

UNITED NATIONS  
AFRICAN INSTITUTE FOR ECONOMIC  
DEVELOPMENT AND PLANNING

DAKAR.

IDEP/ET/CS/2106

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IDEP REGIONAL COURSE  
ON  
AGRO-INDUSTRIAL DEVELOPMENT AND PLANNING  
(Dakar, 3 February - 28 March, 1969)

THE KAINJI DAM PROJECT

by

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February 1968.

## ACKNOWLEDGEMENTS.

The greater part of the field work for this paper was undertaken when the author was an employee of UN/FAO and part of the Kainji Lake Research Project from July 1966 to August 1967. The author owes a special debt to NISER for their constructive aid and co-operation in making the field work possible. The Agricultural Development Council of New York made possible the authors return to the field in 1968.

The author owes a great debt to the administrative authorities, the agricultural extension staffs, and the resettlement authority for their constant patience and co-operation in smoothing the authors field work, as well as for their willingness to share with the author all information necessary for successful research.

The author would like to acknowledge the consultation with his UN/FAO colleague Mr. Jonathan Jenness to whom he owes much of the information contained in this paper about fish and fishermen.

The author had the great pleasure to share the field work with two NISER colleagues to whom a great part of success in the field research is due, Mr. Q.B.O. Anthonio of the Department of Agricultural Economics, University of Ibadan, and Mr. Isaac Adalemo, Department of Geography, University of Lagos.

Finally, it is necessary to emphasize that this paper represents the opinions and insights of the author only and is not the responsibility of any other individual or organization.

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## I. THE KAINJI LAKE REGION

Introduction: This paper examines the problems and potential for rural development in the region of future Kainji Lake. It is not a report on a positive program or project of development, but rather a research assessment of the obstacles and opportunities presented for development in a remote area of Nigeria. In order to place the problems presented by this region into a development context, the discussion will proceed against a background of generalization drawn from geographic theory.

The Study Region: The region under consideration is located on the middle Niger river over a distance of 80 miles upstream from Kainji Dam, which is now under construction. The dam itself is located 65 miles upstream of the Jebba bridge. The east bank of the river is in the southern part of Sokoto Province comprising the Emirate of Yauri. The west bank is located in Borgu Emirate in Ilorin Province.

The region is inhabited by eight tribes speaking ten local languages, the Hausa, Eussa, Gungawa, Shanga, Kambari, Duka, Lopa, and a mixed group called Yaurawa. The Hausa language is lingua franca of the area and spoken by most adults with facility.

Kainji Dam: The lake takes its name from a large dam which has been under construction at Kainji island for several years and is scheduled for completion during the summer of 1968. In August to October 1968 the dam will create a reservoir about eighty miles long and twenty miles wide at its widest, and will cover 480 square miles. Flooding of this area has necessitated the resettlement of approximately 45,000 people into 120 new villages.

The dam has been constructed primarily for the purpose of generation of electric power for supply to the major urban centers of Nigeria. Expected secondary benefits include (1) year round navigation on the Niger to the north-end of Lake Kainji through the construction of navigation locks around the dam and downstream rapids, and (2) management of downstream flows to abate flooding.



Besides these objectives the creation of a large lake brings other changes in its wake. The submergence of this extensive area will result in the transformation of the various ecosystems of the lake basin and its adjacent shore area. Changes in the natural resources will force discontinuation of some economic and social practices, while enhancement of some resources may open opportunities for economic development. In the Kainji Lake case major changes are foreseen in (1) the opportunity for building a commercial lake fishery after initial degrading of the present riverine fishing pattern, (2) in agriculture the loss of valuable irrigated gardens on alluvial soils of shore and islands, (3) major changes in the health pattern affecting particularly the diseases onchocerciasis, schistosomiasis, and malaria, and (4) the potential for expanding the tourist industry near the dam site through sport fishing and an adjacent game reserve.

The resettlement of human populations alone will disturb the existing economic and social pattern. It is thought by some that this may throw open doors to development as well as dangers of decline. No report on the results of resettlement will be attempted in this paper, since these can not be assessed at this early stage after people have occupied their new villages.

Climate: The study area is one of savana climate characterized by a year evenly divided into a summer rainy season with high temperatures and a winter dry season with cooler temperatures. Long term annual average rainfall is 40 inches, with 65 per cent of this amount confined to the months of July through September.

