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Rangeland Problems of the Kainji Lake Basin Area of Nigeria *

by

J.S.O. AYENI, M.Sc.(Nairobi), Ph.D.(Ibadan)

Head, Wildlife Ecology and Range Management Division, Kainji Lake Research Institute,
 P.M.B. 666, New Bussa, Kwara State, Nigeria.

INTRODUCTION

Developments in the Kainji Lake Basin area of Nigeria clearly indicate the need for coordination among several land-using agencies. The agencies which are interested in the area include, primarily, the National Electricity Power Authority (NEPA), the Niger River Basin Development Authority (NRBDA), the Kainji Lake Research Institute (KLRI), and, indirectly, the Borgu Local Government Council through the local farmers and pastoralists.

The events leading to the establishment of the Kainji Hydroelectricity Lake have been described in detail by Olagunju (1972). The social and adjustment problems attendant on the establishment of the dam and the displacement of human populations have been investigated by Oyedipe (1980). The KLRI's Library at New Bussa currently stocks publications on the pre-impoundment studies (Imevbore & Adegoke, 1975), as well as reports on the successful resettlement of the displaced people, and on continuous monitoring of impacts of the dam on plant and animal life within the Basin area.

Despite the fact that the resettlement programme in Kainji has often been referred to as one of the most successful known, two major aspects have been neglected. These are: lack of provision of health-care facilities for the resettled people (Adekolu-John, 1979), and lack of adequate facilities for livestock and Fulani populations (Ayeni, 1979). Also, there was no separate agency charged with the overall development and planning activities within the Basin. The latter shortcoming is already resulting in over-fishing on the Lake (Ita, 1978), as there are no means of enforcing or regulating the number of fishermen and the types of fishing-gear used.

Objectives and Scope

This paper is intended to present the picture of Kainji Lake Basin as regards trends in land-use. It surveys the location and population of the livestock and large wild mammals occurring within 50 km of the Lake, with a view to suggesting possible guidelines for the eventual establishment of permanent settlements for the Fulanis and their stock.

The paper seeks to highlight the predicament of Fulani nomads in the light of current land-use changes and developments. Suggestions are also sought for reducing the areas of conflict between the different users of land within the Basin area.

Materials and Methods

Trends in agricultural expansion and development in the Basin area were determined through discussion with the Niger River Basin Development Authority

(NRBDA). Surveys of wildlife populations within the Kainji Lake National Park area were carried out with the use of high-winged Cessna aircraft flying 300 m above the ground. Similar aerial survey of livestock populations was carried out between longitudes 4° and 5° East and latitudes 9° and 11° North in the Basin. The procedures adopted in the aerial census were similar to those described for the Park by Ayeni (1980). Aerial survey of livestock was carried out for 5 days during the cool hours of late April 1980, just before the Fulanis commenced migration northwards away from the Kainji Basin. There were scattered showers of early rains during the period of this survey.

Information on the development of grazing reserves in the Kainji Lake Basin area (KLBA) was presented by Ayeni (1979), and information in that Technical Report was used as a basis for the discussions on improvement of pasture and range conditions within the Basin.

OBSERVATIONS AND RECOMMENDATIONS

Physical and Agricultural Developments

Fig. 1 shows the location of towns and major drainage systems within the Niger River Basin area before the

