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AN EXPLORATION OF  
ALTERNATIVE LAND TENURE AND ORGANIZATIONAL ARRANGEMENTS  
FOR THE BAKEL SMALL IRRIGATED PERIMETERS

by

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I. INTRODUCTION

The purpose of this paper is to attempt to identify the most appropriate land tenure arrangement for the small irrigated perimeters of the Bakel region of Senegal, first established in 1974. This will be done, in part, by taking a look at the various factors that influence the sort of tenure arrangement adopted, given the introduction of this new technology. These are, namely: the region's cultural tradition, the legal/institutional apparatus of the country with respect to land, the various motives which prompted introduction of irrigation, and finally the technical constraints imposed by irrigation. Also, advantages and disadvantages of alternative frameworks within which to organize irrigation farming will be discussed.

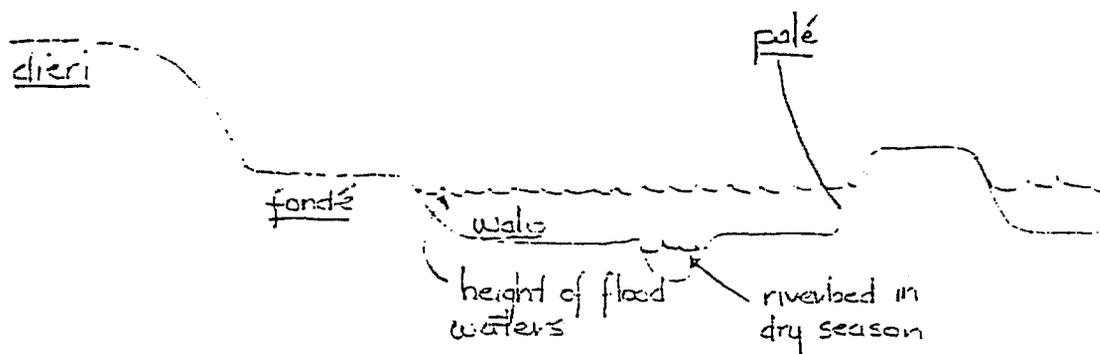
The Bakel perimeters, situated along the Senegal river in northeast Senegal, began to operate in the early 1970s. Because of drought, rainfed agricultural production and livestock activities were no longer reliable means of support for the local population. Furthermore, remittance earnings from migrant workers in France, a very important source of income for the local economy, were being threatened by tightened immigration regulations and high unemployment levels in France.

The inspiration for the irrigated perimeters came from a migrant worker, Diabé Sow, who returned from France to his native village of Koungani and established an irrigated perimeter in 1975, with the assistance of a PVO. Neighboring villages followed Koungani's example. Collective village groups were established and organized into a Federation with the purpose of increasing and diversifying agricultural production to assure a minimum level of production and provide an additional source of revenue. By 1977, both the parastatal agency, SAED, and USAID were involved in the project. What had begun as a modest local initiative quickly found itself transformed into a multi-million dollar project.

## II. THE LOCAL POPULATION

### The terrain

Below is a sketch of a representative cross-section of the Senegal River valley, including the principal land types which determine the possibilities for agricultural production.



- walo is land subject to natural inundation during the river's annual flood. It is by far the best land; not only is it well-watered, but the deposit of silt during floods makes it quite fertile. Walo may not be flooded every year, depending on the height of the river's peak flow.
- pale land is very rich; even with low floods the land is farmable. The distinction between pale and walo lands may not be as clear-cut as it appears on the map.
- fonde land is situated on the margin of the walo. This land is flooded only during the highest flood years.
- dieri land is watered exclusively by rainfall. Such land can be cropped consecutively for only three years, after which it loses its fertility (Kanel, p. 3).

Walo land is the most valuable and the least available. Nobles control allocation rights to these lands and the definition and enforcement of property rights is clear-cut. Use of walo lands by artisans and slaves is in exchange for labor or rent payments to the nobles.

The small irrigated perimeters are situated largely on fonde land where, traditionally, households did not come up against rigid social constraints regarding the amount of land they could farm (Bloch, p. 31).

### The Soninke and Land Tenure Rights

In the Bakel region one finds several ethnic groups: the Soninke or Sarakolle, the Toucouleur, the Peulh, and the Bambara. This paper concentrates on the Soninke, who are the dominant group along the 80-kilometer

stretch from Ballou to Waoundé on the Senegal side of the river. Today, as in the past, they are involved in trade and migration, as well as in agricultural production. A strong tradition of social cohesion and collective action for community goals continues despite the caste structure of the society.

Soninke society comprises a number of clans or dyamu. The dyamu is the patrilineal group that freemen, both men and women, are born into. These various clans are hierarchically organized according to the order in which the clans settled into the region. And allocative rights to land are the privilege of those clans that laid first claims to the land.

Tracts of land by the clans were acquired in one of two ways: land-grabbing by a newly arrived clan whose military power enabled it to gain control of the land, or an agreement between clans by which the newly arrived group consented to leave the land under the control of the previous inhabitants in exchange for political power (Pollet and Winter, p. 313).

Pollet and Winter distinguish between political and land-tenure prerogatives. In the past, even when both privileges rested with one clan--or more specifically, with one clan elder--the two rights remained very much separate one from the other, and did not reinforce each other. Thus, the title of chief could not accord the officeholder any additional allocative rights to land, and non-chiefs with control over land enjoyed no additional political power from their position.

Pollet and Winter claim that the distinction between chiefs, debegumme, and the "masters of the land," nyinyagumme, was somewhat mitigated with the establishment of French colonial rule. During the colonial period, sources of wealth for a chief were greatly curtailed. Restriction of privileges in the political and juridical realm meant that a chief could no longer levy taxes or exact fines, nor could he enrich himself with booty from raids. There remained certain rather limited perquisites. One such right, which presumably exists to this day, was the chief's right to a particular tract of land, usually situated along the river.

