Final Report - Phase I

Guidimaka Integrated Rural Development Project

Selibaby, Mauritania

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Directorate of Agriculture,

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by:

Max D. Goldensohn

Chief of Party

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EXPERIENCE, INCORPORATED

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I. Introduction: Objectives and Field of Action

This document is the final report on the first phase of the Guidimaka Integrated Rural Development Project required by Article I, paragraph C, P.4 of contract AID/afr-0201-C-00-1012-00 betweeen the AID Office of Contract Management, Regional Operations Division/Africa and Experience, Incorporated, 1725 K. Street N.W., Washington, D.C. In the pages that follow I shall summarize project activities and accomplishments, discuss problems we have encountered in carrying out these activities, and present recommendations for future activities in the Guidimaka Region.

This report was to have been submitted no later than November 15, 1982, but exceptional circumstances have led USAID/RIM to postpone this due date until 30 January 1983 (see memo from V. MacDonald, cleared by F[illegible]m a of 14 December 1983). These circumstances have had to do [illegible] some confusion concerning the possibility of a second phase for the DRIG Project and the work-load created by the efforts to determine whether or not such a continuation would take place.

This report was to cover the entire time of the first phase of the DRIG Project. However, I shall write mainly of our activities since the contract for our project was transferred from Pacific Consultants to Experience, Incorporated (EI) on 27 November 1980. The problems of starting up an activity like the GIRD in an isolated region like the Guidimaka and those of dealing with Pacific Consultants, whose contract was terminated for the convenience of the U.S. government, have been amply described in previous reports.

Here let me state only that both caused delays and confusion in getting required activities underway. Nonetheless, since EI took over the project, we have made steady and significant progress toward accomplishing all Project goals. In this report,

I shall attempt to describe the nature and implications of these accomplishments through December 31, 1982. The Project is still operating as I write - trees are planted each day, new vegetable gardeners begin collaborating with us, new animals are brought in for training or treatment, new volunteers trained, new construction projects are undertaken, and old debts are paid. However, our status is still ambiguous as the Mauritanians have provided us with local currency to function for a year, but dollars are only available for six months and have only been authorized through the end of February.

The objective of the DRIG Project has always been very clear. We are to develop and test innovations in agriculture, animal health and nutrition, range management, and forestry that are socially acceptable to the people of the Guidimaka, technically feasible, and economically viable. When we are convinced that these innovations are extendable, we are to conduct on-farm trials and begin extension of them to the peasants and herders of the region. Striving to arrive at this objective implies increasing food production, decreasing the rural exodus, and helping Mauritania diminish her dependence on foreign aid for her survival.

To carry out this work, we obtained from the Government of Mauritania (GRIM) and from local land-owners, five experimental sites: Katamangue, 500 hectares of clay soils for range, animal, and agricultural tests; Nyarwale, 20 hectares of degraded clay/sand soil for forestry and agricultural tests; Singha, 15 hectares of sandy soil for range, forestry and agricultural tests; Guidebine, 1 hectare of lowland clay soil (Parawolle) for forage crops and water management tests; and the Nursery, one hectare of sandy soil for vegetable gardening and forestry. In addition, peasants provided us each year with sufficient land for on-farm trials, and for tests of sorghum varieties resistant to the weed Striga. The GIRM provided us with land for the construction of offices, a garage and storage facilities.

Until the evaluation of the project carried out in February and March, 1982 by a joint commission from the Ministry of Rural Development (MRD) (see below for explanation of administrative situation of the DRIG Project), USAID/RIM, REDSO/Abidjan, and the Regional administration of the Guidimaka, the DRIG's on-farm trials and extension activities were limited to a zone within a radius of 20 kilometers around the town of Selibaby, the regional capital, where all project activities are based. This area included approximately 30 villages and camps and a population of 20-25,000 people. Since the evaluation, we have extended our operation to the entire region, which includes approximately 100 villages and camps and a population of around 100,000. The number of villages and camps varies greatly from season to season and year to year, depending on harvests, rainfall, pasture, water in wells, etc.

II. Observations About the Guidimaka

Though the Soninke ethnic group dominates the region as a whole, there are significant populations of Peulh, both sedentary and transhumant (for some reason, the word Toucouleur is never used in the Guidimaka); sedentary black Moors (Haratin); and sedentary and transhumant white Moors (Beidani). There are no real nomads in the Guidimaka in normal times, but in exceptionally bad years, herders will arrive from the Gorgol, the Tagant, the Assaba, and even from the Brakna or Trarza to find grass and water for their animals. These people, whose normal transhumant patterns have been interrupted by drought, may become permanent Guidimaka residents, or may eventually wander back where they came from.

Rainfall in the Guidimaka is supposed to attain an average of 600mm/year. However, I have spent four rainy seasons in Selibaby and have never even seen 500 mm of rain. There is a remarkable amount of variation in rainfall received at different

spots in the region in any year; even fields 100 meters distant may see variations up to 20%. The precipitation figures below are thus approximative and do not necessarily represent what any given field or village received:

1979 - 350mm, short season, bad crops.
1980 - 490mm, short season, bad crops.
1981 - 450mm, long season, good crops.
1982 - 480mm, long season, good crops.

These measurements were taken in Selibaby.

Pasture production has sufficed for the animals in the region each year except 1979. This latter year's failure led to serious losses of cattle in the hot season of 1980 (April-June).

Soils in the Guidimaka range from light and sandy to heavy clays. All are typically deficient in nitrogen and phosphates. There is, to my knowledge, no deep water table in the region which could be used for irrigation on a large scale. Most wells go down between 10 and 30 meters and a good one produces 12 cubic meters/day.

The Guidimaka thus presents a typical image of a Sudano Sahelian ecology. The vegetation confirms this judgement.

Cram-cram (cenchrus spp) grows throughout the area and the typical trees are Acacia Senegal and Seyal, Balanites aeg., Combretum spp. Bauhinia spp., and baobabs.

III. Staffing and Administrative Structure of the Project

The DRIG Project has always been financed by AID. All expenses, whether in Ouguiyas or in hard currency, were authorized and controlled by AID officials in Nouakchott or Washington. The Mauritanian Ministry of Rural Development has always provided USAID's interlocutor in the GIRM. Major purchases and all imported goods are approved by the Director of Agriculture

who is the project's co-director, and the counterpart of the USAID project officer. The Director of Agriculture coordinates the Project's relations with the other technical directorates in the MRD who provide personnel, advice and supervision to the team in the field. These are the Directorates of Nature Protection and of Animal Husbandry and Range.

The GIRM and the MRD have been very regular in providing the Project with everything that it promised in the Pro-Ag (of September 17, 1977) that defines the terms of the activity. The USAID Project Officer coordinates our relations with the USAID technical and administrative services that we need. In general our support from the Mission in Nouakchott has been excellent.