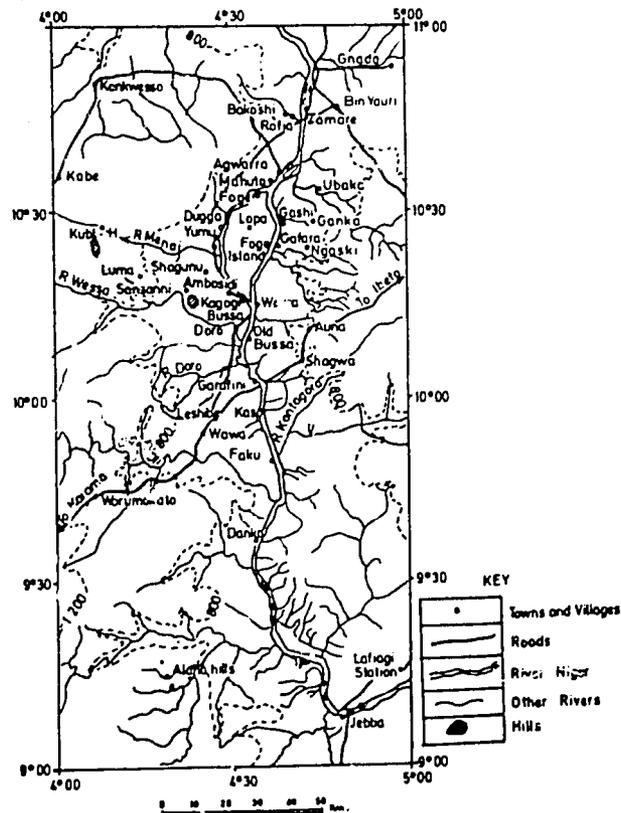


FIG. 1. Sketch-map showing location of towns and major drainage systems before the impoundment of Kainji Lake.

* See POSTSCRIPT on page 245.—Ed.

impoundment of Kainji Dam. The western section between the River Niger and the Republic of Benin is drained into the Lake by a series of rivers—mainly the Rivers Doro, Timo, Menai, Swashi, and Kpan, situated north of the Kainji Dam. Below the dam the same section is drained into the River Niger by the Rivers Oli and Moshi. As the Rivers Oli, Doro, Timo, and Menai, flow through Kainji Lake National Park (KLNP), most of their lengths cannot be developed for agricultural and livestock uses. Only the Swashi River has a great potential for irrigation agriculture, and for this purpose the NRBDA is developing the Kubli Reservoir on the River (cf. Fig. 2). With the development of a dam at Jebba (soon), the water-level in the Rivers Oli and Moshi are bound to rise and further increase the prospects of developing reservoirs along them outside the Park.

In the eastern section of the Kainji Lake area, there is extensive irrigable land between Ngaski and Auna (Fig. 2). Besides the development of the proposed Kontagora Reservoir and tunnel, the NRBDA will further extend irrigation potential on the eastern shores of Kainji Lake. The completion of the Jebba dam will similarly increase the water levels of the Rivers Kontagora, Maigyara, and others between Jebba and the local clam-site, thus offering new possibilities for agricultural etc. development.

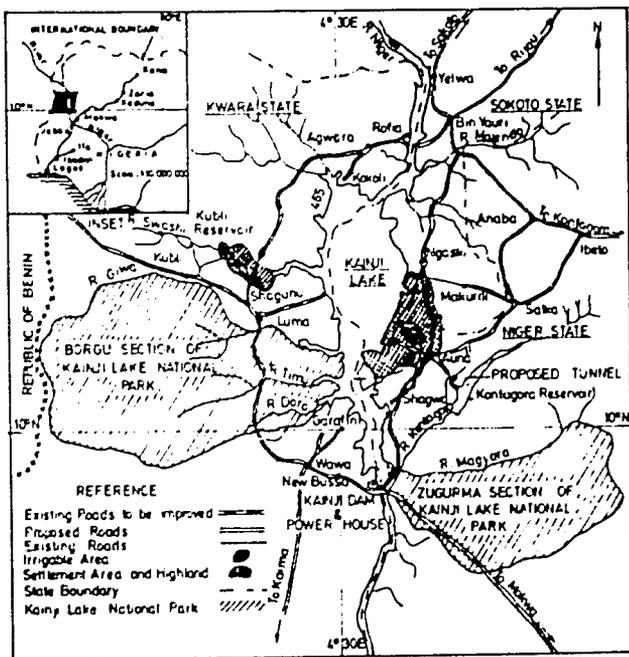


Fig. 2. Sketch-map showing physical development and proposals around Kainji Lake. The scale is approximately 10 km to 1 cm.

Fig. 2 is a map of physical development and proposals for immediate improvement of agriculture by the NRBDA. The terms of reference and the functions of the NRBDA include the provision of suitable land and water resources for agriculture. If the present trend continues, more farmers will eventually have farm holdings close to Kainji Lake, Jebba Lake, and a series of small dams from which drawdown as well as irrigated agriculture will become possible all-year-around.

