

NORTH CAMEROON

LIVESTOCK AND AGRICULTURAL DEVELOPMENT

PROJECT 631-0004

END OF TOUR REPORT

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INTRODUCTION

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The following represents the final report of the program objectives, activities, conclusions and recommendations of the Range Management Specialist for the North Cameroon Livestock and Agriculture Development Project. In order to provide a logical sequence for analysis of the various aspects of my two and one-half year post at the project center in Mindif, this report will be divided into the following sections:

- I. Page 2 Presentation of Objectives of the Grazing Land Management and Conservation component of the project, and brief description of the situation at the time of arrival (November 18, 1982) of the Range Management Specialist.
- II. Page 5 Review and analysis of the Scope of Work for the Range Management Specialist position, the effectiveness with which these duties and responsibilities were carried out, constraints encountered and achievements made as of the project termination (April 30, 1985).
- III. Page 17 Analysis of Specific Range Management/- Livestock Activities proposed to achieve the program objectives, and their implementability within the context of the project and the zone in which it was implemented.
- IV. Page 25 Conclusions and recommendations concerning the Grazing Land Management and Conservation technical program.

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I. GRAZING LAND MANAGEMENT AND CONSERVATION COMPONENT OF THE PROJECT

A. Objectives of the Program:

An evaluation of the program of technical activities developed to realize program objectives will first be preceded by a presentation of these objectives. The objectives of the Grazing Land Management and Conservation component of the project are:

1. To determine the applicability, in the pilot zone, of livestock/range management practices which have been proven successful in other areas of the world.
2. To determine which modifications may be necessary in order to adapt these practices to socio-cultural environment of the pilot zone.
3. To demonstrate the effectiveness of these practices in improving natural forage production and conserving grazing lands.
4. To develop specified watering points in conformity with estimated stocking rate capacity of the pilot grazing blocks in order to assure rational use of these rangelands.
5. To enhance existing organizational structures among village livestock producers which will assure discipline in the cooperative management of livestock water and grazing resources.
6. To investigate the feasibility of establishing a marketing/purchasing association in conjunction with grazing blocks. Legal as well as social/cultural and financial aspects will be studied. Impact of government pricing policy and other constraints on off-take will also be studied. One association will be established in the fourth year of the project.

B. Situation Upon Arrival:

As of November 18, 1982, my arrival date in Mindif, the presence of a range management specialist at the project had been short and discontinuous. The previous range specialist, the first who was assigned for 2 years to the project, departed after 1 year; therefore, although the first of 3 proposed grazing blocks had been located and divided into three grazing use areas, and a program of grazing rotation installed, little progress had been made towards implementation of the technical program developed to achieve the above mentioned objectives. This would have posed no serious problems had a replacement been immediately nominated, approved and made available to the project. However, 16 months passed prior to the arrival of the range management specialist replacement, during which time the following events related to the range management program took place:

1. A three month TDY Range Management Specialist arrived, collaborated with the project Sociologist to propose location of the two remaining grazing blocks, and departed.
2. The position of project sociologist, which should potentially have been instrumental in aiding the range management specialist to tailor the technical program to the socio-cultural milieu of the project zone, was not extended during the project reorganization of July, 1982 at the time of the departure of the project sociologist.
3. The position of the agricultural economist, which should potentially have been instrumental in ascertaining livestock marketing constraints which could affect the range management technical program, was not extended during the project reorganization.
4. The program of grazing rotation proposed by the first "long term" range specialist was put into operation in Grazing Block I during the 1981 rainy season, and was loosely continued during the 1982 rainy season under the supervision of the two Cameroonian counterparts who had been assigned to work with the range specialist during the preceding nine months.

As a result of the project reorganization, the absence of key technical personnel, and the 11 months which passed between the nomination and the approval of the nomination for the range specialist position, the situation I found upon my arrival was one characterized by an intense necessity to condense the activities of a proposed 5-year technical program into the two years of my contract, which was due to terminate just six months prior to the project termination date. One grazing block out of the proposed three had been located, divided into grazing use areas, further divided into pastures, and a simple program in which grazing rotated through the grazing system pastures during the rainy season had been installed and operational for two growing seasons. One dry season livestock feeding trial had been conducted during the 1980-81 dry season prior to the departure of the first long term range specialist. A 1036 ha portion of the rangeland proposed by the 3 month TDY Range Specialist for Grazing Block II had been located, and hand clearing of the perimeter of this area was underway in November, 1982.

As my tour of duty with the project began, I inherited the two Cameroonian technical counterparts who had spent approximately nine months working with the first full-time range specialist, and sixteen months without a permanent American technical counterpart, except for the portion of the three month Range Specialist's tour spent in the field attempting to find suitable locations for the second and the third grazing blocks. Their lack of range management training and short exposure to range development activities prevented the two Cameroonian counterparts from continuing the implementation of the proposed range management program during the absence of an American range specialist, other than to attempt to maintain the grazing rotation program installed in Block I, and to supervise the hand clearing of the boundaries of the above mentioned portion of Block II.

II. SCOPE OF WORK FOR THE POSITION OF RANGE MANAGEMENT SPECIALIST

As stipulated in the Project Reorganization document (1), the scope of work for the position of Range Management Specialist consists of eight duties and responsibilities. In this section, each of the eight will be specified point by point and the effectiveness with which they were carried out analysed; constraints encountered will be discussed, and specific achievements reviewed.

