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Center for Rural Development
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BAKEL SMALL IRRIGATED PERIMETERS
PRODUCTION ECONOMICS STUDY

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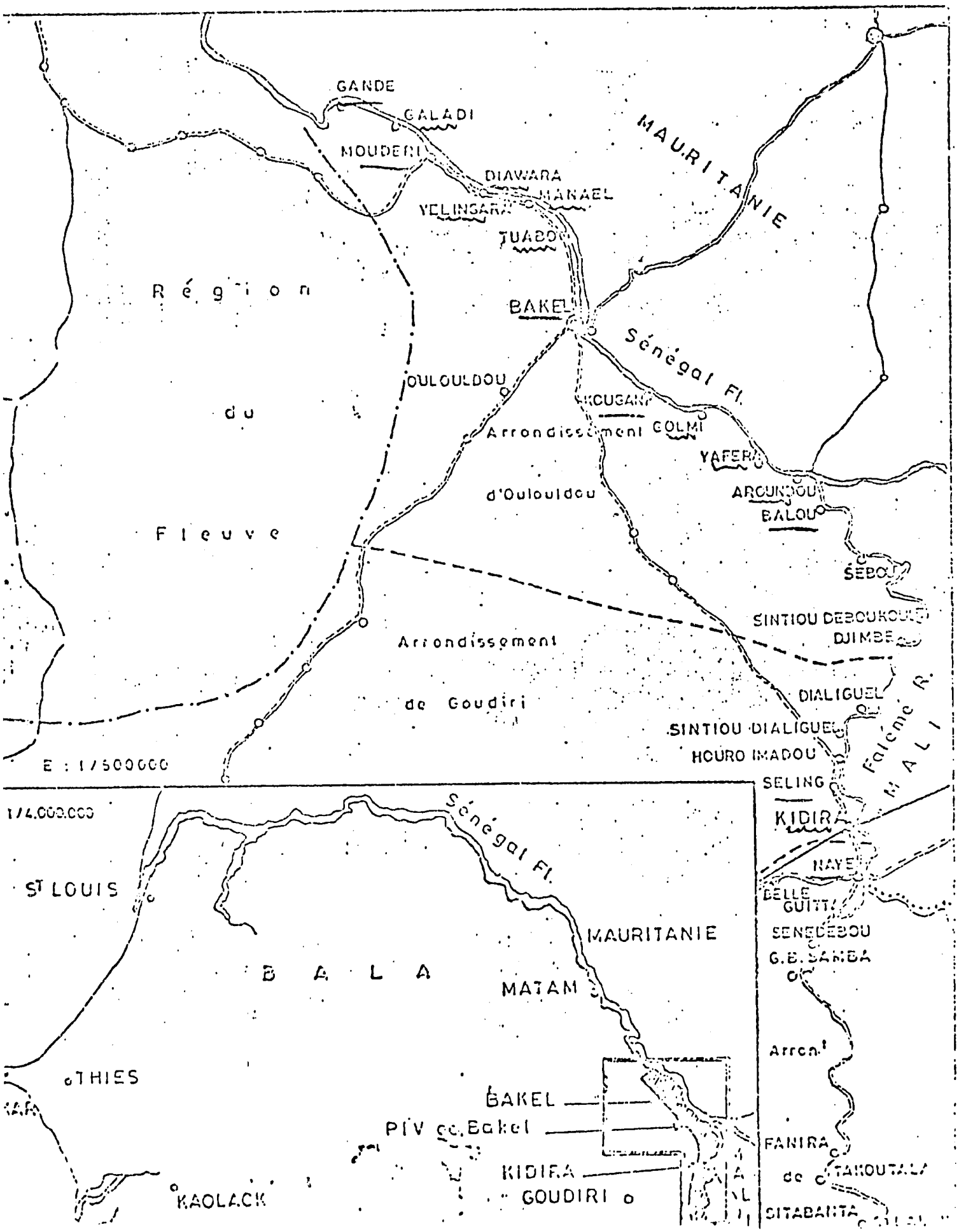
PERIMETRES IRRIGUES VILLAGEOIS

PROJET DE BAKEL



INTRODUCTION

A Tuskegee Institute team composed of an agricultural economist and a graduate student in agricultural science spent seven weeks in Senegal preparing a report on economic analysis of costs of production of the Bakel Region Small Irrigated Perimeters. These irrigated perimeters receive technical and material support (principally pumps, fertilizers, seeds and fuel) from SAED (la Societe pour l'Amenagement et Exploitation du Delta) with funds provided by USAID (Project #625 0208). Funding for the study came from USAID/Senegal and Tuskegee's 211-d Project.

The team spent almost four weeks in the Bakel region visiting the perimeters and interviewing farmers, SAED personnel and USAID technicians. The SAED directors and officials in Matam and Dagana were also interviewed. The documentation centers of OMVS and SAED (Lampsar N'diayi) were consulted. Researchers and officials of ISRA (Dakar and Richard Toll), OMVS, ORSTOM (Hann) were contacted concerning research in progress and problems of data collection and analysis.

Our thanks to all who assisted in this study. It is hoped that the information contained in this report as well as its conclusions and recommendations, will be of use to the Evaluation Team who will examine the Project in the near future.

SUMMARY AND RECOMMENDATIONS

In so far as we were able to establish, all available data relating to the irrigated perimeters of the Bakel region are estimated or proxy figures. Estimated figures include overall surfaces, irrigated surfaces in each perimeter, yields and labor time attributed to each crop. There is considerable debate about many of the estimates used. Proxy figures include costs of diesel fuel bought from SAED (as a figure for cost of fuel actually used for irrigation). Estimates are generalized to a per hectare (ha) figure while individual and collective plots are much smaller (ordinarily .12 ha per parcel), and vegetable plots even smaller. There is considerable debate about these estimates and assumptions. As a result, it is possible to argue and support any economic analysis depending on one's point of view. If figures reporting high yields and low costs are accepted, then economic analysis shows success. If it is decided that yields should be scaled down and cost figures augmented, much lower returns (or even losses) can be proven. This problem is especially critical when figures are aggregated (or simplified) to a project-wide scale (see Frazel:1979; and Keita 1981).

Up until the present, only one study has been made to collect production data in the region but it is limited to one village in one agricultural year (Weigel:1980). Other studies are of other regions of the Senegal River (ISRA/ORSTOM:1980) and are

broadly descriptive (OMVS:1980) or are more sociological in nature (Miller forthcoming).

We therefore recommend that if the intention is in fact to establish accurate baseline data in lieu of very questionable estimated/proxy figures that a record-keeping system be set up at the Groupement des Producteurs (GP) level to establish accurate village data over a long term. In order to accomplish this, we further recommend that Peace Corps Volunteers be attached to certain village GP's to assist them with this farm management system as well as with other production problems.

As an alternative, we recommend contacting ISRA/ORSTOM to extend their research from the four points along the river up to Bakel. As will be explained in the text, ISRA/ORSTOM has an on going farming systems research project in progress along the river. ISRA's research project has already been going for four years and they could be induced to expand their research activities to the Bakel region.

The Problem Proposed: The Scope of Work

The following Scope of Work, dated June 18, 1981, was presented to the Tuskegee team when it arrived on June 22. Each point will be analyzed in its various aspects.

1. Compile and analyze the costs of production for the various farm enterprises found in the villages cooperating in the Bakel Small Irrigated Perimeters Project.

2. Construct a model(s) of the farming enterprises of the project area for analysis of alternative costs and proportions of the factors of production.

3. To the extent data can be collected, compare costs for Bakel with the systems found at Matam, Dagana and other sites along the Senegal River.

4. Recommend a farm record system and/or perimeter record system for future year record-keeping and project tracking.

5. Recommend a sampling methodology as an alternative method of micro-economic performance measurement and project tracking.

6. Develop the Scope of Work for a long-term (2-3 year) production economics analysis program for the Bakel Project.

I. Examination of Costs of Production

We will discuss each of the points of the scope of work in order, focusing especially on points one and two. Here we consider point one.

In order to examine the costs of production, one must have a certain amount of information and the quality of information is the critical factor in determining the quality of the analysis. Unfortunately for the Bakel region, there is no reliable farm level data. All calculations must be done based on estimates about which there is considerable debate and/or based on assumptions for which equally valid assumptions of a markedly different order could be substituted. Obviously this problem is not unique to the Bakel region; however, it is the situation in the Bakel region (and elsewhere on the Senegal River) which concerns us here.

SAED's major concern is rice production (and to a slight extent grain corn) in the Bakel region, and their very limited personnel (six encadrèurs; three chefs de zones and various office people) only focus on these crops. Furthermore, SAED is a governmental body responsible for the whole river basin and as a result, its actions and reports of its actions are as much (or more) political as technical in nature. As an institution, SAED directly manages and farms huge perimeters of thousands of hec-

tares toward the mouth of the the river, and the Bakel perimeters are of only minor consequence in its overall program.

All information about areas farmed in the Bakel region are estimates. Data on rainfed agriculture is totally unknown and irrigation perimeter areas have never been accurately measured. Both types of production vary from season depending on rainfall, the available labor force, weed problems, water management problems and experience of previous campaigns.

Yield data is equally unknown and can be estimated up or down. Yield figures have political implications as well since success of government corporations or the farmer federation are directly reflected in the bottom line of crop yields.

It is worth noting that estimated yields vary considerably from village to village and generally seem to be improving as the farmers become more skillful in this entirely new type of agriculture. See Table 1 for examples of this trend and range of yields in recent years. Ordinarily yield estimates are based on estimated surfaces harvested--and not those planted--and are generalized based on evaluation of very small surfaces actually measured.