Conflicts Between Farmers and Nomads

At present the Fulani cattle, sheep and goats, pass through peasants' farms along the Lake. The Fulanis graze their livestock on after-harvest residues such as leaves of Guinea-corn (*Sorghum vulgare*), cotton, legumes, and other crops. During the grazing, the livestock droppings help to manure the peasants' farms. Conflicts result when the Fulanis are not allowed free access to the farms—either because they arrive too early from the north due to early drought, or when the Fulanis are too late in returning from the south, by which time the current years' crops have been planted.

It would be desirable for the Federal Department of Meteorology to help by announcing weather trends, so that the Fulanis know in advance when vegetation conditions are already green enough for them to return northwards during the rains, as well as to warn the farmers in the Basin of impending southward movement of the nomads and their livestock. During the dry season at any rate, provision of water, concentrates, feeds including silage, and hay supplies, are necessary in the grazing reserves located north of the Kainji Lake Basin—to delay arrival of the Fulanis within the Basin area before the crops have been harvested.

Moreover in the past, some token grazing-fee 'jangali' was paid by the Fulanis to the local villagers. This practice of paying 'jangali' was recently abolished 'officially' in many States; but the issue continues to constitute another area of 'silent' conflict. The farmers do not see any reason why the nomads should be allowed to graze freely on their farms and no longer pay the traditional token fees for the facilities offered.

In view of the developing trends in agriculture, more grazing reserves than formerly must be provided for the livestock, and a time-table for arrival and departure must be arranged between the NRBDA, the peasant farmers, and the Fulani nomads. Currently the Fulanis arriving from the north are provided with free fodder as well as water for their livestock at the Bin Yauri Grazing Reserve by Kainji Lake Research Institute, to prevent the stock from roaming into the farms in the Basin area. Similarly, Fulanis arriving from the south are provided for at Yashikira Grazing Reserve by the Institute. Unfortunately, the facilities at Yauri and Yashikira are inadequate to cope with the high population of livestock passing through the Basin at the peak period, but nevertheless have helped to reduce the conflicts in the vicinities of the reserves.

Livestock Populations and Developments

Fig. 3 indicates the overall distribution-pattern of livestock within approximately 50 km of Kainji Lake and the River Niger between Yelwa and Jebba. Figs 4, 5, and 6, show the relationships between the number of cattle, sheep, and goats, respectively, and the distance of observation from Kainji Lake and the River Niger (below the Dam).

During the aerial survey for this report, some 327,440 domestic animals were estimated, comprised mainly of about 200,480 cattle, 101,520 sheep, and about 25,440 other livestock (goats, horses, donkeys, dogs, etc.). Besides these aerial counts, the resident breeding popu-

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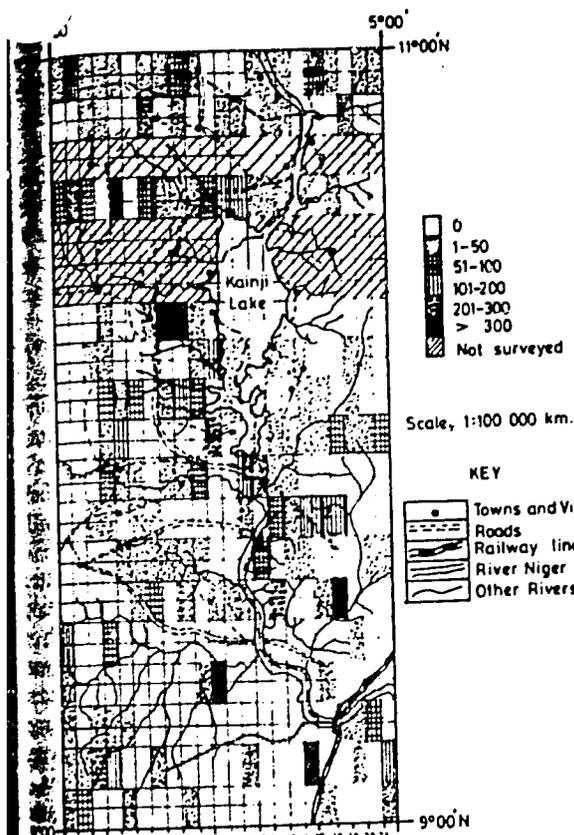


FIG. 3. Map showing the ranges of numbers of livestock animals seen during partial aerial survey of Kainji Lake Basin area.