According to Weigel, in the Bakel region political power and land tenure prerogatives are still not entirely synonymous:

De même que dans le Dyahunu la multiplicité de la maîtrise foncière signifie qu'il n'y a pas superposition entre le pouvoir politique villageois et la maîtrise foncière: tout en reconnaissant la prééminence du chef du village (debegumme), issu du lignage dominant, les différents clans exercent les privilèges qui suivent la détention foncière comme la dévolution de l'usage de la terre, la mise en gage (teyle) ou la vente de la terre (niine xobonte) (Weigel 1982, p. 64).

In any case, today those with control over the land, the nyinyagumme, have rights which consist exclusively of allocating land. Allocation of land to other nobles and also to artisans and slaves is always done so a temporary and revocable basis. Generally speaking, as long as relations between the two parties are good, the individual cultivating land does so indefinitely. Depending upon what the nyinyagumme asks for, the cultivator of the land will usually give to the nyinyagumme an offering of millet (dyaka), sometimes representing a tenth of the crop (Pollet and Winter, p. 321).

Pollet and Winter note that in Mali there are multiple sources of rights to land which can create a rather confusing situation. In effect there are three sources: the traditional Soninke structure of landholding rights based on the clans; the Islamic landholding statutes based on certain written texts; and the Malian government's legal rights to land. Consequently, different parties have not infrequently taken advantage of this legal uncertainty. Customary rights, rights as defined by Islamic law, or state legislation regarding land will be selectively utilized according to which is most fruitful at the time. Though Pollet and Winter deal with Mali, it would not be presumptuous to expect a similar situation in Senegal where the introduction of irrigation has strong potential for increasing wealth and where both customary rights and national legal rights obtain.

Soninke society is not egalitarian, but rather is stratified into castes. At the top there is the noble or hore caste. The hore consist of debequmme, nyinyagumme, and the marabouts, or religious leaders. The power of the marabouts is less than that of other nobles. Next are the artisan castes or nyakhamala. These include, in order of standing, the traditionistes (gesere), the blacksmiths (tage), the griots (dyare), and the leatherworkers (garanke). The traditionistes recite and sing verses that recount the genealogical history and traditions of the noble families. Their role is similar to that of the griots who praise the nobles in song by bringing attention to their ancestral background. The blacksmiths produce the agricultural implements used in cultivation: hoes, sickles, axes, etc. the leatherworkers work on articles such as saddles, boots, sandals, bags, etc. The nyakhamala are allocated land according to the same criteria that prevail for the nobles.

Whether they practice their trade or choose to engage in other more remunerative activities, the nyakhamalas' social and political status remain the same. However, it has happened that certain individuals in the villages, by virtue of their more advanced education, their knowledge of new techniques of resource development, and their ability for organization, have stood on equal footing with the nobles, and sometimes have even been sought out for advice. Any irrigation project will benefit greatly if it relies on such figures to introduce new techniques, provided these individuals are properly trained (Sekou, p. 22).

Finally, there are the kome or descendants of slaves. The kome have no rights in land. Generally, they work the land of their masters in the walo, and have usufruct rights to plots in the dieri.

#### The Family as Production Unit

The previous discussion of Soninke social structure must be complemented by an overview of family organization, for it is at the level of the family, or ka, that production takes place and landholding patterns emerge. Pollet and Winter identify three forms the ka may take:

- A man, his wife (or wives) and their unwed children.
- Two or more brothers, their wives, and their unwed children.
- A man, his wife (or wives), their married sons with wives and unwed children.

The term ka is used either to define the extended family (which may not be residing together), or to define the immediate family group living in the same household. The kagumme, the head of the ka, is the eldest man and the supreme authority of the extended family.

Each household farms a family field, or te khore, as well as individuals' fields. Work on the te khore is performed by all the men in the family, and the kagumme has distributive rights over the produce grown. Generally the men work on this field each morning; the afternoon is left for working their individual fields. Traditionally, women were not required to work on the te khore. Recently, however, there has been a reorientation of women's labor towards work on the family field. That is, the labor shortage due to male migration has been partially compensated for by both a lapse in production of such crops as cotton and indigo, traditionally grown by women, and by women's participation on the te khore. On walo and fonde lands women's aid is recruited mostly during planting, guarding against birds and grazing animals, and during harvest time.

The crops grown on the te khore are shared by the entire family. It should be pointed out that notwithstanding the collective production efforts on the te khore and the cooperative nature of distribution, the te khore is not land held communally; rights to the land are held strictly by the kagumme. Also, it should be kept in mind that the collective production pattern at the family level has not customarily been reproduced on a village scale; in other words there is no tradition of cooperative production organized at levels higher than the ka.

It was suggested above that the Soninke maintain a division of labor and of rights between men and women. Today, the wife is "loaned" a parcel by her husband. She works on this parcel alone with the help of her daughters and she is sole owner of the fruits of her labor. As such, she can freely dispose of her produce as she wishes. It is up to her whether or not to distribute part of the harvest to the other members in her ka (Pollet and Winter, p. 396).

#### The Introduction of Irrigation

With the introduction of irrigation, tension has arisen between irrigation farming and traditional farming. Because irrigation farming on fonde land diverts labor power from walo lands (where nobles enjoy dominant rights to land), it weakens the social and political power of the nobles and increases the freedom of those who previously worked under their control on the walo lands. On the other hand, because irrigation is potentially more lucrative than rainfed farming, economic well-being might increase for all those involved in irrigation farming (Weigel 1982, p. 125).

Two possible scenarios can be visualized. Elites may recognize the economic opportunities inherent in irrigation and try to dominate the project and appropriate its benefits. In such a situation, irrigated land initially distributed in an egalitarian fashion would, with time, revert to those traditionally associated with land rights. Alternatively, traditional elites may perceive implementation of irrigation schemes primarily as threats to their social and political hegemony. Such a situation might imply efforts on their part to prove irrigation a failure.