The staff on the project site in Selibaby includes three groups of people, fused into one coordinated, "integrated" team. The MRD provides 8 counterparts to the Project at all times. In the course of our four years in the field, 3 have moved on to other tasks, with our approval. The current staff is:

Wone Abderahmane	Chief of Party, IAT in regional planning from the IPD in Douala, 20 years relevant experience.
Moussa Kone	Head of of DRIG Animal Health and Nutrition Division, IAT from Bambey, Senegal, 20 years relevant experience.
Bâ Sourakho	Head of DRIG Nature Protection Division, CER from Kaedi ENFVA, 15 years relevant experience.
Bâ Khalidou	Head of DRIG Agriculture Division, MER from Louga (Senegal), 20 years relevant experience.
Kebe Souleymane	Counterpart, DRIG Animal Division, Assistant d'Elevage from Kaedi ENFVA, 2 years relevant experience.

Kane Abdoul Karim	Counterpart, DRIG Agriculture Division, CER from Kaedi ENFVA, 2 years relevant experience.
Barry Mamadou Issa	Counterpart, DRIG Pasture section, CER from Kaedi ENFVA, 2 years relevant experience. Will not continue in project in second phase as pasture activities have ended.
Bâ Abdoulaye	Counterpart, DRIG Nature Protection Division, Agent des Eaux et Forêts. 17 years relevant experience.

Led by Mr. Wone, this team is in very large measure responsible for the success of the Project in the field. Their experience and capacity, both technical and human, combined with their complete dedication to the task at hand are exemplary. I cannot remember a single Sunday or holiday without a good number of them working with their teams or their pilot peasants. If they were paid for their overtime hours, they would be wealthy.

Experience, Incorporated, a private American consulting company, provides the second group of technicians on the DRIG team. This six-person unit is currently composed of the following people, who have provided the indicated number of months of service since EI began administering the project:

Max Goldensohn	Chief of Party. Ph.D. in Social Anthropology. 17 years relevant Third World Experience, 25 months.
Quan Minh Doan	Agronomist. Ingenieur Agronome (Rennes), 28 years relevant Third World experience, 23 months.
Jean Varenne	Mechanic/Administrative assistant, electrician. 20 years relevant Third World experience, 25 months.

Gregory Greenwood	Range Manager, Ms in Range Management, 8 years relevant Third World experience, 25 months.
Duane Schaad	Animal Health and Nutrition, DVM, adequate US experience, first overseas job, but brought up in Africa and familiar with living and working conditions, 15 months.

This group has thus provided a total of 138 months of service. Messrs. Greenwood and Schaad have already completed their final reports and left. The other four are awaiting their replacements before leaving. All members of the EI team speak fluent French and adapte well to the physical, social, and professional conditions in Selibaby. They worked efficiently and with great dedication to ensure good relationships with their counterparts and to achieve the significant results the project can now point out.

The third element composing the DRIG team is the locally-hired agents working in Selibaby and Nouakchott to help carry out the tasks assigned to the project by its assorted supervisors (MDR, USAID, EI/DC). At times there have been as many as 250 people working for pay on the project. Now there are 124, including 15 trained rural animators, 12 animal trainers, 12 assistant animal trainers, 5 vegetable gardening specialists, 9 tree nursery specialists, drivers, mechanics, matchmen, laborers and administrative staff.

All of these people, including administrative staff were entirely trained on the job by MDR/EI technicians. These people were paid out of the project budget which totalled $6,151,000 for the period from September 1977 through 31 December 1982.

IV. Project Activities and Accomplishments

Pages 1-4 of the contract between EI and AID explain in some detail the tasks that the DRIG team had to accomplish in the Guidimaka. I shall go through these requirements one by one and show what we did to satisfy them.

A. Construct Water Catchment Basins

As required by the original PP, we dug three catchment basins on the Katamangue range site. The original plan had meant these as work for a bulldozer, which USAID subsequently eliminated from the project. Thus we dug them by hand. Each basin of approximately 20 meters x 10m x 3.5m required the labor of 40 men for three months. The basins thus cost approximately 20 times per cubic meter of dirt moved what the basins on the Bakel USAID Project cost. The Bakel basins were dug by machine. USAID then agreed to buy a dozer for us (D-6 from excess property). It arrived in early 1982 and has been broken down for all but one month since then, in spite of the presence of a capable heavy-equipment mechanic on the project (Jean Varenne). The parts ordered at the same time as the dozer, also from Excess Property, arrived in Selibaby in late November 1982. In addition, EI has had to procure two lots of spare parts (each costing about $1,000) to provide essential parts not included in the shipment received from Excess Property.

In the meanwhile, we have had three official requests from villages, all approved by the Regional Government, for basins (Mbekhere, Ferlo, Klebiya). There have also been numerous unofficial inquiries. As soon as the dozer is repaired, we hope to fulfill these requests. The basins seem to hold water for two or three months after the end of the rains. We are convinced of their utility and so seem to be the villagers of our zone. The three months of the year when they hold water are crucial for they coincide with a heavy calving period for

cattle and can offer the calves and their mothers water near good pasture without long walks. This is rarely available otherwise at this time. The sites for these three basins have been determined. They are far from current sources of water and are in attractive, grassy zones.

B. Construct Firebreaks (possibly)

We have constructed firebreaks around our three reforestation sites. Some of the work was done by the dozer before it broke down. Project laborers completed the task by hand. We have planned, in conjunction with the regional Nature Protection Service, to construct a system of firebreaks in the Central Prefecture of Selibaby, where soils are heavy and a dozer is necessary.

C. Adaptive Research Which Will Lead to a Determination As to the Most Adaptable and Productive Food-Crop Varieties for Prevailing Conditions

In the rainy season of 1981, we ran a successful campaign of trials of food crop varieties in clay and sandy upland soils (Katamangue and Singha) on our sites. We abandoned the Niarwale site except for soil management because of its general state of degeneration. In 1979, we had no agronomist or seeds or fenced sites. In 1980 a short rainy season caused all crops to fail. Of 31 varieties of sorghum tested in 1981, 15 were retained for experimentation in 1982. With the results of the 1982 campaign in hand, we except to choose two or three for on-farm trials in 1983. The varieties tested came from SAFGRAD/Upper Volta, ICRISAT/Nigeria, Purdue/USA, and E-35-I (a variety now used in many other dry zones in Africa). In 1982, we added some further varieties from Texas/USA. The yields range from 1.1 T/ha to 4T/ha and are far beyond what local varieties can yield (0.5 to 0.8 T/ha) if there is rain. In 1981 the local varieties failed to produce at all while the new varieties gave the yields mentioned. Mr. Quan, the DRIG agronomist is currently preparing his report on the results of the 1982 season. This will be circulalted as soon as possible.

