COERCION AND INCENTIVES IN AFRICAN AGRICULTURE: INSIGHTS FROM THE SUDANESE EXPERIENCE

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A dialectic running through the literature on agricultural development in Africa is between coercion and incentives, between the necessity of compelling peasants to produce certain crops or employ particular technology and the possibility of motivating peasants to opt for specific production strategies through rewards. Coercion presumes peasants lack the capacity and or will to develop agriculture and must be forced. Incentives assume peasants will choose development if given the opportunity. Recent examples of coercionist approaches include Hyden (both 1980 and 1983), La-Anyane (1985), and Hart (1982:156-157). Recent examples of incentive-based approaches include Bates(1981), World Bank (1981), Brown and Wolf (1985), and Lele (1984).

Both sides of this debate are seriously flawed. Policies based on them are unlikely to break the pattern of underdevelopment in African agriculture. In fact, past policies of coercion and incentives have contributed to present conditions. Current frameworks lack an appreciation of the ways in which African agriculture has already been transformed. They therefore underestimate the structural impediments to progress.

This article calls for greater attention to the conditions and relations of production in African agriculture. Specifically, we must examine three factors. The first is the degree to which subsistence production has been undermined. This includes considering how dependent producers are on the market, to what extent out-migration has taken place and how far landlessness has spread. Second, we must look at the degree of control farmers have over production decisions. They may be restricted by such factors as competition for land with commercial growers, sharecropping and other land-tenure relations, lack of resources to provide inputs to agriculture, regulations of development projects or cooperatives, and/or by pressure to allocate resources to off-farm strategies (such as wage-labor) to meet household needs. Third, the means by which others gain control of peasant labor and produce requires analysis. Those classes and institutions that shape conditions under which peasant production takes place also play a part in helping or hindering development. We must not take for granted their interest in promoting development.

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A case study of the Blue Nile Scheme in Sudan[1] suggests that coercive development strategies are limited in their capacity to transform agriculture. Coercive strategies are rooted in a conflict of interest between agricultural producers and the elites who control agriculture. Control by elites reduces farmers' ability to improve production. At the same time, the class interests of elites restrict their progressive role in economic change. The study further suggests that incentive-based strategies fail because African peasants face structural constraints in controlling resources including their own products and because peasants' decision-making power is circumscribed by their dependence on elites. Their capacity to respond effectively to incentives is thus limited.

The paper is broken into the following major sections: limitations of current frameworks, Sudan's irrigated schemes: an example of coercive development, and conclusion.

LIMITATIONS OF CURRENT FRAMEWORKS

Two recent and influential works coming from different perspectives will serve to illustrate some of the flaws in current development thinking. In *Markets and States in Tropical Africa,* Bates (1981) argues for incentives while Hyden (1983), in *No Shortcuts to Progress*, calls for control over peasants—coercion. While their analyses of African agriculture are very different, they share a number of pitfalls. First, both Bates and Hyden devote too little attention to the historical development of African agriculture. They fail to consider the degree to which subsistence production has been undermined, making rural populations dependent on other classes and involving them in capitalist relations of production and exchange.

For example, Bates attributes the failure of African agricultural development to a lack of price incentives to farmers. He criticizes past agricultural policies on this basis and calls for some modifications. He does not, however, consider that the changes that these policies have already brought about might have undermined the ability of African farmers to respond to incentives. Furthermore, African farmers appear in his analysis of food crops only as producers who will benefit from increased food prices, yet many rural Africans are net purchasers of food (Anthony et al., 1979; Ghai and Radwan, 1983).

Hyden argues for a greater appreciation of history, but he substitutes an ahistorical, ideal notion of an "economy of affection" for African history. Hyden is less concerned with the material basis of this economy of affection at any point in time than with what he takes to be the unchanging values associated with it. In his view, capitalism has failed to take hold in Africa because of the anti-capitalist bias of African leaders and the pre-capitalist values associated with the economy of affection.

Their failure to consider historical developments in African agriculture leads both scholars to a second pitfall. They assume too much independence on the part of peasants—commercially oriented in Bates' analysis and subsistence oriented in Hyden's analysis. For example, Bates sees labor migration largely as the outcome of farmers' calculated choices between alternatives (1981:84). He overlooks changes occurring in rural areas that might compel peasants to act in certain ways even where it means subjecting themselves to further exploitation (see van Donge [1984] for example). Hyden argues that the pre-capitalist economy of affection is used among other things to obtain schooling and urban jobs (1983:14). Yet nothing in his analysis suggests why peasants seek education or wage labor.

Bates treats peasant agriculture as "industry" (1981:87). He ignores the fact that unlike industry, peasant production is premised at least in part on unpaid family labor and the production of use-values. Peasants are thus not simply maximizing profits in the marketplace but struggling to sustain their families and maintain viable units of production. What is happening to the subsistence base of rural life must be taken into account in explaining their behavior. Bates does not undertake such an analysis.

Bates' emphasis on peasants' opportunity to choose among alternatives in the market obscures the powerful constraints that govern their choices. Both Bates and Hyden draw attention to peasants' ability to circumvent state control. Bates points out (1981:87), however, that peasants do not do so without a cost: "the peasants avoid the state by taking refuge in alternatives that are clearly second best." Hyden carries the idea of peasants' independence much further, suggesting that peasants are somehow outside of the larger economic system and able to pick and choose when and how they interact with it. He (Hyden, 1983:6) identifies a "peasant mode of production... functioning side by side with either capitalism or socialism." Both approaches underestimate the extent to which forces beyond peasants' control shape their conditions of existence and their production options in agriculture.

Neither Bates nor Hyden fully recognizes that elites' class interests represent an obstacle to development. Bates presents a cogent analysis of how African governments have biased policy toward urban populations and industry in the past. And he sees the need for rural people to organize and to have a greater share of the power. Yet he does not consider structural changes in political or economic systems. Rather, he (Bates, 1981:132) suggests that elites may shift their policies due to "a growing awareness that present measures offer few incentives for farmers to play a positive role in the great transformation." One might ask, given the evidence he presents, if the problem is farmers' lack of incentive or the lack of incentives on the part of elites to alter a system that has enriched them and upon which their power is based.

Hyden thinks the main problem with African elites is that they are not powerful enough. His criticism (Hyden, 1983:200) of the African bourgeoisie is that it remains a professional, bureacratic class that has not been strong enough to take control of production and "has allowed itself to be caught by the remnants of pre-capitalist formations." In contrast to Bates, Hyden argues that African leaders put welfare before growth (1983:2) and are unable to resist popular demands (1983:19). He (1983:7) holds that "African countries are societies without a state" because the peasants are independent of other classes and there is thus little basis on which to exercise power. The problem therefore is how to break peasants' autonomy and bring them under the control of "a dominant class capable of assuring the expansion of [the] econom[y]" (Hyden, 1983:107). Hyden assumes that the economic interests of dominant classes are synonymous with development. He (1983:194) overlooks the role elites' self-interest has played in past development failures, attributing these instead to African governments' and donors' lack of knowledge.

