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Some Aspects of Range Management and Livestock Production in Senegal, Mali, Nigeria, and Kenya

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Bobby J. Rankin and Rex D. Pieper
Department of Animal and Range Sciences

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INTRODUCTION

Our trip to Africa was part of the BIFAD grant to New Mexico State University. The objectives of the trip were threefold:

1) To learn as much as possible about the countries, especially their range and livestock production. Such information would enable New Mexico State University to be in a stronger position to participate in future projects in Africa.

2) To confer with former students to see the types of jobs they have returned to. Such knowledge should enable us to advise African students more effectively when they come to New Mexico State University.

3) To visit and evaluate African schools which send many students to New Mexico State University to complete their Bachelor of Science and Master of Science degrees. This information should help us evaluate students transferring here more effectively. Three schools were visited: the Veterinary Training School at Vom, Nigeria; the Livestock Training School at Kaduna, Nigeria; and Egerton College, Njoro, Kenya.

Our trip was made possible by contacts with colleagues and former students in these countries. We were able to see everything we had planned but obtained general impressions, not detailed information, on many facets of range livestock production. The following people were especially helpful in making our trip successful:

Senegal: Mr. Alex Dickie, IV, and Mr. Larry Harms

Mali: Mr. Stanley Wills and Dr. Jim Dickey

Nigeria: Mr. Samu Nadabo; Mr. Adamu Zakari and Mr. Ahmed Alti

Kenya: Dr. Jon Norris and Dr. Don Burzlaff

For convenience, this report is divided into individual reports on each country in the order in which they were visited.

SENEGAL

General Characteristics

Senegal is located on the extreme western coast of Africa but is included in the Sahelian zone (Thomas, 1980). Senegal is separated from Mauritania and Mali by the Senegal River. In the northern part of the country the rainfall season includes mainly the summer months of June, July, August and September and is followed by an extended dry season for the rest of the year. During the dry season little vegetational growth occurs. In the southern part of Senegal, rainfall is heavier and the rainy season starts earlier.

Vegetation of northern Senegal is a savanna with the trees widely scattered and the understory very sparse. This vegetation pattern is undoubtedly a reflection of the rainfall amount and distribution. The vegetation is also impacted by livestock grazing, but this impact is likely tempered by location of villages and livestock water.

Bakel Range and Livestock Project

The Bakel project is located in extreme eastern Senegal. The project, sponsored by AID, is aimed at improving range livestock production in the area.

The vegetation is represented by a rather dense savanna with an understory of shrubs and annual grasses. The annual grassland apparently extends across the Sahelian zone to Sudan. Factors responsible for maintaining the annual grassland may be related to livestock grazing and fire, but these relationships have not been researched. The only perennial grass species found in the project area is Andropogon guyanus. Some of the major species found on the project area are shown in Table 1.

Table 1. Important Species on the Bakel Project Area, Senegal

Herbaceous Species	Overstory Species
Diheteropogon hagerupii	Combretum glutinosum
Panicum fimbrostylus	Combretum nigricans
Pennesetum spp.	Combretum micranthum
Andropogon guyanus	Combretum geitonophyllum
Loudetia togoensis	Combretum aculeatum
Chloris pilosa	Acacia macrostachya
Elronous elegans	Acacia seyal
Schoenfeldia gracilia	Acacia ataxicantha
Eragrostis spp.	Bombax costatum
	Grewia bicolor
	Feretia apodanthera
	Pterocarpus lucens
	Pterocarpus erinaceus
	Boscia senegalensis
	Boscia angustibolia
	Strychnos innocua
	Lannea acida
	Entada africana
	Sclerocarya birrea
	Adansonia digitaria
	Hibiscus asper

Although the soils tend toward the lateric types, herbage production is very high. Grasses were waist high during our visit. In 1979, herbage standing crop was over 2500 kg/ha on all range sites on the project area

(Dickie, personal communication). However, the herbage largely disappears in 6 months. Livestock then feed mainly along water courses, or they may feed on browse. Additional research is needed to determine year-long diets. However, it seems obvious that livestock are under nutritional stress during the dry season. Having supplemental livestock feed during the dry season and during drought would do much to stabilize the herds in Senegal.