A. "Continue development of existing grazing block."

It has long been an accepted principle of range management that all grazing management programs must be founded upon an equilibrium between livestock and forage which, in simplest terms, allows the productivity and vigor of the forage resource to be maintained and increased over time. If the project's grazing management program was to demonstrate, over time, the forage production improvements and the reduction in erosion and general soil/forage resource degradation which are possible from the program, one of the first steps in the continuation of Block I development was seen to be determination of the actual livestock population using the three grazing use areas, or grazing systems, in the block and determination of the forage carrying capacity. The results of an unofficial livestock count carried out in Block I participating villages by the five current range monitors in December 1982 and January 1983 revealed that the Gay Gay grazing system was used by approximately six times the number of livestock originally thought when the grazing block was developed. After considering several alternative solutions to the problem, the decision was made to enlarge the Gay Gay grazing system. By adding 2824 ha to the original 1024 ha in the Gay Gay system, the intensity of the grazing pressure was brought down to a level comparable to that in the other two Block I grazing systems, but was, according to ocular estimates made by the first long term range specialist, still in excess of the estimated carrying capacity of the grazing block forage by five times.

The second half of determining proper grazing use intensity, or proper stocking rate, for the grazing block is quantifying forage production and composition through a long term program of vegetation inventories. To begin this process, a forage production sampling program employing a modified step transect sampling procedure was begun at the end of the 1983 growing season, and was continued in 1984. Details of the sampling procedure and the first two years of forage production estimates can be found in "The Development and Installation of Range Management Plan: Grazing Block I" (2).

The second step in continuing the development of Block I was to add pasture deferment to the grazing rotation program introduced at the end of the first long term range specialist's tour of duty. The pasture deferment consists of leaving one pasture out of four in each grazing system in deferment for the duration of the rainy season. Forage species in the deferred pastures are rested and provided the opportunity to produce seeds and, in the case of the few perennial forage species, to develop better established root systems which will improve soil structure, add organic matter to the soil, and improve the vigor and reproductive capability of the perennials. A different pasture section each year is deferred, and forage measurements are conducted each year in the deferred pastures.

As is the case whenever traditional methods are modified, cooperation and acceptance of the new system is a slow process and should not be expected overnight. Livestock producers in the 13 participating Block I villages have, through assistance from the three Block I range monitors, followed the rotation of grazing. Pasture deferment, on the other hand, is a less understood feature of the program, and has therefore been less respected. The need for strenuous long term extension efforts is indicated here, if deferment of rangeland is to be continued for a long enough time to quantify forage resource improvement and to determine the potential appropriateness of introduction of grazing rotation and pasture deferment to the socio-economic environment in the project zone.

Due to the reluctance of livestock producers to report actual herd sizes to the project, for fear of increased livestock taxes, it has been difficult to quantify actual use of the grazing block in terms of Animal Unit Days, Months, etc. During the 1983 rainy season, all range monitors were given the responsibility of counting the livestock of every livestock producer using their zones of supervision. Livestock using the various grazing systems were reported by class (calves, heifers, castrated and non-castrated young males and bulls, sheep and goats) at the end of each month, but the quality of the reporting was poor. The monitors had no constant supervision or contact with the project. The absence of the three mid-level range technicians targeted to supervise and coordinate range monitor activities created a communication and supervision gap in the program, which the range management specialist simply did not have the time to fill completely.

The third step in the development of Block I involved the design, placement and construction of livestock waterpoints, the use and management of which were to be integrated into the grazing management program in a manner which does not permit overgrazing of the surrounding forage resources. Theoretically, this implies that forage production be measured, that rainy season grazing use is known, and that available dry season forage can be estimated. Waterpoints would then be designed and constructed to serve only the livestock which the available dry season forage could support. However, the necessary forage and livestock resource information was not available at the time when waterpoint construction began, and the project was forced into a position of contractual obligation to carry out a program which was technically premature. Complicating this issue was the fact that at the same time during the first two years of the operation of Block I, the cooperating livestock producers had been encouraged to cooperate with the grazing rotation program with the promise that as soon as the project's heavy equipment arrived, the project would build waterpoints. It was during the mid-term evaluation of the project in November-December 1983, that project livestock waterpoint development rationale was heavily criticized, inducing USAID/YAOUNDE to require a halt in waterpoint construction. An in-depth study of livestock water development policy in North Cameroon was to be made and a livestock water development policy was to be officially proposed by the project and approved by USAID prior to continuation of waterpoint construction.

The result of this undertaking is a document entitled "North Cameroon Livestock and Agriculture Development Project Livestock Water Development Policy" (3), in which the project recommends constructing livestock waterpoints for only those livestock which the available dry season forage can support. It is further proposed that, should the project continue waterpoint construction prior to and during the accumulation of the necessary forage resource data, the ponds should be the smallest waterpoint for which dimension and volume were calculated in the Soil and Water Conservationist's 1983 Annual Report (4), that is, ponds that are 60m x 30m x 4m, which support 167 Tropical Animal Units (T.A.U.=250 kg liveweight) (5) at 40 litres/day for 8 months of dry season, or 334 T.A.U. at 20 litres/day for 8 months of dry season. It is these recommendations which have been used as guidelines for the two other livestock waterpoints subsequently constructed in Block II and Block III.