Both Hyden and Bates accord little attention to what might check the depredations of elites on peasants. Hyden (1983:208-9) discusses the need for "redistribution" but does not consider how this might come about or why. Bates (1981:132) suggests that as result of the failure of present policies, "dominant interests may be persuaded...to employ strategies that evoke cooperation by sharing joint gains." Their prescriptions thus presume that there is ultimately a community of interest between peasants and those who exploit them.

In short, current development thinking fails to address adequately the existing structure of relations of production in African agriculture, underestimates the impact of colonial and neo-colonial history, the extent of proletarianization, and the collapse of the peasant household as a unit of production and consumption. A case from Sudan illustrates some of the limitations of both coercion and incentives as strategies for development and suggests the need for a broader analysis of the causes of stagnation in African agriculture.

SUDAN'S IRRIGATED SCHEMES: AN EXAMPLE OF COERCIVE POLICIES

Coercive strategies are based on the assumption that small producers are unable to bring about the transformation to efficient, high productivity agriculture. One such strategy is large-scale agricultural schemes which bring small producers under a central administration. This is supposed to diffuse technology and supply managerial skill resulting in a more efficient use of resources and higher yields to the benefit of farmers and society alike. The Sudanese irrigated schemes, begun by the British and continued under successive Sudanese regimes, are a prime example of this strategy. These schemes, most notably the Gezira Scheme, are seen by some as models to be emulated elsewhere. Voll (1981:78) writes that "the Gezira Scheme has served as an inspiration for administrators throughout Africa." (For general information on the schemes see Gaitskell [1959]; Barnett [1977]; Said [1968]; Versluys [1953]; Wynn [1969]).

Irrigated schemes are the cornerstone of Sudan's agricultural development program. Much land, labor, and capital have been invested in them. Irrigated schemes now cover more than four million acres and expansions are planned (ILO, 1976). The schemes' resident population and seasonal labor force total over one million (Keddeman and Abdel Gadir, 1978). The schemes can be credited with the introduction of large-scale irrigation, chemical fertilizers, pesticides, crop rotation, new crop varieties, and mechanization to Sudanese agriculture. The schemes have also helped train a large group of Sudanese agricultural experts and managers.

Yet, by most standards, the schemes have failed to develop Sudanese agriculture. Yields have generally been far below potential (Kiss, 1977; ILO, 1976:258). Productivity has stagnated and may even be declining (O'Brien, 1981; Tait, 1983). Incomes in agriculture are among the lowest in the Sudanese economy (ILO, 1976:356).

Experimentation with technical and managerial inputs continues in an effort to improve performance (Taha, 1973; Koch and Bischof, 1982). Such efforts are inadequate, however, because they do not address the structural causes of failure. These lie in the nature of the transformation the schemes brought about in peasant agriculture and the relations of production they established.

The Sudanese irrigated schemes: 1) destroyed the pre-existing base for indigenous agricultural development, 2) brought peasant production under the control of another class, and 3) facilitated the intensification of labor in agriculture and transfers from peasant producers to dominant classes without significantly improving the productivity of peasant agriculture. The relations of production on the irrigated schemes thus actually inhibit development.

These arguments are set forth in detail in a case study of a Blue Nile Scheme village. Many conditions are standardized throughout the Sudanese irrigated schemes so the findings, with some modifications, should apply to other schemes as well. However, Sudan's schemes are only one example of a coercive development strategy; there are obviously a range of such strategies. The diversity of agrarian structures and policies in Africa cannot be represented by a single case study. Rather, this study demonstrates the insights gained through analyzing the structural constraints faced by African peasants and the nature of their relationship to other classes. The analysis is broken into three parts: pre-scheme agriculture, the irrigated scheme, and agricultural decline.

Pre-Scheme Agriculture: Autonomy and Flexibility

Wad al Abbas, located on the Blue Nile not far from the old Funj capital of Sennar, and settled in 1808 largely by Ja'aliyiin and other migrants from the north, was part of the mainstream of Sudanese economy from its beginning. It was never a completely homogeneous peasant community nor an economically closed corporate one. Some of Wad al Abbas' founders were traders, and the village was in commercial contact with other regions.

Until the scheme was established in 1954, agricultural production remained primarily subsistence-oriented. Land was not a commodity. Land holdings were unequal but there were no landless. Land was abundant and acquired through both inheritance and by clearing new land. As one villager put it, "Every man had land—not for money—you cut the trees and farmed, not for a *grish* (one penny) or a *tarifa* (one tenth of penny)."

A farmer's holdings consisted of three types of land, rainland (*bildat*), riverbank floodland (*jeref*), and river island land (*gezira*). The rainland was irrigated by ridging fields to retain rainwater (*teraas*). No plows or draft animals were used in cultivation. Farming was carried out manually with hoes (*jiraya*) and digging sticks (*seluka*). Technology was simple and within reach of every farmer.

The basic unit of production was the household. A man farmed with the help of his unmarried sons. The degree to which women participated in agricultural production is not clear. Many villagers maintain that women did not farm, but evidence from neighboring areas suggests that women's participation declined greatly as a result of the scheme (Brausch et al., 1964; Gaitskell, 1959). A few local traders were able to expand their land holdings through slave labor and later hired labor. But most households never owned slaves nor did they have the means to pay laborers. The majority of farmers relied largely on their household labor forces.

Agricultural production concentrated on food crops for direct household consumption. Sorghum (*Sorghum vulgare*) (*dura*) was the most important crop, but some fifteen other food crops were also grown. The agricultural year spanned July through February with a three- to four-month slack period in the dry season. Farmers engaged in long-distance trade and craft production in the off-season. Villagers kept cattle and goats as a source of dairy products.

While villagers remember lean years as well as seasons of plenty, they cultivated a variety of crops and were largely self-sufficient in food production. They sold grain to cover cash expenses such as the purchase of oil, sugar, coffee, tea, shoes, and clothing. Part of the peasants' product was thus siphoned off through trade while local merchants accumulated wealth. Traders also gained control of peasants' crops by providing credit to them in a crop-mortgage arrangement (*shayl*). Trade and agriculture were linked to each other in that a good crop could provide capital to enter trade and trade profits, in turn, could be invested in agriculture. But villagers' dependence on the market appears to have remained limited into the 1940s.

