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## Modernization "in the Sudan

Essays in Honor of  
Richard Hill

EDITED BY M. W. DALY



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LILIAN BARBER PRESS, INC.  
New York 1985

## FOOTNOTES

1. "Lou Nuer District Handing Over Notes of Mr. P. L. Roussel," Southern Records Office, Juba (SRO) LND 48 A. 2.
2. For the purposes of this essay, "Nilotes" will refer only to those Western Nilotic groups in the Sudan (Nuer, Dinka, Shilluk, Anuak, etc.).
3. In 1975-76 I recorded well over two hundred different Ngundeng songs among the Lou Nuer. Terese Svoboda, working among the Eastern Jikany around Nasir at about the same time, recorded a number of others which I had not heard.
4. D. H. Johnson, "Ngundeng and the 'Turuk': Two Narratives Compared," *History in Africa*, VIII (1982).
5. The word "Turuk" is scarcely ever used in his songs.
6. Major Alban's son died sometime in 1981-82.
7. Interview with Macar Ngundeng, Waat, 28 June 1975.
8. P. P. Howell, "Pyramids in the Upper Nile Region," *Man* XLVIII/55 and 56 (1948), 53.
9. B. A. Lewis, "The Nuer Political Problem," SRO UNP 66.G.3.
10. D. H. Johnson, "Colonial Policy and Prophets: The 'Nuer Settlement', 1929-30," *Journal of the Anthropological Society of Oxford* X/1 (1979); and "History and Prophecy among the Nuer of the Southern Sudan," Ph.D. dissertation, University of California, Los Angeles, 1980, chapter VIII.
11. P. Coriat, "General Report, S8 Patrol," National Records Office, Khartoum (NRO) Civsec 5/2/11.
12. P. Coria, "Gwek the Witch-Doctor and the Pyramid of Dengkur," *Sudan Notes and Records* XXII/2 (1939), 230-32.
13. Neither P. L. Pawson nor P. P. Howell, who both served among the Lou Nuer in the 1940s, could recall for me ever hearing this prophecy. They did not lack opportunities had it been widely discussed at that time. Mr. Pawson knew Lel Ngundeng, Guek's half-brother, and visited Ngundeng's mound at Lel's invitation.
14. "Lou Nuer District Handing Over Notes of Mr. P. L. Roussel," SRO LND 48 A. 2. By the early 1950s it does seem to have been widely discussed once again. Mr. Roussel wrote me, "It was certainly from the older men, chiefs, from whom I heard the prophecy—but I think it was pretty common knowledge."
15. Cf. E. E. Evans-Pritchard, *Nuer Religion* (Oxford, 1956), 46, n.2 for the use of the word *pake*.
16. To avoid the charge that my own memories of what I was told as early as 1975 have been altered by these later events, I should point out that I committed the prophecy of a second civil war to paper in 1979 when I was completing my dissertation. I speculated at the same time on the possible future application of the rival prophecy to the Jonglei canal ("History and Prophecy among the Nuer of the Southern Sudan," 533-35). So few Southern Sudanese have had an opportunity to read my thesis that I am confident that what I wrote has not been "fed-back" to the prophecies now being so widely discussed in the Upper Nile Region and elsewhere.
17. Samuel Gai Tut, former guerrilla leader and former Minister of Wildlife and Tourism in the Juba governments of Lagu and Rassas, was consoled by a locally recorded cassette of Ngundeng songs during his detention in 1982-83. I am told that he was particularly interested in one song which he claimed made a prediction about him. What it was, and whether it mentioned his own fate, we may never know. He was killed in May 1984 when he led an "Anyanya II" attack on the Sudan People's Liberation Army headquarters.
18. P. Lienhardt, "The Interpretation of Rumour," in J. H. Beattie and R. G. Lienhardt (eds.), *Studies in Social Anthropology: Essays in Memory of E. E. Evans-Pritchard by his Former Oxford Colleagues* (Oxford, 1975).
19. *Ibid.*, 123-24.
20. *Ibid.*, 128.
21. *Ibid.*, 130-31.
22. Public protests in Juba against the Jonglei Canal in 1974 resulted in several deaths and arrests. Anyanya guerrillas who refused to be integrated into regular national army units mutinied in 1975-76 and were subsequently hunted down by the army or fled the country. Numerous Southern Sudanese politicians spent periods in detention or in prison for opposition to specific government policies during the period 1974-84.

