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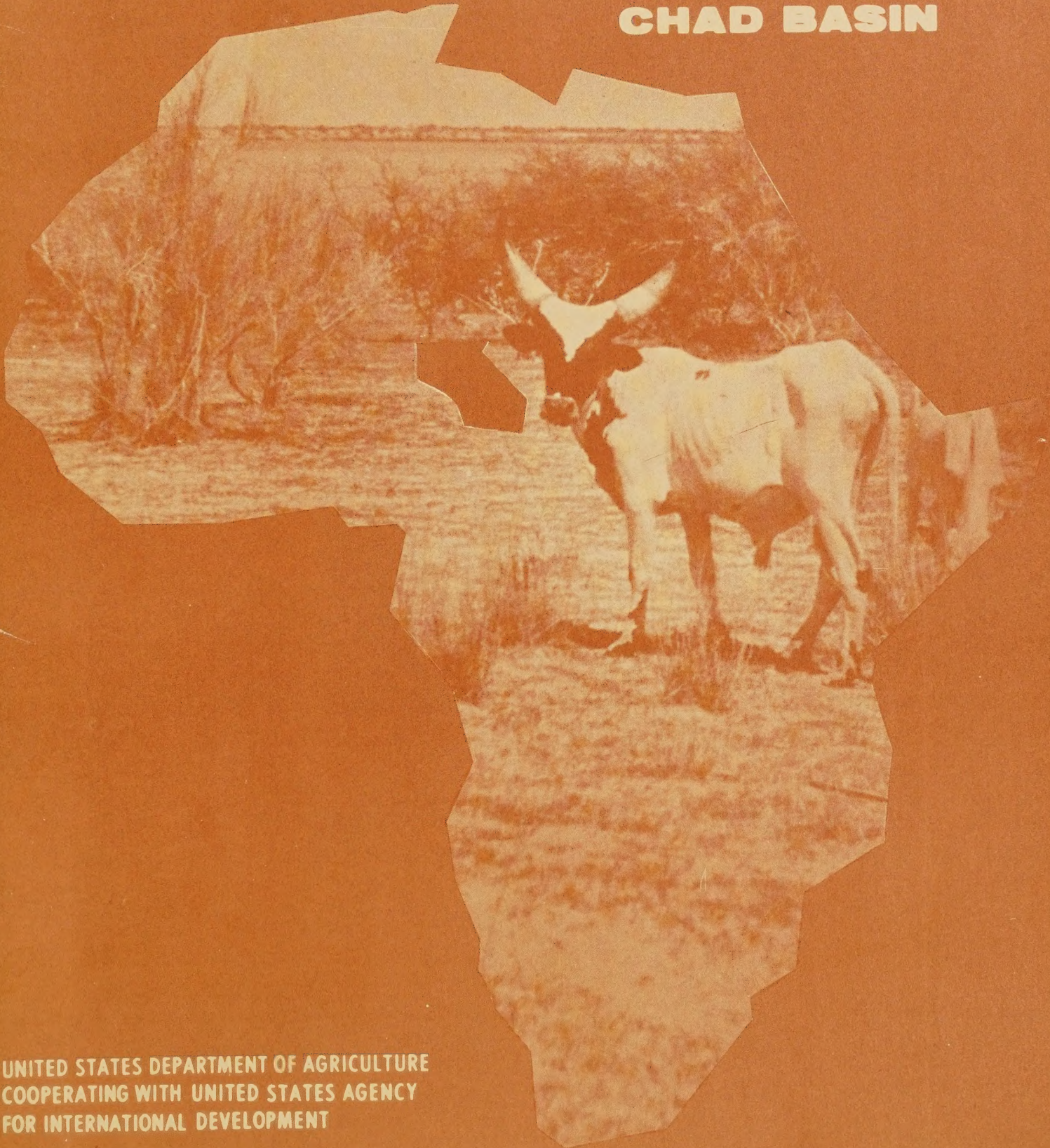
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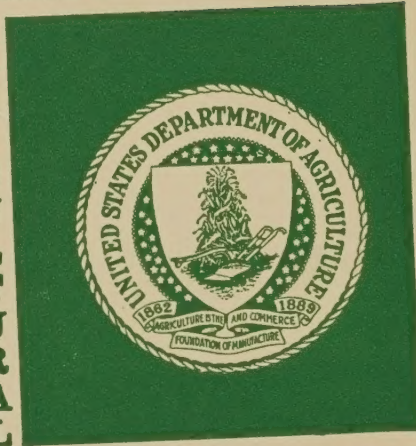


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**RANGE MANAGEMENT AND LIVESTOCK INDUSTRY
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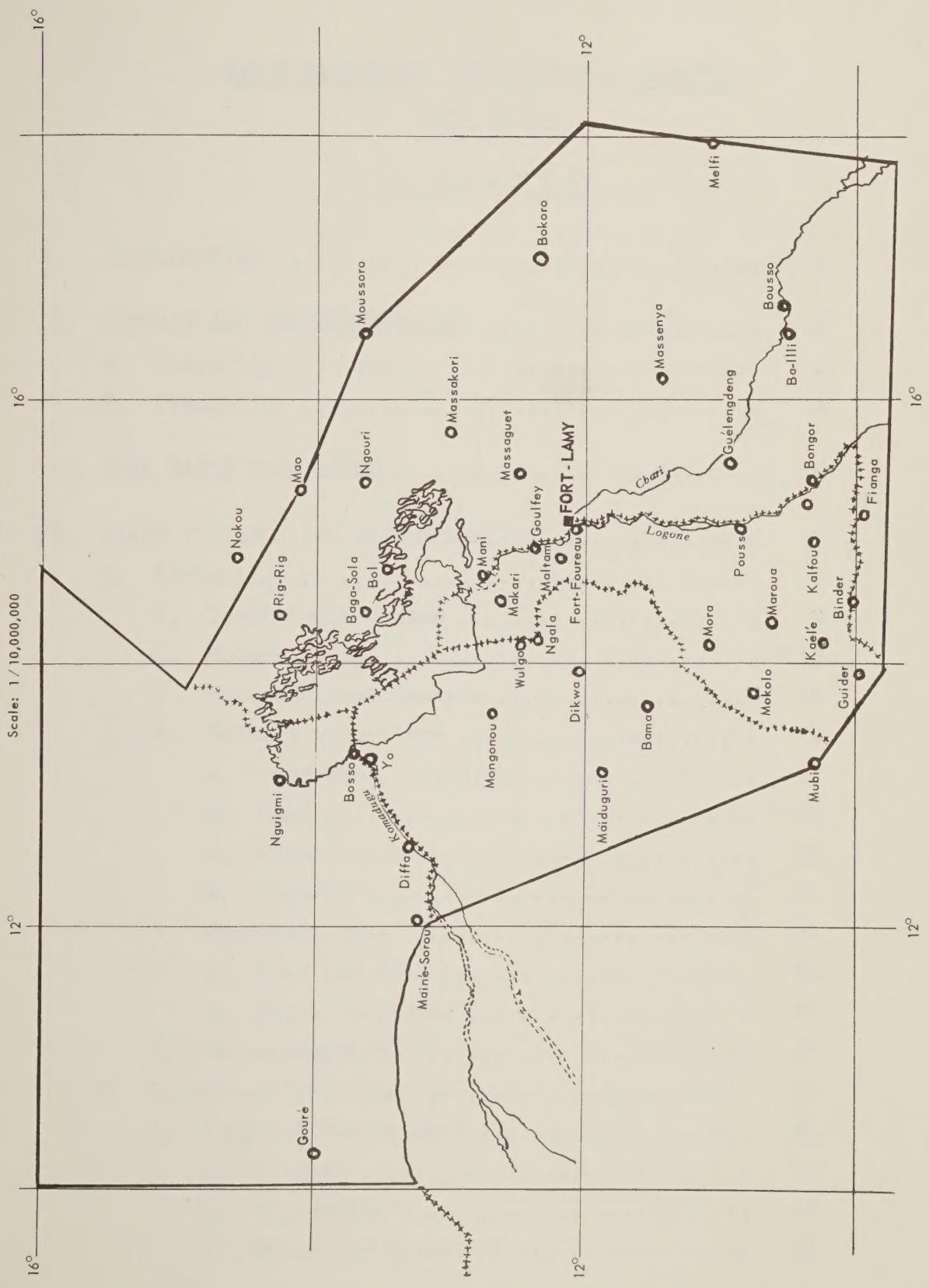
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AUGUST 1968

CHAD BASIN COMMISSION

Scale: 1 / 10,000,000



RANGE MANAGEMENT AND LIVESTOCK INDUSTRY

CHAD BASIN

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RANGE MANAGEMENT AND LIVESTOCK INDUSTRY

CHAD BASIN

AFRICA

I. INTRODUCTION

This report fulfills the April 10, 1968 agreement between the Chad Basin Commission (CBC) and the United States Agency for International Development (AID) which provided for a survey of range management and livestock within the Chad Basin Commission area. The team was asked to analyze the potentials for range management within the Chad Basin Commission's jurisdiction in Chad, Niger, Cameroon and Nigeria; to identify the obstacles to developing range resources and improving the livestock industry; and to advise Chad Basin Commission members of the most rational and economic way to exploit their rangeland resources.

The survey was made during May-August 1968. Portions of the rangelands within each country were examined. Discussions were held with government, mission and industry personnel, and several modern abattoirs were visited.

The authors are grateful for the assistance of the administrative and technical personnel of several ministries, departments, services and political sub-divisions of the Governments of Cameroon, Chad, Niger and Nigeria. Generous assistance was also provided by U.S. Missions in the four countries and by representatives of the United Nations, the Food and Agricultural Organization, the United Nations Development Program, the Near East Foundation and other organizations. We are particularly grateful to Chad Basin Commission representatives from the four Basin countries and their associated technical and administrative personnel.

The exchange rates used in this study are: \$1.00 = 250 francs CFA (Communaute Financiere Africaine) (African Financial Community) - 1 Nigeria = 700 CFA = \$2.80.

II. SUMMARY AND RECOMMENDATIONS

All four countries are vitally interested in managing their rangelands and modernizing and developing their livestock industries. Next to farming, livestock is the most important resource. The extensive land and livestock resources can be important sources of funds to develop their economies. However, certain production and marketing problems must first be overcome.

On both economic and political grounds, the four governments are seeking ways to help people in the range areas. Due to remoteness and transportation difficulties, the range areas have attracted little investment and have lagged behind other sectors in social and economic development.

Past efforts to improve the industry have been unilateral, with the exception of disease control. Consequently, the Chad Basin Commission represents a significant breakthrough in regional cooperation aimed toward an orderly development of Basin resources based on recognition of mutual interests. Nigeria is definitely a meat deficit country and therefore pursues a policy of increasing production and improving the economic life of its people in the livestock-producing areas. Cameroon is presently capable of meeting its meat needs but plans to develop its industry both for an increasing population and future export. Chad and Niger have surplus cattle and therefore must look south to Nigeria and elsewhere for markets.

While the problems are severe, solutions are possible and consist of adopting certain policies and taking actions best calculated to get at root causes rather than a vast reorientation or revolutionary change in the industry.

A. Marketing.

Cattle are the most important livestock resource in Niger, Chad, northern Cameroon and northern Nigeria. Traditionally and today, the natural and mass markets for these cattle are the protein deficient, tsetse fly areas of tropical West Africa - mainly Nigeria. These markets are supplied primarily by on-hoof movements of cattle. The market-destined herds have been bought,

collected, herded, traded, sold and butchered by a host of buyers, dealers and middlemen. This is a completely indigenous marketing system developed over a long period of time with little participation, control or assistance by government. Yet this system is enormously effective in delivering a continuous supply of cattle to the thousands of villages and towns throughout an area half the size of the United States at a price the mass market can afford to pay. Moreover, practically the entire animal including the hides and hoofs is utilized as human food at the terminal markets.

The traditional system is criticized for allowing uncontrolled exports, the many middlemen involved, and excessive weight losses on the treks. While the system has its faults, it will remain the logical market arrangement for the majority of surplus cattle produced in the north until a network of roads and railways is constructed.

A small but growing market for chilled carcass beef has developed mainly in the coastal cities of tropical Africa. Known as the quality market, it is open to competition from cattle producing countries in and out of Africa. Attempts to penetrate this market have led to the construction of many modern abattoirs and canneries in the producing zones with the carcass meat shipped mainly by air or in the case of Nigeria by rail. Inadequate supplies of cattle of sufficient quality, high transportation costs and a limited market have largely negated these efforts, with important exceptions. Thus, the producing countries have been denied profits needed for development.

RECOMMENDATIONS - MARKETING

Short-term

1. Recognize the economic importance and necessity of the traditional marketing system and work to regulate but not restrict cattle movements. Provide credit to buyers to rapidly consummate sales.
2. Seek new African markets or expand present markets for quality carcass beef and enter into agreements to eliminate or moderate import tariffs, establish realistic freight rates and meat quotas and provide for back-haul of goods needed in the producing countries.

3. Provide scales for sales by weight in cattle markets in producing areas and disseminate market news and prices.

Long-term

1. Develop roads and railways connecting producing areas to major abattoirs and markets.
2. Develop stock corridors to facilitate movement of cattle to major abattoirs.
3. Prior to investing in additional processing plants, make realistic assessments of markets, cattle supply and cost-benefits.