In 1931 the British governor of the Blue Nile province reportedly described "the country outside the Gezira [Scheme]...as a plethora of grain, meat, and milk but a complete lack of cash" (Gaitskell, 1959:161). And, although as far back as Wad al Abbas men remember, bridewealth was paid in cash, older men (including those married in the late 1940s) always speak of it in terms of the number of *ardebs*[2] of sorghum they had to sell to raise it. This is in contrast with today when bridewealth is invariably quoted in cash. It would indicate that before the scheme, local farmers did not commonly use substantial amounts of cash and that the sale of several *ardebs* of grain was not a routine practice for the average farmer. On the other hand, some farmers owned fifty *feddans*[3] (twenty-one hectares) or more and produced a hundred *ardebs* (23.6 metric tons) of sorghum in an average year. They were clearly engaged in attempts to produce commerical surpluses on a regular basis. Villagers say traders from Omdurman, Wad Medani, and other towns came to Wad al Abbas to purchase grain.

Prior to the scheme there was almost no labor migration from the village. Nor was there much occupational specialization. Traders and craftsmen remained farmers as well. A man farmed with his father, grew up, married, and eventually farmed his own land. Traders traveled and returned. Farming and to a lesser degree trade were the basis of the village economy. New generations were absorbed into this economy. Families stayed in the village near their farms and livestock.

The Irrigated Scheme: External Control

Two Sudanese merchants from outside the village established an irrigated cotton scheme at Wad al Abbas in 1954. The government licensed and regulated it through the Nile Pumps Control ordinances that standardized conditions on all the schemes. The scheme was nationalized in 1969 and is now administered by a government corporation—The Blue Nile Agricultural Corporation.

Local farmers' land was completely incorporated into the scheme. They became the owners of tenancies rented from them by the scheme for a nominal sum (10 pt.4/*feddan*). A standard tenancy at Wad al Abbas is fifteen *feddans* (6.3 hectares) with five *feddans* cotton, five *feddans* sorghum or optional crop, and five *feddans* fallow. Individuals are limited to two tenancies, but there has always been great variation in households' holdings.

The essential framework of the scheme has not changed since its establishment.

Farmers are required to grow five *feddans* of cotton on each tenancy. The scheme provides water and all technical inputs to cotton. These include tractors and aerial pesticide spraying as well as the ginning, grading, transport, and marketing of cotton. These costs are then charged against each farmer's cotton account through a complex system whereby some costs are born jointly by tenants and management. The scheme also provides cash credit to farmers for cotton production. Cotton profits are divided between the farmer and the scheme. In contrast, the sorghum crop is optional and owned by the farmer. The scheme provides nothing for this crop except water.

The scheme profoundly changed agriculture at Wad al Abbas. Farmers were brought into relations of production similar to those of wage-workers without, however, being paid wages. The net result of the scheme for the peasants of Wad al Abbas was to weaken their control over means of production, the production process, and their products, and to intensify their labor output while undermining their self-sufficiency. Each of these points is addressed in turn.

Control over means of production: the scheme did not create a group of landless. It may have secured farmers' hold on land to the extent that it prevented land accumulation by a few (cf. Awad, 1971). Land on the scheme cannot be bought and sold (though some illegal trading occurs). Tenancies are inherited according to Islamic practice with the restriction that they may not be divided below one half.

The scheme did not separate farmers from all means of production; however, it introduced insecurity of tenure. Farmers can lose their land if deemed negligent in cotton production. Between 1980 and 1982 alone at least a dozen Wad al Abbas farmers lost land this way. Farmers' ownership of means of production was further weakened by the introduction of pumps and other technology which is controlled by management. Ownership of a parcel of land on the scheme is meaningless without control over the technology required in production. For example, farmers have no control over the operation or maintenance of irrigation machinery. Insufficient irrigation is one of the main reasons they cite for poor yields.

Control over the production process: with the establishment of the scheme, control over the production process was transferred from farmers to managers and policy-makers. The household remains the basic unit of production in that each household determines and organizes its own labor inputs and contract independently with any hired laborers or sharecroppers it employs. Each household also controls production on the sorghum plot. But farmers have no choice in the decision to grow cotton. And, all inputs to cotton beyond labor are determined by management. Farmers cannot limit inputs such as fertilizer and aerial pesticide spraying or the prices at which they are supplied although they bear much of the cost. Farmers are also locked into a schedule as they receive water in succession along canal lines. Each must perform operations on time. Some observers of the Gezira Scheme have likened it to an assembly line (Beer, 1955). Cotton fields are periodically inspected to insure farmers are cultivating properly.

Farmers thus lost most of their decision-making power and to a significant degree were reduced to laborers in an agricultural system over which they excercise little control. They became the lowest rung in a rigid, authoritarian hierarchy that plans not for individual households but for a large-scale operation. Furthermore, the interest of the merchantowners and later the state in producing cheap cotton proved to be largely at counterpoint to the interests of the producers.

External control over agricultural production meant that it was no longer geared to peasants' needs but was to serve narrowly defined, so-called national interests which disproportionately benefit the state and the bourgeoisie. In practice this had a number of consequences for village agriculture. The diverse, flexible range of crops that were customarily cultivated and the three types of land used in production were eliminated. In their place was one homogeneous agricultural system that was essentially a monocrop system to produce cotton with sorghum production merely allowed. Furthermore, cotton production is more labor-intensive than sorghum; on the nearby Gezira Scheme where production conditions are similar to those at Wad al Abbas, cotton requires two-and-a-half to six times the labor of sorghum (ILO, 1976). Cotton also has a longer growing season than sorghum. The major part of the agricultural year and agricultural labor were thus shifted from the production of food crops for household consumption to the production of a non-consumable cash crop.

By the early 1980s farmers were well aware that the scheme represented an extension of state power over them. They consistently referred to the scheme and its management as '*al hukuma*,' the government. Throughout fieldwork gossip was rampant in the village that water charges would be introduced or that the scheme would be sold to a Saudi Arabian. Villagers knew that decisions of momentous consequences for their lives and work were being made, without their input, beyond their control, by people in distant places.

Control over their product: the relations of production on the scheme also entail producers' loss of control over their product—the cotton crop. Farmers retain their sorghum crop. The cotton is taken by management right after picking. Management controls the weighing, grading, and marketing of the crop as well as the accounting process by which profits are determined. The structure of the scheme thus allows the state to directly appropriate peasants' produce without an intervening market. Furthermore, although in theory farmers are entitled to a share of cotton profits, in practice, most Wad al Abbas farmers receive no payment and actually have negative incomes from cotton because of the scheme's charges for production costs.

According to scheme records only 6 out of 1,597 farmers under the administration of the Wad al Abbas office received any cotton profits in 1980, a year farmers and scheme employees regarded as average.[5]

Since farmers and management theoretically share cotton profits, it has been argued (Gaitskell, 1959) that the arrangement is equivalent to customary sharecropping practices in the region. In fact, it represents a radical departure. Sharecropping (*masak bil-nuss*) is practiced in the village today, on scheme land. Some villagers want to bring more land under cultivation and others lack the labor or desire to farm the land they have. The relations of production in sharecropping, however, differ significantly from those between scheme and tenant. First, sharecroppers control the production process themselves (within the limits imposed by scheme regulations). Second, they do not have their product entirely alienated but retain half the yield. Third, sharecroppers are not held in debt to the tenancy owner in the event of a poor yield or crop failure.