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## The Big Ditch: The Jonglei Canal Scheme

ROBERT O. COLLINS

For thousands of years the mysteries of the origins of the Nile waters that brought life to Egypt baffled Pharaohs and then Caesars. It was only in the nineteenth century that the source of the White Nile was discovered in the great lakes of central Africa. Having made this discovery the waters of the Nile brought the British to the Southern Sudan and ultimately to the conquest of the whole middle Nile valley.

British diplomacy and military might were marshalled to defend Egypt from its timeless vulnerability—the disruption of the Nile waters. Moreover, the modernization of Egypt as well as the defense of British strategic interests at Suez depended not only upon the control but also the efficient use of every drop of the Nile waters. Thus the British were irresistibly drawn thousands of miles up that great river to threaten or to drive off, in turn, the Italians, the Germans, the French, and finally the forces of King Leopold's Congo Free State. By 1910 no European power remained in the Nile Basin to contest Britain's control of the Nile waters. This fact was the dramatic and victorious result of a consistent policy consistently applied for a quarter of a century.

Once having secured control of the waters, the rulers of the Nile Valley—British, Egyptian, Sudanese, Ethiopian—have agonized and plotted how best to utilize that life-giving substance. Immediately upon the reconquest of the Sudan, the question of Nile hydrology became of paramount importance. One of the central links in the chain of lakes and rivers extending from the equator to the Mediterranean Sea was the Sudd, the endless swamp south of Malakal known as "the Bog."

The water of central Africa plunges over Murchison Falls, through Lake Albert, down the Fola Rapids, and suddenly comes to a halt in a saucer-shaped basin called the Sudd, a permanent swamp that lies in the vast flood plain of the Southern Sudan, before continuing on to the White Nile and its tributaries and then to the thirsty deserts of the Northern Sudan and Egypt. The Sudd, approximately 100,000 square kilometers in flood or the size of Cuba, in fact prevented the exploration of the Nile sources for many centuries.

The actual character of the swamps of the Nile remained obscure until the British began methodically to clear the river channels through the Sudd at the beginning of

the twentieth century. Sudd is derived from the Arabic word *sadd*, meaning barrier or obstacle, and it came into general use among Arab merchants and traders who passed through the swamps in the nineteenth century. Today the term is used more loosely to refer to the whole of the Nile swamps as much as to specific barriers of vegetable matter blocking the river channels. The Sudd is formed in large, shallow lagoons situated on either side of the rivers. The lagoons are ringed, if not covered, by reeds and water plants that bed their roots in the soil and matter just below the surface. Strong gales sweeping through the swamps buffet the plants and loosen the roots. Then, during a rise in the level of a lagoon, the plants break away to float freely on the surface, their roots a tangled web of earth and humus whose weight acts as ballast to keep the tall reeds upright. In this way, large islands of water plants drift aimlessly over the lagoon, constantly changing position until wind and current and chance propel them into the river channel through one of the numerous spillways. Floating downstream, the Sudd soon catches in one of the sharp bends of the channel, and the roots of the reeds quickly strike into the muddy river bottom, anchoring it.

Once secured, a reedy clump catches, entangles, and absorbs other floating islands until the whole surface of the river is obstructed and even obscured. This problem has been greatly exacerbated by the introduction of the water hyacinth which appeared in the Sudd in 1957 and now grows in profusion, creating further disruption to navigation. Then the river is forced to flow beneath the barrier, and as its velocity quickens with every increasing constriction of the aperture, each fresh mass of Sudd is relentlessly sucked beneath the original, until the hole is plugged by a solid block of earth, roots, and reeds broken up and solidified by the pressure of the river. So great is the force of the Nile that a barrier can be pushed well above water level and its surface serrated into alternating ridges and furrows. Soon the river is completely plugged, and its water forced to spill over into the lagoons, where a new channel is cut around the obstruction until it too is blocked by fresh masses of floating islands that have broken loose because of the sudden rise in the water level in the nearby lagoons. Frequently, the pressure of wind and water is so great that the dam will burst, carrying away the obstacle and precipitating a flood which, sweeping all before it, roars down the river until its force is spent in the twisting channels and sluggish lagoons of the Nile swamps.