Since SAED is especially interested in rice production, figures on rice are the most abundant. Other crop production fig-

Table 1

Rice Yields (Bakel Region averages)

1975 76	2 t/ha
1976 77	2.2 t/ha
1977 78	2.8 t/ha
1979 80	3.8 4.0/ha with some farmers claiming 5-8 t/ha*

Rice Yields -t/ha (Bakel Region averages)

1977	4.0 t/ha
1978	4.2 t/ha

1978 79 (by village)**

Gassambilake	6.4	
Yafera	5.5	
Aroundou	4.5	
Gande	3.5	
Balou	3.2	
Diawara	4.1	
Koughani (M)	2.8	
Galade	0	
Manael	0	entirely abandoned
Tuabo	0	

1980 81 (by village)***

Moudery	3.8	
Diawara	3.0	
Gassambilake	5.0	
Koughani Village	8 6	(using replanting from a rice nursery)
Koughani Marabout	4 2	
Yafera	2.9	
Aroundou Village	3.1	
Aroundou Emigre	3.6	
Balou	5.9	
Sebou	3.5	

*Joint Assessment. 1980.218.
**SAED "Campage du Riz 1978 1979. Sondages et Rendements"
***SAED "Compte rendu d'activites." Bakel, 1981.

ures are much more sketchy or nonexistent.

Values of crops produced poses equal difficulties. While SAED contracts require sales of rice to SAED (at the official price of 41.5 f/kg last year) in fact, only three tons from the Bakel region were so sold last year. The proximity of two frontiers (those of Mauritania and Mali) allows ample scope for parallel market sales where prices range up to 90 f/kg. It turns out that most of the grain is not sold at all but rather is consumed within the village. This entails a substitution of millet in the diet of villagers; a substitution which is occuring.

In the documentation, corn yields are estimated as approximately 2-2.5t/ha but in point of fact, most corn produced is sold as green corn so it is necessary to estimate how many ears are produced per hectare; estimates range from 50,000 to 70,000. The value of seed corn is 40f/kg while green corn is sold for approximately 3 ears for 25f. Yields of green corn, since it is picked in the field over an extended period as ears mature, are particularly difficult to record. Prices vary according to the season and market saturation.

In order to analyze returns to labor it is necessary to know the number of workers involved in the production process. Figures on the number of active members in each Groupement des Producteurs (GP's) are available, but it is not known how many family

production units this represents, nor how parcels are distributed among adherents, nor the work done by adherents, hired workers or other substitutes.

Information about person days of work is equally important. The schedule proposed in the Project paper is a fantasy based on the use of animal traction, with questionable estimation of all phases of the work required. Our own timing of work in soil preparation (the only work activity we actually observed) indicated that this activity takes 200-300 person days/ha. Observation was done in two different villages where men, women and children were timed. The work day for soil preparation, done with a daba to a depth of 2.5-3.5 cms during Ramadan was estimated at 4 hours and does not include time to and from the field. See tables 2 and 3 for estimated work schedule for rice and corn on the perimeters.

An important point to consider in the agricultural calendar is collective work. Some of the perimeters have as much as one third of the surface worked collectively (to pay SAED debts). Canal repair and maintenance are also collective activities. In Gassambilake, several hours on Thursdays and Sundays are devoted to these activities. On the day we observed, women did all the collective work (carrying soil to fill holes in the main canal as it was tested). The men were there but were standing around, more or less observing.

Table 2

Person Days per Hectare for Irrigated Rice

Project Paper (1)		estimates based on discussion with USAID technicians in Bakel Present System*		Technically feasible	
plow level harrow	2	preparing land and seeding	300	donkey plow*	5
prepare land (using oxen)		canal maintenance	28	canal maintenance	28
ridging land (using seeder)		replanting (2)	100	replanting	50
seeding crops (using seeder)	1	irrigation	39	irrigation (4 people manipulating water)	39
fertilize	3	fertilize	7	fertilize	7
irrigate	25	weeding	116	weeding (replanted rice)	12
weeding	60	harvest	34	harvest	34
birdwatching	96	threshing (hand threshing with a barrel)	123	threshing with an IRRI thresher	26
harvesting	36				
threshing (using pedal thresher)	15				
transport to storage (using oxcart)	1		747		201
		birdwatching (3)	15		
	239 days		762		

*based on field trials, estimates and report of J.Y. Weigel (1980). Length of work day varies from 4 to 7.5 hours depending on person and time of year.

(1)Cited by Keita (1981) and Franzel (1979).

(2) Replanting is presently done only on a limited scale. We do not include it in our calculations of labor costs.

(3) Birdwatching is ordinarily done by children and is not considered work in the same sense as the other activities listed.

Table 3

Person Days per Hectare for Irrigated Corn*

Preparation, seeding and fence construction	300 days
Cultivation and weeding	67 days
Irrigation	39 days
Fertilizing	87 days
Irrigation	28 days
	441 work days
Gardening	7
	189.7

*It is assumed that the corn is picked green in the field by the buyers. Work day length varies from 2 to 7 hours. If 1/4 of the corn is finally harvested, then the work schedule would be increased by three days (see Weigel, 1980).

An overall bar calendar representing all farm enterprises is given in Table 4 (from ISRA/ORSTOM 1980). Jeeri is dry land agriculture with men growing millet and women growing peanuts, corn, indigo, etc. It has been very unproductive in the past two years due to poor rains. Falo is the river bank on which crops are grown as the flood recedes. See Figure 1 for a schematic diagram of the ecology of production in the Bakel region.

In order to answer point one of the scope of work we will develop indicative budgets based on the information available. We will do so based on information obtained in Bakel from SAED, farmers and USAID technicians. Our assumption is that the yields indicated and costs reported are approximately correct.

It was repeatedly reported that vegetable production was a major factor in the success or failure of the perimeters. It provided the cash to pay for production costs. Yet information about vegetable production was virtually nonexistent. There was repeated reference to technical problems such as a lack of seeds and one wonders about market limitations. Vegetable production is difficult to quantify. Here participants (neither farmers nor encadreurs) could give any quantities. Encadreurs admit total indifference to and ignorance of vegetable production, and farmers do not see production in terms of reference (plants by m2 or by line) that we tried to ask. The problem for us also was that during July there is no vegetable production in the region, so we

Table 4

Representative Agricultural Calendar

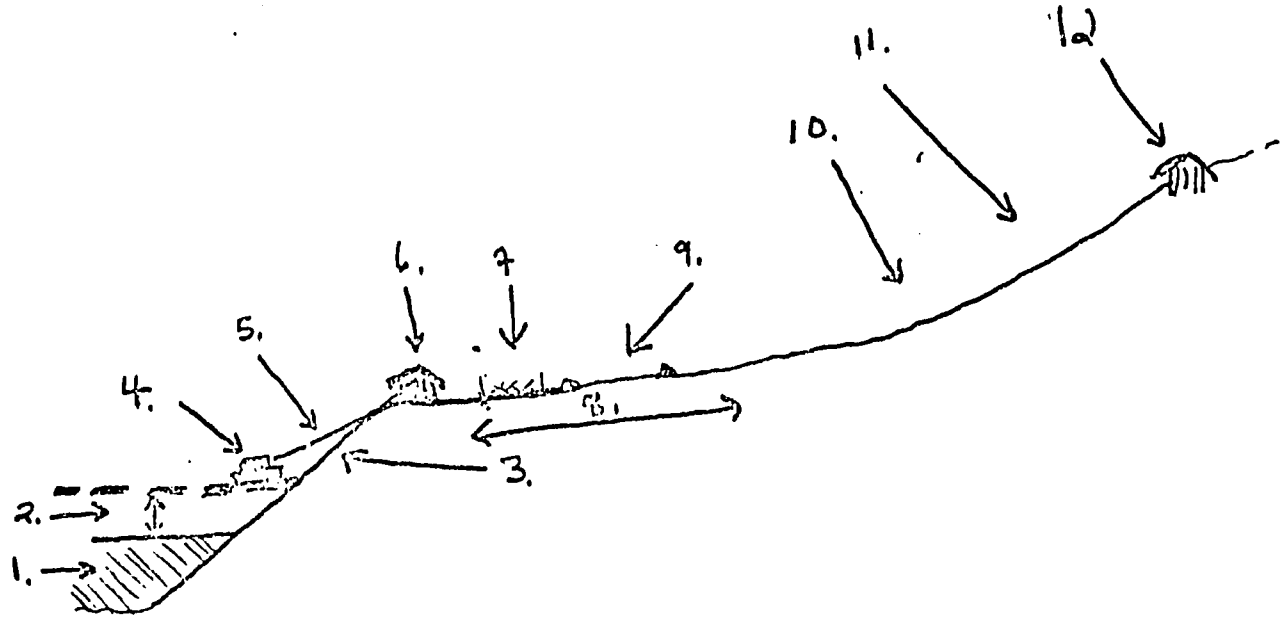
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Perimeter	corn					rice-corn-sorghum					corn	
	vegetables										veg	
Jeeri (a)						millet (men)						
						peanuts	corn	indigo (women)				
Falo	millet, corn		sorghum						millet, corn, sorghum			
Livestock*	<-	-	-	-	-	-	-	-	-	-	-	-

(a) See text for explanation of terms. Jeeri is dry land (rainfed) agriculture and Falo is flood recession agriculture on the riverbank.

* Livestock is an important enterprise but animals of several households are herded together by a hired herder.