In contrast, relations between scheme and tenant effectively give management the entire yield. Wad al Abbas tenants recognize this and consistently refer to the cotton crop throughout the process of production, as belonging to the government *(beta'a al hukuma)*. No comparable statements are made regarding crops on sharecropped land. Thus, in idea and in practice, the notion of the product as alienated from the producer in the production process is institutionalized on the scheme.

Intensification of labor output: not only did the irrigation scheme mean that farmers had to labor on a crop they did not own and under conditions they could not control, it required much more labor than traditional rainfed farming. There is no three to four month off-season; cultivation continues year-round. An older tenant, remembering the farming schedule before the scheme lamented, "But now the whole year, there's not one day free." Gaitskell (1959:101) noted this intensification of labor on the Gezira Scheme: "[Irrigation] means regular attendance, much more rapid planting and weeding, and harvesting in months which were previously idle."

Furthermore, cotton's growing season encompasses that of sorghum. The two crops thus compete for households' labor. This intensification of agricultural labor was such that many households could not meet the labor requirements on their tenancies. By rather conservative calculations, thirty percent of a sample of Wad al Abbas households were short of labor for at least three months out of the production cycle even when labor migrants and other members working outside agriculture were included.[6] Farmers thus not only no longer possessed the technology required in production, they no longer possessed sufficient labor. Hired labor became a necessity.

Another group of laborers was brought directly into wage-labor relations. Migrant workers from subsistence agricultural areas and pastoral groups off-scheme were recruited at periods of peak labor demand. The scheme provides credit to farmers for hiring labor on cotton, but the amount is little compared to the labor required and no credit is advanced for sorghum production. Tenants complain that the credit is inadequate and the data support their assertion.

In 1980-81 agricultural wages at Wad al Abbas were £S2[7] for the customary four to five hour work day (7 a.m. to 11 a.m. or noon). As one tenant commented, "Where can a farmer get that kind of money? The workers are better off than the farmers." Farmers received £S136 in credit that year for five *feddans* of cotton, an amount that could pay one worker for sixty-eight days. ILO figures for long-staple cotton production on the Gezira Scheme show that five *feddans* of cotton require 309-410 man-days per year (1976:259-60). Tenants, thus, have to rely on unpaid labor for most of the work on cotton or pay hired laborers out of their own pockets. The limits of their abilities to pay for hired labor pressure them to intensify their unpaid household labor. The ultimate beneficiary of both this paid and unpaid labor is the state that receives the cotton thus produced. Farmers' only means of resisting this intensification is to use less labor on cotton than the crop requires (cf. Khalafalla, 1981:127-28). This option is regulated by the threat of eviction and the fact that cash credit is only provided for each operation after a field inspection shows it has been carried out. Nonetheless farmers' inability or resistance to meeting the labor demands of the scheme contributes to poor yields, as will be seen below.

Undermining self-sufficiency: the scheme undermined peasants' ability to sustain themselves through agriculture. It did this by raising the costs of production (both technical inputs and hired labor), introducing new elements of risk such as technical breakdown and world market prices, eliminating former risk-reducing practices such as a diversity of crops and land types, enforcing the production of a non-consumable cash crop, and by placing labor demands on the household that restrict the labor they can allocate to food production.

In short, the scheme brought about a dramatic transformation in agriculture. It reduced the viability of the peasant household as a unit of production and consumption but did not completely destroy it. Farmers are defined by the scheme as autonomous peasants receiving services for which they must pay. Yet they are denied decision-making power, threatened with eviction, and routinely inspected to insure they cultivate cotton. Their position is more similar to that of proletarians than independent producers. But they are not paid wages. Nor are they free laborers within the framework of the scheme. They are linked to their own tenancies which are inherited by their heirs and they have labor obligations on those tenancies.

Agricultural Decline

The initial years of the scheme did not reveal how crucial these changes in the position of agricultural producers were. In the 1950s world cotton prices were unusually high, pumps and equipment were new, and costs of inputs were low compared to the levels they later reached while cotton prices fell.[8] Farmers grew cotton and received some profits. While farmers do not recall their precise yields and profits in the first decade of the scheme, they say yields of six to ten *kantar*[9] per *feddan* (2020-3368 kg/hectare) and yearly profits of £S100 on five *feddans* were not unusual.[10] Farmers and management thus appeared to have a common interest in cotton production. Villagers' economic situation seemed to be secure and even improving as unprecedented cash came into their hands.

In the 1960s when world cotton prices declined, however, farmers found themselves in a crisis. They received little or nothing for the cotton they produced, or worse, were in debt to the scheme for production costs. Debts are collected from subsequent years' cotton profits, reducing farmers' chances of receiving cash even in a good year. Having little control over the production process and means of production, farmers could not respond to the changed market conditions. They were dependent on management to insure their welfare.

The conflict of interest between farmers and management that is inherent in the structure of the scheme became manifest as farmers were required to continue cultivating cotton although they received nothing for it. If they refused, they would forfeit their land. This would deprive them of any means to grow food. By 1966 there was a major strike and a violent uprising of tenants on the Wad al Abbas scheme over the lack of cotton profits.[11] According to a farmer who participated, the army and the police were brought in and twenty-one men were arrested. As he said cynically and despairingly, "Since then, there has been no strike here." Conditions on the scheme, however, have not improved.

In 1980 1,591 out of 1,597 farmers under the administration of the Wad al Abbas office were in debt to the scheme. Most tenants at Wad al Abbas have not received cotton profits in years. Cotton yields are extremely low. The average yield in 1980 was 1.5 *kantar* per *feddan* (505.16 kg per hectare) for the roughly 2,500 *feddans* of cotton cultivated under the administration of the Wad al Abbas office. In March 1981 when cotton picking was still under way, average yields were expected to reach only 1.3 *kantar/feddan* by managements' estimate. Mean cotton yields among a small sample of Wad al Abbas farmers were 1.48 *kantar/feddan* in 1981 and 1.23 *kantar/feddan* in 1982.[12] Yields of three times this magnitude are considered low compared to yields that have occasionally been achieved in Sudan and those achieved in Egypt, Mexico, and Peru (Jansen and Koch, 1982:31; ILO, 1976:258).

By the time of this study, farmers at Wad al Abbas no longer saw cotton profits as an issue. Few believed they would be paid, regardless of yields. They no longer wanted to grow cotton at all. There was no sense of a shared interest with the state in the cotton crop. Farmers saw clearly that they were ultimately performing forced labor on cotton for the benefit of others. In 1982 local schoolboys held a spontaneous demonstration and riot in the village that culminated in the ransacking of the scheme offices. Conditions on the scheme affect them not only because their fathers are tenants but because they perform farm work as unpaid family laborers after school and during vacations. About a dozen boys were arrested and promptly tried in Sennar where they were sentenced to whipping. As is customary in Sudanese courts, the lashes were administered on the spot and the prisoners released. Such mass actions by the rural population are relatively rare and they are put down by force, occasionally with loss of life (Ali, 1983).