Following Kitchener's victory at Omdurman, Lord Cromer made it clear that he considered the most important aspect of British interests in the Sudan to be the Nile waters. Within six months Cromer sent Sir William Garstin, the affable Undersecretary of State for the Egyptian Ministry of Public Works, an engineer, hydrologist, and friend of both Cromer and Kitchener, to the Sudan in February 1899 to observe and report at first hand on the Nile. Garstin investigated the Nile in the Northern Sudan and then steamed up the White Nile to test the navigability and hydrological significance of the Bahr al-Jabal and the Bahr al-Zaraf. He found both channels completely impassable and, upon his return to Cairo in the spring of 1899, advised Cromer to clear a passage through the Sudd, without which the occupation of the Southern Sudan would be impossible and the hydrological significance of the

swamps would remain unknown. Cromer immediately made funds available to clear the channels of the Bahr al-Jabal southward from Lake No, but he justified the expenditure of ££ 10,000 by trusting to the probability that the summer supply of Nile water would be increased. This was the origin of the "Garstin Cut" whereby Garstin advocated the use of special machinery, designed like the American grab dredger, to clear a channel for the unimpeded flow of water to irrigate the fields of Egypt rather than lose itself by transpiration and evaporation in the Sudd. After great efforts made under the most arduous circumstances in the midst of this fetid swamp devoid of landmarks and drenched in heat, stench, and decay, a channel was cleared in 1904 which opened the south to communication and firmly embedded in the minds of the engineers and rulers in Cairo the idea that an enormous quantity of water could be conserved from these wastelands. In that same year Garstin published his *Report on the Basin of the Upper Nile*, in which he arbitrarily drew a line on the map of the Sudd region from Jonglei to the White Nile. The Jonglei Canal was born.

The Sudd presents three difficulties. First of all its insignificant slope, no more than five centimeters per kilometer, barely keeps the water moving northward into the Sudan and Egypt. Otherwise the Sudd would become nothing more than a lake. Second, the total area of the permanent Sudd itself in the dry season varies from 8,000 square kilometers to 19,000 square kilometers depending upon the river flow. Of vital importance is the fact that more than a million people on the fringe of the Sudd depend upon its water, grasslands, and fish in order to maintain a way of life which has been well defined for hundreds of years. They also depend upon the rains which range from 800 to 900 millimeters a year and which are brought to the Southern Sudan by moist air masses that originate in the South Atlantic. The wet season begins in April and ends in November. This corresponds with the river flood season that stretches between June and September so that the flood plain becomes enormous. During the great rains in central Africa from late 1961 to 1964 they extended so far into the flood plain that a few centimeters of rain could flood literally a hundred thousand square miles. It caused enormous losses of cattle and many human lives were lost.

As a result of the great rains of those years, young Nilotes were driven out of the region to the Northern Sudan, looking for a livelihood. This coincided with a great building boom throughout the Northern Sudan, in Khartoum, and at the sites of many irrigation and development schemes scattered through the Northern Sudan. Here they experienced the modern world for the first time. They encountered outright discrimination among Northerners, since coming from the South they were viewed as being at the bottom of the economic and social structure. They were considered descendants of *abid* (slaves) who were suitable only for menial tasks. Taking advantage of this situation they formed a "closed shop" union of laborers working on these development projects. Through clan contacts one Nilote could find jobs for five. Soon it became clear that they would not allow other groups to interfere in their monopoly, and this suited Northerners well, since they were only too happy to have cheap labor available. Nevertheless the Nilotes learned to read, purchased transistor radios with their meager earnings, and began to participate in the political life of Khartoum.

Unlike the relatively few missionary-educated Southerners who had dominated Southern political life since independence, these new young men were politically and socially educated, and being at the lowest economic and social scale they became strongly militant as well as knowledgeable of the outside world. They returned regularly to their homes in the South, bringing with them a pent-up hostility and militancy that they developed while working as laborers on construction projects in the North. These angry young men, along with Southern professional soldiers who deserted from the Sudanese army, formed the ranks of the Southern People's Liberation Army currently fighting the Sudanese army for control of the Southern Sudan.

In addition to great rains the Sudd is affected by the hydrological dimensions of a unique yet still not fully understood phenomenon that is of extreme importance in the construction of the Jonglei Canal. That is "creeping flow." Creeping flow filters down from the Imagong mountains through the Sudd area, the water draining northward in October and November through various depressions (khors) which are wide, shallow rivers. At this time the flood plain is exposed, and the Nilotic people who had retreated to higher ground along what is called the Duk Ridge return to it to burn off old, coarse grass. This is immediately replaced by a fresh regrowth created by the moist soil, creeping flow, and receding flood. Cattle become fat, and great cattle camps are established on the intermediate land, on the new fresh pasture which the Dinka call *toich*, and along the khors. They stay there until the end of the dry season.

A third difficulty is that the Sudd has isolated to a remarkable degree the Nilotic people, the Dinka, Nuer, and Shilluk. It has made the area, generally called Upper Nile, one of the most remote and primitive wildernesses in the world, virtually inaccessible except by air or in the dry season by very crude roads.