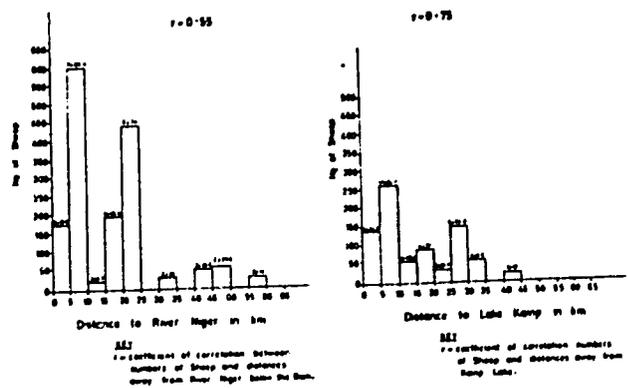


FIG. 5. Histograms showing relationships between numbers of sheep and distances away from Kainji Lake and River Niger. (See also explanation of keys in Fig. 4.)

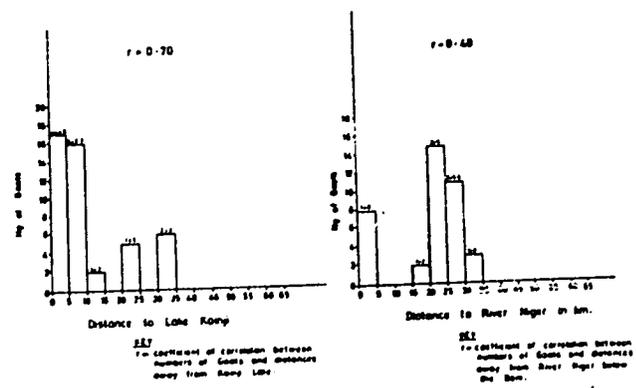


FIG. 6. Histograms showing relationships between numbers of goats and distances away from Kainji Lake and River Niger. (See also explanation of keys in Fig. 4.)

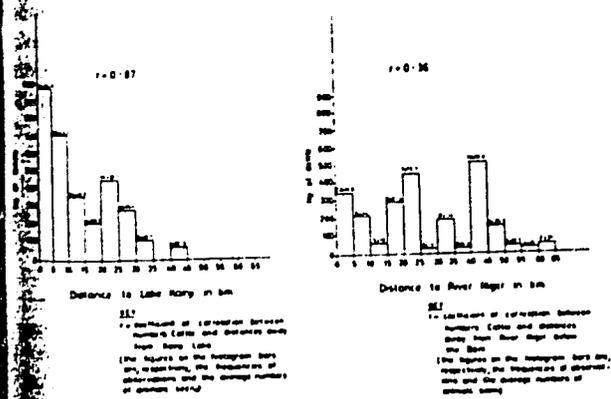


FIG. 4. Histograms showing relationships between numbers of cattle and distances away from Kainji Lake and River Niger.

sheep were observed moving along the drainage systems early in the mornings and late in the evenings. The movements of goats in particular were less restricted to neighbouring villages than was the case with cattle. Table II shows the essential characteristics of livestock numbers in relation to Kainji Lake and the River Niger (below the Dam).

On the whole, a large number of livestock congregated at the mouths of the rivers draining into the Lake. Between the dam-site and Jebba, the livestock popu-

TABLE I

Population of Breeding Stock of Resident Livestock in Yauri Local Government Area* (1965-73).