Range improvement projects have been aimed at reducing the effect of fires and improving livestock distribution by development of dirt tanks. An extensive network of fire lanes has been developed to prevent spread of fires, and metal fire towers have been erected. The effectiveness of these measures is not clear. Burning is done by the villagers for a variety of reasons, but fires annually consume large quantities of herbage which could be used by livestock. The damage of burning to the vegetation has not been determined, but it might be related to the lack of litter on the soil surface.

Most of the villagers in the project zone are sedentary, but periodically nomads from Mauritania bring their livestock across the Senegal River for forage. Consequently, control of livestock grazing is difficult.

Livestock

In northern Senegal, large white Zebu cattle predominate. Cattle in this area are less subject to parasites and trypanosomiasis. Near Bakel, the cattle are derived from crossing Zebu with Ndama. The Ndama are small, less desirable cattle, but they are quite resistant to trypanosomiasis. The derivative of the cross is said to be intermediate in resistance to this disease and is well adapted to the Bakel area.

All cattle were being herded to keep them away from crops. Usually herds are composed of cattle, sheep, and goats being driven and grazing together. Livestock are kept as a status symbol or indication of wealth and thus are not exploited on a commercial basis. Cattle often reach 8 to 10 years of age before being slaughtered for meat. The smaller animals, especially sheep, which are coarse-haired and long-tailed, are used more for meat by the villagers. Milk from all these species is an important source of animal protein in the diet. Diseases and predators cause high losses of livestock, but vaccination programs are being developed for some diseases.

MALI

Mali is a large country, its northern areas reaching into the Sahara desert and the southern into tropical forests. It is a country relatively poor in natural resources, but with opportunity for increased agricultural production.

The area around Bamako is subtropical with fairly dense tree and shrub growth. When the woody vegetation is removed, there is dense herbaceous growth. In northern Mali, the herbaceous layer is mostly annual, but to the south it is mostly perennial.

In the area around Bamako, a type of crop rotation is practiced. A small area around the village is cleared of woody plants and planted to some crop such as millet, sorghum, or peanuts. Some of the work is done by hand and some with oxen. An area is cultivated for several years until its fertility level is depleted. This area is then abandoned and another area is cleared. Thus one can find areas in various stages of secondary succession. These laterite soils have good productive potential, but must be handled carefully. There are many external agencies in Mali working on development projects

(e.g. World Bank, Saudia Arabian Government, International Crops Research Institute for the Semi-Arid Tropics, etc.); however, in many cases it appears that there is a lack of coordination among the organizations and possibly some duplication of effort.

Water development continues to be one of the main focuses of range improvement programs in Mali. It has a major role in the AID-sponsored Dilly Project. However, water development without concomitant grazing management can be disastrous (Sahel Development Program 1980, Thomas, 1980). In some cases, water developments only allow additional areas to be subject to destructive grazing.

Livestock

Near Bamako the livestock herds are similar to those near Bakel. The cattle include both red and white Zebu, crosses between zebu and Ndama, and some Ndama. The rainfall there is near 800 mm annually. Moving south, the rainfall increases, and tzetze fly and trypanosomiasis risk becomes greater. The cattle are moved north to the dryer part of the country during the rainy season and are returned during the dry season. Purebred Zebu cattle are much preferred, but crossing with Ndama provides some protection from the tzetze fly. Deforestation also reduces this problem.

A feedlot was constructed by the livestock project with AID funds and is now being used to keep a supply of fleshy cattle for sale during the dry season when prices are higher. Corn silage is being grown and stored in trench silos. A program is underway in which small farmers buy a few head of cattle and feed them on peanut stalks after harvest.

A large meat-packing plant which operates during the season when fat cattle are available was seen in Bamako. Several herds were observed

en route to market in Bamako, which is the largest population center in the area. About three hours' drive north of Bamako, we visited a village market day where a few hundred cattle, sheep, and goats were staked, and traders were buying a few of them to take to other markets. Carts pulled by donkeys or oxen provided transportation. All the cattle were Zebu or Zebu crossbreeds.