B. Production.

A long dry season forces movement of cattle and people. Diseases weaken or decimate herds. Cattle lack water because there are too few wells, existing wells are poorly maintained and the costs of developing new wells are too high. Frequent and unnecessary range fires destroy untold amounts of needed forage and weaken the better grasses. Expansion of the chilled carcass beef trade is hampered by insufficient supply of quality cattle. Heavy taxes on people and livestock in the producing areas have reduced purchasing power, encouraged tax evasion, fostered distress livestock sales to pay taxes and encouraged uncontrolled border crossing of cattle seeking higher prices.

More professional and sub-professional Africans are necessary to cope with range management, animal husbandry, water development, economics and marketing needs and to handle the technical, administrative, educational and research demands of developing livestock industries.

Range management is needed to protect Basin grass resources, but government operated ranches which exclude traditional users and their herds have had difficulty controlling land and protecting grass resources. In the long run, significant extension of such ranches can only lead to displacement of people, unrest and migration to towns. Developing tribal ranches appears to be the best alternative. To date, programs for developing breeding and fat-

tening ranches and importing exotic beef breeds have had little impact on beef production in the Basin area.

RECOMMENDATIONS - PRODUCTION

Short-term

1. Eliminate or moderate taxes on people and livestock in the producing areas.
2. Control range fires.
3. Maintain existing wells.
4. Initiate a program to finish cattle for the quality markets on farms near major abattoirs.

Long-term

1. Limit government operated ranches to research roles.
2. Develop tribal ranches (grazing reserves) as an alternative to government ranches to apply range management.
3. Reduce the cost of developing livestock water and develop new water points.

RECOMMENDATIONS - RESEARCH

1. Feeding trials with local cattle to test weight gain, carcass quality and economic feasibility.
2. Social-anthropological studies of ways and means to develop tribal ranches.
3. Effect of fires on rangelands.
4. Studies of range sites, vegetation and carrying capacity where not now available.

5. Effect on vegetation and wildlife of diversion of the Logone river to the Benue.

RECOMMENDATIONS - EDUCATION

1. Enlarge and further regionalize the Veterinary school at Farcha Laboratory, Fort Lamy to include range management, animal husbandry, economics and marketing.

III. CHAD BASIN COMMISSION.

Lake Chad and its Basin are nearly at the geographical center of Africa, far removed from the densely populated coast which needs the protein foods the Basin produces or from the seaports from which consumer goods and durables are imported. The high cost and difficulty of transporting to and from these coastal markets and seaports is the single most important limiting factor in developing the Basin area.

The four countries surrounding Lake Chad - Chad, Cameroon, Niger, Nigeria - have many common interests. All four have access to the lake's fish and water resources. Important irrigation works are planned for rivers dividing Cameroon and Chad (Logone and Chari rivers) -- Nigeria and Cameroon (Ebeji 'El Beid' river) -- Nigeria and Niger (Komadugu 'Yobe' river). Developing their common underground water resources also requires cooperation in order to avoid excessive withdrawals.

Livestock is another area requiring cooperation. The natural markets for Chad and Niger are the protein deficient areas to the south, mainly coastal cities in Nigeria. Moreover, herders and dealers with their cattle frequently cross political boundaries in search of grazing or to trek cattle to traditional markets.

Believing that a coordinated exploitation of land, water and plant resources, development of markets, roads and railways and pooling of research

capabilities would benefit all, the four countries in May 1964 created a regional commission. The duties of the Chad Basin Commission include preparing general regulations and ensuring their effective application; coordinating research activities of member states, evaluating projects prepared by member states, recommending surveys and projects in the Basin, and maintaining liaison between member states. (See Appendix XII for further details.)

The Chad Basin Commission, assisted by member countries and United Nations organizations, is undertaking geological studies, surface and underground water studies, research in using irrigation for crops useful for human and animal consumption, road needs and fisheries. The Chad Basin Commission must rely largely on outside technical and financial aid to carry out assigned responsibilities or to expand its operations. The Commission can play an important role in making basic resource studies and recommendations for action programs. With an enlarged African and expatriate technical staff, the Commission can also become an action agency and, by supplying technical expertise to the four governments, enable them to carry out the plans and projects developed by the Commission.

Since anywhere from 30 to 80 percent of the costs of development projects in the Basin must be financed by outside aid or private investment, livestock projects must be carefully selected from among those having the most favorable cost-benefit ratios and least future operating costs. To do otherwise will not only tax the limited aid funds available but will impose a future financial load on the receivers.

IV. MAJOR FINDINGS AND RECOMMENDATIONS

A. Marketing.

The major cattle-growing region of the Basin countries generally lies north of 8-9° north latitude. The much more populous, higher rainfall and tsetse-ravaged southern belt serves as the main natural market for surplus animals coming from this northern area. Over half of the total annual off-take (see Table I) is consumed in meat deficit Nigeria.

TABLE I

Estimated Cattle Exploitation by Number of Head
Among the Four Chad Basin Countries - 1968

(Numbers in 1000's)

<u>Item</u>	<u>Cameroon</u>	<u>Chad</u>	<u>Niger</u>	<u>Nigeria</u>	<u>Total</u>
Cattle Population	2,000	4,500	4,200	7,800	18,500
Percent Offtake	8.5	9.0	8.5	8.5	
Annual Offtake	170	405	357	663	1,595
Intra Chad Basin Country Imports	---	---	---	355	355
Intra Chad Basin Country Exports	15	165	175	---	355
Local Consumption	150	210	157	965	1,482
On balance Chad Basin Country Exports	5	30	25	53	113*

* Ignored are unknown numbers of cattle passing between and within the Chad Basin countries and their neighbors.

The traditional system for moving these animals - principally on foot - is one of the most remarkable examples in the developing world of a large-scale, completely indigenous marketing system. (See Appendix V for main cattle routes.) Operating across international boundaries, it is a multi-billion franc industry that involves thousands of persons and hundred of thousands of cattle. Effective government participation in the trade up to now has been largely limited to the issuance of health certificates and permits and the nominal demarcation/control of main trek routes.

The demands to improve this market structure have been generated by the increasing world demand for meat, plus governmental desire to improve the basic standard of living/sanitation of the masses and to modernize local industries as a means of increasing national revenue. Enough surveys and feasibility studies, showing how to modernize the livestock industry and add profits, have already been made in a range of countries from Ethiopia to Senegal. Consequently there is no need in this report to go into the minute details of meat processing and marketing. What is needed is a realistic assessment of past efforts and the present status and trends in the processing and marketing of meat.

1. Traditional System.

From ancient times, cattle in West Africa have been driven south to the rainforest zone where they were exchanged for other items of produce (e.g. kola nuts) which moved north. This system handles the bulk of the annual offtake of Basin countries. Over 1.5 million cattle move from ranges to slaughter points and the meat made available to consumers.

The system begins with the sale of individual animals to itinerant buyers in the bush markets who in turn sell to intermediate buyers or to small local butchers. The intermediate cattle buyers collect animals from the smaller operations and gradually build up herds suitable for sale in even larger markets. This process continues until the cattle eventually reach the main centers or markets from which trade cattle are trekked or railed to the south. Actual ownership of a beast may change six to eight times before final sale to a southern butcher.

The better quality cattle - older and larger - walk south while the poorer, weaker animals are slaughtered for the local "hot" meat trade in the producing zones. However, many absolute culls are converted to dried meat, and increasing numbers of the best animals are slaughtered and their carcasses transported by rail or plane to coastal cities as chilled meat.

Each major southern market has its agents who take charge of the cattle when they arrive, whether by rail or on foot, and sell them as quickly

as possible. The agents also pay off the drovers and look after them until they return to the north. After the cattle are sold, the agent subtracts his commission from the sales money and transfers the remainder to the northern dealer. These agents also inform northern dealers about local market conditions and requirements and offer credit to butchers.

Cattle markets in the southern cities usually open in the late afternoon when local butchers buy their next day's kill. After the sale (the price is usually kept secret) animals are moved to the abattoir or most likely the municipal slaughter slab. Most facilities are simple concrete floors, poorly drained and without hoists. Muslim practices are followed in slaughtering. Butchers may be wholesalers, retailers or both. Retailing is usually done from rented stalls or tables in town market sections. However, many petty traders and hawkers buy meat to resell in residential areas or nearby villages. Every part of the slaughtered animal except the blood, rumen contents and hoofs is consumed as human food, including some 50 percent of the hides. By-products, often selling for higher prices than carcass meat, account for 20 percent of the value of an animal. The day's kill must and will be consumed before nightfall, eliminating the need for refrigeration. In the main towns, fresh beef is available daily, while in smaller settlements slaughterings are limited to once weekly and/or on market days.

Government officials in Chad, Niger and Cameroon argue that live exports, controlled or non-controlled, do not earn as much revenue to help develop and expand their respective economies as exports of processed meat would. This may be understating the actual contribution of on-hoof exports to their economies. Live cattle exports contributed \$6,000,000 U.S. to the Chad economy, plus another \$800,000 U.S. in the form of taxes and export permits. Moreover, sixty percent of the sale value of the animal goes to the producer. The same situation is true in the other exporting countries in proportion to their volume of live exports. Live exports are thought to be an escape of capital. Yet export dealers have tripled the value of live exports during the past 15 years using their own capital without subsidy or public loans.

There is no actual competition between live animal and slaughtered meat exports in the Basin area since the chilled meat export trade cannot absorb the numbers and quality now going out live. Therefore, other than a loss of revenue (export permits) by illegal border crossings, the situation is not critical and will probably correct itself when the demand for quality meat reaches the point that higher prices will be paid for cattle in the producing countries, thus diverting cattle from on-hoof export.

The biggest problem of the on-hoof movement of cattle is the value that is lost during the trek from the death of cattle or from the loss of quality and weight. Numerous cases are cited of weight losses from 10 to 25 percent of original weight. All range management efforts to produce a heavier animal at an earlier age are negated during these treks.

Past cost studies of the traditional marketing system by competent researchers indicate that the actual cost of trailing cattle is about the same as for shipping by rail. However, rail shipment where available is preferred by most dealers, because animals arrive in better condition. The real problem is not enough trains in the right places with the capacity to move cattle.

The principal charge against cattle dealers is that they try to maintain high prices by restricting the flow of cattle to certain markets. However, evidence does not bear this out. In fact, the actual flow of cattle to most if not all southern markets is surprisingly uniform considering seasonal range and trail conditions and the vast distances involved. Moreover, the retail price of meat handled by the southern butchers shows little seasonal variation, and annual increases in meat prices are in line with other food commodities in most southern markets. Cattle dealers seem to have as their basic objective, getting cattle to the most profitable market by the method causing the least amount of shrink.

The sale price of slaughter cattle in the southern markets is 50 to 100 percent higher than in producing areas. This markup is not excessive considering the number of agents involved and that the cattle often travel

over 1,000 kilometers. Nor do the profits of individual dealers seem excessive. Based on a limited study in Ibadan, Nigeria, agents collect a two to three percent commission based on the eventual sale price. This is quite reasonable considering the many functions each dealer performs, including receiving cattle, accommodating drovers, offering credit and acting as market barometers. It is also personally known that Ibadan butchers take an average markup of slightly over 12 percent per animal handled, again not excessive.

Another frequent criticism is that an extremely high proportion of the on-hoof export of cattle between countries is uncontrolled. No doubt clandestine movements do occur and in great numbers. As long as the nomads do not recognize international borders, their animals will graze over a number of different countries in the process of being grown out. Thus, it is conceivable that 10 percent of Basin slaughter cattle may be simultaneously claimed by more than one government, making the problem of uncontrolled export more apparent than real. The basic question is not how many animals are involved, but why drovers evade control posts in the first place. The answer - cattle, like any other commodity, tend to seek the most profitable outlet.

Assuming for now that improving transportation and/or preventing weight loss due to mandatory trekking is outside the market structure, the system is still open to criticism on a number of counts. First, the absence of scales at any point in the process favors both the initial buyer and butcher. The greatest weakness, however, is at the producer level. Because each owner has only one or two head to sell annually, his access to buyers is limited. His bargaining position is further limited by having to sell when short of money and without full market information.

Despite these and other shortcomings, the present marketing system is not the major factor limiting livestock development. Thus, it is doubtful that a major change in structure is necessary at this time. Preferably governments should aid the existing system to function more efficiently by (1) improving transportation, (2) maintaining trek routes, (3) providing market information and (4) possibly offering credit to buyers. Many suggestions made elsewhere in this report for improving ranges and livestock production also contribute in a general way to marketing.

2. Modern System.

With the demand for beef increasing at an annual rate of some three percent, significant improvements are needed from the producer to the consumer if meat supplies are to continue to expand. A higher price for trade cattle, it is argued, would make beef production more profitable and speed required changes in the system. Also marketing would become more efficient if cattle production were more intensive and if the average carcass supplied more meat. On these points most are agreed, but the best method of breaking the vicious cycle is disputed.

Most governments throughout the cattle producing belt of West Africa have tried to solve this problem by building modern processing plants in the cattle surplus zone in order to move meat instead of live animals to consuming areas in Africa and the world. No less than 12 such abattoirs, costing approximately 150,000,000 CFA each, have been built in cattle-producing areas of the Basin in recent years (See Appendix VIII for locations). Their estimated annual capacity is 500,000 head - approximately one-third of the combined annual offtake from all cattle in the Basin countries.

Most of these plants kill for the local hot meat trade, although this may not have been planned as their primary function. Probably less than five percent of their total output finds its way as chilled meat to consumers outside the primary producing area. Consequently few plants with by-products salvage or canning equipment make efficient use of it. The net result has been to make more sanitary but more expensive meat available to consumers in the producing zone while leaving the basic market structure unchanged. The same results - improving the hot meat trade - could have been obtained much cheaper by upgrading existing slaughter facilities and improving sanitation.