Year	Cattle	Horses	Donkeys	Sheep	Goats	Camels
1965	36,050	420	678	27,270	14,210	5
1966	37,216	462	875	28,145	15,140	8
1967	37,840	520	1,008	29,665	16,245	7
1968	37,972	415	862	30,127	14,875	5
1969	38,055	387	876	30,212	8,652	2
1970	40,125	342	1,002	30,890	8,260	—
1971	42,274	300	1,045	31,126	8,123	7
1972	43,115	316	1,438	33,761	8,000	7
1973	44,029	399	2,349	35,121	7,864	—

* Yauri Local Government Area includes the Ngaski, Gungu, Shanga, Kainji, Bin Yauri, and Yelwa, districts.

lation of domestic animals, based on records from the Yauri Local Government Area (1965-73), increased from 36,050 to 44,029 cattle and from 27,270 to 35,121 sheep (Table I). Thus a huge population of livestock animals can be inferred to utilize the Basin area annually. Cattle distribution showed a strict association with known sources of surface water during the dry season. The cattle were also located within reasonable proximity of villages and towns, to which the Fulanis sold their cheese and milk in exchange for money to buy essential requisites for their nomadic existence. The goats and

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TABLE II
Livestock Numbers in Relation to Distance from Kainji Lake and the River Niger.

Y	Items	x	Regression equation	Coefficient of correlation	Significance $P < 0.05$
Total livestock	Distance to Kainji Lake		$Y = 918.74 - 17.63x$	$r = 0.87$	**
Cattle			$Y = 700.60 - 13.84x$	$r = 0.87$	**
Sheep			$Y = 164.37 - 3.10x$	$r = 0.75$	**
Goats			$Y = 10.89 - 0.22x$	$r = 0.70$	**
Total livestock	Distance to River Niger		$Y = 618.50 - 9.90x$	$r = 0.68$	•
Cattle			$Y = 286.35 - 3.14x$	$r = 0.36$	—
Sheep			$Y = 294.23 - 5.34x$	$r = 0.55$	•
Goats			$Y = 6.44 - 0.10x$	$r = 0.40$	—

** Highly significant

• Significant

— Not Significant

lations also congregated on the islands along the courses of the River Niger. At these locations the animals were seen grazing on the weeds by the Lake and on the lush bushes growing along the mouths of the watercourses.

The animals actually swam to the islands in the process of grazing on the floating weeds (*Pistia stratiotes* and *Echinochloa* spp.) around Forge Island. Observations since the impoundment of the Lake in 1968 have indicated the failure of *Pistia* to constitute a weed problem on the Lake. However, along the Lake shores there are numerous 'mats' of *Echinochloa* spp., which are most numerous at Forge Island and at the mouths of the rivers draining into the Lake. The mats withstand both dry and rainy seasons, spreading horizontally and extending to a depth of about 11 m. The plants are being regularly harvested by the natives, and marketed as fodder for cattle within the Basin. A solar kiln for drying *Echinochloa* for feed supplies to the Fulanis was recently installed at New Bussa by the KLRI, for large-scale drying and production of nutritious hay.

Wildlife Development

Table III shows the total number of animals counted during four aerial surveys (1976-80) in the Borgu Section of the Kainji Lake National Park (cf. Fig. 2). In each of the transects on average 20% of the ground area was 'counted'. For some large mammals such as the Elephant (*Loxodonta africana*), Hartebeest (*Alcephalus caana*), and Roan Antelope (*Hippotragus equinus*), aerial counts were extremely suitable. Aerial under-counting is, however, inevitable in some cases because animals such as Water Buffalo (*Bubalus bubalus*), Lion (*Felis leo*), and Hippo (*Hippopotamus amphibius*), do not run (flush) when an airplane flies over them.

Moreover, smaller game species which are usually encountered under cover, such as duikers (various cephalophine bovid artiodactyles) and Kob (*Adenola kob*) along the rivers, are better counted by road census than by aerial census. Nevertheless the aerial censuses show that the bulk of the wildlife populations in the

TABLE III
Cumulative Numbers of Wildlife in Four Counts over Seventeen Transects in the Borgu Sector of Kainji Lake National Park (1976-80).