Near Bamako, a well-staffed center for vaccine production produces 10 million doses of vaccine per year for rinderpest, pleural pneumonia, blackleg, anthrax, and pasteurellosis. The center is staffed by 5 to 6 veterinarians, 20 to 25 technicians, and about 50 support workers. Vaccine is widely used in the areas where these diseases are a problem.

Mali is lacking in educational facilities, although there is an Agricultural College (Katibougou) outside Bamako and a liberal arts college in Bamako (normal school). Students from these schools appear to have the necessary background to pursue advanced degrees in American universities; however, these colleges suffer from lack of facilities and operating money.

NIGERIA

Nigeria appears to be struggling to make best use of its new-found oil wealth. Some aspects of Nigerian development appear to be up to western standards. Internal problems restrict best use of well-trained personnel. The country has a well-developed university system, but adequate support is often lacking.

Because of Nigeria's favorable climate, its rangelands are very productive. In the northern portion, vegetation is limited by low rainfall, while in the south the vegetation is subtropical. In the central portion of Nigeria, around Kaduna, vegetation appeared very lush at the end of the rainy season.

Many trained specialists in Nigeria feel that the greatest obstacle to proper range management is the nomadic or transhumance pattern of grazing by livestock operators (Bukar, 1973; Rains, 1963). Traditionally, such tribes as the Fulani have moved to follow forage available for their livestock. However, such a pattern makes range management difficult. Consequently, in 1965 the Grazing Reserve Law was enacted (National Council for Agriculture and Rural Development, 1978). The objectives of this law were as follows:

> ... to create grazing reserves so that the grazing rights of cattle owners can be fully protected by law. This will also help to reduce the friction between cattle owners and farmers which has, in the past, led to bloodshed and loss of life. Moreover, it will be possible to carry out pasture improvement work in the legally-constituted Grazing Reserves by planting different types of grasses, and permanent water supplies can be provided. In this way the number of animals that can be kept on the same area of land can be greatly increased. This kind of improvement work cannot be undertaken now because the pastures are open to all and are usually burnt every year for hunting or other purposes to the degradation and detriment of the pastures.

These grazing reserves are put under a management plan which contains the following components:

1. History and current status
2. Statement of objectives
3. Range inventories
4. Grazing systems
5. Stocking rates
6. Necessary legislation
7. Staffing
8. Range Management Committee
9. Control of entry
10. Physical developments

11. Range dynamics
12. Water and watershed management practices
13. Extension Program
14. Disease control
15. Supplementary feeding
16. Fire control
17. Use of forest products
18. Farming by permit holders
19. Reserve Users Association
20. Further education/training of livestock owners

Graduates of U.S. universities are often put in charge of these reserves, which are administered by the Ministry of Livestock and Forestry Resources.

Livestock

Near Kaduna, there is more development for livestock with some fenced areas and government stations. Artificial insemination is used here. Considerable trailing of cattle still occurs from south to north as the rainy season begins and from north to south as the forage and water supplies become depleted in the dryer north. The tzetze fly problem is controlled in Nigeria through deforestation and the regular use of a prophylactic drug. White Fulani, Freisian crossbreeds and Ndama cattle are seen in this area. Members of the Fulani tribe are primarily cattle herders and sell cattle only occasionally when money is needed. Farmer-feeders buy a few head and fatten them on the farm for market. Beef is preferred; mutton is regularly eaten, but goats are not. There are federal and state programs for livestock development, and range reserves are being organized to reduce the nomadic movement of the Fulani cattle.

Much of the university work in agriculture is under the umbrella of the Ahmadu Bello University System whose main campus is in Zaria. The range management and livestock courses are taught at the Livestock Training School at Kaduna. This school is operating on limited monetary resources, so it does not attract the best-qualified individuals to teach at the school. There are several individuals in Nigeria with Master of Science degrees in range management from U.S. universities (New Mexico State University, University of Arizona, Texas Tech University, etc.), and there are a few with Ph.D. degrees. The problem is that little economic incentive exists for the trained personnel to teach at the universities. Economics dictate that these individuals seek employment with the Ministry of Livestock and Forestry Resources. Consequently, range management courses at the Livestock Training School in Kaduna are now being taught by an individual who has completed only one course in range management at Kansas State University.