The life of the Nilotic people remains constant, despite the unusual fluctuations of the river and their need to adapt to its fluctuations. This may be contrasted with the very different situation in the Northern Sudan and Egypt. The rapid expansion of Egypt's population and the ambitious agricultural projects requiring irrigation in the Sudan have made water essential for the development of both countries. Consequently, it is not surprising to find that from the time of the 1904 report to the present repeated efforts have been made to conserve and regulate the Nile waters for irrigation and hydroelectric power purposes. These needs were formulated into the theory known as "century storage," by which the flow of the Nile Basin would be controlled by a series of dams and barrages that would ensure a continual rather than seasonal supply of water for Northern Sudanese and Egyptians.

The annual flow of the Nile water is eighty-four billion cubic meters per year, eighty percent of which comes from Ethiopia. While there is no likelihood of increasing the flow of water from the Ethiopian plateau, large quantities of water have accumulated since the great rains of 1961-1964 in Lake Mobutu Sese Seko (Lake Albert), Lake Victoria, and Lake Kioga. Indeed the amount of water in Lake Victoria during this period rose three meters, sufficient to supply water five times the total annual Nile flow. But the problem of how to utilize this water is not only complicated by the fact that there are eight riparian powers that have some claim to it but also by the fact that of the

waters that flow from Lake Victoria and Lake Albert into the Bahr al-Jabal and the Sudd, nearly twenty-four billion cubic meters are lost through transpiration and evaporation.

As the British empire in the Upper Nile Basin dissolved into independent countries, Egypt became increasingly concerned that the "century storage" concept of water control would require interminable and perhaps impossible negotiations with a complicated number of riparian powers. Other reasons may be cited for justifying the building of the High Dam at Aswan, including the need for hydroelectric power, but a key factor was no doubt the Egyptian interest in having a storage area that would provide them with a year-round supply of water without depending upon independent countries to the south. Even before the High Dam was built, additional storage was to be created by a series of dams and barrages through the Upper Nile. Happily, the construction of the High Dam meant that Egypt no longer plagued the Sudan with demands for minor barrages scattered throughout the tributaries of the Upper Nile. Egypt still very much required every drop of water that could be extracted from the Nile. The agricultural sector of the Egyptian economy utilized fifty-five and a half billion cubic meters of the total eighty-four billion cubic meters of water measured at flood time behind the High Dam. (Ten billion cubic meters are lost annually through evaporation.)

One of the fundamental principles of the 1959 Nile Waters Agreement between Sudan and Egypt was to allocate to both countries an agreed annual share of the river waters. In order to control and to monitor the sharing of these waters, a Permanent Joint Technical Commission for the Nile Waters (PJTC) was established. The first project proposed was the Jonglei Canal, and it was submitted by the PJTC to the Egyptian and Sudanese governments in June 1974. The canal would be dug from the mouth of the Sobat river near Malakal to an insignificant village called Jonglei on the River Atem, a distance of some 280 kilometers. The idea was based on Sir William Garstin's proposal made back in 1904, but since then it had undergone numerous permutations and designs, largely the work of the Egyptian Irrigation Department. The Department (usually called Service), much to the annoyance of the Sudan government, had not kept the latter well informed of the massive amount of hydrological data it had collected in determining the feasibility of the canal. (In fact the Jonglei Canal has been studied more thoroughly than any other project in the Third World.)

One of the difficulties in any discussion of the Jonglei Canal stems from the fact that the canal has been mentioned in a confusing number of proposals over the years. Under the name "Equatorial Nile Project," the study of the Nile Basin titled *The Future Conversion of the Nile Valley* (1946) proposed two canals which would carry fifty-five million cubic meters of water a day during the dry season and seventeen million cubic meters a day during flood time in Egypt when water supplies were adequate. This proposal would have inflicted drastic changes upon the million cattle-owning Sudanese of the area, and as a result the Sudan government was alerted to the fact that the time had come when it should make its own investigation separate from that of the Egyptian Irrigation Department in order to protect the interests of its people.

From 1946 until 1954 the Jonglei Investigation Team appointed by the Sudanese government prepared a detailed study of the environmental impact upon the people and the fauna and flora of the Upper Nile by a scheme as gigantic as the one proposed in *The Future Conversion of the Nile Valley*. The study contains some of the finest investigative material available on this wild and primitive area. Nonetheless, it proved of little practical value, while civil war between the Northern and Southern Sudan was waged from 1955 to 1972. Construction of the canal, of course, could not be commenced during this time. After a peace agreement was signed in Addis Ababa in 1972, there was pressure from the Egyptians through the Permanent Joint Technical Commission to begin construction on the Jonglei Canal. Egypt needed the water despite the fact that the High Dam at Aswan had resolved the problem of century storage; yet even with the dam it was believed insufficient water would be available to provide food for Egypt's exploding population.