The Rivers: The river reaches its lowest flow in June and is subject to two consecutive periods of high water. The first, known as the white flood, starts in July and continues until November and represents the local runoff from Nigerian tributaries. In December the black flood commences which continues until March and brings the runoff from the region of the Guinea Highlands. During April and May the river falls rapidly to reach its lowest stage again in June.

This description indicates that the river is well regulated and that the future lake will represent storage for a short period of low water only. The long period of high water level has encouraged the irrigation along the banks of the river when farmers lift water rarely more than fifteen feet.

The Agricultural Economy: Interest is focused on the economy of peoples living along the banks of the river and on islands in the stream. Almost all of these are farmers, although a small number are full time fishermen. Craftsmen, traders and administrators pursue their calling in the area as well, but most of these are followed as part time occupations.

Most households grow guinea corn (sorghum) for their subsistence as well as millet and beans. Fields are cleared with axe, hoe, and fire, cultivated for three to eight years and then allowed to return to bush fallow. New and old fields are cleared at the end of the dry season in March and April and planted with the onset of the rains in May and June. Guinea corn crops are not harvested until December, millet as early as August.

Fields tend to be large, on the order of twenty acres per extended family, and often at a long distance from the river. Advantages of living near the river are great, so that people will rarely shift their houses away from the Niger, but rather walk long distances to their farms.

Irrigated Farming: Wet rice is cultivated in seasonal swamps which form when the river is at high water, and is processed and sold mainly by women. About a third of the households have permanent gardens along the river which they irrigate by simple hand methods. Farmers will stand in the river and lift water in large calabashes into a ditch intake. Water is conducted along the ditch by other members of the family, and if necessary lifted again to a higher level. As many as six lifting steps have been observed, though rarely is water raised more than fifteen feet. Water is conducted into small bunded field sections averaging four by four feet. Holdings of individual compounds average one acre, usually in several plots strung out along the river or on islands.

The chief crop in the irrigated gardens are onions during the dry season, sometimes double cropped. Most irrigated gardens are double cropped with bulrush millet in the rainy season without irrigation, and catch crops of cassava, tobacco, pepper, and several varieties of vegetables take up the space after the onions are harvested. Cultivation of these fields is extremely intensive and fertilizer or manure is applied in almost every case.

Onions are transported by farmers to one of four regional markets by boat. There they are bulked and bagged to be sold to traders who come with lorries from the southern parts of Nigeria. The onions are the most important cash crop of farmers, and bring the greatest return to the region. Beans are the second most important crop sold; other crops are sold only in small quantities and at retail in local markets.

The Agricultural Cycle: The irrigated gardens are cleared in August when early millet is harvested. After that they are planted with onion seedlings which have been raised in separate seedbeds. Irrigation starts as soon as the rains cease after the river rises and continues until the last crop is harvested in February. The peak demand for irrigation is in December and January when at the same time the guinea corn harvest demands every last unit of labor from farmers. Peak labor demand for the subsistence food crop harvest in consequence interferes with adequate watering of the cash crop. Thus expansion of production for the market depends to some degree on a more efficient allocation of labor, or on introduction of a labor saving means of raising water.

Tribal Distribution: A note on the tribes engaging in irrigation is in order since the practice has been referred to as "Gungawa irrigation" by some investigators. While almost all of the Gungawa households practice irrigation farming, only about sixty per cent of the irrigation farmers are Gungawa. Another twenty per cent are Hausa and twelve per cent belong to the Kambari groups, the remainder are made up of individuals from several other tribes. This indicates that the economic practices of the Kainji Lake region are not confined to specific tribes but are capable of diffusion to groups other than those originating them. This can be of crucial importance to economic development and to the use made of extension services in the region.

Fishing: About forty per cent of the households along the river have one or more members who catch and sell fish locally at least occasionally. Many more engage in fishing at least sometimes for family use. The region contains a small number of full time fishermen most of whom are immigrants or itinerants from more northerly parts of the river.

Fishermen use a large and diverse quantity of locally crafted gear - nets, traps, fences, spears, and longlines. Imported nets and lines made from nylon have gone a long way in replacing locally produced fiber and cotton equipment. Poison is used as well in creeks and pools.

Most important fishing ground is not the open river, which is relatively devoid of plankton and fish. Fishing is concentrated at the rivers edge, in seasonal swamps, and in pools and tributaries. These are areas rich in fish food and most productive of catch. Fishing methods are adjusted to these grounds, and great use is made of traps and fences to bring in the catch.

