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## Water, Land and Labor in Irrigation Agriculture along the Nile : Cases from the Northern Sudan

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## Water, Land and Labor in Irrigation Agriculture along the Nile: Cases from the Northern Sudan

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### INTRODUCTION

The present study has two aims. The first is to introduce, on the basis of data obtained through the author's own field work, the system of irrigation agriculture in a village located in an Arab Muslim district in the northern Sudan, and the sharecropping arrangement therewith. The second aim is to discuss, by comparison with data in the literature, the importance of water, land and labor as elements of production in the irrigation agriculture along the Nile in the northern Sudan.

The research area, "Mahmudab" (pseudonym), is a village on the east bank of the Nile about seven kilometers south of the city of Al-Damar (population approximately 30,000), which in turn is about 300 km north along the river from the Sudanese capital of Khartoum<sup>1)</sup>. According to the 1993 national census, the population of the village was 2,078, many of whom were engaged in farming.

The village comprises two distinct geographical areas: lower Mahmudab (*Mahmūdāb tiht*) or west Mahmudab (*Mahmūdāb gharb*), the settlement near the Nile, and upper Mahmudab (*Mahmūdāb fauq*) or east Mahmudab (*Mahmūdāb sharq*), the settlement about 2 km to the east of the Nile.

The older of these two settlements, lower Mahmudab, suffered severe damage when the Nile flooded in 1946. As a result of the flood, a number of villagers built new homes about 1 km to the east of the original settlement, i.e. on open land away from the river, and moved there with their families. This new settlement is called upper Mahmudab. The movement of villagers to the new settlement continued during subsequent years, and the trend can still be seen today. In 1994, in fact, there were only a few families living in lower Mahmudab. It is highly likely that lower Mahmudab will soon cease to be an area of residence and the land will be used solely for farming.

## IRRIGATION SYSTEMS, MODES OF LAND USE, AND SHARECROPPING<sup>2)</sup>

### Irrigation systems

The vocabulary of the Arabic dialect used in the northern Sudan includes the following three seasonal terms: *shitā*, the cold, dry "winter" period from October or November to January or February; *ṣaif*, the "summer" period when temperatures rise from March until April; and *kharīf*, the "rainy season" from May through September or October, the only time of the year when there is a small amount of precipitation. The average annual precipitation is 40 to 50 mm, but unusually high rainfall is sometimes recorded. The year 1988 was one of these years, but even then the rainfall from July to October was less than 240 mm<sup>3)</sup>.

With such low precipitation, Mahmudab, like the other farming villages along the banks of the Nile in the northern Sudan with similar ecological conditions, depends to a large extent on the Nile for irrigation water. Although on a very small scale, wells have also been used over the years to provide irrigation water.

A variety of irrigation devices have been developed and utilized along the Nile since ancient times. The most effective device prior to the twentieth century was the *sāqiya*, a waterwheel driven by oxen or donkeys. This was used until as late as 1985 in Mahmudab but can no longer be seen today. The villagers now use diesel engines (*bābūr*) and pumps (*toromba* or *tolomba*) to draw irrigation water from the river.

The diesel pump made its first appearance in Mahmudab in 1943, and a large-scale agricultural project called the "HA Scheme" was implemented in the early 1950s to draw irrigation water from the Nile using pumps. As of 1994, the residents of Mahmudab use a total of eight Nile irrigation pumps in addition to those established by the HA Scheme, which I will discuss in detail later.

Today, the diesel pump is also frequently installed on wells and used to draw underground water and to irrigate surrounding land for cultivation. The land where cultivation became possible after wells were dug is called *matara*. The residents of Mahmudab claim that the term is derived from the English word "motor," but this is a curious notion because in former times land cultivation by the installation of a *sāqiya* on a well was also called *matara* (Bjørkelo 1989: 67).

The use of pumps has allowed the cultivation of non-arable land when only the *sāqiya* was available and thus has vastly changed the mode of land use in Mahmudab.

### Various modes of land use

The land around Mahmudab can be divided into four main categories, *jarif*, *jazīra*, *karū* and *khalā*, by the irrigation method, form of ownership and other factors (Figure 1). The following discusses these four categories in more detail.

#### 1) *Jarif*

The Nile, which receives summer rains at its sources, swells every year from July to

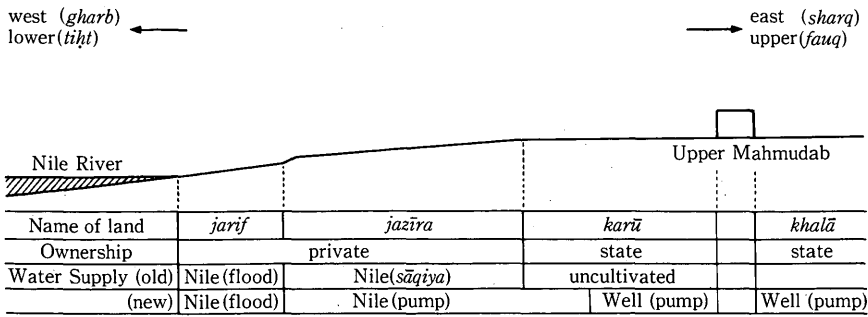


Figure 1. Diagram of the land categories and use

September. Parts of the riverfront in Mahmudab are annually flooded during this period. When the swelling of the river is particularly severe, it floods as far as 1km inland. As mentioned above, the flood of 1946 was so disastrous that it convinced some of the villagers to resettle in upper Mahmudab.

