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LIVESTOCK AND AGRICULTURAL DEVELOPMENT

PROJECT 631-0004

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Introduction:

The North Cameroon Livestock and Agriculture Development Project, locally called the Mindif/Moulvoudaye Project was created as a pilot program to develop and examine methods of improving livestock and agricultural production in North Cameroon. Emphasis in its agricultural-related activities has been directed toward determining feasibility of creating farming systems which could reverse resource degradation while increasing and stabilizing agricultural production so that permanent pasture land could also be improved and maintained.

Soil Improvement

One of the major objectives of the Mindif Project has been to promote soil improvement practices so that intensive cultivation of improved crop varieties can profit from adequate soil water and nutrients.

Most soils in the project zone have a very high sand fraction. Because of the inability of these soils to absorb and hold sufficient soil moisture and nutrients, they are usually droughty and low in fertility. Soil scientists have shown that the only practical method of improving the structure of these soils is through the addition or organic matter. The inherent capacity of a soil toproduce crops is directly related to its organic matter and nitrogen content. However, satisfactory levels of these constituents is difficult to maintain. Therefore, methods of organic matter addition and upkeep have been given priority in all project proposed soil management programs.

Certain sod crops, such as pasture grasses and legumes, build up the soil organic matter content. This is due to the high level of organic residues produced in the root mass, the slow decay of these materials, and the wide Carbon/Nitrogen ratios which promote the conservation of the soil nitrogen. This built-up organic matter also increases the moisture-holding capacity of the soil, both by the high moisture-holding capacity of the organic matter and its favorable influence on soil structure, resulting in greater soil porosity.

The advantage of using a crop rotation system, which takes advantage of benefits produced through the inclusion of sod crops to increase the supply of soil water and nutrients for growing food and fiber crops in an area where soil water is often inadequate, seems self-evident. During the 1984 growing season, there were fourteen periods of five or more days without rainfall. Under those circumstances, cultural practices which promoted greater infiltration and retention of soil moisture helped cultivated plants to receive adequate moisture during dry periods, preventing stunting and death of the plants in most cases.

The Mindif project has evaluated over 100 grass and leguminous species for use as sod fallow. The project expended considerable effort to identify a leguminous specie which would have the additional benefits of nitrogen fixation. Several species of stylosanthes were tried but plant establishment requirements could not be met on a regular basis in the project zone because of the erratic nature of rainfall during early months of the growing season.

The project finally selected two forage grasses, Andropogon guyanus and Hyparrhenia filipendula, to be used as fallow sod crops in the rotation system for the following reasons:

. They are easy to establish from seed even when sown on dry ground.

. They are perennial grasses and, therefore, require seeding only during the first year of the two-year fallow period.

3. For tropical perennials, they produce relatively large amounts of seed and, therefore, sod production increases during the second year of fallow.

4. They produce a deep fiberous root system which increases the soil organic matter.

5. There is an abundant seed source in the forest reserve at Laf and other seed sources exist or can be developed in locally established forest reserves throughout the zone.

6. Forage produced by these species is abundant and, because of their deep root system, they remain nutritious long after the predominant annual species have lost their nutritive value and palatability.

Now that suitable forage species have been identified by the project, there are two major obstacles to overcome before they can be used effectively to improve soil structure for the integrated rotation system. The first problem concerns the use of a farmer's time and other resources. Only 10 cooperating farmers made some effort during the last growing season to establish sod fallow. Of these, only three produced good ground cover. It is only natural that farmers should want to devote their entire resources to the establishment of food and fiber crops from the onset of the rainy season, especially because of the recent history of erratic weather conditions they faced. A possible solution to this problem is planned to be introduced next year. Since, in the rotation, the fallow period always follows a cereal crop, forage seed will be broadcast just after the grain is harvested. Half of the cereal by-products will be left in the field. Cattle and other small ruminants will be allowed to graze the by-products left in the harvested fields in the traditional manner and, in doing so, will mix the seed into the soil so that it can grow during the next rainy season. Experience has already shown that this operation must be carried out before the animals are so desperate for food that they lick up the seeds.

The second problem requires a major extension education effort, since the effects of sod fallow are not immediately apparent. People involved in survival agriculture tend to see farming problems in a short-term framework, usually thinking in terms of only one growing season. Farmers are not highly motivated to adopt an agricultural practice which defers two-fifths of their cropland for sod cultivation and whose benefits are expected to show up in the yield of a crop grown three years later.

Several aspects of the integrated rotation system are hindered by the lack of animal traction development in the project zone. At the present time, SODECOTON supplies credit for traction animals and equipment to farmers, but the conditions imposed on the farmers work against a crop rotation system. Several of the project's cooperators have received loans for animals and equipment from SODECOTON but have had to devote so much land and time to the cultivation of cotton in order to make credit payments that their crop rotations are virtually abandoned.

The Young Farmers Training Centers, one located at Moulvoudaye and two on the outskirts of Maroua, have been training young farmers in the use of animal traction and have also been arranging credit for them to purchase animals and equipment.