Although fishing is intense, yields are rather small. Jenness has estimated only half a ton per part time fisherman per year with perhaps a ton per year for professionals. In consequence most fish are consumed by the family, and some are sold fresh in the local market. Only a small amount of dried, smoked fish is exported from the Kainji region to other parts of the country.

A large quantity of smoked fish, bulked in eighty to hundred pound baskets is landed at Yelwa market and transferred to lorries there. Most of this product comes from areas upstream of the Kainji region, including from the Niger Republic. The existence of this trade reflects a large and growing market for smoked fish in Nigeria. It also indicates that marketing and trade channels for a future lake fishery exist but need expansion.

Crafts: About thirty-five per cent of the farmers pursue a secondary occupation for gain. The largest part of these are craftsmen making mats and grass fences, rope, fish traps, and baskets. A few farmers are weavers, blacksmiths, or carpenters. Pottery tends to be made by women or full time professionals.

Almost sixty per cent of compounds own one or more boats of several types. All of these are dugout canoes, the smaller ones locally made, the large ones imported from near the Niger delta. Boats are used for fishing as well as for transporting goods and persons to market.

Markets: The people of the area are engaged in many kinds of marketing activity and an intensive exchange of goods and services characterizes the region. The larger towns contain a population of craftsmen and officials who represent an urban market dependent upon purchase of their food needs. An intensive trade in imported articles, notable cloth, is carried on by itinerant traders.

About twenty markets exist in the area which meet once a week, while another fifteen meet every four days. Market villages tend to have road or river access, and the construction of a road may encourage the formation of a market. The existence of a road increases the trade area of the market and increases the number of itinerant traders likely to visit the location.

The most important market is located at Yelwa which draws the greatest number of people from the largest area. Yelwa's importance stems from its position on the Kontagora to Sokoto main highway where this touches the river Niger, and is underscored by its role as the capital of Yauri Emirate. It is an important trans-shipment point for goods brought on the river from further north and for goods moving to and from Dahomey and Niger. Yelwa in consequence is visited by many lorry operators as well as by large motorized dugout transport boats.



Yelwa also functions as a wholesale market for the cash crops of onions and beans, and for smoked fish. Crops are brought in dugouts by farmers, collected and bagged by middle men, and then sold to traders. The other wholesale markets are Rofia about eight miles south of Yelwa, and the twin towns of Wara and Bussa on either shore of the river.

Transport Routes: Yelwa is 450 miles distant from Lagos, the largest and most important urban market in Nigeria. The products of the region generally move by lorry to the town of Ilorin, from where they are distributed to the remainder of the south of the country. Ilorin is 150 miles distant from Yelwa and two routes exist to reach the town. The most frequently used route runs 65 miles by laterite road to Kontagora, this is Nigeria route A15. From Kontagora the road is tarmac and runs 185 miles via Jebba bridge to Ilorin.

The other route crosses the Niger by motorized ferry at Rofia near Yelwa, and continues along the western side of the river through Bussa and Kishi to Ilorin. Only fifty miles of this route are tarmac, the remainder laterite. The ferry represents a serious bottleneck in transport, especially at the times when the diesel engine driving it is out of action.

The fourth important wholesale market of the region, Wara, has only dry season access by a spur road off the Yelwa - Kontagora route. Goods from Wara are usually ferried across the river by dugout to Bussa on the opposite bank of the river and moved from there by lorry.

Sheer distance and the low quality of roads make Yelwa and the Kainji Lake region a remote location in the Nigerian scheme of things. The region tends to be a terminus for lorry transport since few vehicles trade beyond Yelwa to more northerly towns. Sokoto and Birnin Kebbi in the northwestern corner of the country are rarely reached via A15, rather, transport moves to these towns on the paved road through Zaria and Gusau.

Summary: The rural economy here described is an extremely varied one producing most necessary goods locally. People have learned to exploit the wide variety of resources in their environment using opportunities of the land, the natural vegetation, and especially of the river. In this economy most families produce the food necessary for their subsistence. Beyond subsistence they have created a rich tradition of handicrafts with many specialized producers. Goods and specialities are exchanged in a lively trade pattern carried on through many outlets giving producers the opportunity to compete in a free market place.

Although remote, the economy of the Kainji region is in constant communication with the outside world. A large variety of goods are imported, some of them productive such as nets and fish hooks, others necessary such as cloth, and many that would be considered luxuries by the local folk. For export farmers have found a profitable crop in the intensive cultivation of onions, and to a lesser extent in the production of beans and smoked dried fish.