The residents of Mahmudab use the term *jarif* to refer to the agricultural land that is subject to inundation every year. This is a narrow strip along the bank of the river. The widest area reaches about 100 m but is less than 10 m wide in some places. *Jarif* can remain underwater for several months in *kharif*, the rainy season, and it is highly absorbent. After the water recedes and the ground is exposed, therefore, it usually does not require irrigation. In addition, the Nile flood water provides silt containing soil and nutrients from upstream and thus makes artificial fertilization of the *jarif* unnecessary.

Cultivation of the *jarif* begins around October after the flood water recedes and the wet soil is exposed. Seeds are planted in holes made in the soil with sticks called *sallūka*. Aside from *lūba*, a bean species used mainly for cattle feed, the plants cultivated are mostly squash (*qara*) and other vegetables. In the *jarif* plots farthest from the river, i.e. adjacent to the next land category, *jazira*, small irrigation ditches are sometimes dug and water provided regularly for seedbed (*hūd al-tirāb*) of onions (*baṣal*).

Ownership rights for the *jarif* belong to the owner of the adjacent *jazira*. That is, the *jazira* is generally a privately owned rectangular plot of land with the two short sides parallel and the two long sides orthogonal to the Nile. Thus the *jarif* is a square piece of land demarcated by the two extended long side lines of the *jazira*, the riverfront, and its border with the *jazira*, and it is considered the property of the owner of the said *jazira*.

## 2) *Jazira*

The second land category, *jazira*, is land one step higher than the *jarif*. Irrigated by the *sāqiya* formerly and by diesel pumps in recent years, this land has always been the most fertile farmland in the area.

In the age of *sāqiya* irrigation, the owners of a number of neighboring plots in

the *jazīra* shared a single *sāqiya* and arranged to supply water according to the varying needs of the crops. To this day the word "*sāqiya*" is used to denote a land unit in the *jazīra* area, no longer referring to the waterwheel, but to the collection of farm plots under different ownership which used to share one waterwheel for irrigation.

The system of inheritance under Islamic law (*Sharī'a*) rules that the assets of a parent are to be divided equally among the children, although a daughter receives only the half-portion of a son. As a result, the privately owned *jazīra* tend to undergo division into ever smaller parts over time. The owner himself cultivates the land with the assistance of siblings and children, and it is the owner who decides what, where and when to plant.

Prior to the introduction of pump irrigation, the *jazīra* was the prime farmland and probably provided the wheat and sorghum needed to make *‘ish raghīf* and *kisla* (unleavened bread), respectively, that are indispensable foods for the people of Mahmudab and other parts of the northern Sudan. Today, however, most of these grains are a large-scale produce in the *karū* areas farther from the river. Now, the *jazīra* is often used to produce easily marketable cash crops such as maize (*‘ish balādī*), clover (*birsīm*), and other domestic cattle feeds, as well as onions and henna shrubs, a plant used widely in the Middle East to make medicines and ornamental dye.

### 3) *Karū*

When *jarīf* and *jazīra* were the only arable lands with *sāqiya* as the most effective means of irrigation, the vast land farther from the river was utterly non-arable. But the revolutionary introduction of the diesel pump brought water to this land.

Today, the land between upper Mahmudab and the *jazīra* are called *karū*. Parts of the *karū* came into the Nile irrigation network with the introduction of diesel pumps, while other parts became *matara* irrigated by wells with installation of pumps since the 1940s. This period is highly significant with regard to cultivation in *karū*, because tremendous changes in the system of land ownership in the Sudan occurred in the early part of this century.

The modern history of the Sudan can be divided into four main periods, namely the Turco-Egyptian period starting from the invasion by the Egyptian Pasha, Muhammad 'Ali's army in the 1820s, the Mahdist State period which lasted from the mid-1880s to 1898, the Anglo-Egyptian Condominium, in reality, a period of British colonial rule, and the Independent Sudan period from 1956 to the present (Holt and Daly 1988). What is of interest here in relation to the system of land ownership is the series of proclamations made at the beginning of the Condominium period. These proclamations stipulated that, excepting land evidently owned or used for housing, farming, and other purposes by certain persons, all land in Sudan was to be considered state property (Daly 1986: 210-214). In other words, with the exception of residential areas and farmland with clearly recognized owners as in the case of the *jarīf* and *jazīra* in Mahmudab where the tiller was the owner, all land, including the *karū*, became state property.