	TRANSECTS																	Total	Average estimate per count	Estimate for whole Park
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			
Hartebeest	4	—	28	33	76	65	6	16	27	59	31	25	22	22	5	—	1	420	105.00	1,625
Roan	8	—	3	1	19	59	29	28	10	16	14	33	16	19	21	22	—	298	74.50	1,861
Kob	—	—	—	1	—	7	8	8	3	1	4	—	—	11	—	4	—	47	11.75	291
Elephant	—	—	—	4	16	8	10	—	9	—	12	3	—	—	—	13	7	82	20.05	510
Oribi	1	1	2	1	7	5	10	8	3	4	—	3	1	8	2	9	—	65	16.25	405
Grey Duicker	—	—	4	6	3	11	3	9	4	8	7	6	2	14	6	8	2	93	23.25	580
Bushbuck	—	—	—	—	—	1	1	—	—	—	1	5	1	5	2	1	—	17	4.25	105
Wart-hog	—	1	3	3	5	3	4	11	7	1	3	5	—	1	—	—	—	47	11.75	291
Red Duicker	—	—	2	—	—	1	—	—	1	2	—	1	—	1	—	—	—	8	2.00	50
Buffalo	—	—	—	—	36	—	—	4	—	—	—	10	—	22	—	—	—	72	18.00	450
Baboon troupe	—	—	—	—	—	—	4	1	2	1	—	3	2	2	—	2	—	17	4.25	105
Water-buck	—	—	—	—	—	—	—	—	—	—	—	7	—	—	—	—	—	7	1.75	41
Hippo	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	3	0.75	16
Grand Total	13	2	42	49	162	163	75	85	66	92	72	101	44	105	36	59	10	1,176	294.00	6,330

Sampling intensity = 0.25%.

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Kainji Lake Basin reside within the National Park area (Fig. 2). To the west of the Lake lies the Borgu Section of the Park, and to the east of the Dam is the Zugurma Section of the Park. The Borgu Section is 3,924 km² in area and the Zugurma Section is 1,386 km² in area.

The Kainji Lake National Park is fast becoming a major tourist attraction, where numerous varieties of birds as well as large herbivores—Elephant, Hippo, Water Buffalo, Roan Antelope, Hartebeest, etc.—and also carnivores such as Lions and other big cats, are regularly sighted.

Conflicts between Nomads and Park Authorities

The National Park laws prohibit the destruction of wild animals and vegetable matter within the Park. Apart from illegal entry and grazing of livestock in the Park, the Fulanis also cut down branches of leguminous trees as fodder for their livestock while passing through the Park. Understandably, the Fulanis attempt to defend their lives and those of their livestock by killing wild carnivores. The possession of hunting equipment by Fulanis within the Park also constitutes a very serious offence. The Fulanis are regularly arrested, prosecuted, and imprisoned or heavily fined, for the offences mentioned above.

As the Park covers practically the whole section between the western shoreline of the Lake and the Nigerian boundary with the Republic of Benin (Fig. 2), there is only a very small gap for livestock to move from the north to the south in this section without passing through the Park. Thus in order to avoid passing through the Zugurma and the Borgu Sections of the Park, some Fulanis and their stocks only utilize the eastern section of the Lake, and pass westwards through the bridgehead at Kainji Dam-site (Fig. 2). In fact most Fulanis, rather than take trouble to avoid the Park, actually graze their stocks by passing through it, hoping to escape arrest and prosecution.

The possible veterinary problems of the nomadic stocks passing through the Park include tsetse-flies (*Glossina* spp.) causing sleeping sickness to the Fulanis and death to the livestock. There is also a possibility of cross-infestation of the livestock by external pests and parasites such as ticks and fleas or wildlife. Utilization of the same waterholes by wildlife and livestock certainly increases the risks of transfer of zoonotic diseases.

The distance between Yelwa and Yashikira is too far for livestock owners to be restricted to going by the major road passing through the Park. If two grazing reserves were established at the points where the road enters and leaves the Park, then the Fulanis might be made to carry food for their journey and be restricted to drink at specified waterholes on their way through the Park.

In respect of the Borgu Section of the Park, a grazing reserve should be established between Babana and Agwara, while another should be established between New Bussa and the National Park Boundary. Waterholes could be developed on the Rivers Timo, Menai, and Doro—along the road where shade may be provided for animals to rest.