Figure 1

Schematic of river valley layout



Key:
1. River (water at lowest point)
2. Flood (approximately 8-10 m.)
3. Falo (flood recession agriculture)
4. Floating pump
5. Pvc pipe
6. Village
7. Galle (corrals)
8. Fonde
9. Irrigated perimeter
10. Jeeri
11. Jeeri (dunes)
12. Jeeri village

could not observe or measure any production activity. It occurs in the contre-saison froide (December to March).

Irrigation costs are divided into operating costs and ownership costs. Operating costs are derived from SAED figures for actual diesel fuel (gasoil), oil consumption and pump repairs as well as pump operators' wages. These figures may be incomplete, since some villages reported buying diesel fuel from other sources besides SAED.

Ownership costs are obtained from a technical report by a USAID technician stationed in Bakel, Ni van Nguyen "Technical Report on Pumping Water for Irrigation--Bakel Small Irrigated Perimeters" (USAID:1981). It is worth stressing that Ni argues that the motor/pump units being used are economical to run only if they are being used to irrigate 18-22 hectares (HR2) or 25-27 hectares (HR3); therefore, many of the pumps are not being utilized efficiently from a technical point of view. Furthermore, in almost all cases improved water utilization will cut down significantly on operating costs--as well as improving yields. See Ni's report for a discussion of pump types and technical data on their use.

No village reported a functioning caisse d'amortissement and none is known of. The village of Balou seems most progressive in its handling of funds and has completed the paperwork neces

sary to file for status as a Cooperative under the SAED rules. This will permit them access to certain bank loan funds.

Very little is known about actual production figures of any of the traditional systems. Problems of traditional crop yield measurement and quantification are well known. Yields vary widely depending on rainfall in any specific year and fields are not laid out by the farmers in any systematic (in terms of m2) way. Direct measurement and weighing yields are the best method to know yields in any specific field and such information can neither be generalized for other fields nor taken as representative of the yield of the specific field for more than the year actually measured. See Table 12 for a record of rainfall variation in the Bakel region--the critical factor in traditional agricultural yield success.

Problems of livestock quantification are well known. See Table 8 for figures on cattle vaccinated during the last campaign of the service d'elevage. Cattle herds, donkeys, goats, sheep and chickens are in much evidence in all the villages, but information on animals, aside from cattle is totally lacking.

II. Systems of Production / Irrigated and Traditional

Before developing budgets, we will raise the question proposed by point two of the scope of work--that of farm model or models--because it is directly relevant here.

Up until now, analysis of the Bakel Small Irrigated Perimeter has not recognized the markedly different production systems found on various perimeters. Furthermore, all irrigated perimeter activity (except possibly Balou) is integrated into the dry land traditional production systems. Since SAED's main concern is rice and it is willing to accept seed corn production (though not to facilitate its production to any great extent because of governmental preference for rice), project cost benefit analysis (à la Frazel and the Project Paper) focuses on these crops. Our study of the region has shown that green corn and vegetable production are both major enterprises in terms of cash flow for some village perimeters and all villages (except Balou) continue jeeri production in spite of recent repeated failures due to lack of rainfall.

We found the region divided into four zones depending on crop enterprise mix found on the perimeter and water availability. Thus, there are:

I. Crop/Corn Double- (or even Triple-) Cropping (especially in the Gande-Gallade villages);

II. Rice/Corn Production (for villages from Moudery to Arroundou - though there is great diversity with this group);

III. Rice Production - One Crop; Balou-Seling

IV. Corn Production - One Crop; in the Faleme Region

In each of these regions vegetable production is of importance to a greater or lesser degree. Each of these systems will be described in turn.

An economic fact of life in the whole Bakel region is outmigration of young men. On the one hand, this reduces significantly the labor power available for agricultural activity, but on the other hand, it has provided significant cash income to the villages. This cash flow plays the dominant role in the economic life of the region. Several villages have used these funds to build elaborate mosques and even dispensaries, post offices and other public facilities. It is worth noting that these financial resources are also being used to underwrite perimeter activity (i.e. the cemented canal at Diawara) and agricultural innovation (i.e. animal traction plows and at least one privately bought motorized cultivator). Furthermore, consumption patterns have developed based on this cash influx. In Tables 5 and 6 (Weigel), it is shown that in 1977-78, a bad crop year, more than 70% of the monthly expenses by person were for food. Thus the cash economy has a major role to play in production (even subsistence production) and in procurement of food. Finally it should be noted that returned migrants began the whole irrigation system in the

Table 5

Monthly Expenditures per Person (in CFA).* 1977-1978

	value	percent
Food	2235	71.9
Maintenance of Ka (1)	29	0.9
Health and hygiene	19	0.6
Transport	31	1.0
Clothing	41	1.3
Semi-durable goods	65	0.2
Construction	316	10.2
Purchase of Animals	171.5	5.5
Purchase of jewelry	50	1.6
Household expenses	56	1.8
Ceremonies and gifts	100	3.2
Taxes and dues	45	1.5
	3110 CFA	100 CFA

*J.Y. Weigel "Economies Rurales et Migrations de la refion de Waoundi." ORSTOM, May 1978. p. 80. Waoundi is not in the Bakel region per se but given the similar out-migration pattern, expenses are taken to be indicative.

(1) Ka is the soninke term for the basic family unit.

Table 6

Monthly Food Expenses by Ka (in CFA)*

	value	percent
Millet	821	22.2
Rice	442	11.9
Meat	443.7	12.0
Cooking Oil	378	10.2
Peanuts	321.5	8.7
Sugar	319	8.6
Fish	295	8.0
Dried Fish	234	6.35
Bread	102	5.2
Tomato paste	58	1.6
Cola	55.5	1.5
Onions	44	1.2
Milk	27.5	0.75
Coffee	25.5	0.7
Salt	23	0.6
Flour	20	0.5
	3699.7 CFA	100%

*Weigel (1978). p. 81. See note, Table 5.

Bakel region and formed their own federation, before SAED came to the region. These individuals continue to be innovative and progressive. Some are working and managing their own perimeters, as for example, the perimeter known as Aroundou Emigre where a returned farmer has set up his own perimeter.

Thus true economic analysis of the complex farming systems developed in the Bakel region should include budgets per production unit (the Ka) for 1) cash remitted by migrants and its use 2) dry land agricultural enterprises and production 3) livestock enterprises 4) falo production 5) irrigated perimeter production. These should all be studied within the political economy of land tenure and social stratification of each village (and its allied jeeri villages).

Unfortunately, this ideal is only wishful thinking by us farming systems enthusiasts. The reality of data available forces us to develop budgets for the irrigated systems of production alone which we will proceed to do within the types of production systems outlined above.

I. Corn/Corn Production Systems

(Gande, Gallade)

These two villages have an irrigation production system which centers on two (if not three) corn crops. The corn is well adapted to their sandy soil conditions. It has proven well adap-

Table 7

Livestock--Bakel*

	Total	T	B	V	J
Gande	590	10	28	385	157
Moudery	1147	35	34		290
Diawara	797	17	41	453	189*
Yellingara	509	10	19	326	128
Manael	768	13	23	493	239
Tuabo	405	25	38	241	101
Koughani	618	11	18	402	197
Golmi	1310	46	56	815	393
Yafera	663	23	40	446	152
Aroundou	584	14	102	247	221
Ballou	340	2	11	206	121
Sebou	618	8	33	359	218
Sintiou Djimbe	486	16	94	241	150
Djimbe	661	22	38	412	226
Dialiguel	693	13	79	406	194
Sintou Dialiguel	630	19	47	308	256
Houro Imadou	671	15	39	264	306
Senedebou	1099	53	67	621	338
Seling	411	11	32	215	153
Kidira	833	24	38	473	298

*Report of Service d'elevage--Bakel, Vaccination Campagne January 20, 1981. Figures for Senedebou, Seling and Kidira are from 1978. The value of bulls (3 years old) was estimated to be 20,000 - 30,000 CFA; steers 40,000 - 50,000 CFA. Cows are ordinarily not sold. Calves sell for 19,000 - 25,000 CFA. Sheep and goats (for which no figures are available) sell for 3,000 - 5,000 CFA.

Key: T--Tauraux = bulls
B--Boeufs = steers
V -Vaches = cows
J -Jeunes = calves

ted as well to market needs since it is ordinarily sold green in the field and there is such demand that other neighboring villages come and pick the corn in the field. Thus, there are no harvesting or transport costs.

Profitability of this system can be seen 1) from the eagerness of local villages to buy the crop (indicating a market need). 2) the ability of Gande and Gallade to pay their SAED debt (though other cash particularly immigrant-sent money might be a factor in this), 3) Gande has paid for the cementing of its principal cool (900,000 cfa), 4) Gallade tried to get more land from Moudery, the next village, to expand its perimeter, but this request was rejected.

Both Gallade and Gande also practice vegetable production on a small scale. The usual crops are cited--cabbage, piment, tomatoes. These meet local market needs.

The village production systems continue to rely heavily on jeeri and falo fields for cereal and peanut production. Galle fields (enclosed cattle pens which are then used for seed corn production) also are in evidence. On our visit to the Gande following two good rains, the village was virtually empty and the perimeter was completely empty. Since the villages have water year round (being on the Senegal River), villagers feel that they can integrate jeeri and falo production with irrigated production

with comparative ease.

Golmi, Yafera, Aroundou (E) and Aroundou all seem to be favoring corn during the rainy season and corn and/or vegetables during the dry season. For these villages as for Gande and Gallade, the critical problem appears to be soil. If their soil is too sandy they cannot grow rice economically.