This did not present any problem when the *karū* was not arable. When it became arable after the introduction of pumps, however, the practice of renting vast tracts of land from the government for agricultural use emerged.

The first pump appeared in Mahmudab in 1943, when all the villagers still lived in a settlement near the Nile, now called lower Mahmudab. Two families procured portions of uncultivated, state-owned *karū* about 500 m from the settlement and obtained usufructuary rights on the condition that they pay a registration fee and taxes to the government. The families then dug wells in their allotted *karū* plots and installed pumps, thus creating *matara* farmland.

Another important turning point for Mahmudab came in the latter part of the decade. H.A., a village leader and key member of the Umma Party (supported mostly by the Mahdists called *anṣār* in Arabic), obtained two large irrigation pumps (eight- and six-inches) through Abd al-Rahman al-Mahdi, then the supreme leader (*imām*) of the Sudanese Mahdists with headquarters in Omdurman<sup>4</sup>. An agricultural organization was born and called the HA Scheme (*mashurūc* H.A.) after the above village leader.

In 1951, under the leadership of H.A., the Mahmudab villagers completed their plan to irrigate some 300 *feddān* (one *feddān* is equivalent to about 4,200 m<sup>2</sup>) of land using diesel pumps. Nearly 60% of that land was *jazīra*, where the traditional *sāqiya* was replaced by the pump to supply water. H.A. registered the remaining land, which was all *karū*, under his own name, and obtained usufructuary rights. Subsequently, he divided the land into small plots and granted tilling rights to individual villagers. This system is still in effect today. H.A. later died and his son A.H. is now the manager, but the organization continues to be referred to by the old name.

These events led to the formation of an agreement between the water supplier (H.A.) and cultivators concerning the distribution of crops. I will discuss this topic in the next section.

Presently in *karū*, large-scale cultivation of crops such as wheat (*qamh*), sorghum (*durra* and *durra shāmī*) and broad beans (*fūl miṣrī*) is conducted under the supervision of A.H.. Every year, the crops to be planted are selected with the consent of A.H., and the villagers with tilling rights plant their crops accordingly. Each plot of land is laid in fallow every two to three years to maintain fertility. These plots are plowed by tractors in order to let sunlight into the soil. The agricultural cycle allowing for plots to be laid in fallow on a regular basis (*daura zirā'īya*) is not implemented in the *jazīra*, which are divided into smaller portions and managed by each owner.

In the *karū*, there are also some *matara* farmland, where individual tillers register with the government, obtain usufructuary rights and cultivate crops, as in the *jazīra*. These crops are mostly maize or clover for cattle feed, onions and other marketable vegetables.

#### 4) *Khalā*

The above three categories encompass the farmland and other property between

upper Mahmudab and the Nile. To the east of the settlement stretch huge tracts of uncultivated desert called *khalā* owned by the government. Until very recently, the people of Mahmudab did not use this land for agriculture. Since 1985, however, a number of individual villagers have paid registration fees, obtained usufructuary rights and begun to cultivate parts of the *khalā*, 2.5 to 3 km from the village. The cultivated *khalā* plots are irrigated using water pumped from wells dug for the purpose and are also called *matara*.

These *khalā* plots are used for the cultivation of crops such as sorghum for cattle feed, vegetables and wheat. A part of the wheat area is used as a pilot farm by the National Agricultural Station located in the adjacent village.

### Sharecropping arrangements

There is an interesting arrangement in Mahmudab regarding the distribution of farm products or the money obtained from sales of these products in the market. This sharecropping arrangement varies according to who provides the three indispensable elements of agriculture in the village, i.e. water, land and labor. The arrangement is not implemented, therefore, when the same person provides water, owns the land and raises the crops. On the *jarif*, there is no need for an artificial water supply and the tiller is also the landowner, so he can choose the crops and keep the proceeds. The same goes for the *matara* on the *karū* or *khalā* where the same person or family is the registered tenant with usufructuary rights, provides water, and raises crops. Even on the *jazīra*, there is no special arrangement as long as the person has purchased his own pump and supplies water to land that he both owns and cultivates by himself.

However, on most *jazīra*, where the suppliers of the above three elements are different, and on *karū* where the HA Scheme has been implemented, the sharecropping arrangement takes on tremendous importance.

Although sharecropping arrangements in the period of *sāqiya* irrigation are not much known, it was certainly established with the completion of the HA Scheme in 1951 and was maintained for some time by the participants. In recent years, however, some of the villagers have purchased pumps with their own funds to draw water directly from the Nile and, consequently, have left the HA Scheme and withdrawn from previous sharecropping arrangements. Furthermore, some of the plot owners neighboring those of the new pump owners have shown a preference to use water from the new pumps instead of the HA Scheme pumps, thereby entering into a new arrangement with the water supplier. Some new arrangements are similar to that implemented in the HA Scheme, while others are not.