In fact, the situation, as depicted by Weigel, supports the possibility for the latter scenario. Land tenure pressures and definition and enforcement of property rights are most strongly felt and evident on the fertile walo lands. In general, it is the nobility who enjoy exclusive allocative rights to these lands. Consequently, they can appropriate the labor power of casted and slave individuals with little access to land for the production process, thereby perpetuating what might be termed servile labor relations of production. Clearly then, irrigation and the distribution of plots across the social hierarchy presents an opportunity for lower-caste village members to free themselves of the obligations due the nobility. It also presents a challenge to the social and political power of the nobility. For once land tenure pressures subside on these flooded lands, so too does the control of the elite over the labor power and resources of other village members (Weigel 1982, pp. 120, 125).

Weigel points out that the various castes have responded differently to irrigation. In the late 1970s nobles showed much less interest in the projects than did the artisans or the slaves. This can be attributed to the fact that nobles continued to have access to the best lands. Artisans and slaves, on the other hand, most readily took part in this new form of cultivation while continuing to grow crops on their rainfed tracts. They were able to continue rainfed cultivation by hiring salaried workers from the outside. The area cultivated by these lower-caste groups exceeded that cultivated by the nobles; this is partly explained by the fact that artisans and slaves hired four times as much outside labor (Weigel 1980, p. 31).

### III. THE RELEVANCE OF NATIONAL LAND LEGISLATION FOR THE BAKEL PERIMETERS

As land has risen in value due to the implementation of irrigated perimeters, national land legislation has come to play an increasingly important role alongside customary land law. Thus, whatever land tenure pattern finally emerges in the region of Bakel will have been influenced by the state's legal power over land allocation.

In 1964 the Loi sur le Domaine National gave sole ownership of all land to the state, and did not give recognition to traditional ownership claims. The law did allow, however, for farmers to maintain their rights of usufruct as long as they continued to actively cultivate their land.

In 1972 the Loi Relative aux Communautés Rurales provided for councils in each rural community to allocate land and to direct the development and farming of such lands. These elected rural councils were to approve any use of land in their area of jurisdiction, with the proviso that it be distributed according to the ability of the applicant to exploit it in the most productive manner possible.

The difficulty with this principle is most easily seen in the case of irrigation or other forms of agricultural intensification. Mathieu claims that because increased productivity in the Senegal River basin is very much dependent on introduction of irrigation, and because irrigation is a costly

affair, the allocation of land by the state to individuals with the means to exploit the land productively really implies allocation of land to the better off. In his words:

Le principe de 'mise en valeur' à partir du moment où celle-ci est nécessairement coûteuse fait donc la part belle à ceux qui détiennent les moyens de la mise en valeur. Cette situation contient en germe un risque réel d'accentuation des inégalités, foncières et économiques, dans la vallée. On a donc ici un 'effet pervers' caractérisé dans la mesure où cette évolution, déjà perceptible, va à l'encontre des objectifs originels et avoués de la loi. (Mathieu, p. 7.)

In the Bakel region state-sponsored irrigation prevails. SAED, the parastatal rural development agency, has been allocating irrigation plots in the villages according to the principle of equal access to plots for all inhabitants, wealthy or not. Initially, SAED set various conditions for the farmers to obtain and retain land-use rights: the compulsory marketing of rice at state-set prices, planting and harvesting timetables, participation in maintenance, and rules for the allocation of land and the distribution of water. SAED's policies have, however, changed considerably in the recent past. In order to encourage increased autonomy of village perimeters, SAED is now calling for transfer of the perimeters to the farmers. To date, security of tenure on the small village perimeters resides with the "groupements de producteurs" (producer groups). It is the G.P.s, not the individual farmers, that sign a contract with SAED; responsibility for the fulfillment of obligations rests on the group. SAED, for example, has suspended or removed land-use rights of G.P.s who have refused to repay loans. The legal status of individual holdings is uncertain (Bloch, p. 38).

Landowners are aware that land potentially suited for irrigation may be subject to reallocation according to the National Land Law specifications. Because, not infrequently, traditional landowners do not exploit their own land, the 1964 and 1972 laws pose a clear threat to their control over the land. They also recognize that privately irrigated cultivation of non-rice crops promises of substantially increased revenues. Success among certain privately irrigated small perimeters installed since 1980 as well as the forthcoming completion of the Manantali dam reinforce this notion (Mathieu, pp. 7-8). Thus, there seems to be strong incentive for these traditional landowners to "play the game," so to speak. They cede their land willingly to be distributed in equal-sized plots among the villagers. That is, they cede to the village group usufruct rights to the land, though not the traditional claim of ownership. Should the project prove to be a failure and cultivation stops, it is understood in the village that the land reverts back to the traditional owner. One suspects that it may be in the interest of landowners to see the projects fail; not only will the land revert back to them, but it will do so with infrastructural improvements as well.

Two forces, then, have been at work since 1975: increased productivity of the land at the village level has been the natural outcome of the introduction of irrigation in the region; and a more egalitarian access to the land has been mandated by the legal and state-directed dictates outlined above. Yet, in the long run, it may very well be that these dictates have the opposite effect of putting into action forces that will result in new forms of inequality.

#### IV. PURPOSES FOR WHICH IRRIGATION IS UNDERTAKEN

The adoption of irrigation methods by villagers and the introduction of irrigation techniques by state agencies have been motivated by different objectives. Different objectives and their realization inevitably lead to differing land-tenure patterns. Most notably, they bear upon the appropriate size of holdings.

According to Adams, the OMVS put out a study around 1973 called "An Integrated Program for the Development of the Senegal River Basin." The program's purported objective was "to provide the people of the Senegal river valley with an adequate basic diet and increased cash income." The paper then went on to state that "the crops chosen must, while meeting as quickly as possible the food requirements of the people, generate high cash flows leading to rapid progress towards the state of economic 'take-off'." The program was one which envisioned extensive rice irrigation all along the Senegal river to meet the requirements of both food deficit areas such as the cities and local consumption needs. Rapid expansion of perimeters would allow for complete substitution of irrigated crops for rainfed crops. According to Adams, the government objective of achieving "high cash flows leading to rapid progress towards the state of economic take-off" implied the establishment of large private or state farms producing with hired wage labor. These industrial plantations would be able to appropriate the entire crop and thus to reinvest the entire cash flow (Adams, p. 119).