This Division also carried out trials of sorghum varieties resistant to Striga. The seeds came from SAFGRAD/Upper Volta. Of 21 varieties tested in 1981, 9 were retained which had given yields 2.5 times that of the local control in heavily infested fields. In 1982 these nine were retested and three varieties seem to merit on-farm trials. The 1982 trials were carried out with seeds from our 1981 tests. In 1983, we shall try some on-farm trials with the best varieties. Yields over 1 T/ha are considered excellent for striga-infested fields where the best local controls only gave 400 kgs/ha.

We have abandoned trials of corn and millet. The local varieties of the former and Souna II (from Bambey) for the latter out-perform everything we have tried. This includes varieties from Cimmyt, SAFGRAD, Kaedi, ICRISAT, etc.

In 1981, trials of cow-peas (niebe) with seeds from IITA in Upper Volta showed 14 of 19 varieties with yields superior to the local varieties. Unfortunately, we were unable to preserve our seed for planting in 1982, in spite of trying a number of methods counseled by experts in the field of crop protection, and the seeds sent by IITA arrived too late for planting. We hope to try again in 1983.

In all trials, we control for advantageous characteristics, from resistance to local diseases (e.g. smut in sorghum) to lodging when ripe. These traits are taken into consideration when choosing varieties for further experimentation or for on-farm trials and extension.

Please note that what the DRIG does is not agricultural research properly speaking. We do not develop our own varieties in controlled conditions, for example. We do adaptive trials of varieties developed elsewhere to test their behavior under the conditions of the Guidimaka. The project is not a research project and our "research" side is meant to support directly our on-farm trials and extension aspect.

D. Seed Production and Distribution

Though not required by the contract, we have, each year, distributed to local farmers seeds of varieties we believe should spread across the region. In 1981, we distributed approximately 500 kgs of Souna III and the same of Sidi Nieliba, a short-cycle, drought resistant sorghum. In 1981, we produced 1,655 Ton of Sidi Nieliba (yield 2.4 Ton/ha) and 446 kgs of E-35-I, as well as approximately 400 kgs of Souna III. All of this seed was distributed in 1982. At a maximum of 6 kgs of seed (2 mounds) per hectare, this means we provided seed for 1,250 hectares. If yields are as expected, this should imply an increase in cereal production of at least 1,000 tons, or at CFA prices, 13,000,000 UM. We produced important quantities of Sidi Nieliba, E-35-I and other varieties this year on our sites. The figures will come from Mr. Quan's report. There is no problem in distributing seed. All the peasants in the region are eager for whatever we distribute.

E. Demonstration of Soil Management Practices Including Rotations with Legumes as a Means of Fertility Maintenance under Continuous Cultivation.

These trials began in 1980 under the agronomist supplied by Pacific Consultants. Inadequate rainfall and bad management nullified the results. In 1981, we began trials with sorghum, peanuts, niebe and fallow fields. Results were obtained and in 1982, we rotated the fields. Mr. Quan will present the results in his report.

In 1981, manuring and composting gave encouraging results on the Niarwale. We use these techniques mostly in market-gardening (vegetables) but they are encouraging for cereal culture, too.

Plowing alone increases yields by 15% on heavy soils. This seems due to greater water penetration and retention and ease of growth for crop-roots.

A most promising soil management technique is using furrows perpendicular to the slope of inclined fields to combat erosion and conserve water. The results of these trials are visually spectacular in on-farm trials and on our demonstration sites. Yields are significantly higher using this technique.

F. Introduction of Animal Traction as an Aid to Crop Protection (including Weed Control) and Adjunct Enterprise (Growing Our Workstock)

On our arrival in the Guidimaka, there was virtually no animal traction used for agricultural purposes. A dozen or so donkey or horse carts were in use and one farmer was said to plow with a horse on the border with Mali. There had been animal traction programs here in the 60's and 70's but no followup or training had been provided. Thus there was some interest in the technique as well as a good deal of unused equipment stored in granaries and under roofs. After a season of experimentation in 1980, we determined that bovine traction is the best prospect for the Guidimaka, given the heavy soils used for cereal culture. Horses can also be used economically. Donkeys are useful only for haulage and on sandy soils.

During that first year, we trained 6 project workers to be animal trainers and assistants. In 1981, we trained 6 more. We began by purchasing pairs of bulls and demonstrating the technique with them in our centers in villages around Selibaby. Seven were purchased for the project and 7 for local farmers. We retained 2 as demonstration pairs and thus 12 were at work for local peasants. We also provide veterinary supervision through the Animal Health Division of the project. In 1982, we trained 14 more pairs in the region of which four were retained by the project. Of the four project pairs, three have been sold and the last one has been spoken for. Thus 25 pairs are now in the hands of Guidimaka farmers. Requests for next year threaten to outstrip our training capacity.

In addition, we have trained between 20 and 30 horses to plow. We have repaired a large number of plows and hoes that had been out of use for years. This usually required some oil, a bolt or two, and occasionally a small welding job. We have sold to farmers approximately 80 units of animal traction equipment, mostly carts. These units are sold on credit, on terms defined by the Directorate of Agriculture. Through January 4 total reimbursement was at 80.50%. If one excludes 4 experimental contracts with exceptional terms, reimbursements are at about 87%. The total proceeds are now around UM 900,000. We have begun procedures to order a third lot of equipment from our supplier, the SISMAR in Senegal.

The continued spread of animal traction in the Guidimaka is now only a function of the availability of equipment and credit and of our capacity to train both animals and farmers. Through increased yields and increased hectares cultivated, we expect farmers using this technique to at least double their production. In addition, plowed fields will resist drought and greatly reduce labor costs. Mr. Quan has calculated that bovine traction is clearly justifiable economically and one pilot peasant amortized an investment of UM 38,000 (pair, cart, plow) in one rainy season.

G. Exploration of Gardening and Fruit Production in the Region

On our arrival in the Guidimaka, there was minimal vegetable gardening in the region, and only in Selibaby town or on the Senegal river where the War on Want Project was working. Most vegetables on the market came from Bakel, Senegal and consumption was rare and expensive. Gardening in the Guidimaka can take place early between November and March. With greater effort and investment, it can go on year round. This latter requires shelters from sun and rain and only certain crops can survive. Many villages were at first resistant to vegetable growing and in the 1980-81 season, we had demonstration gardens with pilot peasants (including many women) in 5

villages. We estimate there were about 80 participants that year. In 1981, we went to 11 villages and had about 200 participants. This year, 1982-83, we are in 18 villages and estimate there were 500-600 participants. In addition, many villages have complained of being left out. Once again, continued extension of gardening depends mostly on the number of agents the project can train and maintain in the field.