#### 1) The HA pump scheme

As a rule, a person owning and cultivating land on *jazīra* but receiving water from the HA pump shares half of his produce with H.A., the water supplier, after subtracting the outlay for fertilizer, pesticides, bags and other necessities. Both the produce and the money earned from its sales in the market are subject to sharing.

According to A.H., there are about 2,000 owners of small plots on the *jazīra* in

Table 1. Sharecropping in Mahmudab

	<i>jazīra</i>						<i>karū</i>
	H	A (absentee landlord)	SA (until 1991)		SA (from 1992)		
			onions	other crops	henna	other crops	
water supplier	1/2	7/16	1/4	1/3	1/3	2/5	1/2
landowner	} 1/2	1/8	1/8	1/8	1/8	1/8	—
tiller		7/16	5/8	13/24	13/24	19/40	1/2

Mahmudab. Recently, a considerable number of these owners have left the village to work in nearby oil-producing countries or in other parts of the Sudan. One informant said that there are dozens of villagers currently working in oil-producing countries in the Gulf. *Jazīra* owners leaving the village temporarily transfer their tilling rights to relatives or neighbors. The latter, which I will call "tilling rights owners," take complete responsibility for raising crops during the absence of the former. In this case, therefore, it is the tilling rights owner who enters into a sharecropping arrangement with the water supplier, on condition that one-eighth of the produce, after subtracting necessary expenses, goes to the absent landowner. This one-eighth share is called *karij*. The balance after subtraction of the *karij* is then split in half between the tilling rights owner and the water supplier. *Karij* is always paid in cash obtained through the sale of produce in the market (Table 1).

The *karū*, meanwhile, is registered under the name A.H., and leased from the Sudanese government for ten years at a time. In reality, the lease is easily renewed and in fact gives A.H. virtual ownership over the land.

The nearly 140 *feddān* of *karū* under the HA Scheme are divided into seventy-two plots. A.H., who is in charge of the scheme, grants tilling rights for these plots to individual villagers. However, cultivation plans in *karū*, unlike in *jazīra* where the tiller is totally responsible, are made by A.H., and the tillers with usufructuary rights are required to comply with these plans. Since *karū* is not divided into small plots like *jazīra*, large-scale tractor farming is possible here. After the subtraction of expenses for the tractor lease, fertilizer, pesticides and other necessities, the produce is divided equally between A.H., the landowner and water supplier, and the villager, the tilling rights owner and actual tiller (Table 1).

As of 1989, the number of villagers who have obtained tilling rights in *karū* totaled seventy-two, as many as the number of plots under the HA Scheme. But there was one person with tilling rights to six plots, four with rights to four plots, four with rights to three plots and six with rights to two plots. Therefore, forty-one persons were actually involved in the HA Scheme. Aside from one person from lower Mahmudab (one of the villagers with rights to four plots) and one person from the neighboring village H to the north, all villagers with tilling rights lived in upper Mahmudab.

This arrangement has been adopted between other water suppliers and tillers



using pumps not belonging to the HA Scheme. In Mahmudab, there were still other cases in which different arrangements are made. For example, let us look at the case of S.A.

2) The pump owned by S.A.

In 1983, after working in Saudi Arabia and saving money, S.A. purchased a pump to draw water from the Nile and to irrigate his own plots and surrounding farmlands. The sharecropping arrangement with S.A. is such that the type of crop determines the proportion of the produce taken by S.A. as the water supplier, the landowner and the tiller.

In 1989, for example, arrangements differed between onions, an excellent cash crop, and other farm produce. One-fourth of the onion went to S.A., the water supplier, and the rest was kept by the landowner/tiller. For grain, animal feed and vegetables other than onions, however, S.A.'s share increased to one-third of the crop. The reason for this difference, according to S.A., was that, since onions fetched a high price in the market, one-fourth of the crop would be sufficient to cover the pump expenses and to allow for a profit. Furthermore, when S.A. harvested his share of the onion, he had to cover all related expenses such as pay to temporary farm laborers and costs for bags. In contrast, all expenses such as fertilizer and pesticide costs incurred prior to harvest, regardless of crop, were covered by the tiller (Table 1).

Some owners of land irrigated by S.A.'s pump were not the actual tiller. In such cases, one-eighth of the total crop went to the landowner, one-third (one-fourth in the case of onions) to the water supplier, and the remainder to the tiller. In the final analysis, the tiller received five-eighths of the onion and 13/24 of other crops (Table 1).

This arrangement was altered in 1992, when henna replaced onions as the choice crop. In the new arrangement, S.A. received one-third of the henna crop and the remaining two-thirds was kept by the landowner/tiller. If the landowner and the tiller were two different individuals, S.A.'s share remained the same with the landowner receiving one-eighth and the tiller receiving 13/24 of the total crop. For crops other than henna, S.A. received two-fifths of the total crop, and if the tiller and the landowner differed, the former received 19/40 and the latter one-eighth of the total crop (Table 1).