While the foregoing paints a rather gloomy picture of what might be called a false start in solving the processing and marketing dilemma in West Africa, bright spots do exist, as will be noted later.

Reasons for failure are, of course, varied and complex. First markets are limited. Expanding the market for quality fresh meat will be diffi-

cult. There is intense competition for the limited urban elite market for high quality meat. Plus livestock diseases endemic in most of these countries preclude the shipment of fresh meat to world markets. Nor does the future for canned meat look better. Africans consume little themselves, and the world market is highly competitive.

There is also a supply problem. In most cases there are not enough cattle available at low enough prices to support these large scale processing plants. Nor have governments been able to supply the required cattle by developing expensive company or government ranches. Cooperative ranches involving the indigenous cattle owners may prove to be an exception, however.

Finally, the cost to operate these plants is prohibitive, because local people do not have the necessary technical nor administrative ability; so expensive expatriates are required.

Even when natural markets do exist, they are usually competitive. Thus, certain economic constraints must be kept in mind when contemplating the erection of new abattoirs or the expansion of existing ones. First, most plants must operate at 60 to 75 percent of design capacity before any profit can be realized, everything else being equal. Also, most transportation systems, especially for cattle and meat, have a basic backhaul requirement of not less than 50 to 60 percent to break even. Further, the expected life of most plants (both buildings and equipment) in a tropical climate is about the same (15 to 20 years) whether sitting idle or used to capacity. The present status of meat processing and marketing and the projected changes are discussed with this in mind.

Although most of the expensive and prematurely built abattoirs will never return a profit on the initial investment, time does favor their use in the processing of chilled meat, especially where improvements in transportation are made.

3. Future Market Demands.

Before turning to the individual Basin countries, it may be useful to

speculate about trends in beef demand, prices and supplies. The following assumes general economic growth and some development of infrastructure and improvement in the livestock industry.

TABLE II

Projected Cattle Exploitation by Number of Head
Among the Four Chad Basin Countries - 1973

(Numbers in 1000's)

<u>Item</u>	<u>Cameroon</u>	<u>Chad</u>	<u>Niger</u>	<u>Nigeria</u>	<u>Total</u>
Cattle Population	2,200	5,000	4,500	8,500	20,200
Percent Offtake	9.5	9.5	9.0	9.0	
Annual Offtake	209	475	400	800	1,884
Intra Chad Basin Country Imports	---	---	---	360	360
Intra Chad Basin Country Exports	15	155	190	---	360
Local Consumption	180	245	180	1,125	1,730
External Chad Basin Country Exports	14	75	30	35	154

We have considered the Basin area as a more or less closed system in which normal nomadic movement of cattle between countries tend to cancel out a part of import/exports. Total 1968 cattle population, annual offtake and local consumption figures are the best possible estimates based on available data; 1973 projections are roughly based upon a 1.5 percent increase in cattle numbers, offtake of 8.5 percent to nine percent and a three percent in-

crease in beef consumption. On the other hand, intra-Basin imports/exports and external Basin export figures denote an effort to rationalize what is now happening and what the future holds.

Demand will slightly outpace supply with an inevitable increase in the price of meat.

The demand for different types of meat will change also. The present pattern of beef consumption among West Africans is estimated as:

<u>Type of Meat</u>	<u>Percent</u>
Fresh, low quality (unchilled)	80
Dried/smoked	10
Fresh, high quality (chilled)	8
Canned/processed	<u>2</u>
Total	100

Consumption of fresh, high quality (chilled) meat will expand at the expense of fresh, low-quality (unchilled) beef. Consumption of canned and dried beef will remain unchanged; plus the economics of canning and drying will become less attractive as the demand for and price of beef rise and as transportation is improved.

It is also expected that with time, rail shipment of both live animals and chilled meat will increase at the expense of trail herds. However, trekking will long persist as the best means of supplying meat to the more remote rural areas. The middle and long-term view is that Africa, and in particular the more highly industrialized coastal zone, will continue as the most logical market for West African beef.

Lastly, increases in cattle numbers will probably stabilize within the next five to ten years. Thereafter, the extent to which additional supplies of beef are available will depend upon a higher offtake of larger

individual animals in the main producing zone plus the opening up of higher rainfall areas to beef cattle raising.

The future of Nigeria, because of its large human population, oil reserves, general industrial advances and reasonably well developed transportation system, is very important to the future of meat and livestock marketing in West Africa and the Chad Basin. Dislocations caused by the present crisis in Nigeria could affect the use of established abattoirs and canneries and the transportation and marketing of products.

4. Country Situations.

Some marketing problems cannot be solved by individual countries; the problems and their solutions depend on what other countries in the system do. Nigeria, the natural outlet for Chad and Niger's surplus cattle, does not tax live cattle but does place a 67 percent ad valorem tax on meat imports. This effectively excludes meat imports from Niger, Chad and Cameroon. As long as this policy remains in effect, cattle will continue to move across the border on-hoof, and major efforts by Chad, Niger and Cameroon to restrict this movement are not warranted.

The Yaounde Convention (to which Chad, Cameroon and Niger belong) imposes a 70 percent ad valorem duty on meat from non-convention countries. These duties may be revised when the Convention is renegotiated in 1969, but no definite information is yet available. Obviously such barriers effectively separate the producing areas from the market areas for chilled meat and dry up reciprocal trade.

a. Cameroon.

Basic livestock improvement goals are to increase the amount of animal protein available for local consumption rather than for export. Meat production and consumption are already roughly in balance, and Cameroon plans for processing and marketing seem quite feasible and realistic.

The internal movement of cattle and meat will become easier once

the Trans-Cameroon railroad is extended from Yaounde to the center of the cattle industry at N'Gaoundere, which already possesses a modern abattoir. Additional planned improvements in processing and marketing include new abattoirs at Yaounde and Douala. A recently built cannery and abattoir at Maroua-Salek in the northern part of the country is largely turning out canned meat for domestic institutions and processes some 15 to 20 head of cattle daily. Since the total plant cost only 20,000,000 CFA, profits may eventually accrue, and it does, of course, offer a market for a limited number of slaughter animals in the vicinity.

b. Chad.

At their present domestic level of meat consumption, Chad has a large cattle surplus. Approximately one-half of the annual offtake (estimated at 405,000 head) is available for export (roughly 200,000 head). All of Chad's surplus cattle find a market. Most, however, are marketed on-foot through traditional channels in Nigeria. Government officials argue that Chad loses the additional value that comes from processing meat; consequently they would like to better control the on-hoof export of live animals and increase Chad's exports of high quality meat.

One of the biggest obstacles to exporting both live animals and processed meat is lack of transportation. Chad is a landlocked country, and the nearest railhead at Maiduguri, Nigeria is over 200 kilometers from Fort Lamy.

Approximately 800 tons of dried meat is exported annually, chiefly to Nigeria. Opportunities exist to better organize and expand meat drying operations in the more remote areas using extremely low quality cattle. The lean meat from a 300-kilogram (live weight) animal can be reduced to 30 kilograms by drying. Such meat can be kept for one to three months and is easily transported. However, since the long term demand for extremely cheap, low quality cattle is poor, too much emphasis on meat drying does not seem warranted.

Chad has three modern abattoirs (See Appendix VIII). The Farcha municipal abattoir at Fort Lamy is notably successful. In addition to killing for the city's hot meat trade (about 60 head daily plus small stock), the plant also slaughters some 35,000 head of better quality cattle annually for exporters who ship principally to Gabon and the two Congos by air. Management has recently had to add a sixth skinning bed and is in the process of installing by-products salvage equipment. The slaughter fee is 5 CFA per kilogram of carcass weight, and a like sum is charged for carcass chilling. The abattoir was built in 1958 for 300,000,000 CFA, and cold storage facilities at the airport to handle air shipments of meat cost an additional 35,000,000 CFA. The Farcha abattoir is operating at above design capacity for a single shift but can expand output by working two crews. It is the only known modern abattoir in West Africa that is paying its way. Since its success is based on servicing exporters of chilled beef, the details and future of this method of marketing warrant further comment.

The major company exporting chilled beef is PRODEL. In operation since 1951, this company will handle 60 to 70 percent of the 7,000 tons estimated for 1968 (over 35,000 head of cattle). The present purchase price for the better type animals is 50-55 CFA per kilogram on a live weight basis. Shipping is by DC-8 aircraft carrying 35-ton loads. Meat is retailed at about 300 CFA per kilogram. Obviously, there is a limit to the absorptive capacity of the markets at this price.

There are two further obstacles to expansion - plane backhaul and the supply of quality cattle. Aggressive management could probably double the size of present exports. However, plane backhaul and supply of good cattle the year around is much more complicated. There is a need for governmental support in solving the two latter problems.

The two other abattoirs, Abeche and Fort Archambault, kill for the local hot meat trade only. While the Fort Archambault abattoir includes canning equipment (although unassembled), the long-range view of this type of operation is far from encouraging. A tannery planned as a part of the complex

has promise but should have ready access to a supply of hides. There is a question of cattle availability at Fort Archambault, both for meat and hides.

c. Niger.

Niger also is completely landlocked; distance from the sea averaging 1300 kilometers. Nigeria is the natural outlet for Niger's surplus cattle (estimated at 175,000 head). A mutual understanding of their marketing problems and an amicable agreement between the two countries are needed. For example, the Nigerian abattoirs at Kano and Nguru, both of which have rail-heads, are the natural markets for surplus Niger cattle from the area between Zinder and Lake Chad. It would be questionable to erect another plant just across the border in Niger.

Nigeria does not tax live cattle but does place a 67 percent tax on meat. As long as this policy remains in effect, cattle will continue to move across the border on foot and major efforts to restrict this movement are not warranted. Under these circumstances Niger should concentrate on improving beef quality and increasing exports of chilled beef by air.

Plans to develop a large ranch and an abattoir near Zinder to export chilled beef were complicated by problems of backhaul, costs and cattle supply. However, a recently installed, modern abattoir in Niamey completely equipped with by-products salvage and chilling facilities offers some hope for expanding chilled meat exports by air. The plant started operations in April 1967. It was built for 150,000,000 CFA. Five-hundred tons of hinds (with 7 ribs) are exported (on a space available basis) by regular passenger planes to Abidjan. The plant also handles 20,000 cattle annually (plus small stock) for the city's hot meat trade.

While offals are not numerous enough to justify use of installed by-products salvaging equipment, the price paid for the total installation was reasonable. Success, however, depends on expanding chilled meat exports. The capacity of the immediate market for this meat is approximately 2,000 tons or 10,000 head of cattle. However, a vigorous administration using freight planes with reasonable backhaul could increase total tonnage to 10,000 to

15,000 tons annually. The efforts now being made to improve carcass quality through prior feeding of slaughter cattle will also help to increase chilled beef exports.

d. Nigeria.

Nigeria has its own vast producing area, plus an extremely large mass meat market. Nigeria also has a large animal protein deficit. Consequently its development plans include both increasing output and more efficient processing and marketing.

Nigeria has rail lines and all-season roads stretching from coastal harbors to the northern borders, and six abattoirs have been built to tap the main producing zones. Three of these plants are in a position to can and export beef, and two ship chilled meat by refrigerated rail cars to Lagos. While these operations have been adversely affected by the present crisis, the existing transportation system and abattoirs can meet the needs of the coastal cities for high quality chilled and processed meats. Efforts are being made to export canned meat to the United Kingdom. Considerable quantities are also being sent to Ghana.

5. Transportation.

a. Road and Rail.

Transportation within the Basin is a mixture of traditional and modern. Goods are transported by head load, camel, boat on the Chari and Logone Rivers, air and extensively by truck. Except for the two Nigerian rail terminals of Nguru and Maiduguri, which link the extreme west of the Basin to the Nigerian seaports, there are no railways in the Basin. Extensions to Fort Lamy of the Nigerian rail system and the Sudanese rail system have been proposed from time to time.

Most livestock moves on foot and some meat by air. The remainder is by road. Roads are elementary, often inadequate and during the wet season (June to October) completely or partially closed by floods. The few excep-

tions include the Maltam-Waza road (Cameroon) now under construction, the Bama-Maiduguri road, the Maroua-Garoua road, the Nguru-Gashua road and the road recently constructed linking the Nigerian Lake Chad port of Baga to the railhead at Maiduguri. Parts of the Fort Archambault - Fort Lamy road are also being improved. Niger also has a long-term plan for continuing the Niamey-Zinder all-weather road eastward to Nguigmi.

It is not clearly known whether the benefits from mechanizing cattle movements would be enough to pay for the infrastructure and operating costs. The future may show that the expanding coastal market for air-shipped carcasses will eliminate the need for refrigerated rail and truck transportation from the abattoirs in Chad and Niger, if the backhaul problem can be resolved. However, this will not relieve the eventual need for internal roads to bring cattle to abattoirs nor the need for international routes for heavy exports and imports.

A study of projected international road links in the Basin area is underway. New or improved international road links from the main cattle-producing areas will not prove economically feasible based on transporting livestock alone. At the same time, the potential contribution of the livestock industry to the Basin economy should not be overlooked in future road and rail feasibility studies.

b. Stock Corridors.

Moving cattle from producing areas to abattoirs can be improved by developing a system of stock corridors to walk herds through. This will also help to minimize weight losses on the way. (The approximate locations and widths of suggested corridors are shown in Appendix IV.)

The following guidelines are given for the development and maintenance of these corridors. Water points will be needed each 25-30 kilometers, with closer spacing desirable depending on costs. On-the-ground reconnaissance surveys must be made to establish alignment, avoid farming areas, mark boundaries (painted trees, posts or other means) and locate water points.