In addition to the five extension agents (rural animators) we have trained, there are five other men who are specialized in helping villagers start and maintain their gardens. Mounted on bicycles, this group covers the numerous individual and collective gardeners who have asked us for help. For individuals, we provide seed and training.

For collective gardens, we also provide barbed wire for permanent fencing (the villages cut dead wood for posts with permission from the Nature Protection Service) and cement and steel for permanent wells. In this way, we have encouraged many individual farmers to group themselves to cultivate collective gardens. This is a more efficient and economically viable organization than individual gardens, with their own fences, wells, etc. Also, supervision is much easier and production is generally higher. There are about 16 collective gardens under DRIG supervision this year.

We have decided not to extend fruit production in our zone. It is expensive to undertake and maintain and must, I fear, remain an activity undertaken or prestige or, more simply, to supply a little fruit for a single family for a short time each year. Citrus and guava grow well but slowly in certain areas, and mangoes can survive with perpetual watering in lowland zones that would be better used for vegetables or

cereals. We help those who have fruit trees already with pruning, grafting, and spacing of new plantings, as well as fertilization and protection. But we do not encourage this activity. We intend to distribute the remaining trees from our Nyarwale orchard to our pilot farmers this year and to end the operation.

H. Improved Cultivation Techniques

This has been one of the most successful of our activities with farmers in the Guidimaka. For cereal cultivation, we have taught farmers to plow with animal traction, weed with animal traction, thin out pockets early to two or three stalks, plant across the slope, trim secondary heads, earth up around plants, manure and compost where possible, and to use furrows and ridges perpendicular to the slope.

Our experiments with spacings and with associated crops (e.g. peanuts and sorghum or niebe and sorghum) revealed that local techniques were efficient and needed no improvement. The other techniques combined contributed significantly to the 30% to 200% improvement in yields and up to 300% increase in production noted by farmers who worked with us. Except for composting and soil improvement through rotation, none of these techniques are still being tested. All are part of on-farm trials and extension campaigns.

For vegetable gardening, the techniques introduced are: hauling water from wells with animal traction, replacing metal pulleys (UM 1,800 lasting one month), minimal effective watering, nurseries and transplanting, correctly dug beds, hilling, regular weeding, thinning, etc. These techniques are also now in extension and on-farm trials, not in experimentation. It should be noted that we maintain a large demonstration garden in Selibaby. There we bring farmers to visit a model establishment, as well as try out new varieties that we receive from various sources. From this garden, we provide

vegetables to the PMI for nutritional demonstrations as well as to the hospital and primary school dormitories for their inmates.

I. <u>On Farm Trials of New Cereal Varieties, New Cultivation Techniques, Animal Traction, and Vegetable and Fruit Production</u>

1981 was the first year we tried extensive on-farm trials and extension of new varieties and cultural techniques of cereal varieties. That year, from 5 centers we had 25 pilot peasants and influenced about 500 farmers altogether. We estimated improvements in yields and production between 30 and 300% for those with whom we worked, with an average of about 100%. In the 1982 rainy season, we worked in only four centers (Selibaby, Koumba N'Dao, Kininkoumou, Dialla) but covered six other villages intensively (Soufi, Guemou, Bouroudji, Hassi Chaggar, Mbekhere, Mamayel). We worked with 150 pilot farmers and influenced about 5,000 peasants altogether, including many women. We do not have figures yet, but guess that improvements in yields and in production are at least as great as last year. Indeed, they may seem even more dramatic this year as widespread variations in local rainfall caused major crop losses in several zones. Our farmers survived these variations quite well. In each of the centers, we carried out at least one set of variety trials, animal traction trials, and technique trials (especially furrows and ridges). The results were generally good. Mr. Quan will present them in his report. I have described the on-farm trials of vegetable production in a preceding section (7).

Approximate calculation of economic effect of DRIG program with 5,000 farmers:

0.5ha/farmer x 2t/ha x 5000 farmers = 5,000T

Without DRIG:

0.5ha/farmer 1T/ha x 5000 farmers = 2,500T

Difference:

2,500T x UM 13/kg = 32,500,000 UM

This is without counting an increase in the area cultivated.

If the 150 pilot farmers, using animal traction doubled their area (which is usual) this would give us an extra 75 hectares x 2/ha = 150T x 13UM/kg = UM 1,950,000 .

This gives a total increase of UM 34,450,000 or 2,650T of cereals. This is a somewhat optimistic calculation I admit, but even if we only achieved half this result, it would be of exceptional economic importance.

The on-farm trials and extension campaigns have been a great success and will be the main pillar of any future activities in the Guidimaka.

J. Range and Animal Management Tasks

1. Establish a Range Management Test and Demonstration Area 8 kilometers North of Selibaby and Conduct Demonstrations of the Technical and Economic Principles of Ruminant Nutrition.

The Katamangue is about 8 kilometers North of Selibaby and was chosen as our range/animal site. Before November 1980, we fenced the outside of the site and then quartered it, all with five strands of barbed wire on termite resistant local palm wood (ronier) as required in the PP. We made a detailed map, built two small and one large storage buildings, a vaccination corral of local termite resistant wood, installed cattle and small ruminant scales, and dug three catchment basins.

In September/November of 1980, we borrowed from local herders sufficient animals (cattle, sheep and goats) to make up experimental herds on three of the four blocks on the site. The fourth was reserved for emergencies. Later on, as we realized that the range could support far more animals than first suspected, the fourth block was occupied and all were divided into sub-blocks for better control of grazing patterns. Electrical fences helped in herd control within blocks, and we hired herders to guide the animals to pasture.

Project agents were trained to feed and care for the animals and to sample and control grass, legumes and trees on the site.

In October 1982, we returned all animals to their owners after final weighings and determinations on the site. Dr. Schaad, the DRIG Veterinarian, and Mr. Greenwood, the DRIG range manager have both submitted excellent reports on their aspects of the experiments that took place on the Katamangue.

These reports are attached to the present general report. They are the best witness to the project's success in fulfilling tasks 10-13, described here and below, and I beg the reader to give them the attention they deserve. While the herd was on the Katamangue site, it was used to demonstrate conclusively that: regular deparasiting, both internal and external, has an important effect on survival, weight gain, and general health of the animals; free-choice water, as opposed to the limited quantities hauled out of shallow wells in gourds by herders, is vital to survival and weight gain; and that reducing the distance that animals have to walk from water to pasture is essential to survival, particularly of calves and nursing mothers. On the other hand it was shown that in normal years, supplementing the animals' diet with peanut cake or composed feed (industrial) is not economically viable under present price conditions. Providing sorghum or other stalks and peanut or niebe leaves, or cuttings from forage tree branches can be economical for animals with special tasks to perform - traction, milk for family, fattening for sale, during lactation, etc.