More generally, the farmers' response to their position as laborers in an agricultural system they do not control has been to do the minimum required on cotton to retain access to their sorghum land. This strategy allows farmers to minimize their losses on cotton and makes it easier for them to meet the labor requirements of sorghum cultivation for their own consumption. Farmers are thus partly responsible for the low cotton yields. But, it is the relations of production imposed on them that make them behave as they do since the scheme severely restricts their options. In the words of a Wad al Abbas farmer, "It's not because of the farmers that production fell. The farmers said, 'You don't supply spare parts, fuel, and water—why should I cultivate cotton?'" Farmers cannot substitute another crop for cotton nor improve the production process which is largely out of their control; they have little means of increasing their chances of cotton profits. They have only the negative option of refusing to invest in cotton production, thereby sacrificing their own chances of a good crop and wasting whatever resources they do put into cotton.

While farmers are partly responsible for low cotton yields, they have every incentive to attain high productivity in sorghum since they own this crop. Yet sorghum yields are also low and crop failure is common. One third of a sample of Wad al Abbas farmers experienced total crop failure of sorghum in 1980; 31 percent suffered crop failure the following year.[13] For those who harvested some sorghum the mean yield was 1.97 *showal/feddan* (443.5 kg/hectare) in 1980[14] and 2.9 *showal/feddan* (652.9 kg/hectare) in 1981.[15] These are extremely poor yields for irrigated agriculture. They are even lower than those reported on the Gezira Scheme where yields are 66 percent under agricultural research results (Tait, 1983; Sudanow in Tait, 1983). Wad al Abbas farmers' sorghum yields do not compare favorably with those achieved under traditional methods at Wad al Abbas or those reported for a Gezira village prior to the scheme there. Wad al Abbas farmers said they used to figure on yields of about 5 *showal/feddan* (1126 kg/hectare) and Randell (1958:38) reports the same for good years at El Gedid in the Gezira where the pattern of traditional agriculture was similar to that at Wad al Abbas.

The scheme's poor performance in sorghum production cannot be attributed to farmers' lack of incentive. Rather, it stems from production conditions imposed on farmers by the scheme. Farmers are unable to insure sufficient and timely irrigation of their crops and are limited in the amount of household labor and land they can allocate to sorghum because of mandatory cotton cultivation. Furthermore, neither sorghum nor cotton production on the scheme regularly generate surplus that farmers can reinvest. Thus, they lack the means to improve productivity.

While productivity per *feddan* is significant as one measure of agricultural development, in terms of farmers' subsistence needs, the total output is more important. Even with lower yields per *feddan* farmers could produce enough grain to feed themselves before the scheme because they allocated more land to sorghum than the scheme permits. As a result of the scheme, villagers are forced to rely heavily on purchased food (Bernal, forthcoming).

Agriculture no longer provides a sufficient subsistence base nor is an avenue of accumulation for villagers. Off-scheme ventures are essential to survival. Labor migration and trade have come to play an increasing role in villagers' household economies. By the time of fieldwork, income from such activities was necessary to meet basic household consumption needs and to maintain agricultural production (Bernal, 1985). Farming has become a subsidiary strategy aimed at reducing expenditures for food. No household supports itself solely through agriculture. At the same time, however, off-farm work reduces household labor available for farming. For the small number of tenants with substantial cash resources from trade or labor migration, under present conditions agriculture is not an attractive investment because of the risk and restrictions imposed by the scheme.

Under these conditions where productive resources and control over production decisions have largely been taken away from farmers, talk of incentives appears meaningless. Yet, during fieldwork in 1981 incentives were introduced on many Sudanese schemes including the one at Wad al Abbas. To stimulate cotton production, accounting procedures were altered so that tenants would be paid outright for each *kantar* of cotton beyond a minimum yield of three *kantars* per *feddan.*

Farmers at Wad al Abbas expressed little enthusiasm for this change. It did not alter any of the conditions that make achieving good yields so difficult on the scheme. Most farmers continued to see cotton production as a futile exercise that might benefit the state but not them. Their apparent fatalism was justified when average yields that year fell below the set minimum and the majority of farmers as usual received no payment.

Elites as an Obstacle to Development

From this case study of Wad al Abbas we see that the very structure of Sudan's irrigated schemes insures that they will not lead to agricultural development in terms of efficient use of resources and increased productivity. Farmers cannot develop agriculture (regardless of incentives) because control over production has been removed from them to a great degree and because they have been impoverished by the schemes. Any development then must come from the top down—from the state that organizes production and has resources.

Yet the state has stopped short of fully transforming peasant agriculture. Rather, through the schemes, the state has extended its control over the conditions of production and reproduction of peasant households. It has destroyed the self-sufficiency of peasant households. Yet it has maintained them as units of production within a production system under state control. The schemes are predicated on a certain amount of unpaid labor from household units that also produce part of their own subsistence. The state thus receives all the benefits derived from controlling the farmers' labor, the production process, and the product without having to pay for the labor.

On the one hand, the degree to which the Sudanese schemes have set proletarianization in motion has been underestimated. For example, Gaitskell (1959:88) states that, "the whole theme of the Gezira project was that of an independent working peasant to whom help was being brought, not of an employee charging up his time." Because peasant households that own their land (tenancies) and use some family labor carry out production, an appearance of autonomous peasant agriculture is maintained. The fact that farmers are able to circumvent or evade some of managements' demands reinforces the image of their independence.

Some writers go so far as to see tenants as landlords who employ hired labor as a luxury, and label those who work off the farm "absentee landlords" (e.g., Culwick, 1955; Osman and Suleiman, 1969; Nigam, 1977). This view holds farmers responsible for the poor conditions in agriculture. It assumes that dependence on hired labor and off-farm work are simply expressions of farmers' free choices. As such, it implies the need for greater coercion in the interest of agricultural development. It overlooks the concentration of power in the hands of management and the subordination of farmers to conditions imposed by the schemes.

On the other hand, it is a mistake to equate tenants with proletarians as Founou-Tchuigoua (1978) and Ali and O'Brien (1984) have done or to see their labor as a commodity as Barnett (1977) does. Unlike workers, tenants are not paid wages and must insure their own subsistence. And, unlike workers, tenants are charged for production costs and forced to share the risks of the enterprise. Tenants also differ from workers in that they retain some control over means of production and over the organization and allocation of their labor.