## II. THE GEOGRAPHIC STRUCTURE OF DEVELOPMENT.

Economic development can be considered an increase in the production of goods and services to the end that the income of the community rises and its members achieve higher levels of living. Planned economic development must therefore focus on finding ways of encouraging increased production. To assess the potential for rural development we have to take a preliminary look at the geographic distribution of production.

Geography of Production: Certain production activities are tied to the location of raw materials from which the goods are fashioned. These primary economic activities are first, agriculture, also fishing, forestry and mining. Some processing of raw materials, i.e. secondary industry is carried on close to the source of primary production, but most is effectively established at the point where transport, labor force, and market are combined, that is in the larger towns.

The tertiary economic activities, trade, services, and administration have to be sufficient in rural areas to serve the agricultural and other population engaged in primary production but most tertiary economic activities tend to see the advantages of the city.

The general structure of the geography of production thus consists of the city where most economic activity is found, and the vast remainder of the country where farming, pastoral herding, fishing, and forestry production are carried on. Some primary economic activity may give rise to its own city, this is true of mining in particular. Rural activity may give rise to small towns as administrative and service centers, but the major outlet for agricultural products are the cities and larger towns with their labor forces engaged in other than primary production. It should therefore be clear that the problem of rural development does not lie exclusively in the rural areas, but hinges on the development of the urban centers and depends for growth on the increase of urban population.

Geographic Structure: Towns tend to arise at places particularly favored by transport opportunities, e.g. ocean ports. Lagos and Port Harcourt are examples in Nigeria. Industry may find opportunities of market and labor force in old established urban centers, Kano is an example of such a modernizing town. Raw material sources seldom give rise to industrial development, but Jos is an example of a mining town which has drawn other industry to itself. In a country where most of the population has been accustomed to subsistence production such developing urban markets will stimulate the farmers to produce in excess of their needs for sale to the towns.

The greatest impact of this new market demand will be in the nearby rural regions, and these will continue to supply fresh fruit and vegetables, eggs and milk. As demand grows grains and other staples will be supplied from more distant regions, while meat on the hoof may come from remote distances. <sup>1/</sup>

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<sup>1/</sup> Readers familiar with geographic theory will recognize that the author is restating a von Thünen model of agricultural production.

The developing country may then be described as consisting of one or several core regions -- the industrial cities with their surrounding immediate agricultural hinterland. These are the regional growth points of economic development. The remainder of the developing country will be devoted largely to raw material supply, -- agricultural regions with market and administrative centers. Finally there may be remote regions sparsely inhabited by pastoral nomads.

The situation in a developed country will be quite similar. The industrial or manufacturing belt will be a larger region of much greater productivity but not fundamentally different from similar core regions in less developed countries. Agricultural regions in a developed country, however, tend to be less transport oriented but to rely more on regional specialization serving the entire national domain. Such specialized agricultural regions have their counterpart in underdeveloped countries in regions of export crop cultivation.

In Nigeria three core regions of growing industrial concentration may be identified. These are the Lagos - Ibadan region; second the region of Port Harcourt; and finally a much more dispersed growth region of the Jos - Zaria - Kaduna - Kano axis. Agricultural development outside of these regions depends on access to the same urban markets; i.e. favorable transport conditions, or on an environment especially suitable for one or another export crop.

The Position of the Kainji Lake Region: As has been indicated the Kainji Lake region is a remote region of primary production. It is located roughly equidistant from two major core regions of Nigeria which are centered on Lagos and Kano respectively. Kainji is not located between these but about a hundred miles off the main rail and road link connecting Lagos and Kano. Thus from a locational standpoint the middle Niger region is an unfortunate choice for development planning. Any proposed investment for the intensification of agriculture or for industrial production is likely to show greater returns if applied to an area closer to markets and labor forces, and to the advantages of supporting services supplied only in urban areas.



The irrigated fields along the river are capable of producing a wide variety of high value vegetable and fruit plants during the dry season. However, ~~none~~ of the crops that can be envisioned is capable of surviving the transport on the very rough roads of the area, neither are any capable of withstanding the long periods of storage demanded by the distribution system. What is more the limited demand for high value fresh vegetables is effectively provided by areas much closer to the core regions of urban demand.