According to S.A., this arrangement has become standard practice on lands other than those irrigated under the HA Scheme in Mahmudab and the neighboring village "J" to the south. As mentioned above, however, there are also pump owners in Mahmudab using the HA Scheme method of dividing crops equally between the water supplier and the tiller. It is also said that the HA Scheme method of share cropping has been adopted on the west bank of the Nile.

### **WATER, LAND AND LABOR: A BRIEF COMPARISON**

The sharecropping system in the village of Mahmudab demonstrates that the water

supplier receives a relatively high proportion of farm revenue. In order to determine whether or not this phenomenon is unique to Mahmudab, I have examined two other sharecropping systems along the Nile in the northern Sudan. One is in the nineteenth century Dar al-Ja'aliyyin, now the vicinity of the city of Shendi. The other is in the Dongola area this century.

### The Shendi region in the nineteenth century

According to A. Bjørkelo, who conducted a detailed historical study on agriculture and commerce in Dar al-Ja'aliyyin prior to the Mahdi Revolution, the agricultural system of early nineteenth century Shendi featured contracts called *teddan* that established sharecropping arrangements prior to the planting of crops. These contracts were formed between the owners of *sāqiya* and land (joint ownership was seen frequently) and the *turābla* (sing. *turbal*), or farm workers, who in addition to labor also often supplied such necessities as seeds, *sāqiya* pots, rope, tools, donkeys, and oxen. These arrangements were made even more complex by the involvement of other persons, such as the *bašīr*, who built and repaired the *sāqiya*, and the *šamad*, who specialized in maintaining irrigation canals and regulating water supply. Bjørkelo described two specific cases and provided concrete figures to describe the sharecropping arrangements among the suppliers of water, land, labor, and other necessities on farms irrigated by *sāqiya* (Bjørkelo 1989: 66–67) (Table 2).

The first is a general case in the Shendi region at the beginning of this century, which Bjørkelo assumed to be not much different from the arrangement in the early nineteenth century. The characteristics of this arrangement were: (1) the landowner was entitled to one-seventh to one-twelfth of the crop; (2) the *sāqiya* owner usually was given one-ninth of the crop; (3) the *turābla* workers received about one-third of the crop (although the proportion varied according to the degree of supply and labor) and boy workers received half the allotment of adults; (4) the *šamad* irrigation specialist took one-eighth if he was also the *bašīr* (*sāqiya* builder and repairer); (5) the *bašīr* took one *ardabb* (about 180 liters) of grain for each *sāqiya*; (6) the supplier of the oxen to turn the *sāqiya* took one-fourth of the crop; and (7) the supplier of a donkey also received a share. Although various other people were involved and received some share, the above were the principal participants.

Classifying the above persons into suppliers of water, land and labor, we see that (1) is the land supplier and (3) is the labor supplier. The persons involved in water supply include the *sāqiya* owner (2), the persons responsible for the construction and upkeep of the *sāqiya* (4) (5), and the persons who supply the animals to power the *sāqiya* (6) (7). What becomes clear is that the persons involved in the supply of water received almost half of the crop while the land and labor suppliers received only about one-tenth and one-third, respectively.

The second case is Bajrawiyya village. It seems to be located in the Shendi region, but the date of the sources is not clearly defined by Bjørkelo. The context

**Table 2.** Sharecropping in the nineteenth century Shendi Region (estimate)  
(Source: Bjørkelo 1989: 66-7)

	a Author's estimate	b Bajrawiyya village
L) land owner	1/7~1/12 (14~8%)	1/10 (10%)
W) owner of water wheel <i>sāqiya</i>	1/9 (11%)	1/20 (5%)
T) <i>turābla</i>	1/3 (33%)	13/40 (32.5%)
W) <i>šamad</i>	} 1/8 (12.5%)	1/8 (1/8 of this goes to taxes) (12.5%)
W) <i>bašīr</i>		1/40 (2.5%)
W) owner of bulls	1/4 (25%)	1/4 (25%)
W) owner of donkeys	1 <i>ardabb</i> / <i>sāqiya</i>	1/8 (12.5%)
	65/72~485/504 (90~96%)	40/40 (100%)

In this and later tables, I use capital letters to show under which classification each person falls: W for water, L for land, T for labor.

of the description suggests, nevertheless, that Bjørkelo considered the case as more or less consistent with the nineteenth century.

In Bajrawiyya, the harvested crops were piled into forty heaps (*kaymān*) and then divided as follows: four to the landowner (s), two to the *sāqiya* owner (s), five to the *šamad* specialist (one-eighth of this share was then collected as full tax), ten to the ox owners, five to the donkey owners, one to the *bašīr*, and the remaining thirteen to the *turābla*. In this case as well, the landowners and labor suppliers took only one-tenth and one-third of the crop, respectively, while the persons involved in water supply took almost half.