The central problem that faced the Permanent Joint Technical Commission was the fact that once the Nile entered the Sudd the river dropped only thirty-seven meters over a distance of 773 kilometers and one-half of the annual discharge was lost annually through evaporation in the Sudd region. Depending upon the flood, from twenty-eight billion cubic meters to as much as forty-four billion cubic meters could be lost in a year.

The Jonglei Investigation Team proposed that in order to safeguard the interests of the Nilotic peoples a separate organization be established to monitor the impact of modernization on this—one of the world's most primitive—area. It urged the establishment of schools, dispensaries, transportation facilities, and other socio-economic infrastructure to promote and protect the inhabitants whose lives would be so severely affected by the construction of the canal. In 1974 a National Council for the Development of the Jonglei Canal Area was established by presidential decree to carry out this plan. To facilitate the plan administratively an Executive Organ for the Development Projects in the Jonglei Canal Area was established.

Upon the conclusion of peace in the southern Sudan the Egyptians anxiously pressed forward with the project that would provide them with water at the earliest opportunity. The proposals for the Jonglei Canal originally envisaged the use of drag lines and steam shovels which would have taken some twenty years. The French Compagnie des Constructions Internationales (CCI), which bid for the project, estimated that digging could be completed in half that time (1985 was their target date) and at a cost of \$350 million (based on 1974 dollar/Sudanese pound conversion rates). The French proposal differed considerably from others: it was smaller: only twenty-two million cubic feet of water a day could be accommodated by the canal, and its increase in the Nile discharged at Aswan amounted to only about five billion cubic meters annually. With evaporation this meant that Egypt and the Sudan would receive approximately two-and-a-half billion cubic meters a year. At the same time, studies conducted by the Dutch hydrological laboratory at Delft made it clear that the Nile bed between Bor and Jonglei was extremely unstable. Since the great floods of 1961–1964 had virtually obliterated the small village of Jonglei, it was therefore decided to realign the

canal and extend it from the Sobat mouth near Malakal to Bor, a total distance of 360 kilometers. The width of the canal would be about thirty-eight meters for the first forty kilometers downstream from Bor and fifty meters for the last fifty kilometers to the junction of the Sobat and the Bahr al-Jabal. For the intermediate 270 kilometers, its width would be about thirty meters. The French proposal was accepted.

The signing of the contract in 1974 immediately sparked a great controversy over the advantages and disadvantages of the canal. In fact this is usual for hydrological projects, since water drastically affects people's lives. The potential disruption of an undeveloped area created consternation among both politicians and environmentalists. Environmentalists feared for the last great herds of free roaming African animals, such as the half a million tiang that migrate through the area southeast of the canal. Large herds of buffalo, giraffe, and elephants would be affected by a canal cutting across traditional migratory routes and considerable hostility arose among European conservationists. More important, a fact pointed out many years ago by the Jonglei Investigation Team, was the potential fate of hundreds of thousands of Nilotes who spend the rainy season on the modest Duk Ridge, passing westward toward the Nile as the dry season proceeds. To resolve the problem of the westward movement of them and their cattle (as well as wildlife), the PJTC allocated 10 gasoline-powered ferries and three permanent bridges. None of this was satisfactory to the Executive Organ of the Jonglei Canal nor to the people living in the Jonglei area itself. The ferries carry few animals at a time and are frequently prone to breakdown, and particularly in such a remote area as the Upper Nile the problem of gasoline to power them is constant. The potential use of the three bridges was also debatable. In an area as flat as a desktop and having no local construction materials available, bridges can be built only at great expense—around eight million Sudanese pounds each. This was because they had to be high enough for steamers to pass under. Moreover, three bridges scattered along a canal of 360 kilometers would hardly be capable of accommodating the million cattle that would congregate at their base during their westward migration. This would create problems of forage and ultimately lead to conflicts among clan groups who would be anxiously waiting their turn to pass over the bridge while their cattle had exhausted available pasturage in the location of the bridges. Although cattle could conceivably learn to swim the thirty-to-fifty meter width of the canal the issue greatly disturbed the local people, their political representatives, and European environmentalists. (It should be pointed out that the Nuer living on the Sobat have swum their cattle across the river in high flood for many years.)