The irrigated schemes are not capitalist agriculture. They have, in fact, institutionalized non-capitalist relations of production and kept some factors of production outside the market. Under scheme regulations neither land nor tenant labor are commodities. Collins (1976:10) writes:

> Under this perverse system, tens of thousands of Sudanese peasants were dragged into the system of commodity production. While their labor power was directly appropriated for capitalist accumulation, they nonetheless remained on the periphery of capitalist social relations. Working individually, without a direct wage, and still engaged partially in subsistence farming, they remained poised between two social orders.

Tetzlaff and Wohlmuth (1980) recognize this aspect of the schemes which they call "crypto-capitalist." On the schemes the extraction of value does not take place by paying producers wages representing less than the value they produce. It takes place primarily through forced labor where farmers must work cotton or face eviction. Reliance on forced labor means there is no pressure to increase the efficiency and productivity of labor. Value is primarily extracted not through increasing productivity (relative surplus value), but through increasing overall labor output (absolute surplus value).

A telling fact is that when the first irrigated scheme was established at Zeidab in 1905 it was organized around a paid agricultural labor force. This was quickly abandoned as unprofitable and replaced by "what appeared to be the only paying method of development—a tenancy system" (Gaitskell, 1959:52). However, while the labor of tenant farmers is clearly cheaper than that of wage-laborers and therefore attractive from management's standpoint, the relations of production on the schemes have in the long-term inhibited agricultural development.

Capitalist production is based on wage-labor and entails a dynamic process of accumulation and reinvestment to increase the productivity of labor. In contrast, the Sudanese schemes are based on extending control over many low-productivity, labor-intensive units (peasant households) that must continue to work in spite of poor and even diminishing returns (Martinez-Alier, 1983; Chayanov, 1966; Bernstein, 1977)[16].

Decades of poor performance have not led to significant reorganization or abandonment of the schemes. To the contrary, in spite of the problems that have plagued the schemes from the very beginning in 1905 (Gaitskell, 1959), there have been continual efforts to expand them. Recently, the 1976-1985 plan of the Arab Fund for Economic and Social Development envisioned more than doubling their area (see Oesterdiekhof and Wohlmuth, 1983). Yet a 1976 report on Sudan's irrigated schemes concluded that "the economic benefit/cost ratio of investing in increased yields is far superior to that of investing in expanding the present system" (ILO, 1976:263). The constant drive to expand the schemes rather than to raise productivity can be explained by the fact that the state's profits derive from total outputs of labor rather than from the relative productivity of labor. The more peasant households that are brought under scheme control—the more profit. What is lost in low yields and inefficiency is thus offset by increasing the number of production units. In the colonial era England was motivated by the need to supply cotton to its mills. Sudanese governments have wanted the export earnings, 50-70 percent of which have generally come from cotton (Oesterdiekhof, 1980:276; Dinham & Hines, 1983:193).

Along with expansion of the schemes, there has been a strategy of increasing mechanization. Mechanization is often taken as an indication of capitalist agriculture and seen as part of the process of increasing productivity. However, mechanization of operations on the Sudanese schemes has not strictly proceeded where labor bottlenecks or costs of hired labor are greatest. For example, mechanization on the Gezira has been extended to sowing and the application fertilizer, neither of which correspond to peak labor demands or costs (Tait, 1983). Rather than being guided by economic rationality, mechanization appears to be part of a strategy to further reduce farmers' autonomy and increase management's power. The ILO (1976:261) report on the schemes states, "It is not clear to the mission that further mechanisation has been demonstrated as economically efficient." According to Tait (1983:117), "mechanization of production becomes the alternative to structural or organizational reforms" of the schemes. In spite of mechanization, farming on the schemes remains labor-intensive and labor requirements per *feddan* cotton have actually increased (ILO, 1976:259-60). Unpaid tenant labor remains crucial to the operation of the schemes.

Sudan's irrigated schemes and the strategies of expansion and mechanization may lead to accumulation of wealth by the state in the form of cotton that is artificially cheap because it is produced by forced labor. But, they will not lead to the development of agriculture. They have not increased agriculture's role in satisfying basic needs and will remain limited in their ability to raise agricultural productivity. A comparison of Sudanese traditional rainfed, mechanized rainfed, and irrigated agriculture found that the benefit/cost ratio is lowest in irrigated agriculture, development costs per *feddan* are ten times those of mechanized cultivation and twenty-five those of improving traditional rainfed agriculture, and that of the three, irrigated agriculture has the lowest net foreign exchange benefit (ILO, 1976:264). However, irrigated agriculture is "superior to the other types of agriculture in generating government revenue..." (ILO, 1976:264). This paradox can be explained by the greater control the state exercises over farmers on the irrigated schemes than over those farming off-scheme by traditional or mechanized methods. The irrigated schemes are the only type of Sudanese agriculture that insures the transfer of farmers' total output (in cotton) to the state. The state thus profits most from the least profitable system of production.

Current prescriptions for African agricultural development do not offer a way out for Sudan, but more of the same. Given the limits on the peasants' autonomy and resources, they cannot instigate agricultural development even if they have the incentive. At the same time, development through coercion has failed because the state and the elite it represents are not fully committed to altering the present system by which they get peasant labor for free.

CONCLUSION

While this Sudanese case may seem extreme, it is not unique. Similar development policies with similar consequences have been described in Burkina Faso (Gervais, 1984), Ivory Coast (Campbell, 1984), Senegal (Adams, 1982), Nigeria (Watts and Shenton, 1984), and Uganda (Mafeje, 1979). These analyses reveal the lack of real increases in the productivity of agricultural labor. Increased output is due instead to increases in the land devoted to a particular crop and in the number of farmers producing it. Both coercion and price incentives in turn are used to achieve this. Campbell's (1984) account of Ivoirian agricultural development illustrates this fluctuation between coercion and incentives over time.

Watts and Shenton (1984:183) report "an increase in output without a commensurate development in the means of production" in Nigerian agriculture. Among the means used to accomplish this, they include the intensification of labor, reduction of household food production and substitution of purchased foods or less labor-demanding food crops, and the use of migrant laborers from subsistence areas (1984:183). All of these, with the exception of changing the staple crop, we have seen in the case of Wad al Abbas.

As in Sudan, such strategies are directly linked to food shortages and rural poverty and, hence, ultimately to a decline in peasants' productive capacity (Roesch, 1984; Gervais, 1984; Campbell, 1984; Franke and Chasin, 1980). Under such conditions, recent exhortations to increase incentives to African peasants amount to a call to stop beating a dead horse and give it a carrot.

Both sides of the coercion versus incentives debate in African agriculture are deficient. Both fail to recognize the structural constraints faced by contemporary peasants and overestimate the progressive role of elites. Their solutions are thus simplistic. Neither considers the profound changes which have already taken place in African agriculture, altering the conditions under which production is carried out and farmers' relationships to states and markets.

Development strategies must be rooted in local conditions and correspond to the transformation in agriculture that has already occurred. They must recognize the degree to which even where the peasant household appears to be the unit of production—its control over conditions of production may be limited through dependence on others, such as government, merchants, or landlords.