The general availability of adequate grass in normal years, but the problem of distance from water, led us to try creating a village pasture reserve, in Diegui, a village about 18 kms from Selibaby. We fenced off about 80 hectares with the help of the villagers. We expect to be able to put

100 tropical livestock units (TLUs) of cattle on the site for the five crucial months: March, April, May, June, and July. We have already had one official request approved by the governor, from the village of Klebiya, to create a second reserve; eight other villages have made inquires. We hope to carry out the creation of reserves under our forestry program in the second phase of the project.

The only economically viable crop for improvement of pasture we found to be the leucaena tree, which can survive without watering in lowlying clay soils (parawolle or rakhe). When planted as windbreaks around a field or garden and clipped regularly, it can provide important quantities of high quality forage from relatively small areas under cultivation. Many farmers are adopting leucaena as part of our live fencing program (see forestry section below). Without entering into technical details here, I believe that the DRIG's experiments on the range sites demonstrated the technical and economic principles of ruminant nutrition to our Mauritanian technicians, to the regional administration, and to the frequent groups of herders who visited the site under our supervision.

All the villagers of the DIZ (20 kms zone around Selibaby) and many from several other villages visited the site while the animals were on it and all were impressed with the state of our herd, as well as with the importance of keeping pasture available near water for certain categories of animals at certain times of the year.

2. <u>Assist Livestock Herders and Owners by Developing Amongst (sic) Them a General Understanding of Range Management Principles and Demonstrating to Them the Value of Techniques Such as Restricted Grazing and Feed-Water Balance.</u>

Most of this has already been discussed in point J-2 above. Herders from more than 30 villages visited the

Katamangue site and understood the value of restricted access to pasture and of short distances from water to pasture. We have had numerous requests for digging catchment basins and creating range reserves in the Region. The regional administration supports these efforts and is convinced of their importance. The Project's Mauritanian technicians are also convinced of their importance and are eager to continue their application.

3. Demonstrate the Value of Animal Health and Sanitation as an Integral Part of Any Livestock Program in Order to Permit the GRIM's Livestock Service to Respond to the Demand of the Project (sic).

On the Katamangue Range site, our demonstrations of improved animal health through regular vaccination, internal and external deparasiting, regular changing of sleeping areas for sanitation, and regular check-ups for specific health problems effectively showed the herders and technicians of our zone the importance of these practices. For example, we had no calf mortality in two years, whereas the rate in the normal population seems to run between 25% - 40%. When we returned our borrowed animals to their owners, they all were pleased with the difference they perceived between the animals we had cared for and those they had with them. These differences in size, in glossiness of coat, of general condition were visible to laymen and specialists (like Dr. Schaad) alike. When the herders learned that we were to have a second phase, all came asking if they could not give us a new set of animals to raise for them. Throughout the trials on the Katamangue, herders from villages who had not lent us animals or who had not wanted to trust us with their animals for the herd watched the Katamangue demonstration. Once, in order to increase the load on our pastures we required about 40 head of cattle. We were able to borrow them in one day, whereas it had taken us three months to convince herders to give us the first group that went on the

Katamangue. All these facts lead me to conclude that our demonstrations will have a positive effect on cattle production in the Guidimaka.

4. Assist the GRIM's Animal Health Service

a) Assistance to the Guidimaka Inspectorate of Animal Health

We gave them a great deal of equipment, including a kerosene-operated freezer for vaccines, access to a second freezer for vaccines and ice-making, syringes, needles, microscope, scissors, clamps, and other assorted small material. In addition, we provided them with US 7,000 per month of material to help them perform their tasks in the Guidimaka. This money was generally used for gasoline, kerosene, carparts, or small material. It was not used to pay personnel or for ordinary office operations. At least twice a week, we send out missions composed of members of the Inspectorate and the DRIG. These missions are for vaccination campaigns wherein we provide vaccinators. Dr. Schaad, the DRIG veterinarian, often went with the Inspector to check on odd seeming symptoms, including two rabies outbreaks. We helped the Inspectorate control these outbreaks and supply feed to the quarantined animals. Dr. Schaad also provided care to clinic cases that the Inspectorate agents could not handle, mostly in cases requiring surgery. Our relationship with the Inspectorate is excellent and they also help us a good deal. The last major item of collaboration has been the complete reconstruction of the Selibaby abattoir and of the meat stall in the market. This was done at the governor's request and under the PPIV program.

b. Procurement and Sale of Animal Vaccines and Pharmaceuticals

Early in the project's lifetime, the Directorate of Animal Health gave us permission to sell veterinary drugs on an experimental basis in the Guidimaka. To my knowledge, we were the first project to have the right to do this.

The herders were accustomed to receiving free drugs and most people said that we were wasting our time, no one would ever buy drugs, because they would hope to get them for free later on. This was disproved immediately. In just about 2 years of sales mostly in the 20 kilometers DIZ, we have sold UM 1,068,014 worth of veterinary drugs. Most of the sales have been of anti-botulism vaccines, which the local herders are very eager to buy. There have also been significant sales of Thibenzole and other anti-parasitic drugs, as well as of antibiotics for specific treatments. These latter are administered by project staff or by the Inspectorate after purchase. Since the evaluation in March 1982, we have extended this program to the whole region and have assigned an extension agent to Ould Yenge to help the Sub-inspectorate there.

c. Training and Supervision of Village Veterinary Volunteers

After a ten-day training period in February 1982, we put eight village veterinary volunteers in place in the DIZ. These men had all been nominated by their communities to undergo training and serve their village's veterinary needs. Soninke, Peulh, and Moorish villagers were represented. Some of the men are literate, others not. For the past year, we have supervised their activities and visited them regularly.

I am very pleased to report that seven of these village volunteers, all of whom were supplied with pharmacy boxes between August and October 1982 are working well; they are making sales, doing treatments and accounting properly for their stock. The last volunteer was called to Senegal on a family emergency and thus we do not know how he is doing. I suspect that his pharmacy is also well run, but cannot affirm this for now. We have planned a second training of volunteers for this February and already have eight volunteers ready to participate. They are from the areas of Ould Yenge and the

Karakoro. These volunteers are not based on officially constituted cooperative groups, but rather on traditional village authority structures, which are extant and effective in the Guidimaka.

K. Involvement of Women Farmers

This aspect of the DRIG Program has had the least direct success. Over two years, we hired and trained six female extension agents. Only one was effective, and then only in a limited way. The expatriate we hired to supervise these agents and to run the WID part of the DRIG turned out to be ill adapted to extension tasks, through impatience and inability to work with most of the women the project contacted. She was highly dynamic and intelligent, but not cut out for this type of work. I take entire responsibiility for this problem as it was I who hired her and encouraged her to undertake the WID work in addition to her purely agronomic duties in the project.