These guidelines could also be used in the future for development of waterpoints constructed in the project zone if there existed a program of integration of livestock water development with grazing management programs. Unfortunately for the project zone, there is at present no coordination of water development with any program of grazing management. In fact, every evidence was given at the project's recent Agro-Pastoral Seminar that there is very little recognition within MINEPIA of the relationship between livestock grazing intensity and long-term forage or of the potential impact of uncoordinated water development on the productivity of rangelands: in spite of the fact that the range management presentation dealt exclusively with the livestock charge and the necessity to coordinate water development with grazing control programs, the only interest demonstrated by MINEPIA was in water development.

In fact, recently MINEPIA has equipped several of the Extreme North Province's Pasture Division Chiefs with bulldozers specifically for the purpose of developing dry season livestock water. By April 1, 1985, at least five waterpoints had already been dug within the Department of Kaele, where there exists no program of grazing control other than the traditional system.

- B. "Design and implement 2 additional grazing blocks, including controlled grazing and waterpoints."

Because the proposed site for Block III appeared to consist mostly of rangeland, development of the site into a grazing block composed of two grazing systems began early in 1983 and proceeded at a steady rate. Pasture divisions were proposed, marked by hand labor crews under the direction of the range monitors, and cleared with the heavy equipment prior to the start of the 1983 rainy season in July. Several series of village meetings were held prior to the rainy season, and the grazing program concept, procedural details and regulations, and the responsibilities of the participating livestock producers explained. The deferred rotation grazing plan was in operation starting with rainy season 1983. At the end of the rainy season, forage production sampling was conducted in the two deferred pastures, and both the grazing program and the forage production measurements were continued in 1984.

Following the USAID approval of the project's livestock water policy paper, construction began on the Horlong waterpoint, for which topographic and subsurface investigations had continued during the moratorium on construction. The Horlong waterpoint was designed and constructed according to the recommendations put forth in the water policy paper, and as such is 60m x 30m x 4m. Early start-up of the rains in 1984 precluded the completion of the Horlong pond prior to the 1984 rains, so although some water was collected, no watershed drainage canals had been created and the small amount of water in the pond at the end of the rainy season dried up quickly. At the time of this writing, completion of this pond is underway, and the beginning of the 1985 rainy season should find all canals, water inlet structures and water out-take structures in place.

It was determined that the site jointly proposed earlier for Grazing Block II consisted mainly of cropland fallow and dry season sorghum fields. It was therefore necessary to relocate the block, and following a number of surveys conducted in the area with the guidance of local leaders and producers, the forested range zone directly across the road from the originally proposed zone was selected, the size of which was based on informal livestock counts made in early 1983. Prior to the 1983 rainy season, four pastures were located and boundaries marked and cleared.

One of the four pastures was deferred, and a rotation begun as boundary lines were marked in September 1983. The deferred rotation grazing plan was fully operational during the 1984 rainy season and forage production measurements taken in the deferred pasture.

Following the 1984 rainy season, meetings were held in the prospective Block II villages in which elevours requested that the project enlarge the portion of the block which was still undeveloped in order to accommodate their livestock, not all of which were reported in the earlier unofficial count.

Thus in dry season 1984-85 approximately 2000 ha were added to the northern 2/3rds of the block which was not yet divided into pastures. At the time of this writing, grazing system and pasture divisions have been proposed, layed out, and are being hand cleared and marked for easy visibility, so that the grazing rotation and deferment can begin in rainy season 1985. Forage production measurements will be taken in all deferred pastures in 1985.

The fourth livestock waterpoint was begun near Baknai in Block II during dry season 1984-85, and was designed and constructed following the recommendations put forth in the project water policy paper. At the time of this writing, inlet structure and water outtake structures have not been completed, although it is projected that the waterpoint will be fully completed and operational in time to take advantage of the 1985 rainy season.

Some constraints in the development of all three grazing blocks were caused by the lack of qualified personnel on five levels. Firstly, as was mentioned earlier, there was a 16-month period during which no American range technician was present at the project. Secondly, the Cameroonian counterpart sent by the project to the U.S. for academic training which terminated with a Ph.D. in Range Management was not returned to the project following completion of this training. This loss of high level Cameroonian expertise crippled the project's grazing program, and became one of the major causes of the termination of American technical assistance in April, 1985. Thirdly, of the original two Cameroonian counterparts assigned to the Range Management Specialist, the more qualified was sent in May, 1983, to the United States for a two year Master of Science Academic training program in Animal Nutrition/Animal Husbandry. The remaining counterpart had no interest in technical field work required in the range management component of the project, he was frequently absent during work hours and therefore could not be counted upon, and he demonstrated very little understanding of concepts behind the project's programs. For the first 18 months of my tour of duty I essentially worked as though I had no counterpart. For reasons unrelated to the above, this technician was transferred from the project as of July 31, 1984, and was replaced by a capable and interested individual. Unfortunately the change came late in the project, providing the newest arrival only nine months of collaboration with an American technician prior to the termination of American technical assistance April 30, 1985.

The fourth level of inadequate personnel included the three missing mid-level range technicians mentioned earlier. Their presence as supervisors of the range monitors in each grazing block would have eliminated many of the project/monitor communications problems caused by the range specialist's inability to be in more than one place at a time.

The fifth level of personnel limiting the development of the blocks consisted of the range monitors themselves. The level of education of the majority of the 10 range monitors was very low, their conceptual ability extremely underdeveloped, and their interest in their work limited in most cases to having a steady income. A system of monitors as liaison between the project and the village useful low-level technical aide, but the quality of both of these benefits could have been higher had the project been able to cultivate individuals with somewhat higher potential.