Broad corridors are necessary to provide enough grass for the moving herds. Where crossing farming areas, corridors should be narrow so that the area denuded by herd movements will be limited. It will be difficult to prevent encroachment by farmers or by adjacent herds once water is developed. Therefore, prior to launching a corridor project, the means and personnel for protecting the corridor and maintaining water facilities must be on hand. Patrolling will be necessary in lieu of fencing. Relay or rest ranches along corridors can largely be dispensed with if corridors are broad enough. In some cases, relay ranches, more extensive areas than the corridor, will be needed for temporary holding and collection of animals into herds near market towns. Moderate fees should be assessed to pay for their operation and maintenance at least during the dry season.

Approximate mileage of suggested corridors is given below:

	<u>Kilometers</u>
Vicinity of Goure to Nguru	140
Vicinity of Nguigmi-Diffa-Gashua (Nguru)	360
Vicinity of Moussoro to Fort Lamy	290
Vicinity of Mao to vicinity of Massakori	150
Vicinity of Bol to vicinity of Massakori	160
Vicinity of Ati to Fort Lamy	450
Vicinity of Massenya (Dourbali) to Fort Lamy	160

6. Recommendations -- Marketing and Transportation.

The marketing of cattle in Basin countries will be improved if governments adopt the following policies and actions:

Short-term

1. Recognize the social and economic importance of the traditional on-hoof movement of cattle to the mass markets in Nigeria and other southern countries.
2. Regulate, not restrict, on-hoof movements by promptly issuing border crossing permits and reducing export tariffs.

3. Provide scales in principal market towns in producing areas. Selling by weight will demonstrate to livestock raisers the value of producing heavier weight, better quality cattle.
4. Provide credit to buyers where payments are not being promptly made.
5. Disseminate market news and latest prices in producing areas
6. Aggressively seek wider markets in meat deficit African countries for chilled quality beef and enter into agreements with such countries in order to eliminate or moderate import tariffs and establish realistic freight rates, meat quotas and provisions for backhauls of goods needed in the livestock producing countries.

Long-term

Due to time and money requirements, developing stock corridors, roads and railways and new processing plants must be considered long-term. Among the following recommendations, developing roads and railways will have the greatest impact on the livestock industry over the long run:

1. Develop roads and railways as rapidly as resources permit from livestock producing areas to major abattoirs and on to consuming markets.
2. Develop stock corridors of sufficient width with spaced waterholes to facilitate movement of animals from producing areas to modern abattoirs now in operation. See page 22 for suggested locations and guides for developing such corridors.
3. Before investing in modern abattoirs, canneries and tanneries, review the difficulties experienced by other African countries in developing similar projects and the status of such projects. Then make realistic assessments of:
 - a. Availability of cattle in numbers, quality and at a price which permits profitable operations now and in the future.

- b. Location and size of market for quality carcasses or other products, amount of competition and price the market can pay now and in the future.
- c. Feasibility for profitable disposal of the "fifth" quarter.
- d. Freight costs, import duties and availability of and markets for backhaul goods.
- e. Minimum cost plant needed relative to expected production.
- f. Operation expenses, capital costs and cost-benefits.

B. Livestock Production.

1. Physical Environment.

Lake Chad is the eleventh largest lake in the world. Besides fish resources, rangelands surrounding the Basin support large herds of cattle, sheep, goats and camels. Surprisingly, the lake is only mildly saline unlike many closed drainage basins. It is fed mainly from the Chari-Logone river systems originating in the higher rainfall area of the Central African Republic. The lake is relatively shallow (0-6 meters) and fluctuates 2 to 3 meters in depth from the dry to wet seasons. Over a period of 30-50 years, when inflow is reduced due to rainfall fluctuations, it has been known to nearly dry up. On the north and east, the lake is a series of partially drowned sand dunes. On the south and southeast, the shores are flat. Reeds and papyrus rim the shores and shallow areas. Bilharzia is rampant along the extensive shore lines.

a. Climate.

Basin climate ranges from Sudanian in the south to Sahelian in the north and into the Sahara desert. Temperatures average 28 degrees C (82.4°F), with daily extremes becoming wider as one moves north. Average maximum temperatures range from 104 to 107 degrees F, with extremes reaching 120 F.

Rainfall (See Appendix I) ranges from 1000 mm (40 inches) in the extreme south (below Bongor in Chad) to 200 mm (8 inches) or less on the edge of the Sahara. Evapo-transpiration ranges from 1734 mm (68 inches) at Fort Lamy, where rainfall is 600 mm (24 inches), to 4392 mm (176 inches) at Mao in the middle north, where average rainfall is about 350 mm (14 inches). Free water evaporation is given as 3400 mm (136 inches) at Nguigmi at the north end of Lake Chad to 3100 mm (124 inches) at Maine-Soroca on the border between Niger and Nigeria, and 2100 mm (84 inches) at Bongor.

It rains from May to September in the south but in the north primarily in July and August. The dry season lasts 7-8 months in the south and 10 months in the north.

Rains come as storms, generally short and often accompanied by high winds. In the north, high winds without rain occur at the beginning of the rainy season resulting in dust storms. Although fairly high intensity rainstorms occur, erosion is negligible due to flatness of slopes in the south and the generally high infiltration rates on the undulating sands in the north. This indicates that moderate amounts of grass cover would effectively control erosion.

Average wind velocity at two meters above the ground varies from a low of four miles per hour (6.4km/hr) in the south to 7 miles per hour (11.2 km/hr) in the north with some falling off (except for storm fronts) in the rainy season (May - September).

b. Vegetation.

Major vegetation zones are shown in Appendix II. More detailed information on topography, soils, climate, vegetation, range sites, range productive capacity and ethnic groups is given in the following publications: Etude Agrostologique du Kamen (Republique du Tchad), A. Gaston, December 1967 & Etude des Paturages Naturels Saheliens de la Region du Nord Goure (Republique du Niger), Peyre De Frabreques, June 1965 (see reference list). No attempt is made here to duplicate this information.

c. Water for Livestock.

Other than Lake Chad, the major rivers to the south and in north-east Nigeria and a few closed depressions, lakes and wells; permanent water for livestock is non-existent except during the rainy season. For many years, it has been the policy of all four countries to develop livestock water in range areas and for villages as rapidly as resources and outside aid permitted. Shallow dug wells are most popular, although recently some bored artesian wells have been constructed. Usually human or animal power is used to lift water.

Well costs are high because material and construction costs are high, and transporting people and materials to remote range areas is expensive. Examples of past construction costs follow:

Dug wells with watering troughs

Average depth 23 m, \$14,400 US each

Average depth 10 m, \$ 6,650 US each

Dug wells require maintenance, and repair costs of such wells may average \$1400 US.

Bored artesian wells, cased, with troughs and concrete aprons

Average depth 800 feet, NE Nigeria, \$10,000 US each

Seven bored wells 80-150 m deep, with pumps, constructed on the Government of Niger - United Nations Special Fund ranch project north of Zinder and Goure in Niger (on the extreme western side of the Chad Basin Commission area) cost an average of \$40,000 US each.

Since the 1950's, several hundred dug wells and a few bored wells have been constructed in the Basin. The average cost per well was about \$10,000 US. Assuming that 1250 additional wells are needed (one to every 100 square kilometers in areas needing water), the cost would be \$12,500,000 US. Assuming that the 1250 additional wells would water an additional 1,250,000

head of cattle (extremely doubtful since the range is already being used for three to four months by means of primitive wells and water available during the rainy season) and an offtake of 10 percent, this investment would produce a net saleable increase of 125,000 head annually. Assuming the wells would have a life of 10 years, this would result in an unamortized cost of \$10 US per head sold over the 10 year period. Today's average selling price (\$50 US per head) would have to be increased by 20 percent in order to pay for the costs of the wells, thus reducing the competitive ability of Basin cattle. Another study of 134 wells showed the actual cost to be \$20 US for each head of cattle watered.

Obviously alternative methods must be found. With ground water in the Basin at relatively shallow depths (10-50 meters), bored and cased wells using windmills to lift the water are worth trying. Average Basin wind speeds of 4-7 miles per hour are enough to lift water from these depths and with a proper size storage tank water can be provided for slack periods. Windmills should be designed to supply enough water for the carrying capacity of the range surrounding the well. Their size, lift, output and wind speed should be adjusted accordingly.

By amortizing well drilling equipment, trucks, windmills and storage tanks and adding labor (one foreign technician and 4 local) and cost of materials, the cost per well should not exceed \$4500 US, assuming one rig would develop a minimum of 20 wells with windmill, storage and troughs per year. This price would halve present costs. Cased well and windmill maintenance costs are low but require regular maintenance by experienced personnel. Further reduction of per well costs can be expected once volume drilling programs with trained crews are initiated.

Developing livestock ponds is another alternative. There are extensive clay areas in the south and clay depressions in the north. Excavated ponds at least 15 feet (5 meters) deep to allow for evaporation should cost about \$1200 US. If sealants are necessary (bentonite, salt, etc.) perhaps another \$1000 US would be needed. The services of a soil scientist to take samples and secure laboratory reports on effective sealants under the pre-

vailing conditions are needed. Maintenance costs for excavated ponds on properly selected sites are minimal.

2. Livestock Resources.

There are approximately 66.6 million head of livestock in the four Basin countries and approximately the same number of people. Although goats and sheep are raised in great numbers (47 percent and 17 percent ^{of total} respectively), cattle (27 percent) are the animal par excellence. Consequently cattle are the primary concern of most livestock improvement programs and a major concern of this report. With the possible exception of Niger, it is doubtful that scarce developmental resources should be diverted from cattle to these less important species.

The animal industry varies in importance between and within the four countries. Livestock contributes 5 percent of Nigeria's Gross Domestic Product, slightly more in Cameroon, 18 percent of Chad's, and 30 percent of Niger's. The ratio of humans to livestock in Niger is 1:4.1; Chad 1:2.9, Cameroon 1:0.9; and Nigeria 1:0.6 (See Appendix IX). In Basin countries, 85 to 90 percent of the total population is rural. Livestock raising as a major occupation is significant chiefly in northern Nigeria, Chad and Niger. In Niger, 20 percent of the people are entirely livestock oriented.

Perhaps the true importance of the livestock industry relates to supplying scarce animal protein, principally meat (although milk is especially significant in the rural areas) to the secondary population. Annual per capita consumption of meat is estimated at considerably below 10 kilograms, with beef making up the largest proportion of the total.

a. Distribution of Livestock.

The major stock raising area lies north of 700 mm rainfall zone. North, on the fringes of the Sahara, the nomads (Arabs and Tuaregs) keep short-horned Zebu cattle, donkeys, camels, long-legged (hairy) sheep, desert goats and horses (Arab, Barb or Dongola). South in the intermediate zone are the Fulani who raise lyre-horned Zebu cattle, Dongola horses, donkeys and shorter

legged sheep and goats. Semi-nomadic stock raisers move out on the range during the rainy season and return to their home wells at the beginning of the dry season.

Herd movements are conditioned by the herder's customs and background and the locations of customary grazing areas and water. In the Moussoro area of Chad, reports on the movements of 100 herds in that area show that:

- 63 are sedentary or move in a radius of less than 20 kilometers,
- 30 move within a radius of 20 to 50 kilometers,
- 9 move 50 to 100 kilometers,
- 8 move 100 or more kilometers.

Further south is a sedentary zone where rainfall is sufficient for millet and grain sorghum farming. Herds on the edge of Lake Chad are sedentary, and the inhabitants also farm on the surrounding dunes and in the polders. The Kuri cattle raised here have a better year-round nutritional level because they have access to forage on the islands, polders and lake shores as well as the surrounding rangelands. The danger of parasitism is higher, however, and the level of breeding management lower than for most other breeds. In the southern tsetse fly belt, the settled agriculturists keep dwarf-like humpless cattle, sheep, goats and pigs as scavengers without a semblance of organized husbandry. Poultry are also found in nomadic camps and villages throughout the entire area.

b. Cattle Breeds.

Animal production in the Basin has evolved over many years in direct response to climate, soil, water, vegetation and animal diseases. Each ecological niche has been filled by a particular people or tribal group raising breeds of cattle which have evolved to withstand the demands and limitations of a particular environment and the needs of their tribal owners.

In the rain forest/tsetse area, cattle have no reason to travel extensively but must live with biting insects. Further north in the Guinea

zone, conditions are more favorable for cattle production, although more management is required than in the south. Within the main cattle belt (Sudano-Sahelian zone), which is characterized by a long dry season and relatively short growing period, some form of periodic cattle movement is necessary. This calls for an animal with the ability to walk great distances and undergo extended periods of semi-starvation. Under such severe conditions, animals specialized in milk production are out of place. Although cattle are used some for draft, riding and transportation, and milk is an important subsistence and barter item, all indigenous cattle are chiefly meat animals.

Cattle are still classified according to presence or absence of hump and/or horns. (See Appendix XI for specific breed characteristics.) Humpless and intermediate cattle are found chiefly south of latitude 8°N in the tsetse fly zone and have some resistance to trypanosomiasis. Humped cattle (Zebu or *Bos Indicus*), which make up most of the Basin's 18.5 million head of cattle, live north of this area as far as the desert. In between is a band of interbreeding where cattle with small humps are found along with humpless animals that otherwise exhibit Zebu characteristics. The humpless Kuri cattle around Lake Chad in the predominantly Zebu area must be considered separately because they bear little resemblance to any other cattle in West Africa. Cattle groupings in the Basin are:

I. Humpless cattle

A. Large

1. Lake Chad, Kuri or Buduma

B. Small or dwarf-like

1. West African Shorthorn or Muturu
2. N'Dama

II. Humped cattle (Zebus)

A. Short-horned

1. Azaouak or Adar
2. Wadara or Shuwa Arab
3. Sokoto Guadali

- B. Medium-horned
 - 1. Adamawa or Ngaundere
- C. Lyre-horned Zebus
 - 1. White Fulani or Bunaji
 - 2. Nigerian Fulani (Peul) or Dialia
- D. Long-lyre-horned Zebus
 - 1. M'Bororo, Rahaji or Red Fulani

III: Intermediate Types

- A. Borgu or Keteku and other unidentified animals.