### The Dongola district in the twentieth century

The evolution of the sharecropping arrangement in the Dongola district is described in detail by El Haj Bilal Omer. The author divided the evolution into three phases: the *sāqiya* irrigation period up to the 1930s, the first pump irrigation period from the 1920s to 1969, and the second pump irrigation period from 1970 under the Nimeiri administration (Omer 1985: 56-67).

#### 1) The *Sāqiya* irrigation period (up to the 1930s)

While acknowledging the existence of numerous variations, Omer cited the following figures as a general rule in the sharecropping arrangement during the

**Table 3.** Sharecropping under *saqiya* irrigation in the Dongola District in the early 20th century (Source: Omer 1985: 58, 75)

	Winter (a)		Summer (b)	
L) land owner	2/12	— 17%	3/12	— 25%
W) <i>sāqiya</i>	} 10/12 × {	1/12 — 7%	} 9/12 {	— 6.25%
W) animals		6/12 — 41%		— 37.5 %
W) <i>aurwatti</i>		1/12 — 7%		— 6.25%
W) <i>šamad moiya</i>		1/12 — 7%		— 6.25%
T) <i>tarābla</i>		3/12 — 21%		— 18.75%

*sāqiya* irrigation period. If the entire crop was divided into twelve equal portions, (1) the *sāqiya* owner received one, (2) the owner of the animals used to drive the *sāqiya* received six, (3) the animal driver (*aurwatti*) received one, (4) the *šamad moiya* specialist who supervises the supply of water and the irrigation of farms received one, and (5) the *tarābla* (sing. *turba*) received three portions (Omer 1985: 58). According to the author's footnote No. 23<sup>5</sup>), however, this distribution was made after the subtraction of seed costs and land rent, which differed according to season and crops harvested. During winter, when the Nile water level receded, the task of digging (*kodaig*) along the bank to secure water for the *sāqiya* became extremely difficult for the animals driving the *saqiya*. As a result, the persons involved in the *sāqiya* received a greater share of the crop, and the land rent was reduced by an equivalent amount, thus becoming one-sixth of the total harvest. In summer, in contrast, when the water level rose and the task of drawing water became easy, land rent soared to one-fourth of the total harvest (Omer 1985: 75). Consequently, the above figures for (1) to (5) accounted for only five-sixths and three-fourths of the total harvest in winter and summer, respectively. This arrangement is summarized in Table 3. If the *sāqiya*, animals, *aurwatti* and *šamad moiya* are all considered to be participants in the task of water supply, it follows that their combined shares exceeded half of the entire harvest.

## 2) The first pump irrigation period (from the 1920s to 1969)

The diesel pump was introduced to the Dongola district in the early part of this century for drawing irrigation water from the Nile. There were two main pumping phases. One was large-scale projects implemented shortly after the First World War such as by cooperative companies and individual or partnership schemes. The other was the use of smaller pumps purchased individually or jointly, a system that gained popularity from the latter part of the 1950s. From the social and economic points of view, the new system was closely related to the methods used in the period of *sāqiya* irrigation. The former, on the other hand, greatly increased the extent of arable land and created an important new socio-economic stratum called the "tenancy holder."

**Table 4.** Sharecropping in the first pump irrigation period in the Dongola District in the mid-20th century (Source: Omer 1985: 61-63)

W) The Scheme (co-operative company, individual & partnership scheme)	50%
L) Tenancy Holder	25%
T) <i>Tarābla</i>	25%

The tenancy holder played the role of mediator in negotiations between the organizations implementing large-scale irrigation schemes and the *tarābla* laborers who comprised the work force. Both the organization and the tenancy holder were involved in the procurement of both water and land as crucial elements of production. The tenancy holder was allotted a certain amount of land from the organization in question and commissioned to take responsibility for its management and operation, including irrigation. The role of the tenancy holder was similar to the *ṣamad moiya* during the period of *sāqiya* irrigation. At the same time, the organization made private loans to the *tarābla* who did not have sufficient funds for farming.

According to Omer, the crops were divided into a ratio of 2:1:1 among the three bodies; the farmland holding organization that installed the pump to supply water, the tenancy holder commissioned to manage and operate the farms, and the *tarābla* (Omer 1985: 63) (Table 4). Aside from the initial preparation of farmland, the organization's most important function was the stable supply of water to farms. The tenancy holders were involved in the maintenance of irrigation canals and the supervision of water supply, but their most important duty was the management of farmland. It can be said, therefore, that the 2:1:1 ration for distributing crops reflected the importance among the suppliers of water, land and labor.

### 3) The second pump irrigation period (1970 onward)

After Nimeiri's coup d'état in May 1969, the structure and arrangements of agriculture in the Sudan underwent a number of changes. Among the new policies implemented by Nimeiri was the transformation of the development projects operated by individuals and companies into cooperative bodies with complete government support for agricultural cooperatives, and the equal division of harvested crops between the agricultural planning body and the *tarābla* workers following the principle of "the land to the tiller." Furthermore, the system of tenancy holders in cooperative companies was officially abolished. As Omer points out, however, tenancy holders continued to exist in companies and cooperatives even in the late 1970s (Omer 1985: 64, 75).