Another major constraint encountered in this portion of program was posed by the absence of a range management extension component to the project. Even in the project's situation, where the local population was asked to participate in pilot activities which were fundamentally trials or demonstrations, the presence of a range management extension specialist and a range extension program targeting the village livestock producers could have at least provided the latter with some comprehension of why it was to their benefit to cooperate fully with the grazing program.

Finally, the USAID decision to terminate American technical assistance to the project at this time has signed and sealed the death warrant for the grazing block program. There is no portion of the grazing technical program that has been in place long enough to ensure its complete development and continuation. Although it is certain that several of the Cameroonian technicians will make every possible effort to continue the technical interventions, the USAID decision has effectively cut in half the projects' technical staff left in place to carry on.

- C. "Design and implement a cattle feeding program emphasizing utilization of locally-produced by-products, leguminous fallow forages and recycling unused crop and animal wastes back to the soil."

During the dry season of 1982-83, four 90 day dry season livestock feeding trials were conducted at the project center in Mindif. In all 4 trials, locally produced crop by-products and project produced-leguminous fallow forages were used, and animal wastes were recycled back to the project center fields. Three of the trials were fattening trials for different classes of cattle (bulls, steers, and old cows). The result of all three fattening trials were inconclusive due to the improper functioning of the water scale used to weigh the trial livestock at the project center. The fourth trial was an attempt to maintain milk production in lactating beef cattle

through the dry season by feeding balanced rations of feed-stuffs. The results of this trial were also inconclusive because all three of the control group cows being kept on improved pasture during the trial ceased lactation, and two of the three test group cows ceased lactation.

Only one of the six cows maintained milk production during the dry season, probably because her calf was the youngest of all the six calves, and therefore the cow was still in a physiological stage during which lactation normally continues. There was no way of determining the influence the feeding of by-products had had on the maintenance of milk production, but the daily production levels were so low (1.0-1.5 litres/day) that, even if the by-products had been influential that level of feeding could not be justified for a small producer whose access to by-products is limited to what he can produce and save, and of that, to what portion he can afford to give to the lactating cows rather than to other of his livestock.

None of the four trials were subsequently repeated because of two factors:

1. Due to the drought conditions and political situations in Chad and Nigeria, livestock market conditions precluded the possibility of selling fattened cattle at a profit;
2. Even with wildly varying livestock weights produced by the cattle scale, it was clear that an average farmer could not produce enough by-products on an average holding to feed dry-season livestock at this level, and even if he did, he would have no way to recuperate his costs in the cattle market, let alone to make a profit.

During dry season 1983-84 one 80-day feeding trial consisting of three groups of seven steers/young bulls was conducted at the project center, the objective of which was to determine which of three levels of dry season maintenance of traction animals was most economically justified in terms of cost of feeding, maintenance of weight and animal health, and ability to work during the plowing season, and to determine whether a small producer at the village level could afford the maintenance. The three levels of maintenance were improved rangeland, improved (artificially seeded) rangeland, and crop by-products, with the latter two supplemented with cottonseed cake, and all three supplemented with salt. NO leguminous fallow crop was produced during the 1983 rainy season at the project center, so none was available for the trial.

In spite of repairs made to the water scale prior to the beginning of the trial, the scale did not function properly and again gave extremely dubious results. No analysis was made of the, again, wildly varying results, though it was clear that both those animals fed by-products and those kept on improved pasture were very healthy, and that those fed by-products had actually gained weight during the trial. Once again, however, the amount of by-products required to feed animals at this level is not normally produced on the average small holding.

Besides the obstacles posed by the malfunctioning cattle scale and the very poor cattle market, there have been more fundamental constraints to the feeding program as proposed in the project reorganization document. After five years of trials to find a forage legume fallow species, it became clear that the undependability of the project zone rains makes it almost impossible to establish a stand of leguminous forage fallow. Since the major benefit of a leguminous fallow comes from plowing under the green nitrogen rich forage material, and since this is highly unlikely in a zone where forage is already in short supply and most or all of the fallow will be grazed, an attempt was made to substitute perennial forage grasses such as Andropogon gayanus and Hyparrhenia filipendula as a forage fallow. These perennial grasses remain green for some time into the dry season and thereby provide some nutrition to the livestock at the time when most forage is long dry. These species are also more drought resistant than the leguminous forage, produce extensive fibrous root systems which anchor the soil in place, add organic matter to the soil and do not have to be replanted the second year. These forage grass fallows, if widely established throughout the project, could provide some relief for the rangeland from the dry season grazing pressure.

- D. "Coordinate development of water and soil conservation activities in grazing blocks".

By far the most potentially effective soil and water conservation activity developed by the project is the deferred rotation grazing management plan installed in the three grazing blocks. By increasing forage production, and thereby increasing soil cover, the velocity of water running across large areas of soil surface during heavy rains is reduced. Soil and forage species seed losses are diminished, and water held in place around the base of plants serves to increase forage species seed germination and has a greater likelihood of infiltrating into the soil than does water flowing across the surface of the soil.

The other obvious water conservation activity has been the livestock water development program designed to impound rainy season surface flow which otherwise would run off the watershed into the mayos and be lost. It is, however, important to recognize that this activity, if not carefully planned, developed and managed within a system grazing management, has the potential to irreversibly damage the forage resources in the surrounding area, and to provoke livestock trampling, soil surface structure destruction, and severe erosion.