As livestock raisers settle down, breeding practices tend to become chaotic. In recent years, the cells of purer breeding stocks have been diluted through indiscriminate crossing. So now there is a need to preserve and improve several of the more promising cattle breeds, e.g., Kuri, Azaouak, Wadara, Sokoto Guadali and Bunaji.

There is no immediate need to introduce exotic breeds. For some time to come productive improvement will depend more on improving conditions of management, feed, water and disease control than on breeding since most native breeds are well suited to local conditions.

Appendix VII, showing the approximate locations of the various breeds, is presented with considerable reservations. In the first place, with the exception of Muturu and Kuri cattle, most animals follow a pattern of seasonal movements that takes them long distances from their primary locale. Second, trail herds moving generally south to market and extensive interbreeding throughout make it nearly impossible to identify prototype specimens even in the center of primary breed territory.

c. Levels of Production and Reproduction.

Lacking facts it is hard to differentiate between breeds. A generally low calving rate (50-55 percent), advanced age at first calving (3-4 years), high total death loss (30 percent) and advanced age required to reach a desired market weight (some 300 to 500 kilos at 5 to 7 years) allows an

annual herd offtake of only 7 to 10 percent, after allowing for a 3 percent herd increase. These low levels are not necessarily breed characteristics but the results of environment. On balance, these results are a credit to both livestock raisers and their cattle, considering the harsh environment.

d. Animal Health.

The most important cattle diseases are:

Trypanosomiasis	Rinderpest
Foot and mouth disease	Anthrax
Streptothricosis	Blackleg (charbon)
Rabies	Brucellosis
Tuberculosis	
Contagious bovine pleuropneumonia	

Blood parasites, transmitted by ticks and other arthropods, result in substantial losses through death and debility. Internal parasites such as liver flukes, lung worms and intestinal parasites, also cause high losses throughout the area.

Several diseases, principally rinderpest, foot and mouth disease and trypanosomiasis are major bottlenecks to developing markets for Basin meat. The first two are the main reasons why Basin livestock and fresh meat cannot enter most developed countries, and the third is a major problem when moving slaughter animals on foot to southern markets. The nomadic life of most herders plus the presence of game animals complicates the eradication of most enzootic diseases.

Over the past quarter century several major killing diseases have been partially controlled through national and international control programs. Rinderpest - joint project 15 - is a classic example. It was sponsored by the Scientific, Technical and Research Commission (STRC) of the Organization of African Unity (OAU), financed by the European Economic Community (EEC) and USAID, and involved all West African countries. Although no mass vaccination

campaign has been completely successful, these programs have been the major reasons for the increases in numbers of livestock over recent years.

As each major disease is better controlled, other diseases assume greater importance. Other problems ignored until now by most West African veterinary services have surfaced as poultry and swine are introduced in the main tsetse belt and cattle production moves into the southern Guinea zone.

The laboratories at Farcha (Chad) and Vom (Nigeria) have the physical facilities to produce most standard vaccines required in Basin countries, but staffing is a problem.

Lack of personnel also handicaps the veterinary field services in all four countries. Apart from routine inoculations and disease control measures, veterinary personnel normally supervise the drying of hides and skins, man control posts for export cattle and technically administer cattle markets/abattoirs and collect livestock statistics. But in most veterinary departments there is only one staff member for 50,000 - 100,000 animals.

Over 30 percent of all animals born still fail to survive their third year. The reasons for such high mortality are complex. Abattoir records do not provide enough facts even on the magnitude of disease among slaughter animals. Condemnations seem to be indirectly related to the demand for meat. For example, at the Farcha abattoir in 1967, only 60 beef carcasses were condemned out of 42,560 head of cattle slaughtered. These same animals in the meat-hungry, tsetse belt would probably have passed inspection because the meat assumes more importance than sanitation. Further, among breeding and trail herds, when an animal is dying of starvation and exhaustion, it is hardly correct to diagnose death as the result of a specific disease organism.

It is still safe to say that the animal health phase of livestock production is further advanced than nutrition and management at this time. Thus while being fully aware of the need to further improve veterinary services, in spending scarce resources, governments must maintain a reasonable

balance between animal health needs and other phases of production. Finally it is vitally important that Basin countries coordinate their disease control programs.

3. Livestock Raisers.

Principal Basin livestock raisers are the Arabs and Toubous in the north and east, Touaregs in the west, Arab-Foulbe in the south, and Fulani-Peuls everywhere except in the desert. (See Appendix III.) Small scale farmers in the southern rainfall areas are also raising livestock now. Mixtures of tribal groups and customs are taking place in the Basin with consequent changes in modes of life - sedentary farmers are raising livestock, semi-nomadic people are becoming sedentary, and a more or less professional for hire or contract group of herders, cattle dealers and middlemen is developing.

Livestock raisers are also becoming more market-oriented. The frequent assertion that cattle are kept as a status symbol is no longer a just criticism. Although they still raise cattle as a way of life, Basin livestock raisers must set aside enough cattle of the right age and sex to assure that their herds survive the hazards of climate, disease and walking distances. The remainder is made available for sale and increasingly so to the highest bidder. There is also evidence that they are dipping into their younger animals, which can only lead to over-exploitation and a future hazard to cattle populations.

Livestock raisers are increasingly aware of cattle prices as well as prices for consumer goods. This more or less precise response to the demand supply-price formula means that cattle move to the market which offers the greatest advantage to producers as well as dealers, drovers, transporters and middlemen. In the long run this should lead to more rapid commercialization of herds.

However, price awareness is not enough. Successful commercialization of the livestock industry also requires that income from cattle sales cover cost of production. Some evidence indicates that it may not. M. Levif, after analyzing budgets in the Moussoro area for families having large, medium and

small herds, reported that in all three cases living expenses exceeded income from sales of livestock. Taxes (animal and head taxes) as a percent of total income ranged from 27 to 40 percent. The index of consumer prices at Fort Lamy increased 120 percent from 1949 to 1965; whereas, the prices paid to the livestock producers increased no more than 50 percent.

Despite his apparent shortcomings by modern standards of herd management, feeding and breeding, the traditional Basin livestock raiser is the prime developer of the livestock industry and will remain so. Any significant advances in production or quality will have to come through him. Since he is the volume producer, measures to improve his lot and ameliorate any physical and economic conditions hampering his production will have an immediate impact on increasing production available for marketing. Grave risks to the industry will result from measures which bypass him or increase his costs of production.

4. Production.

Long periods of political peace, control of cattle diseases and increasing human population have resulted in significant increases in livestock numbers throughout the Basin area. They now stand at a historical high. No longer is a herder assured of finding abundant grass in his traditional grazing area. No under-used grasslands were seen in the areas visited. On the contrary, significant areas of over-grazed grasslands were apparent. In several areas in Chad and Niger, cattle losses from starvation in the dry season are exceeding losses from disease. This condition is aggravated by uncontrolled range fires which consume the limited grass resources and lead to poorer range conditions through loss of the more productive, perennial grasses.

a. Range Management.

Increasing animal production while protecting the soil, water, plants and wildlife is the basic range management goal. Every range management proposal should be viewed in this context.

Good range management is particularly difficult throughout this climatic zone of Africa. Lack of forage and water during the long dry season requires animals to move frequently. Range areas are remote. As a result, the costs of developing these areas is high in relationship to the difficulty and costs of moving cattle to internal and external markets and the low price received for them once there. Rights to use land are not clearly defined among tribes. Rights are based on custom and history of use with government, the ostensible owner, arbitrating actual use. Moreover, there is little information about what would happen to vegetation and animals if grazing periods were extended or about the relationship of range carrying capacity to level of rainfall.

Control of land and water, a must of range management, can be achieved either with range management programs operated by governments which exclude the traditional users and their herds or with range programs which involve the residents or users of land and their herds in management, operations and profits.

Once control of land and water is established, number, location and size of management areas should be determined using land availability and objectives of production as criteria. Boundaries can be cleared or marked. Clearings can also be used for fire lanes. Fencing and its subsequent maintenance costs are high and should be avoided until proven economically feasible.

Wells or ponds should be developed, spacing them 15-20 kilometers or less apart in areas where stock movement is not difficult and water development costs are low. Farming near wells must be restricted, perhaps by setting aside specific areas for it.

Carrying capacity of the range must also be determined. Grass yields obtained by sampling and analyzing clippings for food content will indicate carrying capacity, but this must be tested by experience and adjusted as necessary. A simpler and more effective method is to have an expert estimate carrying capacity based on his knowledge of soils, kinds of

grasses and rainfall and its variations. This can be refined by observing the effects of grazing on a 'key' species. A 'key' species usually dominates other species, is abundant, palatable and produces the major amount of forage. By observing the effects of grazing on this species over a period of years one can tell whether it is increasing in abundance and vigor, which indicates the range is not being overgrazed, or whether it is decreasing, which indicates the range is being overgrazed and that carrying capacity adjustments are necessary. By observing a single 'key' species much of the difficulty in trying to judge range conditions by observing total vegetation is eliminated.

The next major decision is how to stock the range. Should uniform younger age animals (2-3 year olds) be selected and grazed for one or two years before selling them or should a breeding herd of suitable age classes and sex ratios be developed, the offtake set at 3-6 years and enough animals retained to maintain or increase the basic herd? The latter seems preferable because of the difficulty in buying enough young animals and consequent depletion of surrounding herds.

In the early stages of applying range management in an undeveloped area, the simplest forms of grazing systems should be used. Such systems require the least movements of stock and enough flexibility to adjust to the vagaries of rainfall and other hazards. Ideally, one-half (on a weight basis) of the annual range growth should be grazed each year. Besides helping grass retain its vigor and reproductive capacity, this system protects the soil from erosion, evaporation and excessive heating. Grazing should be managed in order to retain enough grass reserves to carry the herd through the dry season. A number of grazing systems can be devised around these principles by technicians acquainted with the area.

Most systems require resting at least a third or fourth of the range each year to allow time for recovery, reseeding and improvement in density of the grass cover. Some variation is required for strictly annual grass ranges grazed at only one time of year. What is now annual grass range may have resulted from fires and excessive grazing which destroyed perennial

grasses. If so, light or no grazing and protection from fire should be tried to determine whether the perennial grasses can be regenerated naturally.

There is no need to spend money for brush control. Browse from trees and shrubs is an extremely important protein source during the dry season. Indiscriminate cutting or burning of trees should be avoided. Frequent fires damage both trees and grass. Controlled burnings may be necessary in the south, below the latitude of Fort Lamy, to eliminate masses of coarse litter but not more than once every three to four years and then only in the latter part of the dry season.

Depleted ranges in the Basin regenerate rapidly, eliminating the need for reseeding programs except for limited trials. Native species adapted to particular soils and climate should be used in such trials.

b. Ranching.

(1) Present Status.

There are no fully operating commercial or government ranches in the Basin now. Nor is there any known viable operation, except the Nigerian grazing reserves, clear across this climatic zone of Africa. Generally, government or commercial ranches have been developed or planned to supply quality cattle to abattoirs constructed or planned in or near the major cattle-producing areas.

Governments have had problems locating areas for their ranches large enough to create an economically viable unit. Often these government ranches have displaced tribal groups and their herds. In the long run, people displaced from traditional grazing lands by large-scale government operated ranches will add to unemployment problems in towns. Locating and buying enough cattle (especially 2 and 3 year olds) at a reasonable price from the surrounding areas to stock the ranches has also been a major problem. Costs to develop water, fences and headquarters have been too high, even when charging part of the costs off to experimentation. It has also been difficult protecting the ranches from encroachment, fence destruction and fires.

A ranch established near Ati, Chad no longer operates as a commercial ranch. Apparently the weight losses on the trek to the Fort Lamy abattoir offset the gain made on the ranch. Fences have been destroyed or

inadequately maintained, and problems have been encountered with range fires.

A feasibility study was made of another ranch site north of Zinder, Niger (UNSF Project for the Development of Animal Production and Water Resources in the East of Niger by Fenn, FAO, Rome 1968). The ranch was originally designed to carry 30,000 head on 450,000 hectares (one head to 14.2 hectares). The ranch was to supply cattle to an abattoir in Zinder whose construction now seems inadvisable. This, coupled with the high costs to develop the project, has resulted in a reappraisal of the project. One alternative may be to reduce the size to 100,000 hectares carrying 4,000 head.

There have been other feasibility investment studies prepared for ranch development in the Basin area including, Exploitation du Cheptel Bovin au Tchad by Sarniquet, Marty and Arnaud, 1967. In the face of the problems encountered in developing commercial or government operated ranches, the above studies should be reviewed.

(2) Tribal Ranches.

Tribal ranches (grazing reserves in Nigeria) present a better alternative. By definition, a tribal ranch is a specified area recognized by a tribal group as their rightful grazing land where tribal members manage their lands together, voluntarily under a rational grazing plan.