The determination of the Permanent Joint Technical Commission to press on with the canal was not matched by adequate explanations to the people upon whom the canal would have its greatest effect. When the initial agreement was signed with CCI in February 1974, rumors, which are endemic in the Sudan, began to circulate that the completed canal would be an opportunity to settle two million Egyptian peasants on potential farmland that would open up, particularly to the east of the canal. These rumors were accompanied by discussions of the problems that the canal would create in the transhumane ecology of the Nilotic people of the Upper Nile. In 1974 heavy

rioting broke out in Juba, the capital of the autonomous southern region, leaving three people dead and 200 arrested, including members of the Regional Assembly. Rumors of Egyptian interference in Southern Sudanese affairs has always elicited opposition. In fact the development of the canal would certainly change and open up an area in which the population presently suffers from disease, malnutrition, and lack of education. The canal would provide water to eastern areas of Upper Nile Province which have always lacked water in the dry season. Irrigation would reclaim thousands of feddans for cultivation and make possible the production of profitable crops, the lack of which has been a fundamental and historical problem for the Southern Sudan.

The canal would reduce the steamer time from Malakal to Juba by nearly five days, and the accompanying road would provide, after these many years, an all-weather route from Khartoum to Juba and from there to East Africa. This is particularly important since Juba and its hinterland is acquiring more and more dependence on goods shipped from Mombasa. The excellent Kenyan road system is now being extended to the Kenya-Sudan border, and the Sudanese with American aid are building a new road from Juba to the Kenyan border. Moreover, the draining off of twenty-two million cubic meters per day through the canal will subsequently reduce the percentage of pasture land lost by permanent flooding that occurred in the great lakes between 1961 and 1964. But none of the potential contributions of the Jonglei Canal has significantly enthused the people who would be immediately affected by them.

The canal, however, has social-economic problems which have been recognized but not dealt with in any serious fashion, largely because of an ignorance of their impact once the canal has been completed. The first concerns "creeping flow," mentioned earlier. Permeating the soil from south to north, the flow is abruptly interrupted by the canal as it proceeds north and westward to the Nile, and this could result in a vast flooding of the Nilotic plains east of the canal. Numerous engineering proposals have attempted to deal with the creeping flow problem, but in fact it will only become an issue when the appropriate portion of the canal has been completed. At that time adjustments and adaptations will be required in order to accommodate humans, domesticated animals, and wildlife.

Another problem arising from the construction of the Jonglei Canal relates to the technology on which all previous plans were based. Digging was to be accomplished with drag lines and steam shovels, and based on the known capacity of these machines, it was reckoned that nearly twenty years would be required to complete the canal from Sobat to Jonglei. Then a German firm, Oreinstein and Koppel, developed a bucket wheel which was first used in 1964 in Pakistan on the Chasma Jhelum link canal from the Indus river to the Jhelum river, some fifty-six miles. A spectacular piece of modern technology, the machine accomplishes the digging with a huge circular disk to which are attached rotating buckets that eat into the earth as the disk moves back and forth every one-and-a-half minutes. The machine has been installed on the Jonglei Canal. Each bucket scoops up a load which is then dumped on a conveyor belt that crosses the canal and is deposited along the east bank thereby making a raised roadway that in due course will link the Northern and Southern

Sudan. Weighing 2,300 tons, the machine creeps along on caterpillar tractors, each supporting 800 tons, and under normal conditions it moves an average 2,500 cubic meters of Upper Nile clay per hour (roughly the equivalent of two kilometers per week). The machine works twenty-four hours a day, and it is shut down for one-and-a-half shifts a week for maintenance. (Breakdowns are not unknown.) So gradual is the slope that the key to the canal's construction is the tolerance of its excavation which is limited to six centimeters plus or minus the proper gradient. This is quite impossible to handle manually, so that the machine is completely automatic, being guided by a laser beam set about a mile down the path of the canal.

Each bucket digs three cubic meters of soil but the rate of rotation of the wheel depends on the quality and condition of the earth and the weather. Impressive as the wheel is, the preparations that precede this Goliath also play an important role in its operating smoothly. Several kilometers in front of the wheel four to six bulldozers work twenty-four hours a day, constructing two dikes of several meters' height that run parallel to the canal on either side. They prevent water creeping into the site, and at the same time create a drainage ditch for rain water falling onto the path of the canal. This is essential for keeping the 2,300-ton wheel on a solid surface. If inundated by either rain or flood waters, the cement-like "cotton soil" turns to mud and would gradually swallow up the machine.