Additional soil and water conservation activities were coordinated with the project Agronomist and the project Soil and Water Conservation Specialist, and included artificial seeding of perennial forage species (Andropogon gayanus and Hyparrhenin filipendula) on erosion pavement surfaces which had been either plowed with a romo plow or ripped with a bulldozer. In both cases the seeded stand establishment was good but costly (Appendix A). These methods might be justifiable in attempting to stabilize eroded areas with slope greater than 5% occurring on relatively productive rangeland, but it is doubtful whether they should be recommended for establishment of improved forage seed sources in the project range zone, particularly when there is little or no grazing control.

Prior to the 1984 rainy season, approximately 15 ha of sloped eroded area in one deferred pasture was ripped with a bulldozer along the contour, and left to reseed naturally. Annual grass seeds produced the previous growing season were washed into the ripped lines, where they germinated profusely and produced effective barriers to surface flow. Before this method can be recommended as a stabilizer for eroded rangeland in the project zone, it must be determined during the coming 1985 and 1986 rainy seasons whether increases in rainfall infiltration and seed germination in one season's ripped lines will carry over into the subsequent years, and whether these stands will spread onto adjacent unplowed or unripped areas.

It had been planned that teams of traction animals with plows would be hired in each grazing block early in rainy season 1984 to determine the feasibility of plowing and seeding perennial forage species in deferred pastures in this manner. This activity was abandoned for the year when it became apparent that the rains were again poor and the ground would never be wet enough to plow before late July, if then - far too late in the growing season to see perennials.

Prior to both the 1983 and 1984 rainy season, attempts were made to establish stands of neem (Azadirachta indica) trees and several species of Acacia to stabilize a heavily eroded area near Gagadje in Block I. Although reforestation is something which should be encouraged in the project range zone, it is unlikely that tree planting is as effective in stabilizing eroded zones as grass stand establishment would be. Furthermore, neem leaves remain green through the dry season when most other vegetation has long been dry, thus attracting livestock to the eroded area. Not only did the livestock defoliate the young neems, but they were concentrated in an already eroded area, potentially exacerbating the soil erosion. A grass which is not particularly palatable to livestock would be a more appropriate method of stabilizing such areas but unless there is better control of grazing, even this is unlikely to succeed.

One major constraint to these soil and water conservation activities was the poor rainy seasons (500mm in 1983 and 1984 as opposed to a normal average annual rainfall of 800mm) and the erratic spatial and temporal distribution of what little precipitation actually fell.

Another major constraint is the cost of heavy equipment use to carry out these activities. A tractor might be more cost effective, but density of brush in the project zone precludes tractor use.

A final constraint is the lack of total grazing control.

- E. "Design and implement an animal nutrition program related to grazing block activities."

Because of a number of factors, including the short life of Grazing Block II and III prior to the termination of American technical assistance, insufficient personnel, two consecutive drought years, and others, this program component was somewhat truncated.. The two major activities related to this portion of the program were the project's organization of transport and distribution of cotton seed meal to the project's collaborating livestock producers in the 1982-83 and 1983-84 dry seasons, and the collection of crop by-products and native forage samples during the 1984 growing season for forage nutritional analysis. The samples were collected at three different times during the growing season, and were air dried and taken in 1-kg quantities to the Institute de Recherche Zootechnique Research Station at Wakwa in February 1985. The research Agronomist, Mr. Samuel Yonkeu generously agreed to take responsibility for assuring that the samples were correctly processed

and sent on to the Forage and Soil Analysis Laboratory at Bambili (in the Mankon), and to pass on the Nutritional analysis results to the project when they are received at the Wakwa station. The project is currently awaiting the results of the analyses.

- F. "Assist MINEPIA agents to further develop and improve animal health services for users of grazing blocks."

During fiscal year 1984-85 the project proposed and received funding for construction of six livestock vaccination parks and six tick baths in the three grazing blocks. At the time of this writing three vaccination parks have been completed and wells have been successfully dug for two of the six tick baths by FSAR.

The project has also provided, through the MINEPIA Arrondissement and sub-Arrondissement service post infrastructure, free treatment against internal parasites, trypanosomiasis, Rinderpest and anthrax for all livestock producers cooperating with the project's grazing management and agricultural development programs. Parasite treatment and vaccination against Rinderpest have been administered in yearly campaigns organized specifically for this purpose.

- G. "Systematically evaluate and report on progress/problems of grazing block related activities noted above."

Reports summarizing progress of program activities have been submitted quarterly to USAID/YAOUNDE and MINEPIA.

III. Activities for the Grazing Land Management and Conservation Component of the Project

In the following section I will address each program activity as specified on page three of the Project Reorganization document (1). Some comments will follow concerning the relevance of these activities to the program objectives articulated in Section II of this report.