It is easier to set aside the necessary land for ranches if they are organized among tribal groups and tribal leaders are cooperative and interested. Development costs for such ranches are lower since the tribe can police its own boundaries, eliminating the need for fences. There is also more interest in controlling fires, labor costs are reduced and no special marketing arrangements are required. Tribal members can continue to market their animals through normal market channels. Tribal ranches encourage tribal cohesion by working with family groups and tribal leaders and gaining their cooperation rather than imposing an outside supervisory structure. Tribal-operated ranches encourage the fullest use of a country's resources - people, herds, land and water - and can be expanded with the least social and economic disturbances.

Technical assistance, especially in range management and disease control, will have to be supplied by governments. Even here the goal should be educating livestock owners and developing among them an awareness of the benefits of sound range and herd management. Governments will have to pay for constructing stock water wells or ponds. On the other hand, patrolling or guarding the ranch boundaries, enforcing the grazing plans and marketing should clearly be a tribal leadership responsibility. Governments may also need to supply credit for well maintenance or emergency feed supplies during droughts.

Selecting a homogenous tribal group with recognized leaders and willingness to associate themselves in a plan to manage their traditional grazing lands is essential.

Ranch sizes depend on the nature of the tribal groups, the extent of their recognizable and respected leadership, the productive capacity of the rangeland and to some extent topography. Ranches ranging from 20,000 to 50,000 hectares should be satisfactory in the 1,000 to 500 mm rainfall zones, increasing to 50,000 to 100,000 hectares in the 500 to 200 mm rainfall zones.

Managing grazing in order to leave reserve forage on the range for use during the dry season requires limiting the number of animals. Since this is contrary to tribal tradition, at first there may be no alternative when developing tribal ranches except to include all animals possessed by the tribal groups on the ranch. Eventually, through technical assistance and advice, the economic advantages of culling older, barren or less desirable animals should be stressed in order to bring herd numbers into reasonable balance with the productive capacity of the range. By enlisting tribal leaders to control range fires, important forage resources now being consumed by fire can also be saved.

c. Improving Carcass Quality.

All four Basin countries are vitally interested in upgrading beef

carcass quality for present and future internal and export consumption. There is an advantage to shipping higher quality meat since quality meat commands higher prices in major African markets and transportation costs are based on weight not quality. Transportation costs of chilled meat are high, however. In the case of air shipments, they represent nearly one half the price of meat delivered at terminal markets.

Beef carcasses now entering Africa from international trade are higher in quality and average 39 CFA lower in price per kilogram than African carcasses. Some disadvantages in price and grade are mitigated by protective tariffs and marketing agreements. However, to meet this competition it will be necessary for Basin countries to upgrade carcass quality if they wish to share in or penetrate new African markets. At present, Basin range areas are not producing a sufficient quantity of quality cattle. Plus, the on-hoof movement of cattle from producing areas to major internal markets or principal abattoirs causes weight losses from 10 to 25 percent and further quality depreciation.

Most attempts to improve this situation have had limited impact. Developing stock corridors to permit cattle to move slowly along a wide corridor would help to reduce some weight-loss and has been recommended. Developing tribal ranches or grazing reserves as near to major markets and abattoirs as feasible to reduce travel distances is a more practical alternative than developing remote ranches. Construction of all-weather roads from major producing areas in the Basin to major markets or abattoirs is the ultimate solution, but obviously long term.

In the short run, encouraging small farmers in the farming areas near major abattoirs to feed and finish trek animals using farm-raised forages and surplus grain, cottonseed or peanut meal appears to be the most feasible and economic means of increasing supplies of quality slaughter cattle suitable for export.

Each Basin country has significant farming areas near principal

abattoirs where forage and small grains can be grown. (See Appendix VI for location of grain producing areas.) Farmers can finish out thin cattle driven in from the range by feeding forage grown in the rainy season supplemented with farm raised grain or surplus cottonseed or peanut meal in a balanced ration in the dry season. The difference in price paid for a range animal and the price paid for a higher quality heavier animal in the areas near principal abattoirs would have to cover the cost of finishing plus a reasonable profit to the farmer. This idea is already being tried in a limited way at Maiduguri and Fort Lamy, indicating its economic feasibility. However, further testing is necessary.

Some type of government educational program would be necessary to interest small farmers. Plus the farmer would need enough credit to purchase cattle and to meet current expenses prior to sale of the finished animals. Other investments are at a minimum.

Forage and grains for finishing cattle could also be grown on irrigated land. In fact the Chad Basin Commission plans to research this possibility on experiment stations at N'Gala, Diffa, Fort Foreau and Bol.

Although technically feasible, our analysis of the economics convinced us that forage produced on irrigated land would not compare favorably with forage raised on small non-irrigated farms. Yields might be higher but the substantial investments required to develop the land for irrigation would narrow the farmer's profit margin.

For example, in developed countries it costs from \$300 to \$800 US to develop one hectare of irrigated land (including developing the water supply, canals to deliver water to the farm and farm works for efficient application of water). These costs would probably be much higher in the Basin countries. Amortizing irrigation development costs of \$400 per hectare over 10 years at five percent amounts to \$50 US annual cost per hectare. With annual operating expenses (land preparation, fertilizer, seeding and labor) of \$12 per hectare, the total annual cost is \$62 US (15,500 CFA).

Ordinarily a mature animal can be finished out in 100 days by feeding forage and supplementary grain or oilseed meal. This would exceed the quality of carcass now being shipped to elite coastal markets.

Assuming five animals could be finished each year per hectare, the added cost for irrigation is \$12.40 US (3100 CFA) per head. This would represent 15.5 percent of the current market price (\$80 US or 20,000 CFA) for a quality animal (400 kilograms live weight) near major abattoirs in the Basin.

Irrigation developments remote from major abattoirs would not be economically feasible because of weight losses on the drive to market. The most favorable locations for irrigation are near Fort Lamy along the Chari-Logone, the Niger near Niamey and along the El Beid between Cameroon and Nigeria. Because of its mineral content, deep artesian water in the Basin is hazardous to use for irrigation on the slowly permeable, frequently saline, clay soils found along rivers and the extensive overflow areas.

The polder areas on the north, northeast and east shores of Lake Chad have drainage and salinity problems which can be partially mitigated by selecting salt-tolerant grasses. At present, the returns from forage production are less than returns from grain or other crops grown on the polders. Here also the distance from abattoirs is a problem.

5. Research and Education.

a. Research.

Perhaps no other activity lends itself so well to a regional approach since the range management and animal husbandry needs are similar, not only in the Basin, but clear across Africa in these latitudes. Regional research programs will prevent duplication of effort and aid materially in reducing costs.

Efforts to improve the various local cattle breeds best suited to the Basin should be stepped up and coordinated between countries. Several

breeding stations already exist - the Wadara (Shua Arab Zebus) breeding station at Maiduguri, Nigeria is one. Selective breeding work should be undertaken in Chad with the unique, large size Kuri or Lake Chad cattle, preferably at Bol. A breeding and range management station should also be established near Zinder to emphasize improving the Azaouak breed.

b. Education.

Without a larger group of professionally trained people, it will be almost impossible to apply some of the recommendations of this report. As the livestock industry grows, the need for more trained people will become even more important.

Much practical information on range management already exists from research and programs carried out in other countries, and much of it, with minor variations, is applicable to Basin conditions. What is needed is a regional school where this information can be transmitted to promising students from all four Basin countries. So far as is known, there are no advanced schools of range management in this section of Africa. Undergraduate training programs in range management, animal husbandry and animal health have been launched in Nigeria at Mando Road, Kaduna. Also, the Veterinary Research School at Farcha Laboratory, Fort Lamy is planning to expand, with assistance of the European Development Fund, and to initiate courses in range management and animal husbandry. In the 1966-67 school year, 21 students attended the Farcha school. It will be difficult, however, to locate teachers with sufficient background to set up professional training programs.

6. Recommendations -- Production, Research and Education.

a. Production.

The following policies and actions if adopted by Basin governments will stimulate livestock production:

Short-term

1. Re-evaluate tax policies in order to moderate or eliminate animal and head taxes in the producing areas, thus permitting livestock raisers to share more equally in livestock profits. Tax reductions should immediately increase livestock raiser's demand and ability to pay for basic consumer goods, thus benefitting the economies of the producing countries through increased trade and import taxes.
2. Through education and extension, improve control over range fires which now consume excessive amounts of grass and weaken the higher producing, perennial grasses. This is particularly applicable in the Sahelian zone, generally those areas receiving less than 600 mm of rainfall, and to a lesser extent in the higher rainfall areas.
3. Implement as rapidly as feasible a well maintenance program. Since funds are limited, well maintenance should take priority over development of new wells in remote range areas.
4. In order to increase supplies of heavier cattle to meet the increasing demands of the quality markets, finish cattle on non-irrigated farms near major abattoirs. To implement this recommendation, certain procedures are appropriate:
 - a. Concentrate on small farmers capable of finishing one to three head of cattle a year to acceptable quality with farm raised forages.
 - b. Make available to these farmers surplus oil seeds, particularly cottonseed, to supplement and balance the forage ration.
 - c. Make extension personnel available near major abattoirs to show farmers how to feed and care for cattle and to help them produce and conserve forages.
 - d. Use the training facilities of government agricultural schools to train youths to raise forages and feed and care for beef cattle.

- e. Either provide government credit for the farmer to purchase cattle and oil seeds, or encourage cattle dealers to consign cattle for feeding on a weight gain or other basis and assume the credit risks.

Long-term

1. Limit government operated ranches to research roles.
2. Encourage livestock raisers and their tribal organizations to develop tribal ranches as a means of establishing range management in range areas. See page 40 for guidance in developing tribal ranches.
3. Reduce costs of livestock water development programs by:
 - a. Having water development plans prepared by a team composed of well development experts, ground water geologist, engineers, range management specialist and economist. A thorough economic evaluation of the alternative methods (dug wells, windmills, hand pumps, ponds, etc.) and associated maintenance costs is mandatory since present methods are too costly in relation to returns from increased livestock production.
 - b. Upon completion of the studies and plans, standardizing the water development program by using standardized well development and lift equipment.
 - c. Phasing in the training of water development and maintenance crews so that crews will be ready when funds for water development becomes available.
 - d. Adopting the following priorities:
 - (1) Water development in stock corridors leading to major abattoirs.
 - (2) Water development in connection with tribal ranches so that range management can be initiated and denudation around new

wells avoided.

(3) Water developments in remote or unused range areas.

b. Research and Education.

Research

Research in the following areas is proposed:

1. Feeding trials with local cattle to determine weight gain, carcass quality and economic feasibility using locally raised forages, grains and oil seeds produced both on irrigated and dry land.
2. Social-anthropological studies to determine ways and means to incorporate tribal groups and their herds into ranching enterprises with minimum social, economic and political disruptions.
3. Effects of range fires on vegetative production, plant succession and animal nutrition.
4. In areas where studies are not already available, range site and vegetative condition surveys to gain basic information useful for determining carrying capacity and management systems.
5. Effects on soils, vegetation and wildlife of the proposed diversion of the Logone river to the Benue. The economic benefits, if any, attributable to improved range conditions by reduction of extensive flooding needs to be ascertained.

Education

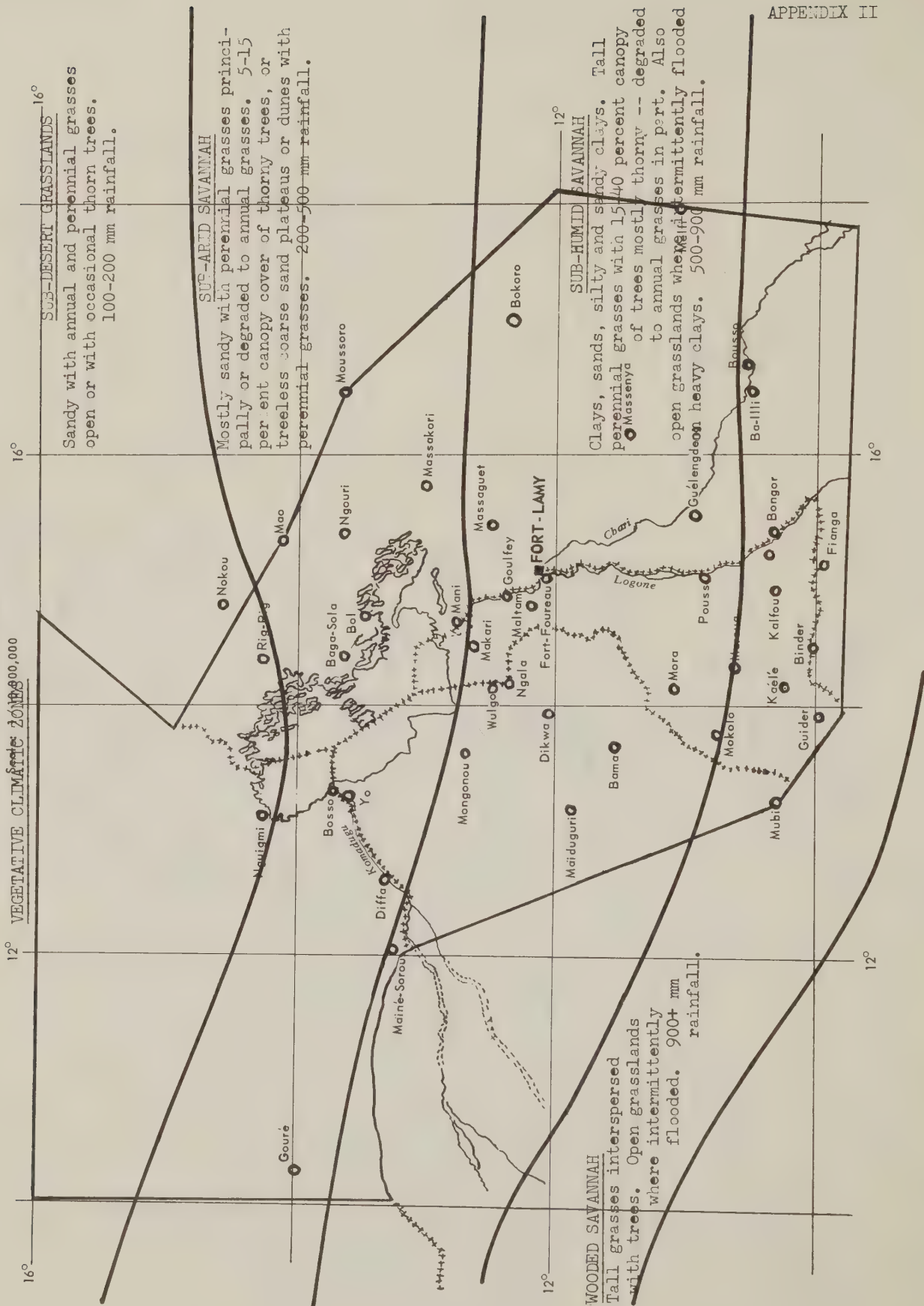
If the Basin livestock industry is to develop, many more professionally and sub-professionally trained people are needed to apply the necessary range management and animal husbandry techniques and to develop markets.