It has been well established that traction animals can plow much more cropland than one farmer can maintain. According to the project's cooperators, lack of time and means of transportation are the major reasons why farmers are unable to collect by-products from their fields while they still have a high nutritive value.

Lack of transportation has also prevented the manure,which has collected where animals are kept,from being put back on the rotation fields. If the manure from byproducts is not returned to the fields, the loss to the cropping system in organic matter and nutrients will not allow the system to operate efficiently.

The problems that SODECOTON and the Training Centers are facing are that: Credit (GRC supplied and regulated) is limited; repayment schedules for loans are too demanding and the program is not cohesive enough (e.g., development/selection of breeding stock, training intensification, etc., more research on cost/benefits of keeping draft animals/equipment is needed)

Sorghum

A sorghum and fertilizer response trial was conducted at the Mindif center. Four improved varieties were compared: 38-3, SPV-35,E35-1,S-35.

Four fertilizer rates were compared:

Plowed down	Manure 4T/ha + 50 kg/ha Urea
	Manure 4T/ha
	Complete fertilizer at first weeding 100 kg/ha-50 kg/ha
	Urea at flowering
	No fertilizer organic or inorganic

The sorghum field was poorly established because of late and insufficient rainfall during June and July. Differences in yields for fertilizer response were not statistically significant. The results could have been predicted at the time of the first chemical fertilizer application because of the poor plant establishment and stunted early growth. If this had not been a fertilizer trial, no chemical fertilizer would have been applied. But by putting on chemical fertilizer which gave no response,

the project has increased support for its fertilizer strategy recommended to cooperating farmers and other farmers adopting project recommended, improved varieties or rotation systems. The project recommends putting manure at a rate of 4 tons per hectare on at least one-quarter of the five-quarter hectares in the rotation system; however, the use of manure on two-quarters in the rotation per year is more consistent with actual plant needs. This manure should be put on the sections of the rotation going into cotton or on both cotton and cereal fields if two quarters are to be fertilized. The manure should be put in piles and then distributed just before being plowed down to prevent loss from wind and heavy pre-season rainfall. Because the beneficial effects of manure are slow and long-lasting, use of manure is always recommended.

Chemical fertilizer has been shown tobe cost effective when applied correctly if the sorghum field is well established at the time of its application and if the rainy season is not too short. The project recommends that complete fertilizer (15-15-15) be applied at the first weeding at a rate of 100 kg/ha but only if the plants are well established. Urea (46%) at a rate of 50 kg/ha should also be applied at the 'sarclo-butage' but only if the plants are healthy and vigorous.

To enable the average farmer to do this, two essential factors are required. First, there must be well-qualified extension agents who can help the farmer decide whether fertilization is a good risk. Secondly, there must be a locally available source ofthese fertilizers for sale when the farmer has determined that the risk is worth the price of fertilizer. The agricultural monitors have been prepared to perform these two requirements for project cooperation in 1985 on a trial basis.

Significant differences were found by the project among varieties in the 1984 sorghum trials. Average total yields are listed below:

Variety	Area Cultivated	Yield/ha
38-3	2056 m^2	1280
SPV-35	2479 m^2	1752
E 35-1	2219 m^2	917
S-35	2294 m^2	701

The yield of SPV-35 outyielded the next closest variety by 37%. The variety has outyielded all other varieties in trials at Mindif and in the fields of the cooperators every year since 1981. The variety is also appreciated by cooperators' neighboring farmers. At the present time, the Mindif project is the only source of this variety. Recommendations are that IRA sorghum researchers compare their promising early variaties with SPV-35.

In 1984, total yields were measured by the project in the cooperators' fields in order to prevent estimation errors due to uneveness of production caused by the poor rainy season. The results are listed below:

Variety	No. of Collatorators	Average Yield/ha
Local	3	900 kg
E 35-1	13	1.020 kg
SPV-35	7	1.396 kg

Five project cooperators had crop failure with sorghum. Four were directly related to the poor rainy season. One cooperator planted SPV-35 on May 19th against the advice of the agricultural monitor. The lack of rain in June left him with a poor stand which matured early and was eaten by birds. His harvest was 21 kg/quarter hectare.

This illustrates another problem which is being given greater attention. Because crop inputs are to be distributed locally by the agricultural monitor, short-cycle varieties will not be made available by the project until the appropriate planting period. This will prevent early maturity, disease and bird problems.