- A. "Three demonstration grazing blocks of approximately 5000 hectares each will be developed in the pilot zone. These grazing blocks will be managed under a pilot system of controlled rotational grazing that will allow desirable forage species on approximately 25% of the pasture area (or 3750 ha) to reach maturity each year before being grazed;"

According to page 22a of the Project Reorganization Document (1), one of the Specific Project Outputs desired was a "replicable system of improved livestock/agricultural management established in the Mindif-Moulvoudaye pilot zone which will demonstrate the ability to increase production while protecting the natural resource base." If a program of effective range management practices was to be developed for later replication in the project zone, time should have been provided to develop several alternative programs of activities and to investigate their appropriateness to the immediate socio-cultural environment and their acceptability to the participating population before proposing any one activity as the demonstration of the solution to natural resource/livestock production problems, targeted deferment were proposed as the appropriate technical solution program to demonstrate it should be noted that the three grazing blocks could have proven to be a useful technical intervention in which the appropriateness of certain technical practices could be evaluated, the socio-cultural appropriateness of the grazing management program could be monitored, and the participating livestock producers could actually enjoy the program benefits and themselves make recommendations to the project concerning aspects of the program that might be modified to make the program more palatable to them, if they had been given enough time. As was clearly pointed out by the project team in their response to the mid-term evaluation (7), the grazing blocks were meant as demonstrations of technical practices which have succeeded in improving forage resources and reducing trends towards resource destruction all over the world, and which can succeed, in some socio-economically acceptable form, in North Cameroon, given time, participation of and dialogue with the local livestock producers, and continual support from MINEPIA and USAID.

Unfortunately, the overwhelming reason why this activity will probably not allow the program objectives to be reached is not the inappropriateness of its scale (too small, according to the mid-term evaluation team) to include nomadic livestock producers also using the project zone, nor that it does not yet provide a completely controlled situation allowing scientific collection of forage data; it is that USAID has terminated all technical support for the program only two and one half years after the program was installed prior to the completion of even the most preliminary data collection cycle.

- B. "Approximately 9 local village or village cluster livestock producer groups operating through the existing traditional leadership system will be provided technical assistance to assume responsibility for management of the grazing system, based on the concept of self-discipline. Assistance to these groups will be the responsibility of the project staff and the Diamare Livestock Sector;"

This activity was carried out on the following three levels during the life of the project's grazing management program:

1. Village and "village cluster" organizational meetings conducted with the American and Camerounian technical staff at the outset and through the development of each grazing block and grazing system. During these meetings local leaders' and livestock producers' advice, involvement, and assistance was solicited concerning location and division of grazing use areas, traditional grazing patterns and livestock water locations, and traditional associations between different villages in an area. In later meetings the project technicians met separately with all members of each 4-pasture grazing system and discussed with local leaders and livestock producers the concepts of grazing management, relationships between grazing use and forage productivity (both short and long term), and the specifics of the grazing management program proposed by the project, with clarifications of the duties and responsibilities incumbent upon all concerned parties and benefits expected from the system. Follow-up meetings were held during which the functioning, rules and benefits of the grazing program were reiterated, responsibilities reemphasized, and

discussions conducted concerning problems encountered. At the time of this writing there are six clusters of villages, each with its own grazing system, and two village clusters being developed as the organization of Block II proceeds;

2. Development and organization of 60 individual village councils, through which all livestock and agricultural producers and all leaders of each village are organized to completely take over responsibility for management and control of the improved agricultural and livestock production practices introduced into the traditional production systems by the project;
3. Development and organization of three grazing block councils, one per grazing block, through which all individual village councils cooperatively using a grazing block area are represented in meetings to coordinate management and responsibilities of grazing block level activities, and jointly resolve problems posed at that level of village interaction. In the case of all three of the above levels of this activity, the Arrondissement and Departemental MINEPIA and MINAGRI technical personnel and service chiefs have participated in carrying out the activities, as have the Sector and sub-Sector administrative and political leaders.

This activity directly addresses program objective "e" (Section II, this report). The major constraint to the complete development of this activity into existing self-disciplined resource management structure has been, again, the extremely short time afforded to the development and functioning of these structures prior to the removal of all technical assistance. The development of a rapport between a project and the collaborating population is a slow and delicate process which requires time for the growth of confidence and dialogue. Given five full years of continuous interfacing between a project and its cooperating village producers through the existing local technical personnel and political leaders, it might be possible to develop a comfortable enough rapport that information exchanges or dialogues could encourage involved local technical personnel to gain enough experience to carry on themselves in the development of self-sufficient and self-disciplined agriculture and livestock groups. If the project had been continued for two and one-half years beyond April 30, 1985, as recommended in the project mid-term evaluation (6), something of this sort might have been possible. But the two and one-half years actually afforded to development of self-controlling producer groups in the grazing blocks prior the termination in April 1985 barely allows the process to begin.

Another important constraint to this activity has been the failure of MINEPIA to assign the nine mid-level technicians, who would have further enlarged the communications network between the project and the participating agriculture and livestock producers, and who would have remained in place as a technical liaison between the two groups.

- C. "The project will demonstrate pilot water and soil conservation practices on selected areas within the 3 grazing blocks to control and reduce water runoff and soil erosion on the 15,000 ha of pasture land. These practices will consist of reestablishing natural ground cover, artificial reseeding, establishing natural water barriers for gully control, dikes, diversions, and subsoil penetration;"

As discussed in Section II-D of this report, several of these activities were carried out in coordination with the project agronomist and the soil/water conservation specialist. The water barriers, dikes, diversions and subsoil penetration activities were the responsibility of the soil/water conservationist, and as such, were implemented by him.