Omer cites two specific cases to illustrate each situation: one, a civilian company with tenancy holders, and the other, a cooperative without them (Omer 1985: 64-67). In the first case, tenancy holders were still present in the Barakoal Agricultural Company at the time of the research, and several different patterns existed in the sharecropping arrangement, depending on factors such as the

**Table 5.** Sharecropping in the second pump irrigation period in the Dongola District in the late 20th century (Barakoal Agricultural Company) (Source: Omer 1985: 64–65)

Case	Scheme	<i>Tarābla</i>	Tenancy holder
a	50 – (50 × 1/12) 45.8%	50 – (50 × 1/3) 33.3%	20.9 %
b	50%	50 – (50 × 1/8) 43.75%	6.25%
c	50%	50 – (50 × 1/12) 45.8%	4.2 %
d	50%	50 – (50 × 1/4) 37.5%	12.5 %

conditions of the farmland, the method of taxation and the presence or absence of capital loans. These patterns are as follows.

- a) If the tenancy holder prepared the land for plowing, supplied fertilizer, paid taxes to the government and advance to the *tarābla*, he received one-twelfth of the company's share and one-third of the *tarābla*'s share at the time of harvest.
- b) If the tenancy holder only prepared the land for plowing, he received one-eighth of the *tarābla*'s share.
- c) If the land had already been prepared for plowing, the tenancy holder received one-twelfth of the *tarābla*'s share as land rent.
- d) Although only one case had ever been recorded, the tenancy holder received one-fourth of the *tarābla*'s share if the latter was a newcomer and the tenancy holder paid taxes to the government.

Table 5 outlines the sharecropping arrangement among the company, the *tarābla* and the tenancy holder. I have referred to these three participants as the suppliers of water, labor, and land, respectively, in accordance with the examples in the first pump irrigation period.

The second case cited by Omer is the Shaykh-Shariyf South Cooperative Scheme. There was no tenancy holder, and the land used by the cooperatives consisted of both private and government land. The former was referred to as *milk* land, and it was the duty of the owner to pay taxes. The government land adjacent to this privately owned *milk* land was called *gusad*, and the owner of the *milk* land had priority over its use. Consequently, when the *gusad* land was irrigated for cultivation, the owner of the adjacent *milk* land gained usufructuary rights while the cooperative had to pay the taxes. According to Omer, the sharecropping arrangement between two persons with *milk* and *gusad* plots of equal area and productive capacity differed when (a) the person did the actual farm work or (b) the person entrusted the farm work to *tarābla* (Omer: 65–67).

In case (a), the participants in the sharecropping arrangement were 1) the

**Table 6.** Sharecropping in the second pump irrigation period in the Dongola District in the late 20th century (Shaykh-Shariyf South Cooperative Scheme) (Source: Omer 1985: 65-66)

a: the landowner (= usufructuary rights holder) is the tiller

b: the landowner (= usufructuary rights holder) entrusts farm work to the *tarābla*

a	Scheme (W)	Landowner (L & T)	
<i>Milk</i> land	25 - (25 × 1/12) 23	27	
<i>Gusad</i> land	25	25	
total	48%	52%	
b	(W)	(L)	<i>Tarābla</i> (T)
<i>Milk</i> land	25 - (25 × 1/12) 23	4	25 - (25 × 1/12) 23
<i>Gusad</i> land	25	3	25 - (25 × 1/8) 22
total	48%	7%	45%

cooperative and 2) the *milk* landowner who holds usufructuary rights on the adjacent *gusad* and is the actual farm worker on both plots. The crops harvested on the *gusad* were divided equally between 1) and 2). With regard to the crops harvested on the *milk*, however, the cooperative gave one-twelfth of its share to the individual landowner as rent. In the final analysis, therefore, the cooperative and the individual received 48% and 52% of the harvest, respectively.

In case (b), the participation of the *tarābla* resulted in a more complicated sharecropping arrangement. As a rule, both the cooperative and the *tarābla* gave one-twelfth of their share of the *milk* harvest to the *milk* landowner. With regard to the *gusad*, the *tarābla* gave one-eighth of his share to the holder of usufructuary rights, i.e. the owner of the adjacent *milk*. Roughly speaking, the final calculation worked out to be 48% for the cooperative, 7% for the landowner/usufructuary rights holder, and 45% for the *tarābla*.

This arrangement is summarized in Table 6. Again, in accordance with the other examples mentioned previously, I have assumed that the cooperative was responsible for water supply while the landowner/usufructuary rights holder was responsible for both land and labor supply in case (a) and for only land supply in case (b).