Any solution for Sudan must take into account the legacy of forced labor, the destruction of rain-fed agriculture in scheme areas, the undermining of the subsistence economy, and the quasi-proletarianization of the rural population. This history simply cannot be erased. The heavy dependence of rural Sudanese on purchased goods including their subsistence grain and their reliance on non-agricultural income must be confronted. Even if the present schemes are dismantled, they have already brought profound changes in rural areas.

Development strategies based on an ideal notion of independent peasants will not work. The base on which such strategies should build has already been destroyed or distorted in many areas. Those who, like Bates, assume that development can come from below guided by the right prices, put too much faith in African peasants' capacity to respond to incentives. They overlook the great constraints that the majority of farmers face in access to land, capital, labor, technology, and in retaining control over their own products. They overlook the economic structures that maintain these constraints. Incentives will not work on those too poor or powerless to respond to them.

Where control over production decisions and resources has been taken from peasants, conditions are created where it appears that development can only come from above. This justifies further subordination of the producers to central administration or other forms of elite domination. Hyden and others who advocate the need for greater control over peasants (coercion) assume that those in power will use it to develop agriculture in a way that benefits society. However, the class interests of the powerful limit their progressive role. It is not necessarily in the interest of elites to transform agriculture if their wealth derives from its present structure. Yet unless their hold over producers is broken, farmers themselves will be unable to effect such a transformation. In development policies this double-bind is reflected in the dialectic between coercion and incentives. Calls for incentives follow the failure of coercive measures to increase agricultural productivity. But, unless structural changes in access to power and resources accompany incentives, the majority of peasants cannot respond effectively. This is hailed by observers as the failure of incentives and a new round of coercive policies begins.

We need solutions to the problems in African agriculture that acknowledge the material conditions of contemporary rural populations and the obstacles to development posed by elites. These make clear that nothing short of great changes in control over resources will lead to agricultural development.

NOTES

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1. Research was carried out in the village of Wad al Abbas from June 1980 through June 1982.
2. 1 *ardeb* = 2.5 sacks at Wad al Abbas, approximately 236 kg.
3. 1 *feddan* = 1.038 acres = .42 hectare.
4. 10 pt. = one tenth of a Sudanese pound.
5. These figures include farmers in other villages as well as Wad al Abbas.
6. For a detailed account of the labor shortages faced by Wad al Abbas farmers see Bernal (forthcoming).
7. In January 1980 £S1 was officially worth US$1.25. It declined to US$1.11 by June 1982 and has since been devalued several times.
8. Both the amounts of inputs and the per unit costs of inputs to cotton production have increased. Mechanization has increased, as have applications of fertilizers and aerial pesticide spraying. Between 1967 and 1974 alone the cost of cotton production on the Gezira Scheme rose 319 percent (Oesterdiekhof 1980:296). And, while the Gezira is gravity-irrigated, rising fuel prices have added to the cost of irrigation on the pump schemes.
9. 1 *kantar* = 312 lbs. = 141.5 kg unginned cotton.
10. Data from the nearby Gezira Scheme for this period suggest a less favorable picture. One unpublished report states that farmers' profits on ten *feddans* of cotton averaged only £S17 a year from 1955 to 1965 (Simpson in Barnett, 1977:88). It is possible that Wad al Abbas farmers exaggerate the good old days somewhat.
11. For accounts of similar strikes on other schemes see Ali (1983) and Khalafalla (1981).
12. n=22 in 1981; n=23 in 1982. Figures are for the agricultural years ending in 1981 and 1982, respectively.
13. n=27 in 1980; n=26 in 1981. Sorghum is harvested in October and November; figures are for the agricultural years ending in 1981 and 1982 respectively.
14. A *showal* (sack) is a measure of volume equal to approximately 208 lbs. or 94.6 kg of sorghum.
15. n=18 both years.
16. The argument advanced here thus differs from Tait (1983) who views the schemes as combining a capitalist sector for cotton production and a non-capitalist sector for the production of subsistence crops and argues that capitalist profitability in terms of returns to

management governs cotton production.

REFERENCES

Adams, Adrian. 1982. "The Senegal River Valley: What Kind of Change?" pp. 67-90 in Hazel Johnson and Henry Bernstein (eds.) *Third World Lives of Struggle.* London: Heinemann Educational Books.

Ali, Taisier. 1983. "The Road to Jouda." *Review of African Political Economy* 23: 4-14.

Ali, Taisier and Jay O'Brien. 1984. "Labor, Community, and Protest in Sudanese Agriculture, pp. 205-38 in Jonathan Barker (ed.) *The Politics of Agriculture in Tropical Africa.* Beverly Hills: Sage Publications.

Anthony, K., B. Johnston, W. Jones, and V. Uchendu. 1979. *Agricultural Change in Tropical Africa.* Ithaca: Cornell University Press.

Awad, Mohammed Hashim. 1971. "The Evolution of Land Ownership in the Sudan." *Middle East Journal* 25/2: 212-28.

Barnett, Tony. 1977. *The Gezira Scheme: An Illusion of Development.* London: Frank Cass.

Bates, Robert H. 1981. *Markets and States in Tropical Africa.* Berkeley: University of California Press.

Beer, C.W. 1955. "Social Development in the Gezira Scheme." *African Affairs* 54: 42-51.

Bernal, Victoria. 1985. *Household Agricultural Production and Off-Farm Work in a Blue Nile Village, Sudan.* Doctoral Thesis. Northwestern University.

___. forthcoming. "Agricultural Development and Food Production on a Sudanese Irrigation Scheme," in Muneera Salem-Murdock and Michael Horowitz (eds.) *Anthropology and Rural Development in North Africa and the Middle East.* Boulder: Westview Press.

Bernstein, Henry. 1977. "Notes on Capital and Peasantry." *Review of African Political Economv* 10: 60-73.

Brausch, Georges, Patrick Crooke and John Shaw. 1964. *Bashaqra Area Settlements 1963, A Case Studv on Village Development in the Gezira Scheme.* Khartoum: University of Khartoum Press.

Brown, Lester R. and Edward C. Wolf. 1985. "Reversing Africa's Decline." *Worldwatch* 65: 59-70.

Campbell, Bonnie K. 1984. "Inside the Miracle: Cotton in the Ivory Coast," pp. 143-72 in Jonathan Barker (ed.) *The Politics of Agriculture in Tropical Africa.* Beverly Hills: Sage Publications.

Chayanov, A.V. 1966. *The Theory of Peasant Economy.* Daniel Thorner, Basile Kerblay, and R.E. Smith (eds.) Illinois: Richard D. Irwin.

Collins, Carole. 1976. "Colonialism and Class Struggle in Sudan." *MERIP Reports* 46.

Culwick, G.M. 1955. "Social Change in Gezira." *Civilisations* 5/2:173-81.