Some constraints to the applicability of the water/soil-related conservation activities have already been mentioned. One that should be emphasized is the fact that collaborating livestock producers have only been participating in the deferred rotation grazing program for four rainy seasons, during two of which high-quality forage grasses were seeded into the deferred pastures. Eleveurs and livestock herders accustomed to the traditional grazing system in which the rule is "get the best that's there before someone else gets it" were often unable to resist the temptation to graze their herds in the seeded areas, thus in several instances devastating the seeded stands. In the case of the neem trees planted, livestock producers made little effort to keep their sheep and goat herds away from the trees, and the grazing of the trees, combined with the poor rains, devastated the first year's planting. It remains to be seen what percentage of the second planting will come back in rainy season 1985.

- D. "Reseeding (approximately 30 ha/grazing block) will be undertaken in these areas where improvement through natural conservation practices cannot be expected to restore production within a reasonable time;"

Approximately 20 ha of rangeland in Block I was plowed and seeded to Andropogon gayanus prior to the 1983 rainy season, as part of the soil conservation/pasture improvement program. Of the 20 ha, about 15 were seeded in the Gay Gay deferred pasture, and stand establishment was excellent. However, when the grazing deferment rotations were lifted at the end of the growing season following seed production, the stand was quickly ravaged. The following rainy season (1984) the same pasture was part of the grazing sequence, and because the seeded area was easily accessible from two of the villages, the stand was surreptitiously but regularly grazed. The regrowth had no chance to become established, and in what had been a luxurious stand the previous growing season, not a tiller of Andropogon could be found.

Prior to rainy season 1984, an attempt was made to artificially seed approximately 50 ha of deferred pasture to a mixture of Andropogon gayanus and Hyparrhenia filipendula in Block III. Due to several miscommunications, the seed for all 50 ha was broadcast on half that area. The stand started out well, but the rain stopped soon after the small Andropogon and Hyperrhenia plants had reached about 20 cm in height. As soon as the local eleveurs realized that this rainy season was another bad one, they began grazing their herds in the seeded stand, usually by night to avoid detection by the range monitors charged with supervising the cooperation of the participating population. It is doubtful that there will be much growth.

The same season, approximately 65 ha of Block I deferred pasture were seeded in bands 3-4m apart using the same Andropogon Hyperrhenia mixture. Only in the Maoudine deferred pasture was the resultant stand well established and left ungrazed. However, when the deferment was lifted at the end of the growing season, the stand was heavily grazed and at this time very little remains of the seeded stand.

Neither the Gay Gay nor the Gagadje stand germinated well because of the very poor rains, and what little became established was grazed down to the soil by participating eleveurs who were violating the pasture deferment, and by nomadic herds allowed to graze in the Block, against all grazing program regulations. It remains to be seen what kind of regrowth this year, if any, will result from last year's seeded stands.

Besides the almost universal tendency of the livestock herders to quickly destroy the seeded stands either in the rainy season or, in the best of cases, as soon as the pasture deferment is lifted, the original pasture rotation sequence of the deferred rotation grazing plan poses a problem for the seeded perennials in that the original pasture use sequence proposed that the pasture deferred the previous year be the last grazed the subesequent rainy season. This, theoretically, would give newly produced forage plants the benefit of deferment during the first two to three months of the rainy season, so that they have time to become well established before being grazed. However, in the case of the perennials seeded in the previous year's deferred pastures, grazing in these same pastures the following year would begin at just about the time the re-growth and newly germinating perennial plants would be almost the only green thing left in the pasture, and at a physiological state when tiller production and elongation would have been dominant. It was proposed, therefore, that the pasture grazing sequence be modified in such a way that the previous year's deferred pasture became the first one grazed during the subsequent rainy season, making the annual forage available to livestock prior to the time when the perennial regrowth or new perennial forage plants have reached a vulnerable physiological stage. Once livestock are moved to the second pasture in the grazing sequence, they should not return to graze the first pasture until the grazing rotation and deferment are lifted at the end of the growing season. Thus every pasture will be deferred for two consecutive seasons, and any seeded or naturally occurring perennial forages will be afforded a second season to establish healthy well developed root systems and to produce seed. This modification of the pasture grazing sequence will be effected starting in rainy season 1985.

- E. "A minimum of 9 livestock water points will be constructed within the 3 grazing blocks or in sufficient numbers to facilitate livestock access within the limit of the normal 5-km grazing range of cattle. Water points will be placed in location which will ensure efficient utilization of available forage under a rational system of grazing;"

This activity might have been an appropriate component of a 15 to 20 year range development project. A project of this length could have included development of demonstration grazing blocks in which forage production had already been measured over a number of years, correct stocking rate for the grazing systems determined and then maintained within the blocks prior to the development of dry season livestock water as the final component of a completely integrated range management system demonstration. A demonstration of this length might have given the collaborating livestock producing population a chance to actually demonstrate their capability to control their own resources, and to suggest ways in which such a program could be modified to better address the actual natural resource and socio-politico-economic realities of the project zone.

However, as it is, this water development activity was a component of what has actually been a two and one half year project. Forage production measurements have just begun. Rainy season use of the grazing block rangeland has not be quantified in any way; dry season use of the range in the grazing blocks has not yet been quantified, but it appears to have increased in the grazing blocks since the development of dry season livestock water. Without a permanent system of long term grazing control for both rainy and dry seasons, and control of livestock access to water, the project's water development activity will attract livestock from surrounding zones into the project zone, and will encourage livestock producers to keep livestock in the villages during the dry season rather than sending them out of the zone on transhumance. There is no doubt that these two reactions on the part of the livestock producers uncontrolled will exacerbate the range resource degradation which the project was installed to arrest.