It is possible to envision a canning factory in the vicinity of the dam with coordinated production of tomatoes or similar products for long term preservation. But again the question arises, why in this remote region. If Nigerian demand justifies such production the factory is best established in an existing center with its supply coming from nearby areas.

Similar arguments apply to the establishment of organized irrigation projects within the Kainji region. Major investment in agricultural development projects are likely to bring greater returns in locations more accessible to transport.

Summary: Farmers of the Kainji region have developed a successful and profitable trade in one crop capable of surmounting the high costs of transport and storage, as well as repaying the labor demands of irrigated agriculture. Improvements in this economic pattern depend not on action by the farmers in the region, but obstacles to economic development should be sought in factors outside of the Kainji area. Locational considerations indicate that development depends on better access to the markets of Nigeria through improvements in transport. Further development can then be expected as demand for high value foodstuffs increases with urban growth.

The building of better roads and markets is the major need for rural development in the Kainji region. Other action must address itself to enhancing the present agricultural pattern. This can be done through (1) improving the present onion cultivation, and (2) diffusion of this form of farming to other groups.

Further development may be warranted where the lake promises a change in resources so that a structural change in the economy is possible. This is likely to occur only where the river is transformed into a lake with the promise of a much enlarged fish population and the consequent promise of an intensive commercial fishery.

### III. POSSIBILITIES OF RURAL DEVELOPMENT

Roads to the Kainji Region: Transport is the most crucial variable in the development framework. For the Kainji area the paving of the road from Kontagora through Yelwa to Sokoto might prove the most effective step for development. This route would have the additional advantage that it would shorten the road distance from the south to Sokoto by two hundred miles.

Another major improvement to transport in the region would be improvement in the ferry at Rofia. Better would be the construction of a bridge, although traffic in the area may not warrant this immediately.

Market Towns: The importance of the four wholesale markets and of the smaller village markets for the local economy has been explained. These places are the assembly points for cash crops from nearby farms. The markets are of necessity transport junctions of river and road where goods are transferred, and which are visited by dealers and lorries from the urban centers of Nigeria.

Because of this role it is of utmost importance that good feeder roads exist to make these villages accessible to traders. In this respect and perhaps only in this respect does the resettlement offer a unique opportunity for improvement. As part of the reconstruction great attention should be given to the provision of an adequate net of feeder roads and markets.

The Central Place Role of Markets: The market towns fulfill an important function as central service centers in the rural economy. Two market towns are administrative centers; Yelwa is the capital of Yauri Emirate and Bussa is the seat of the Emir of Borgu. A third major market is a district headquarters as are several smaller markets.

The market towns have become the foci of other services as well, post offices, upper and lower primary schools, clinics, a small mission hospital, to name but a few. The market is also a place where handicraft workers congregate to work and offer their wares, frequently to remain and to establish permanent workshops. In short the small market center plays in the local economy the core region and growth point role played in the national economy by Lagos and Kano.

From the standpoint of planned rural change it is important to build up this group of market towns. At present some farmers have to bring their crops as much as twenty or thirty miles along the river to a wholesale market, while farmers at greater distances are discouraged from cash cropping. Thus a few additional center could be selected to become growth points for the rural economy. Additional wholesale markets are needed at Utonu, between Yelwa and Bussa, and at a strategically selected point upstream from Yelwa. In these cases feeder road access is a prerequisite for growth. Given this initial encouragement other central services could concentrate in the selected places. Thus, by fostering the growth of central places the growth of the rural economy as a whole would be encouraged.

Change in Agriculture: Considerable thought has not suggested any more profitable crop for the farmers of the region. Development must therefore focus on improvement of the present pattern of cash cropping.

It has been mentioned that peak labor demand occurs at the time of the guinea corn harvest, when onion beds demand regular and intensive watering. A small contractor's pump such as might be purchased by a large family would enable the operators to handle a larger field of the cash crop. Such investment is to be recommended to local farmers.

Development of mechanized irrigation, however, is utterly dependent on repair and parts service in the area. Such service may be initially fostered by extension services until it can be taken over by private traders at a profit. The fostering of a suitable mechanical service fills the additional need for service of outboard engines and motorcycles.

The first are used on the river and are expected to increase once the lake creates greater cross water distances. The second is an increasingly important means of transport in the region.