Check out

Gande and Gallade are experiencing serious weed problems--- invasion by Siberus weeds which are proving impossible to eradicate. Expensive herbicides, vastly increased weeding time, or lowered yields may be in the future.

See the indicative budget for Gande for an idea of the economics of corn production in this region.

Indicative Budget (1980 - 1981)
Corn Production

Gande
(1 pump)
2 corn crops -- 3/4 sold green in field 1/4 sold (kept) as seed corn
(12.5 ha total)

(1)	Value of yield (est)	45,000 ears/ha x 50/3 CFA	=	750,000
		15,000 ears/ha x 40 CFA	=	24,000
				774,000/ha
	less costs per hectare			
	Irrigation			
	(a) operation: gasoil	32 l x 107		35264
	huile	3.2/ha x 365		1168
	wages	19680/12.5		1574
	repair	3325/12.5		266
		Total		38272
(2)	(b) ownership	632,000/12.5		50,560
	(c) seeds	25 kg/ha x 40		1,000
(3)	(d) fertilizers (urea)	70 kg/ha x 35		2,450
	ammonium phosphate	65 kg/ha x 25		1,625
	KCL	30 kg/ha x 25		750
				4,825
(4)	(e) tools			6,520
	Total costs less labor			100,177
(5)	Labor	441 days/ha x 200 CFA		88,200
		Total costs		188,377
		net returns per hectare		585,623

net returns per parcel of .12 ha 70,274(CFA)

Notes

(1) corn planted is estimated between 50 and 75,000 plants per hectare. We are only assuming one ear per plant. It was estimated that it takes 25 ears to make a kilo of grain.

(2) Following Ni report. Gande has an HR-2.

(3) Fertilizer use is taken as half SAED's recommendations based on estimates of personnel in the field.

(4) Based on Franzel and Keita but modified to accomodate the fact of very limited use of A.T. (i.e. only carts). See Mouderi budget for a breakdown of this figure.

(5) Labor estimates are based on discussion with USAID technicians and Weigel (1980)

soil preparation and seeding and fence construction	300
canal maintenance	28
irrigation	39
fertilization	7
weeding	67
	441

Workday length varies from 3 to 7 hours. No distinction is made among work of men, women and children, nor between individual and collective work. Since most of the crop is harvested by the purchaser, no harvest time is included. Labor is valued at 200 (FA) as per Keita (1981). While this is merely a convention, it does reflect a reality of recognized value of labor by the farmer.

II. Rice/Corn Production Systems

The production system covered by the above rubric is very diversified. Villages ranging from Moudery to Seling cover markedly different ecological zones; 1) Moudery, Diawara and Manael which are on the Senegal River and hence have year around water accessibility; 2) Tuabo (which has decided not to use its irrigated perimeter this year) and Gassambilake situated on a rain fed lake which has gone dry by January or February in recent years; 3) Koughani marabout and village perimeter, Yafera, Aroundou emigre and village, all on the Senegal River again. Equally significant is the political economy of each village since the decisions of production and resource allocation are made on an intra-village level. Certain villages, i.e. Balou, and certain individuals, i.e. Diabi Sow, Mamadou Bacily, seem to be committed to progressive agriculture and innovative farming, other villages such as Moudery, and Tuabo continue to opt for traditional systems of production. Gassambilake, being the perimeter for Bakel has faced severe political contradictions since its groupment des producteurs involved both farmers and bureaucrats, but this year portends well and perhaps these problems have been resolved. The opening of Kolongona perimeter on the other side of Bakel will have a significant effect on production by the Bakelians. In all probability it will short circuit some of the political problems which have plagued the Gassambilake Perimeter.

Kounghani is a special case. There are two perimeters. One is worked under the aegis of the Federation led by Diabi Sow. There have been disagreements between the federation and SAED and the required historical perspective on these problems can be obtained from the works of Adrian Adams. Things have changed for the better however, in recent years and cooperation between the Federation and SAED could mean real progress.

Diabi Sow is one of the most innovative and progressive farmers in the region and his commitment for successful development bodes well for the whole region. Sow argues for a rural development approach which integrates traditional agriculture (Jeeri, Falo and Galle) and livestock with new elements such as the irrigated perimeters, cropping rice sorghum, millet, corn as soil conditions permit. He is an innovator in transplanting rice in the region using an IRRI idea of doing the nursing on a sheet of plastic for easy transportation to the field. The Federation has purchased a small truck as well to transport inputs, fish and other commodities. Last year on several small parcels he obtained rice yields of 6-8 t/ha by using replanting. He planted vegetables as well. He also is a strong advocate of animal traction and is setting up a chicken/ egg production unit for the village. What he is looking for is a mixture of enterprises to fill out the agricultural calendar and to provide material well being to the village community. It might be interesting to ask Adrian Adams and Diabi Sow to do a Farming Systems analysis of

Rice Production

Indicative Budget
Rice Production

Moudery (3 pumps)
(20 ha)

(1)	Value of yield	3.8 t/ha x 50 F	=	190,000 CFA
	Less costs per hectare Irrigation			
(2)	(a) Operation	gasoil 256800/20	=	12,840
		huile 20148/20	=	1,007
		wages 24900/20	=	1,245
		repair 32650/20	=	1,633
				16,725
(3)	(b) Ownership costs	59,520 x 60%	=	35.550
				52,275
(4)	Seeds	50 kg/ha x 80 F		4,000
(5)	Fertilizers	70 kg/ha x 35 (urea)		2.450
		65 kg/ha x 25 (Am phos)		750
		30 kg/ha x 25 (KCL)		750
				4,825
(6)	Tools			3.912
		Total costs less labor		61,012f/ha
	Total cost per ton (paddy)			61,012/3.8
			=	16,055 CFA
(7)	Labor			34,052
		Total cost/ton paddy		50.107

Notes

(1) Yield information is from SAED (1980). Value is following Keita (1981).

(2) Costs of irrigation operations from SAED (1980) figured that all costs are derived 60% from rice and 40% from corn.

(3) Costs of ownership based on report by Ni Van Nyugen (1981). Pumps are HR2's with 60% of costs allocated to rice production.

(4) Seed use and cost according to SAED figures.

(5) Fertilizer use is estimated at half of SAED recommendations.

(6) Tool costs are as follows, based on Franzel (1979) and actual observation. 60% of costs are ascribed to rice productions

Shovels	.3/ha	2000/5 yrs	=	120

Dabas	10/ha	500/5 yrs	=	1000
Sickles	10/ha	750/5 yrs	=	2500
Sacks	40/ha	100/3 yrs	=	1400
Cart	.2/ha	65000/10 yrs	=	1300
Donkey	.2/ha	10000/10 yrs	=	200
		6520 x 60%	=	3912

(7) Labor is figured as follows

Rice production takes 647 days per hectare and is valued at 200 CFA (129,400) per day with a yield of 3.8 T/ha, the value is 34052.

Indicative Budget (1980-1981)
Rice Production

Gassambilake (perimeter for Bakel)

1) 2 pumps
1 rice crop (24 ha)

2) Value of yield. 5 t/ha x 50CFA/kg = 250,000

Less costs (per hectare)
Irrigation

3)	(a) operation.	gasoil 2351/ha x 365	=	25.145
		oil 21/ha x 365	=	730
		wages 75000/24	=	3.125
		repair 20820/24	=	868
		Total		29,868
3)	(b) ownership	632,200/24		26,342
		687,300/24		28,637
	(c) seeds	50 kg/ha x 80	=	4,000
	(d) fertilizer (urea)	70 kg/ha x 35	=	2,450
	(Am. phos)	65 kg/ha x 25	=	1.625
	(KCL)	30 kg/ha x 25	=	750
		Total		4,825
4)	(e) tools			6,820
	Total costs per ha less labor			100,492
	(f) labor	647 x 200	=	129.400
		Total cost		229,892

cost per ton of paddy 229892/5 = 45978.4

cost of a ton of hulled rice figuring paddy as 65% of hulled rice = 70736

Notes

1) Gassambilake does not need the large pumps it has. Lift is only 2 meters from the nearby lake which is its water supply. This lake dries up in the dry season.

2) Yields and operating costs from SAED.

3) From MI (1981)

4) Tools are as follows

shovels	.3/ha x	2000/5 yrs	=	120
Dabas	10/ha x	500/5 yrs	=	1000
Sickles	10/ha x	750/5 yrs	=	2500
Sacks	50/ha x	100/3 yrs	=	1700
Carts	.2/ha x	65000/10 yrs	=	1300
Donkey	.2/ha x	10000/10 yrs	=	200
		Total		6820

the Kounghani approach, detailing all the complex production enterprises.

Koughani/Marabout is a small perimeter (5 ha) kept by a Marabout from Kounghani and worked by his students (talibes). Aroundou emigre is another small perimeter (approximately 7 ha) worked by one family. The individual running the perimeter is a particularly astute businessman. Success in this perimeter will be obtained by extensive vegetable production.

III. Rice (one crop) Production

Villages from Balou to Seling on the Falene River produce one crop of rice. The soil situation (hallalde and faux hallalde) is generally favorable for rice production but there is a lack of water in the river once the flood passes.

false

Balou is the largest perimeter in the project. It is approaching its limit unless other factors are dealt with. A nearby marigot fed by rain run-off could pose serious problems. The perimeter is near a deep pool in the Faleme which has water year round and which may be used in the dry season.