It appears that New Mexico State University's transfer policy for students from Kaduna is a good one. The university has been granting 20 credits to those students who have completed the two-year diploma course (formerly the certificate course) and 30 credits to those who have completed the three-year higher diploma course (formerly the diploma course).

KENYA

Generally, the ranges around Nairobi appear to be very productive, although conditions were very dry when we were there. Apparently climatic conditions are quite favorable for plant growth, although brush encroachment into grassland areas may be a problem.

Egerton College

Egerton College appears to be turning out well-trained graduates in the three-year diploma program in range and animal sciences. The college has good facilities and a fairly well-trained faculty. Paul Metto (Master of Science, University of Arizona) and Wilson Yabann (Bachelor of Science, New Mexico State University) are the instructors in range management at the present time. Isaac Kemei (Master of Science, New Mexico State University), who is head of the range management program, is now working on his Ph.D. degree at Texas A & M University.

New Mexico State University has been granting 58 credits to students with a diploma from Egerton, and this appears to be appropriate. Most students have experienced little difficulty here.

The University of Nairobi has recently instituted a Bachelor of Science degree program in range management. Surprisingly, the diploma program at Egerton was not elevated to a full Bachelor of Science program in place of initiating a new Bachelor of Science program at the University of Nairobi.

Kiboko Research Station

The Kiboko Research Station is located about 100 miles from Nairobi. The project to restore the research capability of the station is under the auspices of the Winrock Foundation with funding from AID. Originally, the station was maintained by FAO, but it has fallen into a period of relative inactivity since that time (1973). The station is comprised of about 70,000 acres with an annual rainfall of about 24 inches.

Research in the past has emphasized brush control, grazing systems, reseeding, and cattle breeding. Part of the project entails training Kenyan

students in the United States at Texas A & M University with thesis research at Kiboko. The students will work with an advisor at Texas A & M who will travel to Kiboko to help set up the research project for the student. Students will collect data at Kiboko with the help of the staff there. When the project ends, this core of trained personnel should be able to carry on the research mission of the station.

The project has experienced problems in getting the U.S. staff set up and in finding qualified students who are available for graduate training in the program. Although there are many excellent former students in the ministry, it is not easy to have them assigned to the Kiboko project. Many Egerton graduates have completed their Bachelor of Science degrees at New Mexico State University and are well qualified for graduate work.

Presently the first group of students, graduates of the University of Nairobi, are at Texas A & M. Future students will be Egerton College graduates. However, it will probably be 3 to $3\frac{1}{2}$ years before these students can complete their Master of Science degrees. By then, not much time will be available to integrate them into the research program before the termination of the project.

Livestock

In Kenya, most of the cattle are East Africa Zebu which are small in size and usually spotted black and white. Cattle improvement programs have been under way for many years, and crossbreeding of improved beef breeds on the indigenous Zebu is being practiced. Presently there is interest in crossing with Boron and Sahiwal. A Boron bull stud program was begun at Kiboko in 1975, but it cannot meet the demand. Sahiwal bulls are produced

and tested at another government station, and artificial insemination is used to some degree in the farm areas.

The International Livestock Center for Africa

The International Livestock Center for Africa (ILCA) resulted from several meetings in the period from 1968-1970 and received support from the Rockefeller Foundation (ILCA, 1980). The headquarters was established on the outskirts of Addis Ababa, Ethiopia, in 1979. The staff has grown from 4 in 1974 to 70 in 1980. Initial funding was provided by the World Bank and the International Development Research Center.

The original mandate of the center was "to assist national efforts which aim to effect a change in production and marketing systems in tropical Africa so as to increase the sustained yield and output of livestock and livestock products and improve the quality of life of the people in the region" (ILCA, 1980).

Initial projects in Kenya were related to inventory of the basic resources (ILCA, 1978) and economic analysis of group ranches (Semenye and Chabari, 1980). The group ranches were organized by the Kenyan Government and are somewhat comparable to the grazing reserves in Nigeria. They were designed to provide a mechanism for range livestock planning and management where grazing could be controlled.

The inventory, which included vegetation mapping and livestock inventory, relied heavily on aerial photo interpretation and ERTS satellite imagery. These early phases have essentially been completed and other aspects are now being initiated. Figure 1 shows a schematic drawing of ILCA activities. A concerted effort is being made to increase research activities and information-gathering capabilities to provide a better base for making decisions and recommendations.