In contrast, the local population's objective for irrigation as propounded by the Federation of Villages was that small village perimeters serve as complements to rainfed farming: as a back-up if rains were sparse, as a source of revenue and an impetus to growth if rains were sufficient.

In the past decade the ambitious government plans for irrigation have moderated somewhat. Emphasis has moved away from large-scale towards smaller scale irrigation schemes. Still the question of plot size remains. When irrigation was first introduced, allocation of small plots was desirable given the farmers' inexperience with this form of cultivation and their reluctance to give up dryland farming and/or other economic activities until they could feel fully confident of irrigation's income-earning potential.

The farmers of the small Bakel perimeters show evidence of having passed beyond this stage. Yet plot sizes remain very small, ranging between .05 and .25 hectares. The size of plots is such that farmers cannot satisfy their cash and food needs on their irrigated plots alone. Yet it is not straightforward to determine the acceptable minimum plot size; one must consider many questions, including the following:

- Is production intended primarily for subsistence, for the market, or for both?
- Is irrigation farming to be practiced to the exclusion of other forms of cultivation?

- What other remunerative off-farm activities are there and how substantial are the income streams generated from such activities (i.e., what is the opportunity cost of full-time irrigation farming)?
- How much family labor is available for cultivation and which family members are available (women, children, older men, younger men)?
- How many household members must a given irrigated area support?
- What is the productivity of a given area of land under irrigation?

In Bakel, there has been abandonment of irrigation farming in certain cases and a return to rainfed cultivation. In part this can be explained by the fact that fixed costs of irrigation farming, such as costs incurred from pump implementation, are rather high, and returns rather low given the present market structure. What needs to be determined is whether an increase in plot size will suffice to realize an increase in returns relative to cost, and to secure irrigation farming as a viable source of food and cash requirements for the villagers.

#### V. TECHNICAL CONSTRAINTS OF IRRIGATION

Irrigation systems entail relatively heavy labor requirements for maintenance and repair, and also relatively high operating costs. Thus, the nature of irrigation is such that, technically speaking, cooperative production and communal holding of land may be most desirable so that problems of labor shortage, competition among farmers for water flows, and high operating costs can be skirted. Socially, however, for a community with traditional control of land based on a hierarchical, inegalitarian caste system, this may not be feasible.

As noted above, plots are generally not large enough to allow for the abandonment of rainfed farming. The result is a serious labor shortage during certain critical periods of the agricultural cycle. Given the use of the hoe, or daba, irrigated surface land cannot be worked until the rains have softened the land. Yet it is precisely during the first rains, around June, that the dieri fields must be planted. The high rate of male emigration to France means that a good part of the work force is made up of women and those men who are either old or very young. Thus, there simply is not enough manpower available to prepare both irrigation plots and rainfed fields. The two other critical periods are the corn harvest in mid-September and the millet harvest at the end of October (Adams, p. 186).

Certain progressive farmers, such as Diabé Sow, have tried to introduce new techniques and equipment to ease the production process and increase productivity of the land. Such experiments have run into difficulties; animal drawn plowing requires prior preparatory work in the fields (stump removing, etc.) beyond the capacity of the individual farmer and his family. Introduction of fertilizer benefits crops and weeds alike. Weeding work can increase as much as three-fold (Sekou, p. 37).

Characteristically, costs of running an irrigation system are quite high. Not only are there fixed costs of constructing the perimeter, but there are the variable costs of seeds, fertilizers, and fuel inputs as well. In many of the villages, a certain portion of the irrigated land has been set aside to be worked collectively; the proceeds from this land go towards financing the costs of irrigation. This seems to be the only way of covering such costs without going heavily into debt with SAED. Also, when plots are held and farmed individually, farmers often do not want to irrigate at the same time. The pump, then, has to be restarted many times; frequent breakdowns follow and contribute further to costs.

Most perimeters utilize surface irrigation. Apparently there is a less costly alternative that relies less on definition and enforcement of water rights. Sprinkler irrigation, according to report to AID, entails less time and technical effort for perimeter preparation, and may be more suited to the cooperative efforts of the village groupements (Keller, p. 57). It is, however, unclear whether the system costs and maintenance requirements would make this system economic.

## VI. ALTERNATIVE ORGANIZATIONAL FRAMEWORKS

Having laid out various factors that bear upon the land tenure arrangements adopted in the Bakel region, I would like to address several alternative organizational frameworks within which the Bakel population might carry on irrigation farming. The first alternative models organization of irrigation production on the example of peanut farms among the Mouride brotherhoods in western and central Senegal. The second alternative is based on village self-initiated collective irrigated perimeters that originated in the early 1970s in the Bakel region. Finally, the remaining two alternatives are taken from state-sponsored irrigation projects in Mauritania and Senegal.

### The Mouride Brotherhoods

The Mouride Brotherhoods, an Islamic brotherhood which originated in the late 1800s among the Wolof people of northwestern Senegal, have probably been the most successful force in the expansion of modern agricultural production in the country. It is conceivable that their form of social organization might serve as a model for the organization of irrigated farming as well (stripped, of course, of the religious connotations of the movement).

The Mouride agrarian settlement movement emerged from the social and economic crisis prompted by the expansion of French colonial rule in the Wolof zone. In the 19th century overcrowding of lands was already prevalent in the traditional Wolof zones. Because slaves and casted people enjoyed very limited rights to land in these traditional zones, it is not surprising that they turned their attention to the hitherto uncultivated lands of the Ferlo fringe (Cruise O'Brien 1975, p. 64). These arid lands were essentially barren and barely accessible; it was necessary that there be some organizing framework and numerical concentration of settlers. This was to be provided by the hierarchy of the Mouride Brotherhood.