Seling is a small perimeter with some slope problems but the president of the groupment seemed quite dynamic, well aware of the problems and willing to work. He would like to do more extensive vegetable production but has had difficulty procuring

Indicative Budget (1980/81)
Rice Production

Balou (population 2,500)
6 pumps
1 rice crop (103 ha)

Value of Yield		4.8t/ha x 50CFA =	240,000/ha
Less costs (per hectare)			
	Irrigation		
1)	(a) operation:	gasoil 961/ha x 107CFA=	9,973
		oil 1.9 l/ha x 365 =	709
		wages 162,500/103 =	1,577
		repair 825/ha =	825
		Total	13,078
2)	(b) ownership	4 x 632,200/103 =	24,551
		2 x 687,300/103 =	13,346
3)	(c) seeds:	50 kg/ha x 80F =	4,000
4)	(d) fertilizer	70 kg x 35 (urea) =	2,450
		65 kg x 25 (Am phos) =	1,625
		30 kg x 25 (KCL) =	750
			4,825
5)	(e) tools.		6,520
		Total costs (less labor)	66,320
6)	(f) Labor:	(647 days x 200) =	129,400
		Total cost	195,720
Cost per ton of paddy		= 195,720/4.8 =	40,775

Cost of a ton of hulled rice = 62,731 CFA
figuring paddy as 65% of hulled rice

seeds. It was he who noted that consumption patterns are changing in the village and people, particularly younger ones, are happy with rice as a staple part of their diet. Both Seling and Balou leaders said that jeeri production just was not worthwhile because of the lack of rainfall. See the accompanying indicative budgets for rice production in some of these villages. Note the marked differences in operating costs and differences from Franzel's and Keita's assumptions. Aggregation hides these differences.

IV. Faleme Region

Corn/Vegetables

The ecological situation along the Faleme involves 1) limited water availability. The river flood crests early and then recedes rapidly; 2) Soil is generally sandy fonde, poor for irrigated rice; 3) socio-political problems tied to the Tucouleur heritage which seems to inhibit collective work and cooperative effort.

Our research in this area was limited to contact with two villages, Kidira and Naye, due to road problems with the onset of the rainy season and political problems between many of the GP's and SAED in terms of their debt situation. SAED has not been very effective in the Faleme region in the past and there seems to be a high degree of frustration on both sides. During our visit, the main road was cut for about a week and most of the

villages-some distance from the road--were unreachable except by pirogue.

Naye has had serious difficulties getting its perimeter started. They did one several years ago but it was too far from the river so it was abandoned. A new one was created this year (with the SAED bulldozer) but by July 20 SAED technicians in Kidira still had not parceled out the land. The rains had already started by then so this rainy season is probably lost already for all practical purposes.

It was not possible to develop a budget for this area due to the total lack of information.

Comparison with Matam, Dagana--Point 3 of the Scope of Work

Comparison between the small irrigated perimeters of Bakel and Matam is difficult because of the problems of lack of information. We were only able to obtain information about three small perimeters and close examination of the figure leads us to conclude that the information is an example of what SAED direction thinks costs should be rather than actual costs. For example, oil use was reported as 2 liters per hectare both years given--which is the norm prescribed by SAED. While at Matam, we were informed that production figures were agreed upon by SAED personnel who did field estimates, and then chose "appropriate" figures.

An interesting fact to come out of our discussions was that on some of the perimeters in the Matam area, corn is planted as a second crop and after a perfunctory harvest the fields are hired out to herders who graze their animals there. SAED personnel have not tried to collect data on this interesting coordination of cropping and livestock keeping. It was implied that vegetable production is of some importance immediately around Matam. Again no production or cost figures are available.

At the risk of being wildly in error we have assembled an indicative rice production budget for a Matam perimeter. It is based on three separate sources and hence should be used with even greater caution than our Bakel budgets. Production figures and operating costs are from SAED data obtained at the Matam office. Pump ownership costs are derived from Ni (1981) and other information was obtained from the ISRA/ORSTOM study.

Dagana

Dagana is a large perimeter covering approximately 10,000 ha. It has three large fixed pumping stations which draw water from the river and feed the principal canals from which water is drawn for the comparatively large parcels (1 to 2 ha). Because of the presence of salt water in the river during the dry season, only two crops are possible. These are rice and tomatoes (for the tomato paste factory). Nearly all work is done by machinery.

Indicative Budget for Matam Region (1980-81)
Rice Production

Ndouloumadji (Matam)
(15 hectares, 65 active members)

Value of Yield:		5 ton/ha x 50CFA/kg =	250,000/ha
Less costs (per ha)			
		Irrigation	
1)	(a)	operation	
		maintenance and feed consumption	18,500
		wages	2,000
			20,500
2)	(b)	ownership 632,000/15	42,133
3)	(c)	seeds 50 kg/ha x 80	4,000
4)	(d)	fertilizers	9,995
5)		Total costs less labor	76,628
		cost per ton of paddy	15,325
		labor cost	34,052
		total cost per ton of paddy	49,377
		total cost of hulled rice (figuring paddy as 65% equivalent of hulled rice)	75,964 CFA

The operation of the large perimeter is not our concern. There are two smaller production types within the perimeter. On the one hand an Association des Interesses Kundes has been formed to operate a small perimeter. On the other, there are at least ten private perimeters with their own pumps which have been inserted into various unused parcels on the perimeter. The Directeur with whom we spoke had only been there one month and could provide us with no information beyond that as he had not been in contact with individuals involved in either type yet.

As the director noted, it would be difficult to compare costs of production on these small perimeters since they arrange to use SAED machinery on their perimeters and these machinery costs are supported to a degree by the state. That is to say those costs are political costs and not technical costs. According to him, technical costs in Dagana are not known. Thus the small perimeters depend on the functioning of the large perimeter in a symbolic relationship. This makes analysis or any attempt to forecast an increasingly important role for these small perimeters very problematic.

Points 4 and 5--Record Keeping and Survey Methods

The general trend of this report indicates the desirability of a long term production analysis component for the Bakel project. USAID/Dakar needs data and analysis for project monitoring but does not have the time or personnel for the micro-level work

required for this. Reliance on SAED field personnel has not, for the kinds of data needed by USAID, been feasible and will not be so in the future.

There are two ways to meet this problem. One is to collect the data throughout the region in cooperation with the farmers. This could be done by Peace Corps Volunteers who would work with the GP's as technical assistants. The PCV's would help the farmers follow the directions of the USAID technical experts and would help them with the management aspects of production as well. This is the approach we would recommend and for which we develop a long term scope of work.

A second approach would be to find qualified researchers to do the study according to standard scientific methods. A problem to watch out for here is that there seems to be many research projects going on in the river area under various governmental and international agencies. We may be reaching a saturation point and are certainly imposing on the hospitality of the villagers. So many researchers come in, ask questions and then disappear from the farmers lives without any results seen at the village level.

Perhaps a negative recommendation is appropriate at this time. It is recommended that a survey using questionnaires, or done by experts based in Dakar or even the US not be attempted.

Questionnaires are next to useless as Minvielle, ISRA/ORSTOM and our own experience underscore for the trend of in-depth accurate information a serious production study requires. By the same token, a "flying task force" approach is also inappropriate in a Bakel region where farmers feel imposed on by endless streams of researchers who do not stay and experience their situation.

Since ISRA/ORSTOM is already in the process of collecting data in four villages along the river, they could be asked to extend their research to the Bakel region. They are using a farming systems approach and conversations we had with persons involved showed that they would be receptive to cooperating with USAID.

People already knowledgeable in the problems of the Bakel region might be contacted as a third possibility. J.Y. Weigel has already done good work in Moudery. He might be willing to do further research in other Bakel region villages.

A fourth possibility might be to contact Adrian Adams in Kounghani. She is highly qualified, speaks Soninke and has a profound knowledge of systems of production in the region.

In any case, data has to be collected on sizes of fields, crop mixes, yields, costs of production and work schedules. It is our hope that such information not be alienated from the farmer but remain in his/her domain so that he/she could profit from it. The GP as a new form of production organization which has developed within traditional village production systems might well be the base for modern farm management.

Point 6--A Scope of Work for a Long-Term Cost of Production Economic Analysis Project

We propose the following steps for a long term production economics analysis program:

1) Assist in establishing Peace Corps project. This would include contacting Peace Corps/Mauritania, developing programs for volunteers with SAED and Peace Corps/Senegal.

2) Establish the record keeping systems (based on Delgado, MSU project in Upper Volta, etc.), train volunteers, assemble and analyze data, make periodic reports to USAID and SAED. This would involve a two-three year time span, once it is decided to approach the problem this way.

3) Since SONADER in Mauritania is already using Peace Corps Volunteers in extension work in perimeters on the Mauritanian side of the river, Peace Corps/Mauritania should be contacted to obtain information about the program. Their training program and work experience might well provide the basis for a Senegalese equivalent.

If our principal recommendation is accepted, we propose the following scope of work.

Oct.-Dec. 1981. Bakel Small Irrigated Perimeter Project funding renewed with subproject funding for Peace Corps Volunteer role.

Dec. 1981-Mar. 1982. Peace Corps/Senegal receives request from GRS (SAED) for Peace Corps Volunteer subproject.

Mar. - April 1982. Peace Corps/Senegal contacts Peace Corps/Mauritania for information about their program.

April-June 1982. Peace Corps/Senegal program designed.

Project will need: 2 volunteers in Kidira (Naye/Seling)
2 volunteers in Balou/Aroundou
2 volunteers in Bakel/Bakel - Manael
2 volunteers in Moudery/Diawara

May-October 1982. Program designed and volunteers recruited Volunteers need some French and ideally agriculture or agricultural economics background but business, economics, sociology, or other social sciences are adequate training.