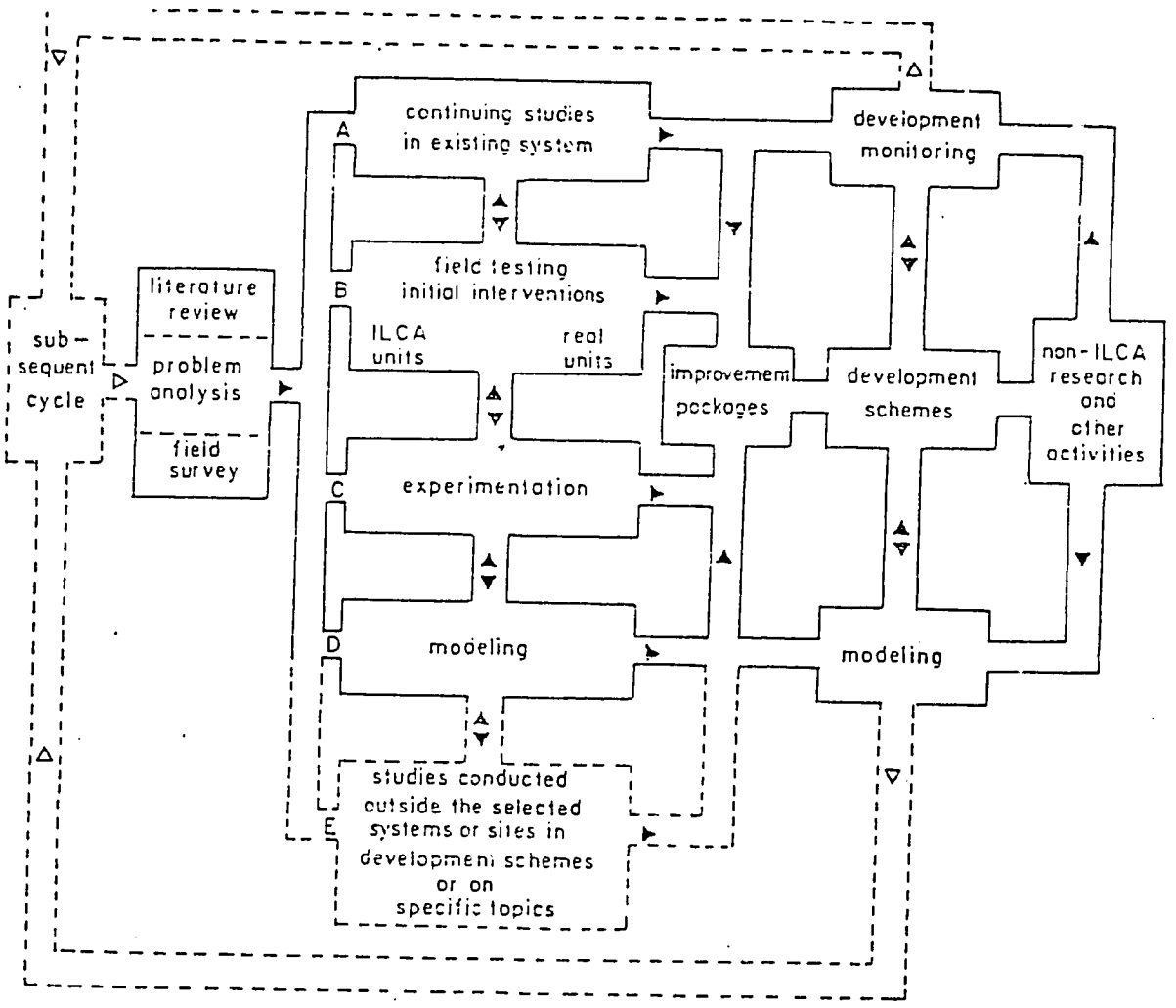

Figure 1--Schematic Model of ILCA's Approach to Research for Development

Most African countries are faced with the problem of the nomadic livestock operators and must either work within the system or try to change this basic way of life. Figure 2 shows the approach that ILCA has taken in dealing with these production systems in the drier areas of Africa.