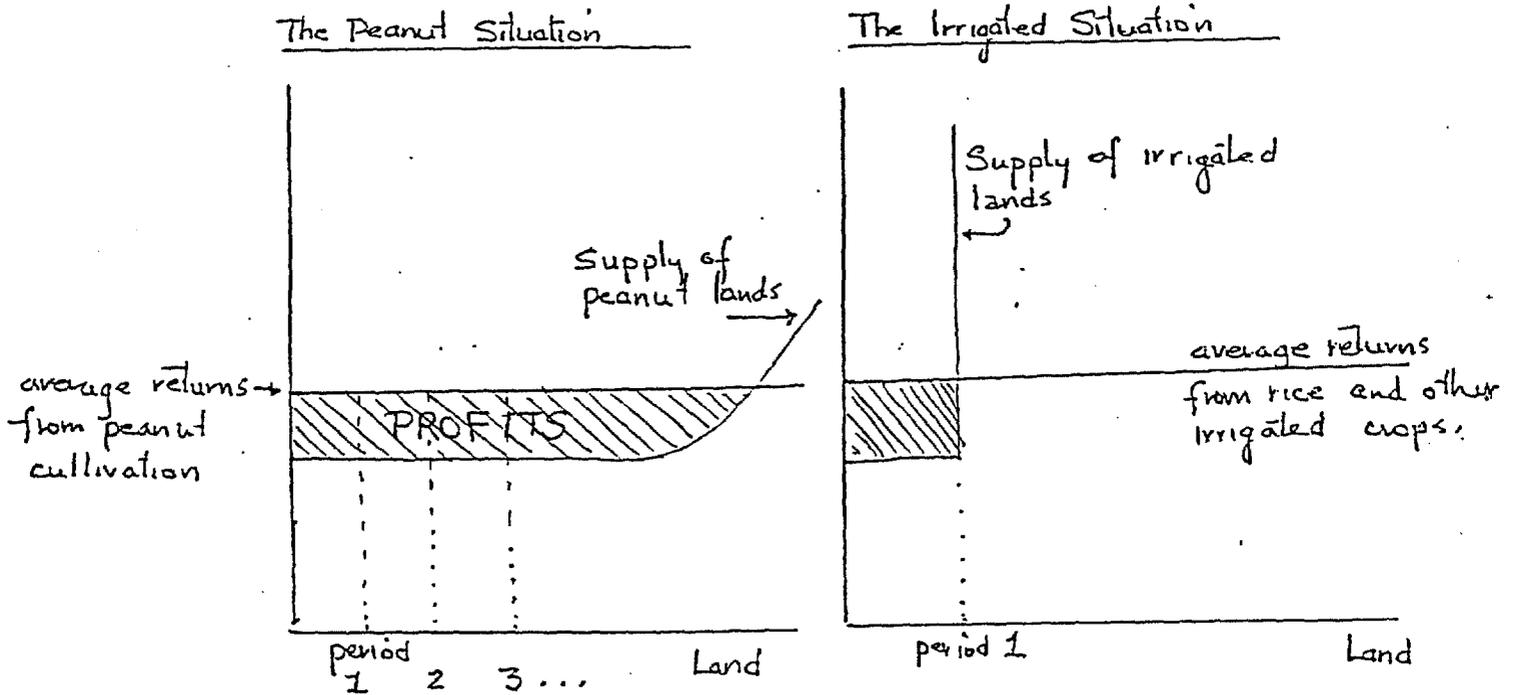
The central organizing unit was the dara or saintly settler camp, a group of twelve or so unmarried landless men working as disciples under their saintly sponsor. Cruise O'Brien points out that the sacrifices undertaken by these disciples were motivated only in part by "non-material incentives." "The dara situation has proven over time to be consistently temporary and transitional. The disciples loudly proclaiming their devotion to paradise alone, in fact receive their own individual plots of land at the end of some ten years of service." Such plots were cut out from the original dara estate; the end result was the establishment of a village. The saint would then recruit new disciples for dara service on new land (Cruise O'Brien 1975, p. 68).

Cruise O'Brien brings up two interesting points. The first is that settlers, whether slave or free-born, were rewarded equally. Only the artisan castes received significantly smaller land plots. This was justified given the allocation of part of their time to their craft rather than completely to farming. The brotherhoods, then, did better conditions for the lower orders of Wolof society. The second point is that such a system worked smoothly as long as land was abundant. Once land proved to be more scarce, it was increasingly difficult for the saints to move on to new lands as the former estates reverted to the disciples or talibes.

Several other aspects regarding this process need to be emphasized. The success of the Mouride peanut enterprises was, ultimately, largely due to strong government support. The interests of both sides were very much compatible: the government sought rapid expansion of the peanut farms; the Mouride leaders sought ventures with quick and substantial returns. The result was that the government gave free rein to the organization and promoted its growth by supplying ample credit and inputs. Second, the eventual breaking up of the estates and the establishment of the villages made the saints very much aware of the temporary nature of their enterprise. They therefore sought to maximize the immediate cash return of their ventures. Thus, soils were rapidly exhausted (Cruise O'Brien, p. 79).

With this background information, one can address the question whether such an approach might be applicable to irrigation farming along the Senegal River. From an economic standpoint, the following should be considered. In the early stages of the movement, the uncultivated Peulh lands of the Ferlo fringe were abundant, and costs of peanut cultivation were low given the rather simple technology used. The marginal effort or cost of acquiring additional plots of land was constant. If we assume that average returns from peanut cultivation exceeded the marginal cost of acquiring new lands, the graph on the next page illustrates that the saints received some profit from peanut cultivation.

Because of the abundance and cheapness of land, it was in the saints' interest to cultivate the soil to exhaustion, reward the talibes with land plots, and move on to new lands. This could only continue, obviously, as long as there was a frontier on which to expand. Once frontier lands no longer existed, the process would have to stop.