Dinham, Barbara and Colin Hines. 1983. *Agribusiness in Africa.* London: Earth Resources Ltd.

Founou-Tchuigoua, B. 1978. "De Facto Wage-Earners in the Gezira Scheme (Sudan)." *African Development* 3/1: 25-50.

Franke, Richard W. and Barbara H. Chasin. 1980. *Seeds of Famine.* Totowa, N.J.: Rowman and Allanheld.

Gaitskell, Arthur. 1959. *Gezira: A Story of Development in the Sudan.* London: Faber and Faber.

Gervais, Myriam. 1984. "Peasants and Capital in Upper Volta," pp. 127-41 in Jonathan Barker (ed.) *The Politics of Agriculture in Tropical Africa.* Beverly Hills: Sage Publications.

Ghai, Dharam and Samir Radwan. 1983. "Agrarian Change, Differentiation and Rural Poverty in Africa: A General Survey," pp. 1-29 in Dharam Ghai and Samir Radwan (eds.) *Agrarian Policies and Rural Povertv in Africa*. Geneva: ILO.

Hart, Keith. 1982. *The Political Economv of West Africa Agriculture.* Cambridge: Cambridge University Press.

Hyden, Goran. 1980. *Beyond Ujamaa in Tanzania.* Berkeley: University of California Press.

___. 1983. *No Shortcuts to Progress.* Berkeley: University of California Press.

ILO. 1976. *Growth , Employment and Equity: A Comprehensive Strategy for the Sudan.* Geneva: Imprimeries Populaires.

Jansen, Heinz-Gerhard and Werner Koch. 1982. "The Rahad Scheme: The Agricultural System and its Problems," pp, 23-39 in Gunter Heinritz (ed.) *Problems of Agricultural Development in the Sudan.* Gottingen: Edition Herodot.

Keddeman, William and Ali Abdel Gadir (eds.). 1978. *Employment, Productivity, and Incomes in Rural Sudan.* Khartoum: Economic and Social Research Council and ILO.

Khalafalla, El Fatih Shaaeldin. 1981. *The Development of Peripheral Capitalism in Sudan: 1898-1978.* PhD Thesis. SUNY Buffalo.

Kiss, Judit. 1977. *Will Sudan be an Agricultural Power*? Studies on Developing Countries 94. Budapest: Institute for World Economics of the Hungarian Academy of Sciences.

Koch, Werner and Friedrich Bischof. 1982. "Weed Problems in Irrigation Schemes in the Sudan," pp. 5-22 in Gunter Heinritz (ed.) *Problems of Agricultural Development in the Sudan.* Gottingen: Edition Herodot.

La-Anayane, Seth. 1985. *Economics of Agricultural Development in Tropical Africa.* New York: John Wiley and Sons.

Lele, Uma. 1984. "Tanzania: Phoenix or Icarus?" pp. 159-95 in Arnold C. Harberger (ed.) *World Economic Growth: Case Studies of Developed and Developing Nations.* San Francisco: ICS Press.

Mafeje, Archie. 1979. "Agrarian Revolution and the Land Question in Buganda," pp. 67-88 in Bernardo Berdichewsky (ed.) *Anthropology and Social Change in Rural Areas.* The Hague: Mouton.

Martinez-Alier, Juan. 1983. "Sharecropping: Some Illustrations." *Journal of Peasant Studies* 10/2: 94-106.

Nigam, Shyam B.L. 1977. "The Labour Requirement and Supply Situation in Agriculture in the Sudan (1973-1985)," pp. 140-60 in A.M. Al Hassan (ed.) *Growth, Employment and Equity.* A Selection of Papers Presented to the ILO Comprehensive Mission to Sudan 1974-5. Khartoum: Khartoum University Press.

O'Brien, Jay. 1981. "Sudan: An Arab Breadbasket?'" *MERIP Reports* 99: 20-27.

Oesterdiekhof, Peter. 1980. "Der Agrarsektor Des Sudan," pp. 257-382 in Rainer Tetzlaff and Karl Wohlmuth (eds.) *Der Sudan - Probleme und Perspektiven der Entwicklung.* Frankfurt/Main: Alfred Metzner Verlag.

Oesterdiekhof, Peter, and Karl Wohlmuth. 1983. "Introduction," to *The Development Perspectives of the Democratic Republic of the Sudan.* Munich: Weltforum Verlag.

Osman, Omer Mohommed and A.A. Suleiman. 1969. "The Economy of Sudan," pp. 436-70 in Paul Robson and D. A. Lury (eds.) *The Economies of Africa.* Evanston: Northwestern University Press.

Randell, John R. 1958. "El Gedid: A Blue Nile Gezira Village." *Sudan Notes and Records* 39: 25-39.

Roesch, Otto. 1984. "Peasants and Collective Agriculture in Mozambique," pp. 291-316 in Jonathan Barker (ed.) *The Politics of Agriculture in Tropical Africa.* Beverly Hills: Sage Publications.

Said, Yousif Hassan. 1968. *The Role of Agriculture in the Economic Development of Sudan.* PhD Thesis. University of Wisconsin.

Taha, El Jack Taha. 1973. "Land Tenure and Size of Holding Toward a New Strategy for Economic Studies of Tenancy Farming in the Gezira Scheme." *Journal of Administration Overseas* 12/4: 211-18.

Tait, John. 1983. "The Modernization of the Colonial Mode of Production in the Gezira Scheme," pp. 81-136 in Peter Oesterdiekhoff and Karl Wohlmuth (eds.) *The Development Perspectives of the Democratic Republic of the Sudan.* Munich: Weltforum Verlag.

Tetzlaff, Rainer and Karl Wohlmuth. 1980. "Einleitung," to Rainer Tetzlaff and Karl Wohlmuth (eds.) *Der Sudan - Probleme und Perspektiven de Entwicklung.* Frankfurt/Main: Alfred Metzner Verlag.

van Donge, J. 1984. "Rural-Urban Migration and the Rural Alternative in Mwase Lundazi, Eastern Province, Zambia." *African Studies Review* 27/1: 83-96.

Versluys, J.D.N. 1953. "The Gezira Scheme in the Sudan and The Russian Kolkhoz: A Comparison of Two Experiments." *Economic Development and Culture Change* 2/1: 32-59, 2: 120-35, 3:216-35.

Voll, Sarah P. 1981. *A Plough in Field Arable.* Hanover: University Press of New England.

Watts, Michael and Robert Shenton. 1984. "State and Agrarian Transformation in Nigeria," pp. 173-204 in Jonathan Barker (ed.) *The Politics of Agriculture in Tropical Africa.* Beverly Hills: Sage Publications.

World Bank. 1981. *Accelerated Development in Sub-Saharan Africa: An Agenda for Action.* Washington, D.C.

Wynn, P.F. 1969. "The Economics of Pump Irrigation from the Nile in the Sudan." *Sudan Notes and Records* 49: 83-103.