Nonetheless, the DRIG has worked with a good many women as part of our normal agricultural program. There is a functioning women's vegetable gardening cooperative in Selibaby that we helped start and many women participate in the vegetable program in the villages chosen for this activity. Though we have yet to have a woman use a plow, a number have purchased carts through us, and some have had their fields plowed by their husbands or brothers. They receive seed of our recommended varieties, and our extension agents give demonstrations on how to use new vegetables in cooking. In the Guidimaka this is less necessary than in other regions, as so many families have had members go to France or Dakar to work. There they learn how to prepare and eat indigenous foods, like turnips, cabbage, carrots, lettuce and tomatoes which are the staples, of our program. Eggplant, onions, mint and beans have long been known in the region. On two occasions we have requested the Directorate of Agriculture to obtain for us the assignment of a female social worker to the project to take over the WID

program. These requests were passed to the Health Ministry, but never granted (nor refused). Thus, while we have had an impact on women in the sense of the requirements of the contract, I cannot, by any means, say that we have succeeded at this task. I hope that the second phase will do better, as the women of the Guidimaka are hard-working, effective farmers. However, I do believe that they are best approached as part of a general extension strategy, not as a separate and thus, excluded group.

L. Small Infrastructure Projects

This program has been one of the most successful aspects of the DRIG Project. We respond to requests formulated by villages or encampments and approved by the Regional Government for help in establishing necessary infrastructure to make life more agreeable or, in certain cases, possible in re- mote parts of the nation. This coalesces village solidarity, diminishes the rural exodus, and permits year-round economic activity in the concerned communities. Most of these projects have involved digging wells or constructing school buildings, though a few other types of projects have also been approved, such as fences, vaccination parks and dispensaries. Since the evaluation of March 1982, we have extended this program to the whole region and have undertaken the following projects:

- 40 classrooms repaired or constructed. The Regional Primary School Directorate has supplied teachers for all new construction. All these schools have cement floors, cement blackboards, wood and tin doors and windows, and mud-brick walls plastered with cement on a lathe of wire and nails. Eight are entirely of cement. In these cases the villages pay nearly the entire cost of the construction, as the DRIG provides only the construction materials to make the "semi dur" schools described above.

- 32 wells dug or repaired. Of these, all but three have hit water. All are cement; steel lined. Pre-cast casings are used when the well is in sandy soil or in the water- table. All have specially reinforced margelles and slabs one meter in circumference on the surface. 10 basins have been constructed next to wells for animals or gardening. These are generally small, 1 to 4 cubic meter capacity, reinforced concrete construction.

Also provided were:

- 2 vaccination corrals in Kininkoumou and Khabou;
- 3 fences, two around collective gardens in Selibaby and one around the pasture reserve in Diegui and;
- 1 abattoir and butcher's stalls in Selibaby.

In all of these projects, the village provides all labor and all locally available materials. The DRIG provides imported materials (e.g. cement, steel, nails, wire, paint, etc.) and technical supervision. We participate up to 50% of the cost of a project or up to UM 100,000/project, whichever is lower.

We constantly receive requests for new PPIV Projects, all of which must be transmitted to us by the Governor with his accord to begin work. We then study the planned PPIV, explain the conditions to the villagers who already know all about it from neighboring villages, and if all is well, we go to work. Wone Abderrahmane, the Mauritanian Chief of Party, takes primary responsibility for this activity and is tireless in promoting its success.

M. Forestry Components

This aspect of the DRIG has for some reason received less praise and consideration than some of our other activities. I feel that this is unjustified, as the program has had quite good success and is much appreciated by the inhabitants of the Guidimaka. By the end of this season, we expect to have over 50,000 trees planted in the following programs:

- Reforestation of the Singha and Nyarwale sites. This program was basically completed in 1981-82. We are replacing trees that die, but there are few of these. These are mostly gum trees, acacia nilotica (gonakier), Bauhinia rufescens, and acacia radiana, 20,000 trees.
- Forage tree plantations in the Guidibine and Katamangue sites. These are mostly leucaenas, 2,000 trees.
- Village nurseries in Dangeremou, Gore-laxa, Guemou, Melgue, Hassi Chaggar. These are to supply trees to vil- lages for shade plantings, live fencing and reforestation. Main species are Nim, Albizzia lebbek, Acacia Senegal and Nilotica, Parkinsonia, Bauhinia refescens, and leucaena.

Altogether there are about 36 beds of seedlings planted with about 500 trees per bed, 18,000 trees.

- Village reforestation sites at Zenegue peulh, Dialla, Digui, and Mbaedia Hamague, 4,500 trees. These are mostly gum trees, nilotica and parkinsonia.
- Shade trees in villages, mostly nim and Albizzia. These have regularly gone out at a rate of about 3,000/year. Thus in 4 cold seasons, 12,000 trees.

  Live fencing: 20 volunteers; Acacia Senegal and Nilotica, Parkinsonia and Leucaena: 5,000 trees. I estimate that to get our 60,000 live trees we have had to plant approximately 100,000 trees.

The nursery in Selibaby was established in 1979 on approximately half a hectare of sandy soil. It is fenced, windbreaks have been planted, seed producing trees have been planted, and beds to produce between 16,000 and 25,000 trees per year have been prepared. All the trees planted on our sites have come from the nursery, which has received visits from many experts and has been regularly praised as the best in Mauritania. Thus far, the nursery has been able to satisfy the demand for trees in the Guidimaka. All seeds except leucaena have come from local sources. The nursery well is one of the best in Selibaby and provides adequate water all year round.

N. Training

The DRIG provides three types of training for Mauritanians on the team. First, the Experience, Incorporated team of veteran, qualified technicians has provided extensive on the job training for both counterparts and locally hired staff. I believe that the successful fulfillment of our tasks bears witness to the effectiveness of this type of slow, daily educational process. In return, the Mauritanian technicians taught the EI team much about local techniques and conditions and contributed equally in this way to the success of our operations.