The pattern described above would be impossible to duplicate with irrigated land. The essential point is that irrigated land is by no means in abundance, and in the short run the amount is fixed. If the saints attempted to reproduce the pattern illustrated above with the working of soils to exhaustion, the process would come to a quick halt given that new irrigated lands are simply not available. If the saints were to invest in production by utilizing fertilizer, improved seeds, etc., in order to continue production on the same plot of land over an extended period of time, certainly the disciples could no longer work with the expectation that they would ultimately become owners of their plots; the land is too valuable and too scarce. Thus, the pattern breaks down.

From a social standpoint there are difficulties as well with such a process. Among the Soninke, children attend Koranic schools and must cultivate the marabout's fields. The marabout, in turn, must support his pupils. If a student wishes to continue his studies beyond the time when he reaches manhood, he then becomes the marabout's talibe, or karandingo. Because of the shortage of labor due to migration, it is only the better off that can afford to let one of their sons attend the school. The high status of the individuals attending the Koranic school implies that there is not that element of need which cemented the marabout-talibe relationship in the past. It is the social prestige acquired from attending such a school that is sought after.

Yet Mouride marabouts, whose income from peanut farming is drying up, have been among those applying for irrigated lands, and the state is lending support to brotherhood leaders who are eager to establish irrigation perimeters (Adams, p. 142). Obviously, such marabouts see it as in their interest to get involved in irrigation farming. Most likely, the organizational form adopted by these groups will be different from that one adopted for peanut cultivation.

### The Collective Village Perimeters

A second model is that of the champs collectifs, or collective fields, established in the early 1970s on the Bakel perimeters. As mentioned above, irrigation was first introduced in the village of Koungani in 1974 by Diabé Sow, a Soninke migrant worker returned from France. In the first year he set about trying to convince the villagers that agricultural improvements could be undertaken on a collective basis. He wished to extend the traditional pattern of family collective work to the village level.

The champs collectifs were implemented as non-individualized irrigation perimeters with the village as the sole unit of production. They existed alongside farmers' household rainfed fields. Anyone who wished to work on such communal village plots was welcome as a full member with no distinction as to age or sex. Members of the groupements, or producer groups, would divide into working teams of men and women, each headed by a leader. Three days of the week were given to collective work. On the remaining days pairs of men's and women's working teams would take turns cultivating the land. The first crops grown on the Koungani champ collectif were millet and maize and these were sold locally, the money earned to be used to meet the group's working costs.

Essentially, collective farming in its most complete sense involves collective ownership of the land, collective production efforts, and equal distribution of output among participants. Sow initially sought to implement all three with respect to the village irrigation perimeters. All three aspects are an answer to the technical constraints imposed by irrigation. The pooling of work-effort on the collective field would help to circumvent the labor shortage problem due to migration and to accommodate the rather labor-intensive nature of irrigation farming; the pooling of returns to irrigation would allow for a greater degree of self-financing of the relatively high operating costs thus moderating the need among farmers to borrow heavily from the government; finally, collective ownership of land, collective production efforts, and equal distribution of output among participants would mitigate competition among farmers for water flows, competition that may plague farmers when plots are farmed individually.

The test comes when one looks at how well the collective irrigated fields function alongside the household rainfed fields producing both for home consumption and for the local market. The incentive for families might very well be to do minimal work on the collective perimeter in order to devote as much time as possible to the individual household fields. Indeed, Dorner argues that such a division of land, labor, and resources can "undermine the entire effort and lead either to a complete subdivision into individual farms, or to an economically wasteful inbetween situation in which the private plots receive most of the resources, while the bulk of the land in the collective sector stagnates" (Dorner, p. 376).

### The State-Sponsored Projects

The following two examples are illustrations of state-sponsored projects. It is worthwhile to look at them together because of the fact that

the approaches for the implementation of irrigation adopted by the two governments have been quite different. The underlying social and economic conditions of the two areas, however, are quite similar.

The Boghe project is situated in south central Mauritania, close to the Senegal River. The project has irrigated 910 hectares and allocated individual plots to prior right holders of land. The project's aim was to create a large irrigated project composed of small village irrigation cooperatives.

As in the Bakel region, lands in the Boghe region can be characterized as walo, fonde, pale, or dieri. The social structure of the Toucouleur people is also very similar to that of the Soninke. The Halaybe regional subgroup of the Toucouleur, as described by Ngaido, is comprised of various leniol or lineages. Each leniol is subdivided into families, or galleji. The families within each leniol belong to various caste groups: either to the rimbe (nobles), nienbe (artisans), or jiabe (descendants of slaves).

SONADER, the government agency responsible for project implementation, allocated individual plots to those holding primary and secondary ownership rights, thereby failing to recognize sharecropping and other lesser tenure rights held by landless people. Primary rights are the exclusive prerogative of those noble households that are members of the Halaybe lineage that controls the land. Secondary ownership rights are granted to those noble households from other Halaybe lineages in exchange for assakal, or payment (Ngaido, p. 78).

Farmers ceded a total of 1594 hectares. They received 56 percent of that land back in irrigated plots. The remaining 44 percent was to go into dikes, and also, ostensibly, to settle the landless. Average farm size decreased from 2.21 to 1.23 hectares. The final outcome of such parcel distribution was that the rimbe or nobles represented 93 percent of the recipients of irrigated parcels, while the nienbe and jiabe (the artisans and slaves) represented only 7 percent.

The landless lower castes must still rely on the nobles for access to land. Now, however, they must compete with those rimbe whose lands were not involved in the project. Whereas prior to the project artisans and slaves received dokal pendungal, or land gifts, now this arrangement is almost exclusively between relatives or other nobles close to the family. Because the land area has been restricted and simultaneously made potentially more productive, traditional tenure relations have meant the exclusion of a large number of the landless from access to land (Ngaido, p. 143).