October 1982. Volunteers arrive in country. Training done in French language and Soninke with assistance of short term farm management experts who will coordinate the project..

Technical training will include training in data collection: field measurement, (both perimeter and dry land) - use of measuring wheel and field compass; labor schedules; yield measurement---laying out of squares, weighing procedures; observation and calculation of vegetable production.

Record keeping: establishment of record books for GP, cost of operations records, bills, credits.

Production assistance: map reading, water use needs, replanting practices.

Dec. 1982-Jan. 1983. Volunteers placed in villages to begin work during dry season crop cycle.

July 1983. Arrival of farm management experts (short term) to evaluate progress and deal with problems in field. Also, they will collect data for project production analysis.

Repeated contact every six months.

The above proposed scope of work would permit accurate data collection and use at the farm (GP) decision level and at the project (USAID) level. It would involve a contractor expert in farm management problems in LDC's to assist in training the PCV's and in analyzing the data for USAID. It would avoid the expenses of ordinary farming systems research and would establish the record keeping systems in the field for use by the farmers.

CONCLUSION

A major theme of this report has been the problems of accurate production data and its major recommendation focuses on ways to solve that problem. Insofar as possible, however, analysis of production was done with data available.

Indicative budgets converted to cost of rice production per ton show that costs of production are comparable to costs of rice delivered to Dakar. According to a recent Jeune Afrique article, Asian rice is delivered to Dakar for 64 CFA/kg (64,000 CFA/ton), (Jeune Afrique #1071, July 15, 1981:75). Even if we accept all the figures as the rough estimates they are it would seem that costs are approximately equivalent. With improved production practices on the part of the Bakelian farmers and development of transportable networks for Bakel, analysis would seem to predict a favorable future for the small irrigated perimeters.

Table 8

Perimeter	Population	Year Perimeter Started	Members of Groupment 1979-1980 Men	1979-1980 Women	1980-1981 Men	1980-1981 Women
Gande	585	1976	55	160	28	79
Galade	698	1977	47	137	47	137
Moudery	3484	1976	100	230	55	122
Diawara	3682	1976	118	207	112	231
Yelingara	662	1979	26	4	26	4
Manael	1212	1976	83	159	83	159
Tuabou	1395	1977	75	35	75	35
Gassambilake	8015	1979	100	125	85	215
Koughani (PIV)	1415	1977	120	70	33	134
Koughani (Mar)	1415	1977	1	-	1	-
Golmi	2417	1978	1	-	1	-
Yafera	1271	1976	102	277	102	277
Aroundou (PIV)	1436	1976	21	74	100	110
Aroundou (Eng)	1436	1976	1	-	1	-
Balou	2499	1977	245	375	242	421
Sebou	480	1978	45	-	45	3
Deboukoule	273	1979	43	-	63	17
Djimbo	393	1979	41	-	47	52
Dialiguel	281	1979	26	-	30	-
Sint. Dialiguel	239	1979	20	-	20	-
Houro Imadou	450	1979	35	1	35	1
Seling	103	1978	28	-	21	-
Kidira	1424	1978	75	-	75	75
Naye	241	1978	32	-	32	63
Guitta	182	1979	36	31	36	31
Senedebou	816	1977	113	255	113	255

Table 9

Perimeter	# GMP	Year Employed	Fuel Oil Bought and Delivered 1980-1981	Motor-Oil Bought and Delivered 1980-1981	Repairs/Parts Costs 1980 - 1981	Pump Personnel (CFA) 1980 - 1981
Gande	1	1976	3800	40	3.300	20.000
Galade	1	1977	2000	20		
Moudery	3	76/78/80	7600	80	54.418	41.500
Diawara	3	76/79-80	7000	60	1.635	75.000
Yelingara	1	1979	1200	20	1.665	20.000
Nabaek	1	1976	600	20		
Tuabo	1	1977	400	20		
Gassambilake	2	1979	5600	40	20.820	75.000
Koughani (Piv)	2	1979	4600	40		
Koughani (Mar)	1	1979	1400	20		
Golmi	1	1977	600	20		
Yafera	3	76-79-80	7200	120	8.265	70.750
Arcundou (piv)	2	1979-80	12000	100		
Arcundou (Emg)	1	1979	1400	20		
Balou	6	1977 1978 (2) 1979 (2) 1980	9600	200	56.337	162.500
Sebou	2	1978 (2)	6000	60	8.265	35.000
Deboukoule	1	1979	4400	40		
Djimbe	1	1979	6000	40		
Dialiguel	1	1979	4000	40		
Sint. Dialiguel	1	1979	600	20		
Seling	1	1978	2200	40		
Kidira	2	1978-79	3000	40		
Houro Imadou	1	1979				
Naye	1	1979				
Guitta	1	1979				
Senedebou	2	1977-79				

Table 10

Cost of Producing one Ton of Rice (1980-1981)*

Moudery	50,107 CFA
Balou	62,731 CFA
Gassambilake	70,735 CFA
Ndouloumadji	75,964 CFA

*Derived from indicative budgets, figuring paddy as 65% of hulled rice.

Table 11
Monthly Rainfall in mm at Bakel (1966 - 1979)

Annee	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annee
1966	-	-	-	-	-	111.8	120.5	153.1	220.7	92.6	3.6	-	702.3
1967	-	-	-	-	6.9	92.0	168.7	384.8	227.7	19.9	-	2.6	902.6
1968	-	10.2	-	3.3	-	36.7	287.3	96.0	79.6	5.3	-	-	518.4
1969	-	-	-	-	.8	41.4	156.9	166.9	84.8	131.6	-	-	582.4
1970	-	-	-	.2	.2	82.8	96.1	188.0	88.9	.5	-	-	456.7
1971	-	-	-	-	-	47.4	133.4	196.7	151.4	5.7	6.0	0	540.6
1972	2.4	-	-	-	33.8	43.7	45.4	130.0	123.7	15.1	-	-	394.1
1973	-	-	-	-	1.2	37.0	147.9	146.2	56.0	7.5	-	-	395.8
1974	-	-	-	-	-	49.0	182.9	273.4	114.0	62.2	-	-	681.5
1975	-	-	-	-	.3	21.3	349.7	138.8	100.7	56.3	-	-	666.1
1976	.7	-	-	-	2.0	21.3	85.5	128.6	49.3	32.2	-	1.1	320.7
1977	-	-	-	7.0	1.0	40.7	73.7	33.3	234.3	1.0	-	-	391.0
1978	-	-	-	-	4.5	39.0	122.1	139.4	195.1	29.4	28.2	6.5	564.2
1979	.5	-	-	-	11.4	33.9	151.4	139.5	54.6	13.8	-	4.0	409.3
Avg.	.3	.7	0	.8	4.4	49.9	151.5	165.3	127.2	33.9	2.7	1.0	537.7

Monthly Rainfall in mm at Kidira (1966 - 1979)

Annee	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annee
1966	0	0	0	0	0	141.0	93.8	227.9	156.0	130.2	0	0	748.9
1967	0	0	0	0	0	73.4	151.7	326.0	165.0	28.0	0	0	744.1
1968	0	1.0	0	0	0	10.0	145.3	94.5	118.3	16.0	0	0	385.1
1969	0	0	0	0	3.2	102.0	148.5	221.6	99.0	187.0	0	0	761.3
1970	0	0	0	0	0	44.5	189.5	226.5	120.9	15.0	.9	0	598.1
1971	0	0	0	0	0	53.0	140.0	265.3	93.7	0	0	0	552.0
1972	1.0	0	0	0	16.4	88.4	111.5	138.0	182.8	84.8	0	0	622.9
1973	0	0	0	0	32.3	85.9	88.6	132.2	40.8	30.2	0	0	410.0
1974	0	0	0	0	0	3.6	124.0	265.2	106.1	12.4	0	0	511.3
1975	0	0	0	0	2.9	32.4	377.8	102.0	105.0	48.0	0	0	668.1
1976	0	0	0	0	.5	69.0	150.0	86.0	115.0	55.0	28.1	0	503.6
1977	0	0	0	0	0	40.3	161.9	159.0	212.7	12.0	0	0	585.9
1978	0	0	0	0	6.6	84.4	220.8	201.0	166.6	84.1	0	0	763.5
1979	4.0	0	0	0	0	75.4	227.5	219.0	119.0	0	0	0	644.9
Avg.	.4	.1	0	0	4.4	64.5	166.5	190.3	128.6	50.2	2.1	0	607.1