Secondly, the DRIG has a budget for short-term technical training for counterparts. These short (one to three month) courses have all taken place in French-speaking Sahelian countries and have been oriented directly at filling gaps in competence on the ground. All the courses were identified and arranged by project staff and all correspondence took place directly between the project and the institutes concerned. USAID/Dakar's training office was very helpful in introducing us to some of these institutes. The following courses have been completed:

- Wone Abderrahmane, Chief of Party: 3 months at the Ecole Normale d'Economie Appliquée in Dakar in project planning, administration and evaluation, 3 weeks at the University of Pittsburgh/IPD (Douala) course in Ouagadougou on Project Administration.
- Bâ Khalidou: 3 months at the ISRA/Bambey for extension and animal traction.
- Bâ Sourakhe: 3 months at the CNRF/Dakar for reforestation and nursery techniques.
  Moussa Kone: 1 month at the Primary Production in the Sahel seminar (University of Wageningen) in Bamako.
- Kebe Souleymane: 6 weeks at CRERV/Nouakchott for parasitology, laboratory techniques and virology, 3 months at the LNERV/Dakar for parasitology and laboratory techniques.

- Barry Mamadou Issa: 3 months at the LNERV/Dakar for range management and agrostology.
- Kane Abdoul Karim: 3 months at the ORSTOM, OCLALAV, and ISRA in Dakar and Bambey for crop protection techniques.
  Wague Ousmane: 3 months CNERV/Nouakchot for parasitology and laboratory techniques.

A final course is planned for Bâ Abdoulaye at the CNRF in Dakar for three months on nursery techniques and reforestation from mid-February 1983. Except for the University of Pittsburgh, no fees were required for any of these courses.

Finally, we have trained specific categories of locally-hired workers for necessary roles on the project team: 18 extension workers for agriculture, forestry, range, and animal health and production. Of these we have recently, fired two for inadequate performance, and also have let go the last two female extension agents as the WID program was not included in the continuation of the project. If it is reinstated, one of the two women should be rehired. There are now 15 competent extension workers on the project and we shall soon hire more to fill our complement. We have trained 12 animal trainers for the traction program. In addition, there are 6 assistant trainers who are quite capable and who soon will be promoted. We have also trained five vegetable gardening extension workers, nine forestry nursery workers of whom three can be used for extension work. We have also trained a good fencing team, masons, carpenters, painters, and mechanics for the PPIV program, traction equipment maintenance and repair and housing and office maintenance. Finally, we have trained an efficient office and procurement staff from inexperienced and largely untrained people in Selibaby.

6. Procurement

On page 4 of the contract between EI and AID, EI is asked to procure a certain number of commodities for the project. All of these commodities have either been procured or

else the need for them has been reconsidered. However, for various reasons, not all the procurement was done by EI. Generally, unfortunate consequences ensued for the project when someone other than EI procured for us.

- D-6 Bulldozer: procured by USAID/PSD in Nouakchott from excess property in the U.S. This arrived late and has nearly always been broken down. Parts did not arrive until two months before the end of the first phase. Procurement was authorized in May of 1981.
- 7T truck: this was also procured by PSD/Nouakchott. This caused a delay of nearly 6 months in the arrival of the truck and cost significantly more than it would have through EI.
- 125 cc motorcycles - procured and now on site
  4WD vehicles - obtained used from RAMS project
- Catchment basin liners - order cancelled because of cost and non-replicability.
- Vet. drugs and supplies: procured and on site
- Animal traction equipment: order cancelled because Senegalese equipment better adapted.
- Camping equipment: procured and on site
- Ag supplies: procured and on site
- Range/forestry supplies: procured and on site
- Generators: order cancelled. Old generators repaired with parts procured by EI.
  Air conditioners: obtained used from RAMS project.

In all we have received 83 shipments of materials from EI. All have arrived expeditiously, with proper papers and documents. Robert Locke of EI/DC, has done a superb job of obtaining appropriate material at good prices and sending it to us quickly.

In the light of the above, I feel that the EI/GRIM/-Guidimaka team has more than satisfied the requirements of our contract with USAID. The evaluation of March 1982 confirms this judgement in acknowledging the significant progress we have made toward achieving project goals.

V. Project Integration

The most frequently asked question by visitors to the DRIG Project and by experts who are interested in us is: what does it mean to be an "integrated" project? We have been accused of trying to be too integrated and taking in too many activities, just as we have been told that we are definitely not integrated because certain activities lack. I feel that we are definitely an integrated project and that this has been a major reason for our success. However, we should expand to other domains, if we can obtain the financial and personnel resources to do so. There are four main axes of integration on the DRIG project.

First, we cover all the traditional domains of rural development activity: agriculture, forestry, animal health and husbandry, range management, and small construction projects (wells and schools). These activities all support each other directly and contribute to a united extension strategy that gives confidence to the villagers with whom we work and avoids gaps in the programs without veterinary care, or vegetable programs without wells, or animal programs without wells, or animal programs without forage tree plantings. I shall not go into all the ramification of the interactions between our divisions in the DRIG project, but each seen each other every day and all tasks and missions are coordinated in the interest of integration by the project leadership.

Second, we have had the good luck to have both research and extension activities in one project. The research provides the extension activities with themes to teach the peasants without

fear of their being ill-adapted to the specific conditions of the Guidimaka; and the extension provides the research with a raison-d'être and orients it constantly to practical concerns with improving the life of the people of our region.

Third, the integration of the three elements of the DRIG team has permitted us to benefit from the resources brought to the project by the EI expatriate technicians, the MRD technicians, and the locally hired Guidimaka staff.

Finally, we have insisted on close collaboration with the regional administration and regional branches of the MRD Directorates. This has permitted us to be an integral part of the Regional Development strategy and to have at our disposal the varied resources of the regional services. We help each other immeasurably in accomplishing our respective chores.

At the same time, it shoud be noted that our project would be much improved if we were to have a human health division and a general human services division to cover alphabetization, nutrition, sanitation, and so on.

VI. Sociological Study

USAID and the MRD have requested that I write a study of the sociological aspects of the DRIG project and its impact on the Guidimaka. I shall do this after I have been replaced as Chief of Party, since all have agreed that it would be impossible for me to carry out both chores at once.

VII. Problems Faced During the Project's Lifetime

Once the problems of the first two years of the project were solved:

- Revision of the PP and the work-plan, personnel problems, Pacific Consultants, creating infrastructure and administrative systems for USAID's first major rural development effort in Mauritania.

- There were relatively few major problems for the DRIG. Nonetheless, the following cause certain constraints from time to time: (N.B. for a discussion of general constraints on development in the Guidimaka, see my Preliminary Progress Report of January 1982. The conclusions of that report remain valid.)
- During our four years of operation, the project suffered from an excessive movement of supervisory personnel in the three bureaucracies which supervise us directly, USAID, MRD, and Guidimaka Region. We had 5 governors, 6 prefets in Selibaby; 7 project officers at USAID (Chessin, Hawbaker, Wirtz, MacDonald, Hirsch, Grayzel, and Goldman), three USAID Directors; six animal health inspectors, three ag sector chiefs, and so on.

This has led to a great deal of lost time and misunderstanding as successive officials had to be briefed on project purposes and methods and brought around to attitudes of helpful collaboration.