The picture would be quite bleak if it were not for my suspicion that the traditional caste system defining landholding opportunities does not necessarily define distribution of income among village members. Members from various castes participate in non-agricultural cash-earning activities. Thus, low caste does not automatically imply low income. This point is worth considering because one tends to think of land tenure patterns as strongly affecting wealth levels, yet in areas where alternative sources of income are available this may not be the case (Ngaido, p. 155).

Tables 5 and 6 reinforce this suspicion, notwithstanding the rather small sample size. The figures come from a survey of 83 households that were

recipients of plots. One can see that there are multiple non-farm sources of income for everyone and that slaves and artisans, despite rather low farm earnings before the project, still maintained a substantial income base from other activities. Their chief source of income was wages.

Also, though overall income of the farmers increased, it would be misleading to conclude that the project was responsible for most of the increase. At about the time the project was implemented, Boghe was affected by drought and the people adapted to those conditions by relying on income from other activities and on remittances (this might explain the huge increases in remittance earnings for everyone after implementation of the project). The project's success was in restoring their previous agricultural income.

Finally, in order to get some idea of the status of those slaves and artisans not included in the project, and taking the effect of the drought into account, the amount earned from irrigation by this sector (24,774) was subtracted from the total amount earned after implementation of the project. Artisans and slaves still earned more on average than any of the other sectors of society (118,872 versus 95,935, 97,875, 90,147, and 112,289 respectively). One cannot draw any strong conclusions because of the weakness of the data. Still, there is the suggestion that due to the presence of alternative income-earning opportunities, economic status is not directly related to land ownership, or access to land.

Table 5:  
Average Annual Income by Sources of Income  
and Caste Prior to the Project

	Slaves & Artisans	Cebbé (nobles)	Subalbé (nobles)	Haratines (black Moors)	Torobé (nobles)
Agriculture	14,568	22,477	22,336	9,217	24,611
Livestock	491	429	1,200	11,667	1,445
Fishing	0	0	40,555	0	0
Remittances	0	2,286	545	0	250
Migration	16,818	0	8,364	0	2,792
Wives	573	2,329	1,364	0	3,525
Wages	47,509	22,286	7,636	0	26,419
Pension	3,273	6,857	0	0	3,374
Other	9,255	4,171	2,568	0	7,319
Parcel	0	0	0	0	0
CSA*	0	0	0	0	0
CPB*	0	0	0	0	0
<b>AVERAGES</b>	<b>92,486</b>	<b>60,834</b>	<b>84,459</b>	<b>20,883</b>	<b>72,221</b>
(No. of Households)	(11)	(7)	(11)	(3)	(51)

\* CSA and CPB are project-related income supplements; see Table 6, below.

Table 6:  
1985 Average Income by Caste  
After Implementation of Project

	Slaves & Artisans	Cebbé (nobles)	Subalbé (nobles)	Haratines (black Moors)	Torobé (nobles)
Agriculture	0	0	0	0	0
Livestock	0	0	0	0	0
Fishing	0	0	0	0	0
Remittances	17,091	30,000	12,327	30,000	33,417
Migration	13,364	0	0	0	1,188
Wives	12,045	4,200	8,800	12,267	3,054
Wages	51,873	6,857	25,942	0	15,630
Pension	3,273	9,714	5,455	0	8,750
Other	16,636	10,714	16,522	31,133	22,242
Parcel	20,504	23,040	19,129	4,200	19,520
CSA	4,590	4,590	4,590	4,590	4,590
CPB	4,270	6,820	5,110	7,957	3,898
AVERAGES	143,646	95,935	97,875	90,147	112,289

Source: Ngaido, pp.

Unlike the Boghe project implemented by the Mauritanian government, which accentuated landholding inequalities between the different castes by granting plots to prior land owners, the project developed by SAED in Senegal encouraged both universal participation of village members in the irrigation project and equal distribution of parcels to all participants. Of interest here is the example of joint sponsorship of the irrigation perimeters at the local and state levels. In Bakel, such a joint venture has only been the outcome of much tension, struggle, and ultimately compromise from both sides.

According to Adams, SAED's plan was to set up small-scale experimental plots, petits périmètres, which would eventually be expanded into grands périmètres. Peasants of the area would be trained to do a large proportion of the work, while SAED would be the sole provider of credit, seed, fertilizer, fuel, machinery, technical supervision, and crop marketing. In December of 1974 the Ministry of Rural Development announced that within the near future the principal crop grown in the region would be rice. At the time the perimeters were producing tomatoes, onions, and cabbage, as well as maize and millet. In addition, the state asserted that collective production (as practiced on the irrigated perimeters by some of the farmers) did not function as well as individual production; it would be more appropriate to divide the land into family plots. Each family would work its own plot according to the calendar established by a technician. Such a dictum was reinforced in 1977

when USAID committed its support of the irrigation projects under the condition that the plots be individualized and that only rice be grown. As Adams writes:

Selon Edward, l'AID-US a posé comme condition à son soutien à la Société d'Etat que les champs collectifs seraient divisés en parcelles et que le riz seul serait cultivé (Adams, p. 143).

By 1976 the Federation of Soninke Farmers in the Bakel region had been formed. The statutes of the Federation made clear the Federation's position vis-a-vis SAED: its intent to handle its own organizational, administrative, and financial affairs; its right not to have to depend exclusively on material and financial aid from the state; its right to market its produce freely; its right not to be obligated to become indebted to SAED; and its right to accept aid from agencies other than those of the state (Adams, p. 135).

Since the beginning there has been change and compromise on both sides. In 1980 an agreement between SAED and the producer groups set the limit to the size of the collective field at 30 percent of the total area of the perimeter. In practice, however, this is rarely attained; most collective fields take up approximately 10 percent of the total perimeter area (Weigel 1980, p. 30).

The irrigation perimeters maintain an egalitarian distribution of parcels among the participants. Each village group works a part of the irrigated perimeter collectively. The remaining portion of the irrigation perimeter is divided up among the members as individual plots. That which is produced on the collective portion of the perimeter is used to finance the costs of irrigated cultivation and to serve as a reserve. According to Sekou, in those areas where collective fields are most prevalent, farmers use their collective experience to learn the modern methods which they can apply on the family foroba (family field) and on the individual fields (Sekou, p. 39).