Table 13
Summary of Production Data

Perimeter	1979 1980 Est. Surface Cultivated in Rice (ha)	1979 1980 Est. Surface Cultivated in Mais (ha) Rainy	1979 1980 Est. Surface Cultivated in Mais (ha) Dry	1980 1981 Est. Surface Cultivated in Rice (Ha)	1980 1981 Est. Rice Yield Tons/ha	1980 1981 Est. Surface Cultivated in Mais (ha) 1 Rainy	1980 1981 Est. Surface Cultivated in Mais (ha) 1 Dry	1980 1981 Est. Surface** Cultivated in Millet/Sorg. (ha)	Vegetable*** Production	1980 1981 Est. Total Surface Cult. in Rice 1979 80 (ha)	1980 1981 Est. Total Surface Cult. in Mais 1979 80 (ha)	1980 1981 Est. Total Surface Cult. in Rice 1980-81 (ha)	1980 1981 Est. Total Surface Cult. in Mais 1980-81 (ha)
Gande	1	1	5	-	-	4.5	8	-	+	1	6	-	12.5
Galade	.	4	4	..	-	9	9	-	+	-	8	-	19
Mouloy	20	6	20	20	3.5	12	15	-	+	20	26	20	27
Diawara	18	-	-	12	3	-	29	-	+	18	.	12	29
Yolingara	-	-	-	-	-	-	1.5	7	O	-	.	..	1.5
Matal		-	-	..	-	-	1 5	7	O	-	-	-	1.5
Tamou	4	-	.50	-	-	-	-	9	O	4	.50	-	-
Gassambilake	22	-	-	24	5	-	-	-	O	22	-	24	-
Kobgnam (PIV)	3	10.5	13	10	8.5	9.5	15	1	+	3	23.5	10	24.5
Kobgnam (Marb)	1	-	1	1	4	1	3	-	O	1	1	1	4
Gobi	-	-	1	-	-	-	2.5	-	O	-	1	-	2.5
Yafra	25	-	14	46	3	16	16	-	+	25	14	46	32
Arcandou (PIV)	13	2.5	10	34	3	12.5	12.5	-	+	13	12.5	34	25
Arcandou (Eng)	1.5	1	1.5	2.5	3.5	.50	2.5	-	+	1.5	2.5	2.5	3
Balou	55	-	18	103	6	-	-	-	O	55	18	103	-
Sabou	12	-	11	12	3.5	-	10	-	O	12	11	12	10
Dandoule	15	-	13	-	-	12	11	-	O	13	13	-	23
Djiriko	11	-	11	.	-	8	20	-	O	11	11	-	29
Dialigué	10	-	10	..	-	8	8	-	O	10	10	-	16
Sint Dialigué	2.5	-	5	-	-	5	-	-	O	2.5	5	-	5
Nouro Imadou****	7	-	10	-	-	-	-	-	-	7	10	-	-
Seling	2	-	8	.50	-	-	7	-	O	2	8	.50	7
Kidira	2.5	13	20	-	-	-	20	..	O	2.5	33	-	20
Naye****	-	-	-	-	-	..	-	-	-	-	-	-	-
Guitta****	1	-	7	-	-	-	-	-	-	1	7	-	-
Sendidou****	.	1.5	1.5	-	-	-	-	-	-	-	3	-	-

*Rainy and Dry season corn yields are estimated to be 50,000 ears/hectare.
**Millet/Sorghum yields are estimated to be 1-2 tons/hectare.
***Actual surface amounts cultivated in vegetables are unavailable.
+ represents significant vegetable production in terms of income.
O represents little or no vegetable production.
****The villages of Sendidou, Guitta, Naye and Nouro Imadou did not utilize perimeters during 1980-81 crop season.

Best Available Document

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Map from Louis Berger, Inc. "Rapport Final--January 1981. Spellings of village names may vary.

SALVO

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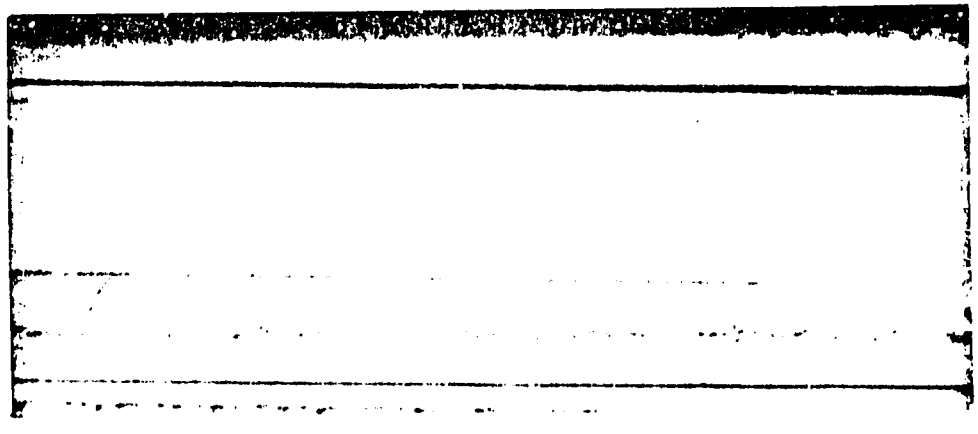
Center for Rural Development
International Rural Development



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Annex to

Bakel Small Irrigated Perimeters Production Economics Study

PIO/T 685-0208-3-7003
Annex

John M. O'Sullivan

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MISSION HAS REVIEWED WITH CONSIDERABLE INTEREST THE TUSKEGEE REPORT
"SEL IRRIGATED PERIMETERS PRODUCTION ECONOMICS STUDY". RE PROPOSAL
P 42 FOR A LONG TERM PRODUCTION ECONOMIC ANALYSIS PROGRAM MISSION
INTERESTED IN CONSIDERING TUSKEGEE RECOMMENDATIONS FOR DEVELOPING
PROGRAM WITH PEACE CORPS AS PROPOSED. IN THIS LIGHT USAID REQUESTS
TORS, PREPARE ANNEX TO ORIGINAL REPORT DETAILING RECORD
TEM (INCLUDING FORMS) THAT COULD BE USED IN THE DAKEL AR
APS ADDITIONAL VERSIONS FOR USE IN OTHER PARTS OF THE SENEGAL
ER VALLEY. USAID MOST INTERESTED IN SYSTEM THAT WOULD IMPROVE
LECTION DOST DATA AND COMPILE INFORMATION ON INPUT COSTS AND
DS OF THE MAJOR CROPS IN THE AREA (RICE, CORN AND VEGETABLES).
THE TUSKEGEE INTEREST/ABILITY TO PROVIDE RECORD SYSTEM.
USAID EMBASSY DAKAR SENEGAL 9047

Best Available Document

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INTRODUCTION

The Center for Rural Development, Tuskegee Institute, sent a two-man team to Senegal this summer to undertake a study of costs of production on the Bakel Irrigated Perimeters. This research was partially funded by Tuskegee's 211-d grant and partially by the Dakar mission.

Before arriving in-country, the Tuskegee team was already aware of Steve Franzel's study of the same region (MSU working Paper 28), and in Dakar read Moribadjan Keita's report (Bakel Small-Scale Irrigated Perimeters Project: A Mid-Term Evaluation Report). It became obvious to us that the major weakness in any attempt at analysis of project costs and benefits was the lack of accurate data.

The difficulties of this problem was brought home to us when we went to Bakel and spent a month there obtaining the data available. For various reasons, the SAED staff in Bakel were not in a position to furnish adequate data (nor to collect it) nor could they vouch for the figures they did provide.

At the same time it was striking how the various villages along the rivers had organized themselves to work the perimeters. These groupements des producteurs (GPs, as they are called) are innovations in the social organization of the villages and as such, offer real possibilities for improving management practices as well as technical improvements.

Furthermore, contact with the villages made it clear that soil and water considerations were such that each village had different crop enterprises options and evaluations of project cost/benefit analysis could not be accomplished meaningfully on an aggregate rice/corn (for grain) basis.

II

The above considerations led the Tuskegee team to make the recommendations that it did. It was our assessment that data had to be collected at the village level with farmer cooperation. We, therefore, recommended that Peace Corps Volunteers be recruited and trained for this task as they could provide services to the farmers in the villages and to the project. In this way, data collection (as part of a Farm Management Assistance Component to the GP) would be of benefit to the GP. Data collection would not be exogeneous to the GP, but part of it and would be institutionalized in the GP system itself. Farmers in the Bakel Region--particularly those involved in the GPs--already are well aware of "westernized" economic considerations (an awareness gained through their temporary emigration patterns). While suspicious of governmental surveillance, they appreciate assistance and the need for accountability by our funding agency. In theoretical discussion of a solution to these needs, they were opposed to the "quickie" short-term studies and were willing to consider a Peace Corps-type program where there would be long term presence --so long as it is of use to them.

From our point of view, a long term presence is desirable because of the nature of production on the perimeters. Records will have to be established throughout the agricultural cycle of two (or even three) growing seasons.

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Thus, a data collection system ought to be established which does not threaten the farmers and which serves the purposes of the funding agency. It is for that reason we proposed the PCV recommendations in our original report.

We perceive the volunteer as being an in-village Farm Management Consultant. His/her primary task would be to assist the GP to establish a recording system and then to implement a recording system in cooperation with the GP. His/her secondary task could be to assist the GP in following the direction of USAID/SAED technicians who visit the village periodically but who do not stay there for extended periods to ensure the implementation of their advice. Thirdly, they might engage in various community development activities agreed upon by all concerned.

Some candor is necessary in attempting to foresee and forestall potential problems with this proposed PC program. Our understanding is that Peace Corps projects must be requested and supported by a Senegalese government agency--as well they should be; In this case, this will mean SAED support and understanding. Given SAED's situation and structure in Bakel (which overall is not one of close cooperation and assistance to the farmers in the village) we must develop the Peace Corps Volunteers' Scope of Work such that he/she does not threaten SAED personnel, but assist them at the GP level. This point is essential to the institutionalization process which we will address later.

Secondly, the PCV must be seen as fundamentally in and of the GP (not SAED) so that he/she does not become the runner res-

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ponsible for seed supplies, fertilizer, fuel and other agricultural inputs needed at the village level.

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ESTABLISHMENT OF PEACE CORPS PROGRAM IN FARM MANAGEMENT

in Bakel Region

Proposed Villages (final siting will depend on USAID technicians, SAED, Federation and Village agreement):

1) Kidira (for Seling and Naye)
2) Balou
3) Arroundou (village and ensigre)
4) Kounghani
5) Moudery/Diawara-- including Gande and Gallade

A. First Step - establish Scope of Work with Peace Corps Senegal, SAED ISRA, OLMVS, Federation. Number of Volunteers - approximately 5.