Although ILCA has been operating for a relatively short time, its accomplishments are impressive. The center is staffed by capable people who have their goals and objectives well in hand.

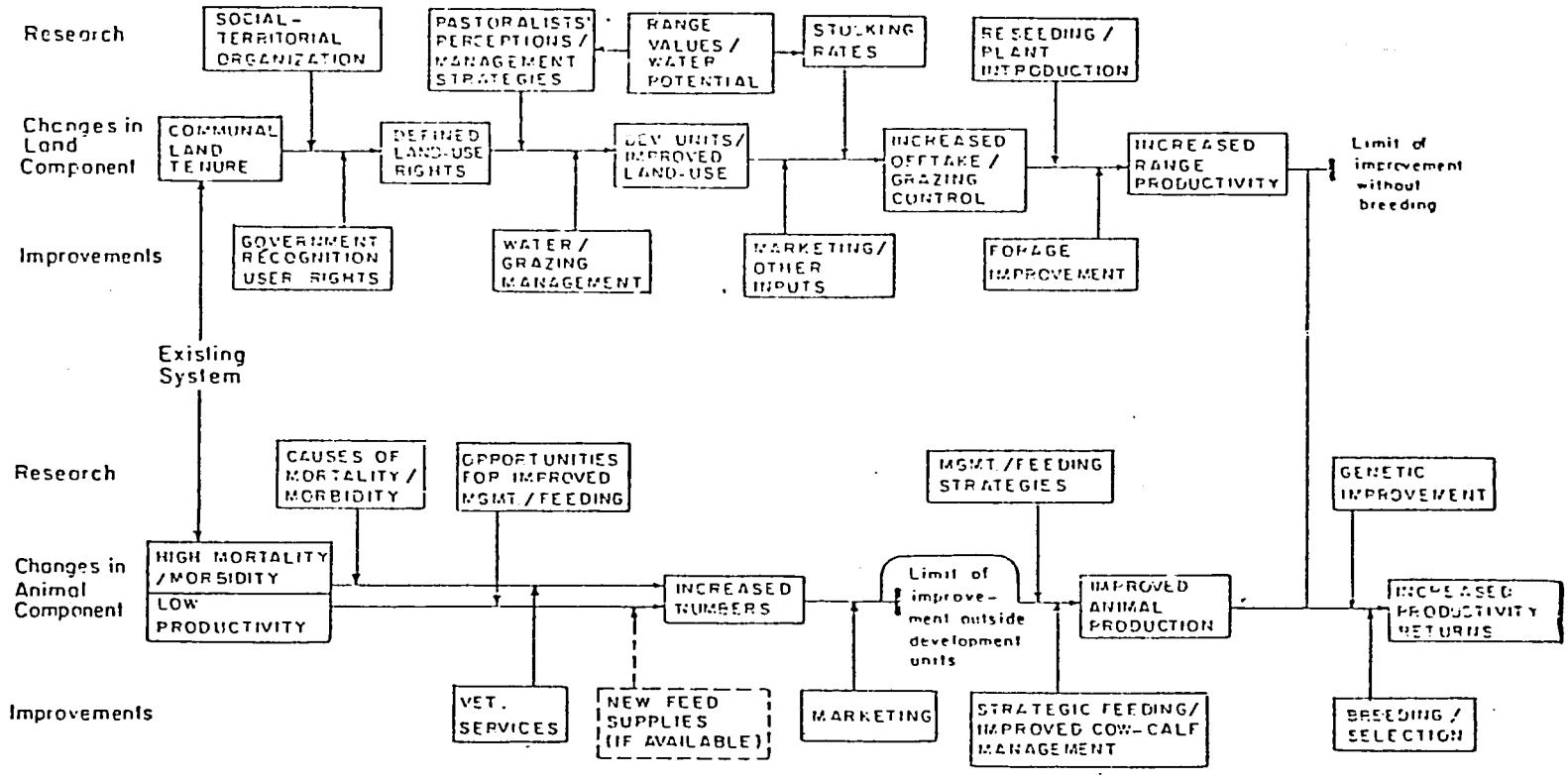

Figure 2--Proposed Development Path for Transhumant Production System in the Semi-Arid Zone

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