A regional school is needed to provide this professional and sub-professional training in veterinary medicine, animal husbandry and breeding and range management. It is recommended that the regional Veterinary Research School at Farcha Laboratory, Fort Lamy be supported and expanded to include range management, animal husbandry, economics and marketing. Associated stations for research and trials in animal health, animal husbandry and range management should also be developed in conjunction with the school and the stations being developed by the Chad Basin Commission.

APPENDICES

CHAD BASIN COMMISSION

VEGETATIVE CLIMATIC ZONES 1:500,000



SUB-DESERT GRASSLANDS
 Sandy with annual and perennial grasses open or with occasional thorn trees. 100-200 mm rainfall.

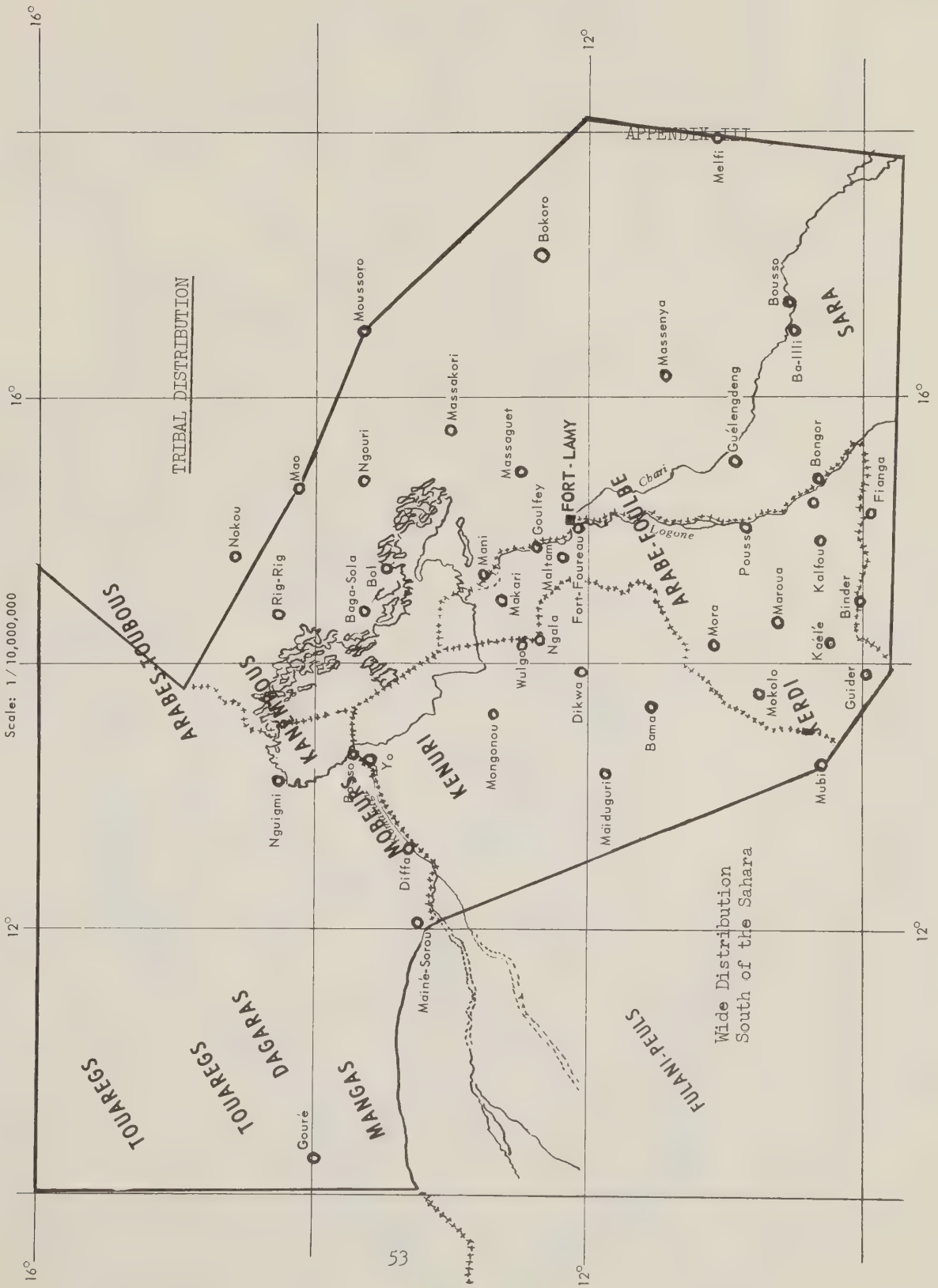
SUB-ARID SAVANNAH
 Mostly sandy with perennial grasses principally or degraded to annual grasses. 5-15 percent canopy cover of thorny trees, or treeless coarse sand plateaus or dunes with perennial grasses. 200-500 mm rainfall.

WOODED SAVANNAH
 Tall grasses interspersed with trees. Open grasslands where intermittently flooded. 900+ mm rainfall.

SUB-HUMID SAVANNAH
 Clays, silty and sandy clays. Tall perennial grasses with 15-40 percent canopy of trees mostly thorny -- degraded to annual grasses in part. Also open grasslands where intermittently flooded heavy clays. 500-900 mm rainfall.

CHAD BASIN COMMISSION

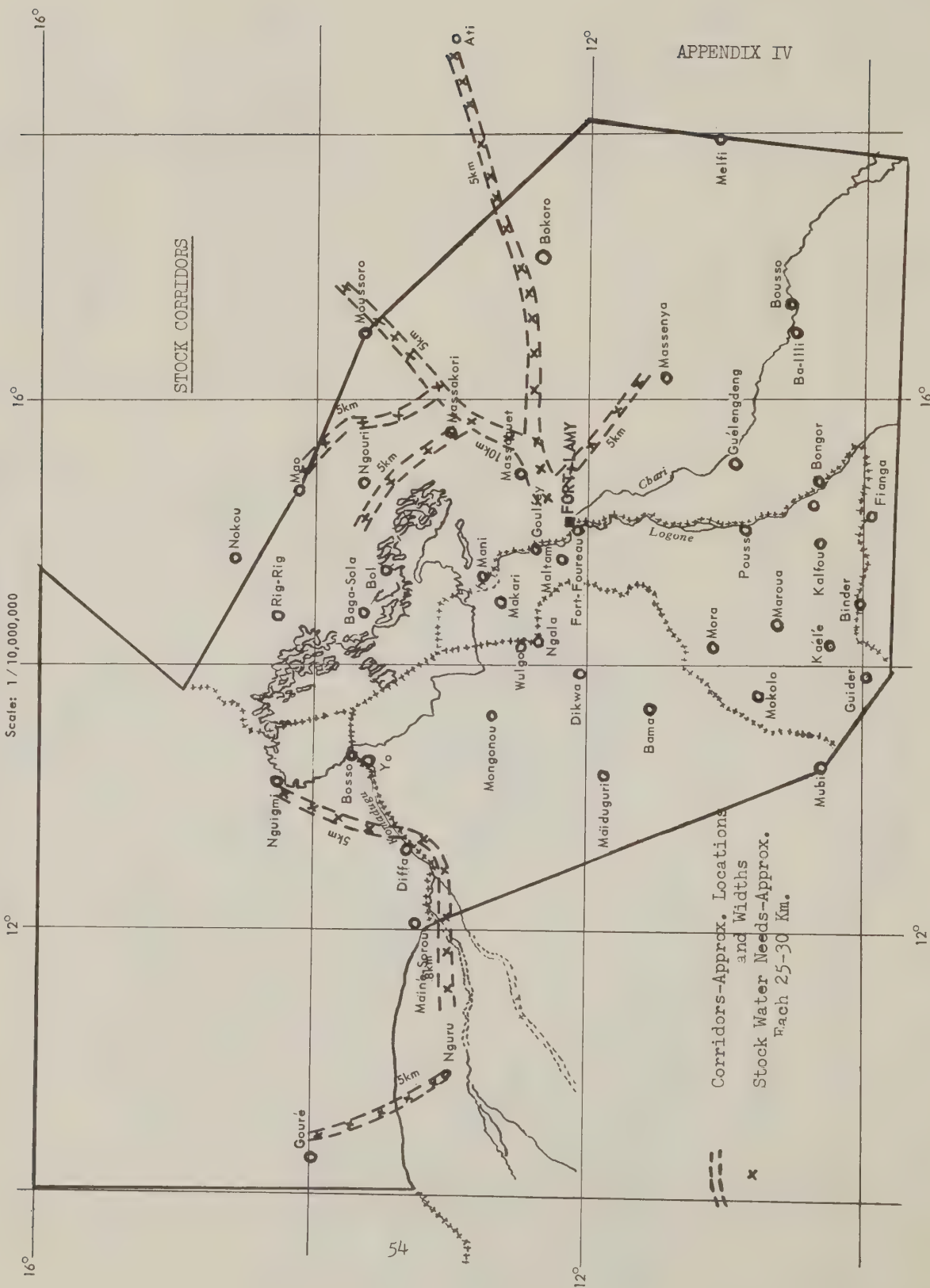
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APPENDIX III

CHAD BASIN COMMISSION

Scale: 1 / 10,000,000



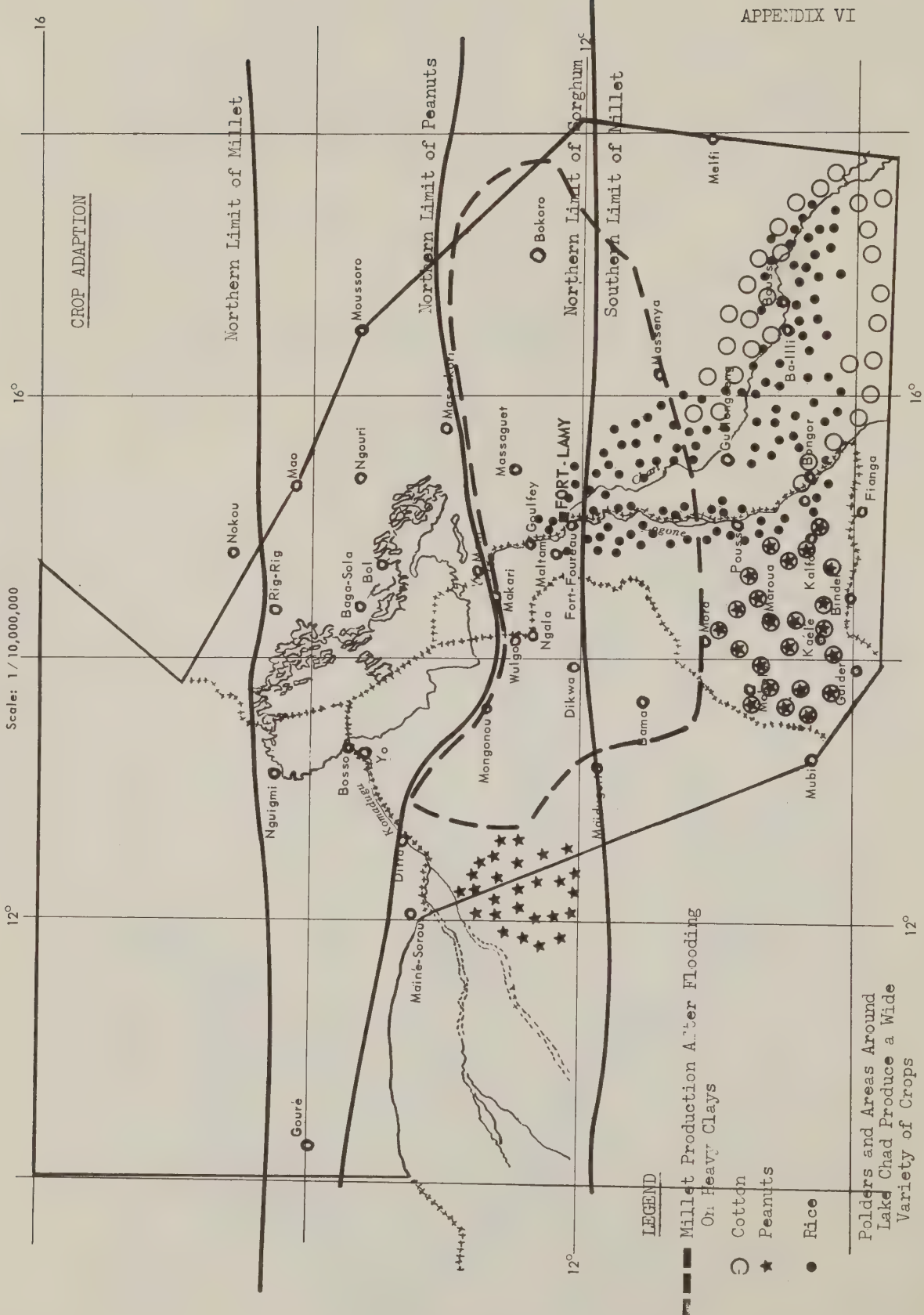
APPENDIX IV

STOCK CORRIDORS

Corridors—Approx. Locations and Widths
 and Widths
 Stock Water Needs—Approx.
 Each 25-30 Km.