B. See Appendix for draft examples of record keeping forms.

We would recommend a position be established for a long term data coordinator for Bakel project and its riverine counterparts This person's primary task would be to coordinate the Peace Corps Volunteer role as described above establish and master research linkages with ISRA and OMVS researchers. Such links would involve Mauritania and Mali as well as Senegal. It might be the

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task of the person in Richard Miller's position in the OMV's office.

SCHEDULE

C. Contact with Peace Corps Senegal, SAED, Federation, Villages, SONADER and Peace Corps Mauritania. (4-6 weeks)

D. Outputs:

Contracts for Volunteers

Scope of Work

Budget

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III

DATA COLLECTION Elsewhere on the River

Our efforts this summer underscored the problems of short-term data collection. This was particularly true in those areas where we had no leverage nor the time to establish relationships. Matam is a case in point Given this fact and the amount of research being done along the river already it is our considered recommendation that linkages with ISRA be established so that research efforts not be duplicated and research being done correctly be disseminated to people who will use it.

Our efforts this summer brought us in contact with an ISRA/ORSTOM research project (basically a farming systems approach) concerned with costs of production. The Research co-ordinator mentioned above with the Peace Corps Project would be responsible for establishing and maintaining these linkages. This would in all probability entail funding to ISRA. A contract with them would then permit our input into collection and analysis of data and our use of the results.

OUTPUT: 1) Contract for data collection with ISRA.

2) Collection of data and information from selected other sites on the River.

3) Budget

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IV

Use of Data and Institutionalization of Farm Management through Lampsar Ndiayi Training Center

The institution responsible for coordinating the long-term Production Analysis Program would be the center for assembling that data and analyzing it periodically throughout the life of the program. Analysis would be submitted to USAID as required for evaluations, reallocation of resources targeting trouble spots, etc.

It is proposed that the record keeping component handled by Peace Corps Volunteers over the first several years be brought into the Lampsar Ndiagi training center. This will institutionalize the Farm Management Process within SAED and villages working with them.

This aspect of the project would be at least a year down the road.

Output: Farm Management training for SAED personnel;
Data Collection institutionalized within the SAED system
Budget (?)

SUMMARY / BUDGET ITEMS

Production Economics Analysis Program (5 year duration)

1 person in Senegal for 24 months to establish Program and coordinate

1 trip/year to Senegal for 2 people (5 years)

Computer time (5 years)

Report publication costs (5 years)

Peace Corps Training Program: ( )

a) French Training

b) Farm Management basics

Domestic Travel (5 years)

Time Principal Investigator (5 years)

Support Staff (5 years)

Expenditure and non Expenditure (5 years)

Part I

Explication de l'importance de la gestion agricole scientifique dans le monde moderne.

Explication de valeur des renseignents inclus pour:

le cultivateur
le groupement
l'agence SAED
l'agence USAID

[developpable dans le futur]

Part II

Explication de la manière de recueviller les donnés:

a) . . . . . .

b) . . . . . .

c) . . . . . .

d) . . . . . .

Explication d'importance des donnés justes:

a) . . . . . .

b) . . . . . .

c) . . . . . .

[developpable dans le futur]

TABLEAU 1

date: _____

Village _____

Chef de Village _____

Groupement des producteurs _____

Chef de GP _____

Adjoint _____

Secretaire _____

Pompiste _____

(autre) _____

(autre) _____

AGENT de SAED _____

_____

Village: _____ Date: _____

TABLEAU 2

Liste des membres du Groupement des producteurs:

Nom	Parcelle	Endettement à GP	Credit à GP
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			

Village: _____ Date: _____

TABLEAU 3

Perimetre Irrigué (1)

(Croquis y compris les canalisations diques, bassin)

I. Superficie totale, orientation planification.

Saison: _

(à repeter chaque fois qu'il y a une changement significatif à ce niveau- surtout à chaque saison)

Village:_____ Date: _____

TABLEAU 4

Perimetre Irrigué (2)

(Parcellesation)

Croquis

(à repeter chaque fois qu'il y a une changement significatif à ce niveau- surtout à chaque saison)

Village: _____ Date: _____

TABLEAU 5

Perimetre Irrigué (3)

Superficie cultivée

Culture: _____

_____

_____

Croquis

Village: _____ Date: _____

TABLEAU 6

Perimetre Irrigué (4)

Superficies specialiseé (per example: planches des legumes)

I. Croquis/superficie/specialisation/Date de Semance

Village: _____ Date: _____

TABLEAU 7

Notes:

Problémes à poser aux techniciens (date)

1) (ex: marvaises, herbes, invasion de.....)
2)
3)
4)
5)

Village: _____ Date: _____

TABLEAU 8

Sommaire

Entrants employés sur les perimetres
(engrais, semances, herbicides etc.)

	type	saison	quantité	valeur
1)				
2)				
3)				
4)				
5)				
6)				
7)				
8)				

Village: _____ Date: ___

TABLEAU 9

Entrants employés sur les perimetre

Semences

	types	quantité	sources	disposition	dosage	date
1)						
2)						
3)						
4)						
5)						
6)						
7)						
8)						
9)						
10)						
11)						
	Total					

Village: _____ Date: _____

TABLEAU 10

Entrants employés sur les perimetre

Engrais

	type	quantité	sources	disposition	dosage	date
1)						
2)						
3)						
4)						
5)						
6)						
7)						
8)						
9)						
10)						
	total					

Village: _____ Date: _____

TABLEAU 11

Entrants employés sur les perimetre
(autres _____)

	type	quantité	source	disposition	dosage	date
1)						
2)						
3)						
4)						
5)						
6)						
7)						
8)						
9)						
10)						

total

Village: _____ Date: _____

TABLEAU 12

Stock du g.p. (semence, grains, engrais, espece)

	type	quantité	valeur
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			
	total		

Village: _____ Date: _____

TABLEAU 13

Rendements (grains)

	type	quantité	superficie	v/ha
1)				
2)				
3)				
4)				

Village: _____ Date: _____

TABLEAU 14

Rendements (mais verte)

1)

2)

3)

4)

Village: _____ Date: _____

TABLEAU 15

Rendements (legumes)

	type	quantité	par	valeur	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					

Village: _____ Date: _____

TABLEAU 16

Systéme des pompe

	pompe modél	date d'emploi	date de revision	reparation faite
1)				
2)				
3)				
4)				
5)				
6)				

	tuyaux (pvc)	quantité	date d'achat	valeur
1)				
2)				
3)				
4)				
5)				

	bassin and canalisation	date de mise en place	valeur
1)			
2)			

Village: _____ Date: _____

TABLEAU 17

Piéces Détacheés

type	valeur	date

Village: _____ Date: _____

TABLEAU 18

Carburant

stock	quantité	valeur	date

achats	quantité	valeur
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		

total

stock

Village: _____ Date: _____

TABLEAU 19

huile

	stock	quantité	valeur	date
	achats	quantité	valeur	date
1)				
2)				
3)				
4)				
5)				
6)				
7)				
8)				
9)				
10)				

total _____ total _____

stock _____

Village: _____ Date: _____

TABLEAU 20

Pompes

mois: _____

heures d'emploi

	date	de	à	
1)				
2)				
3)				
4)				
5)				
6)				
7)				
8)				
9)				
10)				
11)				
12)				
13)				
14)				
15)				
16)				
17)				
18)				
19)				
20)				
21)				
22)				
23)				
24)				
25)				
				total hrs

	date	de	à	
26)				
27)				
28)				
29)				
30)				
31)				
				total hrs

Village: _____ Date: _____

TABLEAU 21

Heures de travail

Culture: _____

Sommaire

preparation du sol	hrs	/ha
semence/repicage (rayer la mention inutile)		
desherbage		
_____		
recolte		
transport		
vannage		
battage		
stockage		
total		/ha

Village: _____ Date: _____

TABLEAU 22

Preparation de la terre

emploi du temps

Culture: _____

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

Village: _____ Date: _____

TABLEAU 23

Emploi du temps

semence/répicage

Culture: _____

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

total _

Village: _____ Date: _____

TABLEAU 24

emploi de temps

Culture: _____

désherbage _____

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					
				total	

Village: _____ Date: _____

TABLEAU 25

emploi de temps

Culture: _____

recolte

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

Village: _____ Date: _____

TABLEAU 26

emploi de temps

Culture: _____

(autre) _____

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

Village: _____ Date: _____

TABLEAU 27

emploi du temps

Culture: _____

Transport _____

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

Village: _____ Date: _____

TABLEAU 28

emploi de temps

Culture: _____

Vannage

	parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					
				total	

Village: _____ Date: _____

TABLEAU 29

emploi du temps

Culture: _____

disposition stockage _____

vente _____

_____ autre _____

	Parcelle	personnes	mode	temps	date
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

Village: _____ Date: _____

TABLEAU 30

Prix de vente (hebdomadaire)

	produits	date	prix au village	marché local	par unité d
1)	sorgho battu				
2)	mil battu				
3)	mais graines				
4)	mais verte				
5)	riz paddy				
6)	arachide à coque				
7)	poisdeterre décortiqué				
8)	haricot				
9)	gombo				
10)	chou				
11)	tomate				
12)	piment				
13)	patate				
14)	sucre				

Dossier de Gestion Agricole

pour

le Perimetres Irriqués

Provisoire

ovember 11, 1981

ohn M. O'Sullivan

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