The facilities provided for livestock within wildlife areas should be adequately fenced-off from tourists' routes, and also made to exclude wildlife in order to

prevent cross-parasitic infestations. Also, fast transportation may be arranged to cross the Park—provided the Fulanis pay only a token charge and the bulk of transportation costs are met by the Federal Government.

DISCUSSION

Development of Grazing Reserves

The Kainji Lake Research Institute has established two experimental stations, one at the Grazing Reserves in Yashikira (Mweri) and the other at Yelwa (Bin Yauri). Ayeni (1979) explained the philosophy behind the establishment and development of these grazing reserves and experimental plots. The grazing reserves provide models for Kwara and Sokoto States, respectively, on how best to develop pasture and water resources, and prevent overgrazing and misuse of fire, in the States' grazing reserves outside the Kainji Lake Basin area.

The philosophies behind the development of grazing reserves by the Institute are that:

- The Fulanis should have rightful grazing and resting lands on their annual migratory routes. Yelwa and Yashikira being major stopping-points along the routes of the nomads, have been selected for this demonstration.
- The grazing reserves should serve as demonstration and extension areas for Fulanis and State authorities. Those Fulanis accepting improved range conditions and adequate health facilities offered at the Institute's grazing reserves, may be persuaded over a long period of time to settle down on similar ones that are being established under States' and Federal Livestock Departments outside the Kainji Lake Basin area.
- The grazing reserves should be located near villages and towns, so that Fulanis may be reached by medical and veterinary assistance. If they so desired, their children might be given specialized education based on 'cattle culture' (F.P.A. Oyedipe, pers. comm.).

Sociological Problems

By far the most serious problems of range management and development in Nigeria today are sociological. In northern Nigeria previously, the larger portion of land was crown land, and as most of the marginal land was not put to any specific State use, it constituted 'no man's land' through which the Fulanis roamed their stocks. The ecological advantages of extensive pastoralism notwithstanding (Yesufu, 1980), the tendency in Nigeria is towards increasing urbanization and mechanization of agriculture. The land-tenure system is undergoing social revolution at present in Nigeria. Although these urbanized developments have certain ecological disadvantages, their social and economic significance at present indicate that Fulanis may not be nomadic for ever. It can only be hoped that the transformation from nomadic to semi-settled culture will not be too sudden for the Fulanis.

Around the Kainji Lake Basin, and indeed in many States in the north, land is no longer 'free'. The Federal and State Governments are indeed seeking means of increasing the areas of gazetted reserves, but the people who are likely to be displaced by proposed grazing-lands insist on getting adequate compensation for their traditional farmlands.

The Fulanis, on the other hand, are not willing to own land, believing that, by their trade, 'all lands' along their traditional routes belong to them. Inability to acquire sufficient lands for grazing reserves may spell doom ultimately for the cattle industry in Nigeria; for when the Fulanis see reason in settling down, the cost of land could have become so prohibitive that the creation of large grazing-reserves in Nigeria would be impracticable.

The greatest threat to the livestock industry in the Kainji Lake Basin is the loss of traditional grazing-lands. The creation of Kainji Lake for the supply of hydro-electricity resulted in the creation of a huge body of water (125 km²), which flooded most of the riverine pasture between New Bussa and Yelwa (Fig. 2). Although nothing tangible was done about the lot of the local population having a total resident stock of over 44,000 cattle, other inhabitants displaced by the flood were resettled into Government-constructed villages and towns.

The larger proportion of the settled communities have since improved their lot, changing from shifting cultivation to more intensive agriculture using farm machinery supplied by Government departments. The new pattern of land-use has been further complicated by the establishment of the Niger River Basin Development Authority (NRBDA), which has already earmarked a large area of land around Lake Kainji for mechanized agriculture (MINCO, 1977). The present and future land-use and development increasingly restrict the areas of 'no man's land' on which the nomadic Fulanis traditionally graze their stock.

Besides the continuous loss of traditional grazing-land and routes, the prospects of increasing conflict between farmers and the Fulanis is an ever-present problem. Already some States (e.g. Gongola) are reintroducing the 'jangali' (tax for grazing cattle) and graziers are frequently apprehended and sentenced for passing through and grazing in national parks, game reserves, and farms (Ayeni, 1980).