- F. "The perimeters and interior boundaries of the 3 pilot grazing blocks will be cleared of brush and grass in order to provide access trials for livestock and project-related personnel to and from rotational pastures, water points and villages. The cleared trials (approximately 40 km/block) will also serve as breaks to control the spread of fire and to facilitate controlled burning."

The firebreaks cleared by hand labor during the first two years of Block I, and then by bulldozer and grader as the other Blocks developed, have been useful in providing access for the project personnel to the grazing block activities and the participating villages. They have enabled Arrondissement and Department level technical personnel to move more effectively within the project zone, and have enabled visiting USAID and MINEPIA personnel to tour the demonstrations.

However, clearing of hundreds of kilometers of 10 meter wide firebreaks is not something that should be recommended even if the grazing block system were eventually enlarged, adapted and installed in the North. In a zone where water and wind erosion is a well known problem, creation of this much more exposed soil invites erosion increases. Furthermore, the ability of these firebreaks to actually arrest the passage of brush fires from zone to zone must depend on the willingness of the zone's livestock production population to maintain these firebreaks clear of all vegetation throughout the dry season. The local population is not well enough organized for this at present, and effectiveness of fire control depends on the cooperation of all involved, not just one section of the participating producers. Furthermore, firebreaks of this sort are of questionable effectiveness in stopping fire spread in heavily forested areas or areas of dense brush, particularly during the dry season months when high winds are prevalent.

An alternative program for fire control might be a government sponsored campaign to educate the population as to the dangers and the forage losses caused by brush fires and uncontrolled burning as is often used by nomadic herders circulating through the project zone. MINEPIA personnel could be increased and trained to serve as extension agents to the population, and as monitors of the fire control program.

IV. CONCLUSIONS AND RECOMMENDATIONS

The North Cameroon Livestock and Agriculture Development Project was one which, unlike many others, attempted to have direct contact with agricultural and livestock producers, to improve production systems at the level where the human population/natural resources interface is steadily destroying the base for both agricultural and livestock production. Even following the project reorganization, the scope for the project activities was too large given:

- a. The lack of sufficient natural resource and socio-economic baseline data prior to the project start-up, upon which to base realistic technical interventions;
- b. The failure of MINEPIA to provide key technical personnel promised in the project agreement;
- c. The short sightedness of USAID/YAOUNDE in deciding to terminate all American technical assistance to the project on April 30, 1985, in spite of recommendations by the mid-term evaluations team and request by MINEPIA to extend technical assistance to December 1987.

It has recently been proposed that MINEPIA turn the Mindif project center into a Center for Coordination for the Division of Pastures and Pastoral Water in the Extreme North Province. It has not been made clear what, if any, of the project's technical interventions will be continued through the coordination center, nor is it clear what will be coordinated through the center. The following are the recommendations of the range management specialist:

- a. That the deferred rotation grazing plan continue to operate in all three grazing blocks, encouraging participation in and understanding of natural resource management activities on the part of the livestock producers.
- b. That livestock water development in the three grazing blocks be immediately halted. This moratorium should be continued until all portions of the grazing blocks have been deferred and measured for forage production, rainy season forage use in the grazing blocks has been quantified, and remaining available dry season forage and the livestock it can support have been quantified. Livestock water development in

the three grazing blocks could then be resumed, only if waterpoints are designed to supply dry season water for the livestock which the calculated dry season forage can support.

- c. That the Mindif project center be developed into a Pasture Development Training and Coordination Center where the following activities are carried out:
 - 1. Supervision of all livestock and agriculture development activities introduced by the project and which are recommended for continuation by the American and Camerounian technical team.
 - 2. Development and implementation of range management technical training programs targeting village, Arrondissement, Department, and Personnel targeted for this extension system; their training should be in natural resource development and management in general, with specific emphasis on range management, soil and water management, and soil and water conservation as related to agricultural production systems.
 - 4. Coordination of grazing management and livestock water development programs developed for implementation in the project zone outside of the three grazing blocks, and eventually for North Cameroon.
- d. That the mini block be completed and put into operation prior to the 1985 rainy season, and that it be used as a data collection and technical training facility for the planned Pasture Coordination Center. The mini-block should continue in operation for at least ten years in order to provide baseline forage data which could be used in development of a long term forage use policy ofr the project zone.
- e. That livestock feeding trials conducted at the project center be continued but modified to accentuate stockage and feeding of all crop by-products rather than selling them as is practiced by many farmers and returning organic matter, in the form of animal wastes, to the fields. Cattle fattening trials designed to encourage removal of old or weak animals from dry season forage to be fattened and then sold for a profit should be abandoned for the time being.

- f. That it be recognized by MINEPIA that agriculture and livestock production are already integrally related in the traditional production systems, and that, because limiting development of either one will automatically limit the development of the other, agricultural development activities as carried out by the project should be continued as a necessary component of an integrated agriculture/livestock production program which incorporates correct and efficient use of natural resources.
- g. That USAID recognize the necessity for long term (15-20 years) natural resource development commitments and act accordingly in designing and implementing future projects;
- h. That USAID incorporate into their project agreements more authority on the part of USAID to review host country government technicians assigned as counterpart to American technicians, with clearly articulated authority to request replacements if deemed necessary.
- i. That Minepia provide all technical and administrative personnel stipulated in project agreements.
- j. That USAID and MINEPIA jointly provide some flexibility in the project agreement for additional technical or administrative personnel during the life of the project if unforeseen personnel needs arise during project implementation.

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