Construction has been carried out by the CCI which signed the official contract with the PJTC on 28 December 1976 and renewed it on 13 March 1980. The signatories included the company, the Sudan, and the Egyptian Ministry of Irrigation. The PJTC acts as overseer and consultant to the CCI in order to ensure that the canal itself is dug according to specifications. It took two years to disassemble the bucket wheel in Pakistan and transport it to the mouth of the Sobat river. There, a large base camp was established to service the machine.

American companies tend to send out unaccompanied male technicians and engineers, and while providing them with adequate housing and food also arrange regular home leave. The French company, on the other hand, constructed a camp at Sobat resembling a model French village (at least until it was looted by the Sudanese army during recent troubles). French technicians were able to bring out their wives and children to live in fully-furnished air-conditioned bungalows; kindergartens and schools were set up for the twenty or so French children under the supervision of expatriate French teachers. There were horses and swimming pools for recreation. Wives, however, were expected to work at least twenty-seven hours a week, and the availability of this additional workforce meant that the company enjoyed a competent secretarial service and excellent supervisors to look after the kitchen staff and gardens. Fresh vegetables were grown in the rich loam of the Sobat delta. The model bungalows were hermetically sealed to keep out insects, rodents and other pests, and an excellent clinic, staffed by two doctors, was responsible for maintaining the health of the French expatriates and local Sudanese workers. The standards of living were equally high at the advance camps beyond the Sobat, where major digging sites were located. Relations between the expatriates and the local Sudanese were cordial. The

company also maintained two planes that flew between Khartoum, Sobat, and the digging sites.

At first it appeared that the bucket wheel was going to be a failure. In Pakistan the machine excavated through sand with apparent ease, but in the Southern Sudan it faced the troublesome "cotton soil" that is muddy in the rainy season and hard as concrete during the dry. By June 1978 the bucket wheel had been reassembled after difficult transportation problems, but during its first two years of operation in the Sudan it was able only to excavate thirty kilometers. This was largely because the cement-like clay soil refused to drop from the buckets on to the conveyor belt. A technical manager, however, resolved this problem by installing an ingenious system of chains in each bucket, forcing the clay out of the bucket and on to the conveyor.

From that point onward excavation proceeded faster than was expected, until the CCI was forced to halt operations by the Sudanese Peoples Liberation Army (SPLA) in November 1983. Although nearly one thousand Sudanese, eight hundred of whom are Nilotes, are involved in construction work, earning salaries ranging from two to ten Sudanese pounds per week, supervision was exercised by forty Pakistanis who had been with the machine since its digging of the Jhelum in the 1960s. The machine itself is so automated that it can be operated by only twenty-five men—mostly Sudanese under Pakistani supervision.

The greatest logistical problem facing CCI is the storage of 7,000 spare parts that are categorized by computer at the main camp at Sobat. (In November 1984 the camp was moved to Bor prior to the cessation of operations.) Another frustrating problem involves fuel which must be shipped from Port Sudan by rail and truck to the CCI warehouse in Kosti where it is then moved once a month by three barges to the Sobat and taken to the excavation site. The machine is a voracious consumer of gasoline. It devours 40,000 liters (10,570 U.S. gallons) a day.

CCI's other problems have been technical and political. After the Juba riots of 1974, considerable discussion took place in the Southern Regional Assembly and the PJTC on the alignment of the canal. It centered on the findings of the Dutch Hydrological Institute that demonstrated that the location of the main flow in the riverbed from Bor to Jonglei was exceedingly unstable and was capable of movement that would seriously jeopardize the entrance into the canal. Further complications arose over the loss of the village of Jonglei. An equally intractable problem arose from the routing of the canal through densely populated areas, with heavy concentrations of Dinka and their cattle in and around the area of Kongor. Consequently, in September 1979 the line was shifted east of the Kongor region and extended to Bor, making the total distance of the canal some 360 kilometers. In fact strong arguments could have been made for an alignment that ran directly from the Sobat to Bor east of the Duk Ridge. Such an alignment would have alleviated the problems of long-scale cattle migrations that occur at the end of the rainy season. But by this time the CCI had already excavated some sixty kilometers, and to have changed directions at that point would have been costly.

The CCI was confronted by open warfare between groups of Southern Sudanese

and the Sudanese army. In May 1983 the 105th battalion of the Sudan army mutinied in Bor over a variety of grievances held by most Southerners. These included the arbitrary dissolution of the Addis Ababa Agreement, the redivision of the South into three separate (but impotent) provinces, and the lack of active commitment to economic development in the South on the part of the central government. It was further exacerbated by the application of Sharia law throughout the Sudan and the attempts of former president al-Nimieri to turn the Democratic Republic of the Sudan into an Islamic republic.