In spite of the loss of several traditional-use opportunities to Fulanis, the creation of Kainji Lake, apart from providing over two-thirds of the electricity consumed in Nigeria, has increased opportunities for commercial fishing (Babalola, 1976) and prospects in some areas for drawdown agriculture (Amaugo, 1977). But if the livestock industry is to survive and rational policy be initiated on development and improvement of Nigeria's economy in animal protein, the Federal Government should be able to reinvest the profits from the mines and power (National Electric Power Authority and the petroleum industry) in renewable resources such as the livestock industry.

Towards this end the Federal Government must encourage, as a matter of urgency, inter-State and inter-Departmental meetings to incorporate the views of the local authorities, the peasants, and the Fulanis, 'at the grassroots'. A separate new Department for Wildlife and Range Management should be established and charged, among other things, with the problem of conservation and management of animals under natural conditions. Such a Department, with the required capital, would go a

long way towards sorting out problems such as those observed within the Kainji Lake Basin area.

CONCLUSIONS

The major conclusions arising from the present paper are that:

- (1) There is conflict in the planning and use of land in Kainji Lake Basin. The agencies mostly affected by the land-use conflicts are forestry (Wildlife Services), Agriculture, and Livestock, Departments at both Federal and State Government levels.
- (2) There is room to improve the lot of the Fulanis and the Nigerian meat industry through the establishment of grazing reserves within and outside the Kainji Lake Basin area.
- (3) Because the River Niger below the dam, as well as the drawdown areas around Forge Island and the rivers draining into the Lake, provide pasture and aquatic weeds, respectively, that are suitable for grazing stock, there is a great scope for harvesting and drying this source of vegetation to supplement feed at the grazing reserves.

The implications of this study have national significance, particularly in respect of the major river basins that are located in the savanna areas which constitute about 80% of the land-area of Nigeria. In such savanna areas it is essential that the Federal Government as a matter of urgency should carry out:

- (1) Survey of livestock throughout Nigeria to provide a precise estimate of the total strength of the national livestock resources;
- (2) Survey of seasonal locations and patterns of movement of the livestock, so as to establish bases for the determination of legal and rational routes to be used by the nomads;
- (3) Mapping of all possible land-areas that might be suitable for conversion into grazing reserves in the most critical areas;
- (4) Acceleration of training of manpower in rural sociology, veterinary medicine, range management, and ecology, which are the disciplines most immediately relevant to the survival of the Nigerian livestock industry; and
- (5) Encouragement of intergovernmental as well as inter-departmental cooperation in solving the problem of the nomads who currently are responsible for about 80% of the livestock population in Nigeria.

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SUMMARY

The development of much-needed grazing reserves and pastures in the Kainji Lake Basin area of Nigeria is being initiated by the Kainji Lake Research Institute with

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erous support from the States' and Federal Governments. However, there is a continuous overlap of interest which results in conflict among land-users such as the nomadic Fulanis, peasant farmers, and wildlife/forestry conservation authorities. Currently the Kainji Lake Basin is a major 'food basket' for agricultural crop production in Nigeria. The Basin is also an attractive big-game tourist centre and a traditional source of dry-season water and green grass for the migratory livestock.

Suggestions are made for a rational resource-management approach within the Basin, with establishment of rangeland reserves. Regular meetings between the representative of the Niger River Basin Development Authority, Kainji Lake National Park, States' Departments of Agriculture and Natural Resources, and the local Governments in the Basin area, should go a long way towards eliminating the sources of conflict.

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* We regret using this device so frequently—*inter alia* to reserve space in proof—but all attempts to contact the Author have failed.—Ed.

POSTSCRIPT

We were shocked to learn, when this paper was in final proof form with the issue fully made up, that one of different main title but based apparently on the same material, had already been published. To blame are evidently the editors, which failed to convey any warning of wider distribution of typescript copies or elicit any response from the Author until far too late after passage for press—hence also the incompleteness of several of his references.—Ed.