The pattern of individual plot distribution is quite interesting. These plots are strips that stretch across non-homogeneous land (e.g., plots that are 5 meters wide and 450 meters long). This is to ensure that access to water and land of differing qualities is randomly distributed among perimeter users. For example, in Ballou, strips are 10 x 528 meters long; these are further divided into five 2 x 528 meters strips. (Keller, p. 88).

Though irrigation plots are distributed among all able and interested males and nuclear families in an egalitarian fashion, thus differing from the traditional land allocation and land ownership system based on the caste structure of society, the irrigation perimeters do not introduce any significant changes in land holding patterns within households. That is, irrigation parcels allocated to each ka are worked collectively under the direction of the kagumme or chief of the family production unit. This is quite similar to the te khore or large household field of traditional farming. Furthermore, this similarity can also be seen in the allocation of individualized parcels (in some villages more so than in others) to women. These compare with the traditional women's fields.

As with customary practice, the produce harvested by the women on their plots does not fall under the control of the kagumme. The reorientation of

women's labor towards work on the male-dominated fields was mentioned earlier on in this paper. On irrigated lands, women's help is largely sought for rice-threshing and weeding during the winter season; during the dry season, on the other hand, women devote most of their time to their own parcels and to help in flood-recession farming. According to Weigel, the area cultivated by the women accounted for 32 percent of the total area in the 1979 rainy season. Clearly, the large number of women in the labor force, due to male migration, makes them a key factor on the perimeters (Weigel 1982, pp. 106, 118).

Given the hierarchical structure of the Soninke society, it would seem that success of the irrigation perimeters depends on a pattern of land tenure and participation that reproduces the traditional landholding system. The organization of irrigation farming in the Bakel region clearly does not do this. SAED's objective has been to distribute plots equally to all interested in the project, membership within the producer groups is based on common village residence, and overall leadership within such groups comes from elected officers.

What, then, has been the response of the nobles to such developments? The AID project evaluation of 1985 claims traditional leadership reinforces the producer group leadership; villages will usually pick key officials from among the chief's relations. "Overall leadership is quite stable as the producer group officers are part of or close to village power, are committed to village welfare, and are established in their age/rank positions" (Seymour, p. 7).

It could be inferred from this that the nobles are acquiring a disproportionate share of the irrigated plots. Weigel pointed out, however, that it was the kome, or slaves, and the nyakhamala, or artisans, who took the greatest interest in such projects, not the hore, or nobles. In fact, artisans and slaves were able to engage in both rainfed farming and irrigation farming by hiring salaried labor from Mali. The kome and nyakhamala employed four times as many salaried workers as the nobles did (Weigel 1982, p. 99). Whether this is still the case is not known.

In trying to answer the question of plot distribution, one must take into account the role remittance earnings play in this scenario. Remittance earnings from migration, though declining, continue to provide handsome returns to labor, perhaps more so than those derived from irrigation farming. It may be the case that a slave or caste member of society has a greater incentive to migrate than does a noble. He has only to gain, leaving behind the constraints placed on him by virtue of his birth, and goes in search of economic opportunity. The noble, on the other hand, should he leave the village, must also leave behind the special privileges he enjoys there as member of the noble caste. In other words, the noble is a noble only in the village, he is not a noble in France or elsewhere. Thus, he may prefer to remain in the village than to go in search of employment. If this is the case, over the long run nobles may benefit more from irrigation than do lesser members of society simply because their presence in the village is stronger.

Very rough and incomplete data collected in January of this year seem to indicate that this might be the case in some, but not all, villages. Notably

in Ballou I, where noble parcel recipients numbered 283 of a total of 308 recipients. This was not, however, duplicated in other Soninke villages. For example in Moudery I ten nobles and twenty-six slaves each had an average of two parcels. And in Moudery II twenty-three nobles and seventy-three slaves each had one parcel. Since the caste composition of the villages as a whole is not yet known, however, we cannot yet conclude whether the perimeters are benefiting any group disproportionately.

## VII. CONCLUSION

The stated objective of this paper has been to identify what might be the most appropriate land tenure arrangement for the Bakel irrigated perimeters. In view of the alternatives presented, the current government policy of equal plot distribution and the local arrangement of collective farming on a given portion of a perimeter seem to be best. In an area where tradition dictates that certain members of a village, simply by virtue of their birth, enjoy exclusive allocation rights to land, implementation of schemes that introduce improvements to the land may have the effect of accentuating inegalitarian access to land (as indeed happened in the Boghe project). In other words, before modern agricultural systems are implemented, traditional relationships of a caste or hierarchical nature may best accommodate the needs of the local people. It is once improvements are put into effect, and once land becomes potentially more productive and also more restricted, that traditional tenure relations may no longer be able to fulfill the needs of lower caste members. Thus, programs that insist on distributing land equally among all are probably taking a step in the right direction.

It may be, though, that simple distribution of plots on an equal basis to all participants is not sufficient to guarantee that there is not, over time, a reversion of land back into the hands of traditional landowners. Here, perhaps, the parallel village institution of the producer group, participation in which is based on common village residence, may be one framework within which land distribution can be monitored over the long run.

The particular arrangement adopted by many of the villages along the Senegal River whereby a certain portion of irrigated land is set aside to be farmed on a collective basis seems likewise to be especially appropriate. Not only does the output produced on the collective portion of the perimeter contribute to the financing of costs incurred from irrigation, but the collective experience is also useful to farmers for acquiring ease with the modern methods that can then be applied on their family fields.

There is, however, room for improvement. Perhaps the first place to begin is with plot size. As long as the plots remain small, farmers cannot produce a sufficient amount to satisfy both home consumption and market demand, and abandonment of irrigation farming and the desire for emigration will continue.

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