The SPLA was established under the leadership of Col. John Garang de Mabior, a respected officer in the Sudan army. The defection of Southern Sudanese troops from the army provided a hardcore for what is essentially a revolutionary army. During the late summer and autumn of 1983 it systematically overran police posts and army garrisons in towns and villages throughout Upper Nile Province and the Bahr al-Ghazal. On the Sobat it attacked the CCI after warning that the company should cease operations on the grounds that the construction of the canal only reinforced domination from Khartoum. There was also growing hard feeling on the part of the SPLA toward the CCI because of its conviction that the CCI field managers, under pressure from the Sudan army, provided gasoline and transportation for Sudanese troops. (This was vehemently denied by CCI's management, but it can well be imagined how a beleaguered field manager, surrounded by Sudanese army troops, might be forced to hand over valuable gasoline supplies.) Following the warning, the Sobat camp was attacked on 17 November 1983, and nine hostages were taken, including eight expatriates and one Sudanese. Later, a French woman, in the advanced stages of pregnancy, was released, and the remaining eight hostages were retained, pending negotiations.

Following the kidnapping, all operations on the canal came to a halt, and French and Pakistani engineers and technicians were withdrawn to the camp at Sobat. The intention was to dismantle the installation and move it to Bor—a move that had already been scheduled by CCI. At the same time the Sudan army was sent to Sobat to reinforce the small base they maintained there in order to protect CCI's position. Then on 10 February 1984 the SPLA assaulted the army garrison at Sobat, routing it and killing an Australian pilot attached to the CCI. The remaining expatriates were then evacuated to Khartoum and French activities on the canal ceased. The CCI headquarters staff in Khartoum was reduced to a skeleton.

Today, a big ditch stretches from the Sobat 267 kilometers to an enormous bucket wheel, now slowly rusting under the impact of Southern Sudanese rainy seasons. Since the SPLA dominates the Upper Nile, there is no possibility of the French returning until peace and security are restored in the region. Given the damage through pillage and natural causes the machine will require four to six months to become operative again. In the meantime wildlife and cattle, which would be capable of swimming the thirty-to-fifty meter width of the canal, are being trapped at the bottom of the canal and have difficulty mounting the opposite bank. In spite of the fact that the French graded an eight percent slope on either side, the crossing has become extreme-

ly hazardous for both domestic animals and wildlife without water in the canal. With the cessation of operations by both the Chevron Oil Company of the Sudan and the CCI, the Southern Sudan has reached an economic stalemate. Unless there is a peaceful settlement that is acceptable to the Southerners and satisfies their major grievances, the people of the Upper Nile will be left with nothing more than a big ditch.

## 10

### Development in Context<sup>1</sup>

FRANCIS MADING DENG

Some years ago, we organized an African-American Conference in Khartoum. During a reception in honor of the participants, one prominent Black American pulled me aside discreetly and expressed concern over what he had just seen during a sight-seeing tour of the city. On a farm where prisoners were working, he had noticed that most of them were Blacks. I wondered what he meant by Blacks, thinking that he might have assumed the Arabs of the Sudan were white. But our friend was well informed and knew precisely what he was talking about. Most of the prisoners he had seen were tribesmen from the South. Did this indicate racism in the Sudan? Certainly not! What then could have accounted for the large proportion of Southern tribesmen in prison?

I had not thought about the issue in precisely those terms, but some speculations from a different perspective came to mind. Those Southern tribesmen were among the people who flooded Northern towns, and particularly the capital city, following the post-colonial removal of the restrictions that had kept the South "closed districts," left to evolve slowly along indigenous lines with minimum, if any, external inputs or stimulants for development. Isolated and insulated from the mainstream of the cross-cultural currents prevailing on the national level, the traditional members of these communities remained rather self-sufficient in a subsistence economy, proud of their ethnic and cultural identity, ignorant of Arabic, the national medium of communication, and scornful of urban conditions. Yet, those conditions offered modern advantages which were lacking in the tribal context.

Once the barriers were removed at independence, many people from these communities began to flock to Northern towns and cities, some to escape the civil war that was then raging in the South, but most to labor for cash, largely motivated by the values of their traditional society, such as the need to acquire cattle, their ideal of wealth, or to supplement their agricultural produce, which in the past they had done through various modes of gathering, fishing, and hunting.

1. The text of this paper was first delivered in an address to the Society for International Development's 25th world conference (Baltimore, 1982).