**Table 7.** Summary of crop shares (%) among suppliers of the three elements of production (water = W, land = L, labor = T) (approximate)

		W	L	T
Table 2a	19th century, <i>sāqiya</i>	49	8~14	33
2b	( " , " )	45	10	32.5
Table 3a	Early 20th century, <i>sāqiya</i>	62	17	21
3b	( " , " )	56	25	19
Table 4	Mid-20th century, pump	50	25	25
Table 5a	Late 20th century, pump	46	21	33
5b	( " , " )	50	6	44
5c	( " , " )	50	4	46
5d	( " , " )	50	12.5	37.5
Table 6a	( " , " )	48	52	
6b	( " , " )	48	7	45
Table 1	Mahmudab (pump)			
<i>Jazīra</i>	HA	50	50	
"	"	43.75	12.5	43.75
"	SA (onions) until 1991	25	12.5	62.5
"	" (other crops)	33.3	12.5	54.2
"	" (henna) from 1992	33.3	12.5	54.2
"	" (other crops)	40	12.5	47.5
karū		50		50

### CONCLUDING REMARKS

In this study, I first presented a detailed description of Mahmudab, a village in the irrigation agriculture area along the Nile in the northern Sudan and then discussed sharecropping arrangements from the nineteenth century Shendi region and the twentieth century Dongola district to highlight the importance of water, land and labor as elements of agricultural production in this area. Table 7 summarizes these various examples in chronological order.

What is immediately clear from this Table is that, in almost all cases, the water supplier receives close to a half of all harvested crops, and therefore, I believe, water has always been considered the most vitally important factor in agricultural production in these cases. In contrast, the suppliers of land and labor receive relatively small crop shares. In other words, neither land nor labor is as important as water as an element of production.

It should be noted, however, that Table 7 shows figures only for water, land, and labor and does not look into the specific features of the persons supplying these three elements. In the *jazīra* in Mahmudab, for example, there are many cases in



which the same person supplies both land and labor. Concerning the *turābla* (Bjørkelo's spelling) or *tarabla* (Omer's) laborers, as I mentioned earlier, the *turābla* laborers in the nineteenth century Shendi region often provided the animals which were used to drive the *sāqiya* and which collected a large share of the crop. In these cases the *turābla* received a considerable portion of the crops harvested. The important issue here, as pointed out by Omer (Omer 1985: 63), is that the introduction of the pump took the special income from the *tarabla* for the supply of animals and reduced their position solely to that of laborers.

Water is thus a lucrative source of income, but today the water supplier, i.e. the person who purchases a pump, must make a considerable financial investment. This has resulted in the establishment of governmental cooperative organizations and private companies, as well as a good deal of investment of commercial profits in agriculture as seen in the Dongola district. Financial and other support from influential people through Mahdist connections are sought after in Mahmudab. A person with sufficient economic or political power, or at least with social or religious connections to influential persons, can become a water supplier by installing a large-scale pump and can then gain considerable profits.

In conclusion I would like to briefly discuss the sharecropping agreement in general. Sharecropping arrangements are usually thought to be agreements between a landlord and his tenants. My study of examples in the northern Sudan, however, reveals that water, not land, is the most important element of production in irrigation agriculture along the Nile and the person who holds power over the water supply reaps great profits. It may be said, in other words, that the sharecropping system in the northern Sudan is based on agreements, not between a landlord and his tenants, but between a "waterlord" and his tenants. The system would therefore be better described as "waterlordism" than landlordism.

In the social sciences and social economic history to date, the sharecropping system has been considered to be intimately associated with landlordism. The wider applicability of the findings I have obtained from research in the northern Sudan is a topic for future research. But if water constitutes the most important asset in agriculture on arid lands, it follows that the very term "landlordism" should be seen to rely heavily on the historical and cultural preconceptions of societies in the temperate zone—such as Europe, North America and Japan—where the ecological conditions make land a more important asset than water. In that respect, the term "landlordism," needs reconsideration.

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### NOTES

- 1) The author's fieldwork was conducted as a member of the research project organized by Protesor Katsuyoshi Fukui of the National museum of Ethnology (now of Kyoto University), which was sponsored by a Grant-in-Aid for Scientific Research of the Japanese Ministry of Education, Science, Sports and Culture. I lived in the village of Mahmudab from October 1986 to January 1987, October to December 1989 and January to March 1994, or a total of five months excluding trips to Khartoum and other places. I stayed in a guest room (*muḍfa*) at the homestead (*nimra*) of the village leader Mr A. H., and I conducted the survey using the Sudanese dialect of Arabic.
- 2) The contents of this section have already been published in Japanese by the author (Ohtsuka 1991). The reader may refer to that publication for more information.
- 3) This figure is based on data from the National Agricultural Station located in “H,” a village neighboring Mahmudab.
- 4) Most of the Mahmudab villagers are Mahdist. The reader may refer to the author's book (Ohtsuka 1995) for details.
- 5) Omer mistakenly lists the footnote as No. 22 in his book.

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