Diffusion of the Present Farming Pattern: It has been mentioned that the Gungawa are the group most closely identified with the cultivation of onions. Hausa and hausaized Gungawa are the second most important growers. Relatively few members of other tribes have taken up irrigation farming and the growing of a cash crop. The fact that some have done so may be taken as an indication that many more members of other groups might take up irrigation. Thus, one of the most promising efforts at rural development aims at drawing subsistence farmers to the lake and into the commercial farming economy on the pattern already established and proven successful.

Another important effort at diffusion of an established crop is the introduction of cotton and groundnuts in the area. Efforts in this direction are at present underway by the extension services in Yauri and Borgu. Both of these crops are export crops in the north of Nigeria with existing marketing structures. Extension of groundnut and cotton marketing into the Kainji area depends again on the strengthening of the infrastructure.

The Role of Extension Services: Agricultural development, the introduction of new crops, the diffusion of established methods to other farmers, the improvement of farming methods, all these depend on the role of extension workers for their implementation.

The present extension service operates under a Ministry of Agriculture. The work is directed by Provincial Agricultural Officers, Agricultural Supervisors on the regional level, and Assistant Agricultural Supervisors at the local level. The man on the bottom of this hierarchy and in direct contact with farmers is the Agricultural Instructor. He is the most important man from whom the farmer learns about new methods and crops. Use is also made of posters and occasional radio broadcasts, these however do not impress deeply in a farm population completely illiterate, so that the burden of advice continues to rest on face to face contact with the agricultural instructor.



Agricultural Instructors pass Standard Seven in primary school, have a rudimentary command of English, and attend a nine month long training course in agriculture. Thus their education must be regarded as minimal only, and their accomplishment as great. Because of their training they are rarely qualified to decide questions of agricultural practice independently, or to advise farmers on the merits and problems of farm management in the individual case. Rather extension work tends to assume the character of implementing general advice received from experts higher up in the hierarchy. Emphasis is on the program to be pushed at the moment, on cotton today, on fertilizer or plowing tomorrow. Yet despite these shortcomings many advances in agriculture made in the middle Niger area must be ascribed to the work of the extension service. The slow patient change engendered by consistent advice to farmers is apparently the most effective method of rural development. An increase in the extension services, and better training for its practitioners should be one of the first priorities of economic development.

The Fishing Industry: Unlike agriculture the creation of the lake promises an enhancement of fish resources. As the reservoir raises an immediate effect will be a decline in fish members relative to the vastly increased volume of water. Over the long run this increase and the extension of shallow water and swamps will produce a great increase in fish populations. Potential yield is estimated at 10,000 tons per year, roughly quadrupling the present catch.

The size of the lake and the value of the potential catch do not appear to make fishing by large scale commercial firms feasible. Neither should such firms be encouraged before local fishermen have had a chance to adapt to lake conditions.

After inundation the present fishermen will lack knowledge of best fishing grounds, much of their equipment will not be suitable to lake fishing conditions, and some of the reeds and grasses used in making equipment will be inundated. The development objective is therefore the rehabilitation of the present fishing population to enable them to exploit the lake environment.

Such rehabilitation is essentially a learning process in which fishermen are helped to make their own investments in suitable gear. Consequently Jenness has suggested a fishery extension service with approximately one instructor for every 500 fishermen. The extension workers would instruct not only in more effective methods of fishing, but would also endeavor to upgrade home processing and handling of fish. Improvements are especially called for in smoking and preserving of fish, and in the cooperative trading of the product. As fish populations increase more itinerant fishermen are likely to visit the reservoir area and to exploit the resource created by the dam.

Boats: The boats used presently may prove too small or too unstable for effective use on the open lake. An improvement in boat construction and handling is needed in the area. Again this does not demand a radical departure from existing models but improvements in design and increases in size. The present dugout boat repair industry could be upgraded and craftsmen should be taught to build plank boats. Such large boats are already in use on the Niger as transporters but are built in the countries farther upstream.

Conclusion: The middle Niger region is remote from the centers of population and production. Its chief contribution to the national economy lies in primary production of food stuffs and in the initial home processing of the product. The development of the region does not so much depend on action taken in the area itself, but on stimulation of demand from the markets in the urban centers of the country. Thus, the most important requirement for rural development is the enhancement of the infrastructure, especially the improvement of transport.

Development efforts in the region that promise repayment are not in the nature of dramatic departures or major capital investments. Farmers in the region have found the modes of production, the crops and the markets which will repay their efforts. Enhancement of the present economic pattern is needed. This is best accomplished through the slow patient work of extension services which would benefit from upgrading and improvement of training.