanks to an ever rising

availability of highly productive pastures and some improvement in veterinary services [220, 1977, No. 76, p. 29], livestock numbers grew by 9 million head reaching 33 million. However, "the increase in cattle in the Sudan was not accompanied by a corresponding expansion of the fodder base and the irrigation of pastures" [17, p/ 203]. Overuse of pastures, as M. Bayumi writes, also furthered their exhaustion and erosion of the soils in many regions of the country [226, 1966, No. 47, p. 105].

Intensive maintenance of cattle in pens (in conjunction with pasturing) was widespread only in a number of landholdings of the provinces of Khartoum and el-Gezira, on irrigated farms and also in the Northern Province where they were used as draught animals. Along with grazing on natural pastures, here cattle were fed grasses (mainly *lobiia* which was included in the crop rotation in el-Gezira), straw, sorghum and millet, clover and sometimes grain [128, p. 679]. However, such intensive forms of cattle raising bore an exclusively local character and had minor significance.

As has already been said, the presence in the Sudan of a large fund of undeveloped agricultural areas in itself signified less than full use of land resources. At the same time this was one of the most necessary conditions for the maintenance of fallow farming which led not only to significant underutilization of the land fund (under this system around 80% of the land is continually in fallow [128, p. 292]), but also to its destruction. As J. Tinker wrote in 1973 "before farmers cultivated tracts over a course of 4, 6, a maximum of 10 years and then they left them in fallow in order to reestablish the fertility of the soil. In recent years, with the growth of population and the contraction of free lands, the period of cultivation has significantly lengthened and tracts are cultivated until the land turns into infertile sand. As a result during the last decade vast expanses in many regions of the country have become barren. Trees, plant cover and soils have been lost, blown away by the wind" [220, p. 28-29]. The universal exhaustion and erosion of the soils in the Sudan were also remarked on by J. Lebon [161, p. 169]. The language of the south Sudanese peoples give witness to this. The words "iopu" ("destroyed lands") and "rada" ("exhausted soils") are among the most common.

Fallow farming leads also to some contraction of the area of agriculture in the country. In the northern dry regions, as a result of the exhaustion and barrenness of the lands, the encroachment of desert has gained strength. According to data of aerial photographs, in the period 1959-1972 the boundary of the desert in the Sudan has moved 300 km to the South and huge areas of earlier cultivated lands and pastures are under sand [220, 1977, No. 76, p. 29]. Sands have also absorbed part of the once fertile lands in the Nile Valley. In some places the desert has come within 30 km of Khartoum.

In the period studied fallow farming in the Sudan, as in

other African countries, was continuing to evolve in the direction of continual cultivation of the land on the basis of the gradual introduction of uninterrupted crop rotation and fertilization of the soil with manure, domestic wastes, alumina, etc. Organic fertilizers were used extremely productively which is explained above all by the sharp lack of land suitable for cultivation in the regions of their resettlement. The dinka system was simple but effective. Not long before the sowing sork cattle were kept in pens for several nights on fields allotted for sowings. Such means of fertilizing the soil allowing the receipt of a fairly high yield. However, such examples were very rare in the Sudan. The evolution of fallow farming was carried out extremely slowly and was hampered by such factors as the absence of a rational combination of farming and animal husbandry in a majority of the outlying provinces (for example, in Azanda), by peculiarities of property differentiation in the communal sector, etc.

Along with the appearance of the rudiments of intensive and semi-intensive farming in the traditional sector, in the first years after the country obtained independence the process of its intensification continued in the modern commodity economies as well. This found its expression above all in some raising of the coefficient of use of arable land. If in 1956 about 56% of the area of tillage was under fallow, in 1970 it was already 49%. Behind these average indicators hid a lower coefficient of use of cultivated dry-farming lands: 50% of this area was under fallow every year at the end of the 1960s. The percentage of cultivated irrigated lands remaining under fallow in this same period was 39 as against the 25 possible under the system of crop rotation adopted in the Sudan.

The shortening of the period that the field stayed fallow and the introduction of more intensive crop rotation became possible primarily thanks to the growing use of mineral fertilizers. The data on some of the types used in agriculture in the Sudan, 1956-1968 (in thousands of tons) is set out below (based on [34, p. 473; 52, p. 496-499]):

Year	Nitrogen	Phosphorus	Potassium
1956	9.0	--	--
1961	24.0	0.9	1.0
1962	18.0	0.4	1.0
1963	24.0	0.4	3.0
1964	23.0	0.4	6.0
1965	23.0	0.4	8.0
1966	29.0	0.5	10.0
1967	39.0	0.7	8.0
1968	42.0	0.8	10.0

Calculations show that in 1956-1968 the use of fertilizers in the Sudan grew more than 5.8 times; however, it was still

characterized by an extremely low level as in the past. Thus, in 1956 0.7 kg of mineral fertilizers were used per 1 feddan of cultivated area and in 1968--2.7 kg, while in Africa as a whole--12.4 kg.

The major reason for such limited use of mineral fertilizers in the Sudan was their high prices and feudal forms of land use. On small peasant farms expensive mineral fertilizers were, as a rule, not generally used. If there were cattle, then manure was put on the fields. In some villages of the Northern Province peasants used land from old or destroyed settlements and from the banks of rivers as fertilizer; in Kordofan and Darfur sesame husks were used. Fallowing and crop rotation served as the major means of maintaining and reestablishing soil fertility.

Mineral fertilizers are used in the main on cotton farms which is explained by the more intensive character of the farming, the high saleability and the comparatively high level of income as well as by the absence in a majority of them of cattle and, consequently, of organic fertilizers. The use of mineral fertilizers on farms of pump irrigation by province is characterized by the data in Table 18.

Table 18

USE OF MINERAL FERTILIZERS ON FARMS OF PUMP IRRIGATION
IN THE SUDAN IN 1963 BY PROVINCES*

Province	Overall Number of Farms	Number of Farms Using Fertilizers	%	Amount of Fertilizer	
				T	%
Blue Nile	981	691	70.4	20,105	87.2
Upper Nile	50	20	40.0	919	3.9
Khartoum	220	157	71.3	813	3.5
Northern	1014	425	41.9	1,201	5.2
Kassala	15	1	6.7	15	0.2
TOTAL	2280	1294	56.7	23,053	100.0

*Based on [45, p.68].

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