- We have always had cars that were too few or too old for the job and thus have had to spend an inordinate amount of time and money on repairs. In March, our entire fleet will have spent at least 4 years circulating in the Guidimaka.
- We were never able to establish a control herd to compare with our Katamangue experiemental herd. We had an endless series of willing herders who invited us to measure and observe their animals, but for reasons that I still fail to understand, the Governor of the Guidimaka at the time refused to let us set up a temporary vaccination park for helping with measurements. This was the <u>only</u> instance of incomprehensible bureaucratic interference in our work that we experienced and was all the more shocking for that.
- The problem of procuring supplies in Nouakchott with PO's from USAID remained difficult to the end due to eternal inefficiency in the PSD office.

- The lack of a social worker from the GRIM hurt our WID program quite badly.
- From the beginning of the project, we have had a series of inefficient agents, along with a great number of excellent ones. While the Directorate of Agriculture understood this problem and removed those persons whose removal we had requested, Pacific Consultants, refused to fire one consultant as I asked. The result was a wasted agricultural season in 1980-81. (Upon assuming responsibility for the project, EI advised this individual that he would not be a member of the EI team). I hope that future problems of this sort can be avoided by supervisors away from the field trusting their agents on the ground and promptly removing inefficient technicians.
- The major problem we have faced has been that of how to get USAID to continue the DRIG activity in the Guidimaka after the first 4-year phase. The project was originally planned as a two-phase operation. After Phase I of research and preparation, Phase II would extend the new techniques to the whole region. This was specified in the original Pro-Ag.

However, from 1979 through 1981, USAID simply decided that whatever the results of the project, there would be no phase II activity. After the evaluation mission (USAID/GRIM) of February/March 1982 unanimously called for a second phase, AID began looking for ways to fund this continuation. Since it was far too late for normal funding procedures (the evaluation report came out in September), USAID decided to finance the second phase with proceeds from grain sales under the PL 480 section 206 program. This seems to have worked out well, as we managed to finish the first phase with enough money left to make a graceful transition to the second. The current USAID team since the evaluation has been extraordinarily cooperative, efficient, and helpful in getting the paper work done to ensure the continuation of the DRIG activity.

VIII. Conclusions and Recommendations for Future Activity

After four difficult but rewarding years, the DRIG project is now at a point where its intervention in the Guidimaka can play a decisive role in leading that region to complete alimentary autonomy and greatly increased stability of population. Since these are among USAID's and the GRIM's stated priority goals, I feel that it is essential that the project continue for its programmed four-year second phase. The following activities shoul be continued, in my opinion:

- Animal traction for cereal agriculture, water hauling, and cartage;
- Extension of improved agricultural techniques for cereal and vegetable culture;
- Extension of vegetable gardening;
- Adaptive research on cereal and vegetable varieties and on soil management techniques, as well as testing promising tree species and planting methods;
- Tree planting for shade, live fencing, forage, erosion control, reforestation (small scale), maintenance of sites;
- Project nursery and demonstration garden;
- Training and supervision of more village veterinary volunteers;
- Sale of veterinary drugs;
- Credit for purchases of production oriented agricultural and other goods;
- Extension of animal husbandry techniques - health, nutrition, sanitation, preventive measures;
- Small infrastructure projects (PPIV);
- Creation of pasture reserves;
- Digging catchment basins;
- Encouragement of collective/cooperative structures for gardening, animal care, pasture management;
- Short-term training for Mauritanian technicians.

These are elements of the first phase of the DRIG project that have succeeded in winning the interest of the local farmers and herders and which have proved technically feasible and economically worthwhile. In addition, I feel that the following aspects should be added in the second phase:

- Long term academic training for younger Mauritanian technicians. There are several young men on the current project team who have proved their worth in the field over the last few years. Several of them are also highly intelligent and could cope easily with academic training. These people, who have a hefty dose of field experience under their belts could be an important asset for rural development in Mauritania in the future.
- Human services sector activity. Given the existence and success of our PPIV program, it seems natural to me to establish programs that can profit from the infrastructure we help villages create. Thus a human health program based on "Primary Health Care Volunteers" and an adult literacy program would seem very suited to our project.

In coordination with the Institute of National Language and the Ministry of Health, we could help spread effective primary health care and literacy in local languages throughout the region. It would also be interesting to have a nutrition/women's services aspect to our program, working with the local PMI's and Feminine Centers. Our contacts with the population of the Guidimaka and the trust they have in the DRIG and its agents would greatly ease the introduction of such activity into the region.

Our infrastructure: garage, storage space, trucks, etc. - also make this proposition economically interesting.

- Firebreaks: These strips of cleared land are effective in limiting fire damage in the Guidimaka. As pasture in other regions diminishes, the Guidimaka's pasture resources become more and more important for the country and should be

protected as best they can. For this reason, I believe that a new bull-dozer should be purchased and used for helping create a complete network of firebreaks throughout the Guidimaka. The current dozer should be repaired and kept operating, but it is old and has proven eccentric and prone to breakdowns.

- Staffing: I agree with the staffing pattern for expatriates proposed in the second phase planning. Maintaining a heavy administrative and logistical support system with a COP, administrative assistant/Nouakchott and a mechanic in Selibaby was essential to the success of the first phase of the project and will be so to the second as well. Maintaining an agronomist is also necessary for that is the domain where research must continue if we are to best serve the region where we work. On the Mauritanian side, it is essential to maintain the current staff in place, with the exception of our Animal Husbandry Assistant Engineer who is no longer necessary as our animal production experiments have ceased. Another experienced agricultural extension specialist would be a welcome addition to the staff, particularly if he were from the Guidimaka and spoke the languages of zone. If a social assistant could be assigned to help work with women, that would be very good and if new aspects are added to the project (health, literacy, etc.) appropriate expatriate and Mauritanian staff shoud be added.

In conclusion, I beg the reader of this summary report to refer to the technical reports furnished by the EI range manager, veterinarian and agronomist. They are complete, detailed, and very interesting. I have permitted myself to summarize some of their conclusions here, but feel that to understand our recommendations and comments the technical reports are essential reading. The DRIG team is very proud of what we have been able to do since April 1979 in the Guidimaka. In spite of endless problems, we have managed to win the confidence of the people of the region and to begin extension of economically useful, technically feasible, and socially acceptable techniques which

we have tested ourselves on our experimental sites and facilities. We have enjoyed good relations with and cooperation from our supervisory agencies - the Directorate of Agriculture in the MRD, USAID/RIM, EI, and the Regional Government of the Guidimaka. I believe that we have already made an important economic and social impact on our region. My most important recommendation and conclusion is very simple: the project must continue its work.