Peanuts

In 1984, fourteen project demonstrator/cooperators and twenty-seven other farmers received the peanut variety 55-437 originating from the Seed Project and distributed by the Mindif project. 1984 was not a good season for peanut production. Attempts to compare varietal production were not possible because none of the neighboring farmers, who had agreed to cooperate with the project in making these comparisons, had peanut yields. These farmers were growing both local varieties and 28-206. Three cooperators had crop failures with 55-437. Yields from the others are given below by grazing block area:

Grazine Block	No. of Collaborators	Average Yield/ha
I (Moudine)	9	350 kg
II (Korre)	2	250 kg
III (Kolera)	7	1.137 kg

Three varieties were cultivated at the Mindif center. Yields were very low. These low yields were attributed to poor rains, sandy soil and lack of organic matter in the soil which occurred as a result of two fallow years in which the project tried unsuccessfully to establish a leguminous fallow. Yields results are listed below:

Variety	Area Cultivated	Yield
55-437	8.175 m^2	135 kg
Argentine	1.000 m^2	184 kg
Spancross	675 m^2	307 kg

Cowpeas

Twenty-four cooperators grew cowpeas in 1984 on a total surface area of 5.0 ha. Cowpea yields were much higher than peanut yields in all three grazing block areas of the project zone. The advantage of making short-cycle, high-yielding cowpea varieties available locally to cooperators is that they can be planted later in the season and even replace an intended peanut crop if consistent rainfall does not arrive early enough during the growing season.

The cowpea variety grown by most project cooperators is Vita 5M. This variety was chosen for its high yield, commercial potential (seeds are cream colored and highly marketable), resistance to leaf diseases, and non-dehiscence at maturity which allows the farmers to work in their mousquari fields without having to worry about harvesting their cowpeas immediately when they reach maturity. To insure optimum yield, insecticide sprays must begin 35 days after planting and continued once each seven days on the same day that the cotton fields are sprayed. Four or five treatments are required.

Project experience has shown that complete fertilizer (15-15-15 + $6S+1B_2O_3$) at a rate of 100 kg/ha has been cost effective and more effective than triple super phosphate on cowpeas when applied at the same rate. Two cooperators assisted with fertilizer comparisons. Each divided his quarter hectare of cowpea into two sections and used a different treatment on each half. Yield results are listed below:

		Yield/ha
Cooperator No. 1	100 kg Complete/ha	1.886 kg
	100 kg. T.S.P./ha	1.620 kg
Cooperator No. 2	100 kg Complete/ha	1.528 kg
	Not fertilized	864 kg

Average yields of the other cooperators are listed below by the grazing block involved. No attempt was made to compare fertilizer use or non-use because, although some collatorators applied fertilizer on some of their fields, the fields were often separated by distance and had different initial fertility levels. When fertilizer was used, complete fertilizer was applied at the rate of 100 kg/ha. No neighboring fields were found to compare with those of the collagorators, since local cowpea rely on residual moisture for seed production and there was not sufficient residual moisture to produce seed.

Grazing Block	Number of Collaborators	Yield/ha Without Fert.	Number of Collaborators	Yield/ha With Fert.
I (Moudine)	6	796 kg	7	1.116 kg
II (Korre)	3	996 kg	0	
III (Kolera)			7	1.428 kg

Reforestation

20,000 tree seedlings were planted in two project nurseries at Mindif center and in Mindif near the Mayo. Tree species are listed below:

1. Azadirachta indica
2. Accacia albida
3. Leucaena leucocephala
4. Accacia holocericea
5. Accacia nilotica
6. Cajanus cajan

Treatment

To soften the hard seed coats of the Accacia and Leucaena species, the seeds were immersed in water at 100°C and left there for 24 hours before planting.

Fresh Azadirachta indica (neem) seed were harvested and kept in water at room temperature for 24 hours. Then the pulp was removed from the seeds before planting.

All species were planted 45 days before the normal transplanting period which in the Mindif zone is the first week of July.

Distribution and Transplanting

A video film was prepared with the help of forestry technicians from IRA/Maroua demonstrating the proper procedures for transplanting tree seedlings. This film was shown to the project's cooperating farmers and agricultural monitors before seedlings were distributed to farmers in the project zone villages.

Approximately 3,000 trees were distributed to the water and forestry service and the 'Sahel Vert' operation in Mindif and Moulvoudaye.

Several thousand trees were planted in a heavily eroded area of Block I in an attempt to control erosion.

Accacia nilotica seedlings were planted along the edge of one water point to see whether a living fence could be grown to prevent direct access by animals.

Conclusions

The very poor rainy season in 1984 with low rainfall and long periods of dryness caused the death or stunting of many of the trees planted. Insufficient protection of seedlings from livestock also caused major losses.

In cooperation with the Water and Forests Service, the project plans to establish small forest reserves throughout the project zone where an undergrowth of highly productive perennial grass species can be established as a seed source for use in pasture reseeding efforts and to provide forage seed for the fallow sections of the crop rotation system. Greater efforts are planned to make cattlemen and farmers aware of the benefits which can be derived from these forest reserves and the need for strict protection in order to establish them.

Initial results indicate that Accacia nilotica can be used to form a living fence around watering points to prevent contamination by direct animal access. Seedlings must be planted in a row with 40 centimeters between each plant. These seedlings must be protected by a temporary wire fence.

Leucaena leicocephala can provide a significant source of wood and dry-season animal feed but these seedlings are so palatable that very intensive measures must be taken to protect them during the first two years after planting. For this reason, these trees are recommended for establishment by individual farmers near their homes.

Accacia holocericea seedlings require at least one more season before they can be evaluated as a dry-season source of supplemental animal feed.