CHAD BASIN COMMISSION

Scale: 1 / 10,000,000



CROP ADAPTION

Northern Limit of Millet

Northern Limit of Peanuts

Northern Limit of Sorghum

Southern Limit of Millet

LEGEND

- ▬▬▬ Millet Production After Flooding
- Heavy Clays
- Cotton
- ★ Peanuts
- Rice

Polders and Areas Around Lake Chad Produce a Wide Variety of Crops



LAND AREA AND HUMAN/LIVESTOCK ESTIMATES - 1968 *

Chad Basin Countries

(Numbers in 000's)

Country	Land Area Square Kilometers	Human Population	Livestock numbers							
			Total	Cattle	Sheep	Goats	Camels	Horses	Donkeys	Swine
Cameroon	474	4,600	4,430	2,000	780	1,220	--	20	60	350
Chad	1,284	3,300	9,526	4,500	1,400	2,800	355	155	310	6
Niger	1,279	3,200	12,995	4,200	2,150	5,800	360	160	320	5
Nigeria	877	56,000	39,648	7,800	7,300	21,300	17	431	2,100	700
Total	3,914	67,100	66,599	18,500	11,630	31,120	732	766	2,790	1,061

* Author's best estimate based on available data.

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Specific Breed Characteristics

Kuri or Lake Chad cattle are distinguished by gigantic bulbous horns (though some are polled) and the absence of a hump. Their native home includes the islands and shores of Lake Chad. From here they have scattered in all directions except to the north. These cattle can be seen frequently in the trail herds arriving in the southern coastal areas for slaughter. Presumably they are best suited to the lake and immediate environs. The most common coat color among purebred animals is white but darker shading does occur. Since the best slaughter animals will exceed 500 kilograms at 5 to 6 years of age and yield a high quality carcass, every effort should be made to preserve and improve them. They are probably the largest indigenous cattle in West Africa and have much to offer the beef cattle industry of the Basin.

The Muturu or Dwarf Shorthorn, although important to villages and towns of southern Nigeria, are of no particular interest to the present study. They are raised as village scavengers without conscious care or management. They are small animals, usually black with small horns and a straight top-line. Perhaps their two most outstanding characteristics are resistance/tolerance to trypanosomiasis and small size. A good slaughter animal will normally weigh only 150-175 kilograms at 3 years of age.

The N'Dama are native to the Fouta Djallon plateau in French Guinea. They are of interest to this study, because they are being introduced into several tsetse fly areas in southern Nigeria and southern Cameroon. Here in their pure form, they are still largely confined to government stations/ranches but are being used to upgrade the intermediate animals (chiefly Keteku types) in the predominantly mixed farming countryside. Under reasonable management they perform quite well in the fly belt and will serve as a base for improved beef cattle production in areas without a tradition of organized animal husbandry. Their color is uniformly russet with dark shading along the bottom line in some cases. They are humpless but rather heavy-

horned considering their size. The goal on most stations where they are kept is a 275 kilogram slaughter steer at $2\frac{1}{2}$ to 3 years.

The Azaouak (or Adar) is a short-horned Zebu breed found in west and central Niger and near the northern borders of Sokoto province in Nigeria. They are kept largely by semi-settled Fulanis, who consider their milking ability important. Breeding management is indiscriminate, so breeding work with these animals is needed in agricultural schemes and/or livestock stations in west and central Niger. Coat colors vary but are normally red or a mixture of red, white and black. Well grown out slaughter beasts will weigh over 400 kilograms at 4 to 5 years, but of course average performance is much lower.

Wadara or Shuwa Arab cattle are shorthorned Zebus found east, south and southwest of Lake Chad, especially in the Dikwa/Maiduguri area of Bornu province in Nigeria. They are similar to the vast herds of the Baggara Arabs of Kordofan and Darfur in western Sudan. They are the main cattle type throughout the area from Lake Chad to Abeche and beyond. These cattle are semi-nomadic. They are also multi-purpose; besides being the main milk suppliers to towns and settled peoples in the area, they are used for draft, riding and packing. Color is dark red or brown, but pied with black or red on white is quite common. The recently established Bornu ranch near Maiduguri, Nigeria is stocked with some 500 head with a goal of 3,000 animals. Young Wadara bulls on the station average 300 kilograms at 30 months, but outside a normal slaughter animal will weigh up to 370 kilograms at 5 years.

Sokoto Guadali cattle are shorthorned Zebus akin to the shorthorned Zebus of India and Pakistan, with which they are assumed to have a common origin. They are found primarily in Sokoto province of northwestern Nigeria and are kept chiefly by the Fulani, a group originally nomadic but many of whom are now sedentary. These cattle are divorced from crop production and depend almost entirely on natural grazing, except some farm aftermath in the dry season. They have a characteristic convex profile, slightly pendulous ears and a well-

pronounced dewlap and umbilical fold. The musculo-fatty hump is well developed in both sexes. The usual color is white or cream with darker shading at the poll, neck, shoulder and tail. An excellent herd has existed at Shika stock farm in Zaria province, Nigeria since 1932. This breed is used for milk, meat and draft. Along with the Kuri and Bunaji, the Sokoto Guadali is among the larger breeds in the Basin countries. A good slaughter bull at 5 years will weigh 500 kilograms.

Adamawa or Ngaundere cattle are medium-horned Zebus found mainly in the Bamanda and Adamawa provinces of Cameroon and the Membila district of Adamawa province in Nigeria. Almost all Adamawa cattle are owned by sedentary Fulani. However, the main herds are placed in the charge of a section of the stock-raising family or professional herdsman and are managed as migratory animals. Usual coat colors are brown, roan, red and white and black and white. Perhaps the most outstanding breed characteristic is the very flaccid hump. However, Adamawa cattle vary widely in phenotype according to location, and many of them in the south blend with the intermediate crosses between humped and humpless animals. The better slaughter animals may reach 400 kilograms at 5 to 6 years.

White Fulani or Bunaji cattle, classed as lyre-horned Zebus, are probably the most widely distributed breed throughout northern Nigeria. Pure animals are bred by nomadic Fulani, and are concentrated in the provinces of Kani, Katsina and Bauchi. The bulk of the Keteku and intermediate animals south of the main Zebu zone are thought to carry some white Fulani blood. Over 90 percent of these cattle are raised by the Fulani. Cattle are a source of individual prestige. They also provide the tribe with its basic wealth and, together with their products, the means to purchase other necessities such as grain, cloth, etc. Potential breeding females are always retained in the herd, but males in excess of carefully selected breeding bulls are castrated and/or disposed of. These animals make up a large percentage of the trail herds reaching the southern markets. Cattle are owned by the men of the family, but the dairy products are claimed by the women. The nomads normally grow no crops but purchase all grain from farmers, who permit

the herds to graze over cultivated land after the harvest in exchange for the manure left behind. In turn, the farmers buy work oxen and animals for fattening on crop residues from the migratory owners. During the dry season (November to April) the nomadic herds are constantly on the move, maintaining a precarious balance between the need for pasturage and the danger of contracting trypanosomiasis in the wetter southern tsetse regions. By any standard Bunaji cattle are good animals, and herds have been established as far south as Ibadan in the heart of the tsetse region. Cows are fair milkers and slaughter animals under good management will reach 500 kilograms at $4\frac{1}{2}$ to 5 years.

Nigerian Fulani (peul) or Diali cattle, have lost much of their original purity in pushing eastward from the Niger river to Lake Chad and neighboring Cameroon. The Fulani (peul) owners are, for the most part, semi-nomadic. Thus, seasonal livestock movements tend to be local or between adjoining areas only. Although these animals are classed as lyre-horned Zebus, they have interbred with other types to the point that within the Basin area they are difficult to identify. The color is usually white, although black and white, red and white and roans are to be seen. They are poor milkers, and while they produce a good carcass, the better slaughter animals only reach 350 kilograms at about 5 years. They do not have much potential for further improvement; there are considerably larger breeds in the vicinity.

The red Fulani, M'Bororo or Rahaji cattle, next to the Kuri, are the most distinctive animals in the Basin. These are long-lyre-horned Zebus, intractible and with a nervous disposition, but well suited to the roving nature of their Fulani owners. To avoid Islamization in the early part of the nineteenth century the Burorodji tribe, originally inhabiting an area in central Niger and the Sokoto province of Nigeria, fled with their cattle to Darfur, Sudan and Ubangi-Shari, Cameroon. Today, these cattle may be found from Senegal to the Nile valley in central Sudan. Hardiness, showiness, red color and ability to walk are the more important characteristics looked for by the nomadic herdsmen in selecting breeding animals. The herds are reared entirely on grazing, and their annual migrations cover hundreds of kilometers.

Animals of this breed can best make the long trek to markets in the south and make up a high percentage of those reaching Ibadan in western Nigeria. The M'Bororo are hardy and adaptable to a wide range of climatic conditions when in the hands of their tribal originators. They are well suited to the present marketing system but probably have little place in a truly developed cattle industry. M'Bororo slaughter cattle reach 400 to 500 kilograms at 5 to 8 years but yield extremely poor carcasses. However, low quality meat is highly favored in the mass coastal markets.

There is no doubt that both the N'Dama and dwarf shorthorn cattle can be described as true breeds, but there is no evidence that crossing between them and the Zebus to the north originally produced the intermediate type animal, of which the Keteku is a prime example. It is possible that the intermediate animals were contemporaneous in origin with the two extreme types. Ketekus are of interest because the beef cattle industry in the derived and southern Guinea zones is being developed using these animals as the base. The Keteku possesses reasonable resistance/tolerance to the tsetse fly, and the better slaughter animals are slightly larger than N'Damas. A good steer will reach 285 kilograms at 2 to 3 years and produce a high quality carcass of approximately 145 kilograms.

THE CHAD BASIN COMMISSIONARTICLE VIII

1. The Chad Basin Commission shall consist of eight Commissioners, two from each Member State.

2. The Commission shall meet at least once a year at its headquarters to be located at Fort Lamy or at any other convenient place.

3. Any two Member States may request a Special Session of the Commission by addressing a joint letter to the Executive Secretary of the Commission.

ARTICLE IX

The Commission shall have the following functions, inter alia:

- a) to prepare general regulations which will permit the full application of the principles set forth in the present Convention and its annexed Statute, and to ensure their effective application;
- b) to collect, evaluate and disseminate information on proposals made by Member States and to recommend plans for common projects and joint research programmes in the Chad Basin;
- c) to maintain liaison between the Member States to ensure the most efficient use of the water of the Basin;
- d) to follow the progress of the execution of surveys and works in the Chad Basin as envisaged in the present Convention, and to keep the Member States informed at least once a year thereon, through systematic and periodic reports which each State shall submit to it.
- e) to draw up common Rules regarding navigation and transport

- f) to draw up Staff Regulations and to ensure their application
- g) to examine complaints and to promote the settlement of disputes and the resolution of differences
- h) generally, to supervise the implementation of the provisions of the present Statute and the Convention to which it is annexed.

ARTICLE X

1. The Commission shall establish its own Rules of Procedure.
2. There shall be a representative from each State before a quorum could be constituted.
3. The decisions of the Commission shall be by unanimous vote.

ARTICLE XI

The common Regulations and the recommendations of the Commission shall be transmitted to the Governments of Member States for decision.

ARTICLE XII

1. The Commission shall, by a majority vote, recommend to the Heads of States and Governments, a candidate for appointment to the office of Executive Secretary from among the candidates proposed by the Member States.
2. Each Member State shall be entitled to nominate a candidate for the office of Executive Secretary.
3. The Executive Secretary shall hold office for three years and shall be eligible for re-appointment. The conditions of his service shall be defined in the Staff Regulations.

ARTICLE XIII

The Executive Secretary shall be assisted in his duties by such staff as the Commission shall determine.

ARTICLE XIV

The Executive Secretary shall be in charge of the staff. He shall exercise such powers and perform such duties as may be determined by the Commission. He shall be responsible to the Commission.

ARTICLE XV

The Commission may by a majority vote, recommend to the Heads of States and Governments that the Executive Secretary should be removed from office. If the recommendation is approved by the Heads of States and Governments, the Executive Secretary shall be removed from office accordingly.

ARTICLE XVI

1. The Commission shall establish a Budget at its first meeting which shall be submitted to Member States for approval
2. The Member States shall make equal contributions towards the regular budget of the Commission. All the extraordinary expenditures shall be financed by, and after agreement by the interested states.

ARTICLE XVII

1. The Commission shall have for all purposes the status of an international Organization.
2. The Commissioners and the Executive Secretary shall be accorded diplomatic privileges and immunities by the Member States. The other staff of the Commission shall be accorded such privileges and immunities as are accorded to officials of the Organization of African Unity of equivalent status.



